The first time I was called in as an expert witness in mining claim disputes was in 1949. Mrs. Mandeville, a member of the Cuddy family who owned considerable land in the Cuddy Valley just west of the Ridge Route, filed for several claims adjacent to this area. Since each claim had springs, it appeared that water might be the objective, although she claimed building material. No type of building material was in evidence.

A hearing was held before a Land Office Commissioner, and the ruling was in our favor. A year later, she refiled and claimed new evidence. This she could not sustain. At her first hearing, her attorney claimed that the Government attorney was harassing her and made a personal issue of it. At the second hearing, he became provoked at her claims and changed his attitude entirely.

These hearings always seemed pitiful in a way. While they, in general, followed court procedure, the Government representatives were skilled in presentation while the attorney of the person filing was usually green at this type of hearing, and often dismayed at the turn of events. For instance, when they objected to the evidence being presented, and said that it was "incompetent, irrelevant, and immaterial," the presiding officer would say "objection noted," and the witness would proceed with his testimony.

On the Stanislaus Forest, there was an individual who made his living filing mining claims on choice summer home sites, then selling his "right, title, and interest" to anyone with the necessary funds. We had such a case in which the defendant was a black gentleman. "You are picking on me because I am colored," was his contention. This made his attorney, also black and a member of the State Legislature, grin. He was claiming granite as a building material. There was plenty of granite, but it had no economic value. The individual conducting this business had a good thing. He was reported as making up to $15,000 per year. There was always a new crop of people willing to pay his price. When he met an adverse ruling, he merely moved his boundary stakes a few inches and filed a new claim. When criticized at the hearing, he said, "What I am doing is within the law. You can't stop me. I intend to continue selling these claims." So the business went on endlessly, with refiling and new hearings.

In 1956, a filing was made on a proposed campsite on the Ortega Highway on the Cleveland Forest, the person filing claiming a granitic material as suitable for building. The mining law says that the material must be unique. This whole area was of the same geological formation, so his claim was disallowed. However, he had mussed the proposed campsite area pretty badly with his bulldozer.

Also in 1956, a filing was made along the proposed route of Highway 30 northwest of San Bernardino on the San Bernardino Forest. This filing included the site of a guard station in use for many years by the Forest. The operator sold considerable decomposed granite from the site before being stopped. This site was on Wilson Diorite, which occurs throughout the southerly portion of the San Gabriel Mountains from west of Mount Wilson easterly, so it could not be called unique. The claim was disallowed. The area would have been very valuable for building sites.

Engineering in Region 6: USDA Forest Service

R.F. Grefe

Preface

A history, as we ordinarily think of it, is a continuous systematic narrative of past events. In order of time, this presupposes research into reliable written records and documents to ensure an accurate picture of what happened in past years and who the men were who were responsible for the events, changes, and developments that took place.

To compile a history of Engineering in District 6, later known as Region 6 and now as the Pacific Northwest Region, it has been necessary to depart from conventional methods. There are no logs in existence covering year-to-year happenings. All correspondence older than 10 years is safely stored in archives and for practical purposes unavailable for historical purposes. This leaves people (and their memories) as the main source of information. For the period 1907 to 1930, however, there are very few men of the Division living. For the later years, the writer is indebted to Vic Flach, Frank Flack, Ethel Chatfield, Ward Gano, L.A. Waggener, and Tom Utterback for their collaboration and assistance in putting events in their proper order.

The writer served as Superintendent of Road and Trail Construction on the old Cascade National Forest (now the Willamette) from 1925 through 1929; in the Regional Office in Operation and Fire Control from 1930 to 1933; as Assistant Supervisor at Mt. Hood from 1933 to July 1934; in Timber Management from July 1934 to August 1935; in the Division of Engineering as Assistant Regional Engineer from August 1935 to July 1951; and as Regional Engineer from 1951 to June 30, 1961. In the following narrative, I have drawn partly on my own recollections for the period 1925–61. Absolute accuracy on dates, names, and facts is not guaranteed. Any corrections or supplemental information will be most welcome and very much appreciated.

The first mention of engineering in Forest Service activities was made in the 1907 Forest Service Field Program with W.E. Herring designated as Chief Engineer in the Chief's Office. In 1908, he apparently had an assistant, A.T. Michelson, stationed in Ogden. In June of the same year, the program listed Herring as Chief Engineer, F.C. Wales as Assistant Chief, and R.E. Mesnard at Ogden. In December 1908, Herring was apparently transferred to Operation, District 6. This is the first mention of an Engineer in the Region, but not of an Engineering Division. There was apparently a slight change in March of 1910 when Herring was listed as District Engineer, but still in Operation.

From maps available from the early period, it is evident that at least a start was being made in the work. The Field Program of 1909 states that Forest Service atlases covering eight Forests were being furnished to District 6. Township plats were apparently pieced together to serve as working tools. Forest boundaries existed on paper but not on the ground. Ranger District personnel cut out and marked a few trails. That was as far as it went in 1910—horses and mules for transportation, few roads and trails, maps extremely questionable as to coverage and accuracy.

The April 1913 Field Program lists Phil Dater as District Engineer under the District Forester, and in January 1917, with George Cecil as District Forester, Engineering was finally given divisional status. In the same year, Allen Hodgson took over Surveys and Maps, R.H. Robertson handled waterpower. In 1918, Cecil Lord was added to the staff in charge of surveys. It can well be assumed, then, that with the expansion 1913 to 1918, Engineering began to get its feet on the ground. Entry and timber surveys provided data for appreciably improving Forest maps. Road and trail construction standards came into being though in very sketchy form. Waterpower was recognized as a coming major activity in District 6. In 1920–21, still under Dater as District Engineer, entry surveys by George Root and E.R. Johnson assumed their place in the program.

In 1917, the first major improvement in mapping methods was put into practice when Lage Wernstedt used panoramic terrestrial photographs with transit triangulation to map 700 square miles of the Columbia National Forest. This mapping was accepted by USGS, and the method was continued in use on the Cascade, Umpqua, Mt. Baker, and Chelan in the early 1920's. During this period, Vic Flach was Chief Draftsman, and his counsel and advice went far in expediting the development of new methods.

From 1922 to 1930, improvements and minor roads were a responsibility of Operation. Major roads and Forest highways remained in Engineering. The 1922 Road Handbook was 4 inches by 6 inches in size and had 14 pages. In 1924, a new name appeared on the Engineering roster—that of Jim Frankland, with Allen Hodgson in Surveys and Maps. Frankland had, however, been on the job for several years prior to this time on entry and timber surveys and other Engineering activities. We will hear much more about him later. In 1922, the Engineering staff numbered 17 men—10 of them in Surveys and Maps.

About this time, a real change began to take shape in road construction. Horse-drawn rippers, graders, and slip scrapers rapidly went out of the picture. Horses were replaced first by surplus Army 5-ton and 10-ton Holt tractors, then by Caterpillar D-2's and 30's, and later by D-4's, D-6's, D-7's, and D-8's. Along with this came the development of the bulldozer. It has been a moot question as to which Region pioneered in this development. The writer does not wish to reopen any controversies, but in 1925 he did see a Caterpillar demonstration of a bulldozer at Wind River on the old Columbia Forest. It worked. Since that time, no piece of machinery has done more for forest road construction than the bulldozer, both in miles built and dollars spent. Following this came the power lift grader designed in preliminary form by K.P. Cecil and Carl Deffenbaugh, and later the patrol grader.

In 1926, Frankland took over Surveys and Maps. With Flach in charge of Drafting, the mapping program went forward as rapidly as personnel and finances permitted. Waterpower assumed a larger role, with construction of the Lake Cushman Dam on the Olympic and Diablo Dam by the City of Seattle on the Skagit River. Road and trail construction was pushed and the "9-foot road" occupied the center of the stage—9 feet of total width including shoulder—not a foot more. Each Forest had a "Construction Superintendent." Before an inspection, he made sure that overbreak on going projects was pushed over the bank to leave only the required 9 feet of width.

1928 began with Phil Dater continuing in charge of the Division and Frankland as his assistant. In 1930, active work was started on Transportation Planning to meet fire control needs by Grefe, Bottcher, and Arnst. The job, as it affected fire control, was completed in 3 years, but the original plan proved to be wholly inadequate to meet timber needs as they developed 15 or 20 years later. Nevertheless, it paid dividends in systemizing road programming in the intervening period. Working for Fire Control, the same three men worked out a system of visibility mapping from lookouts, using panoramic photos. This proved valuable in assaying the effectiveness of existing lookout points and selecting additional points needed to fill the gaps.

In 1932, after the sudden death of Philip Dater, Jim Frankland took over as District Engineer with Herbert Howes in charge of waterpower and hydraulics. The following year marked the beginning of an unparalleled decade of engineering activity. In the spring of 1933, the first CCC camp was established on Mt. Hood, followed in rapid succession by additional camps throughout the Region. At the height of the program, there were 84 camps on Oregon Forests, 41 on Washington Forests, 14 on Oregon State lands, and 7 on Washington State lands.

All of this first required hiring of camp superintendents and foremen, selection of campsites, construction of camps, procurement of tools and heavy equipment, approval of work programs, allocation of funds, and approval of expenditures. The Division of Engineering provided overall supervision, guidance, and inspection. Elliott Roberts was detailed to the State of Oregon to head up its program and Lloyd Brown to the State of Washington. Three men in Engineering were authorized to approve CCC vouchers. A stock of vouchers 12 to 24 inches high was par for the course day after day.

The work done in Transportation Planning paid off during this program. Road construction moved ahead rapidly. The architectural section under W.I. (Tim) Turner did an excellent job in designing a new style of forest architecture to replace the conventional gray buildings up to this time. Following the Tillamook Burn in 1933, Surveys and Maps, with Lage Wernstedt, mapped 2,000 square miles for timber management purposes on a 1-inch-to-the-mile scale, with 100-foot contour interval, from photographs and transit triangulation.

In 1935, Grefe was assigned to the Division as Frankland's assistant. Pagter and Angell continued to supervise the emergency work, which by 1937 included ECW, ERA, and WPA cooperation and some resettlement activities

in addition. During the winter of 1935–36, Regional Forester C.J. Buck and WPA Administrator W.E. Griffith worked out an agreement to build Timberline Lodge at Mt. Hood—the Forest Service to furnish architectural services—the WPA to supply labor and materials. Architectural work started immediately under Turner, assisted by Gifford, Forest Wright, and some eight or ten additional architects and materials men. This is one of a few buildings that were designed from the top down. No topography of the site was available, and the ground floor and foundations were planned after the upper stories were roughed in. In May of 1936, the road to the site was opened using a power shovel in 6 to 20 feet of snow, and the site was cleared using a dragline. Construction was started in June. In July, the west wing was framed, and by the end of November, the roof was on and the exterior well toward completion. The lodge was dedicated by President Roosevelt September 28, 1937.

During 1935–36, Ward Gano, Bill Nelson, and Al Loew came into the Division from the University of Washington. They were designated by the Dean of Engineering as the graduates best fitted for Forest Service activities. The Dean was right. They, along with R.J. Mather, teamed up in 1938 to prepare contract purchase and erection specifications for the first ski chair tramway on National Forest lands, the Magic Mile lift at Timberline Lodge. As the CCC program was gradually cut down, Verne Church, Hempe Erickson, F.D. MacPherson, Max Rands, Bill MacDonald, and Art Glover were taken into the Division, largely on field inspection work.

During this period, the structural section of the Division under R.W. Lincoln and W.D. Smith made important contributions in treated timber construction, using engineering connectors. Among these were the 345-foot span, truss-stiffened, Graves Creek suspension bridge across the Rogue River, erected by CCC forces, as well as 7-foot by 7-foot and 14-inch by 14-inch treated timber lookout towers in heights up to 120 feet, which were adopted as Service-wide standards.

In 1938, the Region made an active start on mapping using vertical photos and the "Wernstedt Photograph." A great deal of credit is due Lage Wernstedt for the pioneer work he did in developing field and office mapping methods, his unswerving tenacity in working on the problems involved, and the good judgment and accuracy he displayed in his work. He pioneered in a new field and set mapping ahead by years through is ability and efforts.

In 1937, the Equipment Laboratory, under the direction of T.P. Flynn, started active work on development of specialized equipment needed by the Service but not manufactured commercially. This work continued until about 1950, and resulted in production of a variety of items to serve road and trail construction, fire control, timber management, and other activities. Among them were the trail compressor, trail tractor, trail beetle, trail mule, trail grader, and trail patrol grader (the latter developed by L.A. Waggener). Road equipment included a portable rock crusher, rock ripper, front and motor patrol blade, and a portable chipper. The original heavy logging tractor and the sno-motor were early development items. Most of this equipment served its purpose well and was later taken over in whole or in part by commercial companies. No attempt was made to patent any of these items, the purpose being to try them out and get them into commercial production if possible.

1941 started out with Al Loew heading up Communications, and the launching of a section of Equipment Control and Departmental Shops headed by R.A. Bottcher, with Waggener, L.C. Roberts, and Venske assisting. Six departmental shops were set up at individual Forest headquarters, in addition to the Portland Shop. With the start of World War II and the bombing of Pearl Harbor, the Division was given the responsibility of cooperating with the Army in setting up, manning, supplying, and operating the Aircraft Warning Service. M.L. Merritt, Lloyd Brown, and Bill Parke were detailed to the Division to handle the job. The whole operation went smoothly in spite of adverse winter weather conditions prevailing on some of the points occupied.

Vic Flach was detailed to the War Mapping Program in April of 1942. The work of the section of Surveys and Maps was capably carried along by Gowan and Simons until Flach's return to the Region in the summer of 1944. In the years following, the Cartographic Section completed a major job in securing prints and indexing 20,000 square miles of aerial photography taken by the Forest Service, Army, Geological Survey, Soil Conservation Service, and Production and Marketing Administration. This index has been kept current, with the scale of photography, focal length of camera, year flown, and other pertinent data for each set of photographs.

In 1943, there was a shift—Bottcher from Equipment Management to Roads and Trails, and MacDonald to Equipment Management in his place. In 1946, Gano headed up Structural Improvements with Mercer and Plath, and W.K. Nelson was placed in charge of Water and Hydraulics. During this period, increasing demands for timber resulted in a rapid increase in construction of timber access roads, with the successful bidder for a block of timber building his own roads and bridges according to specifications included in the sale contract.

Surveys and Maps started the drafting of planimetric maps on a 2-inch scale in 1947 and completed the job in 1954. To carry the work of this section somewhat ahead of sequence, the compilation of wholly new Forest maps was started in 1953 and completed in 1962—100,000 square miles covering all Forests. Each Forest map has since been revised and brought up to date at 4-year intervals.

In 1948, E.P. Roberts took over Equipment Management assisted by Waggener, Guiberson, Deets, and Campbell. L.C. Roberts headed up the activities of the Departmental Shops. Equipment Design was still handled as a separate section under Flynn. In 1951, Jim Frankland retired, and R.F. Grefe succeeded him as Regional Engineer. Gano was transferred to Region 1, Kelly Heffner took charge of Structural Improvements, and DiBenedetto headed up Architecture.

By 1953, further personnel changes had taken place. Fontaine took over Communications, Roger Nelson was placed in charge of Roads and Trails, assisted by MacDonald, MacPherson, Church, Erickson, Rands, E.P. Roberts, and Frank Flack. L.C. Roberts assumed the Equipment Management job. The next year, in 1954, C.E. Remington came to the Division as Assistant Regional Engineer. Data for 1955–57 are not available, but during this period the Departmental Shops were discontinued, Waggener headed up Equipment Management, and Blackwell took charge of Water Development,

Utilities, and Architecture, assisted by DiBenedetto, Hart, and Hahn. About the same time, Tom Utterback came up from Region 3 into the Road section, then in 1960 moved to take charge of Water Development and Architecture, with Blackwell moving up to Assistant Regional Engineer after Remington's transfer.

These changes in assignment are no doubt somewhat confusing, but they were dictated by changes in work load, availability of men to do the job, and for training purposes. By and large, over the period 1940–60, the original personnel integrated very efficiently with additions made from time to time from other Regions.

To go back to 1958, that year marked the beginning of machine computing in road design. It started quite modestly with traverse notes, expanded as new programs were worked out, and finally included all elements of road design, including cuts and fills, quantities, and plotting of notes. Machine work from 1958 to 1966 was done on the BPR computer, and beginning in 1966 on the Forest Service machine. Some idea of volume of work processed and amount of road work actually under way in the Region can be gained from the following figures:

1958	50	miles processed on the computer
1959	500	miles processed on the computer
1960	1,100	miles processed on the computer
1961	1,800	miles processed on the computer
1962	2,400	miles processed on the computer
1963	2,200	miles processed on the computer
1964	1,900	miles processed on the computer
1965	2,000	miles processed on the computer
1966	2,100	miles processed on the computer
Total 1958–66	14,050	miles processed on the computer

In 1967, the Region had 38,835 miles of existing roads valued at $647,985,000 and 14,765 miles of trails with a value of $6,992,500. These values include 2,952 bridges costing approximately $35 million.

At the same time, plans call for further construction of 38,024 miles of roads at an estimated cost of $1,172,548,000 and 2,930 miles of trails estimated to cost $18,811,900. It appears from these figures that the Division has enough work ahead to last for some time.

To again go back in point of time, Grefe retired July 1, 1961, and Gano finally came back to Region 6 and took over as Regional Engineer on that date, with Blackwell as his assistant. Meanwhile, Roger Nelson transferred to Region 3, and Utterback took over his duties. Lynch was designated in charge of Administrative Services. The branch of Transportation System Development was expanded to cover the going program, Frank Flack was designated as Sign Coordinator, and Lee Corbin took over Trails. Warren Davies and then Hector Langdon replaced Erickson in charge of Road Programs and Records. Bruce Plath transferred from the Chief's Office to take over General Engineering, with Don Hart as head of Water and Sanitation. Don Loff assumed responsibility for Methods and Training after Blackwell retired in 1966, and Roger Chamard took over Surveys and Maps when Vic Flach retired after some 50 years of service.

With the advent of Job Corps program in 1964, the Division of Engineering designed standardized prefabricated wood buildings required for the four centers built in Region 6. These plans had wide use throughout the Forest Service and other agencies, and earned a Presidential citation for the Region.

In 1967, there were 115 people in the Division of Engineering. In 1965, the Regional Office had moved to the remodeled Multnomah Building in downtown Portland. For the first time in history, there was adequate room, well-arranged and well-equipped for the job in hand, and the people to do it. The work load of the Division is probably as heavy as that in any Region and getting heavier each year. The organization as set up is handling it well.

Recommendation

It is extremely difficult for one man to pick up 60 years of history such as this. It is my recommendation that the Regions or the Chief's Office continue the Regional writeups each year with the objective of having a more accurate and complete log for the period 1968–2000.

History of Engineering

Ray Huber

Foreword

To prepare a history of any subject, I suppose one should start at the beginning. So, in starting my history record or career record with the Forest Service, I am starting in the year 1910.

I am writing this at the request of my good friends and former associates in the Forest Service, Messrs. A.P. Dean and J.J. Byrne. The expressed intent was to gather a historical record of Engineering in the Forest Service spanning the time since the inception of the Forest Service in 1905 to the present. It is something that has long been needed and must be accomplished before those with intimate knowledge of the anecdotes and reasoning behind many of the successes and failures have passed on. My part of the history involves only two regions but led me into contact with many of the men who "made" the Forest Service. My career in the Forest Service was from May 15, 1933, through 1961, but my contact has been since 1910.

In 1910, my brother, Walter L. Huber, was given a job as District Engineer for the California Region of the Forest Service. As we later knew the job, this was a Regional Engineer's job. I am sure, since at that time I was only 9 years old, the most impressive part of the job was the fact that he had a brass pine tree badge to wear, and this impressed me greatly. Later, in discussing projects with him and reviewing some of the history, I came to realize that his most important work as a Regional Engineer was the review and study of Federal Power Commission projects and mapping. At the time, there apparently was little construction going on, and the road, trail, and other work was being done at Forest level, with minor supervision from the Regional Office. However, the resource studies, which included power development, water management, etc., were handled at Regional level, and therefore this was the major portion of the job. Walter remained with the Forest Service until 1913, at which time he left for private practice.

Frederick Hall Fowler was the next Regional Engineer. Mr. Fowler was well qualified to handle the resource studies and continue on with the Federal Power Commission work. Fowler was from an old-line Army family, was very strict in certain ways, had a very keen sense of humor, and it was always a pleasure to do business with him. He was straightforward and very understanding of problems that bothered other people. His handling of the Regional Engineer's job was a credit both to him and to the Forest Service. He left in 1922 to go into private practice, at which time Frank Bonner became Regional Engineer.

W.L. Huber, June 19, 1955.

Frank had worked with the Forest Service prior to this, understood the problems, and was an excellent man for the job. He also was a highly thought-of Engineer and understood the water problems of the State very thoroughly. Bonner was a "hail-fellow-well-met" man, an excellent man to deal with the public, and a very good man for those working under him. He was very understanding of people's problems and was a good leader in this position.

My first actual contact with the Forest Service was during the time a water filing was being prepared for water rights on the Middle Fork of the American River. This was in 1927, and Bonner was then Regional Engineer. Since I had been responsible for mapping the area, I went before him a number of times to justify certain things that had been mapped, and to explain other conditions that existed. I got to know Bonner fairly well and was quite impressed with his knowledge of the backcountry. In looking back, I am still quite impressed with the intimate personal knowledge the Regional Engineers had of the high mountain country. I am sure that my brother knew the back trails of the High Sierra as well as any man that has worked for the Forest Service, and I am sure that the other Engineers were equally familiar with the outlying areas and particularly with the stream conditions of the various sections of the Region.

Bonner left in 1929, and Ed Kramer, who had been his assistant, took over at this time and held the Regional Engineer's position until 1936.

It was during Kramer's tenure that the Civilian Conservation Corps and other make-work programs were introduced. Kramer had a number of very capable men working for him and was an able leader, so Engineering began to pick up a work load in providing plans, specifications, and leadership in engineering-type projects.

After completing the water filings previously mentioned, and thus losing some contact with the Forest Service, I did not again have an opportunity to work with the Forest Service until May 15, 1933, at which time I started work as a Bridge Superintendent for the Service. No one could have started with any organization under better conditions than I did. It was the beginning of the big make-work program. The Forest Service was working with a nucleus of experienced men who had been with the Forest Service for some time, but it was totally lacking in the numbers of personnel needed to take on the various programs. These men were conscientious and untiring workers and were good leaders, and thus were able to develop organizations under them that were outstanding.

It was my good fortune to go to work directly under the supervision of John Lawrence. At that particular time, John was Bridge Engineer for the Region and in the past had done his design work in the winter and construction in the summer, he doing the actual design as well as supervising construction. When the big program started, he realized that a number of crews would have to be put into the field and the first thing necessary would be to have plans. My first 2 weeks were spent assisting him in reviewing all Forest Service bridge plans, and either okay them or modify them to bring the bridge loadings up to the H-15 standard, which was to be the new standard. The old standard had been the H-10 loading, which John realized would be inadequate for new logging conditions, as well as fire and other equipment. It was his vision that made a great many things possible for us as bridge builders, and also it was his vision that kept the Region abreast of new loading requirements and standards needed to meet these.

John was an untiring worker and was the kind of man who inspired this sort of loyalty in other men. It was not a bit uncommon for him to be working till midnight one night and be back at the office at 7:00 the next morning. With leaders like this, it was obvious that things were bound to move ahead and move speedily. To be sure, plans were sketchy, but it was also understood that when a superintendent took a bridge crew to the field, he would meet existing conditions as they were, and would do the best he could to keep projects moving. In my particular case, I was assigned to the Sims Bridge on the Shasta Forest. At this time the bridge crews, as well as the mapping crews, were working out of the Regional Office as Regional Office crews, and were not directly tied to the Forest organization. This could cause complications, but in most cases, I am sure, it did not. This again I think was due to John's and Littlefield's ability to keep things organized and to keep moving.

Before going on to the bridge building escapades and the history of our bridges, I cannot help but think of certain things that happened in the 2 weeks I was in the Regional Office. T.R. Littlefield, who was then in charge of maps, was working on a program for his mapping crew the same as Lawrence was for the bridge crews. We had been at this 2 or 3 days working in the same room with Lawrence, Littlefield, and a few others.

CCC crew and foreman, Sims Bridge, Shasta Forest, 1933.

Sacramento River at Sims, Shasta National Forest, February 24, 1934.

One noon after we had spent millions of dollars on paper developing various programs, Littlefield in his quiet way said, "Well, let's be practical. Who has 35¢ to go out to lunch?" I have often thought that this type of attitude was prevalent among many of the men and was the thing that kept our feet on the ground, even though we were dealing in ethereal numbers. T.R. has always had the ability to get down to the very basis of life, and I think this is quite worthwhile.

Now, back to the bridges. As I said, our first bridge assignment was to build a 160-foot suspension bridge with a 40-foot timber approach span across the Sacramento River at a point below Dunsmuir, known as the Sims crossing. I was given a pickup and a plan of a 160-foot suspension bridge, and was told by Mr. Lawrence that he would come up and show me the site within a few days, but that he thought the new bridge should cross the river some few feet below what had been an existing bridge, washed out before my arrival. I was sent to the site and was told that my foremen would arrive later. Starting promptly the next day, the foremen came in from various places. There was Pop Thomas, who was known as a principal foreman, which later developed to be the labor foreman. H.K. Pyles was a steel foreman. Bill Frazer was rigger foreman. Raymond Potter was called a blacksmith. Why this title was used I was never sure, but I believe that any title that had Civil Service standing at the right salary could be used temporarily, and probably this accounted for it. Bill Sylvester was sent as the carpenter foreman. I have always felt that Bill must have put in a pretty hard time with us. He was the older man of the group, an experienced carpenter foreman from PG&E, and a man who had worked with and supervised skilled carpenters of the heavy timber-type construction. The average age of our foremen, including Bill and myself, was about 25. So you can imagine the time that Bill had adjusting to this age group. However, he was a very competent man and became the backbone of our bridge crew for a long time.

Foremen, Sims Bridge, August 10, 1933. (Left to right: Ingles, Fraser, Thomas, Potter, Pyles, Sylvester.)

Norman Bailiff, Bridge Locator and Bridge Superintendent, 1935.

I have attempted to keep track of this crew through the years since we had a good start and worked together for quite some period of time. Pop Thomas passed away. Pyles became Assistant Chief of the Forest Service. Potter is handling repair and construction projects for small housing developments here in the Applegate area, and Frazer returned to the Redwoods in the Eureka area, and I have not heard where he finally wound up. I believe Sylvester has passed away.

They were a fine group of fellows. Each one worked his own system for, as was the case in those days, we had no training programs and no real book of regulations. I believe there was a small book available, but none of us knew anything about it, and so we made our regulations as we went along. I always think of Frazer as a trainer for a training program. We had been told that we should have certain little training programs, and it was a conversation piece and really nothing much was being done. I was after Frazer once because rigging was dangerous and he was a little bit wild in his approach. I told him that he had not trained the CCC boys anything about safety, but he assured me he had. I said, "Bill, what have you taught them?" He said, "I've taught them that when I yell 'duck,' they duck."

Frank Thunberg, Bridge Superintendent (later Asst. Bridge Engineer, 1937).

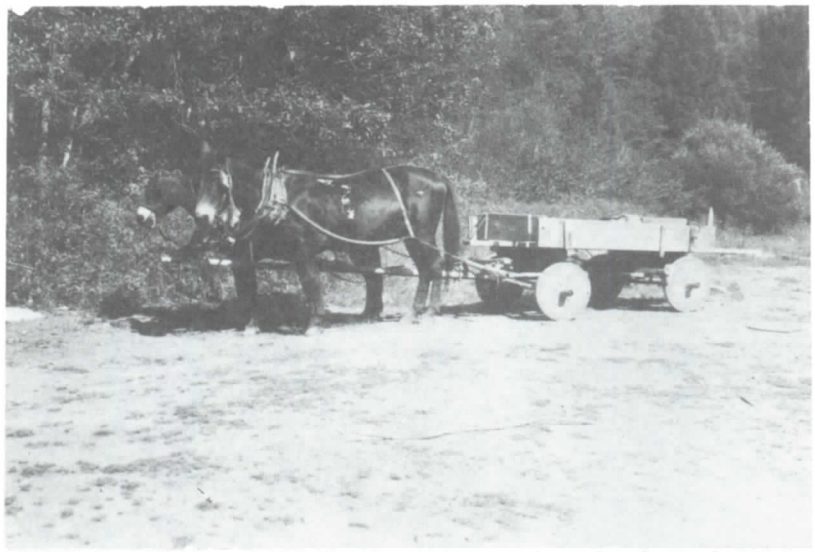
You know, I still believe that there is a certain amount of this philosophy that could be used in our present practices. At least he taught his men to be dependent upon themselves, and to be alert and ready to duck.

By the time our foremen had all reached the project, we studied the location, and since Mr. Lawrence had not arrived at the site, we decided to stake out the bridge and start the excavations. We were advised that we were to get our CCC boys from the Castella Camp. This was a camp 4 or 5 miles above us. We made arrangements with the camp superintendent to send us a crew and started from there. We had the excavation partially completed when Mr. Lawrence finally had time to visit the project. He looked it over and said, "Well, that's about where I would have put it." So we were on our way.

This was a fine project to start on. Bridges were good for the CCC boys to build because there was always something visibly accomplished, and it was easy to build up morale and to have good boys and good crews working on such a project.

One interesting thing was the equipment we started with. Our crew had a pickup, a 1-ton dump truck, and finally secured an old World War I Liberty truck. This was a hard-tired truck, and at full throttle would do about 15 miles an hour. It was an experience, but it was also the kind of equipment that could move things around if it had to be done, and so we made out. For hoists we had a 5-ton chain hoist and later got a hand winch for cable rigging. With this equipment, plus a concrete mixer and a couple of concrete buggies, we were well equipped. I don't think one should leave the equipment setup until we explain the situation on Government Island. Government Island must have stocked tons of World War I tools and equipment, and whenever we needed things, we were to secure them from the Island. These orders, of course, went through Lawrence's office in San Francisco, and then the equipment was routed to us. We particularly needed end wrenches and socket wrenches, and we ordered these almost daily. They always sent us a nice assortment from the Island. Usually they were metric, a great many of them were cast, nothing fit, and the socket wrenches were the little thin-sided metal type that one good pull always turned into full circle. I hate to admit this, but we must have almost filled the river with wrenches of various types. Finally, I believe, Government Island ran out—at least we commenced to get good wrenches and the world looked more level. I think this was true of quite a few of the projects. They too were getting equipment that was not suitable, but no one was worried.

You must remember that these were Depression times, and the fact that we all had jobs was all that we asked. We enjoyed our work, we had a great deal of fun with it, we worked hard, and there was always that thought that this was a job and that we were not going to give it up for anything better. Those of you who did not know the old times should realize that when we were hired we were told these were 3-month appointments, and that they would not be carried on beyond that, or at least they probably wouldn't be. This didn't worry any of us. When we got the jobs, we didn't have jobs, so 3 months was 3 months, and we kept right on going. My temporary assignment lasted from May 15, 1933, until sometime in 1939, at which time it became permanent. I often think of the people today—our young ones coming in worrying about the future and worrying about the security.



Wagon used to transport trail bridge material to South Fork Trinity Bridge site, 1941.

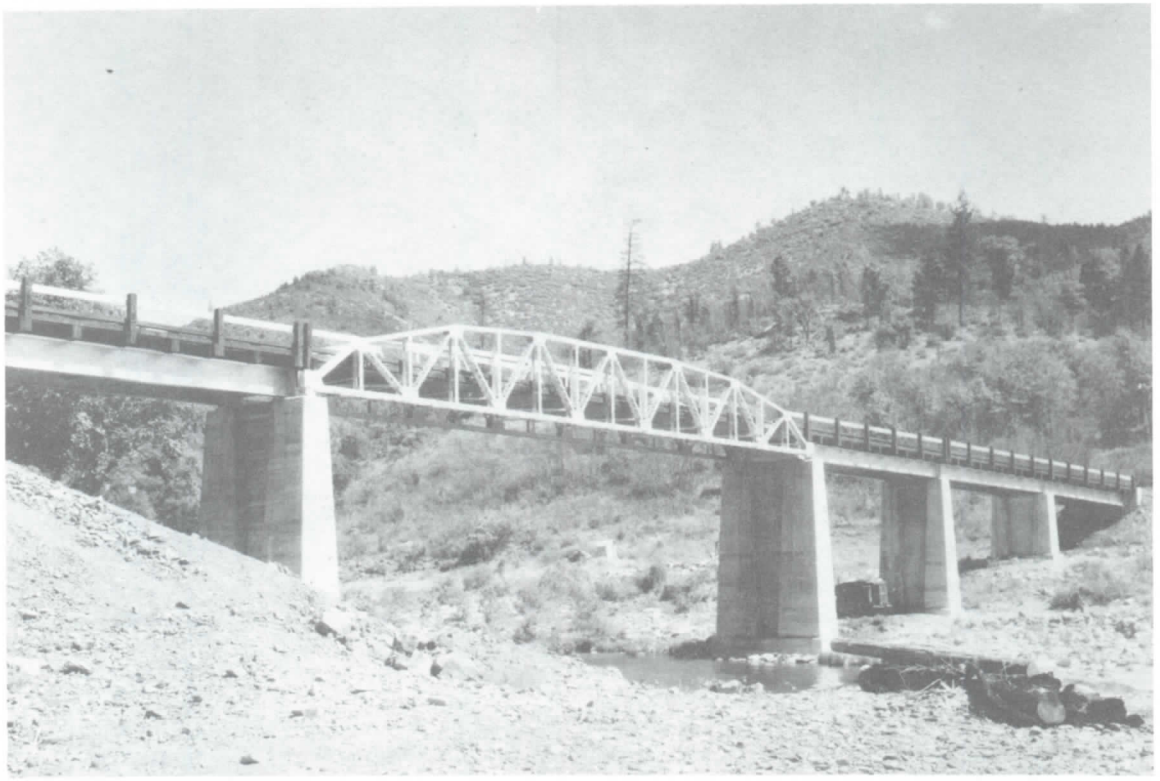
Most would not be satisfied with 6 years of insecurity. Of course, we never felt that this was insecurity. We thought about it as a job, and we were certainly having fun and liking it while we were doing it. What else could a man ask?

During the time that we were building the Sims Bridge, Tom Jones was Supervisor of the Shasta Forest. Tom was one of the old timers that believed in production. He was not too worried about regulations and thought that a man should put out a day's work every day. He was wonderful to work for and had a great ability to make you want to do more and better work every day. His Assistant Supervisor at the time was DeWitt (Swede) Nelson. Swede was a natural with the young fellows, and with all of us. He was able to do considerable explaining about Forest Service regulations, and Forest aims and ambitions, and always seemed to leave a cheerful note with us. He, as was proven later, was a natural leader for this type of a group. It had been my luck all the way through to wind up with such men and to have the leadership of good men and understanding men. I have always felt that this was one of the Forest Service's great assets. It was the leadership of the old timers and their ability to help the young ones come along. Working for such an organization, one could not but help make good.

To continue on with the bridge, we finally worried our way through and completed our bridge in September. This, we understood, was the first major project completed by any of the CCC programs throughout the United States. We were mighty proud of our bridge and, as I look at it today, I still feel that same pride. The old bridge still has its camber, and although it's been very badly overloaded, it shows no signs of distress. I am sure that any of the fellows who worked on it, and could see it, would feel the same as I do.

Doodlebug Gold Dredge, near Weaverville, Trinity National Forest.

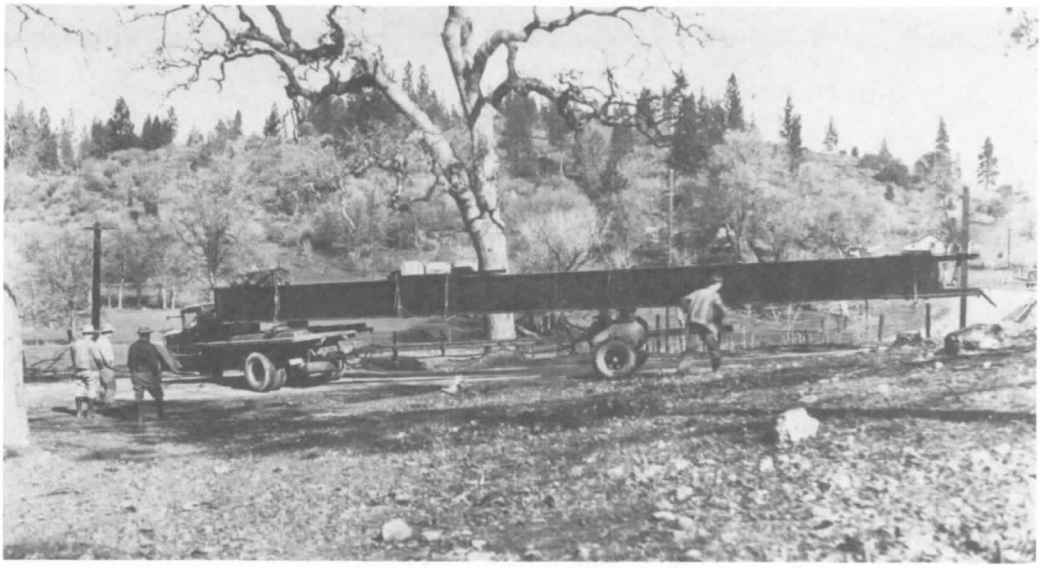
By the time this bridge was completed, John Lawrence had set up a design organization in the Regional Office, and plans started to be more complete and finished. However, before we completed the Sims job, the Shasta Forest decided they needed a bridge at Dog Creek. This was rather a long bridge and needed plans, so I was instructed to make a survey of the site. With the help of two CCC boys, this survey was made and sent in to the Regional Office. Mr. Lawrence reviewed the survey and decided that the bridge that they had originally designed for Gravelly Valley would fit at the Dog Creek site with a few modifications, one being that he would have to cut off some steel legs to fit the profile of the country. Since this was only one pier, I told him that he would be able to dig deep enough to accommodate the legs that had already been fabricated. He said this would not be necessary, and we discussed it further. I thought that we had agreed I would dig the hole deeper and that we would leave the legs as they were. He understood that he was to cut the legs off. So when we built the bridge, I had the deep hole and he had the short legs, but by the addition of a little concrete we again brought things into balance. This was the type of thing that was always a challenge, and always made the jobs interesting. We had to get the job done, and we felt we had to get it done in a hurry with what we had. The fact that the design did not always fit wasn't too important because it could always be made to fit. On the other hand, I am sure that the Regional Office felt that, when they designed the structure as they did, we would meet any field conditions that we had to, in order to make things fit. This type of organization is good.



Sacramento River at Delta, June 9, 1964 (second bridge constructed by Huber's CCC crew).

The construction of the bridge at Delta was somewhat similar to the one at Sims. We drew our crew from the CCC camp nearby, and this made it rather handy for us. I will not go into detail of this construction since these became more or less repeat performances with their own little problems and situations. The main problem was that we had three 50-foot spans, one 60-foot span, and one 98-foot truss span. The truss was shop riveted so that it had to be put together in the field and moved into place as a unit, i.e., with both side trusses and the floor beams in place before we moved it across the river. This caused considerable thinking on the construction engineer's part. Anyway, it was another challenge.

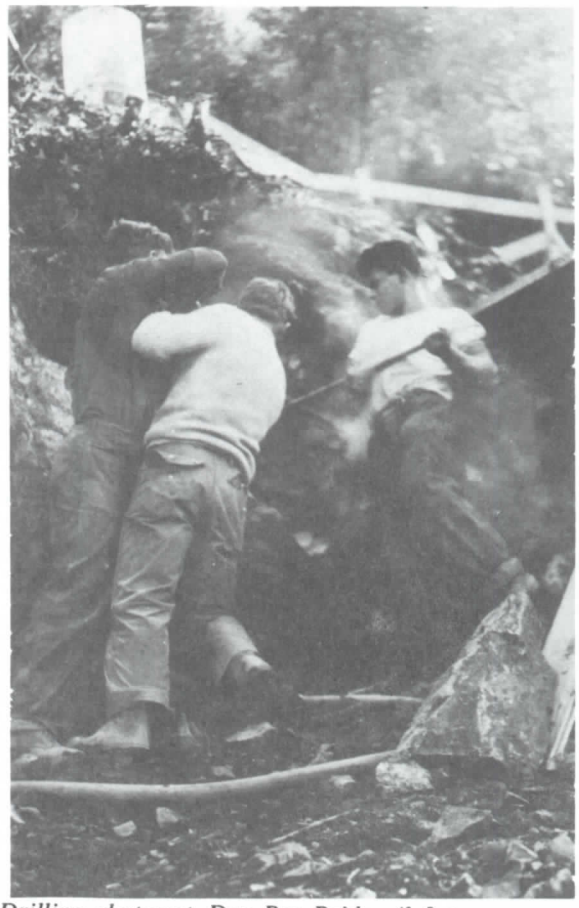
Now to back up into the CCC program a little bit. When we went to Sims, we first drew our boys from the Castella Camp, a California company. Later, they moved a company of Ohio boys into Sims, and we drew our crews from them. This was an experience within itself. The boys coming from Ohio had definitely been hungry. They were a fine bunch of boys, and they were willing to work, but they were physically not up to par. The camp commander and the doctor recognized this and really took over by feeding heavily and also by furnishing the boys with the type of things they needed. I remember that at the end of 6 months, the average gain per boy in the camp was something like 20 pounds. As this company developed, they became a marvelous bunch of boys, and we were very proud of them. When we moved to Lamoine, we again picked up California boys. These



Moving steel bridge beam to Dog Bar Bridge, Tahoe National Forest.

boys were in better condition; they were boys who really wanted to work but had had no opportunity, and they appreciated the camp setup. They, again, were a fine crew and produced fine work. We managed to keep a few of these boys with us throughout the rest of the bridge career.

Bolting field splice, Dog Bar Bridge, Bear River, Tahoe National Forest.



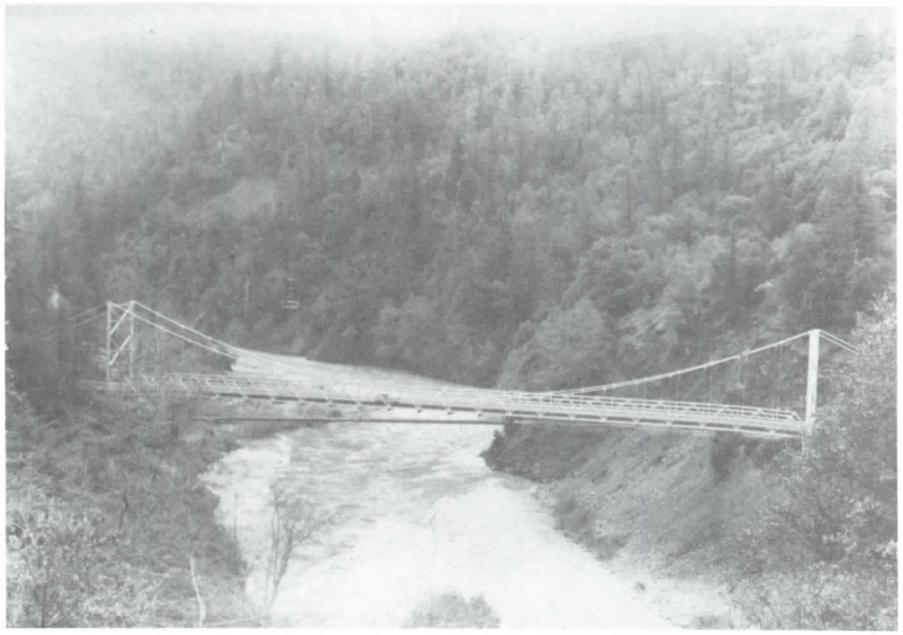
Drilling abutment, Dog Bar Bridge (left to right: Pyles, Morales, Benny Young).

As time went on, we developed better equipment. It was on the Delta Bridge that we got out first three-drum hoist, we got a better highline setup, and things commenced to shape up all around. The fact is we even got a better truck, although we still kept the Liberty with us. Of course, thinking of equipment, I also think of regulations and supplies. I will never forget the first time I went to the warehouse in Mt. Shasta to pick up certain things needed for the bridge. Among other things, I had got seven cases of dynamite. Then I asked for the caps. The warehouseman told me that I would not be allowed to haul caps and powder together, so I talked him into letting me have my wife, who was riding in the cab, carry the caps in the front seat along with our two children. Thus we did not carry caps and powder together. I have often thought that there was certainly a difference in interpretation of regulations. From that time until the time I left the Forest Service, I am sure that we did violate a great many regulations, but it was always unintentional and what we thought was for the good of the job.

Moving 1 1/2-yard truck across Sacramento River at Dog Creek. (Temporary bridge was carried away by December 1934 flood so all equipment was moved by highline.)

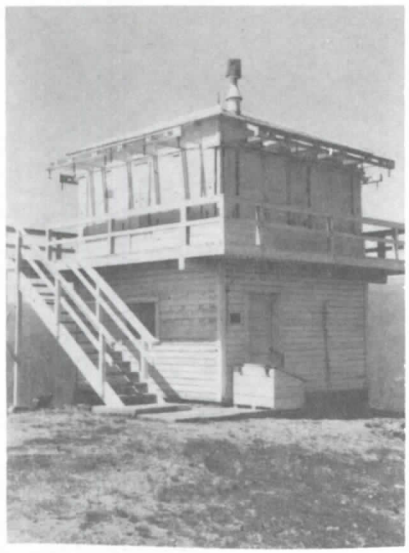
From the Delta job, we moved to the Middle Fork of the American River, which was known as the Spanish "Dry Diggins" or Ruck-a-Chucky Bridge, neither being probably a true designation, but anyway, it was a fine project again. This was a 200-foot suspension bridge with two approach spans. The anchors weren't similar; one of them had to be in a tunnel. This bridge was washed out when the Hell Hole dam failed 2 years ago. I think this bridge was the first bridge of this type to carry a stiffening beam in place of a stiffening truss. This again was one of Mr. Lawrence's innovations. The connections that he worked out for this bridge were far superior to those we had used on the other suspension bridges. They were simpler, cheaper, and showed an ingenuous design. I was always very happy with the looks of this structure and its adequacy. During its career, it carried some tremendous loads imposed by ore trucks and trucks carrying equipment in and out of the mine area.

Construction on the project was a little rough. It was in a canyon that was hot and "down in" with very little breeze. During the summer, the temperature got as high as 120 degrees. Steel got so hot that men couldn't handle it, so we devised a new system of work hours. We would get up at 4 a.m. and move onto the job at 6 in the morning, work straight through until noon, then take an hour for swimming, and bring the boys back to camp, thus putting them back to camp about 2 o'clock in the afternoon. In this way we beat the heat, and it made working easier and probably prevented a number of accidents. The only difficulty with this situation was that we were camped near the edge of an area protected by the State forestry, and it seems that a great many nights in a row we would be called on for fire duty, never long enough to spend the night on the fire, but always late enough to keep the boys from getting a full night's sleep, since they were getting up at 4 in the morning. This was hard on the boys, and it was only



Middle Fork American River Bridge (?).

Big Bend Ranger Station Bridge, Shasta Forest, March 6, 1937.



Shasta Forest Lookout.

because we had such a fine crew at the Greenwood Spike Camp that we were able to carry on during certain periods of the summer. I have always been very grateful to the boys who did this job without complaining of the hard conditions. The project was completed in August of 1934, and we moved over to the Gravelly Valley job.

The Gravelly Bridge was a continuous beam job, the steel beams being designed as continuous beams. Thanks to Mr. Lawrence's vision, he was able to design and have erected the first continuous beam bridge in the State of California. It is a credit to his thinking that all of these new designs were developed and put into practice. The Gravelly Valley job started while we had many of the same crew who had worked so well at the last project. However, in the winter of 1934, the Eel River flooded, and we finally were forced to move out before we could put the steel on the structure. During December and January, 1934–35, we moved into the Applegate area and started construction on two bridges in this area, one over the Bear River and one over the American. These jobs went nicely, and we picked up a third job on Shirttail Creek, and did that incidental to the others, along with a little 30-foot bridge over a creek near the North Fork of the American. It was during this period of construction that I was transferred into the Regional Office as Assistant Bridge Engineer. This was a break because it placed me closer to Mr. Lawrence and also gave me an insight into how things were done in the Regional Office.

Probably at this time, I should point out that during the time I was with the bridge crews and on bridge construction, I really was not closely connected with the Forest organization, nor were we too closely connected with the overall Regional organization. We did not understand how they operated and how to become a part of it. I must be fair in saying that this was probably no one's fault but my own. We were not particularly interested in anything but building bridges, and as long as we were left alone while we

were building bridges, we did not see why we should become a part of any other organization. As I entered the Regional Office, I realized the vast complexities of what went on in there. I realized that the field crews should be a little more a part of the general organization, and I often felt afterwards that we probably could have been more help to the Forest if we had known, or felt, that we were part of them and should help them with other than bridge problems. By the time I had worked in the Regional Office for a while, I found there was a great deal more to what was going on than I had realized, and that the various divisions and sections had their own problems. I was quite surprised to find that the Service was set up for something other than bridge building. It was a good thing to find out, and I am sure that this experience was well worthwhile.

To digress now and go back to the original setup as it was in the Regional Office at about the time I went in. I was quite surprised to find that the organization concerning engineering functions was somewhat scattered. The construction of buildings—that is, ranger residences and that type of thing—seemed to be, and I am sure was, under the supervision of Personnel Management. The Architectural Section was working under Personnel Management. For lookout towers, the cabs, buildings, etc., were designed by the architects under Personnel, while the structures that held the cabs, either steel or wood—in other words, the towers—were designed by Engineering. I noticed later in the field that there was quite a distinct difference, and it was really easy to tell where one left off and the other took over. In other words, the connection of the cab to the tower always left a certain amount to be desired. I am sure that other conditions like this existed, but as time went on, these organizations were realigned. It is a credit to the Forest Service to say that they were able to meet an emergency situation such as existed and set up an organization that would produce as much as was produced under the stress and uncertainty of the time.

Of course, in the make-work programs, the road organization was a big moving outfit. As I understood the organization at that time, some supervision was given from the Regional Office level. However, most of the work was done at Forest level under instructions from the Regional Office. Charlie Young had developed a school for locators and had trained locators as fast as was possible. It must be remembered, too, that the men he was training were experienced engineers, men who had had good jobs but were out of work and willing to do anything to get back in the engineering field. Thus, the training job was not as difficult as it might have been had we started from scratch with inexperienced men. However, this is not to detract from the fact that Charlie did a fine job and started a good basic organization going, whereby road construction was somewhat uniform. I do use that word loosely, however. I remember the standard 9-foot road was mandatory. If a person built over 9 feet, he was wasting and was reprimanded. This is hard to understand at the present time, but back in those days I think it was probably the right move. It was the same principle under which we built bridges to the H-15 standard, which we considered adequate. During the time we were building the Delta Bridge, I was asked why we were building a bridge so heavy—were we going to move locomotives over the river? Yet later, while I was Forest Engineer on the Shasta, I was asked why we built a bridge so light they couldn't carry the then existing logging

Excavation, North Fork American River Bridge, 1935.

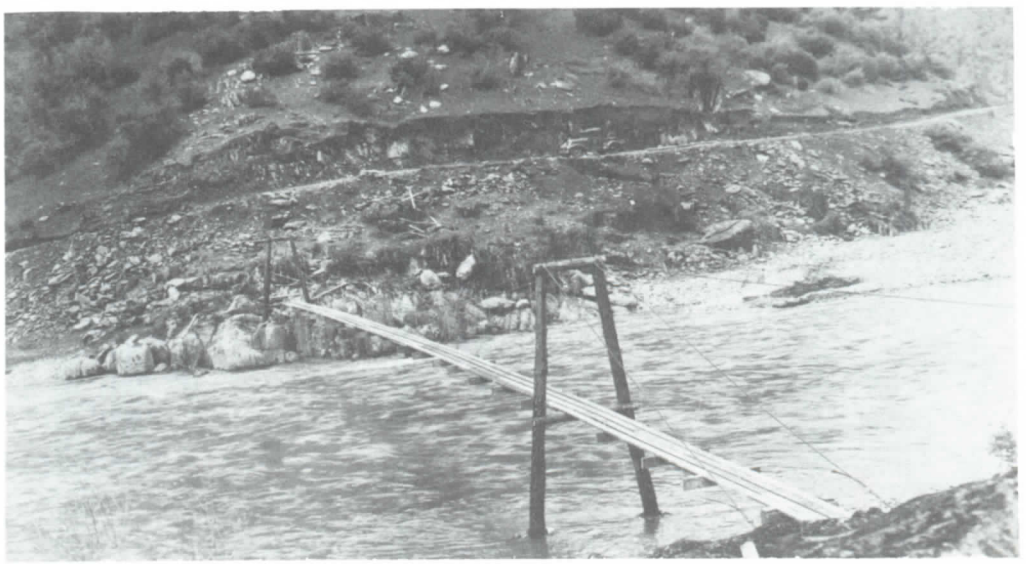
trucks. This shows that standards do change and that one is not able to outguess the future at all times.

When I left the bridge crew on the North Fork of the American River, in the Applegate area, Bill Minaker took over as my replacement and took charge of the crew. He moved this crew from the jobs previously mentioned, when they were completed, to do the Salyer job. The Salyer Bridge design was another innovation sparked by Mr. Lawrence. The bridge was built to look like a cantilever truss, but was actually designed as a continuous truss, thereby lightening up some of the steel requirements and, although it seemed an odd design at the time, it has proven successful and has carried some heavy loads over a long period of years.

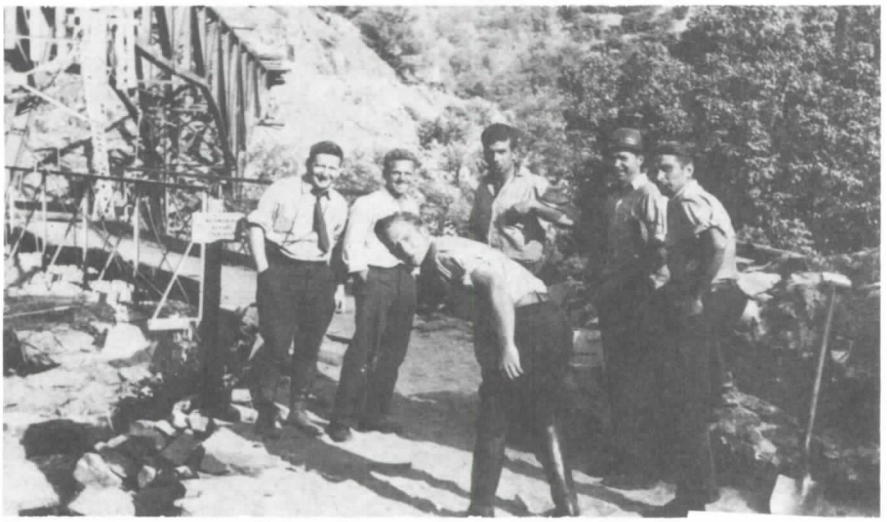
Shortly after I had gone into the Regional Office, I was given a plan to take to Mr. Kramer to be signed. Those trips to Kramer's office were quite an experience and showed the caliber of work the man did. Never will I forget

the first plan I took in. He asked me what the stress was in the top and bottom cords of the truss. I had to go back and look up my records and find the information and take it back to him. I was embarrassed and thought that I would not get caught again. So the next time in, I had all the stress figures and everything was set for him, but he asked me how much streamflow was to pass under the bridge at a given flood stage and how much head room was available. This again required a review of our analysis, which I took in to him. For the third project, I went all set with full information, and I felt that surely the man couldn't ask questions I couldn't answer. I was totally surprised when I took the plan in and he just glanced at it and said, "Shall I sign in blue ink or black?" You could never tell what questions Mr. Kramer was going to ask.

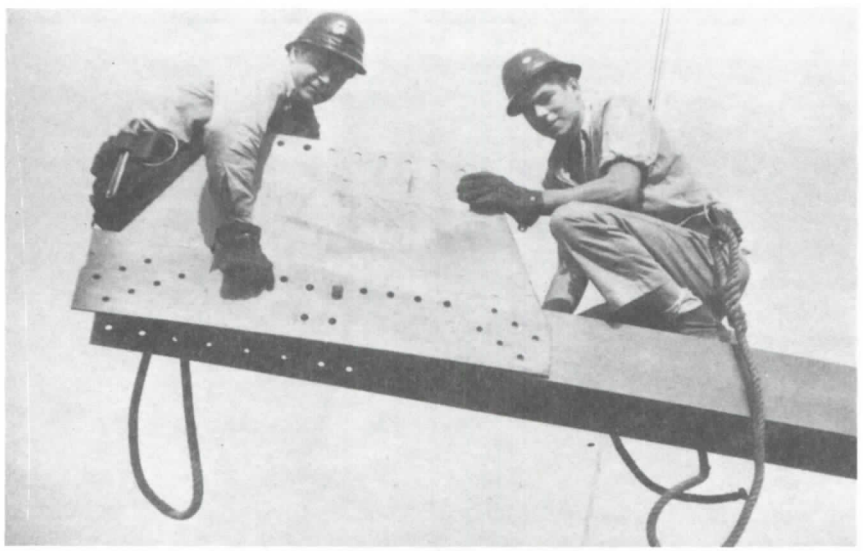
The Assistant Bridge Engineer's job was a very interesting one, because Mr. Lawrence sent me on a great many field inspections, project reviews, etc. He was dependent upon his assistant to get certain jobs done and to get the inspections straightened out. I was also to review designs, and to assist with designs when the problems got complicated and we felt that design support was needed. The whole ball of wax really made a very interesting job, and the training was wonderful. Often Mr. Lawrence went with me—or to correct that, I went with him—and we had many very interesting field trips. During these trips, he taught me a great deal about what could and couldn't be done with bridge construction and how things should be worked to make the projects go right.



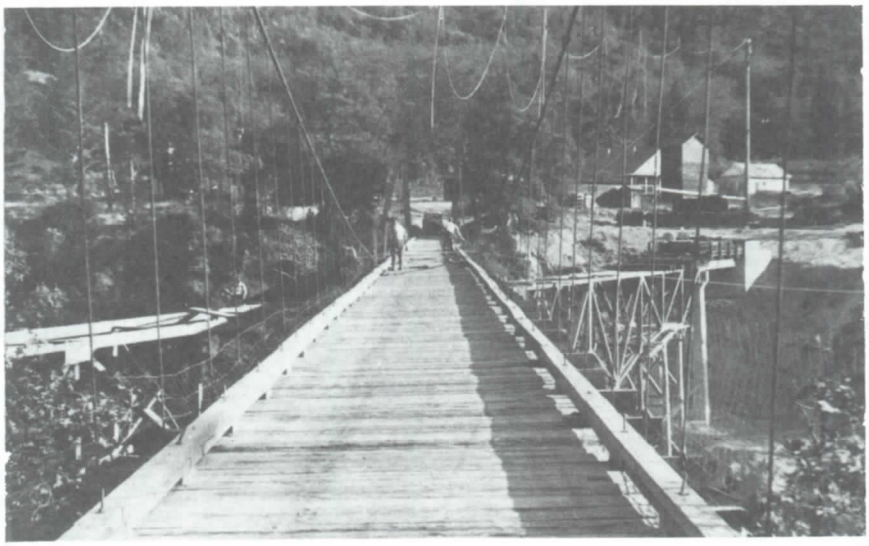
Temporary suspension bridge, North Fork American River Bridge. (This is typical of foot bridges constructed to cross rivers where road bridges were being constructed.)



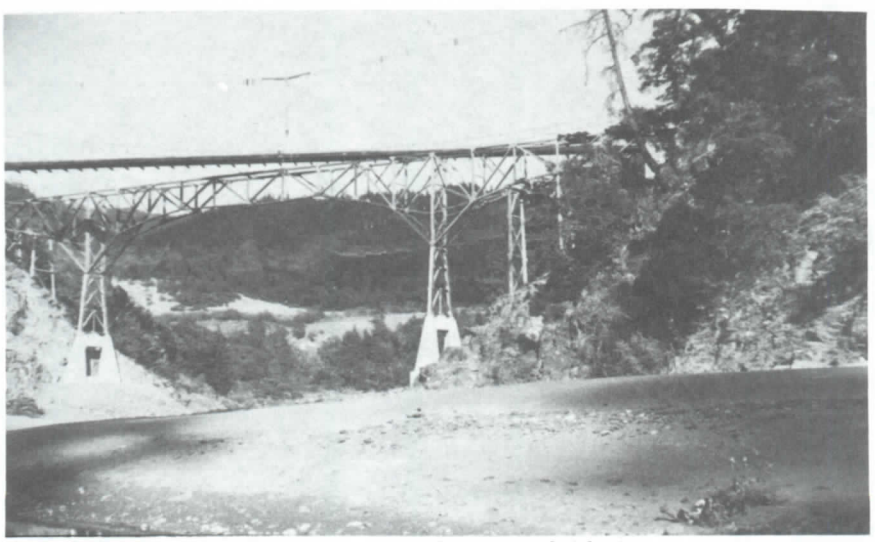
Foreman and crew at Salyer Bridge, 1935 (left to right: Ray Huber, Curley Dougherty, Ham Pyles, Larry Ketcham, Chuck Conner, Ray Potter).



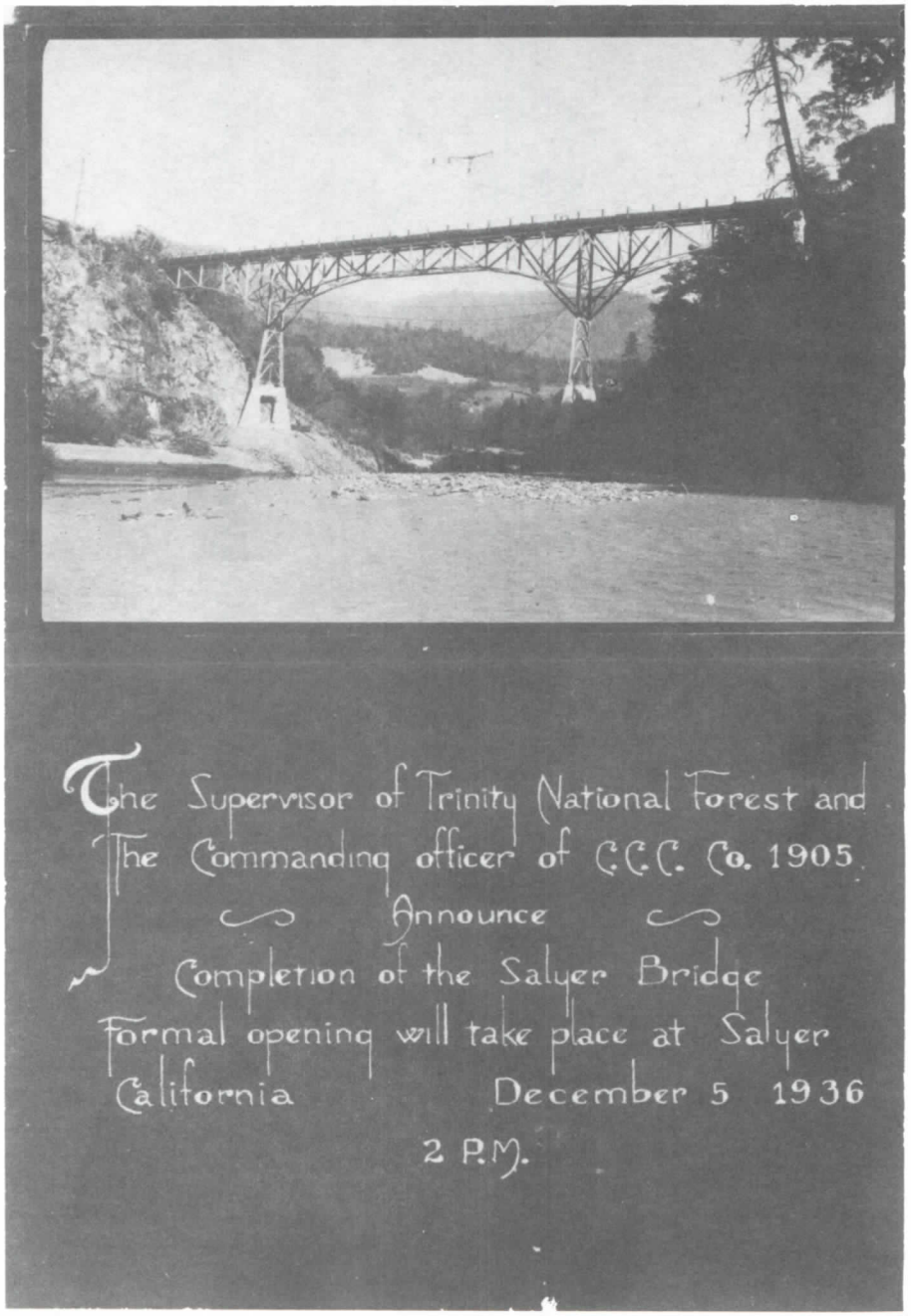
Chuck Conner and Bob Albrecht, Salyer Bridge.



Old suspension bridge over new Salyer Bridge, 1935.



Salyer Bridge (old suspension bridge above new bridge).


The Supervisor of Trinity National Forest and
The Commanding officer of C.C.C. Co. 1905
Announce
Completion of the Salyer Bridge
Formal opening will take place at Salyer
California December 5 1936
2 P.M.

Rigging crew hanging stiffening beam, Middle Fork American River Bridge, North Greenwood.

Another thing he taught me was that personnel and people's problems were important. When Mr. Lawrence moved the bridge crew from one location to another, he knew if the foreman had children, and if so, if schools were available. He knew the health of the families and knew in which areas certain ones could and couldn't work, and always worked the crew wherever possible to give the families the best breaks. It was the crews with the single men that often took the most outlying projects, but, again, he was always considerate of all the people. I have always felt that this has been a great help in training men to lead other men.

I am not very sure of the chronological history of the buildings, dams, etc., but sometime during the start of the program, in 1935 or 1936, the structural design features of bridges, buildings, and towers were placed under the Bridge Section, and at the same time the review and design of small dams were included in this section, so that it eventually became known as the

Bridge and Structure Section. Thus things of a structural nature were more or less flowing through our channel.

Sometime during 1936, John Beebe was made Regional Engineer. John was one of those engineers who was widely known and who was excellent in the field of hydraulics. He understood the California hydrological situation—the power needs as well as other water needs. This was probably his strong point, but dealing with people was another strong point. He again was a natural leader, and we were lucky to have him as our Regional Engineer.

In August 1936, John Lawrence was promoted to Assistant Regional Engineer and I was given the job of Bridge Engineer. The section of the Engineering Division was still known as the Bridge Section, but it was doing quite a bit of other design and construction inspection. We had picked up the building design problems and structural features, as well as a great many dams, towers, and other things. My job really was a continuation of the Assistant Bridge Engineer's job, since Lawrence was handy for consultation and supplied a great many of the new ideas that came forth and were presented by the section. Of course, by this time, the bridge construction crews, which had grown to about 12 and then reduced, were well equipped. Plans were usually adequate and covered most details. Bridge construction became pretty much a matter of routine; that is, as much as a bridge construction can ever be called routine. There are always foundation problems, loading problems, the shifting of locations, etc.

At this time, and to make it a matter of record, we should probably note that on the Gravelly Valley Bridge an odd condition was encountered, and later the method used to solve it was proven to be adequate in many other bridges. At the time we placed the abutments and piers, which was in the

Middle Fork American River Bridge, Ponderosa Way, Eldorado Forest, 1934.

winter of 1934, our system of placing anchor bolts was to make three separate measurements. Usually, the Bridge Superintendent made one measurement, the senior foreman (H.K. Pyles, who had by then been promoted to this job) checked it, and then, to make an independent measurement, the carpenter foreman remeasured. Usually, after these checks, the steel fit well on the anchor bolts. However, when steel for this project was delivered in the spring of 1935, Sylvester was sent in to place the steel, and he found that the anchor bolts were some 2 inches closer than the spacing on the steel. Without actually giving this adequate consideration, we assumed that we had just made a mistake in placing the anchor bolts, and told Sylvester to redrill the steel plates and set the steel as needed. Later, this proved to be an error. It was found that the bridge's foundation condition was such that the piers were moving toward each other, somewhere in the neighborhood of 1 to 2 inches a year. A detailed study has been made of this situation, and at no place are cracks in the soil visible, nor is there any way of telling what mass land movement is taking place. However, it has continued, and obviously the one side is moving toward the river center. This in itself might be considered as just a local situation. However, we found that the Fern Point Trailing Bridge was losing its camber, and we were afraid of an anchorage slippage, but found this was not the case, and apparently this bridge is doing the same thing as the Gravelly Valley Bridge. The Big Eel River Bridge, back of the Old Eel River Ranger Station, did the same thing, and we had to place a roller foundation to pick up the bridge so that it could slide back into position, and thus take care of pressure from the soil moving in. I am pointing this out because I think any engineer dealing with a bridge or other structure that needs a permanent foundation in the area of the Coast Range in Mendocino County, and probably wider areas, should be advised that soil movement is taking place, and that it should be considered when bridges are being designed. It is always embarrassing to admit that one did not notice what had actually happened, but since the facts became known we have reviewed the conditions, gone over the area, and still cannot tell just what the mass movement is. The possibility of land movement should be considered whenever main structures are placed on the Coast Range soils.

During the period between 1936 and 1938, considerable discussions were held and programs developed for flood control in the Angeles Forest. By June of 1938, it was decided that this project would move forward. I was transferred to the Angeles as Forest Engineer to handle the construction and designs of structures to be built in the flood control project. I spent a year on the Angeles under the title of Forest Engineer, but funds did not come forth to construct the project, so I was more or less marking time and was returned to the Regional Office in June of 1939 to take over the Design Section for the Region. By this time the section included the structural, building, and mechanical design and was rather a wide field. I do not wish to leave the impression that the time on the Angeles was not well spent. It was during this period that I learned a great deal about Forest management, how the Forest's problems were interwoven with the public, what was then necessary for recreation and campground areas, and how these projects were handled. It was a marvelous training program for me, but I am doubtful if it produced a great deal for the Region. As a training feature, it certainly is essential that anyone who has worked in the Regional Office a number of years be sent to a Forest to learn and see how a Forest program must be interwoven with the local community, State politics, etc.

Constructing first "Klamath" stove on Angeles National Forest.

I believe it was during the time I was on the Angeles that the Regional Engineer, Mr. Beebe, decided to go to the Federal Power Commission in Washington and Tony Dean took over as Regional Engineer for the Region. Upon my return to the Regional Office, I was closely connected with Tony, and this relationship did a great deal toward developing my understanding for field needs, engineering needs, and how an engineer could fit into the Forest Service. I was in charge of the Design and Construction Section from July 1939 to September 1944. During this period, we did considerable work on the Arroyo Seco and other flood control work. This was an interesting job, but in dealing with flood control in the Angeles it seems as if there is no end to things that must be done. I always think of Frank Jefferson's statement when he looked at the mountains and said, "Well, it's a good project, but we're a million years too soon. It's geologically unstable." It was, I'm afraid, with this attitude that sometimes I felt defeated in what we were trying to do. It seems such a small amount when compared to what had to be done.

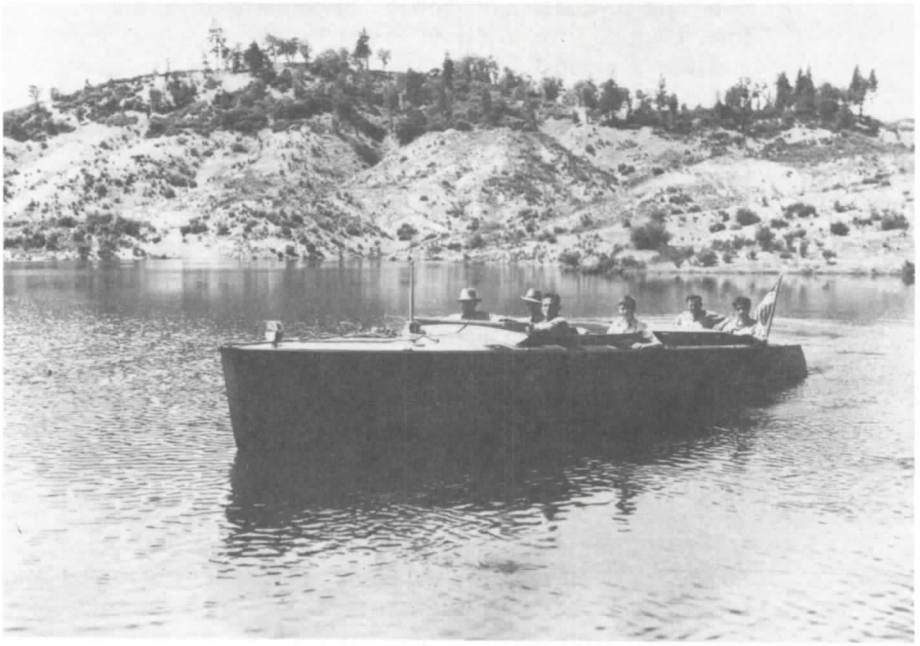
I would like to return to my relationship with Tony during the time I was in the Design Section. I am certain that no one has ever made more of an impression upon me or impact upon my way of thinking than Tony. At first, he asked questions that I thought were totally unfair, and, I guess, as anyone else, my first defense was to be a little bit angry. However, as he explained, I saw that he was really broadening my vision and outlook on life, and I cannot say that anyone has ever done more for me in this respect. He would ask questions such as "What did such and such cost, why did it cost this, and what benefits were gained by doing things in certain ways?" We had been doing it in the old accepted way, and I am sure he felt that this was a good way, but he wanted to know why our thinking led to these conclusions. In other words, he wanted to know if we were thinking or just following a pattern. I believe this is one of the greatest training needs of today. I think that we should impress on our young people that there is a reason for thinking and that there is no substitute for thinking. In other words, we can't just go muddling along the same old way and say to ourselves, "We did it this way before and it's good enough." Men like Dean could do a great deal toward promoting the views of our younger engineers and bringing them to grips with the realities of life. At any rate, I became

so imbued with Dean's ideas that I felt additional field work was necessary if I were to understand Forest Service workings and their problems. Therefore, I applied for a job as Forest Engineer on the Shasta National Forest and was granted this request. My 4 years on the Shasta were educational and very worthwhile, and I cannot recommend too highly that anyone going forward in the Forest Service spend at least a few years on a Forest.

While on the Shasta Forest, I was in charge of Engineering and Fire Control. Norman B. Farrell was Supervisor at the time, and he was an excellent trainer. He did a great deal to assist me through the trial periods of learning the fire control game. This is not to say that anyone has learned the full fire control techniques. Norman was an excellent firefighter and certainly understood, explaining what would happen under various conditions and also how to be ready to meet them. It was during this period that I realized the value of adequate fire training. The fire suppression crew had to be well trained prior to going into action, and we found that it took continual training on all the various steps so that when the fires actually happened the crews were ready.

The Engineering job on the Shasta was about the same as any other Forest Engineer's job. The Shasta Forest, before it was turned into Shasta-Trinity, was an average Forest with an average work load, and certainly we had the usual run of problems. Engineering can do a great deal toward assisting the other units on the forest. For instance, Timber and Engineering should be closely knit to secure the proper road maintenance, road locations, bank and stream stabilization, etc. Again, Lands and Engineering can do a lot working together on the various landline locations and that type of thing, and as the recreation around any area such as Shasta Lake develops, there is a great deal that Engineering can do toward assisting in recreation plans. It is at the Forest level that all of the units must be tied together, and it is certainly essential that all members of the Forest team come closely together, have good communication, and have the understanding that each is willing to help the other. Of course, Fire Control is a natural to work along with Engineering. The equipment and manpower used both for fighting fire and for project work should be very closely tied together and used on both types of work.

It was during my work on the Shasta that I got to be well acquainted with the old-time Ranger "Dutch" Sullaway. This is an experience for any man. Dutch was one of the typical old timers, very well versed in firefighting and certainly an artist in dealing with people in situations that occurred on his District. He started on the McCloud District as a young boy, grew up there, and became a Ranger and retired from the same District. Dutch's philosophies were the Will Rogers' type and were always worth listening to. I will never forget one experience. Regional Forester Show came to the Forest, and we were taking him up to the Mud Creek project. He and Dutch were in the back seat of the car and got to arguing about something. Show finally said, "Well, Dutch, don't forget whom you are talking to." And Dutch said, "That's right, don't forget who put you in the position you are in now." Show had, it seems, worked for Dutch in his early years on the Forest. One could go on forever telling stories about Dutch, but these again were the men who made the Forest Service and were the backbone of the whole organization. It was undoubtedly the courage and far sightedness of



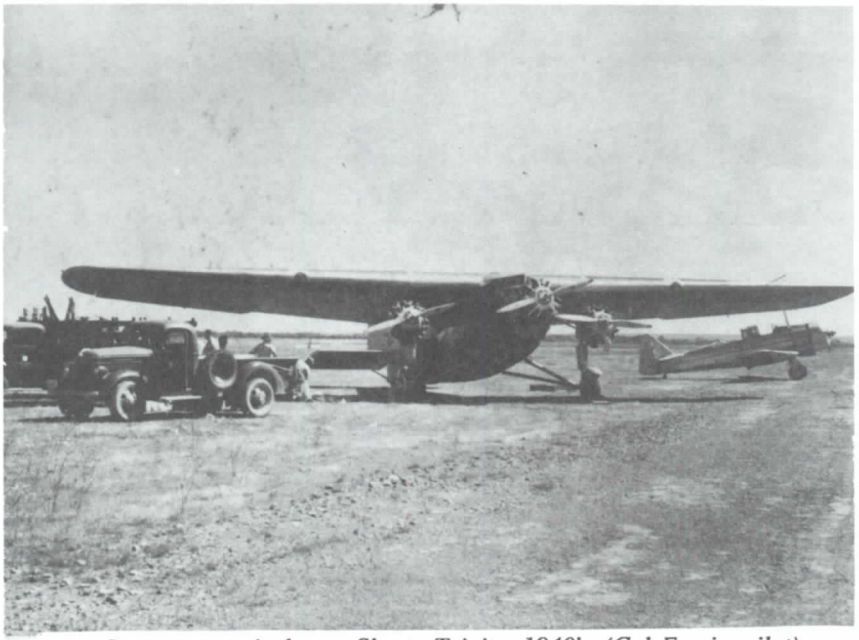
First Forest boat on Shasta Lake, 1945 (left to right: front, Jack Gilman, Peterson; middle, Jay Porter, Ray Huber, Jr.; rear, Blankenship, Bob Martin).

many of these Rangers that helped to bring the Forest Service into a position of respect that the local people held for the Service.

There were a number of old timers on the Forest who did a great deal for the Service and should be remembered. Henry Erhart, who later became a law enforcement officer, was the Fire Control Assistant on the Dunsmuir District. Henry was an artist in dealing with younger people and assisting with training programs. His record with the CCC was excellent as a great trainer. His later record as a General District Assistant was also outstanding. Then, there was the old timer Jack Gilman, who also contributed a great deal. One could go on citing instances of these types of men forever, but one could not work with them on a Forest without developing a deep respect and a deep feeling for all of them.

During the time I was on the Shasta, the Regional Engineer was again changed. Tony Dean went into Washington as Chief Engineer, and Jim Byrne came to the Region as Regional Engineer. I was only sorry that I did not get to work longer on the Forest and get closer associated with Jim in the engineering world. I did not have the opportunity to work as closely with him as I would have liked to.

In July of 1948, an offer came for a position as Assistant Regional Engineer, Region 3, headquartered at Albuquerque. This seemed like a big change for the Hubers, and we discussed it in some detail and finally decided that this was progress and the only thing to do was to move. So in

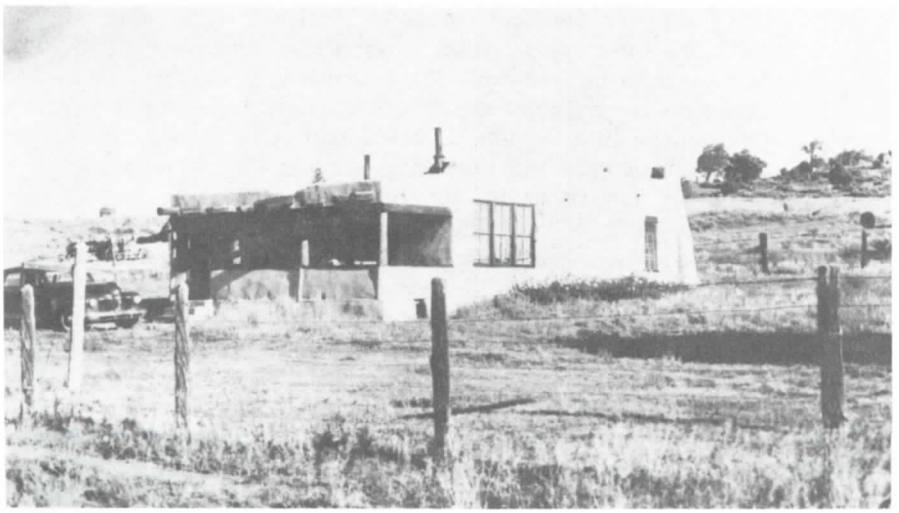


Trimotor fire support airplanes, Shasta-Trinity, 1940's (Cal Ferris, pilot).

early July, we picked up and moved to Albuquerque. This was a decided change for all of us. The Southwest was a new country and a new way of life. Certainly, Region 3 was a new world and had different ways of doing things. It was after this transfer that I realized that inter-Regional transfers of personnel are essential, and I believe it is even helpful to the Regions. It brings new ideas to both, and these, as they develop, tend to benefit all Regions. At the time I went to Region 3, there was only one man there whom I knew well. Hank Mullen had transferred from Region 5 to Region 3 a year of two before. We had many discussions as to how we thought things were different and which changes we thought might be beneficial if introduced into Region 3. Hank had already taken charge of the Equipment Section and was making many changes that were beneficial. I always remember that, in going into the Region, I had stopped at the North Kaibab and saw one of their fire tankers, and was surprised to find a canvas hose on a live hose reel. I asked Hank if this was standard practice in the Region, and he said, "Where did you see this?" I said that it was on the tanker on the North Kaibab. Hank said, "Well, I guess this is standard, because that is the only tanker we now have in the Region."

At the time of my transfer to Region 3, Mr. Woodhead was Regional Forester. Not long after my arrival, he was forced to become inactive and later passed away. Otto Lindh then became Regional Forester. Howard Waha was Regional Engineer and was an old timer in the Region. He understood the Southwest and the Region. For a new man coming into a Region like Region 3 was, it was essential to work for a man who did understand the Southwest, the names, history, and attitudes of the Southwest. It was certainly difficult enough to learn to pronounce the Spanish and Indian names,

Large juniper on Gila (Robert Leonard showing size).



Jicarilla Ranger Station.

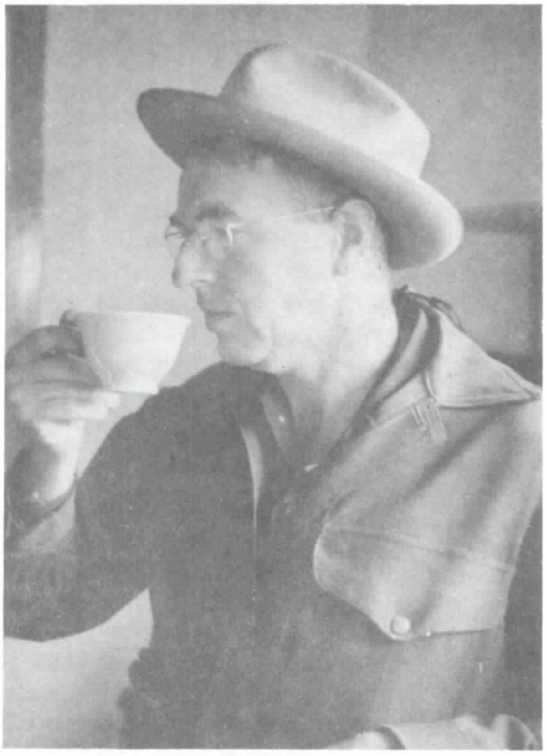
let alone try to spell them. Mr. Waha was excellent in helping me at this sort of thing.

Region 3 was just entering a new timber harvesting cycle at the time, recreation use was increasing, and the Southwest population was increasing at a rapid rate. Due to all of these factors, the Engineering work load was also increasing. This meant that changes in the basic Engineering organization were inevitable. The Engineering organization, prior to the increase of activities, was naturally a small organization. The one Forest Engineer was Harold Horschel on the Coconino. The Regional Engineering organization consisted of Regional Engineer Howard Waha; two clerks, Marcella Madsen and Josephine Gonzales; Chief of the Transportation Section, Horace Stephens; and their Chief Locator, Henry Langston. Maps and Records was under Burton Anderson. This section had four draftsmen and two men in the Reproduction Section, Earl Jarboe and Reuben Rossander. Henry Mullen was in charge of the Equipment Section. He had about five supervisory personnel, plus the mechanical group.

As Assistant Regional Engineer, my primary jobs were to make field inspections and to assist in establishing new procedures for projects such as bridge replacements, building maintenance, and mapping programs. This was an interesting assignment, and it required much field time. This field time furnished a fine opportunity to learn much of the Southwest. The high standard of road maintenance that was being carried on in the Region was very noticeable to a newcomer. I later discovered that this was largely due to the well-trained, hard-working construction and maintenance foremen on the various Forests. Most of these men we road men who understood road equipment and understood road maintenance. It was a credit to the Region to have the road maintenance performance as high as was apparent.

Bridge maintenance left considerable to be desired. There were a number of timber structures and only one concrete bridge. Since bridges had been my hobby, this, of course, was a golden opportunity for assisting in the change from temporary bridges to the permanent type. At the same time, Washington was providing money for construction of permanent bridges, rather than temporary, and thus Region 3 embarked upon a new program of bridge reconstruction and development of permanent bridges. Bridges in the Region were generally of short span and offered the opportunity to use flat slab-type replacements, and this was done with zest. The men on the Forest took to the program, and it was very interesting to watch it develop.

Our mapping program was in need of revamping simply because money had apparently not been available in the past to do the mapping, and much of the area was unmapped. Thus, we were able to take off on a new program. Burton Anderson was in charge of the mapping. He was very enthusiastic about the new program and certainly did a great deal toward getting the Region started on the right track. It was a credit to him that the program developed so fast and in such an orderly manner. Mr. Waha had developed a very close relationship with the Bureau of Public Roads, both in Arizona and in New Mexico, and the Forest Service was closely tied with the Forest Highway program. It was a pleasure to see the two organizations work so closely together, and I was glad to be a part of such a team.



Dahl Kirkpatrick, Region 3.

In 1952, Mr. Waha retired, and I was promoted to the position of Regional Engineer in Region 3. This position placed me in what I considered one of the finest positions in the Forest Service. One has a great deal of latitude for independent action and, at the same time, is responsible for many phases of the Service's work and many activities. Therefore, it is a challenge, and yet one is supported by the Regional Forester, other Assistant Regional Foresters, and their divisions. It is certainly a wonderful opportunity to work with other people and to assist in providing Engineering services to the Region. Engineering should have much to offer other divisions. Engineering services must be available for those divisions, Forests, etc., that have need for these services. I had the good luck of working with a staff of men who were all cooperative and very helpful. They did a great deal to help a young Assistant Regional Forester and were very helpful in advice given.

By 1952, Regional Forester Lindh had the region embarked upon an active and ever-increasing timber harvesting program. He was aware of the many recreational needs and was attempting to develop programs to provide services for these needs. In general, the Region was moving forward in many activities. All of this meant an increasing Engineering work load. Timber and recreation roads had to be located, areas needed mapping, Ranger headquarters and work centers required new building, which in turn required more services, such as water systems, sewer systems, and electrical services.

Ranger Jack Gilman, Shasta Forest Lookout (Squaw Creek District).

To meet these demands, a larger Engineering organization was required and was developed as needed.

As I have said, working with other divisions was certainly a pleasure. Dahl Kirkpatrick of Timber Management was a wonderful partner to work with, as were Zane Smith of Recreation and Lands, Andy Brenneis of Fire Control, McCutchen of Personnel Management, Davis in Operation. All of these Divisions I worked with closely, and they all assisted Engineering in many ways.

At this point, I should say that I think one of the places that Engineering could assist a great deal—and I am not sure that this cooperation has been fully developed and explored in most of the Regions—is in Fire Control. I think that, through their equipment and mapping personnel, they can do a great deal on mapping during the time of a going project fire. I also think that there is a place they can help greatly in mobilizing equipment, manpower, and specialized tools. Since we had such men as Burton Anderson and Bill Bayer in the Mapping Division, we were able to use them to good advantage in the mapping program. Hank Mullen, in charge of equipment, was a natural to help the Forest and the Fire Control Division mobilize equipment and maintain this equipment during the fire. And our road men were able to assist in organizing crews to handle the equipment and take certain places on the fire line. I believe that the Regional Engineer in any Region could do a great deal if he would explore the possibilities and develop a working relationship with Fire Control, so that when the big moment comes, they are able to work together on these projects.

As previously stated, Region 3 had embarked on an expanded program of development. Timber Management definitely set a fast-moving program, starting many new timber sales and developing others.

A large timber stand on the North Kaibab was opened. This required the location and construction of a main hard road from Fredonia to the National Park boundary on the north rim of the Grand Canyon, as well as all feeder roads.

The Coconino and Sitgreaves Forests were opening new timber areas on the Coconino plateau. The Apache Forest opened new areas. In addition to these major sales, northern New Mexico was opening sales on the Santa Fe and Carson Forests.

These developments generated the usual road requirements and attendant problems. However, in addition to these, the northern New Mexico areas presented many land survey problems due to the fact that many large, unbroken, Spanish land grants covered much of the area.

These developments were different than those encountered in Region 5. In Region 5, timber sales had already been in progress for a long period of time, but most of the timber in Region 3 had not been set up for harvest, nor had timber plans been developed. It was after Lindh started pushing this program that real progress was made in timber harvesting. These projects all added an opportunity for Engineering to work closer with Timber Management in the development of the timber sale areas.

At the same time, recreation in the Southwest was growing by leaps and bounds. This again required more work and cooperation between Engineering and Recreation and Lands in developing campgrounds, summer homes, etc. It was very gratifying to see the nice units developed as they did in certain areas.

At this time, the Arizona Game and Fish Department launched an active program of constructing dams to form recreation lakes. Most of these lakes were on Forest Service lands, and so again this program increased Recreation and Lands work load, and also increased the work load of Engineering by the needed review of dam plans and field inspections. This program is one that I believe has gone even faster since I have been out of the Region, but at least a great many of the dams were being built and the lakes developed.

Then again, with the increased activities, the Fire Control activity picked up. Working with Fire Control on these projects developed the feeling that Engineering could have a large part in the firefighting organization if the cooperation was properly developed. With all these activities progressing, it was only natural that the administrative building program would have to be speeded up. Davis was greatly interested in this and did a great deal toward pushing for newer and better buildings. This required new designs and new maintenance procedures, and then the work camps came along requiring another type of design and maintenance. In the work camp areas, as well as at some of the Forest headquarters, it became evident, too, that we would have to develop better water systems, better sewer systems, and better electrical power units. All of these were opportunities for Engineering to enter

into this field, and this again required different types of technical engineering requirements. In our Architectural Section, we were very lucky in having Wybe van der Meer, who was an outstanding young architect. He took over building design and did a great deal for Region 3. Mullen again stepped in when it came to developing the electrical and related equipment. And many of us worked on the water developments as were needed.

After thinking back on the Engineering developments in Region 3, it is evident that the success of a division is not necessarily dependent upon the Division Chief, but is dependent upon the section leaders and their men. For instance, Region 3's Engineering was lucky in having such men as Hank LeFavre acting as Assistant Regional Engineer. Hank was very understanding, very cooperative, and had a great ability to deal with locating problems and coming up with solutions that were very satisfactory. A man of his capability is invaluable. I have mentioned Mullen, who was handling our equipment development and equipment maintenance section. He again was an outstanding man and knew his equipment and knew the Forest Service's needs, so contributed greatly to Region 3 in the equipment field. On roads we had John Adams, and Red Ketcham, and fellows of that caliber, who did a great deal in developing new types of road designs and also in seeing that the roads were properly constructed and that our cooperation with the timber companies was as it should be. These men were able to work with Timber Management, and also with the other field units, to develop the type of thing that was needed.

In mapping, Burton Anderson did a great deal towards starting mapping in the right direction, and when he later transferred, he had developed an organization that was able to carry on. At the end of my stay in Region 3, Wally Lund was handling the Mapping Section and was doing a fine job of that.

One place the Region was probably weak or needed support was in the matter of dam design and review. In about 1952, land formerly under the Land Utilization Act, and later transferred to the Soil Conservation Service, was transferred to the Forest Service for administration. Region 3 was assigned projects in Oklahoma, Texas, and New Mexico. Included in these projects were a number of recreation and water supply lakes. Many of these lakes we formed by dams that were in very poor condition; in fact, some of them failed. These structures required a great deal of study to determine feasible methods of repair or replacement. Once the proper methods of reconditioning and economic justification and financial support were determined, detailed plans and specifications had to be worked up and construction supervised.

Val Lund came to the Region about the time I left and became the expert on these matters. It was too bad that we did not have his help earlier in the game; I believe that we might have come out a little better on some of our activities. However, we did develop a fine relationship with the Arizona Game Department and were able to help them with many of their dams. This was done by all of us taking a little hand in the work and maintaining close contact with the Arizona Game Department.

At this point I probably covered roughly the history of my experiences in the Forest Service, but have not covered certain philosophies that I am not

sure mean anything. However, I cannot help but feel that there are certain things that are being done today that are superior to things done in the past. And yet again, I do have a feeling that in some ways we have lost a little of what we had in the older days. For instance, I attended a training program for young engineers not long ago and was surprised to find that all the training programs seemed to be based upon placing before the young engineer all the facts that he needed, the inspiration to "do this" and "do that," and the paper routine to get the correct procedure. I cannot help but feel that when I started with the Forest Service there were a great many of us starting under the same conditions. We were men who had engineering experience, we were basically untrained in the Forest Service ways, but we were trained to take charge of the situation and do the best we could. As far as training went, we all were supposed to know where to find the information when it was needed. We were supposed to get our training by working on the outside, nights and other times, reading, studying, or doing whatever was necessary to develop techniques to do the job. Now granted, it would have been very nice had these techniques been put forth so that they would have been a little more accessible, but I do feel that each man should have the urge and the drive to go after things himself whether they are made available to him readily or whether he has to dig them out. I also feel that a man should appreciate the job that is before him and the opportunities that he has. There is so often so much stress placed on salaries, time off, and other benefits. These were the things that we did not look for. We had our fun. In fact, I think we had more than the average man working today, but we were willing to work for it and knew that we had to.

You must remember that when we (I mean the group of 1933) started in the Forest Service, we were all needing jobs, were basically hungry, and the opportunity to go to work was all that we needed. I think someplace between that and the present stage is a happy middle ground. I hope to see the Service come back to the time when each man who is employed will have to accept some of the responsibility for his own actions and his own training. To be sure, the world of today is different than our world of yesterday, and men are living under better conditions. This is good. I cannot say that our housing and way of life were always adequate, but I can say that under any of the conditions it was always fun, and I wonder if some of the men today have the same feeling and are getting the same fun out of working as we used to. I have discussed this philosophy a number of times with McCutchen, and he and I have had a great time kicking it around. He is on the side that is doing the training and is certainly sincere about it, and I believe he is setting forth training programs that are well worthwhile. I still think that Mac, being one of the old timers, understands the philosophy and sometimes wonders why a fellow doesn't pick up the ball and run with it without being given all the signals.

In this little writeup I have mentioned a number of men; some of them I have a great feeling for. I would like to enlarge upon what I think of their fine qualities, but some of the men will have an opportunity to read this, and if I said the many nice things I think and feel about a great many of them, it would probably be impossible for their wives to live with them, and therefore I will not go beyond what I have written.

Top and bottom: Ogden.

History of Engineering

Howard R. Jones

My Forest Service experience started at San Francisco in 1930. Then came a 20-year Washington Office assignment, beginning in 1931. Ancient history. R.Y. Stuart was Chief Forester. Our office was in the old Atlantic Building in downtown Washington. The entire organization for Personnel Management consisted of one clerk in the Division of Operations. In 1933, the CCC and other Depression period work programs exploded Forest Service work. But big government was thought to be temporary and needed buildup of organization lagged far behind for several years. Organizational lines and levels were not as important then and were ignored to some degree in the rush of work. This circumstance resulted in more association with our higher level officials and in more meeting with people in the Office of the Secretary of Agriculture, the Bureau of the Budget, and the Congress than would have ordinarily been possible.

The Atlantic Building—the age of this old and dirty rented office building is indicated by the original decentralized heating system—a fireplace in every room. While it was not peculiar to Engineering, as all the offices were there, we do want to remember it. It is mentioned here to sort of set the stage for things as they were long ago. I quote about half of an article in the Service Bulletin of December 7, 1931, entitled "The Atlantic Building—As Is," by E.N. Munns.

We approach the building and look casually for the entrance.

Through the dust and grime of a quarter century we discover on the glass above the door some lettering which is found to read "U.S. Department of Agriculture, Forest Service." Can this be genuine? We had understood that Forest Service signs should be neat, should have some kind of appeal, carry the badge, and be capable of trapping the unwary into reading. Perhaps these ideals are only for the field.

We ring for the elevator. While we wait—and wait—we study our surroundings. We learn that spitting on the floor is prohibited, "to do so may spread disease." Two such signs have been thought necessary, but lest one should take the sign too literally, the drinking fountain is labeled "For Drinking Purposes Only."

Finally, an elevator comes into view and sinks slowly and gracefully to the floor level. The door opens and a truck loaded with publications disembarks, but as the group endeavors to enter, the operator steps out with a "Take the other elevator," slams the door and walks off.

Again we wait. Others join us in waiting. After much button-pushing, a second elevator floats into view. With a "Let 'em out," the floor level is reached, the door clangs open, and several people emerge looking as if they had dropped and broken their Christmas spirit.

Nine of us crowd in as the door slams shut. The operator gives a big wheel a few turns and we look hopefully upward. But the elevator sinks a few inches. The operator opens the door and says "Not enough pressure today. One passenger out." The one nearest the door steps out, the door shuts, the operator winds his wheel, and we sink some more. When four men have thus gone overboard, we manage to take off, just as the clock strikes two. Waving good-bye to the castaways, up we go.

Our ascent is not without its charms. Rising at a gentle rate, we have a wonderful opportunity to observe the floors as we pass. We see the second floor and a clock that says 2:15. Have we been 15 minutes in flight? But the third floor clock reads 2:10. On the seventh floor, we note that it is just 2:05. We reach the eighth floor, the end of the line. To work out the total elapsed time proves impossible; the clock has stopped and our watch has run down since we took off.

Again we see that baneful sign "Do not Spit on the Floor, to do so may Spread Disease." We struggle with an impulse to try it and see what disease will appear. In a large room where numerous people are busy putting roads and trails on the map, we find nobody who knows the why of the sign; it has always been there.

In the Forester's anteroom are photographs of noted personages of the past, and specimens of wood products—likewise of the past. There are some socks, children's sizes and not mates. The label informs us that "$3,440,154 worth of artificial silk was made in 1914." There is a more or less realistic "hot dog," the dilapidated covering of which is said to be "made of wood." Aged samples of matting, paper, and cellophane, the latter wholly unlike the modern product, show recent progress (?) in the use of wood. One bottle is here, the label of which says that alcohol can be made of wood. From its appearance, the bottle has been empty since about 1919.

There was more, but this is enough to give the picture.

About 55 Years Ago

The Forest Service established Regional (then called District) Offices in the West in 1908. Soon after that, Engineers were employed to evaluate water-power sites. The Forest Service had obvious responsibility for decisions setting National Forest land aside for a special purpose. At that time, the sites often seemed to be so far back in such inaccessible high mountain country that potential multiple users were only vaguely realized.

The Engineers were working on a relatively well-financed, single-purpose, technical job. Forest Service financing was at a poverty level. Engineers were temporary technicians for whom the Forest Service provided housekeeping chores. Money came from another agency to do work the Congress had required that other agency to do. The Engineers were sort of step-children, living under the same roof but with little other ties to the rest of the outfit. For many years, Forest Service Engineers were field representatives for the Federal Power Commission. Over the years, some left for promotion and transfer to positions with the FPC.

It took 40 years for the early stepchild status to wear away. Much too long. The older Engineers who stayed with the Forest Service did little to correct it. Forester administrators had other problems. For a long time, hardly anything constructive was done.

Chief Forester Silcox was a rare exception. I attended a staff meeting a few months after he came. He spoke of the matter, and when Silcox spoke everyone listened. He gave a flat order to eliminate our differences. But the message did not go much beyond that meeting. The gradual advance for the better came more from the natural changes of time while the Forest Service grew to confident maturity. I'm glad all that is over with now. Over the long term, it's not too important, but it was there and should be mentioned. I envy the Engineers and Foresters who came recently and do not have to contend with it.

In 1913, Forest Service appropriations included for the first time a little money for roads and trails. Now some bridge designs were needed. Boundary surveys have always been required. Topographic mapping started early and is still going on. Gradually, engineering became a regular Forest Service activity.

The balance of this sketch will be concerned mostly with the Forest road business of the 1930's, and a couple of items to indicate how unbelievably different some things used to be.

Things Have Changed

It gets hot in Washington each year. Come summer, Chief Engineer Norcross and his first assistant George Lautz, field tripped in the less humid West. I held on in Washington till fall. One summer, the peace and quiet was shattered by the arrival in the Office of the Secretary of Agriculture of a man of considerable importance in New Mexico timber business and politics. With only the vague warning of "it has something to do with roads," I went along to see the Secretary and his visitor. The Secretary was understanding. The New Mexican was impatient. It was unusual then, it would be fantastic now, for an employee of my place in our organization to represent the bureau in a discussion with the Secretary about our appropriations, our priorities, and what we could and could not do. Government was more informal and much less expensive then.

On another occasion, I think in 1940, also in summer, Loveridge phoned. An Idaho Congressman had called a hearing. Hearing means a formal meeting where theoretically the witness talks and the Congressmen listen, although it's not always that way. Again something about roads. I represented the Forest Service at a hearing of little importance. Loveridge, of course, guessed the situation correctly and took a calculated risk that nothing critical would happen. It didn't, but it would take much more preparation and more people now.

Thirty years ago, Budget Officer Henry Wold and I used to talk by phone to men in the Budget Bureau. We gave them off-the-cuff, but somewhere-near-valid, guesses to their questions. These served just as well as if they were precise. It's more complex now, as only the folks working in Washington can fully appreciate.

Much later, in the relative quiet of Region 1, my associates could not believe that our most hectic day in Missoula was only about normal for Washington.

Transportation Plans

Early waterpower reports, 50 years ago now, included little mention of other possible future uses, including recreation. No doubt these were inserted by Foresters, but at any rate, the Engineers learned to think along such lines. T.W. Norcross, Chief Engineer in Washington from 1920 to 1947, thought a lot about it. This sort of consideration gave him a good start on developing procedures for a transportation plan for the National Forests. The first planning in the late 1920's was for fire control, soon expanded to include service to all resources. This was a new approach to highway planning, which until then, and for long after, was concerned mostly with traffic volume and cost per mile of vehicle travel.

Many roads were primarily for fire control. A problem then was how to design for speed of travel to meet our control requirements. Curves and grades limit speed. On flat land in a southeastern Forest, curved road sections were built and tests run. During 1929 and 1930, observations of speed on grades were made, but results were not consistent. Advice from the Bureau of Standards was secured. The effect of altitude on gasoline engine power had not been considered.

Then in 1931, I was assigned to the problem of finding what loaded trucks could do on grades on forest roads. A happy summer was spent with trucks, stopwatch, and helper running up and down Pikes Peak for data on elevations up to 12,000 feet. Then in California from near sea level to about 7,000 feet. We got good results.

The economics of travel for recreation was not so easy to measure. What is a Sunday drive worth? What if you go alone? What if a carful has a picnic on the way? We finally decided that it was worth what it cost to get the vehicle there and back. This had slightly screwball aspects, as it was then worth more to bounce over a poor road than to ride in comfort on a good one. Bob Marshall said that it was like putting a dollar value on mother love. He offered no better measure, and our idea was used and served well for years.

Transportation planning was a significant development. An orderly, detailed plan with economic justification answered questions of the Budget Bureau and the Congress. It provided some key to priorities for construction. It gave a useful total estimate. Revisions to keep it up to date could be and were made. Estimates of traffic to serve all foreseen uses involved participation by resource managers and thus were the start of a land-use plan—the start of better planning. T.W. Norcross provided the leadership and was persistent in the face of early objections. He deserves much credit.

While we considered that appropriations for roads and trails were too low, they would have been lower without the plan.

The Bulldozer

Naturally, men using road-building equipment had ideas for improvement. Forest Service Engineers, road foremen, and machine operators contributed to

the development of equipment. The important thing here was the power control that permitted the operator to raise and lower the dozer blade without leaving his seat on the tractor and while the tractor was in motion. In its field, this was comparable to putting the eye of a needle near the sharp end and coming up with a sewing machine.

The idea was quickly adopted by machinery manufacturers. I don't have statistics to prove it, but it is likely that there are more dozer blades in use today on earth-moving jobs than any other crawler tractor powered device.

The following is a page from a booklet prepared in Region 1 in 1955. The accompanying photograph, letter of August 12, 1930, and drawing of April 25, 1930, are from the records of the California Region, San Francisco.

The very earliest dozers were blades pushed ahead of teams of oxen. They were used primarily for backfilling trenches excavated for city water and sewer systems.

The photograph shows the first of the modern type dozers used for road building with angle blade reversible for side casting to either side and with power control for the operator to adjust the height of the blade. Earl Hall of the U.S. Forest Service developed a small scale-model, and then constructed this machine by hand in 1929 in the Bureau of Public Roads shop at Government Island near Oakland, California.

The attached drawing is a part of the design from the first hand-made machine. From these drawings a manufacturer in Davis, California, made several dozers which were purchased by the Forest Service, California Region.

The letter of August 12, 1930, reproduced in part on the next page, is a report of a trial of two machines in Forest Service, Region 1. This was the beginning of use of this type of equipment in the northwest.

The men mentioned in these documents shared with many others in contributing to the development of machines for mountain road construction.

Earl L. Hall, a forest road construction superintendent for the Forest Service, California Region, was an inventor and leader in early days of road equipment development.

Chester E. Jordan, during the 1930's, was in charge of Forest Service road construction in California.

Jack Haile, in the early 1930's, was engineer in charge of forest development road and trail construction and maintenance for the Forest Service, Division of Engineering, Washington Office. He left government service in 1934 to head the road machinery division of Gar Wood Industries.

George Duncan, during the 1930's and until his death in 1945, was head of the Equipment Section, Division of Engineering, Region 1, at Missoula, Montana.

Major E.W. Kelley was Regional Forester at Missoula, Montana. He retired in 1944.

Fred Thieme was Assistant Regional Forester in charge of Engineering for Region 1 until his retirement in December 1950.

Edward F. Huestis was a pioneer mountain road construction foreman for the Forest Service in California.

Howard R. Jones was a Forest Service engineer in California in 1930, then for some years was with the Division of Engineering in Washington, D.C., and in 1950 became Assistant Regional Forester in charge of Engineering at Missoula, Montana.

COPY

U.S. Forest Service
437 Havermale Avenue
Spokane, Washington
August 12, 1930

U.S. Forest Service
Ferry Building
San Francisco, California

Memorandum for Messrs. C.E. Jordan and Jack Haile

The trailmakers shipped to Spokane and Missoula by the Davis Mfg. Co., have all been installed on Cletrac 30's....

One of the machines is down at Pierce, Idaho, working in loose loamy material but with considerable stumpage and downfall. I worked it for two days and actually built about 2,000 feet of road. Did practically all the work from pioneering, to the finished grade, leaving very little for the grader to do. Experimented a little to see to what extent it was practical to clear the right-of-way of timber. I was able to push over all the dead snags, and incidentally, nearly got one of them in my lap—there is some danger of the tops of these snags breaking off and cracking down on the driver.

.....

George Duncan, Forest Engineer, who is a real construction man, watched every move and I don't think I ever saw an old time road man more enthusiastic.

.....

The real demonstrations were made on the Cabinet N.F. near Herron, Montana, where I made a switchback to grade in 40 minutes. While the switchback was located on a rocky point, the rock was of a shale formation and shattered enough that I could easily cut it out with the trailmaker. Considerable powder would have been used for this job if it had been done in the conventional manner.

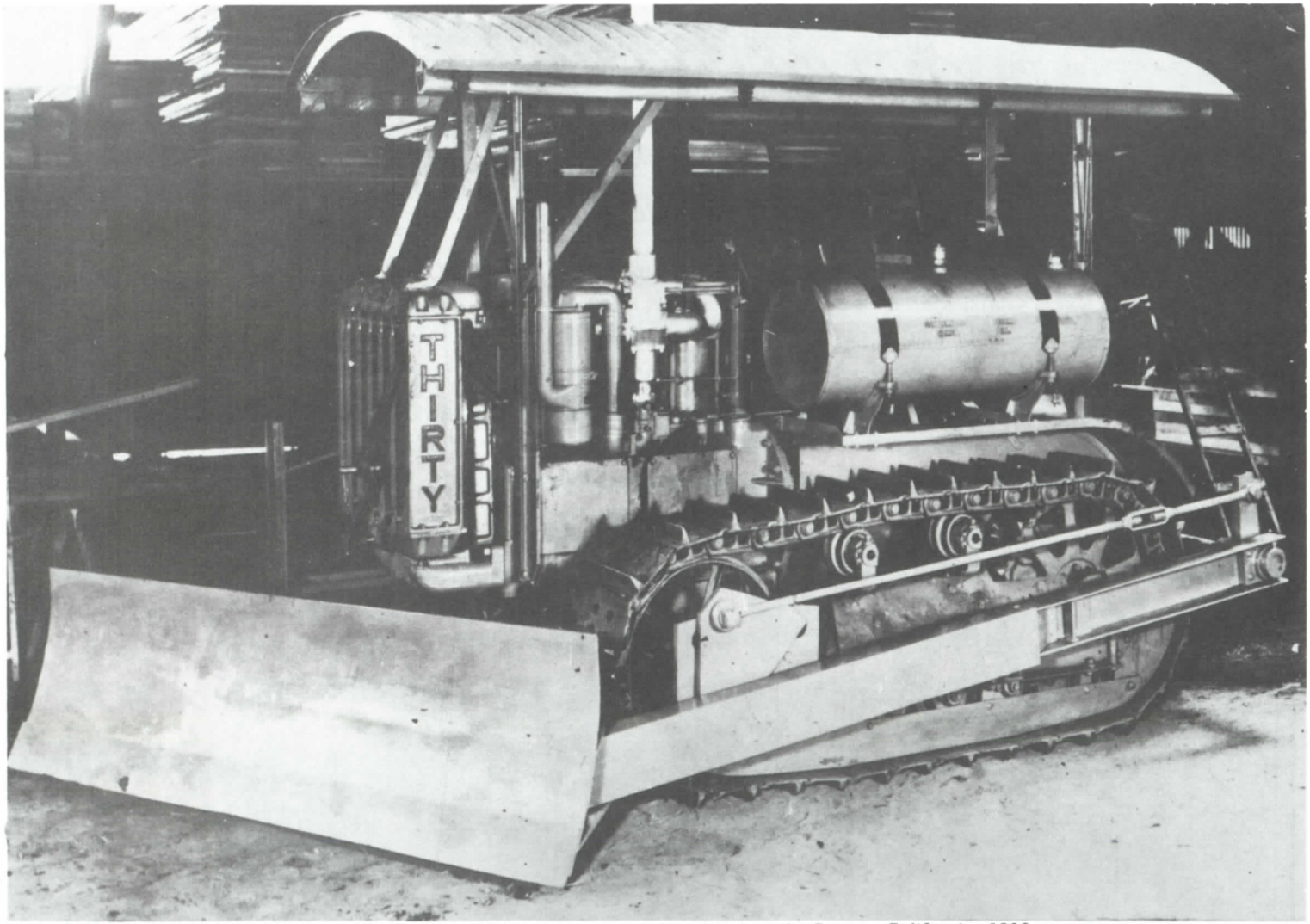
...Next, I made demonstrations of making cuts and fills, digging out rocks, stumps, knocking down banks and moving some downfall for Major Kelley and Fred Thieme, and a number of Forest Officers from the R.O. at Missoula the following day.

...Ed Huestis is doing very well on his project up "Jack Gulch" to the state boundary corner between Idaho and Montana.

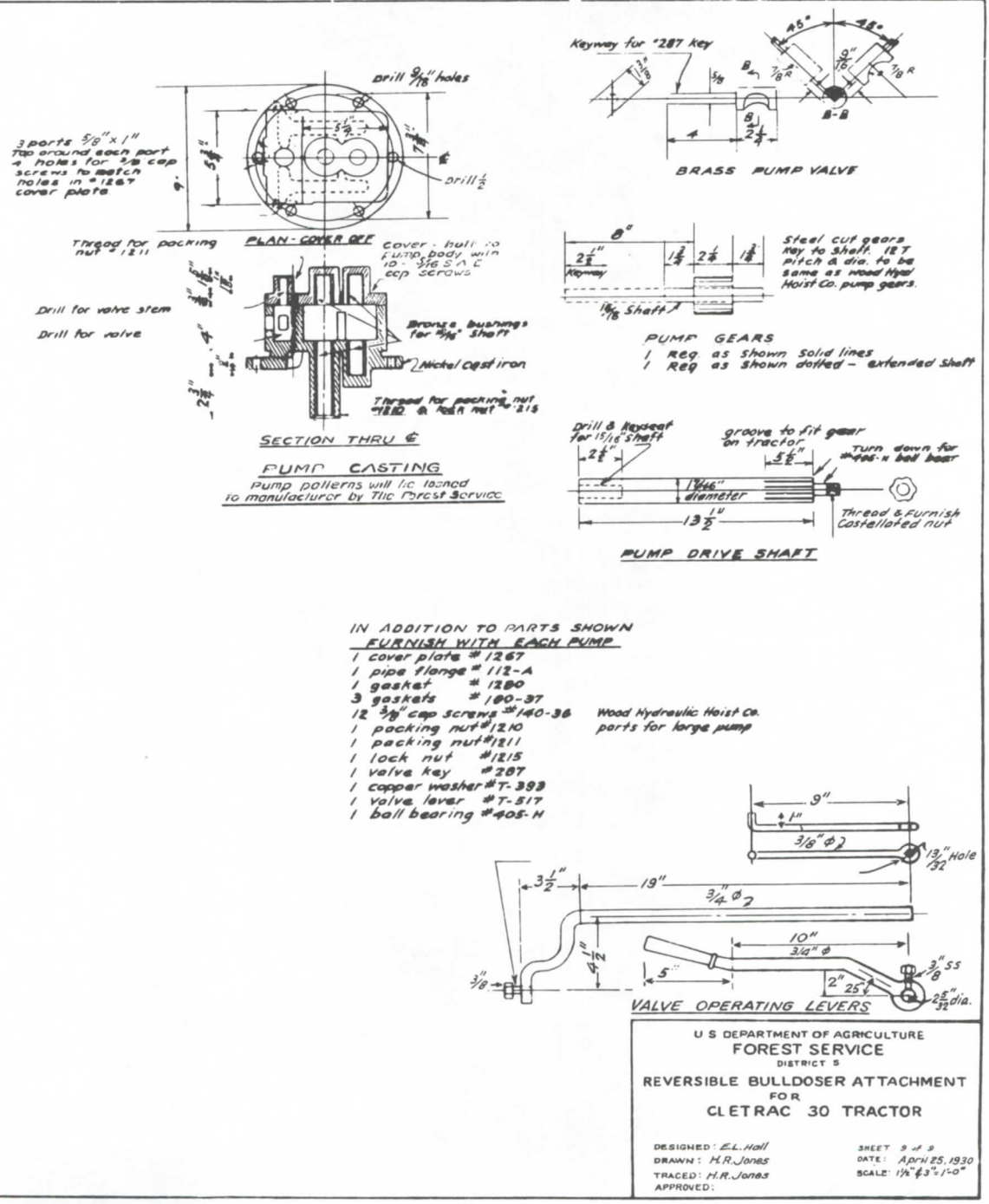
I have been travelling much of the time with George Duncan, visiting the various road projects. Much of our travel has been at night since they are so far apart as to passable roads. To go from the Pierce job to the Montana heading I spoke of, required a trip of nearly 400 miles yet the road will be only about 30 miles when finished. They surely need roads up here.

Yours very truly,

/s/Earl L. Hall



The Hall Trailbuilder attached to a Caterpillar 30, built at Government Island, Alameda County, California, 1929.


Drill 9/16" holes
3 ports 5/8" x 1" Tap around each port 4 holes for 3/8 cap screws to match holes in #1267 cover plate
PLAN - COVER OFF
Thread for packing nut #1211
Cover - bolt to Pump body with 10 - 5/16 S.A.E. cap screws
Drill for valve stem
Drill for valve
Bronze bushings for 5/16" shaft
Nickel cast iron
Thread for packing nut #1210 & lock nut #1215
SECTION THRU ℄
PUMP CASTING
Pump patterns will be loaned to manufacturer by The Forest Service
Keyway for #287 key
45°
B-B
BRASS PUMP VALVE
Steel cut gears key to shaft. 12T pitch & dia. to be same as Wood Hyd Hoist Co. pump gears.
5/16 Shaft
PUMP GEARS
1 Req as shown Solid lines
1 Req as shown dotted - extended Shaft
Drill & keyseat for 15/16" shaft
groove to fit gear on tractor
Turn down for #405-H ball bear
1 7/16" diameter
Thread & Furnish Castellated nut
PUMP DRIVE SHAFT
IN ADDITION TO PARTS SHOWN
FURNISH WITH EACH PUMP
1 cover plate #1267
1 pipe flange #112-A
1 gasket #1280
3 gaskets #100-37
12 3/8" cap screws #140-36
1 packing nut #1210
1 packing nut #1211
1 lock nut #1215
1 valve key #287
1 copper washer #T-393
1 valve lever #T-517
1 ball bearing #405-H
Wood Hydraulic Hoist Co. parts for large pump
VALVE OPERATING LEVERS
U S DEPARTMENT OF AGRICULTURE
FOREST SERVICE
DISTRICT 5
REVERSIBLE BULLDOZER ATTACHMENT
FOR
CLETRAC 30 TRACTOR
DESIGNED: E.L. Hall
DRAWN: H.R. Jones
TRACED: H.R. Jones
APPROVED:
SHEET 9 of 9
DATE: April 25, 1930
SCALE: 1 1/2" & 3" = 1'-0"

Recollections of Anthony P. Dean, Forest Service Engineer—1933–1964

Anthony P. Dean

Washington Office Staff Engineers Predating the Division of Engineering

The following were attached to Operations—the organizational unit comparable to present-day Office of the Deputy Chief for National Forest Administrative Management.

F.S. Plummer, loaned or reassigned from U.S. Geological Survey to be Engineer for Division of Forestry, 1905.

W.E. Herring, transferred to Forest Service from Department of Agriculture, Irrigation Division, to head Reserve Engineering Section of D.A. Division of Forestry, 1906. Herring was later made District Engineer at Portland.

I was never able to get a line on the background of these men. Their names do not appear in professional engineer directories that have come to my attention. A letter that I received from Governor Pinchot many years ago, requesting information about the old Tule River powerplant on the Sequoia, mentioned Plummer. That is the only mention of Plummer to come to my attention.

Forest Service Chief Engineers

Oscar Charles Merrill, best known as O.C. Merrill, functioned as Chief Engineer from 1910 to 1920. The title was given him in 1913 concurrently with responsibility for directing, as well as acting as consultant for, Forest Service Engineering activities. I believe this coincided with formation of a Washington Office Engineering Division.

Merrill was born in Maine (1874), graduated from Bates College, 1899, and from MIT, 1905. Received honorary doctor of science degree from Bates in 1925 and was subsequently known as Dr. Merrill. Taught civil engineering at University of California for 1 year subsequent to graduation from MIT. Spent next 3 years specializing in water supply, filtration, and power investigations in the Pacific Coast States. He became affiliated with the Forest Service in late 1909, Chief Forest Service Engineer in 1910, Chief Engineer in title in 1913.

Merrill's biographical sketch in the 1941 edition of *Who's Who in Engineering* shows him as District Engineer for California, 1910–13, and Chief Engineer, Forest Service, 1913–20. We must assume that 1910–13 Forest Service assignments were, as in some later years, manipulated to fit authorizations.

As a matter of fact, Walter L. Huber was District Engineer for California from 1910 to 1913. This may be confirmed from Region 5 records, *Who's Who*, and *Who's Who in Engineering* editions prior to 1960.

Merrill is generally credited with being the author of the Federal Power Act of 1920. From 1920 to 1929, he was executive secretary for the Federal Power Commission. Subsequently, he served on a number of commissions and world power conferences in the United States and abroad.

My recollection of the single occasion when I remember seeing Merrill pictures him as a dignified, unrelaxing type. A former subordinate of Merrill describes him as being of medium height and build with a round, bald head; a man who at that time, 1925, looked very much as George Nichols looks now (1965). George Nichols was the Region 4 Architect who retired about 1960. A former typist for Merrill says, "I didn't really know him, but he always seemed a little pompous to me."

Dr. Merrill was 50 or older when the above observations were made and some 15 to 25 years senior to the individuals who commented on his appearance.

Theodore W. Norcross, Chief Engineer 1920–1947, was second to hold the title "Chief Engineer" and report directly to the Chief of the Forest Service. The title of the position was changed in 1935 to Chief, Division of Engineering and the Division incorporated in the Branch (later Office) of National Forest Administration, headed by Assistant Chief for NFA.

Norcross was born in Medford, Massachusetts, graduated in civil engineering from Tufts College at Medford in 1904, spent 3 years as hydrographer with the Geological Survey, then became resident engineer for the Springfield, Massachusetts, Water Department. He returned to the Survey in 1909 and was assigned to the Denver office. Here he became a close friend of Alan Peck, for many years Regional Forester at Denver and lt. colonel in the World War I Forestry Regiment overseas.

In 1910, Norcross transferred to the Forest Service as District Engineer at Denver. In 1913, he was made Assistant Chief Engineer of the Forest Service, and in 1920 was promoted to Chief Engineer. Thus began the custom of selecting Forest Service Chief Engineers with Regional Engineer experience.

T.W., as he was commonly known, although to intimates as Ted, had all the appearance and manner of a proper Bostonian. He was rather short and inclined to rotundity. He suggested a high school principal or a Boston banker, although a bit short for the latter. With a Vandyke beard, he could have passed for a science professor or the type of consulting engineer common about Boston and New York before World War I.

I first met T.W. Norcross in the early 1920's while employed on an FPC-licensed hydroelectric power development. We had been advised of a pending visit by the Chief Engineer of the Forest Service from Washington and the Regional Engineer (Frank Bonner) from San Francisco in company with the chief engineer of the power company. I had no difficulty in correctly guessing which was the Washington Office Engineer when we met. T.W.

looked the part. He looked like the East while Bonner, although equally dignified, suggested the West.

Norcross was fond of music. He had an excellent voice in his younger days and was a member of a well-known Chevy Chase choral group, as well as a member of choir at his church. He was an avid gardener, both flowers and vegetables. He was a well-grounded and versatile engineer. His engineering interests were as varied as the many types of engineering he was called upon to direct. He was a constant pipe smoker until age 70 or thereabouts. But he had none of the stolidity of some pipe smokers. Rather, he was inclined to impatience. He would huff and puff around the office with considerable vehemence when he was dissatisfied with progress. I never found him to be the ogre that I think he imagined himself to be in the eyes of his crew.

T.W. was an enjoyable traveling companion. He was all business during working hours and a perceptive inspector. His notes on inspection trips were extensive and comprehensive. They were written in miniscule script that baffled all transcribers except his longtime secretary, Miss Dorothy Smith. T.W. would sip a glass of wine now and then but seldom indulged in anything stronger unless it be coffee. He missed his pipe and his coffee on a couple of occasions when he and I spent long evenings where both were taboo.

During my annual visits to Washington Office Engineering while stationed in California, Norcross and Washington Office Roads and Trails Chief Jones seemed always to be bogged down in the Section 23 report. This was a formidably detailed report of Forest Highway and Forest Development Road and Trail accomplishments and expenditures required by Section 23 of the Highway Act. The report went to the Subcommittee on Roads of the House Public Works Committee.

Chief McDonald of the Bureau of Public Roads, initially a bureau of the Department of Agriculture, and Norcross had been rivals for many years. Each autumn found them hassling over the Forest Highway program and appropriate standards for Forest Highways and Forest Development Roads. Their viewpoints would clash again when it came time to prepare the biennial Section 23 report, and sometimes yet again as they prepared to testify before the subcommittee pursuant to Forest Highway authorizations and appropriations.

T.W. had two other pet interests at this time: the all-purpose transportation plan and the road system it was expected to produce; and photogrammetry. He worked hard at encouraging greater use of photogrammetry for producing more accurate map coverage of the National Forests and for more general application to Forest administration.

Mr. Norcross was author of a number of brochures and handbooks dealing with Forest Engineering subjects and activities. Immediately following retirement, he became Secretary of the American Society of Photogrammetry and editor of the *Photogrammetry Society* quarterly. He continued to edit the quarterly and handle its advertising until shortly before his death in 1965.

Engineering, March 1924. (From left, top row: W.E. Dodson, H.A. Walsh, H.S. Meekham, R.E. Lee, Miss Flanagan, W.H. Morin, W.P. Pyne, Miss Barksdale; second row: A.L. Barber, W.H. Shaffer, C.L. Taylor, Miss Acker, Miss M. Stewart, Mrs. Walter, Miss Sizer, J.M. Witherow, C.A. Kolb; third row: Miss H. Smith, S. LoJacono, Miss Malcolm, G.H. Lautz, T.W. Norcross, M.S. Wright, R.R. Sabine, N.C. Tanner, G.P. Hilton, P.W. Faunce, G.B. Bruce; fourth row: Mrs. Hoyle, Miss L. Stewart, Miss Murphy, Miss Mowbray, Miss Walter, Mrs. Webb, Miss Mehurin, Miss Noyes, Mrs. Shaw, Miss Shinn.)

Engineering magazine articles announcing the retirement of T.W. Norcross in 1947 credited him with supervising construction of 76,000 miles of National Forest roads and 114,000 miles of trails representing an expenditure of $470 million. Fifteen years later, development road mileage had doubled, and existing trail mileage had dwindled by several thousand miles. By then, Forest Service Engineers were supervising construction of roads and other National Forest improvements representing expenditures of more than $100 million annually.

Anthony P. Dean, Director, Division of Engineering, 1948–1964, was previously Assistant Regional Forester for Engineering (Regional Engineer) in the California Region, 1939–47; hailed from Massachusetts; drifted West in 1921. Employed by power companies on snowfall and runoff investigations, 1921–24; pipeline and dam design, 1924–25; construction engineering, 1926–32. Signed on with Forest Service in 1933. He was light–haired, of medium height and stocky build, a field engineer, and construction straw boss type.

Regional Engineers I Have Known

Region 1

Frank Bonner, 1910–1916. Native of Montana; C.E. graduate, University of Montana, 1909; Honorary master's degree at Montana, 1928; with Forest Service, Montana and California, 1909–29; Regional Engineer, Region 5, 19??–1928; executive secretary, Federal Power Commission, 1929–30; subsequently consulting engineer in California for construction of irrigation, power, and water supply projects; Army Officer during World Wars I and II. Bonner was the construction engineer type, easy to meet, easy to talk to; a man for action; a rugged, well-built individual in his prime; and a good engineer. I first knew him after he became Regional Engineer in California. My role at the time was that of a power company employee.

During Bonner's time, the Forest Service Regional Engineer ranked with the Regional Forester. He operated independently of the Regional Forester with respect to licensed power projects. One Regional Forester thought he operated independently on other engineering matters. Bonner brought Bruce Burnett into the Regional Office to administer the Forest Highway Program.

George Lautz, 1916–1925. Born in Wisconsin; C.E. graduate, University of Wisconsin, 1908; engineer with Wisconsin Railroad Rate Commission and for 1 year assistant city engineer at Missoula before affiliating with the Forest Service about 1914. Promoted to Assistant Chief Engineer, Forest Service, at Washington Office in about 1925.

I first met George in 1939 during one of his annual inspection trips to Region 5. These inspections consisted of a brief stop at Regional Office, a cursory glance at photoreproduction facilities and products, short consultation with Mr. Falham, compiler of the Region's Section 23 report (Forest Development Roads and Forest Highways), and hurried conferences with the Chiefs of Engineering and Operations Divisions. Then he was on his way.

George was dark-haired, small and active, the nervous type that always wanted to be on the move. He was valued highly by T.W. Norcross as an

outstanding assistant. He was in many respects administrator for the Washington Office Division of Engineering. He supervised drafting, photoreproduction, and related services, attended to intra-Division personnel actions, employee welfare problems, and Division finances.

George had some income in addition to his salary so drove a Cadillac to work except during World War II. Gas quotas then forced him to the other extreme. He bought one of the first Austins seen around Washington. He had his troubles with the Austin. It fitted in an ideally located parking spot near the Court I exit, a space too small for conventional-sized vehicles, a space that was also below a favorite pigeon roost. It meant a cleanup job on the Austin every evening.

George was a great collector of the latest jokes, particularly naughty Catholic jokes, which he loved to exchange with Miss Smith, a devout Catholic. She in turn was quite successful at running across deflationary statements about Lutherans—George's faith.

Fred Thieme, 1925–1950. Born in Montana; C.E. graduate from University of Montana, 1912; 3 years with General Land Office; affiliated with Forest Service in 1915; made Assistant Regional Engineer 1920.

Fred was a particularly able engineer. He had vision and imagination. His aim was to design and build character into every engineering work, roads as well as structures. He was light-complexioned, short, well coordinated, wiry, and fiery. He wanted production, and he wanted it now.

Fred was always foresighted. He was largely responsible for promoting a good airport for Missoula in the 1930's. Fred and the Region 1 Engineers did most of the designing and supervising for the airport construction. Fred learned to fly a plane at 50, to water ski at 60. He was a skillful fisherman and successful hunter of big game besides being a good engineer.

Region 1 engineering works were well designed and constructed wherever the Engineering Division had been in control. Fred and I had one issue for disagreement. He saw no sense in spending money for bituminous surfacing as long as there were so many miles of new road needed by the Region. He was accustomed to Montana dust. I preferred not to be.

Howard R. Jones, 1950–1960. Transferred to Region 1 at his own request from WO Engineering, where he was previously Assistant Chief of the Division; born in Montana; C.E. graduate, University of Washington, 1923; Engineer with Pioneer Sand and Gravel Company at Tacoma, Washington, 1923–28; draftsman with Weyerhauser and other concerns, 1929–30; affiliated with Forest Service at San Francisco as junior engineer, 1930; transferred to WO Engineering, 1931; progressed to Chief of Roads, 1934, and Assistant Chief Engineer, 1946.

Howard was a dark, tall, lean, extremely youthful appearing, quick-witted individual, an able administrator, as well as an equally able engineer. His decisions received judicious preconsideration and were therefore unusually reliable. His reports were the essence of brevity. C.M. Granger once advised me to ask Howard for "three-page reports; one page is a little too

concise." He was the calm type with a well-developed dry humor—a delightful companion. His hobby was golf, and he was good at it.

Arval Anderson, 1960–1963. Formerly Regional Engineer, Region 4, at Ogden, 1939–1959; born in Idaho; C.E. graduate, Idaho State University, 1925±; Forest Service, 1925–1964, except for 5 or 6 years' military leave during World War II.

Andy was a good engineer, good organizer, and able administrator. He was a straight thinker and good writer. He was well versed in timber and range management. Regional Foresters Rice and Olsen regarded him highly as an integrating inspector.

Andy was tall, good-looking, dark, athletic; a good horseman; a good marksman with rifle and pistol. He was a good fisherman and successful hunter of deer, elk, pheasant, and ducks. His outside interests were many; his staff was kept busy maintaining engineering progress. He was a tower of engineering strength when demonstration was required.

Clifford A. Miller, 1963–19??. C.E. graduate, Texas A&M, 1950; military service, 1944–46; Engineer with Texas Highway Department, 1950–51; affiliated with Forest Service in 1951 as junior engineer, WO Engineering; Road party Chief on Flathead National Forest, Region 1, 1952; Assistant Forest Engineer on Kaniksu National Forest, Region 1, 1953–54; Forest Engineer on Cleveland National Forest, Region 5, 1955–57; Staff Engineer for Transportation System Planning at Juneau, Region 10, 1957–60; Staff Engineer for Water Power and other Water Use Projects, Water Use and Structures Branch, WO Engineering, 1960–63. Good man!

Region 2

T.W. Norcross, 1910–1913. See Chief Engineers.

James Brownlee, 1919–1940±. He was above medium height, husky, rugged, light-haired, a field engineer type. He was a horseman, hunter, fisherman. He was commonly referred to as Sunny Jim because of his good nature and ever-ready smile.

Carl Gould, 1941±–1950±. C.E. graduate, 1907±; had considerable railroad engineering and power company experience before coming to the Forest Service; versatile engineer, experienced in structural (bridge design) and hydraulic design. Carl was slight of build, of medium height, light-haired, a kindly sort of man; the office engineer type, although much of his experience had been field engineering.

Henry Shank, 1950–1959±. Born in Texas; veteran of World War I; pre–Forest Service experience was surveying and drafting; joined Forest Service in Region 4, 1921; Staff Engineer at Ogden, 1921–23; Chief of Surveys and Maps, Region 4, 1923–30; Assistant Chief, Operation, in charge of Fire Control, 1941–43; Regional Engineer at Ogden, Region 4, 1943–44; in charge of Service-wide Trail Study for WO Engineering, 1947–50.

Henry was tall, rangy, of medium complexion; a man of strong convictions; self-disciplined and a maintainer of discipline; excellent horseman, good fisherman, keen and successful hunter of big game, duck, pheasant, quail; a

good man to be with on a pack trip. He was the practical engineer type, self-taught in design; an excellent field engineer. His endurance was phenomenal when he was in his prime.

Charles Emmett Remington, 1959–1961. Born in Idaho; C.E. graduate, Oregon State 1929±; with Idaho State Highway Department, 1929–33; affiliated with Forest Service, 1935; Construction Engineer out of Region 1 Regional Office, 1935–40—Engineer on the Fishhook road tunnel on St. Joe National Forest in Region 1; Army officer during World War II; Assistant Regional Engineer, Region 1, 1946–49; Staff Engineer on National Forest Improvements in Washington Office Engineering, 1949–51; military service, Major to Colonel, during Korean War, 1952–54; Assistant Regional Engineer at Portland, Region 6, 1955–59; transferred to Bureau of Land Management in 1961 to become Chief of its Washington Office Division of Engineering.

Boyd Fisher, 1962–19??. Native Californian; employed by private engineering firms, 1922–33; road locator and right-of-way procurer on Trinity National Forest, Region 5, 1933–41; officer in Seabees during World War II; on Los Angeles Flood Control Project, Region 5, 1945–46; Forest Engineer, Lassen National Forest, Region 5, 1946–47; Forest Engineer, Los Padres National Forest, Region 5, 1947–54; Budget Officer, Region 5 Division of Operation, 1954–57; Regional Engineer at Philadelphia, Region 7, 1957–62.

Fisher was dark-haired, of medium height and build, a breezy extrovert, and a good leader. He had a mind capable of sorting and analyzing technical and scientific information. His inclination and practice was to follow the broad administrative approach rather than stoop to critical examination and specific direction.

Region 3

Howard Waha, 1936–1952. Native of Pennsylvania; C.E. graduate, Penn State, 1908; employed by steel company, 1908–09; land and map control surveyor and road locator, Region 3, 1909–17; Chief Engineer for a steel manufacturing company in Pennsylvania, 1917–32; Staff Engineer, bridge design, Region 8, Division of Engineering, 1934–35.

Howard was dark-haired, well built, of above average height, urbane, debonair, articulate, humorous, entertaining, a keen, highly perceptive engineer, and crackerjack tennis player. Much of his first hitch in Region 3 was spent on land surveys and road location. He located and supervised construction of the original Red Rock Canyon Road on the Santa Fe.

He also did most of the bridge and building design accomplished by the Region 3 Division of Engineering before World War I. On his second hitch in Region 3, Forest highways were his major interest. He retired in 1952.

E. Raymond Huber, 1953–1961. Native Californian; C.E. graduate, University of California, 1923; Field Engineer with PG&E, 1923–27; designing engineer, structural, with Walter Huber, Consulting Engineer, 1927–31; with Coast and Geodetic Survey, 1932–33; Bridge Engineer, Forest Service, Region 5, 1934–38; Forest Engineer, Angeles National Forest, Region 5, 1939–40; Chief of Structures Section, Region 5, Division of Engineering, 1941–45; Forest Engineer and Fire Control Officer, Shasta National Forest, 1946–50; Assistant Regional Engineer, Region 3, 1951–52.

Ray was dark-haired, usually happy except when he was worried, a little below average height, a little beyond average girth, versatile, resourceful, ingenuous, practical, realistic. He was a down-to-earth engineer and a good one. He was well versed in the fundamentals of good design and good construction and could apply both effectively. He preferred the fun of construction, however. He was happiest when erecting a bridge. He was a painstaking trainer and a sympathetic labor boss, always popular with the working men.

Ray was an ardent fisherman and hunter, particularly the latter. He never cared for horseback riding. The saddle was too high up, and the horse was always too wide. Ray preferred to walk. He was a registered structural engineer in California and New Mexico.

Roger Nelson, 1961–1964. Native of South Dakota; C.E. graduate of South Dakota; road location engineer, Region 1 Division of Engineering, 1934–37; collaborator with James J. Byrne at Pacific Northwest Forest and Range Experiment Station on Logging Road Studies, 1946–47; Chief of Roads Section, Region 6, Division of Engineering, 19??–1960.

Roger had brown hair, was a bit under average build, active, aggressive, a fast worker, although a detailist. His specialty was road design. He was expert at it. He contributed significantly to improving standards and utility of Region 6 logging roads. His was a practical approach to good road engineering.

Roger was a registered engineer in South Dakota. He was coauthor of the *Logging Road Handbook,* published as Department of Agriculture Handbook 183.

Richard Weller, 1964–19??. Native of Colorado; C.E. graduate of University of Colorado, 1948; degree in Business Administration at University of Colorado, 1949; Staff Engineer, Region 2 Division of Engineering, 1949–51; Forest Engineer, White River National Forest, Region 2, 1951–53; R&T Squad Chief, Region 2 Engineering, 1953–55; Staff Engineer for Region 10 at Juneau, 1955–58; Forest Engineer, Plumas National Forest, Region 5, 1958–60; architectural engineer, Washington Office Division of Engineering, 1960–62; Chief of Water Uses and Structures Branch, Washington Office Engineering, 1962–64.

Region 4

Joseph P. Martin, 1908–1938. Native of Pennsylvania; C.E. graduate, Lehigh, 1900; with U.S. Steel 1900–03; Superintendent of Construction, Virginia Railways, 1904–07; transferred to Federal Power Commission, 1938.

Although I knew Joe Martin, Webb Kennedy knew him better. Webb should therefore prepare the description and characterization.

Arval Anderson, 1939–1940 and 1946–1959. Native of Idaho; C.E. graduate, Idaho State University, 1925±. See Region 1 Engineers for more detail.

Minor Huckeby, 1959–1962. Born in Wyoming; C.E. graduate, Colorado School of Mines, and served as a professor, surveying and other engineering subjects at Colorado until 1934. Staff Engineer, Communication Systems,

Region 2, 1934–39; Assistant Regional Engineer, Region 2, 1940–52; Regional Engineer at Philadelphia, Region 7, 1952–57; Regional Engineer at Atlanta, Region 8, 1957–59; Project Leader for Engineering Research with Intermountain Forest and Range Experiment Station at Bozeman, Montana, 1962–66.

His successive assignments to several Regions were progressive advancement. The Region 8 position carried a higher grade than the Region 7 position at the time. The transfer to Region 4 was response to his preference for a western Region. The transfer to Research was made in response to WO desire for his experience in the project leader position.

Huckeby was above medium height, inclined to obesity, dark-haired, full-faced. He leaned toward the academic approach. He was good at indoctrinating old engineers with refined concepts of Forest engineering and new engineers with enthusiasm for Forest Service Engineering. He was an active, aggressive, and articulate Regional Engineer. He was particularly effective at recruiting. He was not particularly interested in horseback riding, walking, or hunting and fishing. His principal interest was in developing engineers and engineering leadership.

Huckeby always hoped to return to Region 2 as Regional Engineer. The Service always seemed to have greater need in some other Region for a Regional Engineer with Huckeby's capacity and attainments. He rejected a number of offers of positions in Washington Office Engineering. He did not want to be trapped in a desk job.

James Usher, 1962–19??. Forestry graduate, Oregon State, 1940; engineering student, Montana State, 1940–41; Fireguard on Kootenai National Forest, Region 1, 1938–41; Engineering Aide on War Mapping Project, Los Padres National Forest, Region 5, 1942; draftsman and technologist on Emergency Rubber Project, Region 5, 1942–46; TM Assistant on Ochoco National Forest, Region 6, 1946; Engineering Aide, Ochoco, 1947; Assistant Forest Engineer, Cleveland National Forest, Region 5, 1948; Forest Engineer, Cleveland National Forest, Region 5, 1950–51; Forest Engineer, Eldorado National Forest, Region 5, 1951–55; Supervising Highway Engineer, Washington Office Engineering, 1955–60; Assistant Regional Engineer, Region 4, 1960–62.

Jim was dark-haired, over 6 feet tall, over 200 pounds, a big man, a football player type, a construction superintendent type. Jim was a topnotcher for the position of Washington Office Engineering supervisor for road and trail improvement and maintenance.

Region 5

Walter Huber, 1910–1913. Native Californian; C.E. graduate, University of California, 1905; structural designer with J.D. Galloway, Construction Engineer, 1905–08; Chief Engineer and Supervising Architect, University of California, 1908–10.

Huber left the Forest Service to enter consulting practice. He became a well-known San Francisco consulting engineer for all types of structures. He was prominent as an authority on design of earthquake-proof structures. His office designed and supervised construction for the underground garage

below St. Francis Square in San Francisco. He supervised most of the work at San Simeon, the W.R. Hearst estate in Monterey County. He was on permanent retainer by several power companies. He was retained by many dam-building agencies.

Walter was black-haired, short, with a tendency to rotundity. He was the serious type, too busy for fun, a contrast to his younger brother, Ray. Walter was pleasant to talk with but not one to bandy conversation. He was a long-time member of the Sierra Club, participating in its annual expeditions to the mountains in his younger years. He broke off relations with the Sierra Club in the late 1950's when its misleading releases concerning the Forest Service took on a scurrilous tone. He was on the National Park Service advisory board for several years; President Eisenhower's representative to bring Agriculture and the U.S. Engineers together on the Arkansas, White, and Red Rivers Project; National ASCE President; and always a Forest Service supporter. I enjoyed working with him as a consultant to the power company and later as one of my predecessor Regional Engineers in California.

Fred H. Fowler, 1913–1922. C.E. graduate, Stanford, 1905; varied engineering assignments, California, Egypt, Michigan, and California, 1905–10. Affiliated with Forest Service, 1910–22, except for military service, 1917–18, as Captain of Engineers in World War I. Subsequent to 1922, was in private practice as consulting engineer. Fowler was National ASCE President in 1941.

Fowler, like Huber, had been in private practice for several years before I met him. Fowler was the serious type. He looked the part of a consulting engineer. He was pleasant but reserved. He was dark-haired, above average height, and slim. His autobiography in *Who's Who* was longer than Merrill's—more than twice the length of other Forest Service Engineers. I would have expected that from my slight acquaintance with Fowler. He was quite an author.

John Lawrence has probably furnished a better description of Fowler. I believe John worked for him for a year or two.

Frank Bonner, 1921–1928. (John Lawrence is a better authority for these dates.) See Region 1 Regional Engineers.

Edwin W. Kramer, 1929–1936. Native of Kentucky; Spanish-American War veteran; C.E. graduate at Cornell, 1905; New York State Barge Canal, 1905; Construction Engineer, Quartermaster Department, 1905–07; Forest Service, 1907–36; transferred to Federal Power Commission, 1936.

Ed Kramer was a light-haired, tall, thin fellow when I first knew him in the 1920's. He always seemed more office man than field man, although having the appearance of a field engineer. A considerable portion of Regional Engineer Kramer's time was spent on licensed power project business. Ed was a specialist in dam design. This was a time when there was considerable difference in opinion among California engineers concerning the validity of Jacobsen's patents or copyrights on constant-angle, single-arch design and merits of constant-angle versus constant-radius arches.

Comment heard on Region 5 Forests suggested that the Regional Engineer did not mix much with Forest officers. During my three 3 on the Sierra while Ed Kramer was Regional Engineer, I saw him on the Forest on only one occasion. His visit lasted about 20 minutes. Perhaps that should not be surprising for that time. Operation and Lands were running the roads and improvements programs. Hydroelectric development was quiescent on the Sierra. Some Forest Supervisors felt, nevertheless, that the Regional Engineer should show more active interest in Forest construction and maintenance problems and activities.

Most Forest Supervisors agreed, however, that Kramer had the makings of a good Forest Service Engineer. A favorite Region 5 anecdote, when Forest Supervisors came together, was the account of the night "when Ed Kramer joined the Forest Service." That event occurred during the bull session at a downtown hotel, following a Supervisors meeting about 1932. The baptismal seemed to have involved total saturation. Previously, Ed had been regarded as an aloof type. Subsequently, he was accepted as a member in good standing of the Region 5 team.

Kramer designed or supervised design of water-measuring dams, canals, and flumes at San Dimas. John Cotton also contributed to design and was construction engineer for the San Dimas installations and some of those on Kings River, Big Creek. Spencer Munson, later plant engineer at the Forest Products Laboratory at Madison, Wisconsin, followed John Cotton in supervising installation of the Big Creek sediment catchment basins. Experiment Station Director Kotok had a high regard for the engineering ability of both Kramer and Cotton.

Herman Sedelmeyer. Sedy was Chief Draftsman in the Region 5 Division of Engineering for many years before and after World War II. During the late 1930's, he was detailed as project leader for a task force of WPA workers engaged on producing large-scale plaster relief models for each Region 5 National Forest.

The crowning achievement of the project was a relief model of the State of California. This was a prominently displayed and very popular exhibit at the 1939 Golden Gate Exposition and World's Fair on Treasure Island in San Francisco Bay. The model was subsequently placed on permanent display in the San Francisco Ferry Building.

Charles Young. Charley was project leader for the first Forest Service soils laboratory. Initially, Buck Lane and Charley established the testing laboratory in order to ascertain materials mixes and methods of application best suited to hard-surfacing and dust-proofing Forest development roads used for combination logging and recreation traffic. Charley later became a full-time soils testing engineer. Region 5 Engineering, Charley Young, Buck Lane, and Regional Engineer Byrne, therefore, initiated the soils investigation now customary in conjunction with most road construction and maintenance by the up-and-coming Forest Service Regions.

Charley Young was a graduate in Civil Engineering from Cornell about 1914. Prior to 1933, he was the Road Engineer for the Region 5 Division of Operation. Allotments to Region 5 for Road and Trail construction

were meager in comparison with those in more recent years. One party chief—Charley Young—could locate and stake as many miles of high-standard truck trail as could be built with available funds. Other truck trails were located and staked by the improvement Rangers on the Forests.

With the advent of the 1933 CCC program, Charley became an indoctrinator of potential road locators in the art of abney level road surveys. The Region was suddenly needing dozens of road locators. No trouble was experienced in recruiting engineers. Many were recent college graduates with no road location experience. Others were accustomed to more refined highway location surveys and construction staking than the Forest Service believed necessary for the class of roads it intended to construct. Charley was now known as Professor Young.

Charley prepared texts for abney level road locations, organized instructional material, trained a few assistant instructors, and ran a series of 6- to 8-week training camps in road location and construction staking. Within the next 2 or 3 years, he had turned out a couple hundred or more graduates.

John C. Beebe, 1936–1939. Native of Massachusetts; B.S. at Dartmouth, 1909; C.E. degree at University of Washington, 1910; started with USGS, 1910; with Forest Service supervising Montana Power Company hydro development projects, 1910–12; construction engineer and foreman on construction of irrigation works in Montana, Idaho, and Wyoming, 1913–16; construction superintendent and engineer on highway and other construction in Montana and Wyoming, 1917–25; designing engineer with Fred Tibbets (S.F.), 1927–28; with War Department, then PG&E at San Francisco, 1928–29; senior engineer, Region 5, Division of Engineering, 1929–36.

John Beebe was a husky, outdoor type who immediately impressed one as being as broadly experienced as in fact he was, in both office and field engineering. He was an excellent organizer and wise in the techniques of successful delegation. His ability was as highly respected by the Regional Office Staff as by the Region 5 Engineering Staff and T.W. Norcross. He was by far the most popular Regional Engineer Region 5 Forest Supervisors had encountered.

John transferred in 1936 to the Federal Power Commission's Washington Office as Chief Engineer for Flood Control Surveys. Later, he returned to San Francisco as Regional Engineer for FPC for a short time, eventually retiring to the Idaho panhandle.

Anthony P. Dean, 1939–1947. Described under Washington Office Division Chiefs.

James J. Byrne, 1947–1955. Native of Idaho; B.S. at Montana, 1929; M.S. at MIT, 1931; doctor of engineering at Montana, 1964; research engineer with General Electric, 1931–32; Water Power Specialist on Region 1 Engineering Staff, 1933–41; Chief Engineer, Forest Service Emergency Rubber Project, 1942–46; Chief, Forest Products Utilization Service, Pacific Northwest Experiment Station, 1946–47; transferred to WO as Director, Forest Products and Engineering Research Division, 1955; reassigned to Director of Engineering, 1964. A natural for Chief Engineer for Department of Agriculture.

K. Webb Kennedy, 1955–1966. Native of Texas; C.E. graduate, Georgia Tech, 1927, with Colorado Fuel and Iron, 1927–33; junior engineer, Bureau of Reclamation, Denver, Colorado, 1933–35; Staff Engineer at Ogden, Region 4, Forest Service, 1935–41; military service, 1941–46; Staff Engineer, Washington Office Engineering, Forest Service, 1946–48; Regional Engineer at Philadelphia, Region 7, 1948–51; military service, Lt. Colonel of Ordnance, 1951–52; Assistant Chief, WO Engineering, 1952–55; Regional Engineer, Region 5, San Francisco, 1955–66.

Webb was no "Rambling Wreck," but a hell of a good engineer. He was a mainstay of Forest Service Engineering in upholding high standards of eligibility for Forest Engineer positions.

R. Max Peterson, 1966–19??. Native of Missouri; C.E. graduate, University of Missouri, 1949; master's from Harvard Graduate School, 1959; Assistant Forest Engineer, Plumas National Forest, Region 5, 1949–53; Forest Engineer, Plumas National Forest, 1954–55; Forest Engineer, San Bernardino National Forest, Region 5, 1955–58; Staff Engineer, Region 1 Engineering, 1959–61; Staff Engineer, Civil Engineering Branch, WO Engineering, 1961–63; transferred to WO Division of Administrative Management, 1963–65.

Gus Jurhens. Graduate in forest engineering from a Swedish forestry school. Gus was Region 5 Engineering's contribution to research in vegetative stabilization of decomposed granite soils. Engineering first encountered Gus on a blister rust crew on the Stanislaus National Forest. Subsequently, San Diego County was prevailed upon to put Gus in charge of a county prison camp crew restoring the natural appearance of the side slopes along the road to the Palomar Observatory from State Highway 76. The Forest Service permit for the Palomar Road on the Cleveland National Forest stipulated roadside restoration measures. Gus was so successful on that job that Engineering made him a permanent member of its team. Gus experimented with many plants and shrubs that he hoped might prove to be the solution for stabilizing DG slopes on the Angeles. His hopes were pinned on cistus to solve the problem. He died before his research was complete.

Region 6

W.E. Herring, 1910–1913.

Phillip Dater, 1913–1932. See Ray Grefe's record.

James Frankland, 1932–1952. Native of State of Washington; C.E. graduate, University of Washington, 1914; worked on Big Creek Project (Sierra National Forest) of Southern California Edison in 1912; Region 6 Forest Service Surveyor, 1914–17; artillery officer, World War I, 1917–19; engineer, Port of Tacoma, 1919–22; engineer, Tacoma Smelter, 1922–23; bridge design (Burnside), 1923–24; returned to Forest Service, Region 6 Engineering, 1924.

Ray Grefe has probably sent the foregoing and later information on Jim. Perhaps Ray omitted that Jim was on the crew while at the University of Washington. He was a light-haired, tall, rangy fellow in his prime; had the looks of crewman.

Forest Development Road construction, Nantahala National Forest, circa 1920.

Kraemers, of Hedrick and Kraemers, consulting engineers for the Burnside Bridge, had a very high regard for Jim. Believe they were on other work together. Kraemers and I were employed by the same contractor in 1929. I heard a great deal about Jim Frankland at the time. Jim was an enthusiastic member of the National Guard following World War I. He was ready to go in World War II, but for some reason was not accepted. Some of the Regions had strong influence with military authorities in instances where the Forest Service wished to retain key employees more than 30 years of age.

I think Jim was Chief of Maps and Surveys at Portland for some years preceding 1932. Jim is best described in one word as "conventional." He was a strong Regional Engineer. He rated highly with Regional Foresters—Granger, Watts, particularly, and Buck. Jim recruited some good men during the CCC program—Al Loew, Bill Nelson, Ward Gano, and others from the University of Washington. He was good at assigning men where their talents were effective. He devised the plan for running prospective Forest Supervisors and graduates in logging engineering through the Forest Engineer position. That plan was sound at the time. Jim pictured the Forest Engineer as principally coordinating road construction and improvements maintenance operations. He anticipated that these and other engineering activities on the Forests would continue to be directed and supervised on the ground by detailers from the RO Engineering Staff.

Jim and I saw eye to eye on what was good engineering. Our viewpoints diverged with respect to promotions. Jim subscribed to the sanctity of seniority and respect shown by prospective candidates for certain social conventionalities. I was for promoting the candidate best qualified by demonstrated success in engineering and, where necessary, in supervising engineers.

Ray Grefe, 1953–1961. Forestry graduate, Michigan; private practice as surveyor in Alaska, 1923±–1925; Forest Engineer, Willamette National Forest, Region 6, 1925–1929; Assistant Regional Engineer at Portland, 1935–1951.

Ray and I were on detail together in WO in late 1939. Our assignment was compiling a report for Congress on Forest Development Road and trail accomplishments and expenditures to date. The job proved to be beyond my competency. Ray had to prepare the report, finally.

Ray inherited a going organization from Jim Frankland but one adjusted to a considerably smaller program than was now getting under way. Ray was continuously up against a tough recruiting problem throughout the years he was Regional Engineer. Region 6 kept the ball rolling nevertheless. He was fortunate in obtaining men like Roger Nelson to head the road construction program, and DiBenedetto for architectural design, meanwhile holding onto some good road inspectors like Verne Church and McPherson.

I used to envy Jim Frankland for his smooth-running organization when Ray was his assistant. Ray had the office end of Region 6 Engineering well-organized. Region 6 transportation system records continued to be well maintained after Ray became Regional Engineer. WO Engineering could always rely on Region 6 for prompt, detailed response to any question asked by appropriation subcommittees concerning Forest Development Road

accomplishments and costs. From Region 6 data, WO Engineering could always concoct a report on road program progress Service-wide.

Ward Gano, 1961–19??. Native of the State of Washington; C.E. graduate, University of Washington, 1935; Junior Engineer, Forest Service, Region 6, 1935–38; Structural Engineer, Region 6, 1938–46; Chief, Bridge Design, Region 6, 1946–50; Road Engineering Staff at Missoula, Region 1, 1951–52; Senior Highway Engineer detailed to replanning Kootenai road system back of Libby Dam, 1952–53; Highway Engineer, Region 1 Engineering, 1953–54; Chief, Structures and Water Development Section, later Civil Engineering Branch, WO Engineering, 1955–61.

Ward was an outstanding addition to the WO Engineering Staff. He was one of the most able and industrious engineers I have encountered. He was an immensely valuable staff assistant. My only trouble with Ward was that he soon made a name for himself with Assistant Chiefs, other Division Chiefs, and with the Department. His services were consequently in great demand. As Branch Chief, he was well nigh indispensable. He was a highly effective trainer for younger engineers transferred to WO Engineering for broadening and deepening.

While still Region 6 Bridge Engineer, Ward authored the section on bridges for the Forestry Handbook published by Ronald Press for the Society of American Foresters, 195?. Ward's material was more comprehensive and superior to that in the published Handbook but was editorially cut without review by Ward, in order to fit space limitations.

Region 7

Joseph Cummings Dort, 1923–1948. Native of New Hampshire, B.S. from MIT, 1909; with Pennsylvania Steel, later Boston Elevated Railway, 1909–10; Water Resources Branch of USGS, 1910–16; Engineer with Forest Service, 1916–48.

As I recall, Dort started one of the first formal training programs for junior engineers in the Forest Service. In the period 1934–36, Forest Engineer positions were established on all Region 7 Forests. At that time, Dort foresaw the need to recruit, train, and develop a corps of young professional engineers who would be ready to move into Forest Engineer positions and Regional technical positions as openings occurred. Accordingly, he recruited GS-5 junior engineers for each Forest. Included in this first group of trainees were Herb Holmquist, Ted Gienty, and Clayton Seitz.

Dort was first of all an engineer. He always expected a professional job from people working for him. At the same time, he was never too busy to give counsel and advice on technical problems. He had a philosophy that structures and improvements designed and constructed by the Federal Government should reflect the best in good engineering. With this in mind, he emphasized a conservative position in structural safety and design. A look at the many structures designed and constructed during his tenure in office and still performing satisfactorily reflects this approach.

Dort was highly thought of by T.W. Norcross. He was a meticulous engineer but a highly practical one. During several visits on Region 7 Forests in 1939 and in later years, I was impressed with roads, bridges, and other

improvements designed and constructed under direction and supervision of Cummings Dort. Many had been designed by him.

In the mid-1920's, Dort was detailed to investigate and report on power development possibilities in southeast Alaska. His report was published by the Federal Power Commission—"Water Powers of Southeastern Alaska." I believe Norcross used him at other times to make waterpower examinations.

My first meeting with Dort was in California, about 1924, I think. I remember him as an engaging personality, intent on learning all he could about the project he was visiting but at the same time interested in learning about places and people.

K. Webb Kennedy, 1949–1951. See Region 5 Regional Engineers.

Minor Huckeby. See Region 4 Regional Engineers.

Boyd Fisher. See Region 2 Regional Engineers.

Clayton Seitz, 1961–1966. Native of Pennsylvania; C.E. graduate, University of Detroit, 1931; Assistant Forest Engineer, Cumberland National Forest, Region 7, 1941–42; Forest Engineer, White Mountain National Forest, Region 7, 1946–48; Structural Engineer, Region 7 Engineering, 1949; Assistant Roads Chief, Region 9 Engineering, 1950–55; Roads Chief, Region 5 Engineering, 1955–61; Chief, C.E. Branch, WO Engineering, 1961; Assistant Director, WO Engineering, 1966–19??.

Clayton would never have been transferred to Region 9 from Region 7 if I had known then as much as I learned later of his qualities. We should have transferred him into WO Engineering at that time; we needed Engineers like him. Seitz was highly rated by both Arthur and Kennedy.

Region 8

Resin E. Pidgeon, 1934–1957. Native of Virginia; C.E. graduate, George Washington University, 1931; Forest Service boundary surveys, 1917; military service, 1918; Forest Service boundary and acquisition surveys, Region 7, 1919–19??; Assistant Regional Engineer, Region 7, 19??–1934.

Pidgeon retired from the Forest Service in 1957. He then became instructor, later professor, I believe, at Emory University, teaching surveying, mathematics, and perhaps other subjects. Pidgeon was of average height and build, with light hair and a pleasant personality. He was always interested in the welfare of his subordinates. He went to great lengths to induce them to improve their education. Kelly Heffner was, for example, one of those whom Pidgeon persuaded to return to college and earn a degree in engineering.

Pidgeon was first Regional Engineer for Region 8, ascending to that position when the Region was established in 1934. He was an expert on cadastral surveys, National Forest boundaries, and land acquisition. He was also expert at locating light-duty roads and directing their construction and maintenance. He had graduated "with distinction" from G.W. He was a skilled, resourceful, and practical designer of light-duty timber bridges. Region 8

presented an imposing array of treated-timber, pile-supported bridges on the Region 8 flatland Forests.

Pidgeon had directed the construction of hundreds of miles of excellent light-duty and medium service roads in Florida sand across Mississippi and Alabama bottom lands and in North Carolina and Arkansas hill country.

Resin was a staunch southerner by inclination, temperament, and regional sympathies.

Minor Huckeby, 1957–1959. See Region 4 Regional Engineers.

Kelly B. Heffner, 1959–19??. Native of Washington, D.C.; C.E. graduate, Georgia Tech, 1943; draftsman, private companies, 1923–33. Topographic Draftsman, Region 8 Engineering, 1933–43; Structural Engineer, bridges, Region 8 Engineering, 1943–50; Chief Bridge Section, Region 6 Engineering, 1951–55; Supervising Highway Engineer, Region 6 Engineering, 1955–58; Structures Specialist, dams, bridges, buildings, Civil Engineering Branch, WO Division of Engineering, 1958–59.

Region 9

Hall Coleman, 1934–1947. He was the first Regional Engineer (Assistant Regional Forester for Engineering) promoted to that position when the Region was established.

Coleman was of medium height and stocky, with brown hair. He had been a Region 2 Forest Supervisor and, before that, a land surveyor with private engineering firm's; a surveyor and a road locator with the Forest Service. He was Chief of Fire Control as well as Regional Engineer. Regional Forester Price always believed Fire Control should be one of the Regional Engineer's functions. Kotok also subscribed to this. Granger was neutral. Norcross and Loveridge opposed it. Thus, Fire Control was eliminated as an RE function when Arthur took over.

Malcolm B. Arthur, 1947–1965. Native of Massachusetts; C.E. graduate, Worcester Tech, 1922; engineer with Anaconda in Perry, Colombia, 1922–25; engineer with Southern California Edison Company, Big Creek, California, 1925–27±; engineer with New England Power Company, 1928–33±; advertising business, 1933; Dam Specialist, WO Engineering, 1934–41; Equipment Procurement Officer for Emergency Rubber Project, WO Division of Operation, 1942–43; Project Engineer for Los Angeles Flood Control Project, Region 5 Engineering, 1944–47.

Mal Arthur had sandy hair with a reddish tinge, thinning in later years. He was a bit on the short side, of medium height and stock, probably about 160 pounds. He was a calm, self-assured, quietly assertive, technically uncompromising engineer. He had about equal background experience in design and field engineering. He inspired confidence and respect from his associates in the Regional Office and from the Forest Supervisors. He was equal to any engineering problem whether related to investigation, design, construction, or maintenance.

Mal was recipient of repeated offers of WO Engineering and other Regional Engineer positions. He could not be tempted. He liked Region 9. He was

as good an administrator as he was an engineer. Region 9 benefited greatly by his regime.

Donald Turner, 1965–19??. Native of Iowa; C.E. graduate, Iowa State, 1949; Air Force captain, World War II, 1943–47; Assistant County Engineer in Iowa, 1949–52; Assistant Forest Engineer, Trinity National Forest, Region 5, 1952–55; Forest Engineer, Shasta-Trinity National Forests, Region 5, 1955–57; Improvements Chief, Region 10 Engineering, 1957–62; Architectural Engineer, CE Branch, WO Engineering, 1962–65.

A top-ranking, all-around engineering specialist.

Region 10

Region 10 was for many years the Alaska Division of Region 6. The first engineering force assigned to the Juneau Office as far as I know was an Engineer and an Architect. The Engineer later returned to Region 6 and retired from the Portland Office. The Architect resigned to enter private practice.

The 1948 staff at Juneau comprised Regional Forester Hentzleman, Assistant RF and Operations Chief, Charles Burdick, a Lands and Recreation Officer, the Fiscal Agent, a couple of draftsmen, and three or four clerks. In 1953, Regional Forester Hentzleman and Burdick retired. Art Greeley replaced Hentzleman as Regional Forester. The Staff was expanded to include a Timber Management Specialist and an Engineer. The Engineer reported to the Chief of Operation until 1956. Weller subsequently reported to Regional Forester Hanson for a short period. The Region 10 Division of Engineering was established in 1957. Mitchell was the first Chief of a Region 10 Engineering Division. The first post–World War II Engineer reported to the Region 10 Chief of Operation. The Engineer was:

Milton Page, 1952–1954. Page transferred from the Engineering Staff on the Boise National Forest in Region 4. He was about 40 at the time, brown-haired, of medium height and build, 165 pounds in weight. Page was a high school graduate. Most, if not all, of his engineering experience had been in conjunction with land and road location surveys. Page was separated from the Service.

C. Richard Weller, 1955–1958. Native of Colorado; C.E. graduate, University of Colorado, 1948; business administration graduate, 1949. See description of Region 3 Regional Engineers.

Gerald E. Mitchell, 1957–1960. Native of California; mining engineer from University of California, 1920; Navy veteran, World War I, 1917–18; mine engineer, Arizona, New Mexico, northern Mexico, 1920–24; Los Angeles Street Department, 1924–30; mine superintendent, southern California, 1930–31; affiliated with Forest Service, 1933, as CCC Foreman; road locator, Stanislaus National Forest, Region 5, 1934–37; Forest Engineer, Tahoe, Region 5, 1937–42; logging engineer for a lumber company, 1942–43; Forest Engineer and Fire Control Officer, Mendocino National Forest, Region 5, 1943–46; trail inspector, Region 5 Engineering, 1946–47; Project Leader, Aftosa Project, Mexico, for USDA-BAI, 1947–49; Region 5 Engineering, 1950; Chief, Roads and Trails, Region 1 Engineering, 1951–57; died in Service, Region 10, 1960.

Mitchell was black-haired, 5 feet, 10 inches tall, 165–170 pounds, narrow-shouldered, wiry, strong, a rather rough type; positive, outspoken, politically conservative, a man of strong convictions; unafraid of man, beast, or work; and a road engineer who knew his business well. Mitch was impatient of all grey areas of decision, instruction, and action. With Mitch, it was "yes" or "no," "do we" or "don't we"—no in-betweens. Whatever the decision, Mitch would follow orders and put his heart into it.

His 1942 detour into working for the lumber company was undertaken at the instigation of Region 5 Engineering in order to promote closer agreement between Forest Service and industry on road location, design, and construction standards. A broken leg caused a 6-month interruption in Mitch's employment with the lumber company. Region 5 Engineering was meanwhile experiencing great difficulty in recruiting engineers. Mitch was, therefore, prevailed upon to accept reinstatement with the Forest Service.

Mitch was a great favorite of Regional Forester Pete Hanson. Pete angled for Mitch as Forest Engineer while Pete was Supervisor of the Lassen in Region 5. He lost out on that occasion. He persisted in wanting Mitch on the Hanson team, finally obtaining Mitch's transfer to Region 1 when Pete became Regional Forester there, and to Juneau when Pete was moved to Region 10. Pete and Mitch were an effective team in tackling Region 10 road construction problems.

Mitch was the son of a mining engineer. He was brought up in Southwest and Mexico mining camps, nipping drill steel at age 12, operating a stoper at 14. Mitch spoke fluent Mexican peon Spanish.

Richard Wilke, 1961–19??. Native of Wisconsin, C.E. graduate, University of Wisconsin, 1943; military service, 1943–46; USGS, 1946–48; Forest Service road locator on Hiawatha National Forest, 1951; hydrologist, Southern Forest Experiment Station, 1952; hydrologist with Region 8 State and Private Forestry Division at Atlanta, 1953; Forest Service member on Inter-Agency Task Force for Arkansas-White-Red River Basin Flood Control, at Tulsa, 1954; Region 1 Engineering Staff, 1955–58; Civil Engineer in Branch Staff, WO Engineering, 1958–60.

Dick was a tall (6 feet, 4 inches), slender, black-haired, good-looking, self-assured individual with considerable ability. He was an ardent archer and skier. During the Montana hitch, he regularly brought down his annual deer with bow and arrow.

Recollections

My 30 years with the Forest Service began June 7, 1933, in California. Five or six weeks earlier, I had been sampling the fishing at Bass Lake on the Sierra National Forest. From Forest Supervisor Benedict, I learned that the Forest might be needing CCC camp foremen in the near future. I left my address with the Sierra but heard no more from Benedict until June 6. That afternoon, down river gold panners relayed word up the Stanislaus River that Wood's Store near the Melones bridge had a telephone message for me.

Roy Blood, executive assistant on the Sierra, had telephoned that "Benedict wants Dean to meet cadre at Merced, 6 a.m. tomorrow. Make camp in

meadow across from old Miami post office at foot of Wawona grade. Begin improving Harris Ranch road to put Grimmet logs in Madera Flume. Bring foremen."

Hiring was done informally and expeditiously on the Sierra in 1933. Supervisor Benedict had an agreement with Congressman Church, a Sierra permittee, ensuring certification of CCC camp bosses and foremen hired by the Forest. Eventually, Regional Office caught up with Sierra practice and called for Form 57's on ECW as well as other new employees.

Four good foremen were promptly rounded up from my acquaintances along the river. Five of us were as many as my automobile would accommodate in addition to bedrolls and other personal gear roped to top and sides. No real construction man was without his own bedroll in 1933. The pre-CCC automobiles had no trunk storage space, so bedrolls were lashed to the running boards or the car top.

As instructed, we met a cadre from Fort Benning, Georgia, at Merced next morning, conducted it to Cold Spring Meadow on the Sierra east of Mariposa, and set up camp. The cadre brought its own truck, mess gear, six tents, and a few tools. Forest Service fire caches provided other tools. Mariposa County was familiar territory to me. My survey party had explored the area thoroughly several years earlier while investigating power development possibilities for the South Fork of the Merced River. I knew where to find tools for clearing the camp site, relocating a nearby telephone line, and putting a fire line around the meadow.

District Ranger Westfall showed up that evening with a telephone. He said a truckload of tools and cookhouse lumber would arrive next day. He also told me that an old acquaintance, Rex E. (Buck) Lane, was working a crew of CCC enrollees out of Madera Sugar Pine Camp, some 20 or 25 miles from Cold Spring Camp.

The foremen invited to accompany me to Cold Spring were told that the job was probably good for 3 or 4 months. Wages were not mentioned. I knew nothing about salaries paid CCC camp facilitating personnel and very little else about the Civilian Conservation Corps program. No one was quibbling about wages, however. Jobs were too scarce. Landing a job was the primary consideration. A camp job was a prize. One could at least count on three meals per day.

The promised 3 or 4 months' employment stretched to as many years for three of the foremen. They returned eventually to their pre-Depression employers, Electric Bond and Share, a road contractor, and a logging out-fit. The fourth man remained with the Forest Service. He was Gerald E. Mitchell, subsequently Forest Engineer on several California Forests; detailed to Bureau of Animal Industry's Aftosa (hoof and mouth disease) eradication program in Mexico, 1946–48; Region 1 Chief of Roads and Trails at Missoula, 1950–56; and Regional Engineer at Juneau, Alaska, from 1957 until his death in 1960.

Mitch was immensely popular with the enrollees. He was versatile and resourceful, skilled in the use of axe, crosscut saw, pick, shovel, and hand steel. He understood youngsters. He was highly effective in developing

latent talents of enrollees and stimulating production. Enrollees always appeared inspired, never seemed resentful, when Mitch came strolling along the grade saying, "Bury the point of that pick, boys, the sun will rust it; and you over there, get the heel of your shovel down, the point will take care of itself."

Shortly after Cold Spring Camp was occupied, a Regional Office circular was received over the signature "Kotok." The unusual name stuck in my mind, although we had no idea who Kotok might be. A week or two later, the District Ranger's office telephoned. The clerk understood the message to be "Kapoks will arrive on the Monday truck." Kapok was as foreign to me as Kotok. I dug the circular signed by Kotok out of the file. The clerk then guessed that he had misunderstood the message and that Kotok, not Kapok, was arriving on the Monday truck. So we dressed up the camp in anticipation of a visit by Mr. Kotok. He did not arrive. The headquarters truck driver was unable to explain the nonarrival of Mr. Kotok; neither had he ever heard of Kapok. The truck driver was a recent employee, however.

While checking the truck deliveries that evening against our requisitions, we observed the Kapok label on newly received bedrolls. Several months later, I became acquainted with Edward I. Kotok, Director of the California Forest and Range Experiment Station. Mr. Kotok later became Assistant Chief of the Forest Service and head of Research. He gave Engineering and me a great deal of support when I was transferred to WO 15 years later.

Learning that Buck Lane was running the neighboring CCC camp, I hastened to pay him a visit. Buck's spread was an eye-opener. Buck was a World War I veteran with overseas duty at the front. He had been recuperating from severe gassing when the Armistice was signed. The enrollee C.O. at Sugar Pine Camp was a young, reserve first lieutenant experiencing his first go at sustained active duty. He was imbued with properly high regard for the veteran of actual warfare. Buck was making the most of his status. He was obviously kingpin in that camp.

Sugar Pine CCC Camp was plush by comparison with Cold Spring Camp. Sugar Pine had been in existence for some years as headquarters for Madera Sugar Pine logging operations. It was supplied with well-constructed buildings, family quarters, shops, water supply, etc. Buck had been superintendent there for the lumber company immediately preceding cessation of operations because of the Depression. He, several of his foremen, and other key personnel continued to occupy their quarters when logging operations were suspended. When the CCC company moved in, the always alert and farsighted Buck signed his former logging crew bosses on as CCC foremen and his former cooks, kitchen help, maintenance men, and other Sugar Pine employees as L.E.M.'s. (Each CCC camp was allowed 11 to 14 local experienced men recruited by the Forest.) Needless to say, meals and living conditions at Sugar Pine CCC Camp greatly surpassed those at most CCC camps. Logger chow regularly served by the enrolled Sugar Pine kitchen crew was notably superior in quality, quantity, and variety to the meals concocted by less experienced enrollees at other CCC camps.

Buck Lane was in later years, 1940–1960, the very active, highly competent Chief of Roads and Trails in the Region 5 Division of Engineering. There, he was one of the Regional Office mainstays for 20 years until his

retirement in 1960. On at least one occasion, Buck was the Regional Forester's choice for Chief of Timber Management. The proposal was overruled by Washington Office, perhaps because Buck might be tainted by former connection with private industry. Buck was probably never told of his candidacy. On other occasions, Buck was offered positions as Chief of Roads and Trails in Washington Office Division of Engineering and also as Regional Engineer in another Region. He was adamant, however, in adhering to his expressed preference for California. He could not be enticed to leave California for duty elsewhere, even short details to the Washington Office. His response to all such proposals was the same: "I don't want to have to buy an overcoat."

By December 1933, Buck Lane was under Civil Service appointment as General Foreman on the Sierra. His responsibilities were those of Forest Engineer. Buck was therefore, in effect, the first Forest Engineer on the Sierra, perhaps in Region 5. Other Forests were assigned General Foremen in late 1933 and early 1934, but few were given as much latitude as Buck for the planning and engineering as well as directing of improvements, construction, and maintenance. I had meanwhile received a Civil Service appointment as foreman for an NIRA road construction crew camped at Hutchens Station on the San Joaquin and Eastern R.R. in Fresno County.

In late 1934, Buck Lane was promoted to Road Inspector in the RO Division of Operation. He replaced Frank Wooldridge who had transferred to WO. Frank Jefferson transferred from Region 1 about this time to replace recently deceased Chester Jordan, ex-Supervisor of the Santa Barbara, and recent Chief of Roads and Trails in Operation. Jeff, Buck, and their functions were transferred to the Division of Engineering in late 1936 or early 1937.

I followed Buck as General Foreman on the Sierra. Supervisor Benedict promptly adopted "Forest Engineer" as the title of the position. He proposed that RO acknowledge the change in title by appointing me to a P-3 engineer position. Civil Service and RO agreed on my eligibility. But I was un-willing to accept a $300 reduction to the entrance salary for the associate engineer grade. Consequently, I remained as General Foreman on the Sierra payroll until 1937. Then began a succession of transfers to administrative positions on the Shasta, Tahoe, and Los Padres, in Regional Office Division of Operation, and on the Cleveland.

While on the Cleveland, I was detailed to RO as Acting Chief of the Division of Information and Education. Division Chief Wallace Hutchinson was meanwhile engaged with Regional Forester Show, Experiment Station Director Kotok, State Chamber of Commerce representative Charles Dunwoody, and others in Washington, D.C., combating Department of Interior efforts to trade promise of a dam for irrigation storage at Piedra for support for transfer of Sierra and Sequoia National Forest lands in the Kings River drainage to National Park Service administration.

The I&E detail was interesting. Four months were long enough, however. By the middle of February 1939, I was itching to return to the Cleveland. One final I&E project remained to be completed. Then I would be on my way.

Arrangements had to be made for accommodating 25 Los Padres mules and saddle stock for a few days and nights in downtown San Francisco. The project seemed extracurricular for I&E except that the Division was assigned responsibility for Forest Service participation in events attending the opening of the Golden Gate Exposition. The Padres pack string was scheduled to participate in the parade marking the opening of the Exposition. A lesser chore in 1939 than it would be today, finding stable room or corral space for 25 horses and mules was somewhat of a task. Canvassing livery stables in alleys paralleling 5th, 6th, and 7th streets south of Folsom revealed only an occasional vacant stall until some stable owner suggested, "Try the Morphodite. The brewery is getting rid of its teams. The Morphodite should have plenty of space in a week or two."

The Morphodite, hairy faced under a dirty slouch hat, full-bosomed, dressed as a female, with khaki pant legs showing beneath a half skirt and above men's brogans, puffing a stogie, and seated on a box in the stable doorway, responded to my greeting in a rough, coarse, moderately deep voice with an expression that was neither ladylike nor gentlemanly. Neither the Padres packers nor I ever learned the Morphodite's name, or whether properly prefixed by Miss or Mister. Negotiations were nonetheless pleasantly and satisfactorily concluded with a $10 advance cash payment plus a promise that final payment would be in cash. The Morphodite didn't want no god damn Government check. The agreement was carried out, notwithstanding strenuous objections by Fiscal Agent Lackey and Operations Chief Deering and some inconvenience to me.

The pack string from the Padres proved a popular as well as unique entry in the parade. It performed magnificently. Led by Forest Supervisor Nash-Boulden in Forest Service uniform and with silver mounted saddle, bridle, and spurs, the Forest Service flag stanchioned at his left stirrup, the string of loaded mules wound snake fashion from curb to curb as the parade moved down Market Street. The Regional Offices on the 4th to 7th floors of the Phelan Building at Stockton and Market were favorably situated for reviewing the parade.

Negotiations were scarcely completed for stabling Los Padres livestock when a fluke of circumstance destroyed my prospects of returning to the Cleveland. Engineering Division Chief John Beebe accepted a position as Chief of Flood Control Surveys in the Washington Office of the Federal Power Commission. Apparently, the hierarchy could not agree on who should succeed him from the Engineering ranks, so it resorted to random selection from the field. I moved into Beebe's chair on March 1, 1939.

Before Beebe, the Region 5 Division of Engineering had little to do with Forest Development Roads and other National Forest Improvements, except bridges. John Lawrence was already well known throughout the Region as the creative designer and resourceful construction expert for Region 5 bridges. Among the Forests, John was probably the most widely known of the Regional Office Engineers. He was uniformly popular with the Forest Supervisors.

The major activity of Region 5 Engineering had been supervising licensed water power development. Water power was therefore the predominant interest of Regional Engineers who preceded Beebe. Roads and other

improvements were the exclusive province of the Division of Operation until 1933. From 1933 to 1936, architectural design and administration of the buildings construction program were a responsibility of the Division of Lands. Operation continued to be responsible for roads, trails, telephone lines, equipment, and administration of Emergency Conservation Work allotments to the Region. Engineering, in addition to conducting water power business, was responsible for Forest Highway Programs and Maps and Surveys.

In 1936, the Federal Power Commission established Regional Offices. Most licensed projects' supervision formerly delegated to Forest Service Regional Engineers was taken over by FPC engineers, largely ex-Forest Service employees. Concurrently, major reorganization took place in the Region 5 Division of Engineering. The scope of Division functions was enlarged to include supervision of roads, trails, and other improvements. The title of the Division Chief was changed from Regional Engineer to Assistant Regional Forester for Engineering.

The roads and improvements supervision package transferred to Engineering from Operation included Frank Jefferson and his two assistants, Buck Lane and Jim Irvine, along with other improvements engineers. Jefferson was a former Region 1 Forest Supervisor and staff assistant in the Region 1 Division of Operation. He arrived in Region 5 in 1935 or 1936 to replace recently deceased Chester Jordan, who had been Roads and Improvements Chief in the Region 5 Division of Operation. Jordan was a former Supervisor of the Santa Barbara (now Los Padres). He had also been an Assistant Supervisor on the Sierra.

Regional Forester Show and Associate Regional Forester Jay Price were strong advocates of active participation by Engineering in Forest development and protection. Show, in 1936, had admonished Beebe to "get Engineering out of its ivory tower and onto the Forests."

Dynamic, extraordinarily capable, and broadly experienced, John Beebe promptly accepted that challenge. With assistance from able, Forest-wise improvements specialist Frank Jefferson and resourceful, versatile, and industrious John Lawrence, the Division of Engineering was exercising considerable influence on the quality of Forest improvements by 1939. Through the salesmanship of Jeff and Buck Lane, strongly supported by Personnel Management Chief Paul P. Pitchlynn, nine or more Forests had Forest Engineers, in title at least. Several other Forests were by then convinced that they needed Forest Engineer positions. Buck was still subtly screening available men in order to fill FE positions with men who had road design experience and at least some comprehension of good engineering. Several Forests were still opposed to graduate engineers. Those Forests were claiming college engineers were too fussy, too intolerant; actually, those Forests had never experienced a real engineer.

One capable incumbent of a Forest Engineer position was academically trained as an anthropologist. He ranked with the best of the technically trained engineers and was later invited to accept a position in the WO Division of Engineering. But Ham Pyles' versatility defeated his prospects for appointment to the position. Chief Watts insisted on sending him up the

administrative ladder. He was later a Regional Forester and ultimately an Assistant Chief.

Equipment Fleet Management and Maintenance were transferred to the Division of Engineering in mid-1939. Subsequently and successively, the Division was assigned responsibility for erosion surveys, supervising participation of the Region in activating southern California flood control projects, and for watershed management.

Engineering welcomed responsibility for roads and agreed that equipment maintenance could benefit from Engineering supervision. It did not invite the subsequent expansion of its functions. Engineering suspected that erosion surveys and watershed management were indirect assessments on road funds. It had already found the flood control cost estimates to be untrustworthy.

Cold reception had been given a WO circular telling the Region to activate erosion surveys. WO Watershed Management Chief Gordon Salmond visualized field survey parties. Erosion surveys were, however, unbudgeted and unfinanced. Raiding road funds was customary in such instances. This was a natural. Operation, the guardian of P&M funds, Timber Management, Range Management, and Lands were unable to recollect any significant amount of erosion in Region 5 except that attributable to roads. Engineering knew better. It demurred at a proposed assessment on road funds for cataloging erosion it knew to be extensive on range, cut-over, and fire-scarred lands. The Regional Forester compromised by assigning responsibility for erosion surveys to Engineering to accomplish by any means the division might devise.

Similarly, supervision of the southern California flood control program fell to Engineering by default. Other RO divisions hankered for the eminence of administering the program. But none wanted responsibility for defending costs and unpredictable accomplishment where traditional Forest autonomy would prevail; where RO prescriptions for conducting project operations would be subordinate to maximum off-season employment for summer fireguards and minimum conflict with Forest administrative routine; where Research would accept independent credit for successful measures, and the RO supervising division bear the onus for misdirected effort and excessive cost. Engineering had no illusions but neither was it rejecting a challenge.

Watershed Management and State and Private Forestry, respectively, were being elevated by WO, about this time, to the prominence of titular activities. Again, reasonable action from the staff viewpoint in Region 5 was to finance a Watershed Management Specialist in the Division of Lands by assessing road funds. He must be a Forester, of course. Engineering countered with a proposal for giving a grade increase to T.R. Littlefield, Chief of its Water Power Section, and broadening his functions. T.R. was a graduate forester. His position was already in part financed indirectly from road funds, although perhaps not apparent from casual examination of the Regional budget. The counterproposal was accepted. Engineering became responsible for promoting Watershed Management.

Forests and some RO personnel were confused by according Watershed Management the status of an independent activity. Watershed Management

had been stressed as an overriding objective in managing National Forest resources and land uses. Coordination of those management activities was already the function of the Regional Forester and the other line officers. Training in coordination was the purpose of training courses conducted by Personnel Management. Supervision and on-the-job training for coordination was provided by Regional Forester and Forest Supervisors. Was a Division of Engineering Section Chief going to outrank chiefs of resource and land use divisions as well as Forest Supervisors and District Rangers in affirming appropriate operations on each tract of National Forest land? All were watersheds of a sort. The semanticists as well as the truly confused field officers were finally calmed by adopting "Water Management" as substitute for "Watershed Management" in referring to the Division of Engineering function.

Other gimmicks were introduced from time to time for stimulating interest and inspiring progress in controlling runoff and reducing erosion. T.R. Littlefield deserves unlimited credit for his very considerable part in promoting attention to Watershed Management on California National Forests.

In June 1939, Region 5 was host for a field meeting of Regional Engineers from the Western Regions. Beebe and Norcross planned the meeting before Beebe received his offer of the position with the Federal Power Commission. The itinerary had been planned to impress the visitors with the wonders of southern and central California. WO representatives as well as the visiting engineers became convinced of the affluence of the California Region. Several years elapsed before Chief Engineer Norcross could be persuaded that Region 5 deserved its proportional share of Forest road and trail appropriations. Howard Jones was impressed by the excellent roads he observed during this trip. Buck Lane and I were soon aware that the Region used the wrong approach for promoting increased allotments. We promptly decided that WO inspectors should henceforth see the poorest, rather than the best, in the Region.

Feisty Fred Thieme from Region 1 and debonair Howard Waha from Region 3 were the life of the 1939 party. Fred made no secret of his contempt for what Region 5 had to show, particularly if by so doing he could stimulate a comeback. Fred contended that Region 1 had tougher road-building shows and more fire scars than Region 5 could boast. Howard Waha delighted in miscomprehending the purpose and problems of installations at San "Godimas" and wattling dysentery granite. Some of the Experiment Station representatives attending the meeting were a mite put out by Howard's mispronunciation and his uncomplimentary references to certain rocks, minerals, trees, and shrubs in the San "Godimas" drainage.

Sunny Jim Brownlee from Region 2 was accompanied, as always, by Associate Regional Forester and former Chief of Operation C.J. Stahl. Frank Jefferson, who had known both for many years, did not hesitate to say at times that we would like Brownlee's reaction, not the Region 2 viewpoint. Stahl was actually very much interested in engineering works. He was said to have great respect for Brownlee's judgment and ability. He was reputed to be Brownlee's firm supporter in Region 2. But to those of us unacquainted with Stahl, he seemed to be always pushing Brownlee aside. This did not appear to concern Brownlee. His consuming interest was seafood. He made the most of his opportunity while near the coast to have fish or

shellfish at every meal. As we left the coast, we warned Jim to beware of seafood. Central Valley's refrigeration was unreliable. Brownlee ignored our advice. He ordered crab at an Oroville restaurant. Next morning, he left by train for Denver. He had had one seafood dish too many.

C.J. Stahl was good company despite his insistence on assuming the role of Region 2 Regional Engineer. He remained with the party to the end. By this time, he was pretty well accepted as having the makings of a Forest Engineer, "if you listen to Jim Brownlee and do what he says instead of expecting him to do what you say." The quotation is from a speech by Frank Jefferson at an impromptu award ceremony the evening before the meeting broke up. Jeff's speech was followed by affixing to Stahl's chest a 12-inch Forest Service shield, fabricated with hammer and dies by one of the shop mechanics from a sheet of richly burnished scrap copper. Across the top in prominent letters appeared the words "Forest Engineer." Stahl was wearing his badge when we left for Denver next morning. It was prominently displayed in his office until he retired.

Regional Engineer Anderson from Ogden was preoccupied with a military mission during most of the meeting. Dignified, unrufflable Jim Frankland and Assistant Regional Engineer Ray Grefe represented Region 6. Jim allowed as how Region 5 was building some pretty good roads to protect the elfin forest (Angeles), but why protect it? Why not let it erode down to a more nearly level plane that might grow something more respectable than those sad looking, pseudo cousins (big cone spruce) of pseudo *suga taxifolia*? The Region 5 Engineering staff was present en masse.

Forest Engineer positions were a frequent subject of discussion. Regions 5 and 6 were the strongest advocates. Fred Thieme and Arval Anderson were for the position in principle but doubtful about financing prospects on any but the largest Forests. FR&T seemed likely to be tapped for 95 to 98 percent of the salary of an engineer who might be occupied 50 percent or more of his time on unrelated assignments, resulting in one more inefficient drain on road funds. Brownlee and Waha thought we were chasing a dream.

November 1939 brought a request for my detail to WO Engineering to collaborate with Region 6 detailer Ray Grefe on preparation of a super duper illustrated report to Congress on Forest roads and trails. My contribution proved negligible. My style did not suit T.W. Norcross. I was released in April. Grefe, Jones, and Norcross produced the report.

The 1939 detail was the first of annual, sometimes more frequent, trips to WO during the next 8 years. Subsequent visits to WO were details to the Division of Operation or as counselor and batboy for Regional Forester Show. The 1939 detail was profitable from my point of view. Regional Engineer Dort invited me to accompany him to Region 7 Forests and projects. My return route to California by automobile was carefully planned to take in all Region 8 Forests and a variety of recent and current construction. The most significant information gleaned from the Region 8 visit was that it was in fact far more affluent than Regions 5 and 6, disparity in allotments notwithstanding. CCC camps were much more numerous and wage scales much lower on Region 8 Forests than on California and Northwest Forests.

By 1941, CCC enrollees and work project funds had ceased to be factors worthy of consideration in planning improvement construction and maintenance. Remaining enrollees were assigned mostly to fire suppression crews. A few were being trained in stereoscopic plotting and drafting in a spike camp at Reno and a few others on road survey parties. The supply of engineers was also becoming critical. Some of our best were departing for higher paid jobs with industry or other Federal and State agencies.

Then on December 7, 1941, the Japanese bombed Pearl Harbor. Southern California highways were promptly closed to all but official vehicles. I was in San Diego that afternoon. By nightfall, southern California was almost completely blacked out. Instructions came for me to head north at once. The night drive to Los Angeles without lights was a unique experience.

Immediately following Pearl Harbor, Region 5 activities became war oriented. Construction equipment and crews were temporarily borrowed by military authorities for strengthening coast defense battery positions. Next came winterizing of fire detection lookouts converted to airplane detection service and road improvement for winter servicing. Several engineers with reserve commissions had been called to active service before Pearl Harbor. Others were now leaving to attend OTC. Foremen and equipment operators began to depart for military service or employment with defense industries. The emphasis in Engineering was now on expediting construction of roads that would be needed for greatly accelerated timber production and providing firefighting equipment to compensate in some measure for reduced fire suppression manpower.

Vacancies on the Forests were being plugged by combining Ranger Districts and Forest staff functions. Forest Engineering crews were already relied upon for suppression of project fires. Forest Engineers now became occupants of staff positions combining the functions of Forest Engineer and Fire Control Staff Officer on several Forests. Ray Huber on the Shasta, George Mitchell on the Mendocino, and Ken Huestis on Los Padres were among Engineers assigned dual staff functions.

Late in 1942, the Guayule Project was activated. Major Evan Kelley, until then Regional Forester at Missoula, was detailed to California to head the project. With him came Jim Byrne to be Chief Engineer of the project. Jim was destined to follow in the footsteps of Fred Fowler, Frank Bonner, Ed Kramer, and John Beebe to become the fifth good Montana Engineer to accede to the Regional Engineer position in the California Forest Service Region.

Regional Forester Show had described the purpose and organization of the Guayule Project to the Region 5 staff and Forest Supervisors. They were told that Major Kelley would be in complete charge of all project activity. The Region and Forests accustomed to supervising Forest Service activities in the vicinity of Guayule Project work centers would have no voice in project operations. One can imagine the local rumblings at this apparent disregard for the sacred precept of Forest Service decentralization. The radical and horrible move was when WO assumed direction of the War Mapping Project on and adjacent to California National Forests. Only Engineering was amused. Most of the Division staff was solidly behind divorcing project direction from routine administration. The Division had long advocated

and proclaimed advantages of exclusive direction by project heads for bridge erection, equipment repair shop operation, and major construction projects.

A few RO desk engineers were disgruntled when detailed to the Guayule Project. Forest Engineers, however, were as a rule anxious to be detailed. For one reason or another, many had been discouraged from seeking military service. These were anxious to be more directly associated with the war effort than fire suppression and National Forest routine. Many of us welcomed opportunity to become acquainted with Guayule Project Engineers and Foresters from other Forest Service Regions.

Engineering's Equipment Service reacted with enthusiasm when told that it would be expected to go the limit in cooperating with Major Kelley and his staff. Arcadia Depot Superintendent George Bouck and Depot Foreman Bill Allen were soon congratulating themselves on opportunities for contributing numerous adaptations and innovations for converting standard agricultural and construction equipment to Guayule requirements. Equipment Service expanded its chain of branch shops to service Guayule operations in north central and southern California, southern Arizona and New Mexico, and as far east as Edinburg, Texas. Subsequently, with the advent of War Mapping, Region 5 branch shops were operated at Crescent City, California, and at Gettysburg, Pennsylvania.

Emergency Rubber (Guayule) and War Mapping, the principal war-connected Forest Service projects, concerned Region 5 Engineering only indirectly. The Division was more directly involved with "business as usual" activities: L.A. Flood Control Project, greater mechanization of fire suppression, bridge replacement, and more serviceable timber access roads. Flood control project concepts, estimates, and organization made frequent detours until Engineering prevailed upon Mal Arthur to transfer to Region 5 from the Washington Office. Mal knew his business and was impervious to Forest insistence on jurisdiction over project employees and operations. He later (1948) became Regional Engineer at Milwaukee.

Equipment development was in capable hands. Notable advances were being made in tank truck design and tractor-trailbuilder efficiency. Improvements conceived, supervised, and often executed by Equipment Engineer Silva, his successor, Equipment Engineer Hank Mullin, and Depot Superintendents Don McFarland, Verle Jeffrey, and George Bouck were not confined to vehicles and machines. They and other Equipment Service personnel conceived and put into effect many innovations for expediting the transportation and in-action servicing of tankers and bulldozers. An immense amount of unrecorded, unrewarded credit is due Don McFarland, perhaps the first Region 5 tanker-pumper driver and probably the oldest in years of service (1968) and a mechanically knowledgeable student of fire suppression equipment in Region 5. Don was a Sierra firefighter while still in knee pants and a suppression crew foreman at a very early age. He has spent many a night, all night, repairing Forest Service equipment without overtime compensation, to be rewarded at the close of fire season with the customary, pre–World War II, seasonal layoff.

Bill Minaker and Buck Lane were at the time, as for many years afterwards, supervising bridge replacement and timber access roads. Bridge replacement was critical during the war years as the Region came to rely increasingly on

bulldozers for fire control. Concurrently, road standards were becoming more critical. Industry was turning from railroading to trucking at a time when demand for timber was encouraging truck loads and traffic well beyond the serviceable capacity of a majority of prewar Forest roads. Forest Service appropriations did not begin to meet road improvement or even road maintenance needs for the accelerated logging. Loggers until recently accustomed to rail logging were not building roads to withstand the probable truck loads, traffic density, and vehicle speeds without excessive maintenance and frequent accidents. Buck Lane was busy attempting to impress timber management officers, timber sale purchasers, and loggers of intermingled private and Government with necessity as well as desirability of combining Forest Service and logger financial resources for construction of suitable roads. He accomplished a great deal in this direction during World War II years as well as later.

In 1943, Department of Agriculture Division of Plant and Operations Chief Arthur Thatcher conceived and initiated a plan for mobilizing employee manpower and rolling stocks of all Department of Agriculture agencies in event of widespread emergencies. I was made Project Director for the area west of the Plains States. Warren Benedict, then Regional Director at San Francisco for the Bureau of Entomology, was Assistant Director. Later, he replaced me as Director. Our initial act was to be a complete inventory of equipment and extent to which available. An SCS truck, for example, could be released to a mobilization pool at once, while a Region 5 suppression crew vehicle in the month of August, or a Guayule Project vehicle, would be listed for release in only the direct emergency and perhaps only through Washington Office. We were also to select representatives of the various agencies for area liaison or subdirectors of mobilization. World War II ended before any need arose for effecting actual mobilization.

Canvassing the West to catalog location, type, and amount of equipment assigned to DA agencies proved an interesting assignment. It acquainted me with men, projects, and conditions in all Western Forest Service Regions. The information thus acquired proved helpful in later years.

Most Chiefs of Operation for Department of Agriculture bureaus and their regional offices took a dim view of Mr. Thatcher's mobilization plan. Considerable persuasion was required in some instances in order to extract necessary information. Region 6 Forest Service officers were particularly reticent about divulging information about the equipment inventory. Region 1 was most cooperative. Region 3 did not take the plan seriously and did not presume to have a complete inventory. "Go 'round and count it," Chief of Operation Simpson said. "If there is any you want, take it. Guayule has most of it anyway; we can always go back to horses." The assignment was lots of fun. I took Simpson at his word and visited every Forest. I did the same in Region 6 although not invited to do so by Chief of Operation Jack Horton. Jack didn't mind, however.

In 1944, Region 5 was advised of the availability of funds for mineral roads. The word reached owners of mines, and the Region was deluged with requests. None of the Region 5 mineral roads proved to be very important. Some money was spent on improving low-standard roads to reputed tungsten deposits on the Stanislaus and the Sierra. More was spent on roads for access to chrome kidneys on the Klamath. The most expensive of these

went up the mountain from Seiad to an old chrome mine reported to have been worked out years before. The Region was constantly pushed to complete the road. Improvement cost about $95,000. Promptly following completion, the proponents sent in trucks to remove the old mill machinery. No ore was known to have come over the reconstructed road. Some work was done on roads to the mercury mines in the vicinity of Hollister, but BPR or some other Federal agency did the work.

Concurrently with availability of funds for mineral roads, the Region was advised of funds available for timber access roads that could be completed in time to produce lumber for wartime needs. Several Forests shared in allotments for the wartime timber roads. Some went to the Mendocino, Sierra, Trinity, and perhaps other Forests. The next significant amount of road money came to the Region shortly after the close of World War II. This was known as National Housing Funds. These funds also were to be programmed for roads that could be completed within a specified period, usually too short for extending roads into virgin timber country. Most of the timber Forests received some of the NHA funds.

Early in 1947, WO asked for Equipment Engineer Paul Brown to be detailed to the Bureau of Animal Industry. Paul had returned a few months earlier from overseas military service as Lt. Colonel of Engineers on airport construction in England. BAI was now requesting his assistance for obtaining the equipment and skilled manpower required by the U.S.-financed Aftosa program for eradication of hoof and mouth disease in Mexico. Paul was soon back in Region 5 to recruit dirt-moving and repair shop foremen, mechanics, and equipment operators from this and other Forest Service Regions. He found Region 5 personnel unresponsive until WO and Department pressure was put on the Region. G.E. Mitchell, RO Trail Inspector, later Regional Engineer at Juneau, and some mechanics were pushed into consenting to the Mexican detail. Several foremen and mechanics from other Regions were similarly recruited. Mitch, who was fluent in Spanish, was soon placed in charge of shops and equipment associated with the project. His responsibilities included transportation of vaccines and livestock; gathering, burning, and burying infected livestock; road construction; and fencing.

1947 witnessed the end of my California sojourn. T.W. Norcross chose to retire at the end of the year. Two weeks later, I moved in behind him in WO Engineering. Jim Byrne returned to California to put Region 5 Engineering on its feet. Buck Lane, Frank Jefferson, John Lawrence, and others who knew Jim from the Guayule Project were delighted to learn that he was coming to Region 5 as Regional Engineer.

My trip to Washington by automobile was by way of Mexico City to visit Forest Service detailers on the Aftosa project. My arrival in Washington in the middle of January coincided with a spell of cold weather, snow on the lawns, ice in the street gutters. I could only ask myself why anyone with good sense would leave San Francisco.

I was graciously received in the Division of Engineering by Miss Dorothy Teresa Smith, veteran chief clerk for the Division and personal secretary to Chief Engineer Norcross for nearly 30 years. Miss Smith, as I learned later, had been anxiously awaiting my arrival. She had heard how Mrs. Butler, nee Spivak, long-time secretary to Regional Forester Show in California, had

been summarily bumped by Show's successor a year earlier. Miss Smith feared a similar fate. Her fears were unfounded. I had observed her in action during my WO details. She was a secretary of the old school, fast, skillful, neat, and accurate in taking dictation, transcribing, editing, and expediting. She was knowledgeable about WO sources of information and tolerant of eccentricities in her boss. Dorothy and I enjoyed pleasant association for another 14 years.

Dorothy promptly ushered me into the office of Assistant Chief Engineer Howard Jones. This was the man, I soon decided, who should rightfully have succeeded to the Chief Engineer position. Howard had complete grasp of what was going on in WO and the Regions insofar as it related to engineering services. He was well-liked and respected by the Assistant Chiefs and WO Division Chiefs.

Howard Jones should have a permanent niche in Forest Service Engineering history as mastermind, editor-in-chief, and probably the principal author of the Forest Service Road Handbook of the 1930's.

The 1935 edition of the Handbook was, for the times and circumstances, unexcelled as text and reference for locating, constructing, and maintaining roads in mountainous areas and other rural districts. It was a unique and valuable treatise on road construction for access to undeveloped areas.

The Forest Service (Jones) Road Handbook was in great demand by foresters shipped to underdeveloped countries by ICA (International Cooperation Agency) and FAO during the 1950's. At the request of those agencies, WO was asking Regions to search the basements and garrets of every Forest headquarters in order to locate copies of the out-of-print Handbook. Mimeographed reproductions were made subsequently by ICA offices in the United States and abroad. Excerpts at least, perhaps the entire Handbook, are believed to have been translated into foreign languages. Unfortunately, the Handbook was never produced as an official publication. No credit line or other formal recognition ever appeared to acknowledge the notable efforts of author-editor Jones.

T.W. Norcross had assured the future of his successor by providing him with a strong staff and a particularly able group of Regional Engineers: Howard Jones, K. Webb Kennedy, Edmund S. Massie, Clifford Betts, R. Stuart Henderson, and Herbert Holmquist on the WO Engineering Staff; Regional Engineers Fred Thieme (1), Carl Gould (2), Howard Waha (3), Arval Anderson (4), James J. Byrne (5), James Frankland (6), Cummings Dort (7), Resin Pidgeon (8), and Malcolm B. Arthur (9) were all graduate engineers. Their backgrounds, individually and collectively, included a variety of engineering experience. All except one or two were members of national professional societies. Ed Massie was currently national president of the American Society of Photogrammetry.

Cliff Betts was the expert for FPC-licensed and other water storage and transmission projects, dam inspections, water resource inventories, water supply, and sanitation. Cliff retired in 1955. He was succeeded by Ward Gano. Ward's functions were later broadened to those of Chief of the Water Power and Structures Section, later renamed the Civil Engineering Branch of WO Engineering. Gano, after rejecting opportunities to become

Regional Engineer at Atlanta and elsewhere, elected in 1961 to accept the Regional Engineer position in Portland.

Stu Henderson was supervising equipment for Howard Jones, then heading roads, trails, improvements, and equipment. Henderson continued as expert in equipment procurement proposals for Engineering, Administrative Services, and later the Department until his sudden death from heart attack in 1962. Stu also functioned as WO representative for the Regional Equipment Engineers.

Herb Holmquist was in charge of administrative and technical services for the Division. He transferred to Missoula as Assistant Regional Engineer in 1949. During his Missoula hitch, Herb supervised construction of the Missoula smoke jumper dormitory, parachute loft, and other facilities at the smoke jumper base. Later, about 1960, he transferred to Philadelphia to become Assistant Regional Engineer for Region 7.

Technical Services in 1948 included the drafting unit headed by Jim Powell, the photography and photoreproduction unit headed by Walt Shaefer, assisted by his future successors, Bluford Muir and Ralph Fortune, in the order listed. The Atlas Room and services supervised by Earl Carey also came under the head of Technical Services. Carey transferred later to Interior. Administrative Services, mostly handling Division accounts and keeping track of FR&T allotments to the Regions, was the province of John Waggaman.

The drafting unit in 1948 included Rudy Wenderlin, who has since become famous as creator of the pictorial characterization of Smokey Bear, a variety of illustrated conservation messages, and memorial stamps. Rudy is now an accomplished artist in several mediums and top man in his field for the Department of Agriculture. Tom Culverwell was another member of drafting who did more illustrating than routine drafting. Tom's specialty was pictorial maps, popular with I&E and Recreation. Drafting at this time processed patent drawings for other bureaus in the Department and occasionally other departments. The patent draftsman was a competent patent examiner as well as an outstanding mechanical draftsman.

Drafting also included some outstanding draftswomen. They were skilled and meticulous map draftsmen and editors in addition to possessing highly developed artistic sense and skill. Helen Smith, one of the best known and immensely popular, had retired a year or two earlier. Sarah Acker, Francine Sizer, Josephine Waggaman, and Hazel Hartman comprised the female contingent when I arrived. Miss Hartman was a relative newcomer. The other three draftswomen were already Forest Service employees before the Division of Engineering came into existence. Miss Acker retired in 1950 and passed away several years ago. Miss Sizer and Miss Waggaman retired in the early 1950's. They are still hale, hearty, active, and full of anecdotes of days in the old Atlantic Building headquarters of the Forest Service on F Street, N.W.: synthetic caramels, which were in fact brown-ink-soaked art gum and rubber erasers, left on the girls' tables by drafting room pranksters; the shock of returning from lunch to find a huge ink blot on an almost completed, perfectly executed, tracing—actually an irregularly shaped black transparency.

A notable member of drafting was Sam LoJacano. Sam's only field experience was 6 months on the Monongahela. He was nonetheless a mine of information on Forest geography, Service-wide. He was often better informed than men who had spent years on a particular Forest. He was seldom at a loss when questions arose concerning location of features and culture with respect to towns, township, range, and section. He could spot rivers, creeks, even meadows more quickly than many who had ridden or hiked the Forests. He was particularly well informed on National Forest boundaries. His particular forte was history of boundary adjustments, Forest consolidations, separations, and name changes.

In addition to staff and service units, the Division included architect W. Ellis Groeben and architectural detailer extraordinaire, Ed Hamilton, photogrammetry projects leader Jack King, and roving representative of the Division, Henry Shank.

Groeben was a graduate of the Beaux Arts School of Architectural Design in Paris. He looked the part with his flowing mustache and goatee. For several years prior to Forest Service employment, Groeben had been chief architect for the City of Philadelphia. A political upset there forced him to seek other employment. Groeben's time was about evenly divided between producing concepts for Forest Service structures to be subsequently detailed by Ed Hamilton; composing and meticulously handcrafting illuminated historical scrolls for, and greatly prized by, retiring Forest Service and Department VIP's; and shifting his automobile about the streets of southwest Washington in order to minimize his violations of the overtime parking ordinance.

Jack King, veteran of USGS topographical surveys from the Caribbean Islands to Alaska, pioneer specialist in photogrammetric mapping, and coinventor of the KEK stereoscopic plotter, was also in charge of a photogrammetric mapping unit in Alexandria and overseer for a Navy Hydrographic Office project assigned to the Forest Service.

Henry Shank, Regional Engineer at Ogden during World War II, and in later years (1951–58) Regional Engineer at Denver, was winding up a Service-wide survey of National Forest trails. Henry rode and walked thousands of miles of trails—hundreds of miles in each Region. He was assisted in trail system examination by Forester Ernie DeSilva. The Shank-DeSilva trail study produced the first comprehensive report of National Forest trail conditions. Recommendations in that report became the basis for a continued program for eliminating nonessential trails and improving justifiable trails on the National Forest System.

The 1948 WO Engineering staff was not static for long. Webb Kennedy soon left to replace Cummings Dort as Regional Engineer at Philadelphia. Regional Forester Evans served notice that his staff and he had looked the field over and agreed Mr. Kennedy was way out in front of other prospects. Don Hamilton returned to military duty with the Air Force. C.E. Remington was brought in by Assistant Chief Engineer Jones from Region 1 to fill the vacancy left by Kennedy. Herb Holmquist transferred to Region 1 vice Remington.

Two or three years later, Howard Jones transferred to Region 1 to replace retiring Regional Engineer Thieme. Clyde Timothy Sullivan relinquished his

Washington Office Division of Engineering Rosters

Position	*1928*	*1932*	*1940*	*1948*	*1953*	*1964*
Chief	Norcross	Norcross	Norcross	Dean	Dean	Dean
Asst. Chief	Lautz	Lautz	Lautz	Jones	Kennedy	——
Roads & Trails	Haile	Haile	Jones	Kennedy	Sullivan Usher Waggaman	Sullivan Katcham Howlett Morris Church
Equipment			Jones Henderson	Jones Hamilton Henderson	Henderson	Funk
Architecture			Groeben	Groeben Hamilton	Groeben Hamilton	Weller Turner
Structures				Jones Kennedy		Hahn Hapfl
Water Power	TWN	TWN	TWN	Betts	Betts	
Technical Services				Holmquist	McDermott Porter	Massie Porter
Drafting	Witherow Murphy Acker Sizer Waggaman LoJacano, others	Witherow Murphy Acker Sizer Waggaman LoJacano, others	Powell Acker Sizer Waggaman Wenderlin Culverwell Hartman LoJacano, others	Powell Acker Sizer Waggaman Wenderlin Culverwell Hartman LoJacano, others	Powell Glover Hartman James LoJacano, others	Glover Hartman James Bridges, others
Engraving	H. Smith	H. Smith	H. Smith	Porter		
Atlas	Bruce	Bruce	Carey	Carey	Mayer	Driskell
Photoreproduction	Shipp	Shipp	Shaffer	Shaffer Muir Fortune Jeffrey, others	Muir Fortune Jeffrey, others	Muir Fortune Jeffrey, others
Signs					McDermott	Correll
Mapping			Massie, others	King, others	King, others	Massie
Photogrammetry	Wright		Massie, others	Massie, others	Cain, Elliott, others	Cain
Cadastral Surveys					King, others	King
Geographic Names				Carter	Carter	Cultice

position as Assistant Regional Engineer at Atlanta to transfer to WO as Road and Trails Chief vice Jones. Henry Shank transferred to Denver to replace retiring Regional Engineer Carl Gould. Ed Massie, to my consternation, left the Forest Service for a civilian position with the Navy at a couple of grades higher than Agriculture would go for a good man. James McDermott, formerly Assistant Regional Engineer at Philadelphia, had transferred to WO Engineering to head the Technical Services Section. Cliff Miller had been recruited from the Texas Highway Department to become the first junior engineer hired under a plan for recruiting one or two junior engineers annually for WO indoctrination preliminary to a Regional assignment. That plan collapsed when the Korean War, together with more attractive opportunities in other Federal agencies, proved too much competition for the Forest Service. Les Bean, pre–World War II Chief of the New England Timber Salvage Project, later U.S. Army Major with U.S. Occupation Forces in Germany, had been assigned to WO Engineering as roving representative for whatever purpose might be convenient to the Division Chief.

The years 1948 through 1953 were a period of readjustment for Forest Service development program concepts. The Service had emerged from the pre-1930 custodial era to engage in wholesale construction of roads and administrative improvements made possible by Emergency Conservation Work and other public works programs fostered by the New Deal. That era ended with United States entry into World War II. Defense-oriented activity governed National Forest administration during the next several years.

Chief Watts, since taking office in 1943, had been bent on reversing Forest Service emphasis on physical plant development. He was determined to exploit opportunities for realizing full timber, forage, and watershed potentialities from the National Forests. He was insisting on maximum attention to expanded Forest and range research, reforestation, afforestation, intensive management of timber and range lands, better fire protection, watershed management, and recognition of recreation values. Physical plant development would henceforth be low in priority.

One could sense the WO impression that Engineering would play a minor part in National Forest development activity where resources, rather than improvements, would receive major attention. The Chief stressed one assignment for Engineering, however. He wanted more numerous, accurate, informative direction signs at road and trail intersections, entrance signs at all National Forest boundary road crossings, positive identification of Forest Service roads, and clear distinction for timber sale and other project roads. He had recently wasted several hours of valuable time on Forests in two Regions where Forest Supervisors became lost repeatedly in mazes of timber sale project roads. Engineering promptly accepted the challenge. Most Regional Engineers cooperated with alacrity. But pragmatic Forest Supervisors and District Rangers were loath to spend time and money erecting signs for people who should be able to find the way without signs.

Assistant Chiefs Kotok and Granger visualized Engineering taking a more prominent part in resource development than anticipated by some WO people. Kotok and Granger foresaw that any resource development, more intensive fire protection, and better runoff control would entail mapping, road construction, housing, equipment use, and cadastral surveys, which should be supervised by Engineering. They, and several Regional Foresters,

encouraged aggressive participation by Engineering, even if unsolicited, in work programming by resource divisions, Fire Control, and Research. They cautioned Engineering not to miss a bet by repeating the 1933 error of ducking opportunity for a major part in the CCC program.

Most Regional Engineers reacted with enthusiasm equalling that of the WO Engineering staff. Initiative exercised by Forest Service Engineers caused them to overstep historical bounds of functional supervision at times. They were charged from time to time with attempting to neutralize proper decentralization of National Forest administration.

WO Engineering was more amused than troubled by the misguided critics of Engineering intrusions. Greater significance was attached to reports of assistance being received by resource divisions as a result of collaboration by the Regional Engineers and their staffs. Chief McArdle was firmly supporting augmentation of professional engineers in the Regions and on the Forests. He was highly complimentary following visits to Regions 3 and 5. State officer oversights had been avoided by Regional Engineer Huber's timely insistence on more adequate site investigation for proposed Pittman Robinson dams. The Chief was impressed by observing Regional Engineer Byrne in action to ameliorate flood damage threats in southern California. TM Chief Mason lauded assistance received from WO Engineer C.T. Sullivan. He complimented the initiative and progress by Region 5 Engineering in compromising knotty purchaser road construction problems by introducing FR&T supplementation.

Gratifying reports were received of results achieved by Region 9 Engineering in making efficient use of relatively meager road fund allotments. Region 9 design of administrative improvements and assistance in rehabilitating nursery improvements received favorable comment also. Equipment Engineer Henderson was so highly regarded by Department procurement officers that he was regularly consulted on all equipment purchases. Equipment Development Engineers Funk and Silva were widely known among both Federal and State conservation agencies. Although administratively assigned to Fire Control, Equipment Development was constantly within the inner circle of WO Engineering's scope of interest. Ward Gano, Chief of the Water Power and Structures Section in WO Engineering, was acknowledged by other WO divisions and the Assistant Chiefs as an authority on FPC license processing and structural design. The Alexandria Photogrammetry crew was valued highly by the Chief and Assistant Chief Cliff. These examples and other evidence of commendable performance by Forest Service Engineers reassured WO Engineering that Service-wide Engineering forces were earning their keep.

One of the strong supporters of Engineering in 1948 and later was Ed Kotok, Assistant Chief for Research. He was for expanding, not reducing, the Engineering organization, as some thought desirable. He encouraged, even insisted upon, Engineering representation on interagency committees concerned with sedimentation, pollution control, forest hydrology, runoff intensities, flood occurrence, etc. He encouraged Engineering collaboration with Research in developing timber-harvesting machinery and road patterns. Assistant Chief for National Forest Administration Granger also discouraged contraction of the Service-wide Engineering organization. He agreed that more, rather than fewer, engineers would be needed to achieve uniformly, soundly engineered transportation system and administrative improvements.

He knew these improvements would have to be provided in conjunction with an intensified and expanded program for resource development and adequate protection on the National Forests. Granger encouraged aggressive Engineering direction for all appropriately classed Engineering activities. He also encouraged promptly weighing and balancing equitability of road fund allotments to the Regions.

Equitable distribution of road funds posed a number of problems in 1948. Appropriate distribution was the more difficult because only $5 or $6 million of appropriated FR&T was available for distribution. That amount plus the R&T 10 percent available for expenditure, exclusive of approximately $2 million retained in WO to back vouchers for FFF overruns, was less than needed to finance road and trail maintenance for which a majority of Forest officers believed the Forest Service to be morally if not legally liable. The $15 million of NHA funds made available for timber access road construction was almost exhausted. Timber access road construction must now be financed with Forest Service appropriations. Regions were desperate for timber access road construction funds, particularly on western Forests. Yet several Regions were allowing meager road funds to be dissipated on maintenance of county roads and by disproportionate assessments for equipment repair and clerical services remotely related to Forest Service road system upkeep or betterment.

Widespread maintenance of county roads by the Forest Service was a holdover from the CCC era. Local support had often been enlisted for acquisition programs by promising Forest Service maintenance for all roads on the Forest Service acquired lands. That was feasible during years of Forest affluence when there was an abundance of CCC enrollee labor, equipment, and operating funds. The promises, although unauthorized, were nonetheless binding in the opinion of many Forest Supervisors and some Regional Foresters and their staffs. Others realized that much of the county road maintenance must be discontinued if road funds were to be available for construction. The latter Regions promptly went along with Engineering's campaign to turn county road maintenance back to public road authorities. WO Engineering was immediately aware of the smaller number of complaints about inadequate Forest Service maintenance on roads that were in fact a county responsibility. A few Congressmen raised objections to the new Forest Service policy. Those complaints were skillfully fended by WO Roads and Trails Chief Sullivan. He would agree that the Forest Service should maintain a particular road if funds could be made available for Forest Service maintenance of all similar roads. His estimate of annual appropriations necessary to finance the work would frequently settle the issue, at least for the time being and as far as WO was concerned. Most Regional Engineers performed well over the next few years in prevailing upon Forests to shift maintenance of essentially public roads to public road authorities.

FR&T and R&T 10-percent appropriations were, for several years, sufficient to finance only a negligible fraction of access road construction necessary in conjunction with advertised timber sales. Meanwhile, demand for National Forest timber was accelerating rapidly. The Regions were being forced to rely on timber sale purchasers for most of the access road construction. Engineering, with wholehearted collaboration from WO TM Chief Ira Mason, began promoting a plan already used by Region 5 Engineering for improving the quality of the purchaser construction. Forest Service Engineers located

and designed the roads. In many instances, the Region further supplemented purchaser construction by providing permanent culverts, demonstrating and supervising culvert installation, providing compressors, jackhammers, suitable tractor bulldozers, motor grader finishing for the roadbed, etc.

Region 6 was soon providing location and design for a majority of the major logging roads constructed by timber sale purchasers. Other Regions fell quickly into line due, in most instances, to determined Regional Engineers and their equally aggressive Roads and Trails Chiefs.

A knotty problem in the face of critically tight road funds was how to avoid disruption of carefully planned Forest construction schedules by unpredictable, spur-of-the-moment requests by Research for financing Experimental Forest roads. The Chief's keen interest in Research influenced all too frequent overriding of National Forest road fund programming, as well as inefficient use of funds in some instances. Experimental Forest road costs, while insignificant in ratio to ultimate cost of the National Forest transportation system, were often a severe assessment on already inadequate current allotments to National Forest Regions.

A solution was negotiated with Research whereby the Assistant Chief designated the Chief of TM Research as coordinator for Experimental Forest roads. He was made responsible for annually requesting the list of roads required during the next 2 or 3 years from each Experiment Station Director. The coordinator and Engineering then agreed upon a feasible work schedule by projects for the coming year. Engineering subsequently included specific allotments for each project in the annual allotment letter to the Regions. The Regions were expected to execute necessary surveys and supervise construction and maintenance operations. This is the history of Experimental Forest allotments that seemed unworthy of WO attention to later Regional Foresters accustomed to annual road fund allotments of millions of dollars instead of a lightly programmed few hundred thousand.

The Forest Service took a revolutionary step during the 1948–53 period. Force account had long been the prevailing method for accomplishing construction of roads and other National Forest improvements. Now it would turn to contracting. The transition was slow in some Regions. Procurement officers were inexperienced in contracting construction work. Administrative officers and some of the Engineers were afraid of contracting because they did not understand it. Forests accustomed to executing low-cost projects and having foremen, equipment operators, and labor available preferred not to be bound to contract preparation, close cost estimating, and inspecting against tight plans and specifications.

An occasional Engineer in the Regions was an old hand at supervising station contracts, as well as preparing plans, specifications, and estimates and administering general construction contracts. These contract-wise Engineers had observed the objectionable practices and unsatisfactory results frequently encountered in connection with Forest Service force account work. Contracting seemed likely to assure closer attention to preparation of plans and specifications, and better compliance with them. Some Regions were short of foremen and operators, and were unable to compete with industry for labor or afford capital outlay for the additional equipment required to continue force account construction. Regions 1, 3, 5, and 9 were first to

engage in widespread contracting. Region 5 had earlier contracted NHA-financed roads. Region 7 was soon contracting bridges and perhaps some road construction. Within a few years, construction contracting, even contracting engineering surveys and design, had become common practice.

The change was timely for several reasons. The Associated General Contractors Association ceased behind-the-scenes objection to increased FR&T authorizations. The Association discontinued promoting Bureau of Public Roads administration of Forest Development Road programs. Washington headquarters of the Association and some local contractor groups began to support increased Forest Service appropriations. Congressmen were more easily convinced by contractor bids, in some instances, that Forest Service road cost estimates were valid. Favorable appropriation trends during the next few years coupled with Congress' action in harassing the agencies with manpower quotas would have critically taxed Forest Service ability to continue force account construction. The Service had been wise to prepare Regions and Forests for administering unlimited appropriations and construction programs without relying on force account crews.

C.M. Granger retired in 1952. Ed Cliff replaced him as Assistant Chief for National Forest Administration. During the preceding year, Mr. Cliff had escorted Congressman MacGregor, R. Ohio, member of the Roads Subcommittee, on a tour of Western Forests. Cliff had taken pains to stress roads needed in conjunction with timber sales. MacGregor became Chairman of the Subcommittee on Highways of the House Public Works Committee in 1953. Mr. Cliff's missionary work began to pay off. A firm upward trend could be observed in authorizations for Forest Development Roads.

Mr. Cliff was thoroughly conversant with access road requirements in the West. He had been Supervisor of two or three Forests in Region 6, an ARF in Region 4, and Regional Forester at Denver for Region 2. His testimony before House and Senate appropriation subcommittees was highly effective in promoting increases in FR&T appropriations.

In 1953, Engineering was instrumental in bringing about designation of Mr. Cliff as Department of Agriculture representative on the Board of Geographic Names. Mr. Cliff was later Chairman of the Board for several years. Marshall Wright, who preceded Ed Cliff as Agriculture representative on the Board, and E.M. (Nick) Carter, former WO Chief of Timber Management and, after retirement, unpaid gatherer of geographic name data for Engineering, had struggled for years to have certain names placed on the Board agenda.

Engineering surmised that data gathering might be facilitated and Board action expedited if Agriculture were represented by someone with rank. The hunch proved correct.

Mr. Cliff was not long on the Board before Engineering was benefiting from the combination of his forceful personality and his prestige as Assistant Chief of the Forest Service. Board action was taken on long buried Forest Service requests for name decisions with respect to features and water courses appearing on Forest Service maps.

Marvin Cultice from the Surveys and Maps Section became legman and workhorse for Mr. Cliff on geographic names. Marvin was a natural for the assignment. He shares credit with King and Massie for the indoctrination that made Assistant Chief Cliff a firm and consistent supporter of the Forest Service mapping organization.

The upward trend in FR&T authorizations continued with the convening of the 84th Congress in 1955 and succeeding Congresses. By mutual consent with BPR, the Forest Service had divested itself, a few years earlier, of responsibility for obtaining Forest Highway authorizations and appropriations. Forest Service testimony was still being presented in support of BPR requests for FH authorizations. In the main, however, the Forest Service could now concentrate on securing funds for Forest Development Roads.

Richard McArdle had become Chief of the Forest Service in 1952. Retired Chief Lyle Watts was continuing to exercise his influence with Northwest Senators in behalf of National Forest programs. Chief McArdle became increasingly successful at convincing a Republican Secretary, the Budget Bureau, and a Democratic Congress that Forest Service appropriations represented worthwhile investment. Following realignment of Senate and House subcommittee functions, Agriculture Subcommittees were relieved of action on appropriation requests for National Forest protection, management, and roads. Those requests were now presented before the Interior Subcommittees. The requests were receiving favorable consideration. Forest Service appropriations were increasing for all categories of work. Timber sale business was also increasing.

Most Regions were by now convinced that they needed many more engineers. A few doubted the necessity for professional engineers in conjunction with timber access road construction. All Regions were recognizing the value of academically trained, technically qualified engineers for preconstruction investigations and design of high quality multipurpose roads, as well as for certain engineering aspects of other National Forest programs. Many Forest Supervisors had become aware of the distinction between the graduates of engineering colleges and products of the strictly "field institutes."

Forest development road appropriations never equalled estimated cost of currently programmed and urgently required timber access roads, much less other transportation systems and betterment. Neither could persistent recruiting supply enough graduate engineers to fill all Service-wide vacancies. Still, good progress was made toward both objectives. Congress continued to make large appropriations for Forest roads. Strenuous recruiting efforts by several Regions paid off in attracting good engineers. In a few years, the Forest Service Engineering organization was expanded from a few dozen to several hundred professional engineers in addition to a significant increase in the number of engineering technicians. Staff Engineer vacancies on the Forests as well as in RO Engineering Divisions were soon being filled almost exclusively by graduate engineers, thanks to a number of discriminating Regional Engineers.

Chief McArdle was always solidly behind efforts to man Forests and Regions with an appropriate number of professional engineers. He took

advantage of every opportunity to advance engineer grades and salaries to make Forest Service employment attractive to good engineers.

As appropriations increased, WO Engineering was eventually allowed an additional five staff positions: one for the Transportation System Branch, a Cadastral Surveys Specialist, and three assistants for the Civil Engineering Branch. Photogrammetric Center personnel also increased slightly. Here the problem was not so much financing or obtaining personnel authorizations as finding "warm bodies" for vacant positions—to quote Photogrammetric Center leader, Ed Massie. Ed had been recaptured from the Navy about 1958 or 1959.

One effect of the expanded Forest Service program on WO Engineering was to increase the business of the Water Power Section, and broaden its scope of interest and activity. For several years, transportation system design, mapping, and cartographic and photographic services were the only Division activities where more than one subject matter specialist was authorized for coordinating Regional standards or serving as liaison on interagency matters of an engineering nature. The 1951 Sullivan-Bean report recommending Administrative Management as the appropriate authority for equipment selection and fleet management and maintenance had effectively throttled Engineering's aspirations in that direction. The 1948 water power work load was light in WO Engineering. Water power activity was mostly in Region 5. There it was competently handled by Regional Engineer Jim Byrne and Section Chief T.R. Littlefield. Licensed power project and water use specialist Cliff Betts in WO Engineering could be, and was, forced by PM budget limitations to be spared to serve as part-time trail inspector. Now the picture changed. The water power desk was loaded with requests for assistance. The Section was about to require additional staff and destined to become in a short time one of the three prominent Branches of WO Engineering.

Betts retired in 1955. Before he left, controversies were brewing between Forest Officers and REA cooperatives in Regions 2, 3, and 9, and occasionally in other Regions. The co-ops were defying Forest Service rules and District Rangers by unauthorized clearing for transmission lines across National Forest lands. Conferences with REA were requiring considerable time. Betts' successor would need to be a diplomat as well as an engineer.

Ward Gano replaced Betts. Ward had recently completed a yearlong detail financed by USED. His assignment had been replanning the portion of the Kootenai Transportation System, which must be replaced following construction of Libby Dam. Previously, he had been Bridge Engineer in Region 6. He was known as a top engineer with a calm, deliberate approach. Ward was not long in mastering the ramifications of transmission line permits and water power license applications. He also proved to be an effective liaison with REA and the staff of the Federal Power Commission.

Gano was soon loaded with work to where he needed staff assistants. The Water Power Section was soon to become the Water Use and Structures Branch. Water power and transmission line permit business was booming by 1957. Recreation use was increasing on the Forests. Engineering was busy enlisting FPC support for requiring power project licensees to take cognizance of recreation potential on reservoirs and project roads. Forest

Service dams were requiring attention in the vicinity of recreation areas in Regions 2 and 8. Engineering was being called upon to process proposals for SCS-sponsored dams in Regions 4 and 8. Gano's crew was investigating the feasibility of reconstructing Resettlement Administration dams inherited by the Forest Service in conjunction with administration of Bankhead-Jones Act grasslands. Administrative Management was seeking guidance for its buildings program, Ranger dwellings, and administrative site development. The WO Division of Recreation & Lands was requesting assistance for design of campground improvements, water supply, and disposal facilities. These and other responsibilities were assigned to Gano's section, now renamed the Civil Engineering Branch of WO Engineering.

Gano's first assistant was Kelly Heffner, former Bridge Engineer in Regions 8 and 6, later Regional Engineer in Region 8. Kelly was brought in as a structures specialist. He was followed by Cliff Miller. Cliff, subsequent to leaving WO Engineering in 1951, had been Forest Engineer in Regions 1 and 5 and RO Staff Engineer at Juneau, Alaska. Cliff became the licensed projects specialist in the branch, although he was always able and willing to undertake any assignment. Cliff was highly regarded by the Assistant Chiefs, WO Division Chiefs, and FPC staff. He later graduated to Regional Engineer at Missoula. Others on the staff of the Civil Engineering Branch during the 1956–64 period included C.R. Weller, Richard Wilke, Oscar Hahn, Ralph (Max) Peterson, and Donald Turner. Weller transferred to WO Engineering from the Plumas National Forest in Region 5. He had previously been Staff Engineer at Juneau, Alaska, and in various Engineering positions in Region 2. Weller joined WO Engineering in 1959 when appropriations became available for Research laboratories. Donald Turner, also from Region 5, became the Architectural Engineer for the Branch when Weller followed Gano as Branch Chief. Gano left to become Regional Engineer at Portland. Max Peterson transferred to Administrative Management, later becoming Regional Engineer at San Francisco.

By 1962, Engineering was collaborating with Administrative Management in representing the Forest Service on planning Job Corps camp construction. Wilke had spent a short time on water use activities, later transferring to the Transportation System Branch. Hahn had joined the Branch as Water Use and Structures Specialist.

Other post-1955 changes in WO Engineering included adding the staff position of Cadastral Surveys Chief and acquiring direction of Equipment Development activities. Sam Greenwood, an experienced surveyor, former Party Chief on Region 8 acquisition surveys and Chief of Roads and Trails at Atlanta, later Ogden, transferred from Region 4 to head the Cadastral Surveys Branch in WO Engineering. Sam ranked high among prospective candidates for Regional Engineer, but he was also a natural for the position of Cadastral Surveys expert. WO parties directly concerned with Forest Service property lines would never consent to releasing Sam for any other position.

In 1956, a smart move was made by bringing Jim Byrne in from Region 5 to head Forest Products and Engineering Research. Engineering had long hoped circumstances would someday permit transportation system research. WO Engineering initiated such a plan on a couple of occasions but was unsuccessful in obtaining a suitable grade for project leader. Later, the Division compromised by creating a position in the Transportation System

Branch with the function of exploring opportunities for system improvement. Ward Gano was the last of two or three engineers who occupied the position momentarily. Some more urgent demand for the individual always deactivated the position before the incumbent could make any headway. Gano was in the position about a week when circumstances dictated his reassignment to the Water Power desk in WO Engineering. The Division was therefore delighted when the Office of Research established its division of FP&E Research.

Restructuring and augmentation of staff was occurring regularly in the late 1950's. One of the major changes in the WO staff structure was redesignating the former Office of Land Acquisition as the Office of Protection and Development. The change of title was accompanied by transfer of WO Fire Control and Engineering Divisions from National Forest Administration to the new Office of Protection and Development. Arthur Greeley, Regional Forester at Milwaukee, was promoted to Assistant Chief for National Forest Protection and Development.

WO Engineering heartily approved the Chief's action creating the Office of NFP&D. That represented sound organization in the opinion of Engineering. The Division likewise approved of the choice for Assistant Chief to head the new office. On the other hand, Engineering was torn between satisfaction with the new arrangement and alarm lest its attitude be interpreted as disloyalty to its much-admired and staunch supporter, Assistant Chief Ed Cliff.

I was not aware at the time that Art Greeley had reason to be strongly prejudiced against his Engineering Division Chief. He reminded me later that I had been guilty, several years previously, of arbitrarily transferring his Forest Engineer. Fortunately for me, forgiveness is prominent among Art Greeley's many fine qualities. He repaid my transgression later by urging an extension of my Forest Service career, which added significantly to my retirement income.

In 1960, direct supervision of Equipment Development was transferred to WO Engineering from the Division of Fire Control. Engineering was fortunate in concurrently inheriting Fire Control's equipment development specialist Ira C. Funk, graduate mechanical engineer. Funk was immediately made Chief of an Equipment Development Branch in Engineering. Later, following the death of Equipment Engineer Henderson in 1962, Funk became Chief of the Branch supervising all WO Engineering functions relating to both equipment development and fleet management.

February 29, 1964, terminated my 30 years of fun on Forest, RO, and WO Staffs. The WO years were both stimulating and exciting. The Forest Service was growing, and Forest Service Engineering grew with it. Service-wide, Forest officers were much more professionally oriented than when I moved into WO. The professional stature of Forest Service Engineers matched that of the Foresters.

Credit for Engineer quality belongs to Paul Brown, Minor Huckeby, and missionaries dispatched by Regional Engineers to prospect and recruit at engineering schools. No small amount of credit belongs also to Regional Engineers Arthur, Byrne, Huber, Kennedy, and others, who insisted on graduate engineers for Engineering positions. Their discriminating selections for

Forest and RO Staff Engineers contributed significantly to worthwhile refinements in design of transportation system facilities and other National Forest improvements.

Ed Massie and the photogrammetrists had also contributed notably to the 1964 image of Forest Service Engineering. Functional quality of Forest maps had been greatly improved by wise selection and painstaking development of leaders for the map-producing crews. Massie and assistants John Elliot, Hubert Can, and Marvin Cultice had, furthermore, grasped every opportunity for acquiring modern equipment. Claire Arneson had pioneered, developed, and promoted use of photogrammetry in refining route selection and investigation for timber access roads. Jack King had similarly developed, introduced, and tested substitution of photogrammetry for costly, time-consuming ground methods for recovering section corners and facilitating marking of National Forest property lines.

Unattained objectives were still numerous. Transportation system management problems were as far from satisfactory solution as they had been 16 years earlier. Six or seven thousand miles of blacktop should have been 70,000 miles. Construction of satisfactory District Ranger dwellings was still awaiting the day when administrative assistants to appropriation subcommittees might acknowledge the superior design competence of Forest Service architects. Forest officers and economy influenced Chiefs of Operation, as well as some Engineers, who were still tolerant of overhead power and telephone lines on administrative sites and recreation areas. One could only hope that the Forests will bury the lines eventually. One could be encouraged, however, by support now being given to the Engineers' recommendations for prompt attention to suspicious water supply and waste disposal facilities.

Jim Byrne, my successor, would, for better or for worse, be affiliated with a WO staff infiltrated by ex-Forest Engineers and ex-Region Fivers. Staff composition in 1964 had changed significantly since 1948. Then the staff was dominated by Region 6 alumni: Chief Watts, Assistant Chief Granger for National Forest Administration, TM and RM Chiefs Mason and Dutton, and Fiscal Agent Zimmerli. Region 6 was the money-making Region. Less than a fourth of the hierarchy had achieved the eminence of a Region 5 assignment before arriving at WO. Others were inclined to deprecate glorious, golden California as a Region of fires, floods, and spendthrift affluency. They were critical of the number of Engineers coveted by Region 5.

All was changed by 1964. Region 6 could still claim credit for Chief Cliff. Five of the Deputy Chiefs, however, the assistant to the sixth, and 60 percent of the Division Chiefs had earned a Region 5 Service Stripe at some stage in their Forest Service careers. Two of the Deputy Chiefs were ex-Forest Engineers: Red Nelson, Deputy for National Forest Protection and Development, and Hamilton Pyles, Deputy for Legislative Programs. Thus, most of the WO brass must now be aware that there is more to National Forest Engineering than eyeballing truck trail location and providing drafting services for Regional and WO offices.

The time was ripe for me to quit then as it also is now.

Historical Sketches in Equipment Development

Henry A. Mullin

I was first employed by the Forest Service in September 1933 by the Lassen National Forest. This was about the time the CCC program was really getting under way. The country's financial Depression of 1929 was beginning to be felt by more and more people. At least this was about the time I became conscious of the seriousness of the situation.

Prior to this time, I had been employed by the Red River Lumber Company of Westwood, California, for 7 years. I started with this company in September 1926, and due to a reorganization program, I was appointed superintendent of the department less than a year later. Prior to this, I was busy getting an education, working in automobile repair shops most of the time between school terms. I took some time in the middle of all this to drill a few oil wells and do some auto racing.

The Red River Lumber Company was the largest lumber company on the Pacific Coast in those days and was in the throes of converting from horse logging to tractor logging. By 1928, the Diesel Department had the first 100 Class diesel electric locomotive delivered to the Pacific Coast.

About 1930, the company purchased two Westinghouse electric locomotives to haul the logs from Chester, California, to the mill in Westwood, a distance of 16 miles. The tractor business had spiraled from 15 to 60. We learned that in those days tractor manufacturers did not realize the operating conditions that existed in logging, so we rebuilt the tractors to withstand these conditions.

Sometime around 1928, it was concluded something should be done about dragging the logs lying flat on the ground. This was very inefficient, as was high lead logging. The company decided to see what could be done to improve Cat logging, and this resulted in the development of the first logging arch and logging winch to be used with crawler tractors. In 1932 or 1933, at the company's request, we built a long tractor with an arch on the rear to hold the front of the log up off the ground.

A director was appointed to operate the company, and he gave orders to reduce all personnel salaries that exceeded $250 to a flat $250. This was the first time I realized there was a depression going on. I remained with the company for about 30 days after this; I suspect to get over the shock.

Pete Hansen, now a retired Regional Forester, was then Assistant Forest Supervisor on the Lassen Forest in Susanville, California. He sent a man to contact me to see if I would be interested in accepting employment with the

Forest Service as a master mechanic for the CCC program. I went to see Pete and liked him from the start. I agreed to accept his offer for 30 days at a salary of $150 per month less 15 percent. George Gowin was Forest Supervisor, but I never met him until sometime after I began working.

In those days, each Forest handled its complete operation, which was actually nothing compared to the management problems and objectives of today. However, supervising the work objectives of the various CCC main and spike camps, along with all the problems created by the CCC boys handling the equipment, was a real problem for all phases of management. Other problems were created by the NIRA and ERA programs.

The CCC camps were all engaged in some sort of construction program. Building roads, especially the Ponderosa Way, required considerable effort. Several Forests in California utilized their CCC crews to build sections of this road, which was to provide, when completed, a way through the timbered areas from one end of California to the other. I never found out how near the original project came to meeting its objective. I do know there was a lot of road built that opened up a lot of new country to logging and provided a way to get close to many fires that could previously be reached only by horseback.

The equipment available to build these roads to a great extent created the same problems I had previously experienced with logging equipment. The problems were different, though. Bulldozers for crawler tractors were rather new, and designers had no opportunity to really understand what the equipment was expected to do.

I recall talking to Pete Hansen after he had been made Forest Supervisor of the Lassen National Forest. We discussed the weakness of the current equipment program and what could be done to overcome some of the problems. I told Pete how we financed and maintained equipment for the Red River Lumber Company. He seemed to think some of the procedures could provide the answer to a lot of Forest Service problems. I know nothing about what happened, if anything, regarding Pete's action pertaining to our discussion, but one day about 6 months later, Mr. Paul C. Brown, a Civil Engineer and former power shovel salesman, then in charge of procurement in San Francisco, offered me the job of Area Superintendent at Redding, California. I do not recall the month, but it was in 1936. The Forest Service had nothing in the way of facilities at Redding, but Mr. Brown rented space in the Caterpillar dealer's shop. Some people were transferred from the Forests, clerks and mechanics were hired, and we began the equipment rental program in the seven northern Forests. I persuaded the Redding City Council to give us a 99-year lease on 5 acres of land, and later an additional 3 acres were added. Paul had shops built, and we were in business.

As I recall, we had four Forests that were willing to try the new system of planned replacement and maintenance. The Forests paid operation costs of their fleet of equipment. The Depot's part in the program was to give service on all rented equipment and make additional equipment available, if needed. Paul Brown was probably the most efficient expeditor and organizer known in the Forest Service. This statement could no doubt take in a lot more territory considering all his other accomplishments. I learned a lot from Paul. He taught me more about business management than I ever

dreamed existed. He explained regulations and how the Government functioned.

The Regional Forester, S.B. Show, would not approve ordering any Forest Supervisor to turn his equipment into the pool. His philosophy was that our job was to sell the idea by giving superior service to the Forests in the pool, and if the new system was accepted by other Forests, and bookkeeping and regulations were compatible, the entire Region could then be under one system.

We worked very hard to make the program work, and it did. Service was our motto, and efficiency in the shops and handling our business management functions our way of life. When major forest fires occurred, we made our personnel and facilities available. In the overall, we did a very good job for the Forest Service in Region 5, even if I do say it myself. We had more satisfied customers than unsatisfied ones, so we must have provided a good service.

I cannot recall the date Equipment Management was transferred from the Division of Operation to Engineering, but it must have been in 1937 or 1938. The first time I met Mr. A.P. Dean, newly appointed Regional Engineer in Region 5, was in Mt. Shasta City at the Forest headquarters. I was greatly impressed by Mr. Dean.

During World War II, the Nation's supply of rubber was in jeopardy, as the rubber supply from the Far East was cut off by the Japanese. Our country needed rubber for many purposes, and it was decided to grow Guayule rubber. The Forest Service was chosen by the USDA to get the job done. In California, nurseries were established at King City and other places that I don't recall. Field operations were widespread on leased land all over the central and northern part of the State.

The Redding Depot was required to establish field and shop services in northern California to care for the equipment, with the Depot personnel and facilities made available for the emergency. We started branch shops at Arbuckle and Williams, California, to serve the field operations that were planting the nursery stock of Guayule rubber.

Paul Brown was called to active service in the military, and Gene Silva was made Equipment Engineer. Linne Ahlberg was his Administrative Assistant. On December 26, 1943, I was loaned to the Guayule Project headquarters in Los Angeles, California. Harve Robe was Chief of Operation. I drove from Redding to report for duty on a program established to more or less duplicate the efforts in California to produce rubber in the Rio Grande Valley in Texas and New Mexico.

It required 2 or 3 days to get a line on what I was to accomplish. Harve Robe introduced me to Major Kelley, who was in charge of the entire Guayule Program. His only instructions to me were, "Henry, you came highly recommended to me by Tony Dean, Regional Forester Show, and many others in Region 5. I hope you are able to live up to such an enviable reputation, as we need men of your caliber." He then handed me a sheet of paper explaining, "I have had unlimited purchase authority prepared which you will need in carrying out the work we have lined up for you. Spend

the money prudently, and good luck in your assignment." When I left Major Kelley after shaking hands, I told Harve goodbye and took off in a 1934 Hudson sedan for Phoenix, Arizona. The next morning, I checked in with the Project Supervisor, Mr. Walt Wetzel. I explained my purpose in life at the moment, and Walt advised me that after he completed his initial survey of the other new projects, his program might have jelled enough to perhaps formulate a program of his equipment needs. I bid him goodbye and left for El Paso, Texas.

The nursery program at Mesilla Park just north of El Paso was in the process of being constructed and would be complete in about 30 days. A Mr. Klein was in charge of the nursery and needed some help, so we got along fine. I went downtown and purchased the equipment he needed from a used car lot. The office for the project was in the throes of getting organized and staffed. I met Mr. Ryel Teed, the Administrative Assistant for the project, and a Mr. Benjamin, his assistant; Jack Roak was the Project Supervisor, but I did not meet him until months later. Their office was in the Mills Building in El Paso, Texas, so I arranged with Mr. Teed to secure additional space for Equipment Management. Mr. Teed was very cooperative, as was Mr. Benjamin.

The next morning, I took inventory on events and what I should do about them. I looked at a shop on Texas Street, which had closed due to the war. I negotiated with the owners for rental of this property and later leased it for the duration of the project, of course a year at a time.

I appealed to Mr. Dean to send a clerk on detail or transfer, as I needed someone to head up our office, hire clerks, and handle the details of such an undertaking. I asked for Lucille Haskins, and Mr. Dean had her in El Paso the following week. In the meantime, I had taken off for McAllen, Texas, where a nursery was being installed. I discussed current problems, made a lot of notes, looked over the project and equipment on hand, etc. By this time, I had the Arizona-Texas Guayule Project pretty well sized up, people and locations pretty well located and appraised, so I returned to El Paso to get things started under some sort of control. I managed to get Region 5 to agree to send some mechanical personnel I needed for the three new shops that were about to start. It turned out I could only get Kenneth McDonald, who was put in charge of the Phoenix Shop. The other foremen I recruited locally. Good local mechanics were not plentiful, but then they never are. As I recall, there were approximately 1,000 pieces of equipment, consisting of agricultural equipment of all kinds, passenger cars and trucks, plus both wheel and crawler tractors, in the three project headquarters by the time the project was curtailed in 1944.

An interesting experience relating to my wife, Ruby, and boys, Roy and Henry, Jr., was when school was out in Redding, California. They were to drive to Phoenix, where I was to meet them, and we would travel to El Paso together. This was about June, and I had been away since December of the previous year, and I was anxious to see them. We had a 1939 Lincoln Zephyr of which I was very proud. Ruby had a huge trunk in the back seat. The total load in the car was so heavy, the front end was reared up like a speed boat under full power, and the back end was almost dragging.

After 1 1/2 years, it came time to return to California. The war was still going on, but since synthetic rubber research developments were successful, the urgent need for natural rubber subsided. We drove back in two cars with all our belongings.

I was to report for work in San Francisco, which I did, but I did not get to the office for several days. I checked into the hotel and was unpacking my things when the phone rang. It was Buck Lane, who was in charge of roads in Region 5. Buck wanted me to pick up a car, go to the airport, pick up some overhead from Region 3 who were to arrive at 4:00 p.m. After picking up four men, I was to drive them to Mendocino Forest, where a big timber fire had been burning for several days. The first person I met that I knew was Gene Silva.

This is where I really got to see Ray Huber in action for the first time. Ray was Fire Chief, and when we arrived after midnight, we were fed and bedded down for a few hours rest. We were awakened at 5:00 a.m. and were assigned to a new camp scheduled to be set up at Iron Mountain.

When the fire was under control, I went back to San Francisco and reported for work in the Regional Office. I did not stay very long, as the Texas Timber Salvage Project was being planned and an Automotive Equipment Engineer was needed. I was offered another detail and was not too anxious to go, but the war was still going on, so I purchased a railroad ticket for Lufkin, Texas. Allen Miller, Forest Supervisor of the Texas National Forest, was Project Supervisor. There was a lot of equipment needed, and since I was familiar with acquiring surplus, I arranged for the types and sizes needed. We set up equipment use rates the same as we had done in Region 5. Forms were printed, people hired, two shops started, and service became a reality. Camps for German prisoners of war were under construction. Prisoners were to be the backbone of the labor force. The purpose of the Texas Timber Salvage Program was to salvage the huge amounts of timber damaged by an ice storm. There were thousands of acres of second growth timber damage, and the objective was to salvage as much of the damaged timber as possible before the bugs ate up the logs.

Heavy equipment in the woods in the South is taboo, except for approximately 2 months during the summer. Generally, with one trip over the land, large tractors would break through the sod and bury themselves. We had acquired two small crawler tractors—I believe TD-9's—and upon a trip in the woods one day, I found one with just the smoke stack sticking out. This led to solving a problem I had never experienced before. We purchased 50 OC-3 tractors with wide tracks and equipped them with radiator guards, belly guards, and special chokers to pull the logs. This combination provided sufficient flotation and traction characteristics to operate under these unusual conditions.

Sometime after the OC-3's were in service, I was advised that the prisoners of war, who were a part of Hitler's Tank Corps in Africa, were playing leapfrog with little machines. They would play hide-and-seek, and run over logs and anything else in their way, when their commanding officer was out of sight. I decided to cure this in the following manner. The OC-3 tractor was equipped with a spring seat, normally very comfortable to ride. However, to keep the boys from racing with these machines, I put a stiff brace

under the seat so that it had no resilience when they jumped the tractor over the small, 8-inch- to 12-inch-diameter logs.

After 6 months on this project, things seemed to be going pretty well in our line of work, and I was able to return to California. My work was turned over to Frank Adler of Region 8, and I was on my way home again. I do not recall the date I arrived in Redding, but I was really happy to be back.

After I was in San Francisco for a short time, Silva was transferred to Fire Control and later to Region 1. Ahlberg and I operated Equipment Management until Paul Brown returned from the military, which was approximately 1 1/2 years later. This was a period when I really appreciated Mr. Tony Dean. Tony told Equipment Management that our work was basically service to the Forests. It was up to us to see that every Forest got the service they needed at a reasonable cost.

During my days in Region 5, we were a service organization, and it was up to us to see that the Forest received the required service as part of what was included in the use rate.

The system of inspection, to determine how well the drivers and operators of equipment redeem their responsibility relating to top management's agreed set of rules of what the driver is expected to do or have done to his vehicle or his construction equipment, was initiated by Mr. Dean.

Time went by, and everyone was busy. Paul Brown returned from the military, and I was given a choice of remaining as Paul's assistant or going to Region 3 as Equipment Engineer. I decided to go to Region 3.

When I arrived in Albuquerque in September 1946, Howard Waha was Regional Engineer and as fine a person as one would hope to meet under any circumstances or anyplace. Equipment Management was handled by Bob Hughes, a Civil Engineer. I presume Bob handled the problems relating to Equipment Management to the satisfaction of Mr. Waha and the Regional Forester. The Region had two equipment inspectors who traveled.

The equipment use rate structure was made up of operation and maintenance costs only. There was no record of a comprehensive rate study. Replacements were made occasionally and were financed out of Forest funds.

Regional Forester Frank Pooler retired shortly after I came to Region 3. Mr. Woodhead was his replacement. Mr. Otto Lindh was transferred from Region 6 to become the Assistant Regional Forester in charge of Timber Management. Mr. Woodhead called a meeting of the Equipment Committee and declared the existing committee failed to function, so it was to be abandoned. A new committee was appointed and members were as follows: Otto Lindh, Chairman; H.A. Mullin, Secretary; Division Chief Members, H.B. Waha, Engineering; and Reed H. Jensen, Fiscal Control. When Mr. Woodhead completed his announcement, Mr. Lindh took over and said, "There will be a meeting of the Equipment Committee to be held 30 days from today."

I wrote Manual Amendments setting forth the ground rules similar to, but not as detailed as, those developed in Region 5. The Service aspects were

there, explaining just what Equipment Service was responsible for and what the Forests were responsible to do. Driver responsibility was spelled out in detail. I tried very hard to spell it out as clearly and as briefly as possible. During the period before the forthcoming meeting, I met and talked to every Forest Supervisor in the Region. We discussed automotive equipment and service problems relating to each particular Forest. One or two Supervisors were really happy with things as they were. Most were rather noncommittal, but seemed friendly toward any system that would help in getting the job on the Forests done more efficiently. One Forest had, I believe, 15 or 20 pieces of construction equipment left over from CCC days. There were in the Region a total of 54 McCormick Deering wheel tractors with mounted Davey compressors. There were over a hundred pull-type drag scrapers in the Region.

The Equipment Committee meeting was held on time, and my recommendations for action approved. Since the equipment situation in Region 3 was really pathetic, the only direction it could go was to make it better. Some of my recommendations were as follows: (1) organize a Shop System, which would provide high-class mechanical service throughout the Region; (2) sell all the equipment not needed and upgrade the fleet. To avoid details, I will say the first action I accomplished was to close 7 of the 12 existing repair shops, since they were not staffed with competent mechanical help.

Approximately 2 years after the Service and Management procedures and policies were jelled, Russell Butler from the Apache was made Area Superintendent in Arizona. Later, he became Area Superintendent in New Mexico, and Ralph Bolden from the Prescott became Area Superintendent in Arizona. Both men are now retired. They both did an outstanding job in Region 3.

Howard Waha eventually retired, and Ray Huber, who transferred to Region 3 from Region 5, was appointed Regional Engineer. Ray was a real engineer and probably the best boss I ever worked for, along with Mr. Tony Dean. I personally appreciate being associated with these men, and they did all they could to further the Forest Service and all the people with whom they were associated. Both recognized services needed by the Forest Service relating to automotive equipment.

After a few years in Equipment Management, I had earned a few friends by giving service at reasonable cost. Kelly Traugh, Chief of Range Management, desired to get as much range reseeding as possible done in the northern New Mexico Forests in keeping with funds available for this purpose. The area scheduled for improving range conditions was in high-elevation country, which had been overgrazed for so many years that nothing was left for the cattle and sheep but sagebrush. The idea was not new. Many attempts had been previously undertaken—some, I presume, successfully—but generally all were considered to cost too much. The primary reason for the high cost was that the methods used and the tools available were not efficient. Region 6 had a similar idea. I understand that Joseph F. Pechanic introduced to the Forest Service the basic principle of the brushland plow, which originated in Australia.

I believe Joe, now Director of the Northwest Range and Experiment Station, was then Chief of Range Management in Region 6. Joe was interested in new ways to prepare a good seedbed under wild land conditions. Through his efforts, Mr. Tom Caldwell built the first Forest Service brushland plow. (The plow was tested under field conditions in Oregon and proved successful.) As a result, considerable interest was generated throughout the Service, and a contract was let to build ten more plows. Two were scheduled for Region 3. One, delivered to Santa Fe, operated less than 100 hours, and the other, delivered to the Carson, operated approximately 200 hours. Both were reduced to what appeared to be junk. The plows were hauled into the Albuquerque Depot. Kelly Traugh and I were very deeply concerned when we looked over the remains, and since he showed a great deal of concern in the overall range reseeding program, I became sympathetic to the problem and gave it some thought. Kelly and I discussed the problem at some length. We agreed that any tool that could not be used in rocky range conditions without breaking up was not suitable for Region 3 conditions.

The brushland plow was basically designed to be used under wild land conditions and would probably do if the frame and axles were made stronger. Kelly said it appeared that well-trained people would be required to operate this type of equipment, and he thought if I could repair the plows and make them stronger, he would set up a range improvement program in a large area. This would, of course, benefit a few Forests because plows were not available to all the Forests. I estimated it would cost $1,500 to get the plows in serviceable condition. I set up the rebuilding program and Kelly set up repair funds, and the plows were conditioned for continued service.

I somehow got the idea that since we had only D7 size tractors, why not pull two plows? I discussed this with Kelly and assured him I could make a hitch that would do the job. Everything worked out as planned, and plows were put in service on the Carson Forest the following spring. We had a lot of visitors to watch the plows perform. The two-plow hitch became standard procedure throughout the Service.

I those days, Region 3 had a small fleet of equipment. I recall the total investment in rolling stock was around $500,000. In 1967, it was approximately $3 million. Of course, one must take into consideration the inflation factors. What actually happened was the Region wanted to do more work, so the fleet was expanded.

During this period, Regional Forester Woodhead had passed away and Otto Lindh was appointed Regional Forester.

Since most of our Forest Service project activities seemed to be getting more active, and requests for D7 tractors seemed to keep increasing, and since there was not enough money available to purchase new ones, we decided to get military surplus tractors. I was given approval and over several years built the fleet up from 5 military surplus D7 cats to over 40.

Region 3's overall interest in doing things started all sorts of activities. Road construction was, however, an exception in the force account arena, as most of this work was done by contract. The availability of funds to work was and always will be the criterion that makes things possible.

Otto gave Timber Management a shot in the arm when he saw the amount of slash left in the Forest after the trees were cut and the logs were hauled to the mill. It seemed that in the Southwest, cull logs from felled trees ran as high as 40 percent, which is more than in many other areas. These conditions create a serious fire hazard unless the slash is piled and burned.

The end result in Region 3 during Otto's reign as Regional Forester was that since the slash piling job was not being done the way he wanted it done, he caused timber sale contracts to include a slash disposal increment to enhance the work of cleaning up the Forests, thus reducing the fire danger.

At this particular time, I believe, Otto was in charge of Timber Management, prior to his appointment as Regional Forester. At any rate, Otto asked me if I was familiar with the Region 6 brush tooth, which was a tooth designed to clamp on the face of the dozer moldboard. The back of the tooth was equipped with a bracket, which hooked over the cutting edge and was held in place with a clamping arrangement at the top. The tooth was equipped with a ground-contacting shoe, which extended approximately 12 inches below the dozer cutting edge. Four such teeth, when installed on a dozer, provided a dual-purpose machine—a brush rake and a bulldozer, when the teeth are removed.

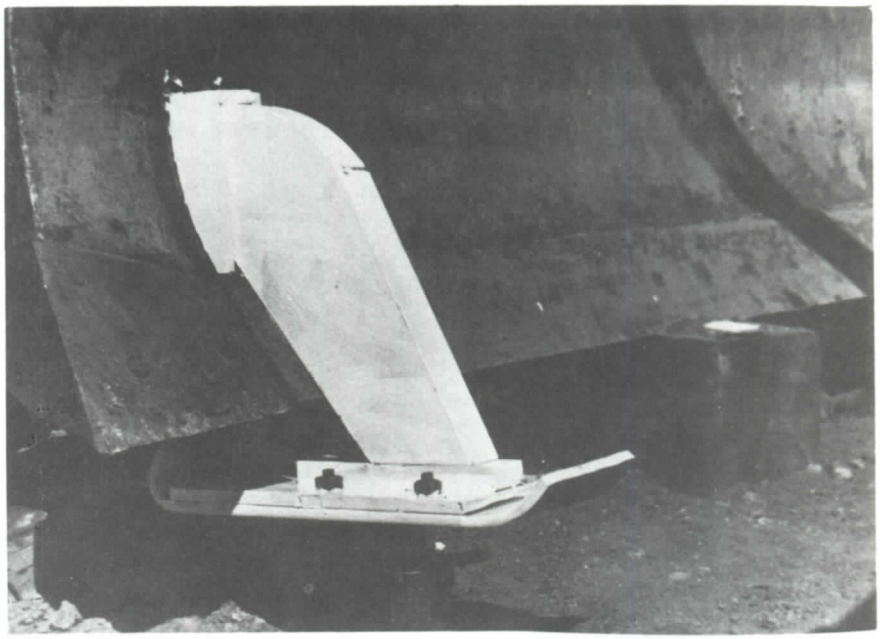
I advised Otto that we used some of these teeth in Region 5, but found them to be difficult to hold in place on the moldboard. In addition, they were so heavy that the tractor (when equipped) became nose-heavy, which in turn limited their use for downhill and/or level ground travel. Otto said the Region 6 teeth were the best thing developed up to this time for slash piling and suggested we encourage the Apache, Coconino, and Sitgreaves to try a set to determine how they would work in Region 3.

As it worked out, the Sitgreaves and Coconino had straight dozers, and the Apache had a La Plant Choate angle dozer. The brush teeth were installed on each respective tractor, and as far as I recall, the Sitgreaves and Coconino machines worked out pretty well, except the teeth required constant attention to keep them tightly attached.

We found out by experience that the La Plant Choate angle dozer was an impractical application as the teeth added to the already nose-heavy angle dozer and the tractor was so out of balance that the teeth were removed and declared to be impractical.

I concluded the La Plant Choate angle dozer was worn out and should be replaced with a straight dozer. I wanted to make a set of teeth much lighter than the Region 6 design, as well as provide a means of providing a tooth installation that, when installed properly, would require no further maintenance except to replace the skid shoe when it became worn, and would be usable on any straight dozer.

This appeared to me to be a real challenge, because if I could design such a tooth that would fit any dozer, we would solve many problems that had stopped progress in job applications, as well as realize some of the advantages of standardization.



Original tooth and brush shoe.

I worked on this several days and some nights until I arrived at the basic design now standard on the Hula Dozer.

Only one set of the original brush tooth design was made and placed in service. It was used for several years and replaced with the newly designed tooth with the digging points.

During this development period, my objective was to increase the availability of our fleet of tractors to more nearly meet the needs of the Forest Service. The basic economics involved here is one of machine efficiency and annual utilization. Prior to using a tractor on slash work, which is a seasonal operation, they were used only on dirt moving, such as stock tanks and road construction. Many rippers were needed to augment tractors throughout the Region. Annual utilization of the tractors was 300 to 400 hours with an average of approximately 350.

These thoughts motivated me to concentrate on developing the all-purpose feathers of the Hula Dozer. In order to increase the efficiency of the dozer, I concluded that if digging teeth would increase the efficiency of the power shovel and dragline, why not apply the same basic theory to a bulldozer? I pursued this line of thought and further concluded that to increase the force concentration of the dozer moldboard, by the use of teeth, they must be at the same level as the dozer cutting edge. Therefore, I must work out a new concept of the complete dozer cutting edge.

To accomplish this, I expanded the tooth design so it has a tapered point on the lower end, which would receive either a brush shoe or a digging point.

The design I had arrived at required using digging points normally carried in most dealers' stock, so replacements would not be a problem. When installed, my tooth design would extend approximately 20 inches directly ahead of and at the same level as a conventional dozer cutting edge. To provide for fast penetration, the top of the dozer would be hand-adjusted forward at the top of a conventional tilt dozer, an equal amount on both sides, so as to maintain a level moldboard. However, the teeth, which are integral with the moldboard, would then be positioned below the dozer cutting edge and the tooth angle would be increased.

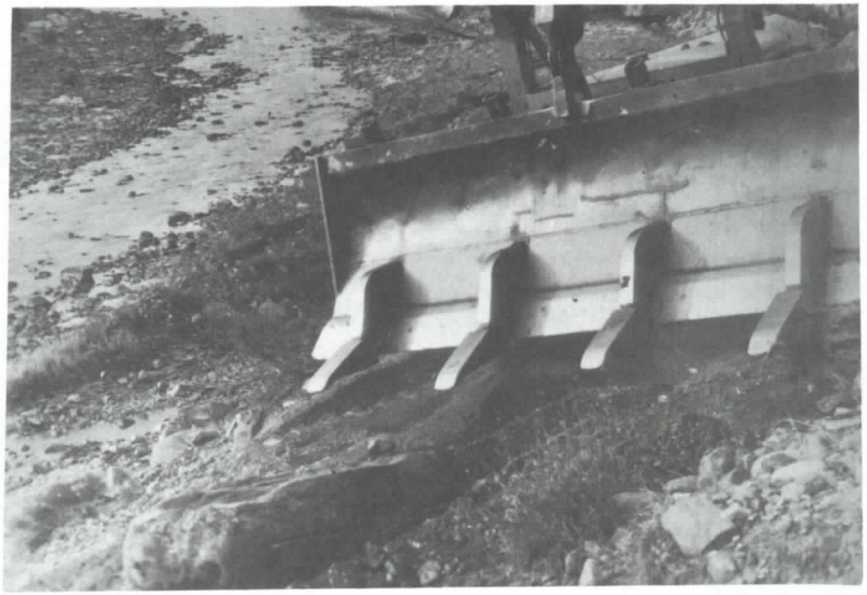
The Forests piling slash with the Region 6 brush teeth wanted additional tractors with teeth, so additional tractors were acquired from military surplus and equipped with the Mullin teeth. These tractors were provided with special brackets installed on the back of the moldboard, which were to provide a means of carrying either a set of brush shoes of digging points. This was done even though we had not tested the earth-moving capabilities of the new dual cutting edge. However, at this time I was engaged in plans to test it under controlled conditions.

I discussed my ideas with Ray Huber and Horace Stevens. With Ray's blessings, Steve and I worked out a test program. Steve had had lots of experience building roads and expressed considerable interest in my developments. He stated that some types of work responded to an increase in production by the use of clamp-on dozer teeth, but his experience with them up to now had been that they all either broke or bent up the dozer moldboard. He also stated that considerable time was lost installing and removing them, and their purpose was to more or less replace a zipper. He stated he liked my idea of using my teeth at different working angles, and he thought the idea of not removing the teeth and using the points directly in front of the conventional cutting edge was excellent. Steve was impressed with the simplicity of the arrangements I had worked out to support the tooth in the moldboard. He said he had a road job coming up in about 3 weeks on the Carson, and, in fact, he planned to check with me pertaining to the availability of a D7 with dozer.

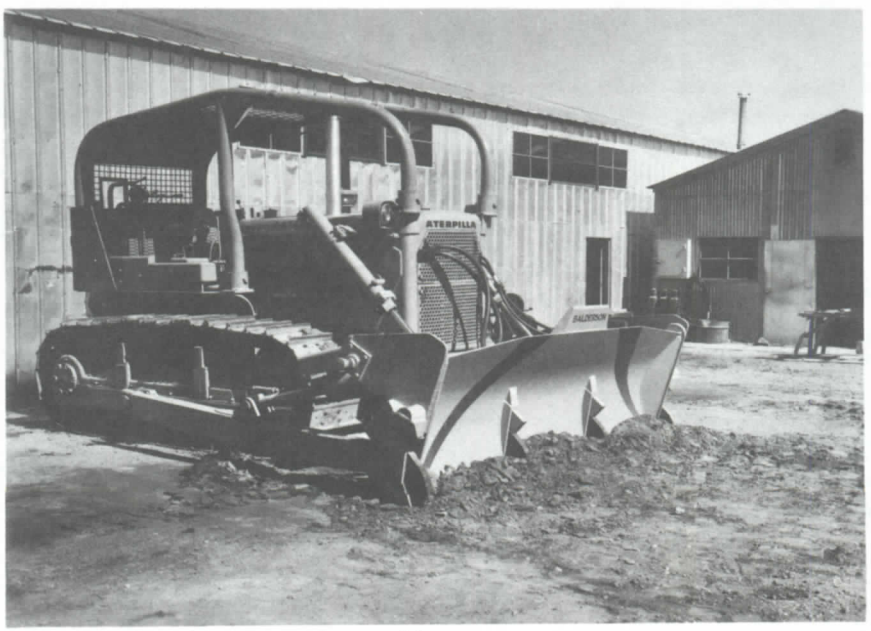
Steve made all the arrangements with the Forest to get started on the road job, and I got the tractor ready and delivered to the project site. I should explain here that most Forests in Region 3 at this time did not have engineers or C&M foremen. However, some had machine operators, a few who could operate a dozer. I met Tuffy Nunn, the road foreman (who, according to Steve, was one of the best in the Southwest) on the job site where the tractor had been delivered.

Tuffy said there was no report on the test other than this road job. The dozer with teeth had outperformed all the other dozers on all types of work encountered on the road job. I concluded then that, if the tilt adjuster controls were located so that the operator could control them from the seat, an operator would have no excuse to operate a dozer with Mullin teeth set at a steep angle, unless he wanted to accomplish fast penetration or use the dozer as a ripper, brush or rock.

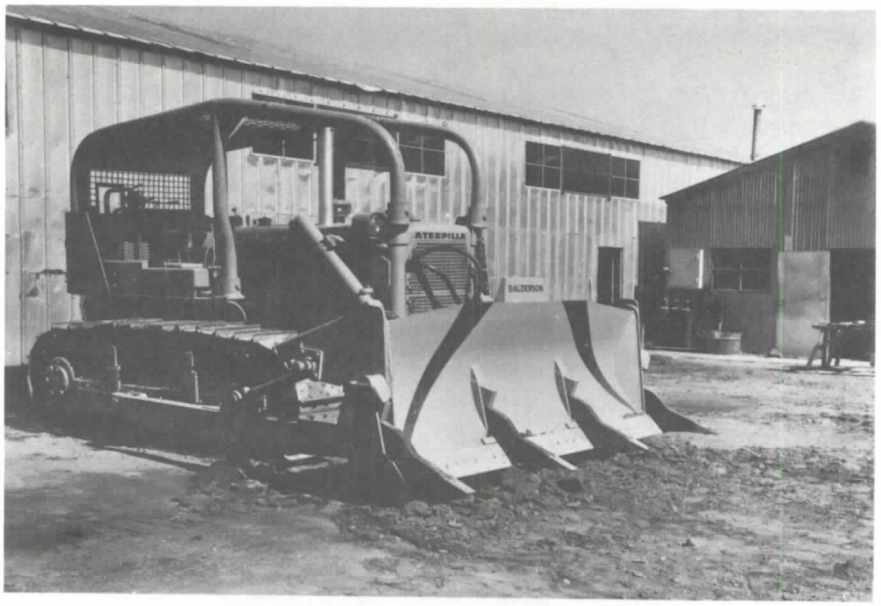
The operating principle of pushing trees with the Hula Dozer is shown in the following pictures. The 4 by 4 represents a juniper tree trunk. Notice tooth is aimed at the root system. As tractor moves forward, push bar



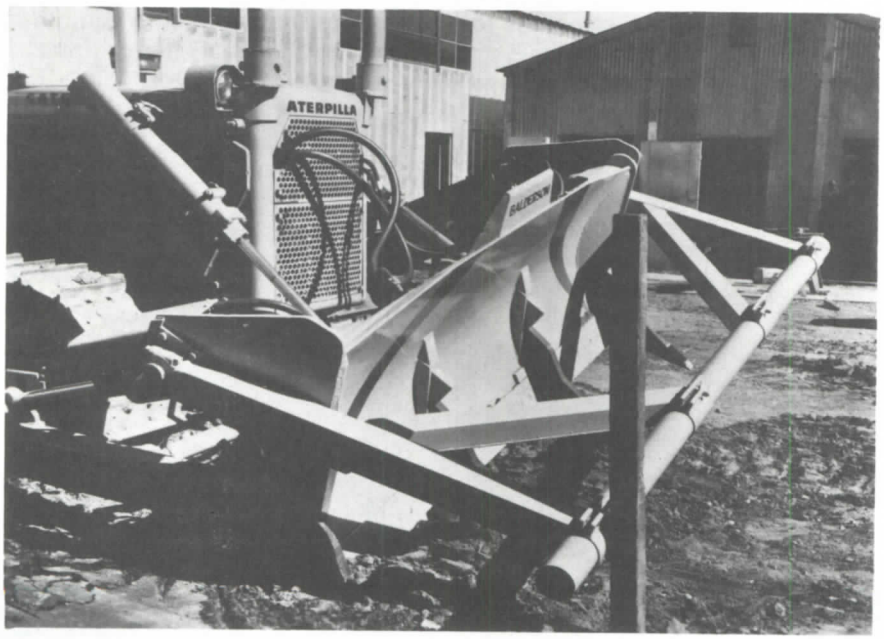
Fully developed Hula Dozer. (Trunnion on plate welded at top of moldboard supports push arm of latest design of hinged push bar. Stop for push arm is provided by bracket welded on top of dozer tooth box.)



Hula Dozer in fast penetration position.



Hula Dozer after penetration. (Teeth precede the dozer cutting edge approximately 20 inches and are positioned at the same level. Teeth provide the means of increasing the force concentration over the full width of the moldboard, making it possible to make most passes using the full width of the moldboard more work hours, thus increasing overall efficiency.)



Latest design of the hinged push bar configuration on Hula Dozer.

provides pressure on trunk at a mechanical advantage; tooth tends to go under main root system as push bar maintains pressure on trunk. As root system is turned upward by a combination of both pressures being applied, push bar is released as tree trunk moves forward when released as angle of contact offers no adhesion for further work. Tooth is firmly embedded in root system and tree is jacked out of the ground. A good operator can remove small trees where tree population is 50 to 150 trees per acre without stopping the tractor. Operator alternates using both sides of dozer, depending on terrain and location of next tree to be uprooted.

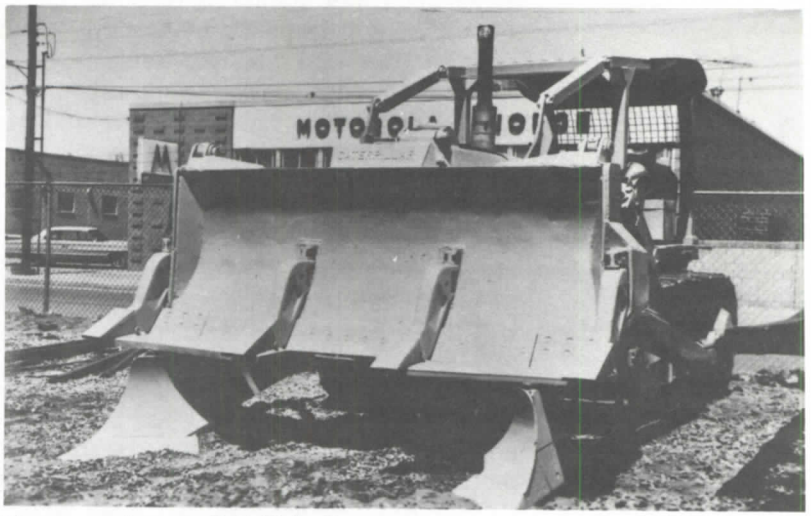
There were many other equipment improvement projects accomplished in Region 3 during the 19 years I was employed as Equipment Engineer. I will list a few as I recall them.

The front-end plow development is one I had hoped would be financed for complete development as it has many practical applications. It should be developed as an attachment to be installed on a Hula Dozer, replacing the moldboard at the push arms and front of the cylinders. In doing this, all the controls that are needed remain attached to the tractor. The only reason to do this is to provide improved visibility for the operator. There were complete TEB papers written up on this subject, including copies of pictures and performance attained.

Fire Control wanted to use the Talladega plow as an initial forest fire attack unit. They arranged with Region 8 to have a plow made and shipped to Albuquerque. The plow arrangement, as used in Region 8, utilized a hand-operated cable control to raise and lower the plow. The draft tractor recommended was an OC3 Oliver. Fred Ames, of the Region 8 Division of Fire Control, came out to demonstrate the use of the equipment. The first demonstration was on the Coconino Forest. This equipment indicated it was a practical approach to build a narrow fire line and was especially effective in areas where back firing was to be used. However, there were definite limitations as to its ability to penetrate quickly in hard or rocky soil. I observed this and discussed the advantages and limitations with Mr. C.K. Collins. C.K. thought if we could improve the penetrating characteristics, it would add considerably to the value of the equipment.

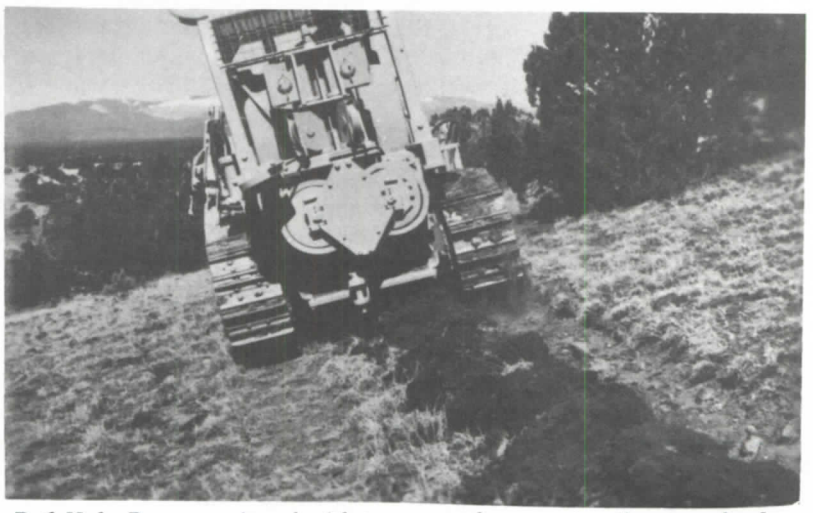
My approach was to install a 3-point hydraulic hitch to the tractor and use a standard spreader bar between the tow lift arms, so as to provide a means of applying up and down pressure to the plow. The next step was to design a retainer on the plow beam, which provided a sliding bearing for the spreader bar, so the plow would be pivoted at the drawbar and would follow the tractor on turns.

Since the 3-point hitch is designed with valves to provide raise, lower, hold, and float positions, we were in business. I might add that it worked real well and eliminated stopping and hand-cranking the cable control setup. We now had a good tool to build a fire line, but we needed a better means of loading and unloading the tractor. Region 8 used what is known as a drop tail body, which is simply a flat truck body extended backward and dropped down within 18 inches or 24 inches above the ground. This system, along with a few timbers and boards for the tractor to crawl up onto the dropped tail, constituted the arrangements provided for loading and unloading the tractor-plow unit. In many cases, a roadbank could be found where the

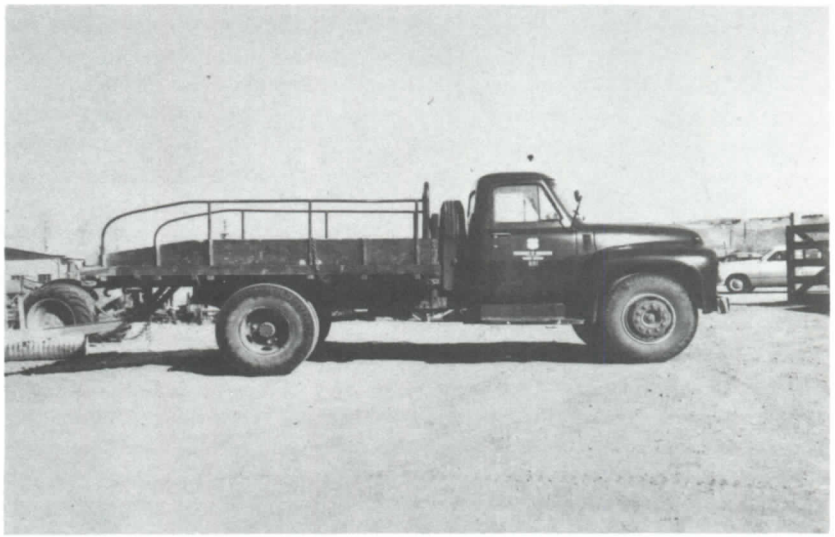


Two-way plow on D-6 Hula Dozer.

truck would be backed up against it and the tractor unloaded safely. However, banks are not always where they are needed to facilitate loading and unloading. The alternate to the above is to dig two ramp-type excavations to match the rear wheels, and when the truck is backed into the holes described above, the body would be close enough to ground level that the

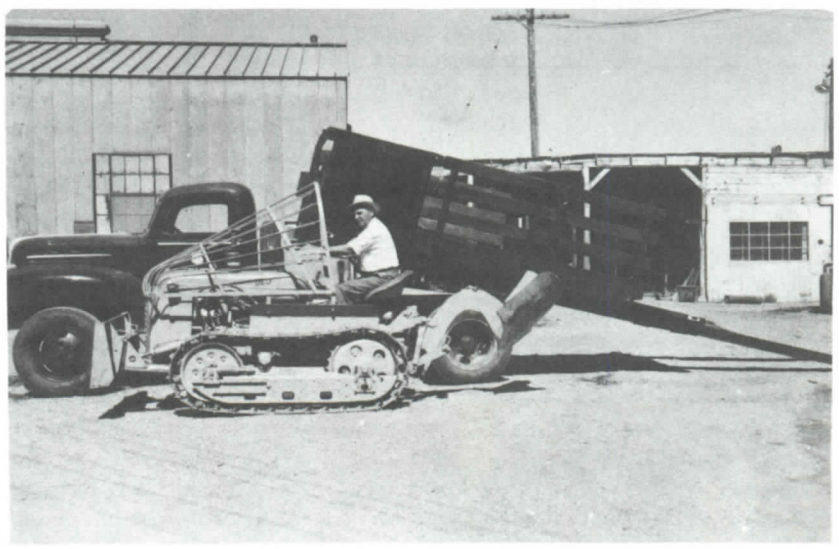


D-6 Hula Dozer equipped with two-way plow constructing trench of 15-degree slope. (Notice RH position of dozer moldboard.)

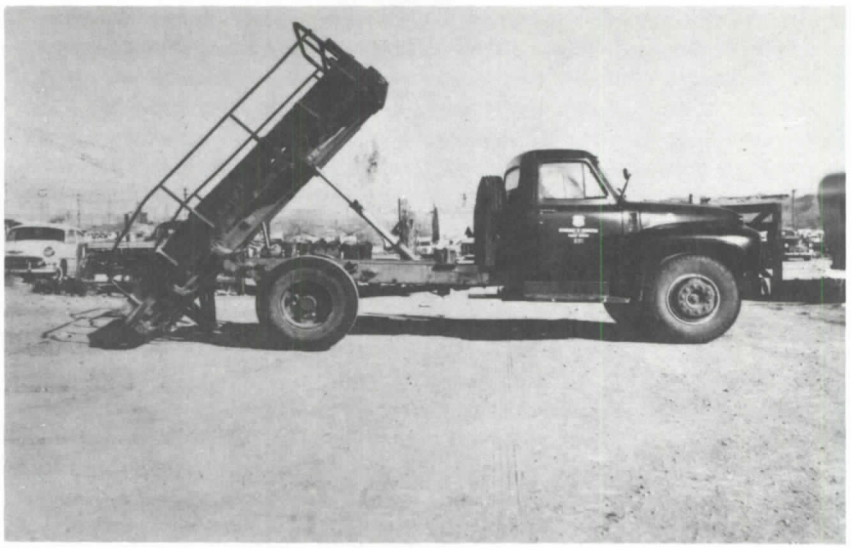


Talladega plow tiltbody on 20,000-pound gross vehicle weight truck.

tractor could be unloaded safely. The above design is not only time-consuming and sometimes dangerous, but limits the use of the truck to a single purpose. In order to correct these deficiencies, we designed a hydraulically operated tiltbody, which had fixed telescoping steel skids that were made of T1 steel and carried in a fixed position under the body.



Talladega plow and transport.



Tiltbody showing capability to be used as dump truck. (Loading skids for tractor are under body.)

The special body was designed to last until obsolescence set in. The original body was designed with a long protrusion over the rear frame, permitting short skids. However, we decided to shorten the body and use telescoping skids on the newer units so they could be used as dump truck, stake sides, or transports for initial-attack, fire tractor-plow units.

As I recall, we must have had at least 12 such units in service for at least 10 years, and unless the tractor plow becomes obsolete, and barring accidents, these bodies could easily be used for a long time, wearing out several trucks.

I will conclude by saying that I really appreciate the fact that I became involved with the Forest Service in the way it all occurred. I am indebted to the Service as a whole, as well as the many fine people I was privileged to associate with and work with during the 31 years and 6 months I was employed as a public servant by the greatest nation thus far known to man.

The Forest Service as Seen by an Engineer

L.H. LaFaver

Early one morning of May 1933, I drove from my home in Iron Mountain, Michigan, to a Forest Service Ranger Station on the Ottawa National Forest at Kenton, Michigan. My purpose was to apply for a job in a new organization that was just getting started, the Civilian Conservation Corps, now commonly known as the CCC.

I met the District Ranger as he came in from a Forest fire—sweaty, grimy, and sooty. He was a tall, well built, muscular chap with red hair and a ready smile. That was my first meeting with a Forest Service official, and it happened to be none other than Clare W. Hendee. (I watched Clare Hendee's advancement through the years with much interest, from Ranger to Assistant Supervisor, to Supervisor of some of the largest National Forests in the country, to Division Chief, to Regional Forester, and 20 years after that first meeting, I met him again when he came to Washington as Assistant Chief, a little grayer now, but with the same ready smile and as capable as ever.) He advised me to apply to the Regional Office in Milwaukee.

Shortly afterwards, I drove to Milwaukee and was interviewed by Crosby Hoar. After some preliminary discussion, he stated that the Forest Service was primarily a Forester's organization and for that reason the Foresters came first. Therefore, the starting pay for Foresters was $2,000 per annum, while Engineers and construction men were starting at $1,500 per annum—all subject to a 15-percent Hoover Economy Cut. (This philosophy was short-lived, however. I could not help but recall the incident many years later when engineers were in short supply and in such demand that the Civil Service Commission decreed that all engineers would automatically go to the top of their grade.)

In a few days, I received a telegram from Hoar to report to the District Ranger at Grand Marais, Minnesota, on the Superior National Forest as Construction Foreman. The Ranger was a young, curly-haired, good-looking Forester by the name of Paul Newcomb, whom I also met several years later as the Supervisor of the Green Mountain National Forest in Vermont.

The Superior

For those readers who are unfamiliar with the Superior National Forest, a little orientation may be helpful. It is a triangular block of land comprising about 7 million acres at the northeast corner of Minnesota. It extends from Lake Superior on the south to the Canadian border on the north, and extends westerly to the towns of Virginia and Eveleth. At the time of my arrival, Les Bean was doing a fine job as the Forest Supervisor.

Technical Foremen (Foresters) and Construction Foremen (Engineers) were arriving at Grand Marais daily in advance of the camps and the CCC enrollees. Among the personnel arriving one day was a youthful Forester with whom I became quite friendly. This was Gordon D. Fox, now Director of Administrative Management in the Washington Office.

One day while we were assembled at the Ranger Station with little to do, waiting for the camps to arrive, Gordon and I conceived the idea that a little landscaping and tree planting was needed around the Station. After all, it was a Forest Service headquarters, and the small, two-room office building on a huge lot grown up with tall grass presented a rather unkempt and depressing appearance.

With the "go ahead" from Newcomb and some volunteers, and in one of those old, reclaimed Post Office trucks, we drove up the Gunflint Trail out of Grand Marais and found some fine spruce specimens. Gordon had previous experience in transplanting trees and had the forethought to bring burlap and twine along so that a good ball of dirt could be moved with the tree. He was most insistent on this detail and we were following his instructions carefully, until Old Chris Lee came along. Chris was a big, burly lumberjack and former lumber camp superintendent caught by the Depression and now a CCC Foreman. In his eagerness to help, he grabbed the tree by the stem and lifted it out of the hole with most of the dirt falling off. Gordon was most dismayed and unhappy at this violation of forestry technique. Nevertheless, the trees were planted, and I understand that most of them lived in spite of Chris Lee's rough handling.

Engineering in the early days of the CCC program was of a most elementary nature. All of the technical phases and design were in the "Truck Trail Handbook," and it was the responsibility of the field Engineer to build in accordance with the standard plans as shown in the handbook.

The general location of the road was determined by the Ranger. It was then the responsibility of the locator to select the most economical route, following contours, avoiding cuts and fills. The roads were long and narrow, 12 to 14 feet wide, with few turnouts. The survey equipment consisted of a staff compass, an Abney level, a 100-foot steel tape, and sharp, double-bitted axes. We made our own stakes, usually about 4 feet long, from 2-inch saplings.

The "Truck Trail Handbook" contained an illustration showing the method for laying out a curve. Two men, with a length of rope equal to the radius, scribed the curve—one man holding the rope at the center, the other marking the road centerline on the ground by swinging an arc. Slope staking was frowned upon—too much refinement. Drainage, however, was most important, and it was heavily stressed. It was usually accomplished by means of dips and outsloping the road, and with open-top culverts.

But, as crude as these methods were, they served a good purpose. By these means, the country was opened up and access for fire control was provided, and in later years, this rudimentary system turned out to be the backbone of the present highly intricate system of timber access roads, not only on the Superior but all National Forests.

My experience on the Superior was limited to Caribou, Cascade, and Wanless CCC Camps, NIRA Camps F and G on the Temperance District, and NIRA Camp E on the Halfway District. I was in charge of construction of NIRA (National Industrial Recovery Act) Camps F and G on the Temperance River road north of Tofte and, on completion, became Superintendent of Camp F. These camps were built to house 50 men and were operated entirely by the Forest Service, including housing, feeding, payrolling, and work supervision. The men were mature and older and more experienced than the CCC enrollees. They had been out of work for months, and all trades and professions were represented. They were all good men and good workers.

Camps F and G, 10 miles apart, were built simultaneously, with my headquarters at Camp F. Due to a shortage of automotive vehicles, I used my own car, making two trips a day to Camp G, once in the morning and again in the afternoon. At the end of the month, I submitted my expense account for mileage at 40 miles a day. The Supervisor's Office in Duluth turned it down with a letter signed by Cal Stott, the Assistant Supervisor, saying if I had planned my work better, one trip per day would have been sufficient. I replied (through Ranger Al Richey, who had replaced Newcomb) saying that the result of having made two trips per day was favorably reflected in the low cost of construction of these camps. I never heard another word, and the claim was paid in full.

I had an excellent timekeeper at Camp F, a young fellow from Minneapolis, not long out of high school, inexperienced, but a hard and conscientious worker, neat and eager to learn, by the name of Jerry Roch. After the camp closed, Jerry went back to Minneapolis and got a job with a lumber and millwork firm. He wrote to me saying that the only reason he got the job was because he knew how to figure board feet, which he had learned at Camp F. He later went back to work for the Forest Service, and the last I heard he was Assistant Chief of Station Management with the Lake States Experiment Station in St. Paul, Minnesota.

The NIRA program enjoyed only a short life. Established by an act of Congress and signed by President Roosevelt in 1933, its purpose was to relieve the serious unemployment that followed the stock market crash of 1929. It regulated trade and industry competition through codes, and it also established workers' wages and hours. In 1935, the U.S. Supreme Court declared the code-making provisions unconstitutional, and the organization was ordered dissolved January 1, 1936.

After the close of the NIRA camps, I went back to the CCC camp at Wanless, north of Schroeder, Minnesota. During this time, my family, wife and daughter Betty, lived in a log cabin on the shore of Lake Superior at Schroeder. Betty was in the second grade in a little one-room school where the only teacher taught eight grades. Our water supply was by the pailful from Lake Superior, clear and cold.

In August of 1935, I was transferred to the Shawnee National Forest as Superintendent of Camp Glenn, a CCC camp near Murphysboro, Illinois.

The Shawnee

Things were not in very good shape on the Shawnee in 1934, and a general shakeup had taken place. Clarence Knutson (now deceased) was moved in as Forest Supervisor. Many of the CCC trucks were out of service for lack of tires and repair parts. Knutson made a trip to St. Louis, took oral bids on a carload of tires and repair parts, and took other corrective actions, and it was not long until things were humming again.

We put in a rock-crushing plant in a limestone deposit near Camp Glenn, procured some old mine cars and rails from an abandoned mine, and built bins and hoppers. I purchased lumber and timber for the bins on the open market form a small local mill, in excess of the limitation ($50 I think it was at that time). But Knutson had said to get it built, and while the fiscal boys gave me a bad time, he supported my action all the way.

Because of the soil conditions in southern Illinois, the newly graded roads had to be surfaced immediately. There was an abundance of limestone cliffs in the area, which made excellent surfacing material when crushed. Road standards were being continually raised now. Better drainage facilities were being installed, and more permanent structures erected. The CCC boys built and surfaced miles of roads, installed telephone lines, and constructed lookout towers and cabins. It was a highly worthwhile program and filled a great need. Educational opportunities for the enrollees were provided after working hours with the forestry and military personnel acting as classroom instructors. Classes for the most part were very elementary and included reading, writing, and arithmetic, with some drafting and algebra occasionally. I found great satisfaction in teaching these boys who were so eager and anxious to learn.

The Manistee

My transfer from the Shawnee to the Manistee, as Forest Engineer, in August of 1935 was a pleasant change, climate-wise particularly. The Manistee at that time was a National Forest Purchase Unit in the Lower Peninsula of Michigan. It covered an area of approximately 1,250,000 acres, extending from Muskegon on the south to Manistee and Cadillac on the north, and bordered on Lake Michigan in a few places on the west.

Under the capable supervision of Al Miller, Forest Supervisor, it was engaged in a huge and active acquisition and planting program to reclaim the denuded acres of white pine forests that had been harvested by the lumber barons under the "cut and get out" policies of the 1880's to the 1900's. A big construction program was just getting started, including roads, lookout towers, telephone lines, Ranger Station buildings, warehouses, dwellings, and offices. The Chittenden Tree Nursery had just been completed by Charlie Rindt and was now in production under his watchful eye and aggressive and efficient management.

There were some good Rangers, too—Howard Cook, Tom Lotti, Clare Armstrong, Randy Strate, and Bob Harper. Ken Pomeroy, now Chief Forester for the American Forestry Association, was in charge of Timber Management in the Supervisor's Office. Bernie Stout was in charge of Lands.

It was on the Manistee where I first met Holland Coleman, Regional Engineer of Region 9. He was noted as a conservative and practical engineer, and had the reputation of being Regional Forester Tinker's watchdog. He

was not only a great engineer, but he was a good guy to travel with. Once in a discussion on per diem rate (the going rate for Forest personnel at that time was $1.20), I heard him say that in his opinion per diem rates should be high enough to provide for a drink before dinner. Not a bad philosophy.

There were a number of outstanding achievements on the Manistee under Supervisor Al Miller and later Phil Brandner and Bob White. But probably the greatest was the year the 36,000 acres were planted, breaking all records for the Region, and probably for the Nation. Considerable friendly rivalry between all of the Lake State Forests was created by this program. At one time, the Upper Michigan (Hiawatha) derided the Manistee record in the Regional Bulletin, saying it was an easy planting chance compared to the Raco District where there was heavy sod to contend with. Al Miller, who had formerly been Ranger on the Raco District, replied with the rejoinder that there was no sod on the Raco District; it had all been tramped out by replanting.

Seven years on the Manistee Forest was a great experience. World War II had now started, and the CCC's were on the way out. I volunteered my services to the Sixth Corps Army Headquarters at Chicago. A few weeks went by without a reply. Then one day, I received a long-distance call from the RO at Milwaukee from Stan Wilson, Associate Regional Forester, asking if I would be interested in going to California to work on the Guayule Project. Two days later, I left for Salinas, California.

The Guayule Project (Emergency Rubber Project)

The Forest Service, with all rubber imports cut off, was assigned the responsibility of growing rubber for the war effort. Guayule (*parthenium argentatum*) is a rubber plant resembling sage brush, and is native to northern Mexico and western Texas. For many years, the Continental Rubber Company had been producing it on a small scale at Salinas, California, from domestically cultivated plants. Unlike other rubber-producing plants, it does not yield a milky sap, but has the rubber scattered in minute granules throughout the tissues of the branches, stems, and roots, and particularly under the bark. Rubber is extracted from the whole plant, roots and all, through a process of grinding, washing, and flotation.

The Continental Rubber Company was taken over by the Forest Service, a pilot plant was built, and the process of acquiring thousands and thousands of acres of California farm land was undertaken. Nurseries for growing the plants prior to planting in the field were built at San Clemente, with Bud Mason as nurseryman; also at Oceanside, Carlsbad, and Indio, California; Phoenix, Arizona; Las Cruces, New Mexico; and Edinburgh, Texas. Labor camps had to be built, and a rubber factory was built at Bakersfield.

It was a fast-moving project, with thousands of men working under the excellent and inspiring leadership of Major Evan Kelley, Director, and Paul Roberts, Assistant Director. Jim Byrne was Chief Engineer. Jim Yule, one of the Forest Service pioneers in aerial photography, was one of his assistants. Men and women from all Forest Service Regions were called—foresters, engineers, accountants, soil scientists, mechanics, foremen, secretaries, cooks, cartographers, and tradesmen of all kinds.

The architectural staff consisted of Kep Johnson, Region 5; Harry Coughlin, Region 1; Clyde Fickes, in charge, Region 1; Gif Gifford, Region 6; Nels Orne, Region 9; and many others.

Jim Byrne probably had more responsibility on that job, considering his youth, than any other engineer in the Forest Service. He always kept his sense of humor, but what is more, he knew his stuff.

The new synthetic rubber finally got into mass production and replaced the slow-growing guayule. Phasing-out action of the Emergency Rubber Project started early in 1944.

Most people who came to the Guayule Project had a line of retreat to their home Region or Forest, which was a just and proper procedure. However, Region 9, my home Region, had served notice to all of her representatives that because of a shortage of funds, a line of retreat could not be provided. Those of us from Region 9 thought at the time that it was a rather shabby treatment, but as it turned out most of us went to other Regions and to better jobs.

Most of my time on this project was spent selecting labor camp sites and preparing a detailed topographic survey of each site. Later, I negotiated and prepared agreements with various municipalities in northern California for sewer and water service to the camps.

A labor camp was scheduled to be built at Mesilla near Las Cruces, New Mexico, to house the labor force required for nursery operation. The camp was never built, but the nursery was; however, it never got into production. I was sent down there to make the camp survey and gather other geographical and economic data, and, among other things, to investigate the possibility of building with adobe blocks. If necessary, I was to go to Juarez, Mexico, and find out about adobe making and prices.

I went to Juarez, hired a taxi and an interpreter, and drove out in the country about 10 miles to the adobe pits. It was a very primitive operation. The pits were about 20 feet in diameter and 2 to 3 feet deep, filled with a mud slurry, which was stirred by a paddle attached to a long pole pivoted at the center of the pit, with a mule hitched to the outside end of the pole. As the mule walked around the pit, the slurry was slowly agitated. When the proper consistency was reached, the material was ladled into forms, 4 inches by 12 inches by 16 inches, and allowed to dry. After obtaining all the information on cost, delivery, and laying, I went back to Juarez and paid off the taxi driver and interpreter (probably $10 in all). However, when I sent in my expense account for this item, it was disapproved by the fiscal department because my travel authorization, which covered the entire United States, did not authorize travel in Mexico.

Another time, I went to Marathon, Texas, in the vicinity of the Big Bend Country, to assist Walt Wetzel in investigating the possibility of harvesting wild guayule. This was in tough country—uninhabited, full of cactus, thorns, and rattlesnakes. But there was wild guayule, and it had to be cruised, not by the board foot method, but by the estimated weight of the shrub. The survey camp was a crude affair—a tent and just the barest essentials. One day, Wetzel had to go to town. He was a very good

photographer; in fact, he had a lot of hobbies. He had fine cameras, movies, and stills. He told the fellows he would leave the cameras and if they saw anything unusual or worthy of a picture to be sure and use the camera equipment. The next day, shortly after breakfast, right near the tent, there was a rattlesnake trying to swallow a rabbit. They watched it a while and later killed the snake. When Wetzel came back, they told him of the incident. He said, "Did you get a picture?" They replied, "Oh, my gosh! No—we forgot all about it." Well, if any of you know Wetzel, you know how hot tempered he could get. He really blew his top. He said, "The picture of a lifetime, and you guys missed it!"

Region 1

We arrived in Missoula in August 1945. My thoughts of the Missoula days bring back memories of great people with whom I have worked, like Art Kahl, Bridge Engineer; Harry Coughlan, Architect; Clyde Webb, Associate Regional Forester; Clarence Westcott, Communications; Tom Moran, Electrical Engineer; Jack Hamblet, Equipment Engineer; Roger Nelson, Roads; Remington, Chief of Roads Section; and Johnny LaCasse, the great artist and cartoonist; and of course, Fred Thieme, the Regional Engineer who, as they say in the Navy, ran a taut ship. There were many things to his credit, but one in particular; he always wanted bridges, roads, and buildings bigger and better than the design called for. Frequently, we would take a building design to him for approval and signature. If it was a warehouse 100 feet long, he would say to make it 140 feet long. If it was 28 feet wide, he would say to make it 40 feet wide. Needless to say, these decisions caused budgetary and design problems, but he was usually right in the long run.

Once he built a boat in his basement. He got it all finished and was ready to take it out. He called three or four of us over to help him—Jack Hamblet, Remington, Roger Nelson, and myself. It looked like it was going to be a pretty tight fit getting it up the stairs. In fact, there wasn't enough head room, so we took the stairs down. Then we all had our doubts whether it would go through the door at the top of the stairs. But we finally got it out, and the only damage we did was to break off the little projecting knob on a wall switch.

He and Mrs. Thieme, a charming lady, held open house occasionally, and it was here that Fred really demonstrated his ability as a mixer of punch that packed a wallop. He called it artillery punch—the third one should have been served with a wheelchair.

As Chief of the Improvement Section, Buildings, Communications, Signs, and Trails, I worked closely with Coughlan, Westcott, Kahl, and Remington. I do not know why Trails were put in the Improvement Section instead of the Roads Section, unless it was because no one in the Roads Section cared about riding horseback to investigate trail conditions. In any event, Trails had been pretty much of an orphan for many years, although they were financed from the same appropriations as Roads. But it was not until Pete Hansen became Regional Forester and laid down the law that the trails had to be fixed. That's when I got the job.

It was about this time that Fire Control decided to go all out for radio communications to the lookouts in the back, roadless country of the Lolo, Lewis & Clark, and Flathead National Forests. This project was known as the

Continental Unit because the lookouts here were in the vicinity of the Continental Divide in Montana.

Fire Control would furnish the equipment. Engineering would do the installation. I thought this would be an excellent opportunity to learn something about communications and to observe trail conditions and signs. Clarence Westcott organized the trip, planned every detail of installation, and was totally responsible for the entire undertaking, and he did a wonderful job. We started out from Montour Ranger Station—two packers, Bill Bell and Lee Cahoon, each with seven mules, Westcott, Virgil Fite, a Lolo Ranger, a photographer, and I. All in all, there were six men, 14 mules, and six saddle horses. The first day, we rode 20 miles. This was my first experience on horseback, and while my horse was gentle and trustworthy, I was hesitant to get off for fear that I couldn't get back on. When I finally got off at the end of 20 miles, my knees refused to function and I just collapsed on the ground. We were at North Fork Ranger Station on the Lolo.

Two days later, after making the radio installation at Falls Lookout, we proceeded north to the Big Prairie District via the South Fork of the Flathead River. Big Prairie Ranger Station was a welcome sight, our first glimpse of civilization in about 10 days. This isolated Station, accessible only by horseback or airplane, was a pleasure to visit. This stop also gave us an opportunity to wash clothes, clean up, sleep in a good bed, and partake of good food prepared by an excellent cook.

After 2 days at Big Prairie, we took off again for 2 weeks, this time for the Lewis & Clark National Forest over the Continental Divide, and the Chinese Wall in the Bob Marshall Wilderness Area. We made several installations on the Lewis & Clark, then down the Sun River to Bench Mark, where we were met by the huge stock trucks from the Remount Station, which hauled us and the horses and mules to Missoula.

This trip gave me excellent opportunity to observe field conditions in maintenance of buildings, telephone lines, and trails, from an engineering and budget point of view. I also learned a lot from Westcott in horsemanship, workmanship, and communications, and I will always be indebted to him for his patience and assistance. I could not have been with a more understanding guide. I also learned a lot about packing mules, and came to have a great respect for our packers. The self-confident manner in which these men maneuvered and led a pack train over almost impassable trails was most spectacular.

One night I remarked to Bill Bell, after a day in which we had traversed some narrow trails cut into high cliffs, about the traveling risk involved. He said, "That was nothing today. I know places down in the Snake River Gorge in Idaho where you can look straight down your pant leg for a mile and a half."

The National Forest Trail Study

This study was conducted in 1947–1948 by H.M. Shank, Civil Engineer, and E.R. DeSilva, Forester, and was authorized by the Chief of the Forest Service, March 27, 1946. The purpose of the study, as outlined in the authorization, was to "examine critically the existing system to find out whether, in the light of present and prospective transportation facilities, it is what we

need; if not, to develop examples of indicators of what is needed; secondarily, to find out what the existing system is costing to maintain and whether the level of maintenance is adequate and reasonable in cost."

The Nation Forest Trail System had in good measure "grown up" over a period of 40 years or more. During that time, no comprehensive nationwide study had ever been made. This raised not only the question of adequacy of the system, and proper allocation of funds, but the question of what the system *should* cost to maintain versus what it *is* costing. The detailed field examination was designed to provide an answer.

It was my good fortune to have been selected as one of the Regional representatives to accompany the examiners in Region 1. I rode about 600 miles of the 1,259 miles examined in that Region. And I want to say here that I have never been associated with a more conscientious, capable, hard-working, analytical engineer than Henry Shank; and more than that, he is a man's man and a perfect gentleman. I came to have the greatest respect for his judgment and decisions.

We started out of Missoula at the head of Rattlesnake Creek, crossed the Lolo District of the Lolo National Forest and headed for the Seeley Lake District. Otto York, the grand old Lolo Ranger, accompanied us. Trails were in deplorable shape; windfalls 3 and 4 feet high blocked our passage. We did considerable chopping, and many times Shank, on horseback, hurdled the windfalls. His horse was a good jumper. We met Ranger Horace Godfrey at Seeley Lake. Otto York introduced Shank to Godfrey, saying "Meet Mr. Shank from the Washington Office, but he also knows how to swing an ax and ride a horse." After the introduction, Shank went over to his bedroll and pulled out a fifth of Old Crow, and as he pulled out the cork, he said, "I propose that we dedicate this trip here and now!" You can be sure that we all eagerly participated in the ceremony. That was the first day of a 300-mile trail trip through the Lolo and Flathead National Forests.

So much for the National Trail Study. It was a difficult and trying job and a job well done by Shank and DeSilva. However, it is my considered opinion that the final report did not command the attention it should have had. The recommendations were sound and well thought out. In many cases Shank was very critical, and justly so, of trail maintenance management from the Chief's Office on down to the Regional Forester, Forest Supervisor, and Ranger. I still think the report should be required reading by all Forest officers directly or indirectly responsible for the management of the Trail System.

Trail Riders of the Wilderness

Every year, the American Forestry Association sponsors a trail ride through wilderness and primitive areas of selected National Forests. Participation is limited to about 25 people, with the trip taking from 10 to 14 days. Horses, meals, and guides are furnished by a reputable packer experienced in organizing for backcountry travel and living conditions. About 75 head of stock (horses and mules) are required to take care of 25 paying guests.

One year, I think it was 1948, the Trail Riders scheduled a trip through the Bob Marshall Wilderness Area in the Flathead and Lewis & Clark National Forests of Montana. Major Kelley, at that time recently retired Regional

Forester of Region 1, was selected as the leader of the party by the AFA. The trip was fairly early in the year before the snow had disappeared from the high country.

As Trails Chief in Region 1, I felt that I should accompany the party at least part of the way to observe trail conditions and render any help that might be needed. Hence, arrangements were made whereby Hy Lyman, then Assistant Supervisor of the Lewis & Clark, Doug Morrison, Ranger at Bench Mark, and I would depart from Bench Mark ahead of the touring party and scout the trail that the Trail Riders would follow.

We saddled up that morning, and as we left, I noticed that Doug had a small hatchet strapped to his saddle. I asked him if we shouldn't take more cutting tools with us. He said, "No. There is nothing but small stuff, and the hatchet should take care of it easily." We hadn't gone over 2 or 3 miles when we began to encounter some rather heavy windfalls, 6- to 8-inch lodgepole, not too heavy for a good ax, but too big for a shingling hatchet. We kept going, however, and when we got to Pretty Prairie Guard Station, Doug went in and brought out three sheathed pulaskis, which he had taken from a fire cache. We now relaxed and figured we were all set. Imagine our dismay on encountering the next bunch of windfalls and unsheathing the pulaskis to discover they were rusty and dull. We literally had to chew our way through those fallen trees.

About 3:00 in the afternoon, in 12 to 18 inches of snow and many windfalls of case-hardened lodgepole, we were chopping madly to clear the trail when up came the Trail Riders behind us with Major Kelley in the lead. Well, we finally got into the camping spot, a high mountain glen relatively free of snow, had supper, and bedded down. The next morning, Major Kelly came over to where Doug, Hy, and I were making up our bedrolls. He said, "I am amazed to find three Forest officers on a backcountry trail trip without a respectable ax or shovel. Those pulaskies," he continued, "are in such deplorable condition as to be utterly useless; and furthermore, 5 minutes' work with a shovel would have diverted all that water running down the trail back there."

Even though the Major was no longer the Regional Forester, he still commanded our greatest respect, and we obviously felt highly chagrined and embarrassed at this caustic but just criticism from our old boss. It was a lesson I have never forgotten, and I never went out on trails again without a good sharp ax, a shovel, and a 4-foot crosscut saw.

Washington Office

One day in November 1951, Howard Jones, successor to Fred Thieme as Regional Engineer in Missoula, called and asked if I would be interested in a transfer to the Washington Office. I said, "I'll let you know tomorrow morning." I told my wife, Norma, about it; she said, "If you decide to go, count me in." So that settled it, and shortly we were on our way to Washington.

The opportunity to work under Anthony P. (Tony) Dean, Director of Engineering, was a privilege and an experience that will always be remembered. Tony told me the first day of some of the protocol and procedures in writing letters for signature of the Chief. He said, "Sometimes you will prepare

a letter and Sully and I won't like it. Then you will change it to suit me and Ed Cliff won't like it. Then you will change it again to meet Ed's approval, and finally it will go out."

Several months later, when Tony and Sully were both out of the office, I found out how true Tony's orientation speech was. Region 1 needed immediate approval of a road change in the Crazy Mountains on the Big Timber District of the Gallatin Forest in Montana. The request was reasonable and of such urgency that I prepared a telegram in reply approving the request. Ed Crafts was Acting Chief. It took 3 days to get that telegram signed, and then it went out exactly as I had originally prepared it.

One day, Seth Jackson, Safety and Training Officer for the Forest Service, came to me after a fatal accident had occurred when a worker had been killed by a cave-in in a sewer trench at one of the Ranger Stations. He came to Engineering, since this accident occurred on an Engineering project. He said, "What can we do to prevent recurrence of an accident of this kind?" "Well," I said, "the Safety Handbook requires that trenches of this depth be shored and strutted, but illustrations are needed showing how this should be done." At his request, I drew up some crude sketches, expecting that a draftsman would prepare finished drawings from my rough outline. I gave the sketches to Seth, and the next time I saw them, they were printed in the Health & Safety Code (pages 201 and 203), exact copies of my rough drawing. This was the first and only time I ever had a drawing published.

The assignment in the Washington Office was most interesting and challenging. Preparing for the Congressional Hearings on the Road and Trail appropriations was always a rush job. It included getting exhibits, photos, and factual data together. However, I was always impressed with the friendly attitude of the Senators and Congressmen toward the Forest Service, and I was also always proud of the presentations made by Chief McArdle and Ed Cliff, Assistant Chief at that time, and other Forest Service witnesses.

Opportunities came to attend many important meetings, among them the Highway Research Board, of which I was later a member. Engineering seminars were held at the Forest Products Laboratory in Madison, which were exceptionally well organized and which were attended by Forest Service Engineers from all Regions. These meetings were outstanding from an in-service training point of view. The Laboratory personnel were most capable in demonstrating and explaining the use of the newest materials and developments in building construction and in structural testing methods.

I was assigned to conduct engineering inspections of various Regions and made inspection trips to Regions 6, 7, and 8. Speaking of inspections, one of my most gratifying experiences came about as a result of an inspection of a lookout tower in Region 1 on the Clearwater Forest. This is the story. One day in 1960, I received a letter from a dentist, Kenneth E. Stosich, in Idaho Falls, Idaho, wanting to know if I was the same Mr. LaFaver who had inspected his lookout tower in 1946 on the Clearwater Forest. I wrote back saying that I probably was the inspector, but I did not recall this particular inspection and I was curious as to why he wanted the information. I then received a long letter from him saying in part, "After some 15 years, I am not at all surprised that you do not remember the inspection to which I

referred. Perhaps if I include a few details, it may help you remember, although it is not very important that you do so.

"During the summer of 1946, I was stationed on Black Mountain in the Canyon District of the Clearwater National Forest. I was fresh out of high school, and a very homesick, lonesome boy about the time you made the inspection with Arnie Nousinen, the District Ranger. You were the first people I had seen in about two weeks. You were kind enough to praise the lunch I had prepared, consisting of pigs-in-blanket (my first), a salad of canned pork and beans (my first and last), and the best (you said) coffee you had ever tasted. I can't help but smile when I think of that lunch, plus the many others you must have endured on so many inspections."

He continued, "A unique feature of Black Mountain was that quite frequently a herd of Rocky Mountain goats spent the day near the lookout quite unafraid of me. You asked if I would try to get a snapshot and send you a copy.

"At Christmas time of that year, you sent an enlargement of a snapshot that you had taken of me. You see, I have several reasons for remembering you.

"I did take some snapshots of the goats, but during the next 10 years, I moved quite a bit and the negatives were misplaced. So after 14 years I finally found them, had one of them enlarged, and then attempted to find the same Mr. LaFaver.

"I realize that the enlargement may not be too good; then too, the original negative had much to be desired with respect to composition, exposure, etc."

The only reason for including that little incident in this writeup is to illustrate how a little praise and encouragement during an inspection can create lifelong good will.

Region 3

There came a time in 1955 when Tony and Sully were trying to arrange a three-way transfer of personnel involving Regions 3, 4, and 6. It seems that the Region 6 man was to come to Region 3, and the Region 4 man would go to Region 6. Tony was in the field in one of the western Regions, and every day or so he would call Sully, to see how this proposed move was working out. Sitting across from Sully, I could hear only one side of the conversation, but it developed that Region 6 would not release their man and the Region 4 man did not want to go to Region 6, and so various other possibilities were discussed, but nothing seemed to work. I thought all the time that the vacant job in Region 3 was head of the Roads and Trails Section. So one day after one of those long-distance phone conversations, I casually remarked to Sully, "I'll throw my hat in the ring for that Region 3 job." He said, "If you really want to go to Region 3, I'll tell Tony next time he calls." Well, it wasn't long until we were on our way to Albuquerque.

This turned out to be one of the best assignments I ever had, and instead of being head of the Roads and Trails Section, I was the Assistant Regional Engineer, assistant to Ray Huber, a great engineer, a great administrator, and

a great leader. He was well liked and highly respected, not only by his colleagues on the senior staff and by his counterparts in other agencies, but also, and this is perhaps more important, by the rank and file, from the truck driver and grader operator on up through his own staff.

Ray had a reputation, in addition to his engineering achievements, of being a good man on a fire. He always drew the assignment as "Plans Chief," probably one of the most important jobs on a fire after the "Fire Boss." I am sure his happiest moments were on a big fire.

Naturally, as main helpers, he selected men from his own staff. Johnny Adams went along as Assistant Plans Chief, Hank Mullin as Equipment Chief, and I was Transportation Chief, and later Service Chief. Bill Bayer was usually a scout both afoot and by plane. In 1956, we were gone a month, first to the Dudley fire on the Sitgreaves, and from there to the Mingus fire on the Prescott, and then to the Nuttle fire on the Coronado.

In spite of long hours, these were pleasant experiences, particularly when some good came of it—like the time on the Boulder fire on the Tonto. The Tonto Creek Ranger Station was the fire camp with 200 or 300 hundred Indian firefighters. Ben Rutherford was the Ranger. Hank Mullin decided he needed a light plant so his mechanics could work nights, but the light plant was too small to carry the heavy extra load of this large camp. Besides, the Station plant was old and practically worn out. So were ordered two light plants, one small one for the mechanic and one large one for the Station.

Six months later, the auditors found that fire funds and been used to buy a light plant for this Station, and Andy Brenneis, Chief of Fire Control, was pretty much perturbed about it. It all ended up with P&M paying for the new light plant, but the Ranger got a much-needed generator, which would probably have take him years to get otherwise.

I had a pleasant experience on the Dudley fire on the Sitgreaves. We had issued a radio call for school buses to transport crews to and from the fire lines. A bus from the parochial school of Winslow, Arizona, showed up driven by a young man, neat appearing, wearing a baseball cap and clean khaki trousers and shirt. He was a good driver, always ready, the bus always clean and well maintained. He looked like a college senior. After 3 or 4 days, he came to me on Friday and said he would like to go into Winslow Saturday to arrange for someone to say mass for him in town on Sunday. If he could arrange that, then he would like (since there were many Indians in camp of the Catholic faith) to hold mass at 5:00 Sunday morning for the day crew, take them to the fire, and then hold mass at 8:00 a.m. for the returning night crew. I told him that would be fine, and asked what he needed in the way of an altar or a pulpit. He said all he would need was two of the big red fire tool boxes, one on top of the other. He said the service would be held in a nearby grove of ponderosa pine. It was a beautiful setting. The entire camp turned out that Sunday morning, and it was most impressive. I think it was probably the first time in the history of the Forest Service that a religious ceremony of this kind was ever held in a fire camp. Over the years, I have witnessed many Easter sunrise services, but none of them could surpass this fire camp service in solemnity and beauty.

When it came time to pay off and disband the camp, the little priest said we didn't owe him a cent. We insisted, however, that he had earned this money and he was fully entitled to it. He was most reluctant to take any payment for his own services or for the bus hire. But finally he said, "Well, okay, the church can use the money." It certainly was a pleasure and an inspiration to work with a devoted man of this high character.

Another assignment I always enjoyed was the annual recruiting trips to the various universities in this area, talking to senior civil engineers and undergrads interested in summer employment.

These trips usually took me to Arizona State at Tempe, University of Arizona at Tucson, University of New Mexico, New Mexico State University at Las Cruces, University of Texas at El Paso, Texas A&M at Bryan, Southern Methodist at Houston, University of Oklahoma at Norman, Oklahoma State at Stillwater, and Texas Tech at Lubbock.

I now find it most gratifying to see that these young engineers, whom I was instrumental in hiring as GS-5's and GS-7's, have now advanced to GS-11 and GS-12 positions, and I am confident that some of them will become Regional Engineers and even higher.

Engineering in the Forest Service has come a long way from the staff-compass-abney level days of 1933 to the computers and tellurometers of today. Much of this advance is due to one man—a man of vision and foresight, a man with intense human interest who inspired all of his subordinates, and who enjoyed the respect and confidence of his associates throughout the service. This man was Anthony P. Dean (affectionately known as Tony), Chief Engineer of the Forest Service for many years. I personally owe much to him for his guidance and encouragement.

I cannot close this rambling treatise without a word of advice to the Forest Service engineers, young or old, whatever position they may hold, wherever they may be. My advice is: Give the Forest Ranger and the Forest Supervisor and his staff all the help you can, take an interest in their problems and their work—from public relations to range improvement, timber sales to fire and recreation—and do not limit your interest to narrow technical engineering phases only. By so doing, you can be assured that your progress will be unlimited.

I retired March 30, 1963, after almost 34 years of Government service, 30 of which was with the Forest Service. The best decision I ever made was when I went to work for the USDA Forest Service.

It is a great outfit of fine people. It gave me opportunities I never would have had otherwise—opportunities to travel the width and length of this Nation many times; opportunities to meet with people in all walks of life, from laborers to college presidents and professional and community leaders. I cannot do more than echo the words of Evan (Major) Kelley when he retired in 1944 as Regional Forester of the Rocky Mountain Region, Missoula, Montana, when he said, "The Forest Service owes me nothing—I owe it much."

History of Engineering

Marion Lamb

I'll try to record a few of the highlights that may have been significant on the outer fringes—places like the Ouachita in western Arkansas and the Texas National Forests, with headquarters 1,000 miles from the Regional Office. Then there was a Regional Office ruled and governed by a martinet who denied access to his domain to the Chief Engineer of the Forest Service for many years. And then, there was the lost Region, the one that time forgot—or maybe it was the Chief's Office that did the forgetting.

The development of Engineering in the Forest Service parallels timber receipts. A check of the record will show that timber receipts prior to World War II were in the neighborhood of $5 or $6 million, compared to $150 to $175 million today. All of this analyzes like this: Low receipts mean little forestry activity, which means a custodial and protection type of organization, small appropriations, minimal funds for capital improvements, hence little or no need for an engineering force.

I hired out as a Project Superintendent of a CCC camp to Forest Supervisor Arnold C. Shaw at Hot Springs, Arkansas, in May of 1933. Competition was keen. Shaw told me that I was the eighth man he had hired out of 200 interviewed. Shaw repeated many times during the interview that he wished he had enough engineering work to keep me busy. He was a man of vision, but not enough.

A new assignment took me to the newly created Texas National Forests in September 1934, with a title that may be unique in Forest Service annals—Special Engineering Staff Assistant. The Forest Supervisor, Loren L. Bishop, who was very busy buying land, was a Forester with vision. He had, and realized that he had, a full job for several engineers. I have always felt that he was an influence in getting the Forest Engineer system set up in Region 8 in 1935 or 1936. In my humble opinion, the men who made the system work were about six parts construction superintendent and four parts engineer. Engineering was sold on the Forests, not in the Regional Office.

Mineral Access Roads—Region 1

Jack Hamblet

Pierce-Musselshell Timber Access Road

Construction of the Pierce-Musselshell timber access road, extending from the highway at Pierce, Idaho, to the Musselshell work center, a distance of approximately 12.5 miles, began about the middle of May 1943. It was built primarily to serve as a main haul road in harvesting large stands of white pine timber and cedar poles in the Musselshell Creek and tributary drainages on the Clearwater National Forest.

The old Brown's Creek CCC Camp, located at about the midpoint on the project, was given minor needed repairs and served as project headquarters. Machine operators and overhead personnel were regular Forest Service employees, all of whom had previously worked together on the chrome jobs. All lived in quarters at the camp or in trailer houses nearby.

New road construction was involved on about four miles over Brown's Creek Summit. The remainder was reconstruction of an existing old road to provide additional width, improved grade and alignment, and new drainage structures. Construction was not difficult and the job would perhaps otherwise be of little interest were it not for two unusual groups of people and related circumstances involved.

Italian internees, all of whom were merchant seamen whose ships were in U.S. ports when the United States entered World War II, operated the mess hall, maintained the camp, did most of the office work, and provided all of the project labor force. These men were Italian nationals, not prisoners of war, who were placed in custody of the U.S. Immigration Service for the duration of the war and accorded all considerations and privileges provided under the terms of the Geneva Treaty.

They were an obviously bewildered but happy lot of sailors when they arrived one afternoon shortly after the camp was made ready for use. All had been confined in the big internee camp at Fort Missoula, and this was their first bit of real freedom since they were taken off their ships. Few, if any, had ever been in an environment like the one in which they now found themselves, and their joy and wonderment at the strange new sights would be difficult to describe.

Included in the group were personnel ranging from ship's captains to deckhands. Young and old, they were all active men and willing workers on whatever job they were assigned. It was remarkable how fast they learned to fell timber, deck logs, install culverts, trim backslopes, and perform many other jobs they had never before seen. Ship's pursers provided excellent office help, barbers insisted on giving us a weekly hair trim, and the cooks

ran the mess hall. The latter were all cooks and bakers off some of the big Italian luxury liners, and the meals they served, despite rationing limitations, were beyond description. In addition to ordinarily prepared food, American style, the cooks delighted in frequently serving delicious Italian dinners and always had an endless variety of fancy pastries for dessert. A waiter in an immaculate white jacket and trousers served each table, while the head chef for the day kept a close watch nearby. First class ship's service was something new for a bunch of dirt stiffs! We were happy to note that the same service also extended to all of the internees.

An incident occurred one day that, at the outset, appeared to be a real donnybrook among a group of about 75 men. They were building a board fence on each side of a section of right-of-way about a quarter mile long as required in the acquisition agreement with the owner of the property through which the road was to be built. Suddenly, and without warning, some of the men began yelling and running, waving shovels, hammers, boards, and whatever else they could get their hands on. The rest of the crew quickly joined the tumult, and the startled foremen thought for a moment that they had a riot to contend with, except that everyone was laughing and no one seemed to be getting clobbered. It was all over in a few minutes, and the cause of the uproar was soon evident. A coyote had jumped out of hiding in some brush inside the fence, and the startled internees nearest to him gave chase, running him toward the rest of the crew. The poor coyote, caught between the fences on either side of the road and the excited internees, fore and aft, was soon dispatched. Work resumed with much laughter and gesturing about the antics of the "fox" whose hide was stretched out to dry on the wall of the tool house the next day.

Most of the men understood some English, and at least two or more in each crew, usually mates and engineers, could speak it fluently, so difference in language was not a barrier to understanding. If there were any personal differences among the men, they were quickly settled by the ship's captains and the Immigration Officer in camp. During nonwork time, they played "bocce," carved beautiful scale model ships, did all sorts of weaving, wrote frequent letters home, and most frequently just went walking in small groups through the woods and meadows near camp.

The only job restrictions placed on their employment were that they were not permitted to handle explosives or operate any moving equipment or trucks. The rock crusher was considered a stationary plant, and all phases of its operation by the internees were approved.

Clearing and grading progressed on schedule, but placement of crushed rock surfacing was held up because there simply were no men available to drive dump trucks. Repeated calls to Missoula and elsewhere for help brought the same reply, "There are none." We had only three trucks hauling, and most of the crushed material was going into stockpiles at the crusher site. We had to find drivers somewhere; but the more we tried, the more hopeless it appeared.

Then suddenly it happpened! Several wives of the overhead personnel volunteered to "give it a try." Driving over narrow mountain roads was not new to any of them, but driving a 2 1/2-yard dump truck on a construction job was something entirely different. Those gals got a condensed truck

driving course in short order from Tom Moran and his mechanics. They learned quickly and well and were soon joined by other wives and two or three women from Pierce, one of whom was a grandmother. Within a week, we had 13 drivers—one for every idle truck on the job.

We were all a little apprehensive the first day or two, but they quickly gained confidence in their ability and were soon hauling "by the clock." Big logging trucks and long pole hauling trucks were by then using the section of new road over the summit, and alert defensive driving was the order of the day. The gals got a big bang out of watching the surprised and startled expressions on the faces of the log truck drivers when they first met the "lady truck drivers" on the road. "My gawd! Them dump trucks was comin' and goin' like a swarm of yellow jackets and every one of 'em with a women driver behind the wheel," remarked one driver when he arrived at the millpond to unload.

They seldom missed a shift, driving in dust and rain, and later over snow-packed and icy roads, always bucking the logging traffic, till the road was closed in mid-November. In all that time, they never lost a load or had a single accident of any kind. It was a remarkable record, and as Clarence Sipes, the crushing plant foreman, often said, "We should have had them driving truck on the chrome job."

That was perhaps the first and only time that women were employed as dump truck drivers by the Forest Service.

It was not easy to say goodbye to the internees when they were returned to Missoula. They were a fine group of men who had gained our respect and friendship and from whom we learned much of a way of life and culture that was entirely different from ours.

Many millions of feet of logs and poles have since been hauled over the Pierce-Musselshell Road, and memories of the lonely Italian seamen and a small group of women who took part in its construction are almost forgotten with the passing years.

The Chrome Mines Road Projects

During World War II, the normal imports of chrome ore from major sources in southern Europe were cut off, and stockpiles in the United States were rapidly diminishing.

The Metals Reserve Corporation and the Defense Plants Corporation, war-time agencies of the U.S. Government, completed negotiations with the Anaconda Company in late 1940 to explore known chrome deposits in the Custer National Forest in Stillwater County in south central Montana. If these explorations disclosed bodies of ore in sufficient quantities to warrant the construction of facilities for production on a commercial basis, Anaconda was to proceed accordingly. Two projects were involved.

The Benbow Mine and the subsequently developed Mouat Mine were in the rugged Beartooth Mountain Range. Elevation of both mines was about 7,000 feet.

The Benbow could then be reached by an old wagon road from Dean, a small log building only that served as the post office for ranchers in the area. This road was wholly impassable for any but four-wheel-drive vehicles. It was, with a limited amount of repair, used during the exploration period and early stages of mine development. There was no road to the mill site at Little Rocky Creek. Two fairly well-defined wheel tracks, occasionally used by ranchers, wound among the boulders through privately owned grazing land and ended abruptly at an old corral about a half-mile from the site.

The mill site on the Mouat property, located on the Stillwater River about 6 miles upstream from Nye Junction, was owned largely by "Jut Jaw Bill" Mouat, an oldtime prospector with strong opinions and an earthy vocabulary. It could be reached by county road to Nye Junction from Dean or Absarokee and then over an old but passable wagon road built to serve the early-day mining camp of Nye. A tractor trail, used by exploration crews, went almost "straight up" from the mill site to Mountain View Lake close below the mine portal.

The decision was made by Anaconda in early 1941 to proceed with the development of the Benbow while exploratory work continued at Mouat. The first and most obvious requirement for development of either project was the immediate construction of access roads. Anaconda tried without success to get this phase of work under way at the Benbow. Road construction contractors, who might have otherwise been available, were engaged on military construction projects in Montana and elsewhere. Neither the Bureau of Public Roads nor the Montana Highway Department could offer any help.

Somewhat in desperation, Anaconda then turned to the Forest Service as the only outfit that might have the equipment and personnel to do the job. A cooperative agreement was subsequently made whereby the Forest Service, Division of Engineering, would furnish engineering surveys and designs, construction equipment, organization, direction, and supervision of all road work involved. All costs incurred by the Forest Service were paid from funds deposited by Anaconda, acting as agent for the Metals Reserve Corporation and the Defense Plants Corporation. The stage was thus set for perhaps the two largest single force account road projects ever undertaken by the Forest Service.

The Benbow Project

The job had been under way for some time when I arrived early in July after a fast move from the Clearwater, and a day in Missoula where Fred Thieme, Region 1 Regional Engineer, briefed me on the events previously narrated and the current status of construction.

Initial progress had been slowed by wet weather and numerous unavoidable delays in getting equipment on the job, the camp constructed, and hiring and organizing the crews, most of whom were recruited locally. Emory Hauswirth, an experienced and capable construction foreman, had been ill for several weeks and had asked to be relieved of overall responsibility. Roger Nelson, later to become Regional Engineer in Region 3, was in charge of the location work being done concurrent with construction. Fred was

concerned by mounting costs and the relatively slow rate of progress, which was of equal concern to Anaconda.

Anaconda had requested that grading of the section of road from Dean to the mill site on Little Rocky Creek, a distance of 5.1 miles, be completed as a first priority objective. Until this was done, material for construction of the mill and facilities could not be delivered to the site. Initiation of their construction program was therefore entirely dependent upon progress made in constructing the road.

George Duncan, who was then in charge of equipment for the Region, came into Fred's office as I was about to leave. George was widely known throughout the Service and will be remembered for his leadership in establishing the first central repair shops in many Regions and for developing maintenance and equipment management procedures for Service-wide use. He gave me some additional information and assurance of his help and support whenever needed. I needed it many times in the days ahead, and George and his outfit never failed to come through during the entire time of construction of both the Benbow and Mouat jobs.

Anaconda had their project office in Columbus. Fred Gethke, project manager, Martin Messner, production superintendent, and Fred Hill, construction superintendent, were the three men with whom we were most closely associated. All were old Anaconda hands, friendly, cooperative, and always understanding and helpful when the going got rough. It was interesting to learn later that both Gethke and Messner got out of Poland one jump ahead of the Nazi invasion. "Marty" once told me, "We just left our cars parked in front of the office and walked away down the street." Just like that!

The first 3 miles of the road from Dean involved relatively easy construction through rolling grassland, and excavation was mostly done with cats and scrapers. The route then followed along moderate to steep slopes where solid rock and large imbedded boulders were the predominant material. The last half mile was through an area of huge surface boulders that required blasting.

Two things were soon evident. The little Cletrac 55 dozers were too small to handle the volume and type of materials involved. More dozers, in the D-8 class, were needed if any greatly improved progress was to be attained. Only two D-8's were then on the job, and these were needed to operate the scrapers, leaving the Cletracs to handle most of the dozer work. Equally important was the need for a competent foreman to handle the drilling and blasting, particularly on the road above the mill site where over a mile of location was through a continuous section of limestone cliffs. Several so-called "good rock men" had come and gone when it was evident that their ability was more in "tamping lifters" in the bars at Absarokee than in real know-how on the job.

The situation was getting desperate when someone remarked that Francis Pixley, then an alternate Ranger on the Clearwater, had been a drilling foreman on several large highway jobs along the Clearwater River. One telephone call and 2 days later, Francis arrived on the job. Concern over this phase of the work was soon over. He "went to town!" I'll always remember the morning he took charge of the rock crew. Most were local men,

and many wore cowboy boots. Francis had observed them on the job the previous afternoon. That morning, he introduced himself and said, "You may all be good cowhands, but from what I saw yesterday, you're a hell of a long ways from being jackhammer operators. Just leave your spurs at home, and I'll teach you to be one—or else." He did just that.

The road to the mill site was opened for truck hauling early in August, and Anaconda started construction immediately. In the meantime, George had sent another D-8, and with the delivery of two new ones from the factory (how he managed that I never knew) about August 15, progress got into high gear. Wind, rain, mud, breakdowns, and a heavy wet snow in early September caused frustrating slowdowns, but the job kept moving. The road to the mill site was completed and surfaced, right-of-way fencing was in the final stages, a treated timber bridge had been built over Little Rocky Creek, and construction on the section from the mill site to the mine was well under way by September 15.

This section was built to a 16-foot subgrade width. Unstable soil conditions, wholly unexpected, were encountered for a distance of about 2 miles above the mill site and required the placement of from 8 to 12 inches of base course before application of a 4-inch surface course of crushed rock. This was the section of road that nearly stopped us cold when heavy rains and wet snow fell.

Fred, who frequently visited the job and prodded us along, arrived one day about the time we were fighting the battle of the mud. With him were Ted Norcross, then Chief of the Division of Engineering, WO; Howard Jones, who later succeeded Fred in Region 1; and Jim Byrne, now Director, Division of Engineering, WO. The rain was still falling, and the mud in places would bog a snipe. Ted wanted to get a bird's-eye view of as much of the job as he could in a short time. We drove a short distance and then, before getting stuck, climbed on a ripper (perfectly safe practice?) and rode behind a D-8 to a good observation point at the beginning of the limestone reefs.

Jackhammers were chattering above us, dozers roaring nearby, and rocks crashing downhill. In the valley below, trucks were hauling gravel, mill, transmission line, tramway, and telephone line. Other construction crews were working all over the place. Ted said not a word for about 10 minutes. Then, turning to Fred he said, "In all of my 25 years in the Forest Service, I have never seen anything like this."

Shortly after his visit, the only serious accident to any of our people during the entire construction of both the Benbow and Mouat roads occurred. George Ramlow, with many years of experience as a logging operator and heavy construction foreman, slipped and fell behind a dozer just as the operator put it in reverse gear. In the darkness, it was a miracle that the operator saw what had happened so suddenly and was able to get the big machine stopped before running over him. George sustained severe injuries, was in a Billings hospital for months, but a year later was back on another job showing little effect from the accident that literally came within inches of being instantly fatal.

The road was opened to the mine early in October and completed in November, when most of the crews were released. Surfacing of about

5 miles of the road then was not considered necessary and had not been planned for. Heavy truck traffic continuing throughout the summer of 1942 made the need more apparent, and surfacing was placed on this section in the fall of 1942 after completion of the Mouat project.

Under terms of the cooperative agreement with Anaconda, the Forest Service also handled the snow removal and maintenance of the road from Dean to the mine. Clarence Sipes, an old pro in the rock-crushing game, all-around equipment operator, and "can do" individual on nearly any type of construction job, was in charge of this phase of the work during the winter of 1941–1942, along with Throop McCracken, one of the best all-around blade operators that ever climbed into a grader cab.

After much additional work was done at the mill site for Anaconda, camp dismantled, repair and storage of equipment arranged for, and numerous other final chores completed, I left for a winter detail in the Regional Office. The first flash of the attack on Pearl Harbor came over our car radio as my family and I drove into Missoula.

The Mouat Project

The location survey of the section of road from Nye Junction to the mine was completed by field crews under the direction of Roger Nelson in the fall of 1941. Design was made in the Regional Office during the winter of 1941–1942. Survey and design of the section from Nye Junction to Dean were made concurrent with construction in the spring of 1942. A topographic survey of the mill and mine sites and a survey for the tramline between the mill and mine were also completed in the fall of 1941. The results of these latter surveys were furnished Anaconda for determination of permanent mill and mine buildings and facilities.

On February 22, 1942, Anaconda requested the Forest Service to start construction of the road from the mill site to the mine and from the mill site to Nye Junction and thence to Dean, where it would connect with the junction of the Benbow Mine road with the county road to Absarokee. It was Anaconda's request that the road between the mill site and the mine be first constructed and the work on this section be expedited for the reason that construction of mine buildings and facilities could not start until this work could be served by a road.

This was the big one, and the pressure was on. Fred had promised Anaconda that the Forest Service would build the road to the mine in not more than 90 days! May 22 was the deadline for construction of 5.2 miles of single-lane road with 16-foot subgrade and 3-foot ditch. The location was along the face of the rugged topography of the Beartooth Range, ascending from an elevation of 5,130 feet at the mill site to 7,065 at the mine. To accomplish the job within the time limit given seemed almost impossible to most of us who were given the responsibility. This opinion was also shared by quite a few others, including Marty Messner and Fred Hill, who jokingly referred to us as "the 90-day wonder boys" when we arrived on the job to start camp construction on March 3. Equipment was moved from winter storage on the Benbow, and road construction began on March 6.

We were much better prepared and organized than when starting the Benbow job the year before. This time, we had the "first team" on the field at the

kickoff. The roster may not be complete (if so, chalk it up to poor memory and not intentional omission) but included Roger Nelson, Herb Norgaard, Paul Ingebo, Herb Kennedy, and Claire Maddox from Engineering; Emory Hauswirth, Henry Flechsing, Perle Swedberg, Lou Marlin, and Joe Collins, all bridge foremen for Art Kahl, Regional Bridge Engineer; Francis Pixley, Mickey Durant, Clarence Sipes, Blaine Snyder, Oscar "Broom Face" Nelson (nicknamed by CCC enrollees on the Clearwater because of his huge black mustache), Paul Prety, now AO on the Lolo, Hank Rust, and, last but not least, Tom Moran and his crew of eleven mechanics from the Spokane and Missoula Shops.

All were top men in their field of work and dedicated Forest Service employees. Full credit for the success of the job must be given these individuals. They gave it all they had and "poured it on" all the way.

A permanent camp consisting of a large mess hall, ten bunkhouses, bathhouse, repair shop, and project and engineer offices went up fast under the direction of the bridge foremen. A temporary camp was also set up near the site of a 176-foot reinforced concrete bridge over the Stillwater River, initial construction of which was undertaken immediately following completion of camp-building. The crusher was set up at a gravel pit near the bridge site, and Sipes and his crew began crushing and stockpiling surfacing material.

During construction of the main camp, a large herd of bighorn sheep could be seen every day on a rocky point about 100 yards from the buildings. They would stay there for hours at a time watching the invasion of their privacy, suddenly disappear, and return again next day. Deer were everywhere. They seemed to travel in small herds of 10 or more animals rather than singly. One evening, one of the dozer operators had just stepped out of the office when a herd of deer came pounding through camp. Seconds later, the door flew open and in came the operator shouting, "Those goddam deer are getting dangerous around here. I damn near got run over."

The elements gave us a real working over during the first 6 weeks. Cold rain, snow, and wind. There wasn't enough dirt on the entire road from Nye to the mine to develop a good mudhole, but the rain and near freezing weather made working conditions miserable for everyone and especially hazardous for the clearing and drilling crews scrambling around on the steep slopes and cliffs. The snow quickly disappeared with the wind after each snowfall, but the wind never stopped. At times, it blew in gale force for hours. Anything not tied down was blown over or away. Lumber was never stacked in piles more than 6 feet high and was promptly tied down when unloaded. Trailer houses not securely anchored were frequently blown over. Even our well-constructed shop building nearly collapsed during one blow. One not acquainted with the area would find it hard to believe that, on several occasions, it would pick up loose boards, swirl them high in the air where they would bend and splinter, and the splinters would stick in the walls of the buildings. Believe it or not, there were plenty of pictures taken to prove it. Everyone cursed the wind, but it was the subject for a lot of humor too.

Paul Prety tells about the truck driver who got a letter from his wife and opened it as he went to the bunkhouse. When he got there, his buddy

asked him how everything was at home, to which he answered, "I'm not sure. The damn wind just blew the writin' clean off the paper before I could read it all."

Work was organized on a two-shift basis, and, with all the equipment possible to use effectively under the circumstances, the road up the hill began to leave a mark along the mountainside. We were handicapped at times by being unable to proceed with the work on more than one or two sections at once. Difficult and sometimes impossible conditions prevented getting equipment ahead to desirable work areas and being able to then meet the subsequent requirement of providing the necessary operating supplies and service. We just kept pounding on in spite of weather, breakdowns, and other daily frustrations of all sorts. At times, it appeared we'd never meet the deadline; but, discouraged or not, we never gave up trying.

One day in the latter part of April, we were doing some excavation and grading of the streets at the mill site for Anaconda. Marty Messner came to me and, with his always friendly greeting, said, "You know, I think you '90-day wonders' are going to make it yet. We didn't think it possible, but I'm going to call Aronson's outfit in the morning and tell 'em to get ready to start hauling on or before the date we agreed upon." Hugo Aronson, who later was elected Governor of Montana for two terms, was then owner of the trucking firm that had the Anaconda hauling contract.

Three weeks later and 7 days before the deadline date, the first truckloads of lumber and materials went up the road to the mine town site. By May 22, excavation was completed and surfacing was in place on the lower 2 miles of road above the mill.

When Fred arrived on the job early that morning, one of his first remarks was, "Hell, I didn't agree that we would do any more than to build a road that they could haul over—not finish it and surface half of it too." Later in the day, he disappeared after leaving word at the office that he wanted to see all of the foremen together that night. All were there when he came in and thanked them for "working together and doing a 'bang up' job." He said that a few times during the last 3 months he felt that he "might have been a little overly optimistic" when he set the completion date. He was obviously happy and proud of his outfit when, in appreciation of what they had done, he handed each man a fifth "for medicinal purposes in case of snake bite." He never explained where he had gone that afternoon, but he didn't have any medicine bag with him when he arrived that morning.

The remark about the snakes was made in reference to the day during early stages of construction when a den of rattlesnakes was uncovered during shovel excavation. The snakes were still in hibernation, or whatever snakes do in wintertime, and their movements were slow and not at all aggressive. The shovel runner, a big blonde Swede named "Whitey" Skretteberg, filled one of the dump trucks with a load of rocks and snakes, leaned out of the cab and told the truck driver, "Don't dump that load in the fill—that dump boss was pickin' 'em off the walls in town last night and no tellin' what might happen if he sees those snakes. Take 'em down to the crusher—maybe it will wake up those guys a little." What happened then is only conjecture, but the odor around the plant for a few days wasn't entirely that of normal operations.

From then on, with the pressure less demanding and good weather generally prevailing, it was a "downhill pull." Progress was good, but not made without annoying problems to be overcome. Ranchers, anticipating that water would necessarily be cut off while irrigation ditches were reconstructed, caused temporary disruptions while they flooded alfalfa fields and hay meadows through which the road was to be built. Absenteeism, particularly among the operators and truck drivers, was a headache. They would go on a binge, and we never knew how many machines or trucks would be idle on the next shift. The cookhouse crew would "hang one on" periodically, and hell was to pay then when 300 to 400 men, ours and the contractors to whom we served meals, had no food on the table. Fortunately, there were some good cooks among the wives on the job who could put out a meal on short notice.

Mention of the mess hall brings memory of the time Anaconda crews tried to gradually lower the level of Mountain View Lake during the construction of the mine town. The lake was actually a big beaver dam covering an area of about 5 acres. When the water started through the small opening made through one end of the dam, it quickly tore out a big section and down came the whole body of water at once. It washed out some of the streets in the mill town, flooded the mess hall, and deposited several inches of stinking mud all over the floor. The kitchen crew was caught totally unaware of what had happened until the water started to come in the building. They made a mad scramble to get flour, sugar, and other foodstuffs off the floor in the storeroom before it got wet, and could be heard loudly swearing dire threats to "fix those stupid bastards that ought to know better than to pull a trick like this." It was hilariously funny to everyone but them.

Keeping the equipment repaired was a major task. Notwithstanding our AAA-1 purchasing priority, parts were practically unobtainable, and much of the equipment might have been sidelined indefinitely had it not been for Tom Moran and his crew of mechanics. They were masters at improvising to "make do," and Tom often remarked that "a lot of things can be done with baling wire and chips and a little ingenuity." In one way or another, he usually got what he wanted, or, failing that, he would make it. When he turned on that big Irish grin, he could charm any dealer into giving him free access to any small stock of parts they would occasionally have hidden for another customer. He once found, quite by accident, a complete set of unused D-8 rails in a dealer's storage yard. They had been lying there for a long time and had become covered with matted grass and debris. The dealer was dumbfounded. He had just told Tom that if he could find any rails in his shop or yard he could have them for free! Another time, the main swing shaft in one of the shovels was broken and couldn't be welded with any assurance of success. Tom drove to Billings, got the Northern Pacific machine shop foreman out of bed early on a Sunday morning, found a piece of suitable steel in the roundhouse, turned out a new swing shaft, and was back on the job with it on the following morning.

Grading, except for the approaches to the Stillwater Bridge, of the remaining 12.5 miles to required standards for a 24-foot finished width was completed by September 1, and surfacing was completed shortly thereafter. A 2-inch oil mat was laid on 4.5 miles before weather conditions prevented further work. The Stillwater Bridge was opened for traffic on January 4, 1943, and the remaining 8.0 miles of oil mat was placed in July 1943, at which time

an oil mat was also placed on the 5.1 miles of the Benbow Road from Dean to the mill.

Concurrent with construction of the main road, a low-standard timber access road to permit hauling of mine stulls from the Picket Pin and West Fork of the Stillwater was completed for a distance of about 8.0 miles. The Forest Service also did most of the work involved in constructing streets and subsidiary roads, excavations for utilities and other developments in the mill and mine town areas, construction of a tailings reservoir, and surfacing of streets, yards, and parking areas.

The end of an era or something was reached when most of the equipment was moved off the job and the crews released late in the fall of 1942. As Roger Nelson remarked at the time, "We'll probably never have another experience like the chrome job, but we'll always have memories of this one."

Hell Roaring Creek Mineral Access Road

The Forest Service undertook construction of the Hell Roaring Creek Road as a project in the Mineral Access Road Program late in October of 1942. Needed equipment and overhead personnel were transferred from the Mouat Project, then in the final stages of construction.

The road was built to provide access to the site of an open pit mine on Hell Roaring Plateau from which chrome ore would be hauled to Red Lodge, Montana, for processing. Exploration work had been completed, and renovation of an old mill in Red lodge was in progress. These operations were owned and directed by the U.S. Vanadium Corporation.

The road was constructed to a single-lane, 14-foot width, with intervisible turnouts on a predominantly contour grade. It extended from a point on the Red Lodge-Cooke City highway about 10 miles south of Red Lodge to the pit site, a distance of approximately 9 miles.

The job may be worthy of mention only because it involved work and travel under the most severe winter weather conditions. These are best described by the accompanying pictures taken during the construction period.

With the exception of foremen, machine operators, and mechanics, the crews were made up of local men, most of whom had previously worked in the nearby coal mines at Coal Creek. Two of the Linderman boys of rodeo fame, natives of Red Lodge, also worked on the job and proved to be good jackhammer operators. All personnel lived in Red Lodge and were hauled to and from the job in 1 1/2-ton stake body trucks provided with only a canvas canopy over the bed and no heat.

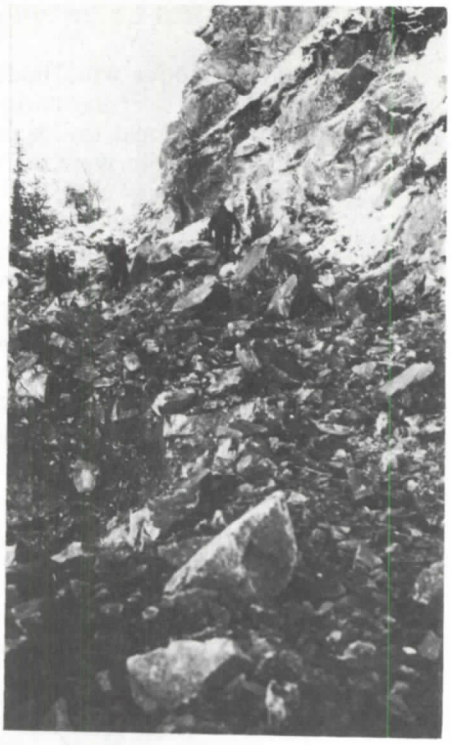
Below zero weather, frequently dropping to -30 degrees, prevailed throughout most of December and January. When dozers and compressors were shut down at the end of the day, lighted lanterns were placed on the ground under the engines and gear cases, and the entire machine then covered with a 14-foot by 16-foot canvas "fly" to retain the heat. Next morning, the oil and gear lube were warm, and starting was then relatively easy. This was a daily procedure for several weeks. At times, a D-8 and two operators were left on the job overnight to remove drifting snow and keep the road open

for the crews returning next morning. State Highway crews kept the road open from Red Lodge to the beginning point of the access road.

It was hazardous work under the prevailing conditions, and driving to and from the job over the narrow, icy road added further to the dangers involved. The local townspeople referred to the outfit as the "suicide squad." Fortunately, there were no serious accidents during the entire period of construction, but "close calls" in one form or another were an almost daily occurrence. There were, however, plenty of bumps and bruises in evidence, most of which resulted from the nightly "warm ups" at local bars and occasionally ensuing "friendly brawls." They were a hard-drinking and brawling outfit but nevertheless good workers who seldom failed to show up for work on time regardless of the previous night's activities.

The job was finished in early April. Shortly thereafter, U.S. Vanadium pulled out, and the road has subsequently been used primarily by sportsmen and as a protection road by the Forest Service.

Construction of Hell Roaring Creek Mineral Access Road, winter 1942–43. Top: Engineer's carryall and crew haul trucks. Bottom: Powder crew placing dynamite charge in rock.



Construction of Hell Roaring Creek Mineral Access Road, winter 1942–43. Top: After blasting. Bottom: Drilling crew at work (note depth of snow that was removed prior to beginning drilling).

Defense Access Roads—Region 1

Hollis G. Stritch

Access Mine Roads

Attached is a list of 39 access mine road applications on which I made field examinations and cost estimates in 1942 and 1943.

The list is compiled from my diaries; however, I am not able to furnish data at this time of the miles and costs involved.

Only a few of these projects, perhaps eight or ten, were approved by the U.S. Bureau of Mines for expenditure of Federal funds for construction on the basis of what they might contribute to the war effort by furnishing strategic metals and minerals.

One of the best producers was the Mikehorse Mine near Lincoln. The Mikehorse was operating a 200-ton mill and was producing 20 tons of lead and zinc concentrates per day. Its trucks were hauling over Flesher Pass to the railroad at Silver City, a distance of about 25 miles. The road needed improvement, but in addition, there was the problem of wintertime hauling. Past experience had shown that severe snow drifting often occurred in the open country near Silver City. It could be anticipated that when the trucks were stalled, the concentrates would freeze in the loading bins and the mill would have to shut down. The final solution was an allotment of funds to the Forest Service for road improvement plus an allotment of Federal funds to the county to beef up its snowplowing equipment.

Another good producer was the Forest Rose Mine near Gold Creek. It was operating a 100-ton mill, which was producing 10 tons of lead and zinc concentrates per day. The road work consisted of about 1 mile of relocation to eliminate adverse grades. I remember an interesting sidelight in this case: The mine superintendent showed me some old mine workings where the early day gold miners of the 1860's had found an outcropping of good galena. He said the old-timers used to gather there, usually in the spring of each year, to melt the lead ore, skim it, and mold a year's supply of bullets. Sort of a spring picnic.

The Fluorescent Mine near Melrose was a small mine, producing tungsten. The owner was operating a small crusher and a shaker mill, which separated the tungsten-bearing granules by means of a flat sieve, which rotated. The heaviest particles moved in a radial direction off the screen by gravity. The outfit was powered by a couple of old Chevrolet engines.

The Greenhorn Gulch Mine near Austin was another tungsten prospect. The owner was operating with pick and shovel and a sluice box, but his mine really produced good samples. (If I remember correctly, tungsten was worth $15 per pound at that time.)

The Charter Oak Mine near Elliston was another case that I remember as interesting: The owner had salvaged part of the ball mill from the old Drumlummon Mine at Marysville, had reassembled it at his mine, and was crushing ore. It was powered by an old automobile engine. He had a crew of about six men working in the mine. They were busy digging around a section of tunnel that had caved in. He called it "heavy ground."

Timber Access Roads

Also attached is a list of timber access roads built during 1943 and 1944. Two of these are worth mentioning because of their timber production during wartime.

The best of these was the Pierce-Musselshell Project DA-RM-18. This involved reconstruction of 11 miles of road to an all-weather standard. The purpose of the project was to gain initial access to a stand of timber estimated to be 300 million board feet, mostly white pine, plus 100,000 cedar poles. Some of this timber was being milled at Musselshell, and the lumber was being hauled to Pierce during the season that the road was being rebuilt. I have estimated the 1943 lumber production at 10 million board feet, and 1943 pole production at 4,000 pieces, average length 50 feet. Production increased in 1944 and 1945 due to improved hauling conditions.

I was responsible for the survey, design, and construction-staking on the project. Herb Norgaard served as my assistant; thus we were able to organize two survey crews.

J.F. Hamblet was general superintendent in charge of construction. He is preparing a report at this time pertaining to the problems encountered during construction. His report will be submitted to you separate from this.

Another good project was the Emery Creek Project on the Flathead National Forest. This involved construction of 6 miles of road to gain initial access to a stand of timber estimated at 80 million board feet of white pine and larch. The road was built in 1944 and is credited with producing 10 million board feet of lumber in 1945.

I made part of the survey. Herb Norgaard completed it. One item that pertained to the survey: We were instructed to keep the location above the elevation of the flowage line of the future Hungry Horse Reservoir. (Hungry Horse Dam was completed 6 years later.)

Region 1

1942 Access Mine Road Program, USDA Forest Service, Summary of Field Examinations & Estimates by H.G. Stritch

Forest	*Project Mine*
Deerlodge	Princeton Mine, near Maxville, w/Mr. Shapard
Lolo	Dry Gulch, near Nimrod, w/Mr. Davis
Bitterroot	Wild Maple Mine, near Florence, w/Mr. Whaley
Cabinet	Mineral King Mine, near Saltese, w/Mr. Buls
Cabinet	Tarbox Mine, near Saltese, w/Mr. Buls
Lolo	Kennedy Creek Mines, w/Mr. Sickrick and Ranger Welton
Flathead Reservation	Glaucus Mine, near Perma, w/Sanford, Indian Service Engineer
Helena	Avalanche Creek Road, w/Belina, Engineer, USBM
Helena	Free Speech Mine, w/Belina, Engineer, USBM
Helena	Northwest Copper Co. claims, w/Belina, USBM Engineer
Helena	Cotter Mine, on Copper Creek, w/Hopkins, USBM Engineer
Deerlodge	Pioneer and Lois Mines, near Gold Creek, w/Ranger Harris
Deerlodge	Forest Rose and Wasa Mines, near Gold Creek
Beaverhead	Rice and Wegener Mining Co. claims near Divide
Beaverhead	Beaton Hill and Ranger Mines, near Jackson
Beaverhead	Saginaw Mine, near Jackson
Helena	Mikehorse Mine, near Lincoln, w/Hopkins, USBM
Helena	Rainy Day Mine, near Lincoln, w/Hopkins, USBM
Helena	Roosevelt Mine, on Rochester Gulch
Helena	Tiger Claim, on Nevada Creek, w/Mr. Finister
Helena	Cyclone Mine on Ophir Creek, near Avon
Helena	Lily and Sure Thing Mines near Rimini
Lolo	Empire Mine, near Clinton, w/Hopkins, USBM
Beaverhead	Ruth Mine, near Bannock
Beaverhead	Elkhorn Mine, Upper Wise River, w/Mr. Allen
Beaverhead	Tiger Claim, on Cherry Creek
Beaverhead	Fluorescent Mine on Rock Creek, near Melrose
Beaverhead	Sunbeam Mine, on Indian Creek, near Sheridan
Deerlodge	Yellow Jacket Mine, on Girard Gulch
Deerlodge	War Eagle Mine, on Toll Mountain
Beaverhead	Faithful Mine, near Divide, w/Wegener Bros.
Helena	Greenhorn Gulch, near Austin, w/Belina, USBM
Helena	Twin County Claim, near Townsend
Lewis & Clark	Hurricane Mine, near Monarch, w/Roby, USBM
Deerlodge	Buckeye Mine, near Basin, w/Munzinrider, USBM
Helena	Evans and Jones Placer, in Greenhorn Gulch

1943 Access Mine Roads

Forest	*Project Mine*
Helena	Charter Oak Mine, near Elliston, w/Bennett, USBM
Lewis & Clark	Blue Dick Mine, on Yogo Creek, w/District Ranger Goodman
Lolo	Nancy Lee Mine, near Superior, w/Sam Cook, USBPR

Timber Access Road Program
Summary of Surveys by H.G. Stritch

Forest	*Date*	*Project Name*
Bitterroot	1943	Moose Creek, near Darby
Clearwater	1943	Pierce-Musselshell DA–RM–18
Flathead	1944	Emery Creek, near Coram
Flathead	1944	Skyland Creek, near Summit
Nezperce	1944	Sylvia Ellen DA–RM–68, near Meadow Creek

Thirty-Five Years in Region 8

Grady Burnett

The 35 years in which I have been closely connected with the Forest Service can best be broken down into four phases. Each phase represents a definite change in my career and, to some extent, a new start after each change.

On July 13, 1933, I reported to the Nantahala National Forest in Franklin, North Carolina. Mr. John Byrne, who died soon after, was Supervisor, and John Herbert Stone, later Regional Forester in Regions 8 and 6, was Assistant Supervisor. I was under the supervision of J. Roane Bradley, with a rating of "Surveyor-Draftsman." Most of my work in Franklin was on acquisition, and much time was spent in compiling the Nantahala base map on a 4-inch scale. Wayne Higdon (now retired) joined us in 1935, and he was still in Franklin when I transferred to the Regional Office in Atlanta. While in Franklin, I also worked with Grady Siler, then Forest Engineer, and with "Pop" Dunbar, who succeeded Grady. During this time I came to know W. Neville Sloan, who was in charge of Acquisition Surveys in Region 8. Neville (better known as "Tod") was one of the oldtime surveyors with the Forest Service, and one of the best.

Region 8 was formed in July 1934, with headquarters in Atlanta, and in October 1936, I transferred from Franklin to Atlanta. Rezin E. Pidgeon was the first Regional Engineer and remained in that capacity until he retired in 1956. I was assigned to map drafting under the supervision of Viggo Christensen. Our method of compiling maps then was a far cry from the modern methods of aerial compilation. Aerial compilation then was a new field, and in many cases, we used the base map compiled from surveys on the Forests and fitted in topography from other sources, such as TVA and Corps of Engineers quadrangle sheets.

In the period from 1936 to 1940, I met many individuals who were well known in the Forest Service. George W. Root, Assistant Regional Engineer, Marion Lamb (father of John Lamb), now retired, and DeFord Smith, Regional Architect, were all standouts in this period.

About 1938, George Pettay and Walter Arch came into the Regional Office from the Pisgah National Forest. Both of these men were outstanding engineers in the structural field. George Pettay persuaded Christensen to let me work with him (because of my prior work in South Carolina on bridge design). Then Walter Arch and I developed plans for the first rigid-frame bridge to be built in Region 8. The 40-foot concrete bridge is still serving recreation traffic into the North Mills River Recreation Area in North Carolina. Not long after this, Pettay talked Christensen into letting Kelly Heffner

work with him on structures also. At this time, Kelly was working on his engineering degree at Georgia Tech. Soon after, in October 1940, I was called to active duty with the Army and served throughout World War II.

What I choose to call the fourth, or present, phase of my career picked up again in December 1946 and has been unbroken since then. I was re-assigned to Structures and again worked with Kelly Heffner and George Pettay. George resigned soon after, and in 1951 Kelly transferred to Region 6, leaving me in charge of structural design.

Mills Gay, another old-timer, returned from the war and was in charge of Cartographic work until he returned to military service in 1952. Pidgeon then asked me to supervise this work as well as mine, and I did so until Larry Marr came in 1957. Needless to say, I was glad to have him come in.

In the last 22 years, many changes have taken place. Pidgeon retired in 1956 and was replaced by M.H. Huckeby, who was here only 2 years before transferring to Region 4. Kelly Heffner then returned (by way of a hitch in the Washington Office) as Regional Engineer and is still in that position.

My experience with the Forest Service has been an interesting and rewarding one. The people I have known have been equally as interesting as the work has been. Among other outstanding people I have known, I remember quite well two Rangers on the Chattahoochee National Forest who were "from the old school." It was my privilege to know and work with Ranger Arthur Woody at Suches, Georgia, and Ranger Roscoe Nicholson at Clayton. The former was the father of Walter and Cline Woody, who both made a career with the Division of Engineering in Region 8. Walter was a district C&M foreman in Georgia, and Cline was Forest Engineer in South Carolina at the time of his retirement. Walter's son, Dick Woody, is now with the Division of Fire Control in Region 8 headquarters.

No paper on Region 8 would be complete without a reference to Sam Greenwood. His was a colorful career, and I kept up with him from 1935 until he retired in Franklin, North Carolina, recently.

I first knew Sam as a surveyor on the Nantahala after he had been in old Region 7 on the Monongahela. Later, on the Chattahoochee, he continued in acquisition surveys until the war. Sam served with the Seabees in the Pacific theater, and was made Forest Engineer in Texas on his return to the Forest Service. After a hitch in Texas, Sam came into the Regional Office as Chief of Roads and Trails, and from here, he went to Ogden in the same capacity. When Jack King retired from the Maps and Surveys job in Washington, Sam Greenwood went into that position. He stayed there until his retirement a little over a year ago.

I started off during the CCC program of 1933. Now, after 35 years, a world war, two Asian "conflicts" (Korea and Vietnam), and two APW programs, I find myself back where I started from—CCC—Civilian Conservation Centers this time!

Historical Record of Engineering in the Forest Service

Verne V. Church

These reminiscences and recollections start in 1924 when I was a logging superintendent in northeastern Oregon.

This was a railroad operation with our logging railroad connecting to the Union Pacific at Wallowa. Engineering for a logging railroad was about the same as for a present-day, mainline logging road.

Logging railroad spurs had a maximum of 6-percent grade and 20-degree curves compensated 1-percent grade for each 5 degrees of curvature.

Railroad grade was mostly constructed by station gangs, usually Scandinavians but sometimes Austrians. Station gang construction, for the present generation, means taking 10 to 20 men over the proposed construction and agreeing, after some haggling, about price per station for the work. Each gang had a head man, and when the job was finished, he would give the timekeeper the amount of time for each man and separate payment would be made to each individual. Side cast was by pick and shovel and through cuts with light steel rail and small cars similar to mine cars. I asked one Swede leader how he figured his price, and he said a good man would shovel 40 yards per day.

In 1926, we became more advanced and let a contract to Morrison and Knudsen for railroad grade construction. They had 200 teams on the job and used slips, plows, and fresnos. Some of this was the station, but the heavy work by the yard was paid at the rate of $0.30 common, $0.55 intermediate, and $1.00 for solid rock.

Track laying was always piece work to regular gangs. The going price was $0.08 per foot for pulling steel and ties and $0.10 per foot for laying. The company furnished the locomotive and cars for loading the ties and steel. Most gangs would pull 1,000 feet in about 6 hours and the next day lay it down in about 8 hours.

Ties were hacked in the woods near the railroad. We paid $0.15 per tie in tree lengths for hacking two sides and $0.10 per tie for bucking and delivering to the side of the railroad grade. A good tie hacker could make about 40 ties per day.

There were no roads whatever in the logging areas, and everything was by rail. We used Shay locomotives (seven of them), and the largest was classified as 110 tons. This large engine was the mainline engine (14 miles to the Union Pacific junction). This 14 miles included 5 miles of 6-percent

grade. Operation of this long, sustained grade was quite a feat. The engine would pull 12 empty cars up the hill and take down 24 loads. This down trip took considerable talent. There was one brakeman for each four cars of logs. When the train started down the hill, each brakeman would start setting hand brakes, and since you cannot walk over a car of logs, it was necessary to jump off and on while the train was in motion. Of course, we had air brakes on the locomotive and cars, but if the engineer used air alone, the wheels might lock, and sliding wheels on a 6-percent grade mean runaways.

The amount of hand-brake tension was controlled by the engineer by means of whistle signals to the brakemen.

Brake clubs were quite a problem until we found a supply from Arkansas that were hand-hewn from old-growth hickory. These cost the great amount of $0.25 each.

Logging in 1924 was about the end of the steam donkey on skids. We used steam ground skidders and horses. The skidders would reach out about 1,000 feet on each side of the spur track. To get 75 million per year, this took a lot of spurs. In 1926, we tried out our first caterpillars for logging. Our first was a 60-Holt tractor.

There was great rivalry between the cat crews and the skidder crews, and as a result, a bet was made in the bunkhouse one Saturday night, and I was requested to permit the test. Sunday morning, the Holt was attached to the skidder mainline, 1,000 feet out in the woods. At the signal, both started. But the Holt was no match for the skidder that had 200 pounds boiler pressure and, I believe, 14 by 16 valves.

The logs were decked along the railroad and loaded with slide loaders. This machine was a steam engine with drums mounted on skids so it could pull itself from car to car as the loads were finished. One of the great improvements to the loader in those days was a new machine on which the loading boom could be swung 45 degrees on each side.

The skidder handled double-length logs 32 to 40 feet long, and the horse logging was 10- to 20-foot logs. For long hauls, we used eight-wheel wagons and two teams. The driver had a saddle on the off horse of the wheel team. This means he rode the left horse closest to the wagon. These wagons were loaded by cross haul and usually carried about 2,000 feet of logs. In scattered timber uneconomical to railroad, we hauled as much as 4 miles with these teams and wagons.

Truck logging was started in 1927 with International trucks with 12-inch solid rubber tires. This was a 7-mile haul by contract. After a few weeks, the contractor was in trouble and could not pay his bills. We were about to close him down when two men came into my office and said they were taking over the contract and that no further bills would be sent in until they asked for final payment. The contract was finished, and I have always wondered how much it cost International to finish that job.

Loggers were a pretty rough lot in those days. No bedding was furnished, only cots and mattresses. Hence the name "bindle stiff." Each logger

carried his entire possessions, including bedding, when he traveled from camp to camp. One of the things he was sure of was good food. Each camp served bountiful meals, as this was one way of keeping a steady crew. We charged the men a dollar a day for their board and lost several thousand dollars a year on our cookhouse.

In 1924, we built a new logging town complete with about 50 houses for families and a two-room schoolhouse. Family houses had become a necessity, because, due to IWW (International Workers of the World), we had shipped in lots of loggers from Arkansas and Louisiana. After a few months, they either wanted to go home or send for their families.

Running the school was almost as big a job as the logging job. I was Chairman of the School Board, and there were only two families in the school district that could vote. My boss said to build a nice school; we did, after voting enough taxes to build the school and run it for 2 years. I thought the camp owned all the land in the school district, but one day I received a letter from a man in Pennsylvania stating he was in favor of good schools, but the taxes on the 40 acres had gone up 500 percent, which he thought was a little high. I had several delegations of mothers call on me complaining that their Oregon children were coming home with southern accents derived from their teacher, who was from Arkansas. In addition, in our Louisiana imports, we had brought in blacks to run the steel gangs. This meant black houses and a separate black school to keep things under control in this wayback settlement.

State fire laws became more stringent in 1925, and we were forced to change from wood-burning to oil-burning locomotives and skidders. In 1926, we brought a large sale of Government timber to the Wallowa National Forest. J. Billings was the Supervisor, and George Donaldson was the lumberman in charge of the sale.

Rangers must have been busy with something else, as I never had to deal with one. In all good faith, we planned to log the Government timber by rail and skidder, so our railroads were built on the ridges so lumber could be skidded uphill. Then the fun began. Brush was to be piled 100 percent. That was okay. Snags could not be felled until the brush was burned for they might get charred and take longer to rot. That meant having our rails in a year and a half after logging in order to get the crews to work. Long before PPBS, we were working on what we called economic analysis. Our figures showed it was uneconomical to log fir and larch. The contract called for triple stumpage for uncut marked trees. We offered to pay, but the Government said no. After several inspections from the Portland Forest Office, we were ordered to quit using skidders due to the damage to reproduction. Our railroads were above the timber, and horses cannot skid logs uphill. We appealed, lost, and gave up the sale.

We did beat or outwit the Government once. We had a forest fire that spread into some Government timber and reproduction. The Government sued us for some $18,000 for damage to young trees. At the trial, our lawyer had the Government witness testify on how he arrived at the amount of damage. He got as far as telling the court it was an estimate based on a 10-percent cruise. Our attorney asked that the case be thrown out on the

grounds that it was an estimate and not a statement of fact. The judge concurred.

We also did considerable logging with chutes, pole, hown, and ice. This is quite a technical job all by itself, so I will pass on.

In 1929, I changed companies and went to northern British Columbia. This was a railroad and skidder operation. Railroad construction was difficult due to the great amount of muskeg. We solved this by building all our railroads on pile trestle with 12-inch cutoffs on the high places and up to 30-foot cutoffs in between small ridges. We used all native material cut on the right-of-way. Three pile bents on 12-foot centers. A good pile driver would drive and cap 16 bents a day.

In 1932, I went to northern Manitoba to log by ice roads and river drive to the mill. The logging season started in October when the ground started to freeze and lasted until the middle of May. All of the log skidding was by horse to the ice roads where the logs were loaded on sleighs with 16-foot bunks. Ice roads are built by clearing the right-of-way and then using a machine that cuts two ruts 8 feet apart. Then the water wagons are started and ice is built up. Periodically, it is necessary to run the ice rutter to deepen the ruts for the sleigh runners. By spring, some of these ice roads would be 3 feet thick. The sleighs were pulled by Caterpillar Sixty tractors. A sleigh train was usually 10 sleighs, each with 8,000 to 10,000 feet of logs. The logs were decked on the river bank awaiting the spring runoff.

The horses were all shipped in from the prairie provinces, since the farmers had no use for them in the winter. And I mean winter—20 below in October and on to 50 or 60 below through the winter. The Mounted Police would not let us use the horses when it got below –50, but there were no rules for the men. This was a rugged time, and the Depression was on. It was 90 miles from town to the logging camp with way stations at 30-mile intervals. The men went in in October on foot. If they quit before the spring breakup, they received nothing but their board. Food was good and plentiful, but not much variety. All supplies had to be hauled in in the summer by boat and were kept in large root houses with lanterns for heat.

In the spring of 1933, I had tired of the frozen north and went down to Spokane to live with my wife and children. In May, I thought I would revisit my old haunts in Wallowa. I dropped in to see the Supervisor who was then Fred Furst. He greeted me with open arms when I said I wasn't working, but wouldn't believe me when I said I was not looking for a job. I had never heard of the CCC, but he called Portland and told the Forest Service I would be there the next day. I reluctantly agreed, and there I was interviewed by the Forest Service and hired to return to the Wallowa National Forest as a CCC Camp Superintendent. I received a letter signed by the Regional Forester saying my salary would be $275 per month and board. I took the next train back to Wallowa just in time to meet an Army captain, four sergeants, and 200 enrollees, and get them to Imnaha and set up a camp.

Supervisor Furst's only instructions were to get along with the Army. We rented trucks to haul the enrollees and went to Imnaha, to which there was no highway in those days. The road was rugged, but passable, and we

arrived at the proposed camp site after dark. The four sergeants were old-line Army and soon had supper on Army field ranges. Tents were another problem. The tents and tent stakes were there, but there was solid rock a half inch below the surface. The next day, I found Grady Miller, the Ranger, and we rented a compressor, drilled tent peg holes using steel reinforcing bars for tent pins, and the sergeants and enrollees soon had a "tent city" under way.

The captain was regular Army and a graduate of West Point. He was one of the finest gentlemen I have ever met. The captain's organization consisted of three second lieutenants, a regular Army doctor with a captain's commission, four oldtime sergeants, a mess sergeant, a supply sergeant, a cook, and a first sergeant. It took a few days to get the camp organized, and about the second week, I had an urgent telephone call to report to Supervisor Furst immediately. I hurried into town expecting that I was fired for doing something wrong since they had given me no regulations. The big news was that the Regional Forester was in error in the wages he had promised me. It looked like an interesting job, so I settled for the new wage scale and had further instructions and reassurance from the Supervisor that we must get along with the Army and do anything in our means to help them. He also stated that the CCC program could not possibly last more than 6 months and gave me a purchase order book with instructions to purchase all the hand tools available in the hardware stores in the area.

There was no shelf of manuals or instructions on how to run things. One Saturday evening, the captain requested to borrow the Government pickup. I gave him the keys to the pickup and asked him where he was going, and he said to the dance at Wallowa Lake. My next connection with him was a telephone call at 4:00 a.m. Sunday morning stating that he was in trouble. The trouble was that he had backed the pickup into the portico of the Wallowa Lake Hotel and knocked the whole thing down. It consisted of four 24-inch round posts, a 40-foot log across the top of these, with intermediate smaller logs running back to the hotel. The captain was quite perturbed and said the hotel manager was threatening him with jail. I told him we would do something about it. Inasmuch as the sheriff was an old friend of mine from olden days, I called him and assured him the damages would be taken care of and please not to arrest the captain.

The first sergeant and I alerted 50 CCC boys, and with two of my best foremen, we loaded up and headed to Wallowa Lake about 65 miles away. Arriving there, I talked to the manager of the hotel, and he was very agreeable either to have the captain pay the damages or have it repaired. With 50 CCC boys, the two foremen, the captain, and I, we repaired the portico and had it better than it was originally by dark that evening. Lots of visitors drove by that day to see what was going on, including Supervisor Furst. He called me over to his car, and I stated the problem, and his only reply was "I never heard, or want to hear, anything about it." Imagine what would happen if something of this nature was done under the present rules and regulations.

Another violation of regulations, which is undoubtedly outlawed by this time, is as follows. The CCC boys had an issue of World War I shoes. The soles would fall off on about the second day of wear. The captain exhausted all his channels of communication trying to get more shoes. With

over 100 boys unable to work because they were barefoot, I decided to do something about it. I contacted a hardware merchant and a shoe store proprietor and ended up with 200 pair of shoes, which the Government paid for as reinforcing steel.

The CCC organization required the Army to have the responsibility for clothing, bedding, recreation, and discipline of the enrollees. The Forest Service had charge of the work program. Enrollees were paid $5 per month and had an allowance made to their closest relative for $25 per month. A small percentage could be promoted to assistant leaders at $6 per month additional, and a few to leaders at $15 additional. After a few months, the regular Army officers were recalled, and each camp had a quota of four reserve officers and an educational advisor. They were supposed to use, not to exceed, 23 enrollees for the management of the camp, including cooks, KP's, supply men, and all the other details. The Forest Service work organization consisted of a camp superintendent, an indefinite number of foremen, usually not more than five, a mechanic, and sometimes a bulldozer operator. The enrollees came from different Army Corps areas. I have had enrollees from Illinois, Indiana, New York, Alabama, Georgia, Texas, Louisiana, and Tennessee. The Supervisor's Office usually appointed the Forest Engineer to be the liaison for the CCC camps. There were very few professional engineers working as Forest Engineers at that time. Most of the staff Forest Engineers had the dual capacity of fire staff and engineering staff. I was fortunate for several years to have a professional engineer, Don Cameron, on the Siskiyou National Forest as my boss. Also, I was quite fortunate to have associated with Boyd Rasmussen, as the Ranger, and Ed Cliff, as the Supervisor, while they were on the Siskiyou National Forest.

Having young enrollees from all points of the United States, and mostly from the cities, required giving considerable training in the use of tools used in road construction. For example, we had a Chicago company in which none of the enrollees had ever seen a double-bitted axe. Since our job at that camp was all road construction, they had to be able to use an axe. For training purposes, we strung logs along the side of a road for a half a mile and gave each boy an axe and instructions on how to use it. The foreman watched them very carefully, and when they could cut a log in two satisfactorily for him, they were promoted to the road gang. This process of training took from 1 to 3 weeks. Sometimes the boys were not interested in working and refused to do so. We had a sure cure for that. We would not let them work. The nonworkers would be placed on a stump at 8:00 in the morning and not permitted to get off until 5:00 in the evening. The Army was very cooperative and said they had no regulation requiring them to furnish the boys cooked food. So the daily ration would be issued raw. Generally, 3 days of this treatment put the recalcitrants back on the job.

Firefighting was one of our biggest jobs during the fire season. We gave the enrollees a minimum of 1 week's training before the fire season began. The Forest Service had an agreement with the Army to furnish the food necessary on a fire over and above the regular CCC ration. This extra food was a great incentive to make the enrollees interested in fighting fire. About 1935 or 1936, the Forest Service started what it called their 40-man hotshot firefighting crew. This proved very effective, so the Ranger and I decided we would start a 40-man hotshot crew for the CCC. We were able to secure the same dehydrated food that the regular 40-man crew had. At

the time, we had enrollees from Chicago who were mostly big, husky Polish boys; in fact, of the 200 enrollees, 167 of them had names ending in "ski." There was considerable rivalry among the enrollees who wished to belong to the 40-man hotshot crew. After the most adequate 40 were selected, there was a considerable number of disgruntled enrollees. To make things fair, we had a standing rule that any enrollee not on the crew could challenge a crew member to a nice fistic encounter, properly supervised, and the successful combatant became a member of the hotshot crew. The morale on this crew was so high that at the close of the fire season, and at the time of the Coos County Fair, the Supervisor told the Ranger to have an exhibit, and the Supervisor thought that a young junior forester should be in charge. The young junior forester had never fought fire with the CCC boys, so at the Fair they threw him out bodily and conducted their own exhibit.

Eventually, the Forest Service decided that maybe they needed a road locator in some of the camps. The salary offered to road locators was $25 less per month than a foreman. So it was practically impossible to hire a very competent road locator. I was fortunate in having one of the best, Mr. Clay Ramsey. A work program was set up and included building several Ranger Stations, and this work would be done entirely by the enrollees under the direction of one carpenter foreman. We also had several heavy road jobs requiring considerable drilling and blasting. On one of these projects we secured a new group of enrollees from Brownsville, Texas, and of these 200 enrollees, only 15 of them could speak English. At the end of that year, they were one of the best jackhammer and explosive crews that I have ever handled. I soon learned that you had to be extremely careful in giving instructions. Evidently, they had been taught never to tell the boss "no sir." After giving them instructions and asking them if they understood, they would always say "yes sir." One of the second lieutenants who came with this group was a very energetic young man and could speak Mexican Spanish to perfection. Besides his camp duties, he volunteered to go with me all of the time to the project and act as interpreter.

During 1936–1938, the Siskiyou National Forest was plagued with innumerable fires. During all of this time, I was stationed at Agness with a CCC camp, which was 35 miles by boat from Gold Beach and the nearest road. There was a considerable number of natives in the surrounding area, who, when they became hungry, would start what they called a 1- or 2-week fire in order to get groceries from their labor putting out the fire. With the advent of the CCC, this local hiring stopped, and, as a result, we had more fires. After about 2 months of steady firefighting, I called upon one of the local residents, Claude Barton, with whom I had struck up quite a friendship. I told him I personally was all worn out from fighting fires and would he stop setting them for awhile. He agreed to this favor and admitted to me in private that he had set a considerable amount of fires that summer. I asked him how he got them going so well so fast. His method was to soak a ball of binding twine in kerosene or gasoline for a week or so, take it out in the hills to the steepest place he could find, then let it roll down the mountain for a quarter of a mile or so, place a candle and light it so that after about an hour the flame would touch the end of the binding twine. By the time this happened, he would be safely home sitting on his front porch for everyone to see that he was not responsible for the fire. Claude felt perfectly safe because I was the only witness to this confession,

and it would be his word against mine, but he did agree not to set any more fires that summer.

One group of enrollees arriving at Agness from Kentucky, mostly from Harlan County, were real backwoodsmen. Some of them had never owned a pair of shoes in their life. The first Sunday dinner the Captain thought he would add a treat and serve ice cream for dessert. The boys would not eat it because they had never seen anything like it before.

Even in the backcountry out of Agness, there were some pretty primitive areas. While locating road one day, I thought I saw or heard something or someone dodging behind a tree. I finally spoke to them, and they came out. They were two girls, 16 and 14, who lived with five brothers and their mother and father in a cabin a short distance away. This 16-year-old girl had never been away from this hill stump ranch in all her life. I prevailed on the parents to let me take two of the girls and two of the boys to Grants Pass one weekend. We had to walk about 15 miles to get to my pickup, and when we got to the highway, the only remark any of them made was "the road would have been much prettier if it had been painted some other color than black." Mrs. Church's treats to them of ice cream and soda pop were something that they had never tasted or heard of before.

The CCC program lasted in full force until December 7, 1941, and then we soon received orders to close out all the camps due to the war. This was done as expeditiously as possible, and they were all closed out early in 1942. I stayed until the finish, after having the first camp on the Imnaha in 1933, to the last camp in Oregon at Zig Zag on the Mt. Hood National Forest.

James Frankland, the Regional Engineer, then moved me into the Regional Office at Portland, and my first job was a detail to the Mt. Hood National Forest to build a logging road up the Clackamas River in order to get timber for the war effort. I was greatly assisted in this road construction by Hempe Erickson who did the engineering work. With an expenditure of $1 million, and force account labor and rented equipment, we had the first logs coming out 11 months later, after constructing 20 miles of road. This Clackamas River Road has been extended, paved, widened, and now has over 200 million feet of logs yearly being harvested over it. Prior to 1942, there had not been much timber sold from the National Forests, so not many logging roads had been constructed. With the war effort, the requirements for timber logging roads became a necessity. Very few Forests had engineers. Mr. Frankland divided the Region into three sections and told Hempe Erickson, Frank McPherson, and me to approve the construction of every logging road in our area. It soon became evident that this was more than a three-man job, and the Forest Service started hiring and training engineers and delegating more work to the Forests.

Most everyone is familiar with the rapid growth of Engineering capability and accomplishments in the last 20 years. To conclude these reminiscences, I will mention only one thing that is different now than during the CCC days. Job Corps supervisory personnel in outlying places all seem to require Government housing. During the CCC period, the Government made no attempt to assist their supervisory employees in securing houses for themselves or their families. I was transferred five times during my CCC work

and was never reimbursed for any moving expenses. After 30 years with the Forest Service, when I was transferred from Portland, Oregon, to Washington, D.C., I received my first reimbursement for moving expenses.

This is not a criticism, but merely a statement to show how much more the Government is becoming interested in the welfare of its employees.

Forest Service Surveys & Maps Activities

E.S. Massie, Jr.

Through a mutual friend, the author met Marshall S. Wright in 1934 when he occupied the position of Chief, Surveys and Maps, of Region 7. At that time, the Forest Service was engaged in a big acquisition program in the Eastern United States, involving areas in Region 7 and later Region 8. Mr. Wright had recommended and been given approval to coordinate the acquisition survey program through the use of photogrammetric methods.

While photogrammetry was not new, its use, at the time, was restricted in the United States. The author's training in the field consisted of a reading assignment of a chapter on the subject in Breed and Hosmer's *Higher Surveying*. Mr. Wright was having difficulty in finding people with photogrammetric experience. The Civil Service Commission had given one competitive examination to fill the positions involving such duties at the insistence of the U.S. Geological Survey. The grade and salary offered were P-1 (GS-5) at $2,600 (not the normal $2,000) per annum. The Geological Survey had employed from the resulting register Messrs. Russel K. Bean and Heinz Gruner, leaving ten others. Mr. Wright had exhausted the register and (as later learned) applied for authority to employ two others on a temporary basis. Because of difficulty in finding people with photogrammetric experience, Mr. Wright suggested the author might want to get some informal training in the office while awaiting a temporary field appointment—probably on the Cumberland, since he had learned that Kentucky was my place of birth.

I reported to work in an unofficial capacity at Region 7 headquarters, which were then located in the Victor Building, 927 Ninth Street, N.W., Washington, D.C., in May or June 1934. Furniture was being loaded onto trucks when I reported to work. Later it was learned that this office equipment was being shipped to Atlanta, Georgia, where Region 8 headquarters were being established. However, all photogrammetric work in connection with the acquisition program for both Regions 7 and 8 would be continued in Region 7 under the direction of Marshall S. Wright. All field survey party chiefs remained under the administration of Region 7 and later, on completion of field assignments, reported to the Regional Office.

After I had been in a familiarization position (without pay) for about 30 days, Mr. Wright informed me that he had been given authority by the Civil Service Commission to give a 12-month temporary appointment to two people for work in photogrammetry. While he had promised to try to place me on the Cumberland at an $1,800 per annum salary, he would recommend me, if I concurred, for one of these two temporary positions, which would classify as P-1 with a per annum salary of $2,600. This appointment became effective on July 2, 1934.

The working force was a small one but too large for the Regional Office on 7th Street. It was soon moved, with three exceptions, to the Printcraft Building around the corner at 930 H Street, N.W. The three remaining in the Victor Building were Chief of Surveys and Maps, Marshall S. Wright; his assistant, J.W. Ninneman; and a draftsman, Salvatore (Sam) LoJacono. This last individual is included because he computed and plotted all polyconic projections on 30- by 40- or 40- by 50-inch, matte-finish, cellulose acetate used in the acquisition program. When Region 7 later moved to Philadelphia (not Upper Darby), Sam transferred to the Chief's Office where he remained as a draftsman until his death, in service. More about Sam appears in its chronological place.

The group moved to the Printcraft Building included Harrison C. Ryker, Edward A. Schuch, Joseph R. Yarrow, Richard Lint, Allan Fay, E.S. Massie, and one or two others. With the exception of projection construction, this group was charged with the responsibility of computation of field surveys (in this case traverse), preparation of aerial photographs for graphic radial line templets, laying of templets, and drafting of map detail from aerial pictures onto the cellulose acetate base. Every employee was trained in, and expected to perform, all duties in connection with preparation of maps employing photogrammetry. On completion of field survey assignments, the ranks were swelled by Craig Blakely, Joseph Kelley, Ralph Carrier, and Melvin Kennedy. Still later, the force was increased by employees who had been assigned to Forests for the preparation of map bases on a trial basis. Two of these were V.R. Sobieralski and Don I. Dunn.

The work of this group deserves special mention in three regards:

(1) Fifty-foot lime circles were placed on the ground prior to aerial photography for identification of points of special significance. Pretargeting of control and other points of special significance is now a regular practice.

(2) The possibility of slotting cellulose acetate templets to achieve adjustment automatically rather than doing so by laying and relaying them was discussed among workers. The idea was abandoned on the basis that theoretically the principle was unsound. Later, a layman in the Soil Conservation Service, on observing a templet laydown in process, had the same idea and, lacking technical knowledge, pursued it to procurement of a patent of the slotted templet method. This is the forerunner of stereo-templets, which will be discussed later.

(3) All photographic imagery was transferred from pictures to map manuscripts by making manual adjustments to take care of relief distortion and scale variation. Difficulties encountered led to the development of first an "underslung" and later the reflecting projector, which is a piece of equipment normally associated with all drafting rooms. (It was later learned that the "underslung" projector idea was borrowed from Region 1 where it had been developed by James B. Yule.)

This particular group deserves further comment:

(1) Harrison C. Ryker was transferred to Region 9 to head up a group engaged in the preparation of the photogrammetric compilation of the

Superior National Forest. He later went into business for himself and manufactured photogrammetric equipment, including a version of the KEK Plotter (a Region 2 development) and the Wernstedt-Mahan Plotter (a combination Region 6 and Geological Survey development).

(2) E.A. Schuch was chosen to head up the cartographic work of the Soil Conservation Service, where he remained until acceptance of the job of head engineer of Aero-Service Corporation.

(3) Craig Blakely transferred to the Soil Conservation Service and was later assigned to head up first its Albuquerque, New Mexico, cartographic work, then to a similar position in Milwaukee, Wisconsin, and finally to a similar position in Washington, D.C.

(4) Joseph Kelley was transferred to Region 1, and later became the head engineer in charge of field surveys for Aero-Service Corporation. He then founded his own field survey organization.

(5) Ralph Carrier was later promoted to Chief, Surveys and Maps, in Region 7, a position he retained until his retirement.

(6) V.R. Sobieralski transferred first to the Soil Conservation Service and then was accepted for a commission in the U.S. Coast and Geodetic Survey. He currently holds the rank of captain and is in charge of photogrammetry for that organization.

In late November or early December 1934, Mr. Wright asked for volunteers for transfer to Region 1. E.A. Schuch, Joe Kelley, and Mel Kennedy were chosen. Within a week or 10 days, Mr. Wright was asked by the Soil Conservation Service to accept a transfer to organize its photogrammetric work. On refusal of the assignment, he was requested to recommend a Forest Service employee for the position. When E.A. Schuch accepted, I was chosen as a replacement for transfer to Region 1, an event which later turned out to be fortunate indeed. It provided an opportunity to meet and work for J.B. Yule, Chief of Surveys and Maps, Region 1, broaden my personal knowledge, and gain a wealth of general Forest Service information.

Jim Yule, on first impression, was an austere person. Nothing could be more misleading. He was a Scot and had worked for the General Land Office before coming to Region 1. He knew what hard work was and expected results from his employees. But he was fair, strong in his ideals, a stalwart in his support of worthy individuals, and a lover of life. He had a real program in work in mapping, which was full of innovations, for that time. It has always been a matter of conjecture as to what he would have accomplished if he had had full support of program and been provided funds to carry it out. Instead, he accomplished what he did through cooperation—to Jim, this was "you put up the money, and we will produce for you."

Missoula, Montana, in 1960 had a population of 27,000. In 1935, it couldn't have been more than 15,000. The Forest Service and the University of Montana were the largest *raison d'etre* at the time. There were no other mapping agencies with whom Jim could easily consult. So he resorted to reading and ingenuity in his work. He and Howard Flint had in some way gotten an aerial camera and, using the facilities of the Johnson Flying

Service, acquired some aerial photographs of some of the more active and problem areas in the Region. Jim had read an article on mapping from aerial pictures in the *Timberman* magazine. He knew GLO surveys and surveyors and recognized the advantages of some public land surveys and the poor values of others. Ingenuously, Yule made strip maps from aerial photographs, laid out control, using public land surveys of which he had personal knowledge of the surveyor, and fitted map information to the public land net. While the result would not meet current accuracy standards, the improvement over what had been available was fantastic, and recipients of the work became staunch supporters of the "Yule Maps." This work was performed in rugged terrain where relief distortion was excessive. Visual adjustments such as those made in relatively flat Region 7 (and 8) areas were not practical. Yule designed and made (in this instance, designed and made means homemade by trial and error) projectors that admirably served his devised system. It was this projector designed in comparative backwoods country that triggered the manufacture of the more sophisticated projector purchased in Region 7 in an area that was then, and might still be, considered the center of knowledge in the United States for expertise in mapping.

The work of Yule was known elsewhere. As a technician, I saw Yule showing his methods to two visitors. It was later learned that these visitors were V. (Vic) Flach and Lage Wernstedt, who were performing photogrammetric surveys for Region 6. They had come over to Missoula to learn of advances initiated by Region 1. It was much later, however, that full appreciation of the situation was realized since both of these men, even at that early date, had reputations of their own.

At the end of the 12-month temporary appointment (June 30), the author returned to the East. Region 7 had reduced its force to a minimum. However, it was through the Region 7 experience that employment was obtained in the Soil Conservation Service with E.A. Schuch (a former coworker in Region 7) as supervisor. During this period of employment, my path again crossed with that of Marshall S. Wright. He was selected, offered, and accepted the position of Chief, Division of Cartography, with the Soil Conservation Service. It was during this period that we became fast friends, and ground was broken for a return to the Forest Service. It was also during this period that Jasper (Jack) E. King came to my attention.

In August 1934, 12 men met and organized the American Society of Photogrammetry. Among the 12 was Marshall S. Wright, who was Chief of Surveys and Maps, Region 7. Immediately on incorporation of the Society as a nonprofit organization for the furtherance of photogrammetry, Mr. Wright talked to his employees collectively and urged filing an application for membership. Response, as I recall, was full participation. Marshall S. Wright occupied the position of Secretary of the Society and his assistant, J.W. Ninneman, was Treasurer.

With Forest Service knowledge and consent, these men utilized Dorothy Prater and Ida Burak for clerical services. Ida Burak later transferred to the Washington Office Division of Engineering and changed her name, through marriage, to Ida Wiesel. She, at this time, is still employed by the Washington Office Division of Information and Education.

The Society continued to struggle for its existence with the wholehearted support of some of the most important surveying personnel (Federal and commercial) in the United States. All work initially was performed on a voluntary basis by the organizing group. In 1937, the workload was such that the directors felt additional people should be brought into the group. Wright, by this time, had moved over as head of the Soil Conservation Service Division of Cartography where I was employed. Apparently, he had recommended me as his choice for this position. As a result, Captain O.S. Reading of the U.S. Coast and Geodetic Survey, who was then President of the Society, discussed with me the possibility of accepting the duties of Secretary-Treasurer, program chairman, and editor of *Photogrammetric Engineering*. Performance of these tasks was probably the deciding factor for offering me a position in the WO Division of Engineering in 1938. It was in this position that I learned much of the surveying and mapping activities of the Forest Service prior to my first connection with it in 1934.

James B. Yule should probably be considered the dean of surveys and maps. He was not a map compiler, but a surveyor who made every effort to improve map quality and accuracy through the incorporation of original survey data. His procurement and use of aerial photographs date from the mid-1920's, which is the earliest record of use observed in Forest Service files prior to 1938. Jim Yule or Marshall Wright told the story of Yule helping Wright in the organization of Surveys and Maps in Region 4 when Wright first transferred to the Forest Service. Later, when the Washington Office Surveys and Maps position in the Division of Engineering was established, the choice between Yule and Wright was a difficult one.

Marshall S. Wright, like Jim Yule, was a cadastral surveyor for the General Land Office. As mentioned above, he was placed in charge of Surveys and Maps in Region 4 and received assistance from Yule in establishing his organization. It may be an erroneous impression, but from conversations it would appear that Homestead Entry Surveys centered in Region 4. The background of Forest Service Chiefs of Surveys and Maps doubtless influenced the General Land Office to delegate to the Forest Service the execution of Homestead Entry Surveys.

Wright was selected by T.W. Norcross and brought to Washington to handle surveys and maps. This gave him an opportunity to work with recognized authorities of each Federal agency as well as representatives of commercial organizations engaged in this work. As a result, when the Zeiss Aero Cartograph Corporation of America was formed, he accepted, at the request of Col. Claude H. Birdseye, Chief Topographic Engineer, U.S. Geological Survey, a vice-presidency with the Company. Through this company, he became associated with two later Forest Service Surveys and Maps individuals (J.E. King and J.W. Ninneman), and perhaps the first Forest Service–contracted photogrammetric survey.

While an official with Zeiss Aero Cartograph Corporation, Wright became connected with a State of Idaho photogrammetric survey for the Lewis and Clark Highway, which included as a possible route following in part the Lochsa River in Region 1. Jim Yule was intensely interested in this survey and acquired copies of aerial photographs procured for route study purposes. These were in Region 1 files when I reported for duty in January 1935 and were used for improving the Forest map of the area at that time.

Zeiss Aero Cartograph Corporation of America was ahead of its time in the 1920's and was unable to survive the Depression years. Wright, King, Ninneman, and others found employment with the Curtiss Wright Company in photogrammetric work. While there, Wright was instrumental and assisted Region 2 in the preparation of specifications for a planimetric map produced by photogrammetric procedures on a portion of one of the National Forests in southwest Colorado. Bids were solicited for this work and a contract awarded to Curtiss Wright, after the company had found it necessary to release Wright, King, and Ninneman. Wright has related that he received a wire from Curtiss Wright asking if he wanted to accept the job on a subcontractual basis for two reasons. First, Curtiss Wright had failed to include in its bid any cost of establishment of control surveys, and second, it now lacked qualified personnel to undertake the job. Wright contacted King and Ninneman, who also were seeking employment, to determine if they desired to join with him in performance of the contract. On agreement to do so, the three pooled resources and rented a house to serve as headquarters. Mrs. Ninneman kept house for the three. Wright performed office work while King and Ninneman acted as the survey crew in the establishment of control. This continued harmoniously until King and Ninneman had a disagreement. From then on, neither spoke to the other so long as they remained in the field.

On completion of the map, Wright made delivery to the Regional Office in Denver. Specifications, while lax for present-day standards, were rigid at the time. Wright relates that all concerned with acceptance marveled at the detail shown. But when the Forest Service produced an overlay with plane table triangulation plotted thereon to check for accuracy compliance, he was "scared to death" that inaccuracies beyond specified tolerances might be discovered. He was greatly relieved when it fully met specifications. Later, he was told that Forest Service representatives were also "scared to death" when the check was applied since they did not know anything about photogrammetry and thought Wright might be able to prove the Forest Service in error.

Jasper (Jack) E. King was Chief of Surveys and Maps in Region 2 in 1938. He had previously worked with the U.S. Geological Survey before accepting employment with Zeiss Aero Cartograph Corporation of America. After working with Wright and Ninneman on the photogrammetric survey for Region 2, King organized and operated the King Aerial Surveys Company. This company was awarded contracts by several Federal agencies, including Forest Service projects concerned with the Region 7 acquisition program. Quality of performance and delivered material was adequate, but King's optimism resulted in the company's financial difficulties. As a result, he dissolved the company and returned to Federal service as Chief of Surveys and Maps in Region 2.

As the Regional Surveys and Maps Chief, King sold an aggressive photogrammetric program to the Region. Contracting for plane and pilot, he undertook the photographing of not only Region 2 areas of interest, but that of other Forest Service Regions and the Bureau of Reclamation. Concurrently, he initiated a program to map planimetrically all Region 2 areas of responsibility, utilizing the current photogrammetric procedures. It was based on plane table control surveys, radial templet laydown, and map detail transfer by projectors. Started later than the Region 1 program under Yule,

it took advantage of improved techniques and materials. Improvements were use of stable base (metal-mounted) manuscripts in preference to tracing liner and control surveys to serve the particular need rather than utilization of already-existing materials. Whether King had seen Yule's projectors or not is not known, but the use of metal mounts made the Yule projector of no value, and King caused to be built a reflecting projector that might well be considered the prototype of the ones now accepted as indispensable cartographic equipment.

The program had weaknesses, too. In-house photography resulted in lax adherence to specifications. The result was gaps in aerial photographic coverage and resulting maps. Correction of these deficiencies was interrupted by World War II and was undertaken thereafter by the Soil Conservation Service.

Difficulties in use of the radial line templet led King into the design and patent of a metal expansible templet comparable in many respects to the slotted templets and metal spider developed in connection with the Air Force trimetrogon mapping system. This templet, though patented, was never put to use because of (1) the wider acceptance of the slotted templet and (2) appreciation of the need to transfer map information stereoscopically rather than monoscopically.

The latter of the two above points had an indirect bearing on acceptance of the Region 2 metal templet. Stereoscopic transfer of map detail seemed to be of more urgent importance, and attention was focused in this direction instead of seeking a commercial supplier of the templet. It was known that Lage Wernstedt of Region 6 had been working on, and had built, a prototype of a paper print stereoscopic plotter. King's representative visited Region 6 and studied this equipment. Many excellent qualities were recognized but the machine was crude and cumbersome—still needing equipment design. Region 6 had no plans to seek commercial manufacture, so King, with the assistance of John W. Elliott and Phillip B. Kail, modified the design and manufactured, in late 1940 or early 1941, the prototype of the ***K***ing, ***E***lliott, ***K***ail Plotter. This plotter was patented and is still supplied to customers on a worldwide basis by Kail (Associates), who left the Federal service to establish his own business (a successful and remunerative one).

At the outbreak of World War II, the Army engineers requested assistance of civil agencies and commercial contractors in the topographic surveys by photogrammetric methods of areas vital to the defense of the United States. The Forest Service was included in the civil agencies, much to the surprise of many, inasmuch as it had no surveys and maps organization in Washington. I visited each Regional Office, exclusive of Region 10, to learn what and how much each could contribute to the effort. As a result of this visit, there appeared to me to be no question that the Forest Service was incapable of contributing on a Region-by-Region basis. As a consequence, in all naiveté, I recommended the establishment of a Chief's Office project housed in the Region when the mapping assignment was made. This project would pull qualified personnel from all Regions for staffing purposes. This unusual, at the time, recommendation was accepted and King agreed upon as the logical project chief.

After a faltering start, utilizing the KEK Plotter for topographic work rather than planimetry for which it was designed, the project was successful to the extent that the Department requested the move of the personnel from California to the East to assist in the redemption of its commitment to the Army in mapping areas in Virginia, Maryland, and Pennsylvania (Gettysburg area).

The overall result of the project was the acceptance of the Forest Service as one of the five Federal agencies qualified to perform standard topographic mapping. The Division of Engineering was told to prepare a budget for this purpose, and I, again in naiveté, recommended the permanent establishment of what is now known as the Photogrammetric Service Center attached to the Washington Office Division of Engineering. This recommendation was also approved and King placed in charge. He remained in this position until his retirement.

After the formation of the War Mapping Project and before 1955, there were two or three contributions made to photogrammetry by this group worthy of mention.

(1) The KEK requires a larger number of elevations on a stereoscopic model than other plotting equipment for the production of topographic maps. In mountainous country, the problem of determining these elevations is greater than in developed areas. Utilizing aerial photographs and a templet laydown, horizontal distance from instrument to image point was determined for use in connection with field-measured vertical angles to determine differences in elevations.

(2) The Gettysburg area was in rolling mountainous country. Traverse by transit and tape is expensive and more subject to error than triangulation. Erection of wooden towers for triangulation was the result. A tower was built and mounted in a hinged horizontal position on a truck. The truck was driven to a control station site. The tower was raised into a vertical position for observations to similar towers or signals. On completion of observation, the tower was lowered to a horizontal position and moved by truck to the next site. Such towers, now made of lightweight metal material, are used elsewhere.

(3) The Kelsh Plotter, an invention of Harry T. Kelsh while employed in the Soil Conservation Service, was improved by him (and others) as an employee of the Geological Survey. Recognizing the limitations of templet laydowns because of errors introduced by tilt and tip, the Kelsh Plotter seemed to offer possibility of corrective action. With the benefit of elevations acquired by the method described in (1) above, it appeared possible that a stereoscopic templet could be prepared of half a photograph in the Kelsh. Forest Service employees, using a Geological Survey plotter, made a complete templet with stereoscopic positions located for half the picture and image point positions for the other half. Later, the USGS made two half templets stereoscopically for each picture. This later method had been adopted as a standard photogrammetric procedure in connection with accurate templet laydowns.

E.R. Sievers was Chief of Surveys and Maps in Region 3 in 1938. With Regional approval, he caused to be established a WPA project for the preparation of topographic maps by plane table methods. Because of this interest

and initiative with respect to topographic mapping, Region 3 was able to provide at the beginning of the War Mapping Project more experienced personnel than any other Region. Sievers was also used by the Region as its mineral examiner.

Subsequent to the War Mapping Project, the demise of Jim Yule, and the retirement of his successor Frank Cool, Region 1 selected Sievers to head up its Surveys and Maps Branch. He continued in this position until the mineral examination job demanded additional staffing, at which time he transferred to this division, where he remained until his retirement. He was succeeded by Burton D. Anderson, who had previously occupied the position of Chief Draftsman in Region 3, stereoscopic operator on the War Mapping Project, Chief of Surveys and Maps in Region 3, and head of control activities in the Photogrammetric Service Center.

Charles J. (Slim) Truscott was Chief of Surveys and Maps in Region 4 in 1938. Slim was given his first job as a rodman by Marshall S. Wright while working as Chief of Party for the General Land Office. Slim left GLO for service in World War I. On his return, Wright, who had moved over as Chief of Surveys and Maps in Region 4, employed him for control services in Region 4. On Wright's transfer to the position of Chief of Surveys and Maps in the Washington Office, Truscott was promoted to the vacant position in Region 4, where he remained until his retirement.

Charles D. Jackson was Chief of Surveys and Maps in 1938 in Region 5. Don was another Wright-trained employee, having worked as a draftsman under him in Ogden, Utah. I am not quite sure of the succession of individuals to the Surveys and Maps position in Region 5 prior to 1938. It should be noted, however, that prior to Don Jackson the position had been occupied by T.R. Littlefield. Littlefield exhibited interest in water and, in connection with Watershed Management, had started a program of topographic mapping of Region 5 areas by plane table methods. T.R. later vacated the position of Chief of Surveys and Maps, and it is believed he was succeeded by Don.

Don Jackson had many sterling characteristics, among which were the faculties and selling a job of selecting people who were prima donnas in their respective fields. Many of these people were developed to this stage by Jackson. He had a Chief Draftsman under him, Sedelmeyer, who was outstanding in the construction of relief models, being commissioned to produce a relief model of the State for exhibition at Treasure Island. "Sede" attracted only the best in draftsman. In 1938, Henry Klamt was available and was an artisan commanding high respect in map drafting. There is little doubt but that Region 5 maps have long excelled in appearance. This, however, had faults because the Region, blessed as it was in outstanding pen and ink artists, continued this sort of work of metal mounts long after technological advances dictated a change in methods. While the Region at the present time has two good draftsmen, it has now reached the point where map bases must be revised by scribing in order to maintain the material.

Jackson established in Region 5 a planimetric mapping program similar to that under way in Region 2. Jackson was able to obtain the services of Leigh B. Lint as head of his Control Survey Unit. As a matter of fact, Lint was the Control Survey Unit, being experienced in the field and with little

tolerance for anyone who was less than perfect in performance. Perhaps as much credit should go to Lint for the success of the War Mapping Project as to any one individual. It was under his tutorage that vertical angulation was introduced. He took over both the control surveys and the stereoplotting work on the project and ran the combination with an iron hand, demanding quality production throughout.

A.W. (Wally) Lund was also trained by Don Jackson. Lund was in charge of the office phases of the work. He espoused technological improvements, and was placed in charge of the preparation of Transportation "B" maps. He developed the use of scribing and photo etch methods for the execution of this work.

It is a small wonder that on the retirement of Don Jackson, the Region had difficulty in deciding whether Lint of Lund was to be promoted to fill the vacancy. Both men were good in their respective fields. Lint had a wealth of experience in many phases of the work, and in several agencies. Lund was efficient in his field, with experience only in Region 5. A solution to the problem presented itself when a challenging position became available in the Photogrammetric Service Center and was offered to Lund. Lint then succeeded Jackson as Head of Surveys and Maps in Region 5. Lund, with the broad experience gained in the Washington Office, was later reassigned as Chief of Surveys and Maps in Region 3, and subsequently promoted to Chief of Surveys and Maps in Region 4. In his desire to return to the "Bay" area, he accepted reassignment to Region 5 as Chief of Surveys and Maps at a lower grade in order to return there.

V.H. (Vic) Flach was Chief of Surveys and Maps in Region 6 in 1938. I learned later that his Service computation date was 1917, indicating that he had been in the Surveys and Maps Branch for a period of 21 years at the time I first knew him as Chief of Surveys and Maps. To the best of my knowledge, Flach's entire career was based on office experience. He was, however, very sensitive to the need of field control, as evidenced by the fact that in the early 1930's, when it became necessary for the U.S. Coast and Geodetic Survey to release some of the employees on its geodetic control survey crews who had been hired in the "Make Work" program, Flach recommended the establishment of a control survey program in Region 6 and was allowed to put Ray W. Fassett in charge of this work. Practically all of the third-order control established by the Forest Service in Region 6 was done by Fassett during this period.

Flach's attitude toward photogrammetry was influenced by two specific factors. The Twenty-Ninth Engineering Topographic Battalion was headquartered in Portland, Oregon. The staff of this Battalion consisted of some of the leading photogrammetrists in the country at that time. Through his contacts with this battalion, he became well indoctrinated with all types of photogrammetric equipment at its then advanced stage of development.

The other direct influence was Lage Wernstedt, who was employed in Region 6 and has been mentioned previously in connection with a visitation to Region 1. Flach was of the old school when Surveys and Maps was almost without financing. As a result, his entire mapping program was influenced, in part, by the lack of funds. On the other hand, he should be

given a good deal of credit for the quality of maps he produced during his tenure and the quality of surveys provided to the resource divisions.

The influence above mentioned resulted in the initiation of a photogrammetric program. When the first Forest Service Surveys and Maps conference was held in Missoula, Montana, under the auspices of Jim Yule, Lage Wernstedt and Vic Flach were in attendance. Also in attendance was Heinz Gruner (previously mentioned), who was imported from Germany and remained here as an outstanding photogrammetrist. When that meeting convened, Lage Wernstedt had already mapped many areas in Region 6 from oblique aerial photographs producing topographic maps. The accuracy of the result for oblique mapping was amazing to everyone who saw it. At the 1936 meeting, Wernstedt was preaching the use of oblique photography.

Heinz Gruner indicated that the days of oblique reconnaissance mapping were over and that Wernstedt should direct his attention to vertical photography. Being embarrassed by the remarks of an outstanding photogrammetrist, Wernstedt returned to Portland, dropped all the developmental work in connection with oblique photography, and started work on a vertical, paper-point, stereoscopic plotter. This is the plotter that was viewed by King's representative just prior to World War II, and on which was based the KEK design.

After the KEK was produced, Region 6 Surveys and Maps personnel labored in the belief that Wernstedt's ideas had been borrowed for the aggrandizement of Region 2. By this time, the KEK Plotter had already been patented. The Washington Office, therefore, insisted that Region 6 send sufficient material to make application for patent for the Wernstedt Plotter. After continual bickering, material was received and the application filed. The material was inadequate, and the Washington Office sent the Patent Attorney from General Counsel's office to Portland to personally inspect the equipment. This Patent Attorney was both a qualified engineer and a lawyer. As a result of this combination, and WO Engineering insistence, not only was a patent granted for the Wernstedt Plotter, but all commercial rights were retained for the inventor. It has always given me a sense of satisfaction to know that we pursued this course, since in later years, Harrison C. Pyker, a former employee in Region 7, as mentioned before, sought permission to combine principles of the Wernstedt patent with principles of the Mahan Plotter to market what was known as the Wernstedt-Mahan Plotter. As a result of this, Wernstedt, after retirement, and during his terminal illness, continued to receive some income from his endeavors in the developmental field. It is somewhat ironical to note that some of the principles envisioned by Wernstedt in connection with oblique maps were later incorporated into the trimetregon and multiplex mapping from oblique photography during World War II, in spite of the fact that Heinz Gruner had advised against pursuing this sort of developmental work.

Flach's keen interest in the cartographic field continued for his entire tenure in office, and I think it is safe to say that he was probably the best cartographer produced by the Forest Service up to the present time. He probably holds the distinction of being the first Chief of Surveys and Maps to complete the Forest Series under current requirements in the Forest Service.

W.N. (Tod) Sloan was Chief of Surveys and Maps in Region 8 in 1938. Earlier it has been mentioned that Region 7 directed the initial preparation of Region 8 maps by photogrammetric methods in connection with the acquisition program. As a result of complete coverage and in line with the Region's policy, map maintenance was delegated to the Forest level. Tod's duties consisted of coordination and directing cadastral surveys in the Region. S.K. (Sam) Greenwood, who later headed the technical phases of Land Line location in the Washington Office, was taught cadastral surveys by Tod, and made the observation that Tod Sloan was one of the best land surveyors he ever saw. When Tod retired, the Region left it to each Forest to carry on with its mapping program. This continued until 1957, and the Region in 1968 is still suffering from the effects of this decision.

Frank Kemp was in Region 9, but the survey and maps activities were not comparable to those in other Regions. This was probably due to the comparatively low percentage of public ownership of lands in the National Forests except for the Hiawatha, Huron, Superior, Chiquamegon, and Nicolet.

World War II did much to focus attention on Forest Service surveying and mapping activities. The Corps of Engineers, Department of Army, included the Forest Service in the list of Federal agencies to assist in the mapping of strategic defense areas. While not recognized by others in the field of mapping, charting, and geodesy when the work started, the Forest Service completed its assignment in California and moved to the East Coast to assist in completion of another area, which had been assigned to the Soil Conservation Service. At the completion of the war effort, the Forest Service was named as one of five Federal agencies qualified to produce topographic maps for standard coverage of the United States. This portion has been held since then, and, by agreement, all topographic quadrangle manuscripts produced by the Forest Service are delivered to the U.S. Geological Survey for field accuracy check and completion, color separation, publication, and distribution.

At the conclusion of Forest Service cooperation in the defense mapping effort, approval was obtained to retain a centralized photogrammetric group attached to the Washington Office Division of Engineering. This group has kept the Forest Service prominent in the mapping, charting, and geodetic fields. It has pioneered in various Forest Service uses of photogrammetry. Most important, the Regions have depended, for the most part, on this group as a reservoir from which to draw replacements for retiring Chiefs of Surveys and Maps. The following list shows by Regions the names of Chiefs of Surveys and Maps who have succeeded those in office in 1938 when I became a member of the Washington Office. An asterisk before the name indicates that the individual received training (not necessarily initial training) in this photogrammetric group.

Region 1

*Frank J. Cool
*E.R. Sievers
*B.D. Anderson
John Collins

Region 2
*Matthew A. Walker

Region 3
*B.D. Anderson
*H.C. Cain
*A.W. Lund
*C.E. Carnahan

Region 4
* Lewis
*C.E. Carnahan
*A.W. Lund
B.W. Hostrop

Region 5

*Leigh B. Lint
*A.W. Lund

Region 6
*Roger Charmard

Region 8
*L.C. Marr

Region 9
*R.W. Fassett

Region 10
*H.C. Cain
*R.E. Whitaker
*D.M. McVay
*William Bayer

Engineering on the Guayule Project

J.J. Byrne

During a Supervisors' meeting in Region 1 in late January 1942, Major Evan Kelley, Regional Forester, was called to Washington. He returned before the meeting was ended and told the assembled people that he had been chosen to head up a project to grow natural rubber. He said that the "weed" from which rubber would be extracted was called Guayule and that it resembled sagebrush or rabbit brush. He said that he would get in touch with certain people later that afternoon about participating in the job.

It would be a mistake to proceed further with this account without saying something about Major Kelley. He was a very intelligent, self-educated man, a hard worker, and a good organizer. He attained the title of "Major" in World War I when he served in a forestry regiment. He had steel gray hair combed in flat-top fashion. He also was a fine physical specimen and, with his military bearing, made a striking picture. In Region 1, he had a reputation of demanding a very high level of performance. One rumor has it that the Forest Service was assigned the Guayule Project provided Major Kelley was put in charge. Such was his reputation.

Up to that time, I had had very few personal contacts with Major Kelley. Fred Thieme, Regional Engineer, fielded any criticism the Major might have made of my performance. He did not pass the buck. However, I did have a feeling that the Major did not consider me a very well-qualified engineer—at least for Forest Service operations. It was, therefore, a big surprise to me when he called me in and asked if I would head up engineering work on the project. He pictured the engineering work as being the establishment of nurseries and estimated that my services would only be required for 3 months. I told him that I had been notified that I had been recommended for a commission in the Navy but would like to go if the Navy would agree to a delay. I also told him that I would talk with Fred Thieme and get his reaction. Fred was a little apprehensive of my taking the job but gave his permission.

In characteristic fashion, the Major lit out immediately for California by airline. He asked me to follow and drive his official convertible to Salinas, California, where project headquarters were being set up. I did so and arrived around the middle of February.

By the time I arrived, many people had been assembled from all parts of the Forest Service. Evidently, the Major had been assured that he could pick anyone he needed. The majority of those assembled had been transferred from the Shelterbelt Project and Region 9. Paul Roberts, who had headed up the Shelterbelt Project, was second in command. Larry Gross from the

Washington Office was in charge of Crop Production. He was my boss. Other branches of Crop Production were Nurseries, headed by John Emerson, and Field Plantations, headed by Hank Lobenstein.

Our first step was to find out what was available and to make estimates of cost of operations. The project had been purchased by the Government from the Intercontinental Rubber Company at a cost of $1,271,235. The most important items purchased were "know-how," a rubber extraction plant (Salinas), 23,000 pounds of seed, a 640-acre plantation (20 years old), a small nursery, and an assay laboratory.

The "know-how" was both good and bad. It was studied critically by Doc McGinnis and other researchers, soil scientists, agronomists, entomologists, nematologists, geneticists, and chemical engineers—to name a few of the disciplines available. The Department of Agriculture "threw the works" into the effort. The Bureau of Agriculture and Industrial Chemistry handled rubber extraction research. The Bureau of Plant Industry, Soils and Agricultural Engineering, researched the plant-growing area. The Bureau of Entomology and Plant Quarantine studied insect problems. The Forest Service threw its research and operational people into the job. All of this talent had something to offer. Many problems were resolved—but not without disagreement. The Major had real problems in resolving differences in recommendations made by highly qualified specialists. In my opinion, he was a second Solomon.

One of his first problems was a controversy as to the best soil for nursery construction. The company expert, who had done much research in this field, recommended heavy, clayey soils. Our own soil experts and agronomists recommended loamy soils. The compromise was to build 350 acres of nursery with heavy soils and the other 150 on loamy soils. So the job of land leasing proceeded on this basis. Experience proved the agronomists to be right. The loamy soils were better. We were able to discard duckboards since they were not needed on well-drained soils.

Since I knew very few engineers outside of Region 1, my choice of assistants was largely from that area. The Region 1 Engineers who came to the project at that time were Art Kahl, Mel Walker, Fred Jacqueth, and Fred Stillings. Our job was mainly the design and construction of nurseries, but we got into other things.

Clyde Fickes, who headed up building construction in Region 1, was given the job of directing the construction of a labor camp, laboratories, and shops. He handled the design through an architect-engineer contract.

The Engineering group and engineering technicians handled site surveys, supervision of improvement construction of all kinds, and estimates for engineered facilities for the entire proposed program. The estimates included such things as the cost of rehabilitating the Salinas Rubber Extraction Plant and the cost of a similar plant to be built elsewhere. We did not have much time to make detailed estimates but did pretty well. One item that was to haunt us later was my estimate of the cost of a new mill. I had previously participated in the design of an ore mill, which resembled the extraction plant. The mill was about one-half the size of the Salinas Mill.

It cost $250,000, so I did the easiest thing and multiplied by two. Later, we had some difficulty building the Bakersfield Mill for $500,000.

The War Production Board had set up a priority system for release of materials for construction. This was a potential problem. However, we were given a priority next to that of the military. Natural rubber was scarce, and the stockpile was low. The Japanese had taken control of major rubber plantations. Deliveries were uncertain from other areas.

About 50 nurserymen had been assembled to handle nursery operations when the nurseries were completed. John Emerson and I consulted them on nursery standards. Everyone liked his own method best, so John and I made an analysis of the various nursery factors. We decided to standardize on 4-foot-wide beds, 400 feet in length. We also found that about 30 feet of clear space was needed at the ends of the fields for turning around farm equipment. Since experience of the Intercontinental people had indicated that "sand-splash" would hurt the seedlings, we decided on an overhead sprinkler system, which involved a rotating pipe equipped with fine-spray nozzles at 10-inch centers. We found that sprinkler lines had to be located 50 feet apart to ensure coverage. We established optimum operating hydraulic pressures. Since brass was a scarce item, we were forced to go to a system for rotating the pipes, which used one "gang" oscillator rotating several pipes.

Based on the standards that we had developed, we designed the irrigation system for the three nurseries that had been acquired. O.C. Bradeen, our Purchasing Agent, arranged with Region 5 people in San Francisco to invite pipe salesmen to meet with us to bid on pipe required. I had devised some simple specs for each type of pipe, i.e., steel, transite, and wood. I had also a list of needs. These were passed out by Bradeen to the 20 or 30 salesmen and company specialists who were present. Bradeen handed out our rough request for bids and told them to come back in 2 hours with their bids and guaranteed delivery dates. Bradeen, Katie Watts, his secretary, and myself then went down to Joe DiMaggio's place, and I had bouillabaisse.

We went back to the office and received the bids and analyzed them in front of the bidders. (About 54,000 feet of large pipe was involved, along with about 87 miles of overhead galvanized pipe.) The low bid on the larger pipe was wood stave. The next low bid was steel but with unsatisfactory delivery. The next lowest was transite. We eliminated wood stave because Guayule seedlings were subject to rot when the soil became saturated, and we knew that wood pipe would leak until it had a chance to swell tight. We chose the transite, since a quick analysis showed it to be the most economical in the long run. It was a relief when the people present came up and shook hands and agreed that we had made a wise choice under the circumstances. The Johns Manville Company assigned one of their experts to us to expedite delivery and consult on installation problems.

We were operating under the War Powers Act, which directed us to get the job done without regard for ordinary procedures. We could "make or break contracts with or without consideration." This made it easy for us to get the other material needed. One local lumber yard was encouraged to set up a plant to manufacture 1,000 miles of duckboards (1 by 8 redwood with 1 by 2 crosspieces every 18 inches). Local pump manufacturers scrounged the

State to get us the needed pumps. The local mercantile in Salinas took extraordinary measures to procure other material.

It took us about a week, working long hours, to finalize plans and specifications, and advertise by telephone for bids. We broke the job up into two parts. One was for underground and the other was for the overhead sprinkler system. We decided to call for lump sum bids rather than resort to cost plus fixed fee.

On the underground system, we had three bids. Two were fairly reasonable, but the other was about twice the lower bid. Bradeen thanked the lower bidders. He then turned to the high bidder and said, "I won't thank you for your bid!" The bidder's face reddened, and he apologized for his irresponsible bid. That is the way he did business.

The Stolte Company was the successful bidder on underground, and Binkley was the bidder on overhead. Engineers, nurserymen, and contractors worked together to meet schedules. All were impressed with the importance of the project to the war effort. The scheme of construction was to finish sections of each nursery so that planting could proceed without waiting until the entire job was completed. It was important that schedules be met because Guayule seed had to be sprouted in advance and would spoil if not planted. Working together, we met schedules, but it was nip-and-tuck on occasion.

On one occasion, a 10-inch transite main broke on Sunday morning. I was on my way to church when a man in a pickup drove up and gave me the sad news. I put on my working clothes and stopped by the contractor's shack for tools and supplies. The Johns Manville man had told me how to pour a joint under water. To the nurserymen's amazement, and mine, it worked. It involved melting about twice as much pouring compound as needed for an ordinary joint. The runner that retained the pour was pulled out at the bottom. Then the pour was made quickly. When about half the compound was poured, the runner was kicked back into place and the pour completed. In this way, the pipe and fitting were dry enough to adhere to the compound.

A more humorous emergency occurred when one of the wells that we had rented caved in. We got a well driller to drive a slotted casing inside the old casing and then pumped to clear the well. It was too dirty to use. We installed a long, portable irrigation line on an incline so that we could fill the line and then stop the pump and let the water run quickly into the well. I worked all night by myself. Sunday morning arrived, and so did Fred Stillings. He offered to take over and let me go to church. I was glad to do so as I was about ready to give up. I went to church and met two of the girls who worked on the project, Katie Watts and Margaret York. After mass, we went to have a cocktail, since I was still pretty cold. One led to another. We were having a pleasant morning when in staggered Fred Stillings, dog dirty and loaded for bear. He would have been really put out if he hadn't good news to report—the well had cleared up. More incipient Guayules had been saved.

The whole gang, engineers and nurserymen, worked long hours for about a month; then the deluge came. It was Easter Sunday, and we spent the

whole day eating, playing cards, and loafing. It was timely. On Monday, we were back to the grind.

On another occasion, it appeared that one of the wells being drilled would not come in on time. The driller had reached the depth of surrounding wells but had not struck water. He had the flu and shut down the rig and went to bed. Fred Stillings and I went out with some whiskey and mixed him a hot toddy. He showed us how to run the rig, which we kept going all night. We had a few shutdowns because the rain made the belt slip. We all drank hot toddies, and, in the morning, the well driller was able to take over himself. He drilled to 750 feet before he struck enough water. We made the deadline again. Although I did not see much of the well driller after our night of well drilling, I understand that the boys kept furnishing him the same remedy that Fred and I had prescribed. The well was straight enough to allow the installation of the pump.

As mentioned earlier, the company had accumulated 23,000 pounds of seed, which was considered adequate to plant 30,000 acres. In addition, there were about 640 acres of mature Guayule shrubs in seed. This was calculated to be enough, when collected by methods used by the company, to plant an additional 30,000 acres. However, we did not feel that the collection method used was getting all the available seed. We put some workers out with flyswatters to knock all seed into a container. The sample area yielded about ten times as much seed as was formerly recovered from the same area. Two developmental mechanics, George Bouck and Bill Allen, whom we had obtained from Region 5, proceeded to develop a seed collector to simulate the flyswatter and pick up the seed by vacuum. They succeeded.

In 3 months, the project had built a 540-acre nursery, a 1,500-man labor camp, a seed extractory, a pilot rubber extraction plant, two research laboratories, and a large equipment repair and development shop.

Clyde Fickes, Art Kahl, and I returned to Missoula. I had only been home a few weeks when the Major got in touch with me again and asked if I would head up a Division of Engineering on the Guayule Project, which was being expanded. Since the greater amount of seed made available by the new seed collector was sufficient for 200,000 acres beyond the previous authorization, Congress had increased the authorization from 75,000 to 500,000 acres. This meant that a much bigger and continuing organization was needed.

I told the Major that Art Kahl and the rest of our gang had sold him a bill of goods. I truthfully told him that they were the ones who made the accomplishment possible. I told him that I would be happy if he turned the job over to someone else. He insisted that he wanted me, so off I went again.

Our Division of Engineering was staffed by Forest Service Engineers from several Regions. We also obtained a rubber chemist from Firestone and a few other engineers from outside the Forest Service. Our organizational procedures were not traditionally Forest Service. We had the counterpart of Regional Foresters, but they operated mainly in a coordinating capacity. They also "fronted" for the project locally. The technical work was run

from project headquarters by each division. I believe that we could never have accomplished the work, which I will now relate, if Pete Kiplinger had not sold this type of organization to the director. (It was later changed to the traditional type of organization after the major engineering work was accomplished. This resulted in poorer technical supervision.)

This account of the Guayule Project would be too long for use in our Engineering memoirs if I related all of the interesting sidelights that occurred. I will, therefore, summarize the results of work to meet our objective of planting 208,000 acres by the spring of 1944. I will also cover related accomplishments.

In nursery construction, we expanded from 540 acres to 2,075 acres all under overhead irrigation. Each nursery we built was the largest in the world. The new nurseries were located near Oceanside, California; Indio, California; Phoenix, Arizona; Los Pasos, Texas; and Brownsville, Texas. This stretched them out along the so-called Guayule Belt, which was a strip approximately 100 miles wide extending along the southern border of the country from Sacramento, California, to Brownsville, Texas. Water for most of these nurseries was obtained from deep wells. Two used surface irrigation water from ditches. In the Brownsville Nursery, we used natural gas to propel the pumps. We had problems of filtration and purification of the water from ditches. We learned a lot about well drilling and well-forming technology, which varied from area to area.

About 17 labor camps were built. Some were large enough to accommodate 2,000 people. The smallest was a 400-man camp. Sewage disposal and water supply were major problems. In the largest camp, we used an Imhoff tank with a rotating-arm, rock filter. The standards of these camps were better than usually provided farm labor in many areas where we operated. The usual accommodation for a family consisted of a 14 by 14 room with concrete slab floor, a stove, a bed, and no plumbing. If the family was large and had mixed sexes, two rooms were allowed. People lived, cooked, and slept in these cells. For each building of about 16 such cells, we had a central slab where cold water taps and garbage cans were available. A camp of 400 would have one central clothes-washing and bathing facility. Large camps had more. In spite of these meager facilities, the project received much criticism in the press, from political rostrums, and on radio. The criticism was largely generated by wealthy farmers in the central valley of California. They were apparently afraid that we would raise standards of housing for itinerant farm labor. Some had other objections, which will be discussed later. One of the most publicized objects was "baby bathtubs." Actually, in later camps we put in six flat-rimmed kitchen sinks. In order to give the taxpayers their money's worth, the architect labeled them "baby bathtubs." We had found that babies don't like to be bathed under a shower. Our peak payroll of workers was 9,000.

We were constantly trying to upgrade facilities and work methods. Some of our engineering effort was directed at systems of collecting shrub samples from field plantations and assaying them for rubber content. This involved a redesign of the assay laboratory. We also completely redesigned the seed treating facility and reduced labor about tenfold. Also, we contracted out designs of planting machines and other farm equipment. The best of these

designs could usually be improved by our developmental mechanics, Bouck and Allen.

On the project were engineers from other agencies. We had water supply engineers working to evaluate economics and suitability of water on land available for lease. We also had irrigation engineers from Agricultural Engineering. These people contributed a great deal to improving irrigation practices in the Southwest. These practices are still being used.

We had two steering committees to guide research, one on biological matters, and the other on rubber extraction. I headed the latter, which was labeled "The Committee on Concatenation and Integration of Research and Development on Rubber Extraction." George Miller, our rubber chemist, also served. He was constantly working to develop better processes for manufacturing products using Guayule rubber.

Guayule rubber as processed in ball mills was of the same chemical structure as havea rubber. However, it contained about 15 percent resin and about 2 percent ash. The rubber occurred throughout the plant in the fiber structure. It was in latex form in the live plant. The process originally used to extract the rubber was to dry it to coagulate the rubber, chop and crush it, run it through a battery of ball mills in series, separate rubber and bark by flotation, autoclave the skimmings to waterlog the corky bark, separate the rubber "worms" by flotation, ball mill in presence of hot water to wash the worms, float the outflowing material to obtain cleaned worms, dewater on a screen, dry, block, and pack the product in boxes. Each box weighed about 100 pounds.

The research being conducted on rubber extraction involved both the extraction of rubber as coagulated particles and extraction from green shrubs as latex. Extraction efficiencies in the former process could be as much as 90 percent of the rubber present. In the latex process, as high as 60-percent recovery could be made in the pilot plant. The green shrub was crushed and squeezed to extract the plant juices. These were centrifuged to recover the latex. Latex rubber had lower resin and ash content and a higher tensile strength than havea rubber.

Since the urgent uses of rubber for the war effort could use the less pure rubber, most of the research done was to improve the process. Instead of ball mills, paper-making machinery was used. Also, studies to improve flotation and purification were made. Retting of the shrub on a batch basis was developed. Deleafing of the shrub before milling was also developed. (The deleafing and retting were done in an effort to improve quality of rubber without reducing the extraction efficiency.)

An interesting side event in research was a cooperative project managed by the California Institute of Technology, which used Japanese scientists interned at Manzinar, California. For a small amount of cooperative funds to buy materials and equipment, they were able to get some very interesting results. I was liaison man on this project. I met many fine Japanese people.

In 1943, we activated the Salinas Mill to extract rubber from available mature shrub. Ralph Hastings, a former mill operator for the Intercontinental

Rubber Company, was in charge. Shift foremen were mostly former District Rangers. The mature shrub, from which the aforementioned seed was collected, yielded 876,200 pounds of rubber. Another field of 28-year-old shrub in southern California was also harvested and milled along with wild shrub from the Big Bend country of Texas. The latter harvest yielded another 510,086 pounds of rubber.

The rubber was sold to the Rubber Reserve, which distributed it. Most of it went into the inner plies of heavy-duty truck tires. The industry was not able to cope with the high hysteresis in synthetic rubber, which caused deterioration of the inner plies from which heat could not escape. The Guayule was mixed with buna synthetic for this purpose.

In March 1943, the Rubber Director told the Secretary of Agriculture that no more land should be acquired. He said that synthetic rubber could do the job. He later regretted this act. But, we proceeded to curtail the project. At that time, we had planted 30,000 acres.

In June 1944, we suddenly received orders from Washington to proceed with the building of a second mill. Our extraction research people had not developed a flowchart for a new mill so I made one myself, based on what I knew of research results. I went on the road to buy secondhand equipment. I got most of the milling equipment in Denver. We ordered two new rubber washing mills. In the meantime, we had contracted with a designing firm to prepare detailed plans for the mill. We placed one of our Engineers at the design office to expedite the work.

In order to select the design firm for the mill, we invited several industrial design firms to submit schematic plans based on our prospectus. These firms were to be paid the nominal sum of $500. We were surprised that all firms contacted took up our offer. We made the award to Southwest Engineering. They showed a better understanding of the problems than the others and had demonstrated their ability by making many innovations in similar plants designed by them for ore processing.

The Bakersfield Mill was finished in mid-summer 1945. It contained the conventional ball mills, but the rest of the process was based on research results. During this time also, we improved the Salinas Mill by putting in a continuous rubber drier.

By this time, the Rubber Reserve was frantic. The stock of natural rubber had become practically exhausted—except for some foul-smelling, rock-laden residuals. This put the heat on us to produce. Our goal was 100-percent operating efficiency. As I remember it, we did hit about 99 percent after we had ironed out difficulties at Bakersfield. If we didn't ship 15 long tons of rubber each day from each mill, we had Rubber Reserve expediters on our tail. By this time, the Guayule rubber was being used both for inner plies of tires and, in a 20-percent mix with Buna S, for bulletproof gas tanks for airplanes.

One illustration of how dire the situation was is that the Defense Department had even considered eliminating bulletproof gas tanks. A rubber chemist experimenting with substitutes for havea rubber found that a mix of 20 percent Guayule with 80 percent havea was as good as 100 percent

havea as the expansible sandwich material. The cover and liners of the tank were made of neoprene synthetic.

Early in 1945, the natural rubber supply had so worsened that people began to talk of rubber in pounds rather than tons. They began to look closer at Guayule. By that time, we had about 30,000 acres of 2-year-old shrubs, which could yield several thousand tons even though it had not reached the optimum maturity age of 4 years. The Rubber Czar formed a committee of rubber officials and technicians to investigate the project. After 2 weeks, the committee reported that 11,000 long tons of rubber could be extracted. Four new mills were proposed. The committee recommended that the Forest Service be authorized to proceed to build the mills, harvest the shrub and extract the rubber. However, the Chief was miffed at the vacillations of the Rubber Director and refused to take on the whole job. He agreed that we would harvest the shrub, but that someone else would have to build and operate the mills. This was a disappointment to me because I had already lined up some top designers and construction men to do the job.

The Rubber Director persuaded Firestone to take on the job. He called a meeting in Akron, Ohio, at the Firestone plant. He invited us along with several chief chemists of rubber companies. Our researchers produced their results. We told them of our recommendations. One big question was whether research had proceeded far enough to introduce "retting" and pulp-processing equipment into the process. It was agreed that Firestone would proceed with the design and make it flexible enough to change if a pilot test on full-scale prototypes was successful. I was delegated the responsibility of assembling a pilot plant as soon as possible. I was told to call a certain individual in the Rubber Reserve if people having needed equipment would not release it. We had number one priority in the Nation.

I was able to find the equipment. The main pieces were a rotary cement kiln, which could be modified for our purposes, and four Jordans. The latter were plucked from a production line. The hammermill was already being built under our previous purchase order for trial at Salinas.

I returned to Los Angeles, but immediately set out with Leonard Firestone and some of his experts to view our operations, as well as to select sites for the four new mills. Our rubber chemist, George Miller, was in the group. We not only talked with our operating people, but also with Research.

Firestone assembled about 200 engineers and draftsmen. George Miller and I made ourselves available on call. Design was soon proceeding at full steam.

The equipment began to arrive for the pilot plant. Unfortunately, our Mechanical Engineer, Ed Meldrum, was laid up with a hernia so I had to take on the job. One piece, the kiln, was 200 feet in length and weighed 76,000 pounds. The Jordans, four in number, were huge affairs and weighed about 10,000 pounds each. Rigging companies had all the work they could handle and were not interested in our job. I called George Lours, President of Stolte Company, with whom we had worked on several projects. George said, "Don't worry, I will have a competent outfit down there tomorrow." They arrived on schedule and made the job look simple. Everything was in place at the end of the day.

Noble Wood Manufacturing Company, the manufacturer of the Jordans, made a specialist named Robinson available to us. He was capable and colorful. His conversation was loud and unprintable. We soon had all the equipment set up except the retting drum.

The Jordans would not agglomerate the rubber particles in sufficiently large particles to be recovered by the available flotation equipment. We soon found that our flotation would have to be increased. This was relayed to Firestone, and their engineers decided to use the same flotation system they were using in their reclaimed-rubber plant. This was one contribution we made immediately because we were not satisfied with extraction efficiency at Bakersfield. The young shrub, at 5-percent rubber content, did not process the same as the 20-year-old shrub with 20-percent rubber content.

The design of the retting drum was based on the results of a batch laboratory drum made from an oil barrel. In the laboratory model, it was found that, by controlling temperatures and air flow, chopped shrub could be retted in 48 hours rather than 48 days as was being done in stored bales at Bakersfield. This design of the prototype involved thermostatically controlled sprays on the outside of a long rotating drum. This chopped shrub would be moved along the inclined drum with specially designed lifters. Air flow through the drum would be controlled.

Japan fell in August, and liquidation of the project was begun. The pilot operations, as well as the Firestone design, were buttoned up. Field crops were mostly disced into the soil, and leased land was returned to the owners. I was transferred to the Pacific Northwest Experiment Station.

In looking back on this project, I take a great deal of satisfaction out of the accomplishments of our Forest Service people. They made history. They produced a total of 3 million pounds of rubber critically needed in the war effort. But, this was only a part of the accomplishment. New farming techniques were developed. In addition, many people who gained valuable experience here went back to the Forest Service with improved competence.

Major Kelley had retired halfway through the episode and left Paul Roberts in charge. The Major announced his retirement to the entire staff. He said that he wasn't retiring because he did not feel that he was the best man in the room. He gave three reasons. The first was that he felt that he deserved retirement since his work had interfered with so many things he wanted to do. The second reason was that he felt that older people should make way for younger ones. The final reason was that he could not adjust his thinking to the new economy of spending.

Paul Roberts did a fine job. His lot was to handle emergency problems of which Guayule was one. He had a tough job. We had just gotten organized to plant 200,000 acres when the Rubber Director said we couldn't justify taking lettuce out of production to grow rubber. (The lettuce farmers had "gotten to him.") In a short time, the same official was putting heat on the project to mill out the rubber we had. These are only a few of the many irritations he had to shrug off.

During the life of the project, we had a visit from Senator Harry Truman, who headed an "Honesty in Government" committee at the time. He took one look at our honest faces and did not dig any deeper.

The main congressional investigation was made by a House Committee headed by Congressman Poag, who still is seated in the House. I will always remember Poag's remarks to our detractors at Bakersfield. He had found that their publicity against the project, particularly about the standards of our labor camps, was unfounded. He had seen a "baby bathtub." He really gave them a blistering that day. He reminded them that the country was at war. His committee returned to Washington in time to disrupt a move by the Appropriations Committee to liquidate the project. The end result was that the House of Representatives overruled the Appropriations Committee by an overwhelming majority.

What about the future of Guayule as a source of industrial rubber? It is my opinion that it does have potential for many uses—not alone, but in combination with synthetic rubbers. Research done during the war indicated that much better rubber tires could be built with Buna S combined with about 20 percent Guayule. Production capacity could also be increased considerably by using Guayule as a master batch into which vulcanizing compounds could be mixed, after which the master batch could be diluted with Buna S to desired proportions. Another example of the use of Guayule was in the sandwich part of bulletproof gas tanks. The thing that tends to hold back use of Guayule is that it is not available in large enough amounts to interest industry in experimentation. It could be planted on land retired from crop production. Guayule farming could provide jobs. Why not a rubber bank as well as a soil bank?

In this account, I have tried to restrain myself and have covered only the highlights of the Guayule Project. Our experiences could fill a good-sized volume and make interesting reading. I hope that someday a more gifted writer than I can put such an account together. We mixed with all classes of people from millionaires to poagies, from PhD's to illiterates, from Congressmen to selfish demagogues, and from movie stars to live people from the *Grapes of Wrath*. However, those of us who participated from the Forest Service learned of the real strength within our organization. It was the high point of many of our careers.

Ted Flynn

J.J. Byrne

A history of Engineering in the Forest Service would be deficient if it did not include some mention of Ted Flynn. Ted's contributions in the field of equipment development have been numerous. This summary account of his inventions is taken partially from an article furnished by Bud Wagner, Equipment Engineer, Region 6. The article is entitled, "From Bulls to Bulldozers." It is contained in *Forest History*, Vol. 7, No. 3, Fall 1963.

Ted was born on the banks of the Gatemean River, Province of Ontario, Canada. (The date of his birth is not available to the writer.) He came to the Northwest at the age of 15, where he worked in logging. He later went to school in Portland before joining the Forest Service.

In 1923–24, in collaboration with Ralph B. Moore (John Wood Iron Works) he designed, built, and installed the first double-drum hoist on a crawler tractor. The patent for this hoist was later upheld in a circuit court case, *Willamette* v. *Moore.*

Bud Wagner furnished an old photograph of a blade mounted on a Cletrac tractor that was devised by Flynn. The photo, included here, shows the unit operating on a road on the Columbia National Forest in 1925. Bud Wagner obtained this photo from Walt Lindauer, who worked on the Columbia in 1928. Walt stated that the primary purpose of the counterweights on the levers, attached to each end of the blade, was to balance the blade, and also to tilt the blade by adjusting the weights. Walt told Bud that the operator dragged the blade backwards. Walt also said that, by 1928, a cable lift version was in use on the Columbia. (Note accounts of action in other Regions by Fred Thieme, Howard Jones, Hartley Calkins, and Charlie Young.) Evidently, Earl Hall, Region 5, built the first successful mechanically controlled bulldozer. Also, Region 5 was the first to obtain commercially produced bulldozers.

Another first for Ted's group in Portland was a power-lift pull grader in 1930. Subsequent to this, he developed "a hundred or more" improvements, which were adopted by equipment manufacturers.

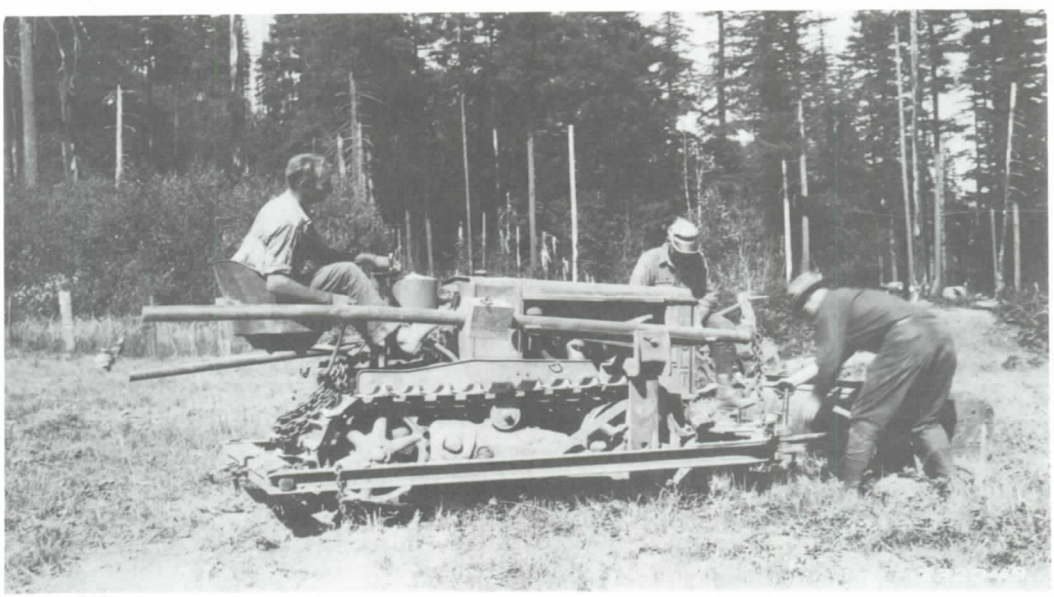
In 1936, he designed and built a midget trail tractor, which he named "The Beetle." This tractor was later adopted by the U.S. Army for its Airborne Engineers.

Around the same time, Ted developed a snow tractor, which was also adopted by the U.S. Army.

He also developed and patented the first adjustable-tooth blade for bulldozers. This was shortly in use on a worldwide basis.

Around 1945–46, Ted developed a logging machine, which he called "The Tomcat." It was designed to replace the comparatively cumbersome tractor-and-arch combination used widely for skidding logs. Although the timber industry expressed a desire for this unit, Ted was unable to get tractor manufacturers to build it. Instead, some companies installed a pseudo-arch on a conventional tractor. None of these were as well-balanced and maneuverable as Ted's design.

This is not intended to be a comprehensive account of Ted's exploits. It is entered in this compilation in hope that people who were more familiar with his work would provide additional information. Also, it is entered to ensure that he is not overlooked since his accomplishments have nationwide significance.



Counterweighted blade on tractor, Columbia National Forest, 1925.

Me & the Forest Service—1935–1961

C.E. Remington

It was in late March 1935 that the telephone on my desk rang in the Idaho Highway Department in Boise and my good wife said, "You have been offered a job as an Assistant Civil Engineer with the U.S. Forest Service at Missoula, Montana." I answered real quick: "We'll take it. Start packing." Her reply was of course that we should think it over, but after taking Civil Service examinations, receiving and refusing offers for lesser jobs for several years, we had agreed to accept the first offer on this one. It was nearly a 40-percent increase in our pay, so we took it and were never sorry!

I reported to Missoula, to the second floor "Bull Pen" of the Old Post Office Building, promptly at 8:00 a.m. on the morning of April 10, 1935. I reported to "Little John" Taylor, then Chief of Personnel, and thence to W.P. Stephenson, Chief of the Road Location Section. I soon found that I was part of a 12- to 15-man class of Truck Trail Locators SP-8, and Civil Engi-neers P-2, reporting that day under the NRA (National Recovery Act) pro-gram to be trained as road locators. We learned that we had been taken from the Highway Engineer Register and given appointments as Civil Engineers, though many of us had been refused the latter rating by CSC because the Forest Service didn't build highways and therefore could not call us Highway Engineers. Our first brush with red tape! Some transferred to other Government agencies as Civil Engineers where they had been refused previous appointments, as soon as they served their probation with the Forest Service.

The class in road location was mostly practical, and only a very little was classroom theory. The classes were held in the area up the river above Missoula. We were shown some staked, "contour" road locations, then formed into parties and did it ourselves—brush cutting and all. We climbed through the rocks and wood ticks along the railroad tracks and were shown more "full-bench" sections in steep cliffs. We made bough-beds, set up tents, read the compass, adjusted the abney level, set up a Kimmel fire box properly, learned how to order groceries, etc. All along it was rush, rush, rush. We were needed in the field, and each day the class grew smaller and smaller until there was only one left—Remington. I was practically broke and to eat well was dependent on being sent to the field. My family was still in Idaho. So I asked, "When do I go to the field?" And came the answer, "We're keeping you here as an instructor for the later classes!"

The other classes came, and I was an instructor. I taught other Civil Engineers P-2 and Truck Trail Locators SP-8 how to make bough-beds, pack mules, set up tents, order food, and such things. When the new men asked, "How long have you been with the Forest Service?," and I would answer,

"3, 4, 5, 6 weeks," they would usually go off talking to themselves. I never really heard what they said. Between all the classes from April 10 through about the middle of June of that year, we "graduated" something over 100 road locators. It was about this time that the NRA Eagle crashed on the front steps of the Supreme Court Building and the Road Location Program became one that for the next 5 years was preponderantly CCC, or ECW, as it was known to the knowing.

It was at about this time, the middle of May, that we were given our appointment papers and read that all of us had been appointed "for the duration of the emergency, but not beyond June 30, 1935." No one can imagine the turmoil that those few words caused to the morale of the new engineering group that night. Many a man called his former boss to try to go back, and some actually quit. None of us believed John Taylor when he said, "It's only a form and means nothing." We could read, and we were very unhappy. All of us, and many others, were carried in the "Temporary" status for the next 4 years until the writer, one day, did a little research and wrote a memo showing that the Region 1 Directory had more "Regular-Permanent-T" employees than there were without the "T" after their names.

Then came the evening when classes were all finished and my life had generated into that of a computer, or shall we say, an office engineer, when suddenly on July 2, 1935, something went wrong in the field. A road had been located a few years before, and the crew had arrived to build it. The locator had misinterpreted his standards. He had felt that since he could use a 14-percent grade, anything between plus or minus 14 percent was satisfactory. As he moved ahead and read his abney on his back sight, if it was between those limits, he felt he was A-OK and drove a grade stake! Gravity took him down the hill. The inspector just before construction said, "No!" He phoned Steve and said, "Send out Remington—he ain't doin' nothin'." I drove like mad to Deep Saddle on the Lolo Trail and next morning started on a set grade at the saddle of −8 percent and tied in to the former locator's grade at the bridge site on the same uniform grade 1 1/2 miles later, at noon, and slopestaked it in the afternoon—1 1/2 miles of completed location in 1 day! My crew all quit that night as I went back to Missoula for the Fourth of July.

After the normal Fourth of July holiday in Missoula, it was decided that there should be a training party for Assistant Locators. In those days, a normal Road Location Party in Region 1 consisted of a Locator, and Assistant Locator, and three helpers, and there was a general shortage of capable Assistants. It was also determined that Remington should take a party made up entirely of college students who were potential Party Chiefs and train them by actually surveying a road project. The project selected was the road up Kelly Creek from the Kelly Creek Ranger Station to the mouth of Cayuse Creek, thence up Cayuse Creek to the Landing Field. The survey was made in July and August 1935. The road was started that same summer, and about a quarter mile was built. In 1969, nearly 35 years later, the road has not been completed, although there is a real good survey there. I know—I made it myself.

While on the Kelly Creek Survey, the Missoula personnel office notified me that my fingerprints were poorly made and for me to report in for a redoing. I walked to the end of the road—2 miles. There I expected to be able to

be driven or to drive to the Ranger Station, but no!—I didn't have a driver's permit, and no one could be spared to take me to the Station. I walked the 30 miles to the Ranger Station, where I spent the night. Next day, I rode with the mail truck 60 miles to Superior, Montana, and hitchhiked the other 60 miles to Missoula. Next day, I had my fingerprints made, and the Survey Inspector (Hollis Stritch) took me back to the project. The second set of fingerprints were no better than the first. The day after I was in Missoula, it was decided to transfer me to the Coeur d'Alene National Forest as Forest Engineer, and the second Survey Inspector (Jack Hamblet) and my replacement (Chris Taft) followed us to Kelly Creek and thence on foot over the pass, 10 miles to my Cayuse Landing Field camp, to take me back to Missoula. Now it's the middle of August 1935, and my experience is broadening.

I wasn't really the Forest Engineer on the Coeur d'Alene, even though my record so indicates. I was so assigned for the record, but detailed to the Idaho State Forester as the CCC Engineer on the North Fork of the Clearwater River at Ahsahka, Idaho. I was sent from Missoula to take charge of a State location party to survey the road up the North Fork from Ahsahka through the location of where the Dworshak Dam is now located, thence past Dent Post Office and on up the river. The road, as I cleared Missoula, was to be a Class 4 road, a single-track, surfaced road. While I was en route to the project, I learned that the Regional Forester had decreed that there would be no Class 4 roads built in the Region, and I was to locate a Class 3 road, single-track, unsurfaced. Upon arrival at Orofino, headquarters of the Clearwater National Forest, I was advised by the Chief Forester for the State of Idaho that he planned to build a Class 5 road, double-track, surfaced road. Now what was I to do? I asked Eldon Myrick (Supervisor of the Clearwater) for advice, and he relayed my request to Fred Thieme, the Regional Engineer. The reply was, "Tell him he is to locate a Class 3 road, and it's none of his damn business what they build." So be it! My road could be classed as having poor Class 5 alignment, but good Class 3 alignment, and since it was on a water grade just 5 feet above the 1933 flood, the grade was good, but more about the survey later. My survey assistant was Dewey Carrico, a native of Orofino.

There were two camps on the river, and our survey crew was locating road for both of them. They were both planned for winter camps that would be in the backcountry on blister rust eradication in the summer. When we arrived in the lower camp site in late August 1935, we greeted a 25-man spike camp set up to clear the camp site and put in wood for the winter. We all worked helter-skelter all fall trying to beat the rains and get a start on the heavy rock road construction.

The Camp Superintendent was a man who had had a great deal of trouble with the military at his previous camp, and both the civilian and military organizations were at each other's throats at the slightest provocation. Generally, "Hoppy," the Superintendent, was too smooth for them, and camp commanders came and went with regularity. The civilian organization in the camp consisted of machine operators, steel sharpeners, and shift foremen sufficient to operate the camps on a two-shift basis. This was probably the last road job in the Region to use conventional steel instead of detachable bits. The organization was generally under the supervision of the Idaho State Forester, but the mechanics, all equipment, and the Engineer were

supplied by the Forest Service. It was a weird setup, but believe it or not, it moved more rock per shift or per month, or per any other measure, than any other camp in the Region for the entire winter.

Came the spring of 1936, and the main camps were scheduled to go back to the woods to build roads or work on blister rust. So it was decided to see if some sort of organization could not be left on the river to carry on the road construction. Several strategy meetings were held, and on June first, I was placed in charge of a 107-man spike camp on the river to continue a two-shift road construction project. The 107 men were drawn from three main CCC camps with none of them really in charge, but the military man from the headquarters at Lewiston was assigned. He was a Marine Reserve officer and, as a civilian, was postmaster in a small town in Oregon. We had a lot of work to do. It was hard work. We couldn't do it on the weekly issue of "brushes and GI soap" we were getting from each of three parent CCC camps. Something had to give, so we had a meeting with the Army on a Tuesday, and they said, "If you don't like the way we feed, why don't you feed them?" We said, "We'd love to—when can we start?" They replied, "July 1." That was the following Thursday at 4:00 a.m. for breakfast. We agreed—stole a cook (Chet Chilton) from blister rust headquarters at Pierce, made a rush order to Spokane for two truckloads of groceries (in spite of a going fire), and served an excellent breakfast and regular meals the rest of the summer. We did it all, except for the cook's wages, well within the Army's allowance for food! Production more than doubled, and morale was the highest in the District. (My CCC baseball team won the District championship.) For example, during June, our jackhammers averaged 58 feet per hammer per day (two shifts), and in July they averaged 120 feet per hammer per shift. M-K Company sent their foreman to the project from the South Fork job to see why we were moving more rock than they were. It was our well-fed Chicago boys who, years later, would see me on the street in Chicago and climb off their trucks to shake hands, and let traffic pile up. Some things are worth remembering!

But fall came, and changes were made. Our Chicago camp was changed for an Arkansas camp, and the main camp came back to the river, and it came time for Remington to get on with his engineering. It was at about this time that the camp had its first real inspection from Engineering. Thieme was on the Clearwater and in a meeting with the State Forester (Jack Foster) to decide what I should do and to look over carefully what I had done. After supper in the evening, he asked me what yardage had been moved on the project to date. So help me—I couldn't help it—I said, "Mr. Thieme, you remember when I came to this job you told Eldon Myrick to tell me that I was to stake a Class 3 road and it was none of my damn business what they built?" He said, "Yes, I remember that, but I would think that any engineer with a little curiosity would wonder what was going on on the job." I said, "My curiosity has led me to wonder that, and I can tell you now how much has been moved up to last night. If you will wait a little while, I will tell you how much was moved up to 5 o'clock this evening." We gave him the figures. They were impressive, and he was pleased.

It was agreed that I would take my survey crew to be enlarged by a cook and another instrument man and start the survey on up the North Fork of the Clearwater River above the spur road that had been built above Dent Post Office. Before he left camp, Fred told me, "As soon as you feel that

you can leave the survey, you come to Missoula." On February 1, 1937, I felt I could leave, so I moved to Missoula, Montana, the same place where I had reported nearly 2 years before, but this time I had no orders—had shipped my books, etc., on a GBL without authority, only Fred's telling me—and I and the Fiscal Agent had our first falling out.

The first few months in 1937 were spent designing the portion of the North Fork Clearwater road that we had surveyed in the early part of that winter. The design was a continuation of the water grade working on an improved contour location, improved as necessary to bring the alignment within that for the required standard. This was the system followed for the surveys from that period on in Region 1 and later in Region 6.

For the first few months in 1937, I wondered why I had been returned to Missoula. I worked steadily and watched as new engineers came into the organization, but I had no specific duty. One day, Fred Thieme called me into his office and inquired as to how the new Engineer on the Beaverhead (Dallas J. Houston) was doing. I replied that I had no idea. His answer was that I was supposed to know—that was what he had called me in to Missoula to do! I thanked him for the instructions, advised W.P. Stephenson of my new job, and started to travel Region 1 as Engineering Inspector. There were 77 Engineers in the field that summer with their parties, and looking to their problems was interesting and exciting. I learned as much as they did.

This was the first year that Region 1 started to hire P-1 Civil Engineers and train them, instead of the P-2 and SP-8's they had hired in the years previously. 1937 was the year the Region began using the larger (14- to 16-man) survey parties. It was the plan that a larger party would not have to work over the same ground again and again as a smaller party must. The transit party could move right along setting the preliminary line, followed by the leveling party, and this, in turn, followed by the required number of cross-sectioning parties. There were three such large parties organized that year, under Haines, C.V. Nelson, and Ingebo. The idea continued in a reduced way for several years, but Haines' party was the only one that really survived intact for about 3 years. C.V. Nelson became Forest Engineer on the Kaniksu, and Ingebo became Office Engineer in Missoula.

The Haines party, for the 3 years they were in operation, completed an average of about 100 miles of completed P-line survey each year. Morale on the crew was the highest of any crew ever employed in the Region. Stories of happenings on the crew would well fill an interesting book by itself. One requirement to be a member of the crew was that the man must be a good baseball player. Normally, the crew took a half-day of annual leave each Saturday morning (we worked a 5 1/2-day week in those days) and would travel all Friday night and Sunday night to and from someplace—Billings or Boise or Walla Walla—to play baseball. It was not unusual for me to go to the ball park in Missoula on a Saturday evening or Sunday afternoon and find "my" survey crew, which I thought was a hundred or more miles away, playing the University Store team in Missoula. They were good—played far better than .500 ball, and that's what we always hope for the Senators!

During the 1937–38 period, we developed a performance rating system for Road Location Party Chiefs and Forest Engineers that was unique but extremely satisfactory. Each man was rated on 22 items, and the entire group was rated both by the Forest Supervisor under whom he worked and by me. The group was rated relatively as to where each man stood on each of the 22 items before being given a summary rating.

Everyone who was familiar with the entire group of Engineers was amazed at how well the mechanical method corresponded to their perosnal ratings. All the Engineers were assigned and rated by the Regional Office Division of Engineering, although some worked yearlong on a National Forest. It was proper!

During the summer of 1937, it was decided to oil the road from Highway 10 to the Remount Depot west of Missoula. The roadway was a two-way road and had been graveled with the original construction in 1935, and was well compacted. At that time, the Montana State Highway Department had a policy of only applying a heavy sealcoat of oil and chips on their roads, and were experiencing large amounts of breakup each spring. When I was told by Fred Thieme to proceed with the oiling of the Remount Road, "The Major" (Regional Forester Kelley) took a very dim view of that project. He called me in and asked, "Is this to be one of those jobs that you will do over and over again each year?" I answered very promptly, "No, Major, when I do this job, it won't ever have to be done over again." He was surely taken aback and of course did not believe it. I'm sure Fred Thieme didn't either. However, we applied a good road-mix oil job to the road right on top of the good gravel base—something I had done for several years for the State of Idaho. In 1938, after it was well set up, we applied a good sealcoat to the surface, and as fast as I can learn in 1968, some 30 years later, my promise to Major Kelley is still good. It has stood up well with only normal maintenance.

Early in 1938, there came a request from the U.S. Congress, through the Washington Office, for examples of Forest Development Roads, "where value had exceeded their cost." This was known at the time as the "House Roads Committee Report." The same request probably went to all Regions. Preparation of the report was assigned to me. We examined roads whose primary value was for timber, recreation, grazing, and fire. In most cases, it was simple to find the actual cost to the Government for the construction and relatively simple to determine or assume a supportable value. For roads built primarily for protection, it was difficult to assign a value to the actual suppression. In this case, we reported on roads where a good road and trail system had made good "initial action" possible. We examined Forms 929 for all the fires since the forms were required. We read diaries for the 1919 blowup, etc. The best example of a road and trail system making good "initial action" possible was on the Pete King Fire on the Selway in 1934. We did not include in our report that the fire was burning over 160 acres when the first man arrived a few minutes after the strike, nor that the fire burned 250,000 to 300,000 acres before it was put out. That wasn't part of our report request.

At the Remount Fire School in the spring of 1938, there was a strong urging from Fire Control and from the Regional Forester for people to try "new methods of fire suppression." Why not use the bulldozer, the airplane, and

other innovations? The general complaint was that if "one tries new methods and fails, he gets fired." There were three of us at that school who had just finished a careful examination of records of some 1,400 fires per year for the previous 20-year period. We believed, and said so, that men didn't get fired in Region 1 because of mistakes on fires, but because they were finally "found out" on fires. As a result, the three who took that stand (Hamblet, West, and Remington) were given blanket clearance that they were not to be refused anything they requested when they were ordering equipment for fighting fire. It was an interesting period for the next few years.

Shortly after I started to work for the Forest Service, I learned that Fred Thieme wanted to build a road tunnel somewhere on the Region 1 road system. There were several places on the St. Joe River that tunneling was possible, and one place several miles above Avery, Idaho, where a tunnel should have been built. By the time the road was built that far, they had developed it so far above the river that all of the assets needed by saving on lower cuts and fills had been wasted and the "tunneling chance" was only about a hundred feet long with less than 50 to 75 feet of cover. In other words, had they kept the road down along the river for the several miles they were climbing out of the canyon and then tunneled the reef at about 800 to 1,000 feet in length, there would have been an economically justified chance. Fred was right, but those opposed to any tunnel at all kept on building road until Fred's tunnel opportunity was lost. There were other places that were similar, but Fred was never able to get the "ducks in a row" at the right time. There were several places where roads that had taken over old railroad grades were using existing tunnels.

In 1938, there was a CCC spike camp at Avery, Idaho, building a road up Fishhook Creek to a large body of white pine timber. It was to be a water-grade road to serve the timber and an administrative road for the area of the Forest. The road was being built in solid rock, and the locator had never been over 200 feet ahead of the construction crews. There was a bridge to be built about 100 feet ahead of construction, and the crew planned to build the bridge, and the locator would then plan the road on up the canyon. This was the situation when I came to the project early in February 1938. There had been no "planning ahead." I then organized a crew of "all locators" and we made a P-line transit survey on up this canyon from the bridge site. To almost everyone's amazement, less than a quarter of a mile above the bridge was a section of the canyon where it was impossible to build a road without a terribly expensive "half tunnel" section in which all the material must be hauled completely out of the canyon. Fortunately, the quarter mile of costly road could be avoided by the construction of a 420-foot tunnel directly through the mountain. Here was the ideal location for Fred's tunnel.

Now started 6 to 8 months of the most careful surveys and estimates ever made for a Forest Service project. The Forest Supervisor was adamant that there would be no tunnel. Thieme was equally adamant: "If it is the cheapest thing to do, we are going to build a tunnel."

As the estimator, I was in the middle along with the Regional Forester. It was impossible to give really comparative figures because the construction through the canyon, 20 feet wide at the bottom and overlapping by more

than 4 feet at the top, was probably impossible, as it might dam the canyon and render useless much of existing road and greatly increase the problems above. But costs of the tunnel construction must be well and carefully estimated. Then the propagandists started the story that CCC enrollees could not be used underground. This story had to be carefully run down completely, and it brought the entire CCC officialdom into the act. We found out that CCC's could be used any place as long as the work was handled safely.

Now our estimates had to be based on obtaining capable supervision, which was beyond the wage rates being paid for normal CCC foremen. We had to acquire equipment not normally available to the Forest Service. We had to plan all of this for weather that would be below zero most of the time, and fit a working schedule that normally did not produce tunnels. All of this was considered, and in spite of it all, the tunnel figured to be the cheapest way to do the job. We had session after session with the Regional Forester and explained our findings in great detail. He was hard to sell, but when sold, he was all sold. He called the Forest Supervisor and told him we were going to build the tunnel. The Supervisor's reply was, "You'll build it over my dead body!" The Major replied, "That might be a good idea, but Remington is going ahead with the project."

The tunnel foreman was paid $2,600 per year, and he was an excellent man. The kids loved him. He knew his job, demanded that every man work safely, and had the complete respect of everyone on the project. The project worked on a two-shift basis. The night shift that came on at 4 p.m. drilled and shot a 7- to 8-foot lift, and as soon as that was done, they were through. While CCC regulations prevented "task" performance, there were times when this crew was back in camp before 8 p.m. The day shift did the "mucking" and the other work on the project. Three 370 Ingersoll-Rand compressors, all hooked to one unloader and feeding one receiver tank, supplied the air. They were housed in a heated shed. Fresh air was pumped to the face and exhausted there for ventilation. Drilling was by six Leyner drills mounted on a Truck Jumbo platform.

The face was pulled by an 8-hole vertical wedge cut with instant primers, and a total of 34 holes were drilled to pull the entire face, using six delay caps. The Engineer would paint the drilling pattern on the face each day, and the last job of the day shift was to move the Jumbo into position and level and block it so the night shift could start drilling. The tunnel was short, and the wedge cut and six lifters resulted in scattering the material a long way from the face at each shot. A dozer was used to push the material back to the face each morning ready for the air-operated shovel. The tunnel was a 20-foot horseshoe section, being 20 feet high and wide.

We went underground about the middle of January 1939, and the Forest Supervisor was there to witness that shot. His question that day was, "How soon are you going to finish this ____ tunnel so we can get on with building the road?" I answered that we would finish the tunnel on May first, not really being as certain as I wanted to sound. His reply was, "I'll bet you a hat you're in here messing around on the Fourth of July." I replied that I felt it unsafe to bet because he might shut down the job to win a hat. On May first, I went to the project because there was a curve in the alignment and the Engineer was worried that we had "curved him into the mountain

permanently." As I walked into the tunnel, I saw the Supervisor standing there, and I spoke to him above the din of the drilling. One of the CCC boys on the Jumbo saw me and came down and handed me a detachable bit and said, "Here's a souvenir. I just poked this one out into daylight"—meaning the tunnel was completed. I thanked him and turned to the Supervisor and said, "See, it's the first day of May." He walked away without a word. He came later to think a lot of the only tunnel ever built by the Forest Service and by CCC, and many is the visitor to the St. Joe National Forest that he personally detoured that way just to see "Fred Thieme's tunnel."

The original estimate of the cost of the road through the canyon was $57,940, and the cost of the road through the tunnel was $50,761. In the original estimate, the cost of the tunnel excavation was figured to be $4.11 per cubic yard, including all equipment depreciation and engineering. The final cost of the tunnel excavation was $3.95 per cubic yard, including actual depreciation and engineering costs. The original quantity of tunnel excavation was computed at 5,125 cubic yards, and the final quantity was 5,613 cubic yards. So the tunnel was estimated to cost $21,064 and the final cost was $22,185. As has been said before, "That's pretty close for Government work!" The "swell" on the tunnel rock saved over 2,000 cubic yards of rock excavation on the road section and the $1,500 included for the cost of surfacing.

It may be of interest to some to know that the CCC crew worked 130 shifts on the tunnel, 65 drilling and 65 mucking. Drilling shifts averaged 3.9 hours, drilled 2,207 holes, 20,085 lineal feet, and used 9,368 bits in 413 feet of 20-foot tunnel. They used 506 instant caps, 1,732 delay caps, and 23,745 pounds of powder to move 5,613 cubic yards of solid rock that became 8,382 cubic yards of loose rock in the fill. All in all, 1,097 man-days were used in drilling and 736 man-days were used in mucking and grading—all accident free!

On occasion in this story, I have mentioned safety in connection with the Fishhook Tunnel job. We held safety meetings with all the crew before the tunnel was started. Every man was equipped with a hard hat, perhaps the first for the Forest Service (November 1938). Each man was impressed with the fact that this project was the first time CCC's had been used underground and that continuation of this caliber work depended on the way they conducted themselves on the job. The result was that there were no accidents on the Fishhook Tunnel job: no deaths, no broken bones, no bruised fingers—no accidents. The seals on the four first aid kits that were available on the project at all times were unbroken at the end of the job. Fred Thieme came to the job one afternoon between trains at Avery and planned to come into the tunnel to see me. He'd just started in when a young CCC said, "Where do you think you're going?" Fred replied, "I'm Remington's boss and I'm going in to see him." The reply was, "*I don't* give a damn who you are, Mister; you don't go in that tunnel without a hard hat. Here's mine." Fred never forgot that, and when you have that kind of safety consciousness, you don't have to worry.

The tunnel was completed on schedule and almost exactly on the estimated cost. The CCC spike camp overhead was charged entirely to the tunnel project although only about one-half of the enrollees worked on that project.

Only those who worked on the tunnel and drivers, etc., we charged to the project. All gasoline, oil, and rental of equipment, and an allowance for depreciation for equipment that could only be used on the tunnel, was charged. Every effort was made to assure that the project was properly "costed," and it still came out below the estimate. I am sure that if a cost-benefit study could be made of the savings that have resulted in the hauling distance of about 3/8 mile that has resulted for the millions of board feet of white pine logs that have moved through the tunnel in the last 30 years, it would show that the job has paid its cost many times over.

With the tunnel completed in the summer of 1939, things sort of quieted down around Region 1 Engineering. As a result, it was decided that Remington and George Duncan would divide the Region and each be responsible for all location, construction, and maintenance activities in their respective areas. It wasn't any real split of the area, but each of us traveled pretty well over all of the Region and "hot spotted" as well as maintained a routine schedule. There were 33 CCC camps in the Region and only a relatively small "hired crew" program.

By this time, it was becoming easier and easier to get me on fires, and I served as Sector Boss and even Fire Boss on some of the larger fires in the Region. I learned what it means to be told to "take 350 men and hit the stinger end of a running fire in Ceanothus" and be expected to put it out and still have 350 men ready to eat their double lunch at noon. I also learned the satisfaction of having done it and the endless gratification of telling about it for years afterwards. This was the year that Region 4 had so many fires early in the season, and by the time the Region 1 season opened up, the Spokane warehouse had replaced all of the sleeping bags shipped to Region 4 with new ones. I slept many a night on fire in 1939, and I think I slept in a new sleeping bag each night!

The year 1940 was eventful for all us. It started out as quiet as the others, but it appeared that there would be a shortage of money. Early in the year, I had decided that I had paid rent long enough and, like many Forest Service employees before me, started to build a house. I had lots of good advice and much real help, but right in the middle of everything, it was decided that I should take a large location crew and survey the road on up Fishhook Creek above the tunnel and into the Basin. It was to be a hotshot crew of experts, and we moved onto the job right after July 4th. I had boarded up my house for the summer.

We had hardly gotten started on the survey when the famous July 12, 1940, electric storm ran through the Region. It set some 1,690 fires across the Region in that one night. When one considers that the average seasonal fire load for the Region from 1910 to 1940 was 1,400 fires per year, it is realized just what that load of lightning fires meant to the Region. Our crews were ordered back to the Ranger Station at Avery. All the crew was dispatched to fires, but I was held for the possibility of a crew fire and put to bed. Thirty minutes later, I was awakened, given 75 men to guide to a fire, and then told to leave them and contact some 10 to 15 other fires where there was no communication, and report in. This was 4 a.m., and I completed my task and phoned in at 5:30 p.m. There was a message: "Take your survey crew and go over the hill to the nursery and meet a 100-man unit there." I gathered them up, and we went to the nursery, but there was

no crew. We were told that we were expected at Plains, 60 miles north. We arrived there and still no crew, but were told that now it was two fires at Pleasant Valley, another 60 miles on north. We arrived at the fire and found a messenger who said, "Take your crew and go to Missoula." So with 1,690 fires, we never found one to fight for 3 days. When we did, we had to walk 28 miles to get to it, and after the fire, I never went back to Fishhook Creek.

The rest of the summer, I worked in the office at Missoula, fought a few more fires, and continued to drive nails in my house. All of this time, the Army was flirting with me because I belonged to the National Guard and was on inactive status. I could not learn whether the Congress was going to call all of the Guard for a year's training or just the active units. I wrote letters and made phone calls, all to no avail. On September 8, 1940, Congress passed the bill, and a few days later, the President ordered all "National Guard—active and inactive" to active duty for 1 year effective September 16, 1940. I packed up the things on my desk into a footlocker, put them into the dumbwaiter alongside my desk, and sent them to the storeroom in the basement, supposedly for 1 year. As a parting shot, I took three papers (magazines) from my "In" basket and threw them on top of the stuff in the footlocker. My house needed about 3 weeks' work, mostly painting, so in true Forest Service fashion, I left my wife and two sons to finish off the work and became a first lieutenant in the headquarters of the 116th Engineers, 41st Division, for what was supposed to be a year's active duty. I think that I was the first officer called up from the Region, and as a parting shot, someone said, "I hope that when you come back, you outrank the Major." What a horrible thought for anyone to have had in September 1940!

Of course, a book could be written about the next 5 1/2 years, but that is not the purpose of this story, so a few incidents will have to do. As anyone who had eaten in as many good Forest Service camps as I had in the previous 5 years, and hired as many good cooks, I found it hard to put up with Army food—even in the so-called "officers mess." I complained and then I kicked, and finally the good Colonel responded that, "If you don't stop complaining, I'll make you Mess Officer." I responded that if I could hire one of four or five cooks I knew, I would take the job. So I sent a wire to Chet Chilton of Orofino, Idaho—remember, he was the one who rescued me in the CCC mess deal. I asked him if he was interested, and he wired right back, "I'll be there Wednesday." So I was Mess Officer, not only for the Engineers, but for the entire "Special Troops" portion of the Division, about 75 to 80 officers. They never had it so good! They still talk about how they ate when Chet was their cook.

Another time, it became known that I had experience as a firefighter with the Forest Service, and I was immediately made Fire Marshall for the corps. It was on the Los Padres National Forest in California, and the local Ranger thought I was crazy because I always sent my entire 30,000-man crew to a fire. He didn't understand that we were all trained firefighters and wanted to "stomp out the fire" and get on with the training that we could not do when a part of the outfit was fighting fire. Then there was the time the Commanding General of the 41st Division sent a wire to McArthur and said, "Will approve Remington's permanent assignment to your headquarters if you will send us a 3/8-yard shovel." That story has been told many times to

illustrate the fact that often a machine is worth more than an officer, but I have as often replied that McArthur sent them a 3/4-yard shovel—twice what they asked for. Who else in the Army can look in the catalog and find out exactly what he was worth in September 1942?

The war went on, and I used my construction experience in the Forest Service to excellent advantage, and finally ended in Army logistic requirements where I was used to develop supply availability as the war in the theater accelerated beyond the planned rate. I was in Washington as an expediter, with a large group of trained officers at each shipping port, when the war ended rather abruptly. I had had enough and couldn't wait to get to Fort Lewis, where I could be processed out and get back to Missoula and forget it.

One thing I had overlooked was the law that said that at the end of the fighting I would revert to my old status as a first lieutenant in the Idaho National Guard. But I had been a lieutenant colonel in the Great War! So I took a reserve commission to protect my rank, and at that time Congress also passed a law that said, "20 years as a reserve officer and you can retire on some pay." I, at that time, had 14 years' service, so decided to try and last out the 20 and broaden my retirement base. Everyone tried to talk me out of it, but I worked hard in the reserve unit in Missoula and, like a good soldier, earned my points. I even did some correspondence work.

On the third day of December 1945, having been cleared so that I could go to work for the Forest Service while on terminal leave from the Army, I reported back to the third floor of the Federal Building and went to work. I called Modlin in the basement, and he sent my footlocker back up to the same desk I had left over 5 years before. I opened the footlocker, took out the three magazines, initialed them, and put them in my "Out" basket. It wasn't very long until Gisborne, next on the list, came down the hall asking, "Where in hell have these papers been for the past 5 years?" They were not really important, but Giz had missed one of them!

Settling down to routine Forest Service work wasn't to be my lot for very long. First, there was the matter of settling into the organization at the position I had left. The Government had assured that the soldier absent in the war would get his promotion, but he did not get his Ramspeck promotions—something that had not been in the rules when he went away. So while I came back to the same higher grade as those who had remained in place, they were at a much higher salary level. After awhile, this was all corrected, and we settled down to our positions. I was Chief of Roads and Trails, and on the organization chart, was Assistant Regional Engineer. I enjoyed that assignment because Fred Thieme demanded high engineering standards, and a careful review of Region 1 during the 1935–50 period will show that he usually got what he demanded.

Early in 1946 came the National Housing Administration (NHA) Program of road construction and perhaps the longest period of uncertainty the Region ever knew. There were rumors and rumors of money to come and programs to be started. Region 1 was far ahead on location and design and ready to organize crews and start work. Contracts could not be awarded nor crews hired because funds were not there, so all we could do was wait. Finally, early one Monday afternoon, word came through that the money was ready

and we could go, but the fiscal man did not have the "Green Sheets." However, on the following Thursday, an Engineering Inspector from Washington arrived and proceeded to give us hell because we were not well under way. In fact, he sent a report to Washington that Region 1 would not be able to spend the $3 million allocated. In due course (a couple of hours later), we had a phone call from Granger asking whether or not they should withdraw the money and how much we would be able to spend.

The Regional Forester (Hansen) called me to his office where he had the ARF's, including Thieme, and told me of Granger's call and asked me if we could spend the total amount allotted. I told him that of course we could spend that amount of money in the time allowed, and if they had twice that much, or any other Region had trouble spending their money, we would take that too, and spend it in the same period. He said, "What makes you think so?" I replied, "We have 17 of the best spenders in the Forest Service, and if it is a question of spending the money, just show it to us." He said "thanks" and sent me back to work. A few minutes later, I learned that Fred Thieme had given him the same general idea. We received our share, and later almost half again as much, and spent it properly. We built some 96 projects by force account and by contract, and to the best of my memory, only one had to be completed by the bonding company. We ran four force account crews from the Regional Office in addition to the many Engineering location and design crews. It was a busy and hectic period until 1948, when it was further complicated by some extensive flood damage.

In 1948, there was a change in command in the Engineering Division in Washington. At the start of the year, Norcross retired and Tony Dean from Region 5 succeeded him. Other changes were made, and in the course of these, Remington was offered the chance to move to Washington to replace Kennedy, who was moving to Philadelphia. At almost the same time, I was offered the opportunity to be Forest Supervisor on the Cabinet National Forest in Region 1. I was torn between the choices because it really meant that I might be choosing between a permanent, strictly administrative, career and one that would give me a chance to be partially, if not totally, in Engineering. I had heard terrible things about living in Washington. It was lateral transfer; no promotion was involved. I received a lot of advice, but Gisborne was the one who finally said, "Go to Washington—that is where the action is. You will never learn anything as a Supervisor." I took his advice, but never had a chance to learn how good it was.

The first 3 years in Washington were routine. I traveled a lot and learned a lot about the Regions and the workings of the Forest Service and Congress. I never learned to write a letter that would be signed until it had been rewritten from 10 to 50 times, not because it was not a good letter in the first place, but because it did not contain the thoughts of enough people at the first writing. I did learn the blessing of shortness in initial attempts, however, and found that many pages of paper could be saved in rewriting if the first draft was limited to less than one-half page.

Another thing I learned in Washington was the ease of keeping abreast of a commission in the reserves. There were many, many reserve organizations meeting in Washington every evening, and I could "make my points" quite easily. All I had to do was be sure to keep up my annual 2-week trainings, and I was slowly but surely earning my way toward the reserve retirement

award. About March 3, 1951, I went to the Office of the Army Chief of Engineers for a 2-week active duty. After I was well settled there the second day, the Chief of Personnel said, "You get over to the Pentagon and take a physical. We are going to keep you on active duty." I did, and they did, and on February 28, 1954, I was again released from active duty and returned to the Forest Service. I reported the next morning, March 1, 1954, at Portland, Oregon, as the Assistant Regional Engineer for Region 6.

I arrived in Region 6 in time to be whisked off to the Wind River Experiment Station, where a Forest Engineers' meeting was in progress. There were representatives from every Forest, from other Regions, and of course, from many other Divisions of the Regional Office. My first reaction was that here was real engineering setup—what is all the talk I had been hearing about Region 6? For the year or so just before my release from the Army, I had carried on a lot of correspondence with Roger Nelson about his problems with trying to develop a stronger Engineering organization. Since it had been well established that early that I was Region 6 bound as soon as I could get away, I counseled him to hang on until I made it. Region 6 had made it a practice for years to assign any forestry graduate—and many who were not graduates of any school—to the position on the Forest of Forest Engineer. Many carried the title whether they wanted it or not, and whether or not they might have graduated from the only two schools that claimed to graduate Forest Engineers—Oregon State and the University of Washington. As a result, even after I arrived in the Region, you could count the actual graduate Engineers on the fingers of one hand and still have enough left over to scratch with! This, in the Region with the engineering work load that is probably the equivalent of the balance of the Forest Service combined.

At the time of my arrival in Region 6, there had just been completed a study of the equipment management setup for the Region. Prior to this time, it had been a completely centralized setup with branch shops at the various places around the Region, operating under the Selwood Shop in Portland. The Selwood Shop had an organization of some 60 to 70 mechanics, and each branch shop had a smaller contingent. They had complete control of all equipment and, in addition, maintained an equipment development center that was second to none in the Service. All of this had come to a screeching halt in the spring of 1954, and the RIF actions were very difficult to accomplish. All of this was brought to finality in good order, and the small remaining shop was left in Portland with repair mechanics left on each Forest. It developed into a good working plan, probably because of the good relations enjoyed by Waggoner with the various Forests, and not really because one type of organization plan is better than another. It should serve as a warning to the great centralized shops, however, that when you are overhauling equipment merely to keep your organization working, it is time to look it over and break it down. There is also a tendency in smaller shops to bring a tractor into the shop in the fall and tear it apart. Then when they can't add up a total of 8 hours any day on the job card, to just charge an hour or so to the tractor! Isn't that so?

My first step in recruiting Engineers for the Region was to visit the Engineer School at Oregon State University at Corvallis. I was well acquainted there and found that no representative of the Forest Service had visited the Engineering School before. I did find a letter from the Forest Service

Division of Personnel Management on the bulletin board. I read the letter very carefully and found that it pointed out to the prospective graduate employee that he could be given only a temporary appointment and that if he failed to gain Civil Service standing within 3 months, he would be dropped. There were literally dozens of letters from other Government agencies on the same bulletin board that never even mentioned the possibility of a temporary appointment, even though it was technically correct. I very carefully removed the technically correct (and laughed at) Forest Service Personnel Management letter from the board and took it back to Portland before I was asked to explain it to prospective students who, at that time, were dropping out of engineering and enrolling in wildlife management because they wanted outdoor work!

Road design in Region 1 had developed from the older, direct contour type of location to one in which a P-line was run that would generally approximate the contour location, but from which an accurate contour location could be projected on paper. This location could then be "improved" by rolling the grade and using curvature within the limits of the standard adopted, and developing a center line location that could be staked by offsetting from the original P-line stakes. This procedure was adopted completely in Region 6 and was taught to our location and design schools conducted each spring in Portland. These schools became so popular that it became necessary to hold two each year, and the methods were taught to Forest Engineers at the School of Forestry at Corvallis and to other Government agencies. It is the fastest and best way, I believe, to obtain good field data and transfer it into a proper Forest Service road, or for that matter, a military road. It results in a contour road brought up to a standard rather than the normal BPR method of locating a super highway and then trying to bring it down to a standard—an extremely expensive method of building roads.

While at Region 6, I found that I had much more time for extracurricular engineering activity than at any other time in the Forest Service. I was second-in-command in Engineering, but it was rarely necessary to take active part in operation of the branches. As a result, I had much time for Washington Office details and for dealing with such things as nationwide equipment management meetings, etc. During the 5 1/2 years I was assigned to Region 6, the record will show that I spent over 1 1/2 years on detail to the WO. I organized the annual meetings of the equipment managers and helped them develop some uniformity in their procedures and specifications. We worked with the trail equipment people in the development of construction equipment and utilizing the same equipment on fire line construction; put on demonstrations in all of the western Regions and in Region 8. Working with Operation in the Washington Office, we traveled to all the Regions and established the use of the Electrical Accounting Machines (EAM) in setting up and maintaining the road and trail record for each. We did pioneer work in the development of procedures for the use of computers in the design of roads. Then, to cap it all off, I was selected to head a study team to work up a job load study for the Engineering function at all levels in the Regions of the Forest Service.

This was a team effort, with a representative from the Operation and Engineering Divisions of the Washington Office. Representatives from Region 4, Region 5, Region 8, and myself from Region 6. We met first in Washington for a month. Here we developed the general rules, and each contributed

his share. Then we were assigned to a room in the furthest corner of the South Building basement to work out our problems. Each man developed reams of pencilled notes, but we were not allowed any typist help. I tried in vain for the assignment of a typist, but none was available. Finally, I asked if I might bring my wife in to do the typing. She had been here a year before to work on the Manual (while I was on detail to the WO) and was on the Civil Service rolls. Personnel immediately gave her clearance, and a phone call brought her here from Michigan the next day at 3 p.m. for a hasty sign-in. She worked hard all the next day (Saturday) and for the next 3 weeks to type the original draft. I might add that I borrowed an electric typewriter from a vacant office that Saturday morning, which I took back nearly 3 weeks later, and it hadn't been missed! After the first draft was circulated and reviewed, there were many changes made, but generally, our second meeting in Portland merely consolidated and assembled the first month's work in Washington. In general, the work of the committee was a very acceptable product. It did have the same hurdle to cross that every study of its kind must meet—it looks awfully large when it is all put down in one place under one cover. It is surprising how close at least one Region (Region 6) is now to the total work load estimated in the first draft of that study.

We had just completed the final work load meeting at the end of 1959 in Portland when I received a letter that I was being offered the Regional Engineer's job in Region 2. I was again torn between refusing the job and taking it. I had turned down a couple of other chances and was now nicely settled in Portland. Our youngest son was just well into college and did not want to move. I was on the fence about that for several days, but finally there was a phone call from Tony, and I started to pack and move again.

I enjoyed my time in Region 6. There were times when it was frustrating, to be sure. We now had dozens of real graduate engineers scattered throughout the Region and were developing a real strong backing among the Supervisors. We had not convinced the Dean of the Forestry School of Oregon State that engineers were necessary, but we had persuaded some of his professors to get a degree in civil engineering. We had not convinced Stub Stewart of the Umpqua Lumber Company that his quoting a speaker at the 1912 Pacific Logging Congress was not still a sound basis for his evaluation of civil engineers. But we had been able to read that Senator Morse, in discussing the fact that industry had laid the blame for high road costs on the Forest Service, had said, "Remington parried most of their criticism with dexterity." He didn't say I answered them, but in my book, "parrying" saves your skin, and I liked that! But now, the boss wants me to go to Denver and said that I had better take this one, so. . . .

It was only a matter of days after I arrived in Denver until I could say with conviction, "This is a whole new ball game." Working with Don Clark and the Region 2 organization after my experience in Region 1 and Region 6 was like coming from a dark room out into the light. To be sure, I had never been the ARF in either of the other Regions, but I had been "Acting" for sometimes as long as a month in both. But Region 2 was the first place where the Regional Forester made the Regional Engineer feel that he was really a part of the Forest Service team. It was wonderful, and I enjoyed every single minute that I served in Region 2. At staff meetings, the opinion of the staff was called for and expected. I perhaps enjoyed the

quarterly Staff Retreats that Don Clark had most of all. In these, the RF and ARF's would go to one of the Forest headquarters and spend a week in a hotel there, in what would probably be called a "think tank" meeting, and go over the plans and perhaps budget, etc., for the next working period. Here, unhampered by the telephone, everyone (and this always included the Engineer) was expected to contribute to the planning of the future for Region 2.

The short time that I was in Region 2 was in reality a settling down period for the Region. It was the end of the long period of extensive force account work in Region 2. For many years, several force account crews had built bridges and roads, working from the RO with little or no contact with the Forests. The foremen of these crews had reached retirement age at about the same time as my predecessor, and at about the same time that it became popular to contract for most construction work. All of this settling down was good for us all!

After about a year and a half of life in Region 2, and in the summer of 1961, some 26 years after the first phone call, my wife again got into the act. I was out playing golf, and Tony Dean called my wife and said I was being offered the job as Chief of Engineers for the Bureau of Land Management in Washington, D.C., and for me to call him back. I did, and he told me about it, saying the Forest Service staff had approved it. I accepted, and on July 1, 1961, became Chief Engineer of the Bureau of Land Management in the Department of the Interior. Sometimes I wondered if I didn't do more for the Forest Service after I started with BLM than I did when I worked for the Forest Service.

When I started with the Forest Service in 1935, I worked with Stephenson, Calkins, Modlin, Yule, Sawhill, and several others who were originally surveyors for the General Land Office. All of us worked for Fred Thieme, who was a contract surveyor for the General Land Office. Then, after some 26 years, I left the Forest Service to become Chief Engineer for the Bureau of Land Management, a successor job to the old title, Surveyor General of the General Land Office.

I retired on October 20, 1967, and as I said several pages back, I enjoyed the work and never regretted taking it up.

Some Reminiscences on the Work & Character of John H. Lawrence—Engineer, USDA Forest Service

Hamilton K. Pyles*

In my 35 years with the Forest Service, I met and worked with many wonderful people. None, however, could surpass John Lawrence in his devotion to duty, for his love for the Service, or his efforts to professionalize the improvement work of the Forest Service. When John started with the Forest Service, you could count the number of qualified Civil Engineers in the Service on the fingers of your hand. When he retired, there were probably more Civil Engineers than that in his own California Division of Engineering.

John Lawrence was the first Forest Service person I had ever met. I found him in a little cubbyhole of an office in the old Ferry Building on the wharf of San Francisco Bay. I told him that a fraternity brother of mine had told me he might have a job for me in the summer. He got down from his drafting stool, put on his coat, and sat down at his desk for the formalities of an interview. He explained the conditions of bridge work in the mountains and the fact that he mostly hired experienced construction workers. He also made it quite clear that college boys were tolerated only to the extent that they could put out as much work as the next man. Wages, work hours, and all the rest of present-day interviews were not even touched upon. He abruptly ended the interview by telling me he could pick me up at my house at 6:30 a.m., June 1. I never found out, until July, that my daily pay was $3.50 per day plus board, and I never questioned whether I had earned it or not.

On June 1, 1931, 6:30 a.m., John drove up in a battered 1925 Dodge stake wagon. He said, "Hop in," and my Forest Service career began. This was one of the most memorable rides of my life. To begin with, I knew nothing of the Forest Service, slightly more of the Park Service, and nothing about building anything.

It was about a 7-hour ride at what seemed to me breakneck speed. John never did anything or drove anything at less than top speed in those days. He was about 35. Our destination was a tent camp near Trinity Center, California, at the base of the Trinity Alps.

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* Hamilton K. Pyles retired from the Forest Service after rising to Deputy Chief, Programs and Legislation.

It was on this ride that I learned about the Forest Service. He impressed on me the mission of the National Forests and the difference between National Forests and National Parks—the importance of firefighting, fire prevention, and the part that access must play in the ultimate development and use of the great resources of the forest backcountry. He left me with the unalterable impression (largely unchanged throughout my career) that (1) the Forest Service was the best and most important agency in the U.S. Government, (2) the California Region was the best Region in the Forest Service, and (3) bridge building was the most essential, if not the most important, facet in the management of the California Region. I was so charged up by the time we reached camp that I was ready to do my utmost to meet John's objective—which, at that time, was to complete "x" number of bridges before snow halted the work. John had this great ability to instill loyalty and a sense of urgency in people who worked for him.

I was most certainly the lowest man in the pecking order of the bridge crew, but he somehow made me feel that my contribution was important. I never forgot that.

There were any number of unwritten, back-breaking rules and objectives in building these backcountry bridges. In every move—and we moved about once every 3 weeks—only 1 day was allowed per move. First priority was to set up the kitchen and dining tent, and dig latrines and grease traps. After this was accomplished, we were permitted to erect personal tents. In my first summer, the part of digging latrines and grease traps was largely mine. Other unwritten rules were to fill a 2-cubic-yard dump truck with river run gravel in 20 minutes; to mix, pour, and tamp six 6 yards per 8 hours per two men; to hand rivet 200 rivets per 8 hours per three-man crew; and so forth. These standards were so firmly established and understood that if one fell below them, he was something less than a member of the crew in good standing.

John Lawrence was not fiscally inclined; in fact, auditors and accountants, though necessary, were among those he not only considered unworthy of his time, but distrusted as not being wholly in harmony with sound management objectives. For example, all "good" hunters in the crew were allowed to be off the job on the opening day of deer season. If they were successful, they got a full day's pay, and the camp ate fresh meat far in excess of the amount the Government provided. I got an extra day's pay for retrieving a steel beam from the Consumes River, which was lost in the steel erection process, and so on.

How John managed to instill this sort of *esprit de corps* in the heterogeneous group called the Bridge Crew, I'll never know. These were Depression years. Most of the journeymen were bachelors, widowers, and drifters of one sort or another. All were characters of the most unusual sort. There was Coyote Bill, the blacksmith, excellent at his trade, but who otherwise carried with him the aroma of his trade. Then there was Slim, a 6-foot-7 Swede who revelled in his ability to lift more, carry more, and work harder than anyone else. Mitch was the soft-spoken foreman from the deep South who ran a crew. Italians drove the Liberty hard-tired trucks that broke through as many county and Forest Service wooden bridges for the crew to repair as we were building. There was "Quigga" (meaning bacon rind), and quiet Big George (5 by 5 by 5 feet) who could drive tunnel and build loose

stone walls with a precision and accuracy that commanded admiration and respect from all of us. Only two members of the crew were addressed as Mister—one was John Lawrence, and the other was Mr. Lockwood, a feisty little carpenter whose wife sometimes visited us.

We had a fine cook, an Irishman named Brady, who had spent most of his life and fortune hunting gold in Alaska. Most of the experienced crew looked upon the summer work as a means of grubstaking them for a winter of mining or trapping. Six or seven of us were college students, two in engineering.

JHL drove himself relentlessly. The Coleman light in his tent was always ablaze long after midnight. During the summer, he made the surveys and maps for the bridges to be built and budgeted for the next 3 years.

I had the good fortune to be his rodman and general tote mule on many of these surveys. I jumped at the chance to go because I expected it to be a snap and a good change of pace from excavating, pumping gravel into a cement mixer, etc. It was a change of pace all right, and I learned a great deal, including how to carry, set up, and run a transit. What I hadn't realized was that John was a prodigious hiker and that 15 miles a day in mountainous country was a small part of the day's work. Also, depending on the distance from camp, we left long before dawn and got back late at night. If we had to use horses (JHL never minded a chance to ride and loved good horses from his cavalry days), nothing changed but the distance.

JHL was the only man on the crew who was a regular. He wore his uniform, badge, and tie at all times in the field. These were the days of the high boots, breeches, and Smokey Bear hats. Whether true or not, this seemed to us to carry considerable prestige on forest fires. During the fire season, we worked 6 days a week and were required to "stand by" on Sundays as an emergency crew. The younger members of the crew were first attack troops of five-man crews. I finally became a crewman, and, with the use of my car (packed and ready to go), my Sundays were often more lucrative than ordinary days and, many times, more exciting. JHL's orders were simple: i.e., that no foot of any fire line assigned to the bridge crew would be lost.

A few years later, the Bridge Crew was broken up and assigned as foremen and experienced local men to CCC bridge crews under bridge engineers. JHL, as the responsible officer in the Region for the design and construction of all these bridges, just about drove himself to utter exhaustion and physical breakdown in attempting to keep in personal touch with the problems and progress on every bridge under CCC construction in the National Forests of California. He drove long hours, sometimes all night, to keep impossible self-imposed schedules. I presume he was ordered to stop and get organized for the long pull ahead. A Bridge Design Section was organized in the Regional Office, special survey crews were set up, and more responsibilities were assigned to qualified bridge engineers. JHL had no less zest for the work, and he took on greater responsibilities, such as liaison with the Corps of Engineers and encouraging National Forests to put professional engineers on their staffs. The jobs got bigger, the responsibilities more, but some of the flamboyance of the old Bridge Crew's days had to fade into history.

Part II: 1933–1989

My Story

Peter J. Meyer

This is Peter J. Meyer, age 81, relaxing in Truth or Consequences, New Mexico. It is June 13, 1989. I was the former Forest Engineer on the Chippewa National Forest, but my story starts in the spring of 1933 when Jim Trestrail and I were hired by the Regional Engineer as Construction Foremen and sent to Cass Lake, Minnesota, where we reported to the Forest Supervisor, Jim Walley.

Jim Trestrail had a 1926 Essex, and, as I remember, it took about 6 to 7 quarts of oil to get there from Milwaukee along with several gallons of gas. We were probably 3 or 4 weeks prior to the arrival of any of the CCC's. While their camps were being built, we pitched pennies under the Cass Lake fire tower for a few days. Then Al Miller, who was an assistant supervisor, rounded up a truck and sent us scalping for a reforestation program. After a week of this type of activity, Mr. Walley called us in, handed us an abney level and a staff compass, and explained to us that it was impossible to see into the Federal Dam area from the Cass Lake Fire Tower because of a blind spot between the Cass Lake Fire Tower and the Bena Tower. So, he asked us to run levels with the equipment to find this blind spot, which was approximately located by azimuth from various towers. Having recently graduated from Marquette University, as well as having had a course or two in surveying, a staff compass and an abney level were hardly adequate for the purpose. But, Mr. Walley said this was the equipment and, therefore, this was the best we could be furnished. So, we proceeded to locate this high spot on Cuba Hill where a tower was later built. We were furnished the equipment and a Ford Model T truck that was apparently abandoned by the Postal Department, and that was the equipment and the way we had to operate. But, as I recall, the Bena Camp was completed by the middle of May or early June.

CCC's had moved in, and I was assigned to the Bena Camp and Jim Trestrail was assigned to the CutFoot Sioux Camp. Lou Harmon, a first class gentleman, was made Superintendent of the Bena Camp and operated and cooperated 100 percent with the Army. We got along reasonably well and were assigned various projects, one of which was a 100-foot fire tower on Boulder Hill. I was given a crew of young fellows (who had no previous experience in carpentry or masonry work) to build a cabin at the tower site. While the steel was being ordered, shipped, and delivered, we completed the foundation work (crude as it might have been, but it was substantial). After completion, I was ordered to take the crew and build a telephone line to Mud Lake where a tower—I think it was an 80-foot-high tower—existed. The telephone line was approximately 15 to 18 miles long. We were given a crew and had to cut poles, peel the cedar, and then set the poles at

intervals and run lines. Previously, they had used just a ground line system, nailed to trees, which proved to be quite inadequate; so, we built a two-wire system that proved to be effective.

At about this time, Lou Harmon, the Superintendent, was called away—I think to a meeting of Superintendents or other Forest employees—and I was acting Superintendent at Bena for a few days. During this period, we lost a man on rodent control who apparently had stumbled while trying to jump a rabbit out of a brush pile. He shot himself in the head and died immediately. It was a short time later that I was transferred from the Bena Camp to the Cass Lake District and made Superintendent of the NRA camp at Onegum. Here we built a lookout cabin, a road, and a campground at Stony Point. While building the road through heavy maple timber to serve the campground, I had to serve as my own powderman, since none of the crew was experienced in the handling of dynamite. While the crew worked from Monday through Friday, I set and arranged to blow up stumps on Saturday as well as tending to the brush fires that had been lit and were burning. One Saturday, while I was so occupied, Gif Adams, Forester, was serving as inspector out of the Supervisor's Office and decided to inspect my work. While maneuvering his pickup along the partially cleared roadway, he got into my stump-blowing activity. I had just cut a spitter for 10 shots and had set off about half of them, when a pickup appeared very close to my first shot. You can imagine what happened! He sat frozen while the charges fired and then proceeded to give me hell—because I was not a certified dynamite man, I was not supposed to be working by myself, I was supposed to post lookouts, and several other minor details that I had neglected to observe while doing what I thought was a good job for the Forest Service.

At any rate, soon afterwards I was replaced by Harry Altman, Forester, to continue the work I had started. I was assigned to the Cass Lake District to replace the Mission Bridge, across the Mississippi River, that had broken through while a heavy truckload of supplies was being hauled up to Big Lake Camp. After a brief survey of the bridge site, which included measuring the width of the fill on both ends of the bridge, I started to draw plans for a new bridge in the evenings. The very next day, I (with the help of a CWA crew) started to cut piling at Norway Beach on Cass Lake. I marked the piling even before I knew how many were needed. After about 3 nights, my plans were complete enough so that I at least knew how many pilings were needed in order to figure the number of caps needed, as well as the approximate amount of timber for the deck and guardrail. Then, I made a deal with Riggles Saw Mill (just outside of Cass Lake) to saw the caps, decking, and guardrail for half the timber, so I had to mark a double amount. I then borrowed a D2 Cat from the Indian Service, a 500-pound hammer along with a cable and a grab hook from Beltrami County, and proceeded to build leads to complete the necessary equipment. The D2 pulled the hammer to the top of the leads, the hammer would drop, and, with a tag line, a couple of men would pull the grab hook back and lock it into the hammer for a repeat performance. Caps were laid with a tripod and the same D2 Cat. It appeared that CWA had money for labor only, all equipment had to be borrowed or otherwise procured.

In 1935, I married a girl from Cass Lake who, at that time, was principal at the elementary school at Bena. While courting this lovely lady, half a

dozen sticks of dynamite rolled out from under the seat of my new 1935 Ford Coupe. This made her very uneasy; so, I promised not to carry that stuff around. I also had to use dynamite to start piling on Number 1 and Number 2 and the last bents of the bridge; I don't remember exactly how many there were.

After completing this bridge project I returned to Bena Camp where I located and built several miles of road. A little later, I ran chain for Hi Goldberg, Forester, on a new acquisition program that had started. After which time I was transferred to Remer where a new Ranger Station had been built. At this location, I laid out and built a telephone line to the new Remer Tower and did some road location work. Then I was transferred to Squaw Lake Camp where I located probably 30 to 40 miles of road throughout the entire winter. After this project, it seemed that the CCC program was being curtailed or abolished, and I was offered a position as custodian at the Remer Camp. I considered this for a while, but I couldn't see where this kind of work would develop into anything more permanent, so I resigned from the Forest Service and returned to Milwaukee.

I spent a couple of years with consulting firms out of Chicago. The last year was really enhancing—I was sent to Tullahoma, Tennessee, to work on the construction of Camp Forest. The camp was 75-percent complete when all fixed fee contracts were canceled or terminated and I was taken over by the Quartermaster Corps to finish the job. Later, the Corps of Engineers took over the work of the Quartermaster Corp. I suppose the camp was 95- or 96-percent complete, when I was sent to Smyrna, Tennessee, to be engineer on a B-24 base. As that project neared completion, I was sent to Nashville, Tennessee, to extend the runways at the airport there. While there, they informed me that they would have to put me in uniform. Well, I wasn't too sold on the Army after that program, so I went directly to the Naval Officer Procurement Center and volunteered into the Navy as a Junior Grade Lieutenant. After serving well over 3 years, it seemed longer, I was separated from active duty and put in the reserves. I started a little consulting engineering firm in Nashville and was doing well when my wife had to return to Cass Lake to help her grandfather who had raised her. So I sold my business and we moved to Cass Lake. At the time I left the Corps of Engineers at Nashville, I had a rating of a GS-11; so, the first thing I did when I got back to Cass Lake was to go to the Forest Service and ask for a job. I was told the Forest Engineer, a Forester by the way, was a GS-9 and there wasn't any possibility that the position would ever justify a GS-11. So, I went to work for a consulting firm in St. Paul, Minnesota. After a while, I think a little over a year, I was offered a Forest Engineer's position as a GS-9. I accepted it because I needed to be with my family as I had been away from home for so long in the Navy, except for very short weekends with the consulting firm. It developed that the Forest Service was beginning to see a need for bridge site surveys and drainage area studies so that a proper size bridge could be designed and built. The CCC bridges that had either failed or were inadequate were being replaced with bridges built out of treated timber. Most of the CCC bridges had been built out of raw, untreated material and were beginning to deteriorate to the point where it was just not practical to continue their use.

This is probably the story you wanted in the first place, but I felt a need for the background. I served as Forest Engineer through the tenure of Lewis

Hermel, Dan Bolfore, John Von Bargen, Dan Westerberg, and the last one, whose name escapes me now. When he was first employed, he worked under me as a chainman and a rodman on surveys; he then transferred to another Forest for a few years and came back as Forest Supervisor. This rankled me. I figured I knew more about the Forest, its programs, and its cause than he would learn in his tenure. Why does a Forest Supervisor have to be a Forester, when his work is strictly administrative and he has a competent staff? He was one of my reasons for early retirement—of course, I had others.

One of the first challenges that I had as I started work as Forest Engineer was introduced by Lewis Hermel. The shores of Lake Winnibigoshish were eroding at a rate of about 10 feet per year, so he put me in charge of stopping this erosion. Of course, in the interim, there were bridges to build and replace, roads to build and upgrade, buildings to build and replace, as well as the maintenance of many miles of roads and buildings at eight Ranger Stations. There was also the development of new campgrounds, new wells, small sewage systems, and many jobs that required ingenuity and attention. We finally designed concrete pilings, brought gabrian baskets, a filter X material that was made in Italy, and worked on the erosion projects. One of the projects was the erosion of West Wini Campground, which, by the way, I inspected last summer. While the project had taken a beating by the elements not one foot of ground has been lost. We also performed the same type of project on the east shores, where resorts under lease, as well as an extensive summer home group, were losing shoreline. I didn't get to inspect them last summer, but I'm sure they have also held up.

Another interesting project was the construction of a tramway around Knudsen Dam at the outlay of Cass Lake, so that boats could be lifted over the dam and continue down the Mississippi River, approximately 20 miles, to Lake Winnibigoshish. I was and still am a great believer in force account work. My opinion is that a good crew can do better and more economical work than can be done by contract. When the Forest Service decided to curtail crews and do contract work, it gave me another reason for early retirement.

I remember one occasion when I was sent to Fort Snelling in Minneapolis to qualify as a driver/trainer instructor. I drove a 5-ton truck around the city for a couple of days, passed the test, and returned. I left Cass Lake at 0400 one morning to be at school in Minneapolis by 0900. I left Minneapolis 2 days later at 1700, drove home (arriving at approximately 2300), slept in, and reported for duty at 1000 the following morning. I was informed that I had to take 2 hours of annual leave because I was late for work. After giving the Government 10 hours of my time, they wouldn't give me 2 hours of theirs. In spite of all my complaints, I am very fond of the Forest Service. I also have a very high regard for Foresters in general. Some of the finest people I have known were Foresters, so I have no quarrel with them. Mal Arthur, Regional Engineer at the time I was hired as Forest Engineer on the Chippewa, is by far one of the best engineers and finest gentleman I have ever known, and I am sure his record will bear me out. I am now enjoying hunting and fishing on the Lincoln and Gila National Forests.

Personal Reminiscence

Lawrence A. Waggener, Jr.

I'll preface this story briefly by stating that I graduated from high school in June 1932, the height of the infamous "Big Depression." I went to the San Francisco Bay Area during the summer of 1932 looking for employment. I had full intentions of entering the University of California in the fall term to study Mechanical Engineering. I was to stay with my Aunt and Uncle in their Berkeley, California, home. Finding employment was my only challenge, and at that I failed. So for lack of funds, I returned to Portland and worked at part-time jobs.

On October 15, 1933, I was hired by the Mt. Hood National Forest as a laborer on a DEV NIRA–financed road crew. Salary was $4.00 per day less $0.90 per day to cover the cost of meals. This was considered "good money" in those times, and I was most fortunate to obtain the employment. Our camp was located initially at Windy Camp, Barlow Ranger District, on the truck-trail between Gumjuac Saddle and Lookout Mountain.

Our job included grading roads using a 30 Gas Caterpillar tractor towing a Russell drawbar grader. I followed behind the rigs picking rocks and boulders, opening drainage and holes in roadside beams. The camp superintendent was a man named Kelsey. My foreman was Ed Sweeney, and my coworker was Ed Sandstrom, an experienced "short-termer." Sandstrom taught me to fell snags, build dry rock headwalls around culvert catch-basins, shoot powder, and bulldoze road-imbedded boulders. Next, we moved to the old "Barlow Road" and built two log-stringer bridges in the Devil's Half Acre area. Our crew also reconstructed the first half mile of the Barlow Road from the Loop Highway to Devil's Half Acre. As this job was completed about December 15, 1933, snow began to fall in depth, which ended our work for the winter.

I returned to Portland and soon thereafter was hired by the Portland Park Bureau as a Recreational Director. Leon Fabre, long-time physical education instructor at Jefferson High School, recommended me for the job. I taught classes in P.E. to all ages, ballroom dance classes to teenagers and adults, and coached several basketball teams. This activity was another temporary emergency-financed program. These classes were held at the Abernathy Grade School gymnasiums. My salary was $130.00 per month—*fat city*!

I knew that this program was scheduled to end in the spring, about the time schools let out for the summer. So, I contacted Mr. Bob Pemberton, Mt. Hood National Forest, searching for future work. He did not have any work in sight, but said that if I would enter the Civilian Conservation Corps (CCC) program as an enrollee (LEM—Local Experienced Man) at the

Zigzag, Oregon Camp 928, he would try to arrange an in-service job for me as soon as a financed program became available. I quit my job with the Park Bureau and enrolled in the CCC, earning $36.00 per month and keep. My work assignment was at the FR&T Warehouse working for Mark Johnson, the warehouseman.

Johnson was "one-of-a-kind"! He had unbelievable mechanical talents. He was a master machinist. He could weld (electrical and gas) and fabricated some unique machines while also doing his job in the warehouse. He designed and fabricated the "Shake Mill," which made the first shakes cut for the Timberline Lodge. For reasons unknown to me, the project was abandoned and the shakes were procured by contract. I believe that lack of an adequate cedar supply in the Zigzag area led to project stoppage.

I assisted Johnson for a period of 8 months. We worked long hours and repaired many kinds of camp equipment. I installed new handles in every kind of tool imaginable—broad axes, adzes, falling and swamping axes, shovels, asphalt rakes, picks, etc. I became an experienced tent and fly repairman, using a large industrial sewing machine to make the panel insertions and mendings. We put new linings in large camp cooking ranges, welded all types of camp gear, and handled the ordering, transportation, and receiving of all materials and supplies used by four major road crews (Carl Alt, Orval Thompson, Ben Illige, Merle Acker) and the Zigzag major repair shops that made overhauls to all types of vehicles and heavy equipment.

On December 1, 1934, I was discharged from the CCC and entered the employment of the Mt. Hood National Forest. My job was to purchase all the supplies ordered by the Zigzag Warehouse and to handle its delivery to the field. I took the job previously handled by Horace Cooper who, having passed the Junior Forester Exam, was assigned to the Olympic National Forest for duty. My immediate superior was Floyd F. Murray, Superintendent of Construction.

I will never forget my indoctrination and training for this job. I reported to Murray's office in the Glisan Street Post Office, Room 501, on November 29, 1934. Cooper showed me the layout of the Supervisor's Office, introduced me to several people (Supervisor Thomas Sherrard was in the field), and took me back to our room. He gave me a handful of field prepared requisitions, handed me his telephone directory, and turned me loose to learn the job. He gave me one instruction that never fails; he said, "Never guess but always do the best you know how, and you'll make out alright!" I found this to be absolutely true.

Friday, November 30, 1934, was Cooper's last day on the Mt. Hood. On Sunday, December 2, 1934, I drove him and his wife, Dorothy, in a Forest Service pickup to Olympia, Washington. As I recall, they had three or four suitcases, an alarm clock, and a cat. The next Monday morning, I was in the office and totally on my own.

My tenure on the Mt. Hood National Forest lasted until September 30, 1939. My salary at the start was CAF-1, Junior Clerk, $1,000 per annum. Since emergency program employees were charged with a 15 percent reduction in their pay at that time, I netted $850 per year.

I found Floyd Murray to be an outstanding boss. He would give you explicit instructions on what your job was and then turn you loose to do it. He'd add that he was there to help if you needed some, but never interfered. He quickly became aware of my very strong working relationship with all the key field personnel, including the District Rangers and others. At the outset I was certain that because of my youth, Murray was dubious as to whether I could do the job. I know that he originally accepted me for the job on the confident recommendations supporting me for the job by Loren Roberts, Forest Supervisory Mechanic; Mark Johnson, Warehouseman; and Horace Cooper, my predecessor on the job.

Besides the purchasing aspect of the job, I did several other tasks as time permitted. Principal among these were the maintenance of the Forest Road & Trail inventories and maps and miscellaneous drafting, including the plotting of road traverses recorded by road locating personnel. I made, with Murray's direction, the first Mt. Hood National Forest Transportation Plan.

During my Mt. Hood National Forest employment, the projects of a major scope that I was involved in were the building of Timberline Lodge and the construction of the Larch Mountain Road.

Floyd Murray directed the crews that opened the East Leg, Timberline Road, to the lodge site, so that site preparation and building layout, including surveying, could be accomplished well before the area was free of snow. Snow removal on the road was supervised by Cap Jones. The principal machine used was a 1-yard Northwest crawler shovel. We contracted with Monarch Forge & Machine Works, Portland, Oregon, to fabricate and furnish a 2-cubic-yard-sized snow bucket for removing the snow. Removal was mostly side-casting the snow to the lower side of the road. As the crew neared the proposed lodge site, they were forced to leave the East Leg Road right-of-way. Cap Jones used the existing snow profile to guide his location; actual ground profile varied so greatly with that of the snow that, when the snow was removed, the road had a stretch of 22-percent grade in it.

Once operations reached a peak in the area, a crew set up a rock crusher site in Salmon River Canyon just east and a little south of the lodge. Again, the crusher and its crew were under Murray's supervision. The gravel produced was used for road surfacing. Some was put through shaker screens and used in the making of the concrete sections of the lodge. During the operation of the crusher, it had the usual run of breakdowns. These were repaired by the ZigZag forest shop personnel directed by Loren Roberts. One was major in scope—the eccentric (cam) that actuated the movable jaw of the primary crusher failed. Monarch Forge again made the major repairs to this vital part. I picked it up in a half-ton Ford pickup on a Sunday morning and delivered it to Timberline in a blizzard. The ZigZag repair crew was awaiting my arrival. The part was unloaded and installed that day so the crusher could be back in production on Monday morning.

My last task at Timberline Lodge, while in the employment of the Mt. Hood National Forest, was to drive the Secret Service agent who controlled the roads to Timberline Lodge from the Mt. Hood Loop Highway during President Franklin D. Roosevelt's visit and dedication of Timberline Lodge. The Pacific Northwest Region had only one vehicle, which was equipped with a two-way radio. It was assigned to the Chief of Fire Control, Jack Campbell.

The Secret Service directed the Regional Forester, C.J. Buck, to furnish one vehicle (with two-way radio) and a driver to transport their agent in advance of the President's travel to and from Timberline. I drew the assignment on that now famous occasion.

The other project of note was the construction of Larch Mountain Road. Again, the equipment used in that construction belonged to the Mt. Hood National Forest. The project superintendent was one Carl Alt.

Labor for the project was provided by the Works Progress Administration (WPA). The crews worked two 5-day weeks each month. They rode to and from the project daily. Murray assigned me the job of establishing and coordinating the trucking of the crews. We used canvas covered trucks equipped with wooden boxes for seats. The boxes were made to haul tools such as shovels, saws falling, axes, etc. Can you imagine today's crews riding 25 miles to the job and returning in unheated trucks with canvas tarps for cover? That's the difference when the populace is hungry and in dire need of a job!

I almost forgot to relate that, while on the Mt. Hood, I attended the first Forest Service training school, which taught the skills of cargo-dropping from airplanes on forest fire operations. The training was held at Pearson Field, Vancouver, Washington. Lage Wernstedt, cartographer by profession, was the training director. As I recall, it was a 3-day session. Larry Soller, contract pilot, flew each recruit on his training flight in a Travelair Monoplane, also owned by Mr. Soller. Others in attendance were: Larry Mays, Al Hanson, Rogue River; Red Thomas, Siskiyou; and James Oliver, Columbia. There were at least eight others, but I cannot recall their names.

No sooner had the training ended than the whole of southern Oregon and part of northern California was afire from Bandon, Oregon, to Gasquet, California. I was on fires dropping supplies for the whole month of November.

I truly enjoyed my stay on the Mt. Hood. It was a tremendous learning experience. I shall always be indebted to the fellows at ZigZag and Floyd Murray for their help and training.

On October 1, 1939, I transferred to the Regional Equipment Pool, which was located at the newly acquired Sellwood Shop and Office Building. The operations were under the direction of Albert Bottcher, Forester, University of Heidelburg, Germany. Bottcher had been on loan from Region 6 to the Farm Security Administration for 2 years. He knew my background, needed personnel badly to man his new organization, and asked Murray if he could hire me. Floyd Murray told me later that he realized that the opportunities offered me by the transfer far exceeded those that I could ever attain by continuing my Mt. Hood job, so Murray approved the transfer.

My first assignment at Sellwood was to set up and care for the index card records, which accounted for all the vehicles and heavy construction equipment that made up the Region 6 Regional Equipment Pool Fleet. Horace G. Whitney and Howard P. Campbell, the organization's Administrative Assistants, each helped me immensely in the "how" for doing this job.

Shortly, I was moved to the Central Shop activity. I should probably digress long enough to relate the story of how the USDA Forest Service obtained the Sellwood complex. First, the Region's leaders decided that it would operate a Central Repair Shop in the Portland area and that doing so necessitated acquiring adequate facilities. A lengthy search produced the idle streetcar barns and two-story office waiting room building owned by the Rose City Traction Company.

Its availability had been brought about by the closure of most interurban streetcar lines in the greater Portland area. These lines included Gresham, Belleview, Estacada, Dodge Park, and others. The Sellwood, Mt. Scott, and Woodstock lines were also serviced here.

Facilities included the car barns with in excess of 4 acres (5 bays) of covered space. The Barns reached from Southeast 11th Avenue to Southeast 13th Avenue. Two and one-half of the longest barns were used for repair activities, and office and stockroom facilities. In the fall of 1939, the Forest Service purchased these properties from the Rose City Traction Company for $37,500. Regional Equipment Pool and repair activities were carried on at these premises from 1939 until early 1953. The work force grew from 8 shop (a foreman, a clerk, a laborer, and 5 mechanics) and 10 equipment pool personell (including Mr. Bottcher, Regional Equipment Engineer, an administrative assistant, 2 equipment inspectors, and 5 clerks) to 101 shop and 15 equipment pool personnel during the 1951–1952 Korean War. In addition to usual Forest Service equipment fleet needs, the organization was repairing and refurbishing all kinds and types of military equipment (amphibious vehicles, tankers, 10-ton wreckers, trailers, and tank retrievers, etc.).

My first shop assignment was to do the procurement of all parts and materials required, handle the time records for all shop personnel, prepare jobcards, make billings for all work accomplished, and oversee the layout and management of the parts and tool room. I had one clerk (named Hiatt) helping me with the clerical jobs and Ed Bornstedt, storekeeper, assisting me with the parts and tool activities. Principal overhead were: Shop Superintendent, Albert Venske; Construction Equipment Foreman, Bill Goetze; Automotive Repair Foreman, Charles Nicholson; Carpenter Foreman, Roy Allen; Fabrication Foreman, Ernest Gronlund; and Machinist Foreman, Frank Rhodes.

Regional Equipment Pool Inspectors were Carl Deffenbaugh, George Hall, and William Shambo.

During this period, the Sellwood Shop undertook the reconditioning of most of the Region's heavy equipment that under individual forest supervision had been allowed to reach a state of disrepair. I recall a group of eight Model "55" Cletrac tractors that were completely disassembled and from this pile of parts and components a total of four machines were salvaged. The remainder were removed from the property records as unusable property and sold as junk!

The Shop also made room for the Region 6 Equipment Development organization, headed by Theodore Flynn. Its mechanics—Gene Parker, Arden Robinson, and Herb McGinley—continued to man the development activities. When extra welding, machining, and other fabrication assistance was needed,

such was provided by the Sellwood crew. Development projects included the Logging Tractor, the trail equipment program (Beetle, Senior Beetle, trail mule, trail trucks, grader, etc.), tractor-mounted fire plows, and many other machines.

The Sellwood Shop also undertook the fabrication of all-metal cattleguards on a project basis, producing 100 guards at one time. Cost per guard was reduced significantly.

Timberline Lodge snow removal equipment, consisting of two motor graders, a four-wheel drive truck with push plow, and a Walters Sno-fighter truck with rotary snowplow, was serviced and maintained by Sellwood mechanics.

Along came World War II, and I enlisted in the U.S. Army, Ordnance Department, and departed for points unknown on April 13, 1942. This entails another story in itself. I will only say that during almost 4 years' service, I attended Antiaircraft Artillery Mechanics School at Aberdeen Proving Grounds, Maryland, graduated from QMC OCS School, Camp Lee, Virginia, and spent 2 years in the Southwest Pacific as Master of an Air Force Rescue Boat Crew and Detachment.

I was separated from the U.S. Air Force at the end of World War II and entered the employment of the Forest Service on January 3, 1946. I reported to the Regional Equipment Pool. Mr. Elliott P. Roberts took charge of the organization on the same day. I was hired as an Area Superintendent and charged with serving all the Forests in the State of Washington and the three Forests in Northeast Oregon (Amatilla, Wallowa, and Whitman). Mr. Joseph Guiberson was the other Area Superintendent in charge of serving the remaining 10 Forests in the State of Oregon.

The postwar years resulted in many advances and challenges in the management and maintenance of the Region's equipment fleet. A major increase in the building of roads to facilitate increased timber harvest as well as significant increases in other Forest resources required sizeable acquisitions of all types and sizes of vehicles and heavy construction equipment. The majority of the construction equipment (motor graders, crawler tractors, carryalls, rippers, rock crushers, and power shovels) was obtained from War Surplus stocks. Some of the equipment acquired was new; other pieces required extensive repair. Some pieces were transferred without cost; others at fair cost. The Region limited its acquisition of motor vehicles to special items such as truck-mounted power shovels, fire tankers, and a few large truck-tractors.

I spent a good portion of my time during 1946 visiting Army and Navy establishments, to inspect surplus items to ascertain their condition before acquiring them. Points visited extended from the greater Seattle, Washington, area; Sand Point, Idaho; Ogden, Utah; San Francisco Bay Area south to the Los Angeles-San Bernardino, California, area. Most items arrived at the Sellwood Shop via railroad flatcars.

While the overall Region 6 field programs were abnormally large in scope and complexity immediately after World War II, the impact on the Forests brought on by the major floods experienced in May 1948 were stupendous. Road repair and reconstruction went on throughout the Region, but the major

impact was on the Okanogan, Wenatchee, and Snoqualmie areas. Mechanics, road crew overhead, and so forth, were detailed from many other less affected Forests; and these people remained in the area until the winter snows ran them out.

From mid-1950 until late 1952, the Portland Departmental Shop was repairing many types of equipment for the U.S. Army Ordnance Department headquartered at Fort Lewis, Washington. That agency was preparing equipment for shipment to military units involved in the so-called *police action* better known as the Korean War. At the peak of this service, the Shop mechanic force reached 100 in total number. About this time, political actions brought on by Congress included the levying of arbitrary personnel ceilings on civilian government agencies. Region 6 decisions forced the departmental shop to make vast reductions in its work force, which brought the military work to a halt.

In fact, in early 1953, Region 6 decided to close the Portland Shop at Sellwood. The Office building was eventually transferred to the Pacific Northwest Experiment Station, and the shop building was sold to private holding for $87,000.

Shop Superintendent Irwin Peterson and a crew of eight mechanics were moved to the basement of the Forest Service Warehouse, 2760 N.W. Yeon Avenue, Portland, Oregon, where the Portland Shop continued its operations on a much reduced scale. Primarily, the shop handled the receipt and servicing of new equipment acquisitions, the maintenance and repair of Gifford Pinchot and the Mt. Hood Forests' motor equipment, and various fabrication jobs such as cattle guards, etc.

Temporary personnel were notified and terminated at the closing of the Sellwood Shop operations. All permanent personnel were handled administratively without a "reduction in force" by transfers, other Forest job assignments, and a limited number of retirements for those who were eligible.

Meanwhile, the Regional Equipment Pool personnel was reduced to the following: Loren C. Roberts, Equipment Engineer; Joe Deets, Albert A. Venske, and Lawrence A. Waggener, Jr., Equipment Inspectors; Gilbert C. Lynch, Administrative Assistant, and Loretta King, Clerk-Stenographer.

During the period of 1946 to 1956, Region 6 carried on an intensive mechanical trail equipment program. Wide use of the Beetle and Senior Beetle trail tractors was made to construct and maintain its Forest trail systems. During this time the Merry Trail grader, a mechanical machine originally intended for fire line construction, was employed on many Forests. Use of gas-driven rock drills, the Region 6-designed and -constructed trail mule, and the trail motor patrol were common.

Messrs. Verne Church, Division of Engineering, Donald Fife, Wenatchee National Forest, and Bud Waggener, Regional Equipment Pool, were the leaders in the introduction, operator training, and application of this equipment program. They also conducted demonstrations on the use and productiveness of these equipment items at seminars in Regions 1, 4, 5, and 8.

About 1953, the Western regional equipment managers began, as opportunities allowed or arose, to meet one-on-one to discuss their problems and disclose to one another what they were doing to meet field needs. As a matter of fact, the first such meetings could be categorized as clandestine; they certainly weren't authorized by "top management." Nevertheless, out of such meetings came an exchange of helpful ideas, the first efforts to standardize such programs as driver licensing, operator training, equipment specifications, and procurement procedures, to name a few.

As a result of these gains, the Washington Office in about 1956 undertook the sponsorship of such meetings. Formal agendas were defined, placing emphasis on principal fleet equipment problems and the collective development of solutions. Out of these meetings came the recognition of the benefits of standard specifications for general classes of motorized vehicles and equipment, Service-wide methods for Fleet cost accounting and finance that ultimately resulted in the establishment of the Working Capital Fund and its myriad of advantages.

Simultaneously, a committee of regional and Washington Office personnel was established to write and produce the Handbook on Fleet Equipment Management—FSH 6439.11. The project was started in mid-November 1960, and the printing and distribution of the manuscript was made final in mid-1961. I was named the chairman and leader of this Service-wide project.

In the writer's opinion, this publication was the most valuable tool ever made available to the users and managers of equipment in the Forest Service, regardless of their level of such activity. All went well until May 1969 when Washington Office Budget and Finance "threw the first curve," which ultimately led to the "beginning of the end" of this most useful management tool. The Handbook on Fleet Equipment Service Accounting (FSH 6509.11) was published and distributed to field units. Actually, it amounted to little more than withdrawal of Chapter 900, Accounting (intact), from FSH 6439.11, Handbook on Fleet Equipment Management.

This was really my first experience of seeing the Forest Service condone backward movement in its management procedures. Next came an in-house undercurrent to abandon equipment cost accounting records. No official can manage any program successfully without accurate records of costs.

In 1955, Assistant Regional Engineer Charles E. Remington and I discussed the painting of Forest Service vehicles. We agreed that something should be done to brighten their appearance and, at the same time, make them standout among the other government agency equipment in use in the Northwest.

I suggested that the color scheme should probably be two-toned and of more reflective colors to enhance safety against vehicle accidents. Remington liked my idea, told me to try it, and, if the results were worthwhile, we would recommend the idea to the Chief for adoption.

I painted two vehicles, a sedan delivery and a half-ton pickup. The colors used were *polar gray* below the vehicles' belt lines and *hudson green* above. When the painting was completed, reaction was more favorable than we had anticipated.

The pickup was assigned to the Mt. Hood National Forest and used by the Forest employee administering safety and log hauling on the Clackamas River Road. After a couple of months, the log truck drivers were queried as to the visibility of the new color combination and its effectiveness. Again, the response was favorable.

The two-tone paint combination on vehicles was recommended to the Chief, and he approved it. Its use started with the purchase and delivery of 1956 model vehicles. One change in the color layout, green bottom and gray top, was made by R.S. Henderson, Equipment Engineer, Division of Engineering, Washington, D.C.

Following the inception of the Job Corps program in Region 6 in the early 1960's, the Equipment Management organization was faced with new challenges, which we were soon to discover even exceeded those I had known to be a part of the extinct Civilian Conservation Corps and Works Progress Administration programs of the mid-1930's.

First, we undertook the testing and training of all drivers assigned to the four Region 6 camps. These were overhead people, but they were not an easy group to control. High speed and overtaxing engine speeds were the initial problems eventually brought under satisfactory control.

Our people next wrote lesson plans for training enrollees in all aspects of automotive mechanics. Each plan embodied a step-by-step introduction and method for teaching the work or task to be learned. Subjects included gas engine (2- and 4-cycle), engine tuneup, transmission, differential, steering gear, power train overhaul, and others.

Our Portland Shop constructed to our specifications the following training devices:

(1) Portable stand with 6-cylinder gasoline engine in running condition.

(2) Hydraulic brake system, complete.

(3) Three-speed manual transmission with cutaways in main case.

(4) Steering gear assembly with cutaway showing worm and sector.

(5) Rear axle ring gear and pinion assembly.

Job Corps enrollees participating in auto mechanic training classes used these assemblies to train on. Disassembly, reassembly, and learning how to properly make necessary adjustments were an important part of the learning process before enrollees were introduced to actually making such repairs in a real repair situation.

It is sad to me that today's forester knows little about the part early Forest Service personnel played in the evolution of developing equipment such as the "bull-dozer," prescribing basic equipment preventive maintenance programs, establishing cost record systems, and writing equipment specifications and performance standards that resulted in the procurement of items of equipment that performed satisfactorily and met field needs.

Today's forester also probably is not aware that the U.S. Army, in preparing for the demands of World War II, employed many Forest Service equipment procedures and practices in its initial technical manuals. The Army also borrowed such items as the Region 6 trail tractor and the Snow Motor to facilitate its "Assault Landing" and "Ski Troop" programs. Several Forest Service equipment management personnel were picked up by the military as civilian technicians with a simulated rank of lieutenant colonel to design and lead training of divisional motor transport organizations.

Following are a few statistics that reveal rather convincingly the growth of Region 6 Fleet Equipment motor vehicle operations during my tenure as Region Fleet Manager; these were the result of applying sound management practices supervised by a knowledgeable and dedicated group of managers:

	1956	*1972*
Number of vehicles, all classes (in vehicle-years)	978	2,455
Total miles run (in million of miles)	6.9	26.7
Average miles per vehicle	7,055	10,874
Average age per vehicle (in years)	3.3	2.7
Cost per mile, all classes	$.119	$.127

Lastly, I want to emphasize that I found the progress that the equipment management activity made during the late 1950's and 1960's was the result of a tremendous in-service program driven by knowledgeable people at the regional levels supported by the key Directors in the Chief's Office. But, it was those at the Forest and Ranger District levels who actually made it work. Their compliance with procedures, their use and care of the equipment, and their input and suggestions on what was needed to make the program workable provided its success.

At the Regional level, it was the teamwork between members of the Divisions of Engineering and Operation and Fiscal Control that got the program in gear. Without the assistance and support of key people at the Chief's level, it is highly doubtful that we would have had the benefits of FSH 6439.11, Handbook on Fleet Equipment Management, standardization of Forest Service equipment specifications, the Working Capital Fund system of finance, and other progressive management tools and procedures.

At the Forest level, equipment fleet and shop management programs were normally assigned to the Forest Engineer. In Region 6, he usually had under his direction a forest fleet manager and shop foreman who were knowledgeable, competent, and dedicated in the conduct of fleet maintenance and repair. Most were able improvisors; they carried out their programs with competence and cost-consciousness. Statistics shown above support this position. A library could be written about the manner in which this group met field emergencies making improvised repairs that often merited recognition that they never received.

During the period 1951–1960, I handled the operational inspections of all ski lifts operating on Region 6 Forests. This included field inspections of lifts, T-bars, and rope tows for cable and rope conditions of wear and wire fatigue, operative safety gates and related devices, effective counterbalances, general condition of tower members, maintenance of brake systems, bogie wheels, chairs and safety straps, availability and crew knowledge of use of emergency unloading equipment, and evaluation of the general performance of crews operating the installation. As a part of my training, I attended the first formal Service-wide Avalanche School; it was held at Alta, Utah, in 1952.

Most memorable of my ski lift inspections was that of the Magic Mile Lift at Timberline Lodge, just 1 week prior to the Portland Rose Festival-sponsored "Golden Poles" downhill race in either 1958 or 1959. Because the race was started high on the Palmer snow field, the Magic Mile Lift played a key part in transporting materials, gear, and contestants "up the mountain"! Its use was deemed absolutely essential by tournament officials.

My inspection revealed that the lift was unsafe and its mechanical deficiencies demanded that further operation cease until satisfactory repairs had been completed. This included the immediate replacement of the "main cable," a time-consuming and costly repair. There were other operational malfunctions of significant importance, but this was the critical one.

My report and recommendations were received by the Regional Engineer, Mr. R.F. Grefe, with deep concern. Fortunately, I had requested Mr. Kelly Hefner, Civil Engineer, to accompany me on this field inspection. It was his statement that my findings and recommendations were accurate and justifiable, which ultimately made them stand. During the race, the lift remained idle. Snow tractors were used to facilitate the event.

The lift was idle for the balance of the summer, while the main cable was replaced and other corrective repairs were made.

Having assisted Mr. Vern Church for several years in the conduct of the Region 6 Forest Lead Examiner training and licensing programs, I was assigned and directed this activity following Mr. Church's transfer to the Chief's Office.

The assignment entailed the assembly and preparation of the program's training material and agenda and the scheduling of updated classes for the training of Forest Lead Examiners annually. The Regional Engineer approved the final training and licensing programs, based on my recommendations. Since I relied heavily on his technical knowledge, current field experience, and invaluable assistance, Mr. Paul Grooms, Construction and Maintenance Superintendent, Gifford Pinchot National Forest, should be recognized as having contributed significantly to the success and effectiveness of the Region 6 Blaster Examiner program.

During my lengthy service in the Region 6 Division of Engineering, I worked under the direction and supervision of three Regional Engineers. They were James Frankland, Ray F. Grefe, and Ward Gano. Each was a competent, successful, and professional engineer, and because of their individual "track records," each was respected by both his "coworkers" and his

professional colleagues. The success of their individual tenures as Region 6 Regional Engineer was not unlike, but their personalities and management styles were. Regardless, the people in my equipment management organization and I experienced much personal satisfaction in carrying out their Fleet Equipment and Shop Management programs, because they consistently expressed confidence in our judgment, trust in our commitment to mission accomplishment, and a strong belief in our ability to do our jobs competently.

These comments highlight my Forest Service career. I would not have missed this opportunity "for the world," and I would gladly do it again. Serving this outstanding organization and its incomparable personnel was my everlasting privilege.

Recollections of Forest Service Engineering

Ward Gano

This account necessarily overlaps, in part, ex-Regional Engineer Ray Grefe's article in the first volume of *Engineering in the Forest Service*, about early days in Region 6. In recalling experiences that have been of particular importance to me, I'll be covering some of the same period he did—but probably from a different perspective. My time in the Forest Service breaks down into four assignments:

Regional Office, Region 6	1935–1951
Regional Office, Region 1	1951–1954
Chief's Office, Engineering	1954–1961
Regional Office, Region 6	1961–1973

Assignment in Region 6—1935 to 1951

This was the time of organization build-up to handle project planning and construction of the CCC program, collaboration with the Works Progress Administration (WPA) in the 1936-1939 design and construction of Timberline Lodge, Mt. Hood National Forest, and its Magic Mile ski lift (second lift area in the country after Sun Valley, Idaho), the DA-RM (Defense Access—Raw Materials) timber road program during World War II and the related surge in timber sale road construction that continued to expand after the war.

Prior to this time the Regional Office Division of Engineering had been organized primarily to handle mapping, surveillance of Roads and Trails activities on the Forests, and liaison with the Federal Power Commission (FPC) on water power projects. Regional Engineer Jim Frankland, a 1914 engineering graduate of the University of Washington, had been promoted to this position in 1932 after serving as Chief of the mapping section. Ray Grefe, a mining engineer graduate, was transferred from his position as Assistant Supervisor, Mt. Hood National Forest, in 1935 to become Frankland's assistant. Herb Howes, with a New England background, was the Region's Hydraulic Engineer and primarily handled details of the FPC liaison. (In the 1920's, several Forest Service Engineers, nationwide, were recruited by the FPC for principal assignments in this new agency.) Tom Rice and Art Glover were providing Forest Roads and Trails surveillance. This was about the extent of professional engineering people in Region 6 at that time. Most of the individual Forests were staffed with a Construction and Maintenance superintendent to look after these activities.

In 1934, Frankland set up an architectural section headed by W.I. "Tim" Turner, with assistants Linn Forrest, Howard Gifford, and several draftsmen and materials men. This unit developed standard plans for offices, warehouses, guard stations, shops, residences, and others, in a distinctive "Cascadian" architectural style, for construction by the CCC forces. The same group, with the addition of architect Dean Wright, later developed the design and plans for the Timberline Lodge WPA project.

At about the same time, Frankland hired structural engineers R.W. Lincoln (from the Rivers and Harbors Branch of the Corps of Engineers) and W.D. Smith (from private practice) to establish a bridge and structural design section. As the work load built up, he took on several recent civil engineering graduates (the writer, Bruce Olsen, Bob Swanson) to serve as detailers, draftsmen, and inspectors. In this period, too, he took on recent electrical engineering graduates John Mather, Martin Lantz, Allan Loew, and Bill Nelson to work under Herb Howes in a hydraulic/electrical engineering section. Of these names, Gano, Loew, and Nelson extended their temporary 3-month appointments to make full careers with the Forest Service.

Smith, assisted by Gano and Olsen, did the structural design for the Timberline Lodge and Gano, Nelson, Mather, and Loew teamed up in 1938 to prepare the bid specifications for contract purchase of the design, equipment, and materials for the 5,000-foot-long ski lift adjoining the Lodge. It was built in 1939 as a continuation of the WPA project that built the Lodge. This had to be one of the early contracts for professional services awarded by the Service. Gano served as resident engineer on the Lodge during its first construction season in 1936, and as project engineer on the 1938–1939 design and construction of the ski lift. Articles on these projects were published in Region 6 *Timberlines*, Vol. XXIII of September 1979, and Vol. XXIV of August 1981, respectively.

Lincoln and Smith were well-regarded as timber design engineers and were adept in following out the Region's policy of making prudent use of timber in structural applications. "Modern" timber connectors (split rings, shear plates, etc.) were just coming on the market after a period of design criteria testing at the Forest Products Laboratory in Madison, Wisconsin. Among others, the section designed a 345-foot span, single-lane, H15 loading, treated-timber, truss-stiffened suspension bridge over the Rogue River near Galice Creek on the Siskiyou National Forest—reputedly the longest such structure in the country at that time. The bridge was erected by CCC crews. Another design, also erected by the CCC in 1936, was a 135-foot span, three-hinged, treated-timber, spandrel-braced arch across the North Umpqua River on the Umpqua National Forest. This bridge, subsequently reinforced for heavier loading, is still in service (1990) and has been designated as an Oregon Historic Civil Engineering Landmark by the Oregon Section, American Society of Civil Engineers. The section also designed prefabricated treated-timber lookout towers with 7-foot by 7-foot and 14-foot by 14-foot cabs in heights up to 120 feet, which were incorporated into a Service-wide handbook of standard lookout structures along with plans for comparable steel structures as designed by Region 5. Working under the direction of these engineers was a rewarding experience that emphasized the importance of competent professional supervision of a young engineer in his early years. Both Lincoln and Smith left the Forest Service in 1939 to return to their pre-Depression careers, and Frankland named Gano as head of the section.

It was especially rewarding to work under the supervision of Regional Engineer Jim Frankland and his assistant Ray Grefe. Jim was a 6-foot, ex-racing shell crewman at the University of Washington, a Major in the U.S. Army Reserves, stoic in nature, and not given to frivolous conversation. His supervisory style was distant, but he was always available for advice in the event of a policymaking bind. He backed his people to the hilt and had the respect and loyalty of every one of his staff.

In those days, Ray Grefe acted as Jim's executive officer. Ray was closely familiar with all activities in the Division. Despite the heavy load of supervising Division of Engineering involvement in the strongly centralized CCC program, Ray found time to visit regularly with section heads in looking for any problems he might help with. Ray had a reputation in the Chief's Office of setting up and maintaining the best set of Roads and Trails records in the Service. In 1939, he was called on by then Chief Engineer T.W. Norcross to help co-author a voluminous and detailed landmark report to the House of Representatives Committee on Roads covering the National Forest Transportation System—its relationship to forest resource management, its planning, financing, construction, and maintenance. Grefe had also been associated with early "seen area" mapping of existing and planned lookout points on the Forests, and their relation to an "hour control" standard of road networking, primarily for Fire Control purposes. After World War II, in 1945, multiple-use transportation planning began in earnest. The planning was targeted for timber harvesting access on a watershed-by-watershed basis, at the same time serving special recreation and other multiple-use purposes. Under then Region 6 Timber Management Chief Ira J. "Jenckes" Mason (later head of Timber Management in the Chief's Office), it allowed plan-wise timber sale offerings with each contributing to effective development of the watershed. This coordinated action might be taken for granted today, but at the time it was a breakthrough in implementing transportation planning objectives.

Three other familiar names became associated with the structural section later in this period. Bob Mercer transferred to the section in 1946 as Construction Engineer from his position as Forest Engineer on the Rogue River National Forest, Bruce Plath joined up the same year as a design engineer after his discharge from the Army Air Corps, and Kelly Heffner accepted a 3-month detail to the section from Region 8, in 1948, to assist on the heavy load of preparing bridge replacement plans following the disastrous flooding that year in the Columbia River basin. Heffner moved to Region 6 from Region 8 in 1951 to take over as Section Chief when Gano transferred to Region 1, as Plath also did in 1952. After a period of reassignment as head of the Roads and Trails section in Region 6, Heffner transferred to the Chief's Office in 1958 and was promoted to Regional Engineer in Region 8 in 1959.

The first major bridge built with permanent materials as a requirement of timber sale was in 1949, across the West Fork Humptulips River gorge on the Olympic National Forest. The structural steel–arch span was about 180 feet and the gorge, with vertical walls, was 186 feet deep, so it was not a site adaptable to some kind of log trestle. The timber sale operator contracted out the construction of the bridge, and the total cost was allowed as a stumpage deduction. Bob Mercer was assigned as construction engineering inspector to assure conformance with the plans and specifications. However,

the bridge became the rallying point for protest by the timber industry as an imprudent cost for a single timber sale. From that time forward the Region had to live with the "prudent operator" concept, requiring supplementation with appropriated funds if road or bridge standards exceeding those prudently necessary for the particular sale were to be required in meeting long-term objectives.

Road construction programming was primarily geared to Forest Service timber sale plans, but requests for Engineering assistance began to come from other activities. The Olympic National Forest needed help in evaluating the worth of an abandoned logging railroad grade, with bridges, on private land that was to be the subject of a condemnation suit by the Office of General Counsel to gain access to a critical portion of the Forest. Forest tree nurseries were looking for help in designing irrigation systems. A major day-use picnic area at Eagle Creek, near the construction site of Bonneville Dam, was to have a public restroom with flush toilets and needed a septic tank and effluent disposal design adequate for the anticipated heavy use. There were other needs for technical direction in electrical, communication, power, mechanized equipment, and mapping. The demands prompted architect Howard Gifford to design a "tongue-in-cheek" Engineering coat of arms, graphically showing some of these activities with the legend "Omnia Servitiae ad Omnium Quisquem"—all services to all who seek them.

At this time, technical services, except those related to road and trail planning, location, and design, were centralized in the Regional Office. The one exception to this (that the writer remembers) was the design, by Arvid Nelson of the Regional Office Engineering Staff, of the road on the Ochoco National Forest that was named for him following his untimely death from leukemia.

This road was completely field-surveyed, designed for balanced cuts and fills, and fully staked for construction control—the first completely designed road job in the Region. Otherwise, F.D. "Mac" Macpherson, Verne Church, and H.F. "Hempe" Erickson divided the Forests between them and acted as liaisons with the Forests on all matters of programming, funding, and surveillance of the Roads and Trails activity, except for bridge matters, which stayed with the bridge section. Their work was supervised by Ray Grefe.

At that time, the Forest Engineer position was often filled by a professional forester, and his responsibilities were likely to include another resource function—Fire Control, generally, but also Timber Management. Several of these men went on to become Forest Supervisors, and a few as Regional Foresters or staff assistants to the Chief in the Washington Office. Other Forest Engineering positions, as already mentioned, were filled by Construction and Maintenance men who had the know-how in organizing and administering their crews to get the field survey, construction, and maintenance jobs done, and done well. However, decentralization of technical design and investigation work would have to wait until the Forest Engineer positions could be filled with competent graduate engineers at an appropriate grade level.

One activity from this period that demands recognition is that of the Surveys and Maps Branch under its long-time Chief (1932–1965), V.H. "Vic" Flach.

Vic started with the Forest Service as a messenger in 1916 and continued in the mapping specialty until his retirement. One of the principal field mappers in the Branch was Lage Wernstedt, a pioneer forester but also a pioneer in photogrammetry. Lage designed a stereoplotting instrument called the "Wernstedt Phototopograph," which was later granted a patent. In 1938, the Branch was assigned the job of producing a topographic map of about 2,000 square miles of the disastrous Tillamook Burn area in Oregon. With the help of the Wernstedt instrument, the Branch was able to produce a three-color, 1-inch-to-1-mile, 100-foot contour map of this area at the unheard of low cost of about $4 per square mile. This and subsequent mapping jobs demonstrated the importance of aerial photographs to resource inventories and mapping. The Surveys and Maps Branch started the planimetric mapping of Region 6 in 1947 and completed it in 1954. It started a new set of 1/2-inch-to-1-mile Forest Series maps in 1953 and completed it in 1962. In all this work, C.W. "Red" Gowan was an indispensable associate of Vic's. Vic wrote "Some Mapping Reflections" in Volume XIX (June 1967) of the Region 6 Thirty-Year Club *Timberlines*, which describes many of the innovations he introduced in carrying on the mapping program. In school we were told that an engineer is a guy who can do with 50 cents what anyone else can do with $1. By this standard, Vic Flach established himself as one damn fine engineer—regardless of his modest beginning.

Any recollection of the Engineering organization in the early years, up to about 1950, would not be complete without mentioning the Region 6 Equipment Development Section, headed by T.P. "Ted" Flynn. Mechanical Engineer Ray Neils, a refugee from private employment during the Depression and up to the start of World War II; Tom Coldwell, patternmaker-turned-designer after Neils' departure; Art Kelly, draftsman; and machinist/mechanics Kreilich, Parker, and Robinson were the nucleus of the closely knit development group. As Bud Waggener wrote in his article "Region 6 Snowcat Was A Breakthrough" in Volume XXVI (Aug. 1985) of the Region 6 Thirty-Year Club *Timberlines*, "the scope of the group's development projects was almost unlimited." Also, in Volume XXI (June 1974) of the same publication, Tom Coldwell has written a fascinating, detailed story of the development of the TomCat logging tractor. The TomCat combined the functions of conventional tractor and logging arch into one machine, with resultant reduction of adverse watershed impacts. Although field tests by several major timber companies were not all that unfavorable, the TomCat idea was never picked up by equipment manufacturers for commercial development.

Finally, Tim Turner, Chief Architect for the Region and for Timberline Lodge, died in 1950. Jim Frankland replaced him with A.P. "Benny" Di-Benedetto from the Corps of Engineers. In the immediate future Benny was to take responsibility for guiding correction of the deterioration that had taken place in and to Timberline Lodge as a result of its long closure during World War II and the poor management it experienced in the early postwar years. He was instrumental in developing justification for the Granger-Thye Act, which provided a continuing source of maintenance funding for the building.

Assignment in Region 1—1951 to 1954

In Region 1, it was good to learn that the men and women of the Regional Office, Division of Engineering, were no less human, friendly, and dedicated than those of Region 6. Regional Engineer Howard Jones was also a newcomer—he had asked for the transfer from the Chief's Office, where he was the top assistant to the Chief Engineer, first Ted Norcross and then Tony Dean. Back in 1948 I had worked under Jones, on a detail to the Chief's Office, in writing the bridges chapter of a revised Road Handbook, and had learned high regard for him. He was an Abe Lincoln type, with a similar build and dry sense of humor.

My immediate boss in Region 1, the head of the Roads and Trails Section, was Gerald "Mitch" Mitchell—also a newcomer (from Region 5). He had replaced Herb Holmquist, who was reassigned to head the Improvements Section. By education, Mitch was a mining engineer; rough-cut, but with an outstanding consideration for others. He had the ability to break down problems to basic elements in arriving at "go" or "no go" decisions without cluttering them with "what if" complications. He was a favorite of the Regional Forester Pete Hanson (also from Region 5), who took Mitch along as Regional Engineer when Pete was transferred to Region 10.

On paper, the man I replaced in Region 1 was Roger Nelson, a top highway design engineer who, as a part of the trade package, was transferred to Region 6 to take over as head of its Roads and Trails Section. Roger was the man who in 1947, together with Jim Byrne of the Intermountain Experiment Station (and later Chief Engineer of the Forest Service) and Paul Googins of Region 5, conducted the basic research and wrote the "Logging Road Handbook: The Effect of Road Design on Hauling Costs." This study established, for the first time, a technically sound basis for evaluating alternative road designs in terms of their effect on the cost of hauling logs. As I remember, Roger actually delayed, for a few days, his departure for Portland so he could introduce me to some of the techniques I'd need to know in attempting to fill his shoes. I spent the following few months in liaison with the Montana Forests on Roads and Trails programming and general supervisory matters. An ongoing spruce bark beetle epidemic in western Montana Forests generated a heavy work load in road location, design, and construction that necessitated the collaboration of the Montana District Office of the Bureau of Public Roads.

In April of 1952, and for the next 15 months, I was assigned to the onsite study of forest economic impacts of the proposed Corps of Engineers' construction of the Libby Dam on the Kootenai River, Kootenai National Forest, in northwest Montana. The study team included Clyde Webb, ex-Associate Regional Forester in Region 1, who came out of retirement to head the study; Blair Hutchison, forest economist from the Intermountain Experiment Station; and Paul Logan, a timber management specialist I had worked with in Region 6. My job was to plan and cost out possible transportation systems for several postdam forest management alternatives. These possibilities were then matched with the estimated costs and relative advantages of administering and managing forest resources under the several alternatives. The objective was to determine the kind of replacement facilities that could be recommended as justified for inclusion in the dam project, if and when built. After many months of reconnaissance surveys and planning, and page after page of analysis tabulations, with Clyde Webb's concurrence I proudly presented my report to Regional Engineer Jones for his review. His

bubble-bursting comment after thumbing through it: "About as interesting as a telephone book!" Satisfaction came in knowing that the team report was well accepted by the Corps (who paid for it) and that most of the mitigating measures recommended in minimizing the adverse forest impacts of a major dam and reservoir were included in its construction (1969–1973). At the time, this was a first in getting the need for such a study recognized by the dam construction agency and the inclusion of many of its findings in the construction program.

Assignment in Chief's Office—1954 to 1961

Anthony P. "Tony" Dean was now the Chief Engineer of the Forest Service, having replaced Ted Norcross in 1947 by transfer from the Regional Engineer position in Region 5. Jim Byrne had replaced Dean in Region 5. Dean took me on as a Highway Research Engineer, a position he had been trying to fill for some time. Six weeks later, Cliff Betts retired as Hydraulic Engineer and I was shifted from the research position to fill in behind him. After my short fling at the research job, Dean gave up in his attempt to fill the position. However, a research engineer position was later established, and filled by W.K. Nelson, in what became Byrne's Division of Forest Products and Engineering Research in the Chief's Research Office. This seemed to satisfy Dean's objectives.

Tony made inter-Division respect and collaboration a hallmark of his tenure. He had sound engineering judgment and could discuss engineering matters with any staff specialist on an equal footing—mapping, equipment specifications, transportation planning, structural design, or whatever. And he had competent grasp of most other resource activities—to the point of identifying where Engineering involvement could pay off. He had a fantastic memory for detail—could remember a faulty culvert installation, for example, on a remote road, from one inspection until the next, maybe 4 years later. Most impressive was his unfailing courtesy, whether talking to a powder monkey or acknowledging, again in detail, a delightful evening he might have spent with an inspectee's family.

Cliff Betts, the man I replaced, had made a name for himself in the water power field. He had collaborated in a publication on the water power potential of southeast Alaska. His primary activity had been in reviewing conditions necessary for resource protection in the granting of permits for water storage projects on National Forest lands, in preliminary permit or license conditions for power projects to be licensed by the Federal Power Commission, and in transmission line projects built by private utilities or rural electric cooperatives. Thanks to Dean's policies, as I grew into the job of replacing Betts, we began to get requests for technical help on building standards and specifications, on water supply and sanitation standards, and on recreation developments, reservoirs, and structures (except for bridges, which remained under C.T. "Sully" Sullivan in the Roads and Trails Branch). Mine became the Civil Engineering Branch, and we had to man up to stay abreast of the load.

These men went through the Civil Engineering Branch during this period:

R.W. Wilke—became Regional Engineer in Regions 10 and 2.

K.B. Heffner—to Regional Engineer in Region 8.

J.S. Mead—to Assistant Regional Engineer in Region 2.

C.A. Miller—to Regional Engineer in Regions 1 and 4.

C.R. Weller—to Regional Engineer in Region 3 and Assistant to Director of Engineering, Chief's Office.

R.M. Peterson—to Regional Engineer in Region 5, Regional Forester in Region 8, and Chief of the Forest Service.

Assignment in Region 6—1961 to 1973

In 1961, Ray Grefe announced his retirement as Regional Engineer in Region 6, and I was offered the chance to replace him, 10 years after first transferring away from the Region. Much had gone on during those years:

(1) **Jim Frankland** had retired in 1952 and was succeeded by Grefe.

(2) **C.E. "Rem" Remington** transferred from Region 1 in 1952 to become Assistant Regional Engineer. In 1959, Rem went on to become Regional Engineer in Region 2, then in 1961 to Chief Engineer of the Bureau of Land Management. During his time in Region 6, Rem had led a strong, but unfinished, effort to place graduate engineers in Forest Engineer positions.

(3) In 1951, **Roger Nelson** had transferred from Region 1 to become Roads and Trails Branch Chief. Nelson established an annual road design school to train Forest technicians in design methods. It was a bootstrap effort in developing and raising the skills of Forest road designers throughout the Region. Roger's work left an ineradicable track of Road Engineering accomplishments in Region 6.

(4) In 1956, **Tom Utterback** transferred from Region 3 and, together with Verne Church and Hempe Erickson, served as a Regional Office Area Engineer. In 1960, he succeeded Nelson as Roads and Trails Branch Chief when Nelson transferred to Region 3 as Regional Engineer. For a time, 1959 to 1960, he served as Chief of the General Engineering Branch. Tom was a key person in initiating, in 1959, the use of Electronic Road Design (ERD) in Region 6. By 1960, the Regional Office had its own computer, and an ERD unit was established and running hard. It was staffed at different times by Ron DeClark (from the Bureau of Public Roads), Larry Palmer, Jack Foster, Harry Heislein, Marge Hergert, and others.

Significant accomplishments within the 1961–1973 period covered by this account include:

(1) After consultation as to their practices with northwest State Highway Departments, Assistant Regional Engineer **Vance Blackwell** designed and placed in operation a construction inspector training and certification program. This helped assure the qualifications of those responsible for inspecting conformance with plans and specifications of construction by timber purchasers and contractors. Blackwell retired in 1966, and the position was redescribed as Methods and Training. The position was filled successively by **Ron Metcalf**, **Don Loff**, and **Kjell Bakke**.

In 1972, Kjell served as leader of an eight-man interdisciplinary study team charged with examining road planning and construction practices in the light of avoiding, or minimizing, adverse environmental impacts. In its 1973 report on Timber Purchaser Road Construction, after the field audit of 63 recently completed road projects located on every Forest in the Region, the team made a number of recommendations on fundamentals of acceptable performance. Dave Trask, who took over as Region 6 Engineering Director in 1973 and became responsible for implementing the report recommendations, has said he found the report "a superb vehicle for change to address the environmental concerns that developed across the country, but were specific to the Pacific Northwest."

(2) Architect **A.P. DiBenedetto**, under the administrative direction of the Pacific Northwest Experiment Station but nonetheless very much a part of Engineering, designed and supervised construction of many notable state-of-the-art Forest and/or Range research laboratories throughout the Pacific Northwest, as well as other Station areas.

(3) The accomplishments of the architectural group, particularly Engineers **Pat Jones** and **Bruce Hendrickson**, and architects **Ken Reynolds** and **Joe Mastrandrea**, in developing plans for a wide variety of administrative improvements throughout the Region. These included the development of bid plans and specifications for contract design and, later, construction of convention facilities (the Price Wing) at Timberline Lodge. This group shared, with the Division of Operation's Branches of Work Programs and Administrative Services, in a Secretary's Special Merit Award for expeditious preparation of practical and economical plans and specifications in anticipation of Job Corps Center needs under the Economic Opportunity Act of 1964. The plans were also used in other Regions. Then there was **Don Hart** and the way he geared up, along with the Divisions of Recreation and Operation, and the Forests, to lead in conducting site evaluations, design, construction, and operation of recreational and administrative sewage disposal systems in meeting the objectives and standards of the Pollution Abatement Act. In the Bridge section, first **Bob Tousley** and, after his death, **Phil Keasey** (by transfer from the Bureau of Public Roads) and their staffs provided the bridge designs and plans, the contract construction of which was supervised by Forest Contracting Officer Representatives. These, and other groups, were smoothly and effectively supervised by **Bruce Plath**, who transferred from the Chief's Office in 1961, first as Chief of the General Engineering Branch, and after the Division reorganization in 1971, as Assistant Regional Engineer for Design and Investigation.

(4) **Tom Utterback**, continuing his accomplishments as Roads and Trails Branch Chief, was a valued leader and spokesman in working with Forests to achieve improved stabilization in placement of road excavation material, as well as in design and placement of surfacing materials. His efforts in the negotiation of road construction specifications with recalcitrant timber industry road committees were well-reasoned, well-presented, and well-respected, even if not always fully adopted. He was to become one of the three Assistant Regional Engineers (Construction and Maintenance) when the Division reorganized in 1971.

(5) The establishment of a soils engineering capability with a Region-wide testing laboratory in Portland, and soils investigating competence on nearly all Forests. **Chris Schwarzhoff** was the initial leader in developing a soils engineering consciousness in the Region, subsequently carried on by **Larry Hendrickson** when Chris was transferred.

(6) The impetus and skills given to advancing the road paving program by **Ron Williamson**—a program pioneered by the Mt. Hood and Gifford Pinchot Forests, and one that has had a major effect in reducing maintenance costs, avoiding dust pollution, and contributing heavily to user enjoyment.

(7) The interest in staying abreast of advanced technology, evidenced by people like **Bill Shiley**, Division transportation planner and formerly Forest Engineer on the Mt. Baker National Forest, **Bob Swarthout**, Bridge Engineer, and others who volunteered for yearlong advanced logging systems training under Forest Engineering systems leader **Hilton Lysons** of the Pacific Northwest Experiment Station (out of its project office in Seattle).

(8) The way in which **L.A. "Bud" Waggener**, as Equipment Manager, worked with the Forests and other Divisions, especially Operation, in achieving a high level of conscientiousness in the care and safe use of motorized equipment. Bud led in the training of Forest mechanics, and in standards of repair practices and tooling. This, along with strong performance by Forest fleet and shop personnel, allowed gains in all measures of management effectiveness, even with sharp increases in inventory in all classes of automotive units during this period. He also carried on the blaster's training and certification for the Region for many years. He was one who could, and would, accept assignments outside his specialty and perform a thoroughly professional job in doing so.

(9) **Roger P. "Sky" Chamard**, who had been Forest Engineer on the Siuslaw National Forest, took over the Surveys and Maps Branch when Vic Flach retired and, at a prudently planned rate, turned it into a thoroughly modern unit, with state-of-the-art photogrammetry and stereoplotting equipment. Sky took advantage of every chance to make the Branch a model of equal opportunity practice. He became an Assistant Regional Engineer (Programs and Planning) in the 1971 Division reorganization. Sky's organization and mapping talents were recognized in 1974 when Chief Engineer Mike Howlett appointed him Director of the newly established Service-wide Geometronics Service Center at Salt Lake City.

(10) **Russ Niblock**'s name must be mentioned. Russ did much to put "management" into administration of the Forest road systems, particularly in collaboration with rights-of-way specialist Bob Beeman in the Division of Lands, in carrying out the program of cost-share agreements. Forest Engineer **Paul Enberg**, on the Wenatchee National Forest, also had a strong, contributory part in this activity.

Then there were **Herman Kuppler**, lead cartographer; **Charles Hof**, lead road designer; **Gilbert Lynch**, administrative officer, **Hector Langdon**,

Roads and Trails programmer; **Rob Keeney**, construction engineer; **Stan Thorn**, water resources engineer; **Ethel Chatfield**, who spent her long career as secretary and administrative assistant in finding ways of being helpful and valuable to her supervisors even before they were aware they needed what she could give them; and **Frank Flack**, signing, and **Lee Corbin**, trails—both 50-year career veterans. These and many, many others, both in the Regional Office and on the Forests, gave skilled and dedicated service in fulfilling their part of Engineering responsibilities within the Forest Service program. Only the limitations of time, space, and a foggy memory stand in the way of giving them the recognition they deserve.

If there is any term that characterizes the direction of the Division in this period, it might be the word *professionalism*. Tony Dean may have set the stage for it by his example of thoroughness in investigation and respect for professionals in other disciplines. Beginning steps were made in decentralizing investigation and design responsibilities to the Forests. The Forests were anxious to decentralize these responsibilities to the District level, close to where the work was generated. This gave us problems because, at that time on most Districts, the grade of the Ranger would not support a grade level for an Engineering Assistant that would be compatible with the expected level of professional performance. The answer, on heavier work load Forests, even if not the ideal one, was to establish Zone Offices or Technical Centers serving more than one District. This allowed the opportunity of assigning a professional level of responsibility close to the District but still under the technical direction of the Forest Engineer.

Speaking of Forest Engineers, it is gratifying to know the number of those in that position during this period who went on to become Regional Engineering Directors:

Bob Larse, Okanogan, to Engineering Director in Region 1.

Beryl Johnston, Deschutes, to Engineering Director in Region 1.

Don Loff, Gifford Pinchot, to Engineering Director in Region 2.

Walt Furen, Umpqua, to Engineering Director in Region 3 and Assistant to Director of Engineering, Chief's Office.

Dale O. "Jack" Frost, Wallowa-Whitman, to Engineering Director in Region 3.

Marion E. "Bud" Unruh, Mt. Hood, to Engineering Director in Region 5.

Dave Trask, Gifford Pinchot, to Engineering Director in Region 6.

It's disconcerting, however, not to be able to name all those in other Region 6 Engineering positions in this period who went on to higher Engineering specialist and staff positions, as well as the several who made their way into Forest Supervisor line positions.

Contributions to the History of Engineering in the USDA Forest Service

James M. Usher

My Career

1937–1940	Kootenai National Forest, Region 1	Lookout, Headquarters Smoke-chaser, Ranger Alternate
1940–1941	Regional Office, Region 1	Fire Control
1941–1943	War Mapping, Region 5	Party Chief
1943–1946	Guayule, Region 5	Rubber Technologist
1946–1948	Ochoco National Forest, Region 6	Forest Engineer
1948–1950	Cleveland National Forest, Region 5	Forest Engineer
1950–1955	Eldorado National Forest, Region 5	Forest Engineer
1955–1960	Engineering, Washington Office	Assistant Chief, Roads and Trails Section
1960–1972	Regional Office, Region 4	Roads and Trails Branch Chief and Regional Engineer

Distinct Periods Relative to Forest Service Engineering

Period I	Formation Until After World War I
Period II	1919 to Pre-Depression (1929)
Period III	Depression Through World War II
Period IV	Post–World War II Through 1969
Period V	1970 Until Present

Period I—Formation Until After World War I

This was before my time, but seems characterized by efforts to produce an organization and provide its staffing. National Forests were delineated in the West from the Public Domain and were designated Forest Reserves. Because there was little or no public land in the East and South, areas needing watershed protection and seemingly best-suited for timber production were set aside for acquisition programs. On-the-ground work, other than land acquisition, fell into protective categories, with fire prevention and control of

fire high priority. Some use permits were issued for activities related to livestock grazing, local timber uses, minor water developments, and mining. A number of southern purchase units needed protection from erosion because they were primarily cropped-out cotton and tobacco lands. Work of administrative units in the Engineering field was accomplished by well-qualified construction and maintenance personnel. Few, if any, engineers of other categories were available or needed. I'm not even sure if there was an Engineer on the Chief's staff. The first Chief Engineer (that I know of) was Mr. Norcross, who preceded Tony Dean. Engineering work, such as boundary survey, water power and water supply developments, mining activities, and work connected with the railroads, was generally accomplished by other agency engineers or by those from the private sector.

Period II—1919 to Pre-Depression (1929)

This period also was before my time, but it was still fresh in the memories of a number of oldtimers with whom I worked in my early years. Generally, this period was characterized by organization refinement into Regions and Forests. It was a period in which work on inventories was intensified, and individual resource management planning followed.

There were engineering organizations at the Regional level. These engineers were well-qualified, older, and experienced people, sometimes borrowed from other agencies for short- or long-term assignments. These engineers would work for Forests if a Forest Supervisor felt he needed technical assistance. I'm not sure if any National Forest had a forest engineer as part of its staff prior to 1929.

Service-wide, Engineering activity in automotive equipment use and development was becoming standard work load, and "trucking" of National Forest products required roads and bridges. Use of resources made property line location a bigger part of the work load. Planning for management of resources made location maps and access necessary. Fire problems needed detection, suppression, communication, and equipment development. These needs included lookout structures, access trails and roads, and groundline phones and lines to replace the old heliograph. (The use of number 9 galvanized wire for the single-wire phone system made number 9 the "baling wire" of the Forest Service.)

In the West, Federal power license activity on National Forest land developed engineering problems relative to dams, transmission lines, communication systems, and necessary access. The Army Engineers were beginning to have an interest in flood control, and a number of cities proclaimed their interest in National Forest watersheds for municipal water supplies. Examples are Portland's Bull Run Watershed and San Francisco's Hetch Hetchy Dam and appurtenances. In the South, the Tennessee Valley Authority produces both flood control and power generation. Much of the watershed of the project is National Forest.

The matter of field data for map preparation, for use in resource inventory and management, may be of interest. The usual method was "line and plot." Starting from a found or "suspected" section corner, the mapper measured along the section line a distance of 5 chains (330 feet). Turning a right angle into the area he is planning to map and inventory, he uses a staff compass to parallel the boundary line of the section. At a standard

distance, he set his compass up on the line—which point becomes the center of a circular plot of an established size. Within the area of this plot, he measures the resource he is inventorying. If it is timber, he records the height, diameter, and species of reproduction within the plot. He then proceeds on his established line until the next specified distance to the second plot, where the procedure is repeated as in the first plot.

The number of "lines" and the number of "plots" are pre-established to produce a sample equal to the percentage of area desired. "Lines" are run from section line to section line. When the second section line is reached, a right-angle turn is made along the section line for a distance of 10 chains. Another right-angle turn is made back into the area, parallel to the first line run, and the line-plot system is carried on. This procedure continues back and forth with parallel strips through the section. However, this is only the inventory part of the job.

An elevation also is established at the starting point of the line. These elevations may be assumed or actual. While running the "line" and "plot," pre-established contour intervals are computed, and the mapper stands on the line at the contour level and sketches on his map sheet an ocular estimate of a level line for a distance of 5 chains on each side of the line. This procedure is carried out at each contour level as he goes up and down the line. As you can see, when reversing on a parallel line, he must re-establish a contour spot on the same level as on the previous line.

All distances are done by pacing. Elevations are computed through use of a percent abney. Direction is by staff compass. It usually turned out that the staff compass was the most accurate of the three tools being used. To those used to measuring vertical angles by degrees, it may be difficult to understand the use of a percent abney until one realizes that "percents" compute directly into feet per 100 degrees. This saved a lot of arithmetical errors in establishing contour points on a "line." Since all distance measurements are computed on a horizontal basis, it was necessary to be able to make correction for converting "slope distance" to the horizontal. This was accomplished by a lot of practice and checking measurements of pacing on varying slope percents. The mapper also noted on his map sheet any cultural features such as buildings, fences, telephone lines, streams, lakes, or roads and trails.

A "line-plot" crew usually consisted of one man, a long way from anyone else, camped out for usually 1 week at a time. The rough field data were turned in to map people, who tried to figure out what the heck this guy was doing with contours traced in at right angles to each other, streams running uphill, and square sections being many odd shapes, when "field" measurements were projected.

It always amazed me, the beautiful works of art that the cartographers produced. Somehow, they reconciled many field errors into perfect images on paper. And what was most surprising of all, the maps were relatively accurate. Many of the inventories have yet to be tested or have already been redone.

Period III—Depression Through World War II

This period was characterized by Forest Service struggles to maintain its basic concepts and programs in the face of deep Depression problems, followed by wartime emergencies and constraints. It was, however, a "boom-time" of Engineering development in the Forest Service. The Works Progress Administration (WPA) financed public works that used many men at hands-on jobs, particularly where an established agency could provide plans and supervision. This fit the Forest Service to a "T." People out of work included laborers, technicians, craftsmen, and professionals. Lots of engineering people were looking for work. Most projects were construction and reconstruction in nature and required design, layout, and construction.

The Civilian Conservation Corps (CCC) was similar in purpose but aimed at employing the youth of the country. This program, as it related to the Forest Service, also usually meant housing, feeding, clothing, and transporting the enrollees. As well, Forest Service people were responsible for their training and physical, spiritual, as well as psychological well-being.

The foregoing two projects were almost entirely "in-house" in that they accomplished work that assisted with use and management of National Forest resources. They needed Engineering services to conceive and develop building, water and sanitary systems, lookout towers and housing, station offices and residences, warehouses, barns, major recreation facilities (Timberline on Mt. Hood and Magic Mountain in Georgia), campground and picnic facilities, dams, stream improvement, roads, bridges, trails, airfields, equipment of all kinds, communication systems and facilities, and anything else anybody thought they needed! All the foregoing work was to be done when there were no fires to fight.

In addition to "in-house" projects, the Forest Service was assigned emergency projects, such as recovering merchantable timber from blowdown by a hurricane in the New England States (NETSA).

The Forest Service also provided some personnel to the Soil Conservation Service for the Dust Bowl Shelterbelt program and was able to recruit some engineers when it closed down at the start of World War II.

Just prior to this war, the Military of the United States realized that existing topographic and type maps of a number of western coastal areas were totally inadequate for their purposes. By this time, aerial photographs could handle both type and topographic mapping, but very little ground control was available. The Forest Service was asked to do the necessary elevation and direction controls, procure aerial photography, and produce quad sheets. The Army provided the money, and the Forest Service provided the people and the equipment and did the work. Of course, the primary reason the areas did not have adequate maps was that they were neither flat nor accessible, nor were they devoid of ground cover! As an example, a part of coastal California and Oregon in the redwood area was so thickly wooded that ground targets could not be seen on aerial photographs. The answer to this problem was to establish a target pattern, select tall trees to fit that pattern, climb and top, build a 4-foot by 4-foot platform and paint it white, measure down to the ground, run random line traverse with levels to the nearest benchmark, and thus establish elevation and location of the platform for stereoplanigraph control when aerial photographs were taken.

Shortly after the United States entered the war, it became apparent that much more natural rubber would be needed than might be available. Therefore, the Guayule Rubber Project was set up under the guidance of the Forest Service. Guayule is a bushy plant somewhat resembling a sagebrush. It grows wild in the hot and desert sections of the Southwestern United States and Northern Mexico. Rubber, in latex form, is found in the woody stems of the shrub. Latex extraction from the air-dried plants is started by crusher-rolling. The material is then further pummeled in a stone ball-mill that agglomerates the latex into rubber "worms." The pulpy mass of rubber and woody fibers is put in a pressurized chamber with steam, which waterlogs the wood fibers. Thus, when material is dumped into a flotation tank, the raw rubber worms float, and the water-filled fibers sink. Curing and drying follow.

The purpose of the "Emergency Rubber Project" was to expand and speed up harvest of wild Guayule; grow and harvest planted Guayule; test and process plant material; and produce rubber. Land, facilities, and equipment were purchased, leased, or developed. Thousands of acres in Texas, New Mexico, Arizona, and California were procured and eventually planted to Guayule. Many acres were row-cropped and were ditch-irrigated by existing irrigation systems. However, much land had to be leveled and deep wells drilled to provide irrigation water for both surface and overhead systems.

A number of large nurseries were established to grow the Guayule plants from seed to seedlings. The largest, I remember, was 640 acres (a full section) under an overhead sprinkling system, with attending greenhouses, storage buildings, equipment sheds, offices, and housing. A large labor and supervisory force was required for nursery work, planting, raising, harvesting, and transporting the Guayule shrub. Large labor camps were built to house seasonal and permanent work forces. A large production mill was constructed to process shrub material and cure the rubber produced. Engineering forces worked on design and construction of water systems from wells to pumps to delivery systems, as well as for housing, development, and camp needs.

Unavailable, or unheard of, equipment meant mechanical, electrical, or hydraulic engineering problems to solve, test, and put to work. Some architectural, land surveying, cartographic, and soils engineering chores were complicated by the volume of work and shortage of personnel, rather than by the complexity of the projects. All Engineering development work was hampered by shortage of standard materials and experienced construction personnel. A lot of creativity in the use of substitute materials helped, but all projects were monitored closely because urgent needs precluded proper testing and normal evaluation.

The urgency of the project was characterized by having a manpower priority equal to that of the military, so that we could retain personnel. However, to hold them, we had to get to them before they enlisted or were drafted.

Period IV—Post–World War II Through 1969

This period was a time of rapid and somewhat unbalanced growth and development. Engineering organizations expanded first at the Regional and Washington Office levels, and then on the Forests and Districts. These expansions were brought about to meet the increased demand for use of the

National Forests and resources. The postwar boom radically increased demands for timber, water, recreational, and minerals. In addition, in the West, water development, grazing, recreational facilities, and explorations for oil and minerals were particularly demanding of engineering services.

In the early phases of this period things were going well, and it was so exciting to get so much done that standards and some of the niceties seemed less important. Many miles of primary timber access roads were hastily surveyed and constructed with insufficient attention to possible watershed damage and future requirements. To meet existing hauling equipment constraints, ruling grades were set at 3 percent adverse and 6 percent favorable. There was little attention to soil problems or fill slope stability. An "L" line grade was run one day; plotted on cross-section paper in the tent that night; and "P" line established. The next day the "paperwork" was taken to the field, and the "P" line put on the ground by offsets from the staked "L" line. Elevations were taken on the new "P" line stations, size of needed culverts or bridges were noted, and clearing intensity was estimated. That night in the tent, the profile of the "P" line was plotted on cross-section paper, and an "eyeball" grade line laid in. Since the controlling factor of speed in haul was percent of adverse grade, rather than alignment, zero cut or fill at center line was a primary objective. End-haul of material was determined by counting the small squares on the cross-section paper in cut cross sections as against those in adjacent fills. A ratio was used for a balance between cut and fill. This ratio was established by using 1:1 backslopes, 2 feet extra width for ditches, and 1 1/2:1 fill slopes. As an added refinement, some designers used different color pencils to indicate on the cross-section profiles which material went where. If, during construction, there turned out to be excess or unsuitable material, the standard was to store it in low spots inside nondrainage through fills. If there was a shortage, it was remedied from the inside bank of the closest curve.

Clearing limits were designated, and the road construction staking was accomplished by leveling-out from centerline. The Forest Service was to pay a high price for the "expediency" type work on these roads. As hauling equipment became more efficient and powerful, unnecessary distances and lack of flexibility occasioned by the 3-percent adverse grade restrictions meant more hauling miles than necessary. Also, lack of fill compaction and bank stabilization resulted in wasted surfacing and increased maintenance costs. Low-speed alignments reduced optimal haul costs. Many of these early access roads have been relocated or reconstructed.

During the late 1950's and through the 1960's, recreational use on the National Forests boomed. Also, major water developments produced a number of large reservoirs. These reservoirs became ideal locations for associated recreational developments and also major conflicts between agencies for development and control of the areas for recreational use. One of the major weapons used by the Forest Service to retain and advance administration and development of National Recreation Areas was the Service's proved ability to provide quick and appropriate access and facilities for public use and enjoyment when funds were made available. These on-the-ground investments improved local economies and gained political support for congressional assignments. There also was friendly, but serious, competition between Forest Service Regions for use of available funds. In the early part of this period, funding depended upon approved development

plans and ability to manage construction. So, the more projects a Region could get ready to contract, including necessary rights-of-way, the better its chance of getting a larger "slice of the pie."

Besides development of recreation areas on National Forests, the Engineering work load associated with various special use developments was mushrooming. Many winter sports areas were being developed by private concerns. There was also the Olympic winter sports area in Region 5. Public highways through the Forests were under improvement, and the Interstate System made a major impact on many National Forests.

This period saw advancing oil and gas explorations, as well as water and power developments. Public communication and military advance-warning systems occupied a number of peaks in the western Regions. Although these developments were not major undertakings by the Forest Service, they all required technical and administrative review with a major emphasis on Engineering compatibility. Some winter resort areas created city-sized water and sanitation problems with highways for year-round use and maintenance. These access problems encroached on areas of thin and sensitive soils, as well as on avalanche and landslide areas.

A major change in transportation system management during this period was brought about by a change in concept—from Forest roads being viewed as a private system to serve a Federal property to a recognition that most of our roads were open to the public. Attention to the primary concern for public traffic safety changed standards for sight-distance, signing, road width, and traffic data. Computers came online to assist with designing, cost estimating, and recordkeeping.

The amount and complexity of engineering required for the continuing programs and diversified needs were staggering. There were few, if any, major developments with advance plans or reliable cost estimates. The need for engineers in many specialties was glaringly apparent. Recruiting of Engineers became a major Forest Service effort. Most regions had in-house training programs and also sent a number of our regular Engineers to universities for specialized training. We worked closely with the Bureau of Public Roads (now the Federal Highway Administration of the Department of Transportation) on improvement of Forest highways and development of the scenic road program. As far as they could, the Bureau also assisted with design and contract administration on some of our higher standard access developments. Most Regions and Forests developed courses for technical qualification of our people for construction engineering and road design.

During this same period, use of National Forest resources, particularly timber, was occasioning construction and reconstruction of many miles of road as a part of the sales agreement. This added to the Engineering work load because of the increased need for design approval and construction inspection. Special uses, other than timber, usually had some structural or access features that required Engineering review and approval. These needs were usually occasioned by mining, oil exploration, dam and water power developments, private resorts and guest ranches, and similar nonforest activities.

By the late 1960's, engineering organizations at all levels had been modified to better relate to changed work loads. The quantity, quality, and grade level of Engineering personnel were relatively compatible with responsibilities, and Engineering work load, including coordinated management activities, was stabilized or in the process of settling back.

Multiple-use management was in full bloom, and environmental balances were being studied and incorporated in all management and development activities. Multiple-discipline team planning and action programs were producing better integration and more appropriate results. Most evaluation teams had Engineering members and/or Engineering input. Participating Engineers experienced broadened basic understanding of the complexities of management decisions. Management and other disciplines gained understanding of the significant contributions that Engineers contribute to better decisions and results. In addition, the team planning approach to activity planning really served to provide more concise criteria for development of solutions to problems.

Period V—1970 to Present

Because I retired in June 1972, most of this latter period was after my time. However, I have kept in touch with friends still at work or recently retired, and it appears Engineering responsibilities have been characterized by maturing and refinement of organization and missions. I have been favorably impressed by the enthusiasm and the work ethic of the young Engineers with whom I have come in contact. It seems Engineering is functioning as a full partner in the USDA Forest Service organization and its missions.

Letter to Director Wilcox

Robert A. Kemper

Sterling Wilcox, Director of Engineering
USDA Forest Service
Washington Office
12th & Independence, S.W.
P.O. Box 96090
Washington, DC 20090-6090

Dear Mr. Wilcox:

Reference is made to your 7100 letter of June 20, 1989, regarding my help in updating the history report *Engineering in the Forest Service*. The following are some of my thoughts and remembrances of my career in the Forest Service, and you are welcome to use any or all of them.

When I started with the Government in 1939, there were few Civil Engineers available. Most of the Forest roads were built by a foreman with only practical knowledge; and, with some, quantity came before quality. If they had a bulldozer, that was great, because most of the work was done with a tractor with a pull grader. The operators were CCC enrollees who were learning, and some of them became very good operators. I trained several who went on to work for contractors for many years.

Most bridges were built of native timbers and logs. The abutments on most bridges were rock-filled log cribs. The piers were either mud sills or pilings. When we replaced these bridges in the late 1940's and 1950's, several had mud sills, even in some fast-moving rivers. Pilings were driven with a set of leeds on skids, with a 1,000-pound hammer. Most of these bridges, even the 125-foot multispan on the Chippewa River, were built without an engineer's technical knowledge.

After World War II, it was customary in our area to assign one engineer to serve two or three Forests. Most of the survey work was confined to bridge site surveys. Standard plans were used for all timber bridges, and they were modified for length of span or height above water.

In the early 1950's, most Forests had a Civil Engineer. In 1952, Murvin Johnson became the first Forest Engineer on the Chequamegon. That summer, we went to the Chippewa River to make a site survey. The crew was as follows: Louis Pommerening, Forest Supervisor, was the transit man; Murvin Johnson, Forest Engineer, was the rod man; and Bernard Ernst and myself were chain men.

About 3 years later, another Engineer was added to each Forest. Then more aids were hired, and survey crews were organized. After that, road and bridge plans and specifications were made for each project. In the 1960's, plans and specifications were made for timber purchaser roads.

Until the early 1950's, road and bridge work was under the supervision of the District Ranger. Many jobs were used to give more employment for part-time District people, with little thought to how or if the project was completed. Then for 25 years, when the Forest Engineer took over and there was a good balanced crew, costs went down and better work was accomplished. In the 1980's, Engineering supervision jumped from four to eight on the Chequamegon. Most of the other Forests had similar additions with no more work. Paperwork is all that has increased.

It has been a wonderful experience to have worked for the Forest Service for over 39 1/2 years. Of those years, 4 1/2 were spent in the military during World War II. During my tenure on the Chequamegon, I worked for four top notch Forest Engineers, and their guidance was very valuable in my career.

As a friend said, "It is too bad that new employees will never know how good an outfit was to work for." Now with the new concept of all employees working together to make decisions, it will be a free-for-all.

/s/ Robert A. Kemper
484 S. 7th Avenue
Park Falls, Wisconsin 54552

Forest Service War Mapping

Clair L. Arneson

In 1941, in view of the war in Europe, the U.S. Army knew that the United States had very poor topographic maps of the coast lines for defense purposes. The Army Corps of Engineers was commissioned to obtain up-to-date topographic maps of the coasts and 100 miles inland, as soon as possible. The Corps asked every Government agency with mapping units to assist with this gigantic effort. This project was called "Defense Mapping" and later changed to "War Mapping" in December 1941.

The Forest Service was uniquely qualified to make these maps inasmuch as it had very qualified engineers, two types of stereoscopic plotters that used contract 9-inch by 9-inch aerial photographs, plus mules for packing into very rugged mountains. The Wernsted and the KEK stereoscopic plotters were invented by Forest Service employees—Loggie Wernsted, Jasper King, John Elliott, and Philip Kail—and patented by the Department of Agriculture.

Marshall Wright of the Department of Agriculture was the negotiator with the Corps of Engineers. He and T.W. Norcross, head of Engineering, agreed that the Forest Service would map coastal areas of the Los Padres and Six Rivers National Forests. Each Regional Chief of Surveys and Maps was instructed to transfer all qualified personnel to San Francisco for assignment. Jasper King was in charge of all personnel for the War Mapping project. The War Mapping headquarters was in the Massey Building in San Francisco, where the employees reported until such time that the field office was established in Maricopa, which was near the Los Padres Forest.

In the beginning, there were just two KEK plotters for training purposes, and as they were built in Denver, they were shipped to San Francisco, ending with about 20 KEK plotters. Loggie Wernsted, in Portland, built one plotter and sent it to the field office in Maricopa. Training was done in shifts in San Francisco.

The field engineers were assigned to the Los Padres to establish both horizontal (latitude and longitude) and vertical (elevation above sea level) control to be used to position the aerial photographs. The Forest Service packing mules from Montana were used in the rugged mountain area. The aerial photographs were made at the same time as the field surveys.

An additional field office was established at an old CCC Camp at Gasquet, east of Crescent City, on the Six Rivers National Forest. We worked and camped all week, returning to Gasquet on Saturday. One Saturday when we returned, the FBI was waiting to interrogate us concerning an aircraft that was supposedly trying to start a forest fire. We had seen the plane and gave the FBI the location to the best of our knowledge, but we did not see any fires.

Other crews were establishing flags and targets on the tallest redwood trees. One tree was 220 feet tall and required a tree-topper to build a platform that could be seen on the aerial photograph.

Triangulation work took us well into November, and we still had to identify the horizontal control stations and the bench marks on the aerial photographs with a pin prick. This portion of the work was finished just before Christmas, and the field office was moved to Maricopa.

In about June, the mapping of the Los Padres was completed, and everyone was moved to Crescent City to finish the mapping there. Before the maps could be completed, additional vertical control was required in the thick redwood Forest. Crews would start from a known point (usually a highway) and, to find their way back, would use a ball of string to mark the way.

Inasmuch as Crescent City was on the coast, evacuation plans were made for all the employees and their families in the event of an invasion.

In September 1943, the entire Mapping Unit was moved to Gettysburg, Pennsylvania. The Soil Conservation Service mapping unit was behind schedule with its mapping project of the area, so the Forest Service completed this mapping by July 1944.

Then the Navy Hydrographic office requested help from the Forest Service mapping unit in making maps for use in the Pacific war area. As I recall, every fourth plane on a bombardment mission was also photographing the area. In turn, these photographs were sent by courier to Gettysburg to be used with existing maps to make charts for bombardment or invasion of the area.

The Japanese had excellent topographic maps of all the Japanese Islands, and the Navy Hydrographic office had a complete set of these maps; however, portions of these maps were deleted by the Japanese as "secret." When aerial photographs were taken of these areas, the "blanks" had to be filled in.

The majority of the Mapping Unit remained in Gettysburg through 1945, and in 1946, the Unit was moved (see newspaper article) to Washington, D.C., and named the Eastern Photogrammetric Service Center.

Included here is a copy of the Forest Service War Mapping Emergency & Evacuation Plan for the Crescent City field unit in 1943. Also included is a copy of another article from the Gettysburg newspaper, dated October 29, 1945, which details the work of the Mapping Unit.

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Maps For Pacific Conquest Made Here; Staff Lauded By Admirals King, Nimitz

With the lifting recently of the solid wall of secrecy that has surrounded the Navy War Mapping program at the Lee-Meade inn, an amazing story was revealed about the part of J. E. "Jack" King and his staff of 45 played in winning the war in the Pacific.

Gettysburg knew there was a "war mapping project" underway at the inn two miles south of here along the Emmitsburg road but only a few of the top men there knew that charts needed by the U. S. Hydrographic office to complete highly detailed maps for the invasion—and later the occupation—of Japan, most of the charts for the bloody Iwo Jima campaign and scores of other Yankee targets in the Pacific were being made there.

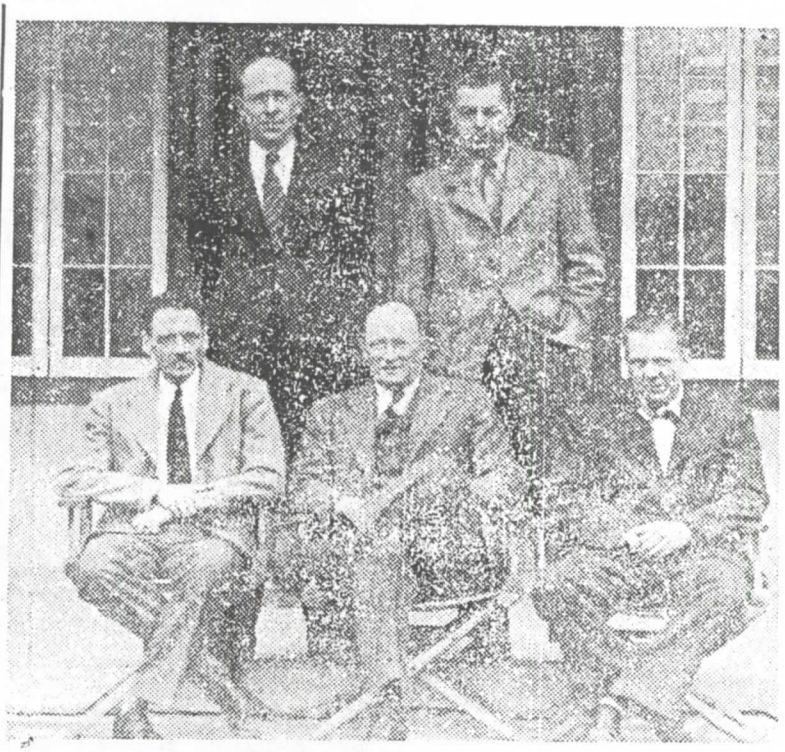
That story was told in detail for the first time to a reporter for The Gettysburg Times by H. C. Cain, engineer in charge of photo-cartographic control at the inn.

Invented Machines, Methods

Striving to help meet the navy's critical need for adequate bombardment and target charts, the Gettysburg staff often had to go far beyond established engineering practice to solve new problems that only Yankee resourcefulness and ingenuity could lick. Necessity mothered many new methods and designed new equipment at the Lee-Meade inn. Cain admitted that in the future some of them probably will be developed further, and may be found worth patenting.

But the U. S. Forestry Service crew at Gettysburg takes new inventions in stride for the prime instrument in their work was the KEK steroscopic plotter—invented by a trio of forestrymen just before the war while they were on forest service work in Region 2 in Colorado.

Without that machine, dozens of models of which were built by P. B. Kail, one of its inventors, in his own machine ship, the forestry service engineers don't know how they could have met navy demands, and advancing deadlines on high priority work.



Much of the responsibility for producing accurate war maps here for the Navy rested on the shoulders of these five men: Seated (left to right) J. W. Elliott, engineer in charge of stereo-plotting; J. E. "Jack" King, project engineer who was in direct charge of work here; H. C. Cain, engineer in charge of Photo-cartographic control. Standing (left to right) M. A. Walker, engineer in charge of photo-hydrography, and P. B. Kail, who with King and Elliott invented the invaluable KEK steroscopic plotter.

"Well Done" From Nimitz

The way in which the Gettysburg staff turned out accurate work under the pressure of navy needs has won a "well done" from Admiral C. W. Nimitz, commander in chief of the Pacific fleet.

The Nimitz letter came through in July with a congratulatory endorsement by Fleet Adm. E. J. King. At about the same time "Jack" King's men received a letter from Rear Adm. G. S. Bryan from the

(Please Turn to Page 3)

Maps For

(Continued from Page 1)

Navy Hydrographic office at Washington congratulating them upon the work they had done in their first year of service for the navy.

Strict secrecy was observed in the work. The aerial photographs which came here from the Pacific were identified only by a project number and were always referred to by number. What the men did know of their work, they could discuss with no one outside the staff, not even their families. Telephone conversations were guarded and place names omitted.

Work Closely Guarded

While their husbands put in long hours at the inn on their secret duties, the wives of the Gettysburg mapmen organized their own social group, The U. S. Forestry Service Ladies, and met regularly. Many of the women in the group took an active part in Gettysburg community life. Several served as Red Cross nurses' aides and others were often called upon to entertain local organizations with their musical talents.

When highly critical work orders came through that put the men on 24-hour duty, seven days a week, the families could only guess that "something big" was coming.

Civilian guards employed by the National Park Service guarded the inn 24 hours a day and all critical maps and manuscripts not in use were kept in specially constructed vaults in the inn's basement.

Never Missed A Deadline

There were few visitors—an occasional military party from Camp Ritchie or others with official permission—but even then secret maps and charts were locked up and the visitors saw only the machinery with which the men worked.

"There were times," Cain related, "when navy deadlines seemed impossible . . . and then before we were well into the project the deadline would be moved up. After we had been working for the navy about five months, they ordered us to double production. We could find only a few more photogrammetrists and engineers to add to the staff so it meant harder work, longer hours and speedier methods."

The Gettysburg mapping crew never missed a deadline and had the satisfaction of rushing many topographic maps and charts under special navy guard to the Hydrographic office at Washington days ahead of schedule.

Maps Rushed to Pacific

The urgency of the work done here was demonstrated by the fact that frequently when maps of high priority areas were rushed to Washington, the messenger found a navy plans with its motors idling and ready to rush the maps and charts westward by air to the battlefronts thousands of miles away as soon as the Hydrographic office incorporated them into charts and printed them.

The end of the war did not bring any letup for the mappers. There were immedite cancellations and then the cancellations were promptly rescinded and the mapping of Japan—either for use by invading forces or an army of occupation—went ahead on full schedule. The navy wasn't taking any chances on being caught without complete maps of Japan if they should be needed.

Only last month did the rush let up and on September 10 the map project went on a 40-hour week with Saturdays and Sundays off—the first time the "pressure" has been off for the staff since they began war work soon after Pearl Harbor.

Worked On West Coast First

When the Japs struck at Pearl Harbor most of the men now working at the Lee-Meade inn were in the U. S. Forestry Service, Department of Agriculture, and were scattered through nine regions of the United States.

In those days when enemy invasion of this country was more than a possibility, the government found itself without adequate maps of much of the nation's coastal area and the Forestry service engineers were one of the groups called upon to meet that deficiency as rapidly as possible. All of the trained personnel of nine regions were assembled for the work and assigned to top priority areas on the west coast first.

They were making maps for the army only 60 miles away when the Jap sub shelled the west coast. The mappers had orders to evacuate the area and burn secret records that could not be taken along in event of invasion.

Came Here In 1943

The mappers put into use their own patented and inexpensive steroscopic plotter. They weren't sure then how good it was but it produced and Kail built dozens of them in his Denver workshop while the mappers did the first field work on the west coast.

As the war progressed, the urgency of the army mapping work diminished. The most important areas in the west were finished and the mappers moved east coming to Gettysburg in the fall of 1943 to map an eastern coastal section. By July of 1944 the work for the army was finished.

The Navy Department liked the accomplishment record of the Forestry Service mappers and a contract was completed placing the Forestry Service men at the disposal of the Hydrographic office of the Navy. Strict secrecy restrictions were placed on the work, guards were posted and production for the navy began with a degree of urgency never encountered in their work for the army. Gettysburg seemed an appropriate place for the work for security reasons and as far as the mappers know there was never any attempt at sabotage or interferance with operations here.

Stressed Accuracy

Other mapping services were doing similar work elsewhere in the country but the Gettysburg project was unique in many ways. Much of its equipment was developed here, new methods were found and the Gettysburg staff solved difficult problems in their own way as they arose.

The entire inn was utilized. The lobby floor was covered by a huge "laydown board" measuring 16 x 52 feet, substantially built and painstakingly surfaced with plywood and dozens of coats of paint and enamel to offer the best possible working surface in the interest of accuracy—which the mappers strove to attain because of the big stakes they knew were being placed on the product of their work.

The mappers knew that American planes, ships and lives depended on their accurate indication of the contour of a shoreline, the location of a reef, the features of an atoll, the elevation and exact location of a hill, a building or a stream.

Mapped Nagasaki Area

The men worked almost exclusively from 9 x 9 or 9 x 18 aerial photos made by Yankee reconnaissance or bombing planes over enemy territory.

The Nagasaki area was mapped in detail—and there was special pride among the mappers when they knew the area they had mapped received one of the atomic bombs that helped speed the end of the war. They know their maps were used when that momentous flight was plotted.

They mapped many critical sections of Japan including part of the Hiroshima section, many targets in the Marshalls and Marianas

when the Americans needed detail maps for bombardment or invasion. Part of Borneo was mapped and one of the biggest rush jobs handled here was the mapping of Formosa. Islands in the Okinawa area also were mapped.

Use Captured Maps

One of the toughest problems faced by the mappers was to find maps or charts on which they could locate "control points" about which they could orient their new maps. In some instances captured Jap maps and charts were brought here, old marine charts, some of them made 80 years ago, were pressed into use. Because of Jap secrecy for years, few adequate maps of enemy territory were on hand when the war started.

The mappers here devised a system for transferring control points between maps and the laydown board that they have made standard practice. Their plotting was done with a tolerance for error of five-thousandths of an inch. All of the maps had to be up to specifications on accuracy. A system of radio-plotting was used that in the field would have been handled by a surveyor's tripod—but the area they were mapping was thousands of miles away. All of this group's work for the navy came from the Pacific.

One "war baby" the mappers here had to learn to handle was the trimetrogon photography the navy developed. Instead of a single camera pointed in a vertical position, a battery of three cameras was used with one on each side of the vertical machine set at an angle so that the target area was photographed from horizon to horizon in each set of three photos.

Used King's Projector

There were problems of "tilt analysis" to be computed before accurate composite photos could be transferred to maps. Each shot had to be oriented and clouds, enemy action, and mechanical difficulties with the cameras combined to complicate the mappers' problems.

Some of the equipment used here was provided by the navy including one vertical reflection projector. But the mappers had two of those machines to use for they had the model built years before by "Jack" King with some features that the new commercial model lacks. King's machine was brought here from Denver.

Tables with underlying lights for map work could not be secured so the engineers designed their own models and had them built by I. H. Crouse and Sons in Littlestown. The project held top priority on any materials they needed so there was no serious supply problem.

Eight Specially Praised

The second floor of the inn was used chiefly as work rooms for steroplotting. Other rooms were set up as editing and checking offices. A part of the basement was workspace but much of it was given over to vaults to protect the maps—maps which never covered quite all of any target area so that if any set had fallen into enemy hands it would have been of little value alone.

Eight men heading the project were singled out for particular commendation for their work by Rear Admiral Bryan, Navy Hydrographer.

The list includes: Marshall S. Wright, technical assistant to the chief, Office of Plant and Operations, who worked in the office of the Secretary of Agriculture at Washington; T. W. Norcross, chief of the division of engineering and also stationed at Washington; J. E. King, project engineer and man directly in charge of the Gettysburg program; E. S. Massie, Washington, assistant project engineer; W. E. Webb, administrative officer, formerly located here but now stationed in Washington; H. C. Cain, engineer in charge of photo-cartographic control; J. W. Elliott, engineer in charge of stereoplotting, and M. A. Walker, engineer in charge of photo-hydrography.

The KEK Inventors

King, Elliott and P. B. Kail were the trio that invented and perfected the stereoscopic plotter. Kail has since developed another type of plotter for specialized work.

"Jack" King, the boss on the job for the mapping project here, has had many years of experience in aerial mapping. A native of Banners Elks, North Carolina, he has been with the U. S. Forest Service for 11 years.

In 1932, he organized and served as president of the King Aerial Survey and did a great deal of aerial photography in the west in that business during the next two years. He made his own aerial photos and continued in that business until joining the Forestry Service.

Competent Staff

His earlier engineering and mapping experience had taken him to Alaska, Venezuela and the Dominican Republic as well as many parts of this country. He served years as a topographical engineer with the Geological Survey.

Most of the members of his staff here are engineering school graduates. Some however were inexperienced and untrained but have acquired engineering skills during their work with the Forestry Service crew.

A few local employes have been added: Willard Weikert and James Pierce, both discharged veterans of overseas service; James Smith, Dale Shields, Robert King and Mrs. Clara Riley, the office secretary and only woman on the staff. Her husband is serving overseas in the armed forces.

"Fairly Satisfactory"

In his letter of "congratulation and appreciation," Admiral Nimitz spoke highly of the manner in which the Hydrographic office "habitually" met navy deadlines.

"The efficiency and promptness with which the Hydrographic office has filled the needs of unanticipated and varying operations has been and is an important contribution in offensive action against the Japanese forces," the Pacific chief wrote. Their task "of major proportions" has been "well done," he asserted.

As he finished his story of the mapping staff's part in Pacific victory, Mr. Cain ventured the opinion that "we feel the work we turned out has been fairly satisfactory."

To Stay Here Until July

The mapmen's work here forms a new and colorful chapter in Adams county's contribution in World War II.

Maps of Gettysburg have long been studied by military men but in this conflict maps made at Gettysburg—in a building facing the historic Round Tops and on land over which Pickett's men charged 82 years ago—played an important military role in final victory.

The mappers will remain in Gettysburg at least until next July on navy work. There are a few final charts of Japan to be made and the navy needs more maps and charts of many areas in the Pacific before all of the Forestry men can return to the far from complete task of mapping many large areas in this country.

The complete roster of persons employed on the war mapping project here follows:

Stereoscopic Plotting

B. D. Anderson, W. S. Astle, W. F. Bayer, F. H. Blaschke, D. J. Buxton, L. H. Carlson, J. W. Elliott, V. O. Goodwin, J. H. Groesbeck, B. E. Hippler, J. R. Jones, W. W. Lenfestey, L. C. Marr, R. C. Pragnell, R. R. Riley, W. C. Schopfer, P. F. Vogel, Stephen Webb, R. E. Whitaker, F. D. Williams, and T. O. Thornton.

Control

C. L. Arneson, W. E. Berry, H. C. Cain, R. J. Edin, R. W. Fassett, V. Hedman, R. M. King, R. P. Olsen, K. B. Roche, Dale Shields, A. C. Spaulding, R. J. Trimmer, Louis Williams, J. E. Pierce, Jr., W. C. Weikert, and J. F. Smith.

Guards And Custodian Service

B. D. Gilbert, Irwin Logan, Harry Rhine, C. E. Sheads, and C. Spriggs.

Editing And Hydrographic Delineation

B. J. Abrahams, Sterling Arnett, L. M. Kennison, J. H. Parker, M. A. Walker, and T. A. Zary.

Mechanical And Research

C. E. Arendt, G. C. Mitchell, and P. B. Kail.

Clerical And Administrative

H. A. Purnell, Mrs. C. B. Riley, Miss F. M. Stock, Miss E. M. Segrue, Miss M. L. Erdman, Miss C. Jones, Mrs. T. McKay, and W. E. Webb.

U. S. FORESTRY MAPPERS WILL LEAVE AUG. 1

Gettysburg is about to lose its only strictly "war industry"—the men of the U. S. Forestry Service and their families.

By August 1 the Forestry Service mappers, who operated the Navy War Mapping Project here for the last two years, will move their headquarters to a new building on Mt. Vernon avenue, Alexandria, Va., and continue current duties with the National Mapping organization.

Nearly a dozen of the men and their families already have moved to the Alexandria area while others' families will remain here until they can find homes near the new headquarters. Project Engineer J. E. "Jack" King, Mrs. King and their daughter, Mildred, will move to 1107 Inglewood street, Arlington, Saturday from their home here on North Stratton street.

Completing Navy Work

In Alexandria, the U. S. Forestry Service cartigraphic section (the Gettysburg unit) will be joined by the drafting section that is now in Washington and the staff of about 47 technicians will occupy the third floor of the Masonic home now being completed there. The Alexandria postoffice will use the first floor and the lodge will occupy the second.

The Gettysburg unit is completing work for the U. S. Navy and is carrying on projects resumed for the Forestry Service soon after the end of hostilities last fall. Field men from the local unit are at work now in the forest areas of Arizona, California, Washington and Oregon. The entire United States is being mapped.

Navy work, which probably will not end officially until November, includes charting work in sections of the Pacific, Mexico and South America.

Did Secret Work Here

The "mappers" have been in Gettysburg nearly three years, coming here in the fall of 1943 after finishing emergency mapping work for the army along the west coast. East coast areas were mapped for the army before the group went under Navy contract two years ago.

Conducted under the strictest secrecy and with the building under 24-hour guard, the mappers prepared charts and highly detailed map work for many Pacific campaigns including the contemplated invasion of Japan and much of the areas attacked with the two atom bombs dropped at Hiroshima and Nagasaki.

The mappers' work won special commendations from Admirals Nimitz and King and a commendatory letter from Rear Admiral Bryan of the Navy Hydrographic office.

Remodeling Inn

Photogrammetric machines and methods developed here and elsewhere in his wide experience as an aerial mapper won for Project Engineer Jack King last January, the coveted Photogrammetric Award for 1945 from the American Society of Photogrammetry at a banquet in the Willard hotel in Washington.

At the Lee-Meade inn, headquarters for the project for the last three years, remodeling is going forward under the direction of N. W. Ream, the new owner. Cabins already have been remodeled and are in use.

At least two of the local residents employed with the mappers will go along to Alexandria. They are R. M. King and James Smith, engineering aides. Four others have the option of accompanying the unit if they wish.

1943

U.S.F.S. War Mapping Program
Emergency & Evacuation Plan
Field Unit—Crescent City

(Confidential)

This plan is set up to provide for efficient removal of equipment and vital material of the War Mapping Program—Field Unit, in time of emergency due to fire, flood, and enemy attack, and to insure safe evacuation of personnel in case of invasion.

The members appointed to the various committees and details shown herein have volunteered their services and shall be held responsible to carry out the duties of their designated office to fulfillment.

These plans coincide with all existing military and civilian authority function, and no alternatives shall be taken without their prior approval by these authorities.

The plan will go into immediate effect upon receipt of a "Blue Alert" and will continue in effect until receipt of the "White Alert" the following outline is given for clarification of the "Alert" signals in respect to the W.M.P. emergency personnel:

"Blue Alert" Stand by—all emergency personnel report to field headquarters

"Red Alert" Attack and Blackout—
1. Removal of materiel on time limitation.
2. Evacuation of personnel on time limitation.
3. Destruction of materiel.

"White Alert" All clear. Clean up and dismiss.

I. Personnel (See chart #1)
A. Names and locations in order of priority
1. W.M.P. Field Hdqts—High School—Phone 832
2. F.E. James—822 H St.—Phone 31
3. P.D. Williams—1184 H. St.—Phone 1562
4. B.D. Anderson—1062 J St.—Phone 352 (Hippler)
5. C.L. Arneson—777 G St.
6. L.B. Lint—75 Pebble Beach Drive
7. C.A. Thielen—Aurora Courts, G St. off 2nd.
8. P.B. Kail—1084 4th St.
9. J.E. Elliott—183 S. A Street
10. H.G. Long (See Map)
Alternate—E.M. McKee (See Map)
Alternate—C.K. Lyman—856 4th Street
Alternate—V.O. Goodwin—Aurora Courts, G St., off 2nd.
Alternate—J.H. Groesbeck—Ideal Court
Night Watchman
This listing is to be used by the Del Horte Defense Council in notification of alerts, in the priority shown. Upon receipt of

notification from the Council, the individual notified will adhere to the same priority in notifying the others on the list. A personnel location map is attached. (Chart #1)

B. Duties of Personnel

1. F.E. James—Director—Duties will consist of being first person to receive notification and get to Headquarters. He will assume full responsibility for operation of the plan. He will certify that all personnel are notified and on their posts. He will maintain liaison between the W.M.P. and the Military & Civilian authorities. He will assist in removal of materiel. He will maintain his post until all personnel and materiel are completely and safely evacuated.
2. L.B. Lint—Supervisor—Duties will consist of getting to Headquarters immediately upon notification and accepting full responsibility for supervision of removal of materiel. He will adjudge what items are to be evacuated in relation to time limits. He will assume responsibility for destruction of materiel when and if necessary. He will drive or accompany the truck (or trucks) removing materiel and assure its delivery to a zone of safety. (See charts 2 & 3 for materiel and 4 for routes)
3. H.G. Long—Aide & Messenger—Duties will consist of getting to headquarters immediately upon notification. She will assume duties as Headquarters secretary, maintain telephone communication, keep records of all details and bulletins and carry any messages necessary to notification of personnel or change of plans. She will be responsible for removal of vital records. (See charts 1 & 2)
4. P.B. Kail, C.L. Arneson, J.E. Elliott—Materiel Movers—Duties will consist of getting to Headquarters immediately upon notification. They will report to L.B. Lint and carry out his orders for removal of all materiel in accordance with Charts 2 and 3.
5. B.D. Anderson, P.D. Williams—Evacuation of Personnel—Duties will consist of getting to Headquarters immediately upon notification. They will report to F.E. James, and upon receipt of "Red Alert" shall proceed immediately to the Control Center (Sheriff's Office at Courthouse) to assist local authorities in location and evacuation of all W.M.P. Personnel if situation warrants. They shall be responsible in distribution of chart 4 to all W.M.P. personnel and any changes in plans for evacuation of citizens.
6. C.A. Thielen—Equipment Driver—Duties will consist of getting to Headquarters immediately upon notification. He shall report to L.B. Lint and assist in removal of materiel. He shall be responsible for driving any allotted equipment and transporting to a zone of safety any materiel loaded in such equipment. (See charts 2 & 3 for Materiel and Chart 4 for Route of Evacuation)

7. C.K. Lyman, V.O. Goodwin, Elden McKee, J.H. Groesbeck—Alternates—Duties will consist of getting to Headquarters immediately upon notification. They shall report to F.E. James for any assignment necessary to the operation of the plan.

II. Removal of Materiel (See charts 2, 3, and 4)
   A. Notification & Timing of Movement.
      1. Fire & Flood—Immediate removal of all property to adjacent safety zones. Property evacuated in order of priority as shown in Chart 2, Section 1, Paragraph B.
      2. Red Alert—Notification will be received from the Military & Civilian Defense authorities governing time of movement. This notification will be received at Headquarters and immediate action shall be taken under one of three headings outlined in Chart 2.
         1. Ample time—Chart 2 Section 1, Paragraphs A & B.
         2. Little Time—Chart 2, Section II, Paragraph A.
         3. Immediate Destruction—Chart 2, Section II, Paragraph B.
   B. Emergency Equipment & Transportation.
      1. Trucks—Ford Pickup #731 has been allotted for emergency use—Lint, Thielen & McKee as drivers—Keys on Key board in Lint's office. Ford 1 1/4 Ton truck for use if ample time.
      2. Miscellaneous Equipment—Five gallon cans of Gasoline and oil are available in Lint's office—Shovel and axe on Pickup—Fire extinguishers throughout building.

III. Evacuation of Personnel (See chart 4)
   A. Information for all Personnel.
      1. All W.M.P. personnel shall be furnished a copy of Chart #4.
      2. All W.M.P. personnel shall arrange for proper transportation to be available through friends or their Air Raid Warden.
      3. All W.M.P. personnel shall make it their responsibility to meet and know their local Warden.
   B. Emergency Evacuation Personnel.
      1. Fire, Flood or Blue Alert—Report to Headquarters for further instructions.
      2. Red Alert—Report first to Headquarters and then to the Defense Council. (Sheriff's Office at Courthouse) for further duties, namely assistance in evacuating W.M.P. personnel.
      3. Maintain master area map of all W.M.P. personnel.
      4. Furnish Defense Council with personnel list and changes.

CHART INDEX

1. Emergency Personnel Area Map
2. Evacuation of Materiel Priority List
3. Evacuation of Materiel—Exit Plan of Headquarters Building
4. Evacuation Routes and Instructions.

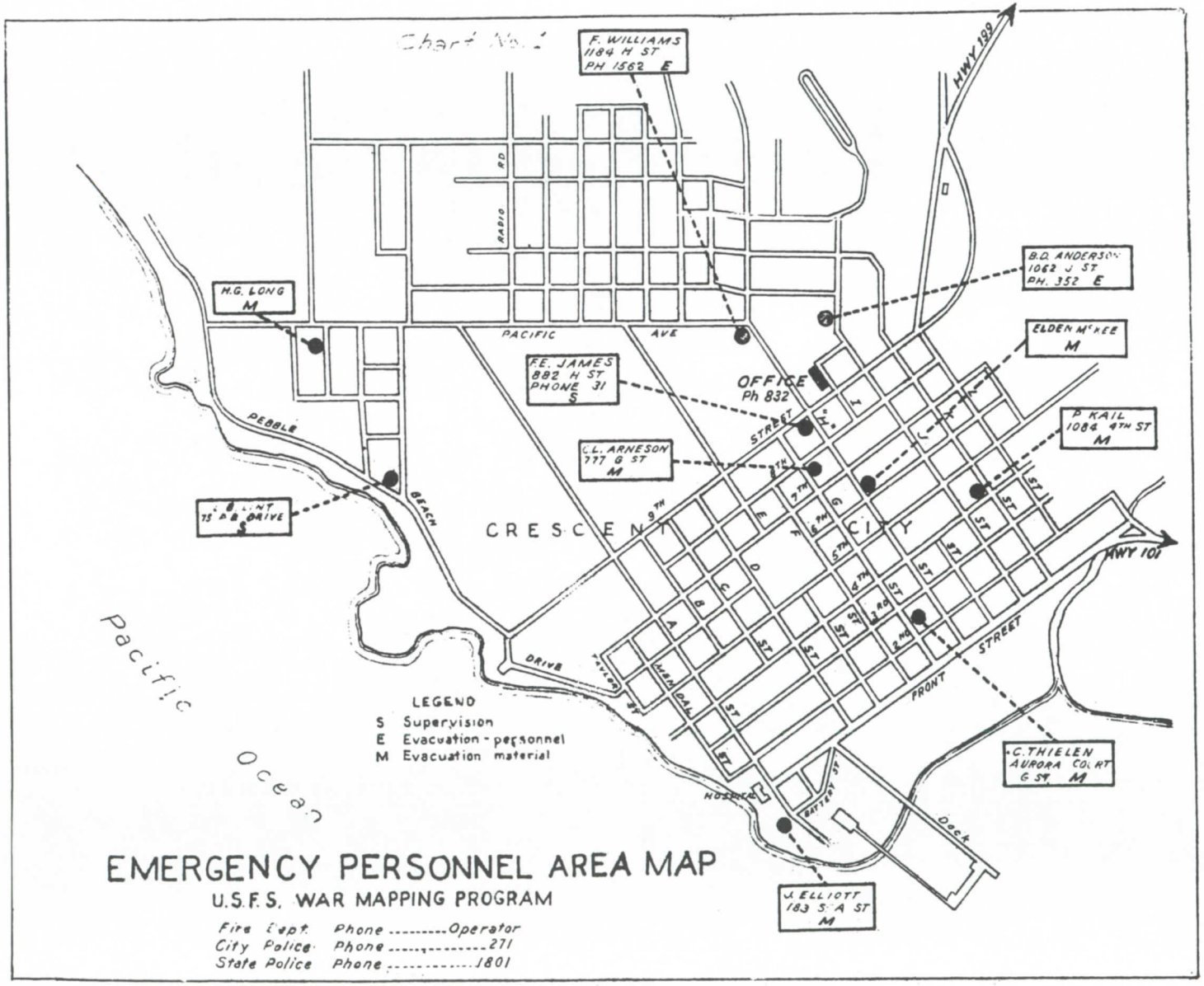


Chart No. 1
F. WILLIAMS
1184 H ST
PH 1562 E
HWY 199
B.Q. ANDERSON
1062 J ST
PH. 352 E
ELDEN McKEE
M
H.G. LONG
M
PACIFIC AVE
RADIO RD
F.E. JAMES
882 H ST
PHONE 31
S
OFFICE
Ph 832
P. KAIL
1084 4TH ST
M
C.L. ARNESON
777 G ST
M
PEBBLE BEACH DRIVE
CRESCENT CITY
HWY 101
FRONT STREET
C. THIELEN
AURORA COURT
G ST. M
J. ELLIOTT
183 S. A ST
M
Pacific Ocean
LEGEND
S Supervision
E Evacuation - personnel
M Evacuation material
EMERGENCY PERSONNEL AREA MAP
U.S.F.S. WAR MAPPING PROGRAM
Fire Dept. Phone .....Operator
City Police Phone 271
State Police Phone 1801

CHART # 2

EVACUATION OF MATERIAL

Supervisors—L.B. Lint—F.E. James
In charge of Photographs Arneson
In charge of Maps Elliott
In charge of Plotters Kail
In charge of Records Long

I. One Day or More Notice
   A. Evacuate as much material as possible by truck and pick-up.
   B. Load in order of importance
      1. Aerial Photographs
      2. Maps & acetate overlays
      3. Plotting Machines
      4. Office Records
      5. Instruments
      6. Rest of Property

II. One Day or Less Notice
   A. Road out—open.
      1. Pick-up will be available at all times.
      2. 5 gal oil & 5 gal gas will be on hand.
      3. Load all photographs, maps, acetate overlays, records and tip & tilt mechanisms on pick-up together with 5 gal oil & 5 gal of gas.
      4. To prevent material from falling into enemy hands, destroy by burning with gas & oil.
      5. Pick-up Drivers
         A. Lint
         B. Thielen
      6. Loading
         A. Photos—Arneson
         B. Maps & acetate overlays—Elliott
         C. Machines—Kail
         D. Records—Long
   B. All Roads Blocked.
      1. Destroy all photographs, maps, acetate overlays, records immediately by burning with gas & oil.
      2. Bury tip & tilt mechanisms.

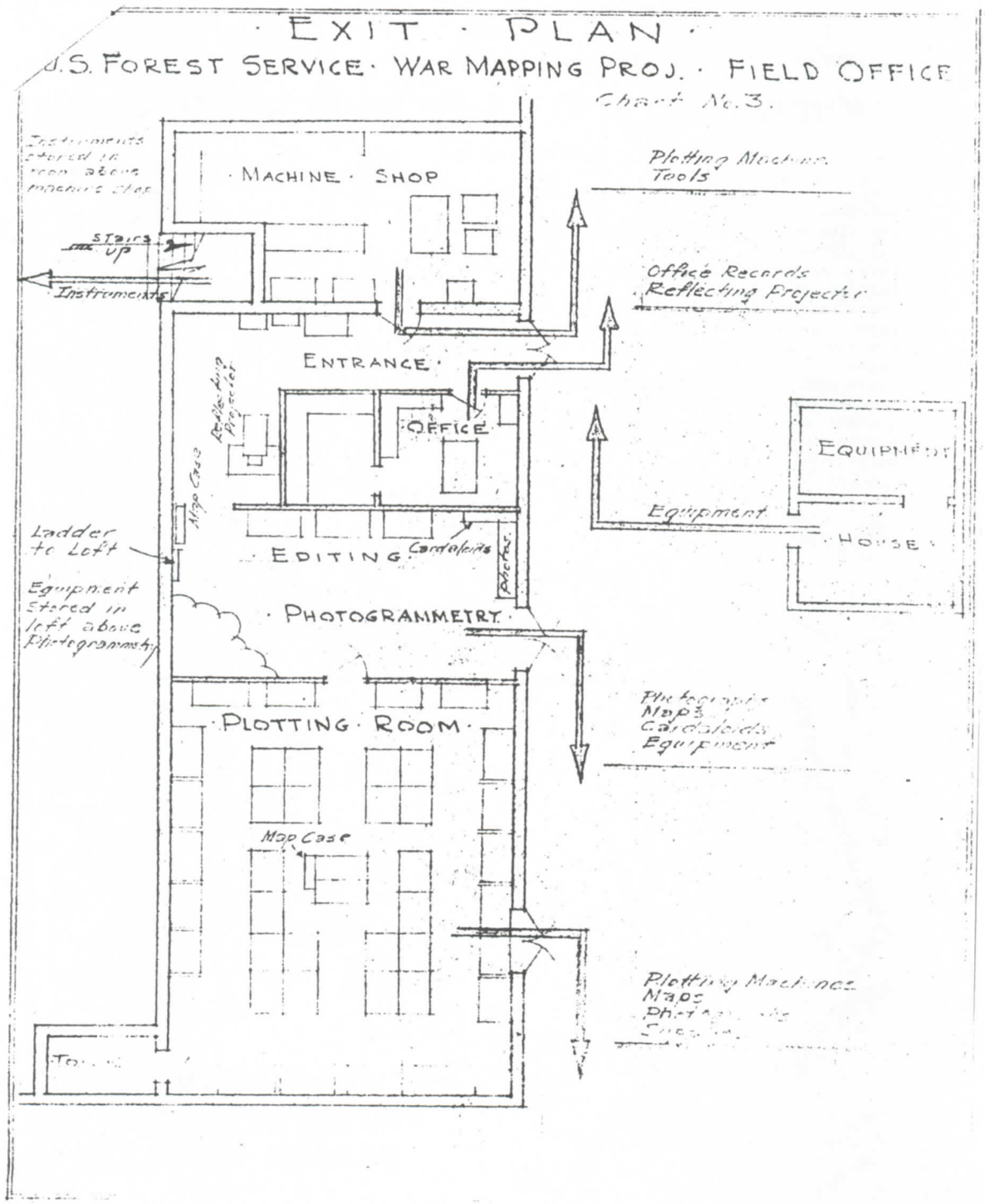

EXIT · PLAN ·
U.S. FOREST SERVICE · WAR MAPPING PROJ. · FIELD OFFICE
Chart No. 3.
Instruments stored in room above machine shop
MACHINE · SHOP
Plotting Machines Tools
Stairs up
Instruments
Office Records Reflecting Projector
ENTRANCE
Reflecting Projector
OFFICE
Map Case
EQUIPMENT
Equipment
HOUSE
Ladder to Left
EDITING
Cartafacts
Planimeter
Equipment stored in left above Photogrammetry
PHOTOGRAMMETRY
Photogrammetric Maps Cartafacts Equipment
PLOTTING · ROOM
Map Case
Plotting Machines Maps
To

CHART 4

U.S. FOREST SERVICE - WAR MAPPING PROJECT - FIELD HDQ'S., CRESCENT CITY

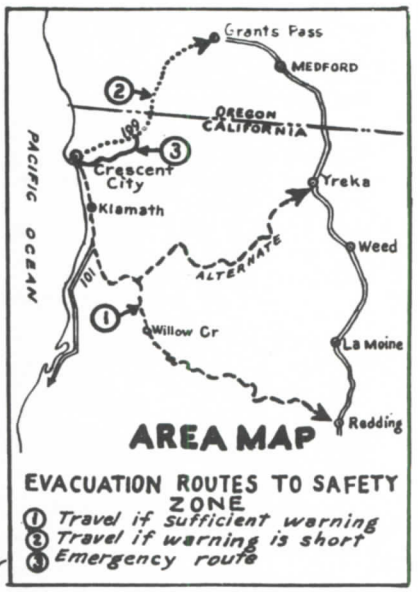
KNOW WHAT TO DO IF ENEMY INVASION COMES

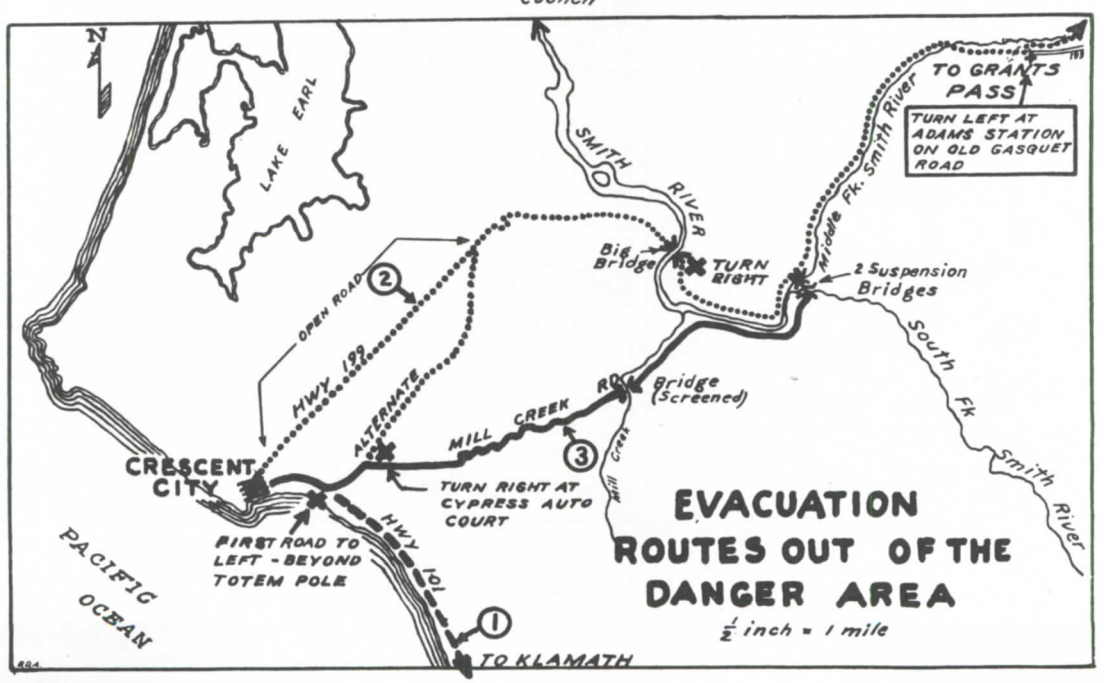
Confidential

1. Obey all military and civilian authority orders and instructions.
2. Memorize routes and keep this map in your car at all times.
3. Keep your car filled with gas and ready for instant operation.
4. Short emergency food and water rations should be kept in your car together with first aid kit.
5. A minimum of personal belongings only should be taken.
6. Drive with caution -- excessive speeds endanger the chances of all.
7. Contact your air raid warden for any further instructions. He is the responsible civilian authority.
   - A. Review these instructions with him.
   - B. Notify him of available space for the transportation of others in times of emergency.
   - C. You will be notified by him at the proper time which evacuation route should be used.

Approved by Lt. Roy M. Towers, ARMY

Approved by _____, Del Norte Defense Council





Some History on Forest Service Mapping

Ed Carnahan

Fresh out of college, my first assignment was made to the War Mapping Project, shortly after the entry of the United States into World War II. My effort was directed toward the establishment of geodetic control (horizontal) in southern California; later to northern California, and finally to the Pennsylvania and Virginia areas. Cecil Stowell was my Supervisor—he had his hands full trying to tell a fresh graduate what to do! The work was difficult and exhausting, requiring long mount-climbing trips on foot, or horseback, and living with a pack string of mules. My favorite animal was a donkey named Benjamin, not much larger than a dog, but a willing helper that carried theodolite and other survey equipment. Benjamin never required a lead line—just followed along like a devoted pup. Often wondered what happened to Ben after we left southern California. We had one member of the crew who was continually complaining about getting the heaviest backpack (won't mention his name). One morning, Cecil prepared the backpacks, putting a substantial number of rocks in his own and the complainer's pack. The complainer tested the two and agreed they were about equal. A few hundred feet up the mountain, Cecil dropped back and removed his rocks! It wasn't until the summit was reached that the complainer discovered what had been done. That was the last we ever heard of who had the heaviest pack!

Moving from southern California to the Redwood area was a contrast in working conditions. In the south, it was bad water and rattlesnakes; in the north, poison oak, redwood worms and snails, and never having a dry sleeping bag. It was my first experience of coming close to being lost in the woods with so little in the way of reference points in towering redwoods and heavy undergrowth. Establishing triangulation stations atop a redwood tree was another first in survey effort, I'm sure.

My work in the Pennsylvania area was of short duration before leaving for service in the Navy. It wasn't until years later that I discovered we had established control for mapping areas around Camp David and the "Underground Pentagon." Again, the change in working methods and techniques involved many changes for the bunch of westerners that we were.

After my service in the Navy PT Fleet in the South Pacific, I returned to the Forest Service Mapping Unit and found myself assigned to a project that was to attempt the topography of Tibet. To establish horizontal control, we were given panoramic photographs taken from generally indicated ground positions in that rugged country. I've often wondered how those maps finally turned out and how many people actually were able to use them.

The mules and me on Montecito Mountain during a mighty cold morning.

Later, I was privileged to work under the direction of Jack King, John Elliott, and Herb Cain in the early development and use of the Kelsh Plotter After a good bit of research and development, primarily carried on by the U.S. Geological Survey, it was to become a major mapping instrument and would largely replace the KEK plotter, a Forest Service–developed plotter by King, Elliott, and Kail.

In 1956 I was transferred to Region 4, where the first Regional Engineering survey work would be undertaken with the use of the Zeiss Stereoplanigraph. Photogrammetry was then figuring heavily in road reconnaissance and development of survey data. Along with it came the initiation of the use of the helicopter for survey crew transportation—a vast improvement over the prewar backpacking and mule train.

A lot of credit must go to Regional Engineer Andy Anderson, who crawled out on the proverbial limb to enlarge survey applications for Photogrammetric Engineering systems. Sotero Muniz, who years later was to become Director of Engineering, participated in this early work, even before he had completed his university studies. Attendant to all of this was the development of techniques to retrace established Cadastral Surveys for Homestead Entry Surveys and Patented Mineral Claims. Bill Bayer and Charlie Doak were two who were deeply involved in these applications.

My final assignment was to Region 3 as Assistant Regional Engineer for Operations. Working with Rich Weller and Don Roper was a rewarding experience in so many ways. So much was accomplished with such limited funds compared to big timber regions. There were many challenges to conducting Survey and Engineering projects, such as gaining the cooperation of Indian lands' governors and their staffs. Much was accomplished to the benefit of both the Forest Service and the various Indian Reservations. In

addition was the communication barrier that faced me personally when called upon to deal with many in the rural areas who spoke only Spanish. Can you imagine being confronted by a territorial dog that understands only Spanish?

Well, it's been a delightful career; and of course there have been some dumb stunts I've pulled in those 32 years. I just hope the Forest Service Engineers of the present can look back on their years of service and be as happy about it as those of us who are "has beens."

My Contributions to the History of Engineering in the Forest Service

J.A. Adams

From 1942 to 1944, I worked for the Army Corps of Engineers. I began as a P–1 Engineer, supervising road survey crews on Army engineering projects and designing drainage facilities. As a P-3 Engineer, I was the assistant to the Engineer in charge of the Fort Bliss Area Office and supervised project designs. I then moved on to P-3 Associate Engineer, in charge of the Hydrology Branch of the Flood Control Section, Albuquerque Engineering Section on Hydrology and Hydraulic Design for Large Dams and Canals.

From 1944 to 1946, I served as a P-3 and P-4 Hydraulic Engineer, Liaison Officer with the Army Corps of Engineers in Washington, D.C., and in the Hydrometeorological Section of the U.S. Weather Bureau. During this time, I supervised maximum precipitation studies and directive preparation of spill-wag design floods for design of large flood control dams.

From 1946 to 1953, I was Chief (GS-12) of the Engineering Section of the Flood Control Surveys Division, USDA Forest Service, in Ogden, Utah. I was in charge of Engineering phases of flood control survey reports in the States of Utah, Idaho, Nevada, and Colorado. This included supervising field surveys, water control structural designs, and cost estimates. During this assignment, I developed a plan on specifications for roadside erosion control items and stabilization.

From 1953 to 1955, I was Forest Engineer on the Coconino National Forest in Arizona. I was in charge of all Engineering work on the Forest, including survey, design, and construction of roads, dams, and buildings.

From 1955 to 1961, I served as Chief of the Roads and Trails Branch of the Engineering Division in Albuquerque, New Mexico. As Assistant to the Regional Engineer, I directed surveys, plans, estimates, and construction of roads, trails, and airports for 12 National Forests. I updated log haul studies using Arizona and New Mexico data and published a pocket-sized log haul computer that was used by Engineering, Forest staffs, and logging companies.

Between 1961 and 1963, I was Assistant Regional Engineer in Missoula, Montana, and was in charge of the Hydrology and Water Development Branch. I directed the branch in survey, design, and construction of dams, water systems, sewer systems, and irrigation systems on 16 National Forests. I also directed hydraulic and streamflow studies.

From 1963 to 1969, I was the Sanitary and Water Systems Staff Engineer in the Washington Office. I also was the liaison between the USDA Forest

Service and the Federal Power Commission. I developed a computer program and added data from Federal Power Commission files on all minor water power projects and major projects. I also worked with the Federal Power Commission, from 1968 to 1969, on the development of environmental guidelines for power transmission line rights-of-way.

I ended my career with the Forest Service as Regional Engineer in the Southern Region in Atlanta, Georgia. I was there from 1969 until 1973. Among my other duties during this time, I also worked with Timber Management in development of equipment techniques for the containerized pine seedlings growth system.

As I Remember the History of Forest Service Engineering

Fred Burnell

My name is Fred Burnell, and the following discussion covers the highlights and lowlights of what I remember of Forest Service activities.

I went to work for the Forest Service in 1942 as a lookout-smoke chaser at the Bob Marshall Wilderness Area on the Flathead National Forest.

Following my discharge from the Army in the spring of 1946, I went back to work as an Engineering aide on the Flathead. Region 1 was rapidly expanding its timber business and consequent road development, so I felt opportunities seemed pretty good in Engineering, and I stayed on as a road locator rather than apply for a Forester appointment. Over the next 30 or 35 years, I worked in a number of different capacities, including routine planning, programming, and development of roads, along with the unexpected—the emergencies—and their aftershocks, such as the Yellowstone Earthquake; planning and construction of the Hungry Horse, Dvorsak, and Libby Dams; the 1948, 1953, and 1964 floods; and numerous "fire busts."

Hungry Horse Dam resulted in flooding out the Forest Road System on the South Fork of the Flathead and consequent construction of roads on both sides of the reservoir. I worked on those in 1949, 1950, and 1951 under K.B. Yeager, Les Morris, and Roger Nelson. At the time, Nelson was involved in the Byrne, Nelson, and Googins log haul study that eventually became the Agriculture Fabrication 184, and Morris was Forest Engineer on the Flathead National Forest.

In July of 1951, I was sent from the South Fork to the North Fork of the Flathead to locate roads serving a proposed 45,000 MBF Canyon Creek spruce sale. During our preliminary review of the area, we found that about 25 percent of the mature timber was dead or dying. As a result, the timber staff officer, John Castle, called in an entomologist named Jackson. Mr. Jackson and others reviewed this and other spruce areas and determined we were in trouble. All mature spruce stands in the Region were infected to a degree, and the most infected had to be salvaged. As a consequence, we in the West spent the next 2 or 3 years locating, designing, and constructing spruce bark beetle roads. During this period, Howard Jones was Regional Engineer, Ward Gano was his assistant, and Guy Mitchell was in charge of all road activities.

In January 1954, I was detailed to the Lewis & Clark National Forest to design a 12-mile stretch of road that was almost completely washed out during the 1953 flood. I stayed on the Lewis & Clark as resident engineer in constructing the project, and, late in the summer of 1955, I worked on

the restoration of the Sun River Road by force account contract. The Sun River Road terminated at the base of Gibson Dam—a 200-foot or so high structure with a "glory hole" as a spillway. During the subsequent 1964 flood, the waters exceeded the glory hole capacity, and about an 8-foot head spilled over the face of the dam, shearing off all the superstructure and badly frightening residents as far east as Great Falls, Montana.

In 1956, I was reassigned as the Regional Eastern Zone planner for the periodic transportation plan revision. That 1956 revision was the first attempt to come to grips with the transportation planning problems associated with the many miles of road required by conventional logging practices. Previous plans depicted major drainage roads and a smattering of roads into the larger side drainages. The past planning practices, along with density guidelines, were developed in the mid-1930's and were contained in the Chief's instructions dated June 11, 1937. The scope of the pre-1956 plans can best be gauged by the fact that all the Forests in Montana used less than 1,000 parent road numbers to identify Montana Forest Development Road systems. By contrast, the 1956 revision used about 1,000 parent numbers for each Forest.

The goal of the 1956 revision was to get a handle on the total miles needed for resource development and the cost. We came up with these figures, but they were based on a lot of either faulty or nonexistent information in terms of road use, location, and consequent development costs and jurisdiction. Any more accurate revisions would have to await the development of more dependable basic information.

To this end, I was assigned to the Regional Office in June of 1959 under Roads and Trails Chief H.R. "Hal" Williams. In a subsequent meeting with Regional Engineer Jones and Williams, I was told that, within my abilities, they wanted me to become somewhat of an authority on the basic elements that plagued our planning efforts. Mainly, these were road use, development and maintenance costs, economic analyses, and jurisdictional problems. In this direction, they suggested I might:

(1) Develop an overall traffic count and classification study for the Region.

(2) Study maintenance costs under controlled conditions.

(3) Look at jurisdictional problems, determining how they developed, and work with the division of lands in developing a solution.

Concurrent with our traffic volume studies, we in Engineering worked with the Division of Lands to get a handle on the jurisdiction problems. Because the origin of about 25 percent of our roads was unrecorded, we had to go back and dig up the road histories, and this, in turn, forced us to review in detail the national legislation and regulations authorizing road development, the practices resulting from the authorizations, past State and local government practices, and finally the original Forest proclamations, as the jurisdiction of most roads existing at the time of the proclamation were vested in the public.

The Federal Highway Acts of 1917 and 1921 totally defined Federal Aid, Forest Highway, and Forest Development Roads; appropriated money for

their development; authorized the Secretary of Agriculture to supervise their development; and required that by 1923 the States had to designate these proposed Federal Aid systems. The Bureau of Public Roads (BPR) was formed to administer the terms of the act.

In practice, in a number of western States, the original BPR offices often were set up in the same buildings as the Forest Service, and since a significant portion of the resulting Federal Aid systems was on National Forest land, these roads were worked on by both agencies. Thus, in Montana and Idaho, all through the 1920's, Forest Service Engineers and even Forest Service construction crews worked on the original development of Federal Aid Roads, and some of these roads were receiving Forest Service maintenance well into the 1940's and for all intents and purposes were under our jurisdiction.

The Federal Aid problems were further complicated by the so-called Forest Highway Needs Study in the 1950's. This study, authorized by the Federal Highways Act, was conducted locally by the States, BPR, and the Forest Service. A number of the proposed additions were Class 2 Forest Highways on existing Forest Development Road locations. Many States, urged on by the two Federal agencies, put these proposals on their Federal Aid Secondary System, hoping this action would strengthen their hand with Congress. The study languished in Congress for several years and then was dropped. The States and the Forest Service were left holding a bag of Federal Aid designations and no way to finance them. We all thought we were the victims of a put-up job!

Then there were the counties. Most of the Forest roads that became public by proclamation were never picked up by the counties. They languished in a limbo and in the 1930's were joined by others abandoned by the counties because of shrinking revenues. Neither Montana nor Idaho had any laws governing county systems, so counties could abandon roads simply by ignoring them.

Once we determined these itemized sources of problems, we were able to address the total issue by working with State and county road people and legislatures. By about 1970, in conjunction with the Division of Lands, we developed a series of State and county agreements exchanging and reassigning jurisdiction, and in about 1975 the Montana Legislature, supported by our testimony, passed a law mandating the counties to itemize and declare their systems and requiring public hearing for changes.

These were the courses of our actions, and while we did not solve all the problems, we had developed some tools to address them.

At the time, Williams and James also pointed out that Region 1 Engineering, in conjunction with the USGS, would set up a Region-wide program to develop large-scale topographic maps for the Region, which would help the planning process in providing for the more accurate location of planned roads with consequently more realistic cost estimates.

In 1960–61, I worked toward fulfilling Jones' and Williams' wishes. With the assistance of Art Young, who later was one of Kennedy's first Peace Corps candidates, and John Greenwald, I developed a controlled traffic count

study system. We tried out the program on the North Fork of the Flathead, where we established a permanent counter site in October 1960 and set up count stations at a number of periodic sites tributary to the permanent site. We followed this with a series of origin, destination, and purpose surveys, along with visual axle counts. By the end of 1961, we had a fairly accurate use survey for about 800 miles of North Fork drainage roads.

In the next 3 years, we developed and implemented similar traffic surveys for most of the main drainage systems in Region 1.

During 1962, Greenwald and I wrote a report on our efforts showing how we developed the 30th-hour volume on each section of road, factors for associated logging use and administration traffic, estimates for public service and recreation traffic, traffic increase factors, and statistical support of accuracy. A copy was sent to the Washington Office in about 1964.

With success also came some failures. During our traffic studies, we attempted to determine the correlation between road deterioration and types of use. We were seeking a more equitable assignment than the old 1,000 board feet equals one passenger car in determining both maintenance responsibility and cost-sharing construction as used in the 1956 Transportation Planning revision. We were not able to make any positive determinations, and the American public has paid heavily for our failure in our cost-share agreements with industry.

I worked on our first cost-share agreement in 1960–61, which involved several hundred miles of the Fisher River system on the Kootenai National Forest. In December 1961, Flemming K. Stewart and I carried the package to the Washington Office and met with Axel Lindy, John Castle, and Dale Arnold for a weeklong review. The Washington Office group was even then developing the procedures and policies that would guide cost share, so, during the course of these meetings, Deputy Chief Art Greeley both called and dropped in several times. Greeley was not able to participate the first day because Axel instructed his new office girl that he did not want to be disturbed during our meetings and she took him literally. She wouldn't let anyone near us. It was almost noon of the first day before John Castle figured out what was wrong, and after that Art had no trouble contacting us!

Anyway, during the course of the meeting, all aspects of cost share were discussed, including maintenance, and the 1,000 board feet equals one auto factor was reviewed. We from Region 1 pointed out that the Highway Research Board's Illinois study was observing deterioration of flexible rates and rigid pavements subjected to controlled loads, and even then, in 1961, the preliminary findings were startling. The study proved there was no direct relationship between weight increase and road damage and that there were indications that the variation of damage increased exponentially as weight increased. While this study was on paved roads, it certainly indicated there might be a similar relationship on lower standard roads. And, if this was the case, and it appeared logical, then the 1,000 board feet equals one automobile factor would excessively penalize the Forest Service and the public.

In any case, during the ensuing negotiations with industry, the 1-to-1 ratio stood, and its continued use has resulted in a lot of contention inside the Forest Service. To date, the problem has never had an acceptable solution.

But, if we failed occasionally, we had some great successes. One of these was in our Berkeley studies.

Sometime in late 1967, Dave Trask, then in the Washington Office, called me about our Region 1 traffic studies and asked that I come to Washington and work on a report to be used Service-wide at a Transportation Planning meeting scheduled at San Diego for February 1968. Subsequently, I spent 2 weeks in Washington rewriting and updating our original papers on traffic surveys and then attended the San Diego meeting and gave a report. At that time, no other Region had any extensive traffic sampling programs, so our efforts were the basis for at least some of the direction that came from the meeting.

Webb Kennedy headed up the effort, and Dave set up the agenda. Out of this came the Transportation Planning Studies at Berkeley, which probably resulted in more advancements in low-standard road planning than any other single effort by the Forest Service. It also educated a cadre of Engineers that ultimately took over planning in the Forest Service.

By 1979 when I retired, Forest Service Transportation Planning practices were probably more advanced than the planning practices of any other function in the Forest Service.

Regions 4 & 6 & the Washington Office

Ray P. Connelly

I have compiled an account of my time in the Forest Service; however, it is quite a volume as it covers my 39 years in the Service. Moreover, it appears too detailed and lengthy for this history issue. Therefore, I will try to summarize here and submit separate manuscripts, including many pictures and records, at a later date.

Region 4

I started on May 10, 1944, on a Ranger District of the Minidoka National Forest (now part of Sawtooth) near Malta, Idaho. I worked part of that summer on the Sublett District, helping with everything from painting the Station buildings to timber marking. In July, the Road Foreman needed some help, so I was loaned to this crew. As a laborer, I picked rock, cut brush, cleaned culverts, maintained signs, bridges, cattle guards, etc., until school started again. I returned to the road crew each spring thereafter until graduation from high school and during 2 years of college. I was generally laid off in the fall but worked most of 1949, 1950, and 1951. A reduction in force in December 1951 brought about a transfer to the Salt Lake Shop, where I worked as a mechanic's helper, auto and heavy equipment mechanic, and transport operator until 1956. At this time, I was selected to fill a new position in the Regional Office Division of Engineering as Regional Driver/Operator Examiner. Congress had passed a bill that brought about stringent requirements of drivers and operators in physical fitness, driving and operating knowledge, and expertise. Physical aptitude and vision tests were also required. This all was due to a very poor accident record in Federal service at that time. (Oddly enough, many years later, in the Chief's Office, I was to lead a national committee that recommended and brought about a reversal of these requirements.)

When I first became acquainted with Region 4 Engineering on the Forest, it included the full "gamut" of road and trail maintenance and construction. I soon became interested in the equipment, through servicing and moving it, and became an equipment operator in my second summer. I also fell heir to the "logs" and records maintained then on all work done by the crew in road and trail maintenance.

We had a minimum of and often inadequate equipment. I "broke in" on a crawler-tractor-drawn Adams No. 12 pull grader. Next was an old Caterpillar No. 11 motor grader and a totally inadequate Adams 201 belt-driven and very small grader. However, in 1948, we were blessed with a new Austin Western Model H all-wheel-drive and steer grader, and soon after we received on loan from the U.S. Army a new Caterpillar No. 12 grader, which was the best grader on the market at that time. These two machines

greatly improved our road maintenance production and efficiency. At this time, there was little or no technical engineering help on the Forest; however, we were often visited by an Engineer from the Regional Office, who stayed out with the crew giving training and guidance in "what" and "how" was to be done in blading and other maintenance practices and other work. His name was Art Potter, and a good one he was.

We performed all kinds of other work on the Forest, such as range reseeding, fence building, removing many miles of telephone line, constructing bridges, installing all sizes and types of culverts, making road changes, installing sewage and water systems, and doing just about anything needed. The road crew was the "do all" outfit on the Forest. Always during the season, we were ready and responded to fires with a D6 cat dozer and/or the grader and then immediately did the machine reseeding, often starting before the fire was totally mopped up and out.

During my time at the Salt Lake Shop, the Forest Service had a contract rebuilding all types and makes of equipment for the U.S. Army. The criteria was to 97 percent of new with the equipment being returned to troop stock at the Ogden Utah Army Depot and others in the West and Alaska. A lot was learned here in such complete and rigid requirements. As an operator, I tested many of these and our own units prior to final inspection and completion. I spent a lot of time in the field repairing and inspecting equipment or consigning it to commercial shops. Many hours, days, and weeks were also spent fighting fires as an operator, mechanic, tractor boss, or Safety and Equipment Officer. The last 1 1/2 years at the shop, I drove the heavy equipment transport hauling all kinds of equipment to and from the shop, throughout Region 4 and other Regions, and for the military as requested. I spent several weeks during the bad winters of 1949–1950 and 1952–1953 plowing snow in Idaho, Utah, and Nevada for ranchers and farmers. We actually "wore out" the undercarriages on two D7 cats in Nevada. We worked out of a small trailer and often 22 hours out of 24. Only stopped to "grease" or eat. It was good for me and our young family, however, when the checks finally showed up.

When I was promoted to the Operator/Driver/Examiner position in the Regional Office in 1956, I soon was made a full assistant to the Regional Equipment Engineer and became involved in virtually every phase of the Regional Equipment Engineer work as well as my own job.

I was assigned to work on a Service-wide Equipment Specifications Team headed up by Regional Engineer C.E. Remington from Region 6. We met each year in Denver, or more often, to prepare standard specifications for vehicles and other equipment. It was through these efforts and leadership that the Forest Service actually convinced industry that a heavy-duty pickup and other vehicles were needed in our type of service. Consequently, much more suitable vehicles started coming off the assembly lines, with heavier springs, better tires, larger radiators and alternators, heavy-duty shock absorbers and brackets, and improved cab and bed designs, to mention a few improvements gained by this effort.

A highlight of my time as Regional Driver/Operator/Examiner and Trainer was the writing and issuance of a Driver/Operator's Handbook. Kyle Thomas, who had the same job as I had in Region 6, and I produced this

Handbook. We worked on it for over a year, using an illustrator from Arcadia Equipment Development Depot to draw the many illustrations in the Handbook. Defense Printing in Ogden published it the first time. It was a very usable and helpful book and a rewarding experience.

At this time, we were very active in Region 4 in site preparation and tree planting work. Therefore, I spent a large amount of time in the field working with the operators and crews, training operators, modifying equipment, especially hitches, dozers, disc plows, etc.

In March of 1961, our Regional Equipment Engineer suddenly died of a heart attack, and I was made Acting Regional Equipment Engineer under H. Minor Huckeby, who was then the Regional Engineer. "Huck," as we knew him, tried me out for some 10 months and then promoted me to the position. Region 4 was still in need of civil and other engineers, and I remember Huck telling us he was going to hire 90 engineers, hoping to have 60 of them stay with the Forest Service. I found out what he was talking about as over one-third of whom we were able to hire soon found they were not the type or cut out for Forest Service Engineering and left the Service. The Region had only two or three Forest Engineers at that time. We used 8 to 12 Engineering survey crews operating out of the Regional Office each summer. My outfit supplied the vehicles and training of their drivers, especially those using trailers.

As Regional Equipment Engineer, I found myself "buried" in paper work, including the establishment of Regional equipment rates that I did for over 8 years. Due to the problems with utilization and small numbers of equipment in some classes, it was evident to me that we needed some kind of a "flat rate" system to pay for depreciation and increased purchase costs. Working with our Operations and Fiscal people, we came up with such a system and submitted it to the Washington Office for approval. After much consideration and study, the Washington Office decided to put together a team to work up an acceptable system for all. I was assigned to the team, which created the Fixed Ownership Rate System, and got it approved for Service-wide use and implementation. I worked with some of the best heads we had on this team, including Arlo Seegmiller, our Working Capital Fund Manager in Region 4. We had members from the Washington Office and Regions 2, 6, and 4, and our team leader, Ken Wiesenborn, was from Region 5. It was a pleasure to work with such a "dynamic" and effective crew right down to going to the National Forests to give the training and get the system under way. I later used these methods, lesson plan approaches, etc., to get projects approved and implemented in Equipment Management.

At the time I became the Regional Equipment Engineer in Region 4, we still had the Boise and Salt Lake Area Equipment Depots, along with some Forest Shops. Throughout the 1960's, there was much study and decisions made on retention of the Depots and Forest Shops. Seems we were always in a study of this force account activity.

The 1950's and 1960's were some real "doing" years in Region 4, and we in Equipment Management were very active in supplying or developing equipment to meet these needs. Some of the more significant and historical ones are in the following sections.

Development & Use of Specialized Equipment for Site Preparation & Tree Planting

We were using over 75 small crawler tractors for this in the Region then. As Chairman of the Region's Equipment Advisory Board, I was involved in this and other equipment needs throughout the 1960's and early 1970's. We used the Arcadia Equipment Development Center (now San Dimas) and the exceptional help of its Director, Gene Silva. Gene responded quickly to our needs, often coming out himself before assigning Engineers to help us, and we worked out the funding and other details with no more than a phone call most of the time. Our Foresters determined that we needed to plant the seedlings in trenches in order to take advantage of better moisture, rainfall, etc., on these arid sites. We launched into the use and development of trenches, plows, and even subsoilers and improved mechanical tree planting equipment and hitches. We utilized about any mechanical engineering help we could get, along with our Shop and Forest people who had long experiences in this field.

The first mechanical engineer I worked with that we hired (he was one of the 90) was Dick Smith, a local graduate from the University of Utah. He knew his engineering, but his dad was a successful real estate broker, and Dick, after about a year and a half, decided it would be better for him to join his dad's firm. It was a good move for him as he also became very successful and soon had his own business. We later hired Tom Stockdale (now Equipment Engineer in Region 1) right out of college. I felt very good about this offer as were able to go to his college with an offer in hand, not a "maybe" or "if." Our recruitment team signed him up, and Tom soon reported to my office. I remember asking him where he would like to start, and he promptly said he wanted to perform as a mechanical engineer as that is what he went to college for. This we did, having him design such attachments as hitches, brush blades, etc. He and a top-notch mechanic technician named Jack Cronk, at our Boise Shop, soon developed an excellent working relationship. They were very productive and helpful in design and development, including fabrication and supply to meet demand in tree planting, watershed restoration, and brush piling equipment.

Due to volume of work and activities, we soon were able to offer another mechanical engineer a position in the Regional Office. We obtained Bob Hartman from Engineering Research in West Virginia. Bob and Tom worked together in the Regional Office until Tom was promoted to a new mechanical engineer job in Region 3. They were assigned to test and evaluate a new grader for road maintenance that was the first articulated grader made. We purchased two John Deere Model 570's that were assigned to the Fishlake and Challis National Forests. They were the first articulated graders purchased by the Forest Service. Tom and Bob, working closely with the California Equipment Development Center, tested, evaluated, and published a report on these graders. It was an excellent evaluation and report. Apparently, the graders were okay as the articulated frame concept is about all that is available today, and John Deere has enjoyed much success with their machines.

Use & Development of Angle & Tilting, Five- & Six-Way Dozer Blades in Watershed Restoration, & Other Trenching Work Using Larger Crawler Tractors

During the era of Public Law (PL) 566 watershed restoration, Region 4 had a lot of acres where this work was needed. Consequently, we endeavored to find better equipment to do it. We first tried conventional dozers, then the already-developed Hula Dozer from Region 3. The first attempt of using a multifunctional blade on a tractor of 100+ horsepower was on a machine developed by EIMCO Corporation of Salt Lake City, who attempted to break into the crawler tractor business from their mining equipment factory. I worked with a young mechanical engineer from a British college. He was brought in to design a blade that would stand the stress on larger crawlers. He was a good scholar and knew a lot about stress in such designs, but he had no experience with tractor dozer blades.

I was selected to operate the tractor in testing the first try at it on the Wasatch National Forest. I'll never forget that day as I promptly "tore" the blade off the tractor in front of some 50 people, including the Governor. It was just not designed correctly. Needless to say, it was not a good day for anyone! After several redesigns and our help, the company marketed the tractor and blade.

The dozer blade functioned well in our work, but the tractor did not, so we looked further for a tool to do the work. We then tried a blade manufactured by Ulrich Company named the Vari-Dozer. I learned of this blade and went to California to see and try one. It performed very well in making trenches and cross dams in the watershed work. We purchased several of them mounted on Caterpillar D6 tractors for the PL 566 and other special or regular dozer needs. It was also an excellent blade for fire line work. An equipment development test and evaluation report was performed on this blade by Arcadia Equipment Development Center Engineers.

We also used both small and a large 48-inch disc trenchers in the watershed work. Disc plows making trenches to contain water and soils were largely used on lesser slopes, including rehab of lands denuded by fire. Designs for both the rear and front of tractors evolved, which created some complex hitching problems of which we all contributed to design and fabrication for effective utilization of equipment.

Vertical Lift Hitches & Tree Planters

With all of the acres and tractors using already-developed tree planters in reforestation in the Region, we soon found the need for improved hitches and planters. One big problem was trying to keep the operators and the planting shoe level on the planters. After several attempts with three- and four-point hitches, we developed a vertical lift model using the forklift principle. Jack Cronk of our Boise Equipment Depot had the vision and came to me with a design. It looked good, so we developed a prototype and gave it a try. It was what was needed and greatly improved safety and production. After design modification by Cronk and Stockdale, several were fabricated and put to use. Jack Cronk received a healthy cash award for his idea and design. I would guess that well over 5,000 acres were planted in Region 4 using this hitch. We also used it with the 32-inch trenchers for watershed and site preparation work.

We also developed an improved model of the original tree planters and worked with the Development Center on what was to be called the Rocky Mountain tree planter. These are a few of the equipment needs we worked

on that come to mind now; however, I am working on a separate history project in that area, including many photos and reports.

Start of the Working Capital Fund System in the Forest Service

Region 4 was the one to "try out" this system in Equipment Management. I'll never forget one day when the national team was working out the details in Ogden. They were struggling with a formula for equipment depreciation, and after sitting in the room for some time, Arval Anderson, our Regional Engineer, walked to the blackboard and wrote one there. He then left without a word. The committee studied it and quickly adopted it that day. The WCF replaced our old Equipment Operation & Repair (EOR) system. It was then, and I guess always will be, controversial; however, it was the first system that forced managers to recognize and plan for the replacement of assets. It also brought about a more knowledgeable situation with regard to all costs. Budgeting was enhanced, and, most important to me as a young Equipment Manager at that time, it brought help and awareness to the program managers, especially Timber, Engineering, Range, and Watershed.

Like most Regional Equipment Engineers, I resisted it at first and felt that the system and people in it were taking over my responsibilities and, I guess, autonomy. However, I soon learned that the Regional Working Capital Fund Committee and WCF Financial Manager were the strongest assets I had in Fleet Management. The committee, which had the Assistant Regional Forester of all the big programs like Engineering, Timber, Range, Fire, and Watershed, was most helpful, especially in decisions on fleet additions, special fleets, equipment, etc. I also found they were most helpful with the Regional Equipment Rates, although they often "tore me apart" when approving the rates. However, their knowledge and decisionmaking was passed on to the Forest line officers, which really gave support and commitment to the Equipment Management program. This is why I was disappointed when the committee was abolished in the Region and Washington Office. I believe to this day that we would have not become "buried" in so many reports and the massive "numbers game" in the WCF if the program managers had stayed close to and directed the use of the WCF system.

High Point in Region 4 Engineering—the "Fabulous 1960's"

I worked as a full staff assistant from 1961 on under Minor Huckeby and then Jim Usher most of the 1960's. Jim utilized each of us to the fullest, including field inspections. I participated in and made 18 of these during this time. Jim was a traveler for sure; therefore, each of us were often designated as his Acting, and believe me for Jim it was not just a title. He expected us to do the Regional Engineer's job when he was gone, including staff work for the Regional Forester. I did a lot of this in the late 1960's, sometimes averaging over 8 days per month.

A very helpful and memorable practice that Jim used was to take his staff on a field trip each year to study and decide on projects or other Engineering needs on Forests. We went all together in one rental vehicle and with only the knowledge of the Forest Supervisor. It was often quite a surprise, especially to some Forest Engineers. However, it was an effective and helpful approach to the Engineering effort. I furnished the vehicle and did most of the driving and often had quite a challenge getting us to areas Jim had selected.

The 1960's also saw all of us very involved in Multiple Use and Sustained Yield Management under the fine hand and direction of Regional Forester Floyd Iverson. This included on-the-ground workshops, actual project decisions, and other training sessions. I look back on this as some of the best all-around training and insight to the total Forest Service concepts and effort that I received.

Other Duties & Programs In the Late 1960's & 1970's

As ceilings tightened and people retired, some of us wound up with other duties and programs in the last of the 1960's. I was assigned to head up the Region's Sign Program and Sign Shop at our facilities in Salt Lake City. This was indeed an interesting and rewarding assignment, although pressures to contract out and people ceilings made it quite frustrating.

The change in Regional Office Engineering to three Assistant Regional Engineers was significant to many of us as it changed our status as full staff under the Regional Engineer to working for one of the assistants. Bob Larse came to Region 4 as the first Assistant Regional Engineer that I worked for. He came directly to this new position from a Forest Engineer's job so it was quite a challenge for both him and us! However, after a bit of understanding and learning, I felt he and I had a good working relationship. More important, he and I had the tough job of reducing many ceilings and closure of a Regional Depot and the Regional Sign Shop, as well as reduction of personnel at all operations by mechanics throughout the Region. There were sad times as we knew the force account operations were needed and that the pressures to go to contracting would affect production and efficiency of these services to users and needs in the Region.

In 1972, we were hit with the 10 Standard Region thing, and a lot of people either retired or transferred as Region 4 was slated to close. By the spring of 1973, we were down to two Assistant Regional Engineers. I had lost the Regional Equipment Specialist and Sign Specialist, Gary Crawforth, to Region 5 and now was assigned the Region's Solid Waste and Regional Office Engineering Administrative Services along with what I already had.

Region 6

In June 1973, I received a letter assigning me to the vacant Equipment Engineer's position in Region 6. I will never forget that direction, which said, due to the Region's closing, my position was being abolished and I had 90 days to report to Region 6 or be separated from the Service! Well, as it worked out, the Region didn't close, but I was advised by close friends that we should go to Region 6 anyway as Region 4 would never be the same. Moreover, it was a good opportunity in the largest Region (money and people) and a much larger fleet job. How true this was! We never regretted the move, although it was tough to leave friends and the challenge still in Region 4. The Region 6 assignment was very interesting to me and the family. The next 7 1/2 years in Region 6 as Regional Equipment Engineer were fun. Ray Hemphill was there as Regional Office Mechanical Engineer when I arrived, with Chuck Morgan as Regional Equipment Specialist. Although a few things had piled up on them due to the vacancy, I found the work and program well in hand and made the transition without hardly a problem. Like Region 4, we had the specifications writing, inspecting, and/or COR work on equipment modifications and attachments, except the job was two to three times larger due to the volume. Therefore, all of

us spent a lot of time in this work, which I put under the direction of the Mechanical Engineer.

I found the people in this Region exceptionally good to work with and was able to utilize many things I had learned in Region 4. I found a well-organized and staffed Forest Equipment Management program in most cases and a top-notch shop and mechanic organization on most Forests. We just needed some updating and the constant shift to meet pressures and direction from management to meet current funding, program changes, and personnel restructuring. Not new after Region 4!

Not much was going on by now with specialized equipment development needs in the Region, although we did have some needs at the tree nurseries and field work in these operations. Ray Hemphill transferred to the Forest Products Laboratory in 1975 and was replaced with Tom Stockdale from the San Dimas Equipment Development Center. We needed another mechanical engineer to carry on the load here but were never able to get a position approved. We did get some help in the special programs like Job Corps by getting another hand to help in safety and training of the people coming into these programs.

Much like Region 4 as Regional Equipment Engineer, I was able to work in most phases of the Regional Engineering effort. Dave Trask, our Regional Engineer, and I reported nearly at the same time. Although this was Dave's first assignment as a Regional Engineer, we found him to be an excellent manager with full rapport and support from the Regional Office and staff. His assistants were certainly some of the best, with John Pruitt as one who came up from Region 4 at the same time I did, so we had quite a time getting started in our new environment and positions. Sky Chamard, Assistant Regional Engineer, Operations, was my first boss in Region 6, and as I had worked with Sky in Region 4, there was no problem in transition. After about a year, he was promoted to head up the Geometronics Center in Salt Lake City. I then spent nearly 5 months as Acting Regional Engineer for Operations. This was another good challenge, and I certainly appreciated the opportunity, faith, and help of the Regional Engineer and his assistants.

While in Region 6, I was able to participate in several Forest Engineering reviews and other assignments. I especially enjoyed the relationship and field reviews by the Regional Road Maintenance Engineer, Bob Strombom, with me and my people. We made several coordinated reviews in Road Maintenance and Equipment Management that were very effective and productive in getting better equipment and working results on National Forests. I had always wanted to do this, as it was obvious that a closer relationship and function were needed between Road Managers and Fleet Managers. I would have liked to have been able to get this going at the national level but must take the blame for not working harder at it when I was in the Washington Office.

The Washington Office

The Region 6 assignment was hard to leave in early 1980 when I was asked to apply for the newly created Chief Equipment Engineer's position in the Washington Office. However, this was another good move for us, and although I had just over 3 years to work before my already established retirement date, I was able to get several important things accomplished