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FIRE CONTROL NOTES

A PERIODICAL DEVOTED TO THE TECHNIQUE OF FOREST FIRE CONTROL

FOREST SERVICE • U. S. DEPARTMENT OF AGRICULTURE

FORESTRY cannot restore the American heritage of natural resources if the appalling wastage by fire continues. This publication will serve as a channel through which creative developments in management and techniques may be communicated to and from every worker in the field of forest fire control.

Volume 12 Number 1

FIRE CONTROL NOTES

A Quarterly Periodical Devoted to the

TECHNIQUE OF FOREST FIRE CONTROL

The value of this publication will be determined by what Federal, State, and other public agencies, and private companies and individuals contribute out of their experience and research. The types of articles and notes that will be published will deal with fire research or fire control management: Theory, relationships, prevention, equipment, detection, communication, transportation, cooperation, planning, organization, training, fire fighting, methods of reporting, and statistical systems. Space limitations require that articles be kept as brief as the nature of the subject matter will permit.

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Forest Service, Washington, D. C.

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1949 FIRES AND TRENDS OF FIRE OCCURRENCE IN THE NORTHEAST

A. W. LINDENMUTH, JR.

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In 1949, 10,858 fires were reported to have burned on State-protected and national forest land in the Northeast.[1] This was a 42-percent increase over 1948. Was the increase caused by a larger number of fire starters, a letdown in fire-prevention efforts, a more severe fire season, or a combination of all three? An analysis of fire-danger measurements and fire records provides some good clues.

We know that about 99 percent of the fires starting in this region are caused by man. Hence, the number of fires depends chiefly upon two factors, risk and flammability. Risk, or the probability of someone or something causing a fire, can be controlled by fire-prevention efforts but cannot be measured directly. Flammability, on the other hand, cannot be controlled but can be measured quite accurately. Burning index in the Northeast is a measure of flammability.

In order to separate the effects of risk and flammability (burning index), a method of rating the severity of fire seasons, reported in a previous article,[2] is used. Briefly, the number of expected fires is calculated from the cumulated burning indexes as reported from the fire-danger stations, assuming for purposes of the calculation that an unchanging risk prevails. Then the expected and the actual number of fires are plotted for a number of years.

To show this, data from all northeastern national forests and States, excepting Delaware (for which information is not available), are graphed in figure 1. It is evident that both the number of actual and expected fires took a sharp upswing in 1949. The trends are not exactly the same but the amount of divergence is small—1949 ratio 1.03, 1948 ratio 0.95. For the region as a whole, the risk was almost the same in 1949 as it was in 1948, and it can therefore be concluded that the difference in the number of fires between the years was caused by weather conditions.

In graph B, figure 1, the ratios plotted for the past 7 years indicate a downward trend, even though there are humps and dips from year to year and there is a slight upswing in 1949. Statistically, the odds are about 10 to 1 that this is a real trend. While these odds are relatively small, they

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[1] Only fires that occurred on days when fire-danger measurements were made are included.

[2] LINDENMUTH, A. W., JR., *and* KEETCH, J. J. A NEW MEASURE OF THE SEVERITY OF FIRE SEASONS. U. S. Forest Serv. Fire Control Notes 11(1): 15-19, illus.

are supported by the fact that fire prevention efforts are being intensified each year. It is reasonable to suppose that in this region the annual expenditure of, roughly, 3 million dollars for prevention is accomplishing something.

We can't assume that the over-all downward trend necessarily applies to individual States or national forests. This is evident from the data in table 1.

One major comparison that can be made within the region is between States and national forests. The State job is to prevent fires on privately owned lands on which the protection agency has relatively little control over the fire risk. On the other hand, the U. S. Forest Service is chiefly concerned with reducing the number of fires on Federally owned lands, where it has considerable control over risk (timber sale agreements, campfire and hunting permits, etc.).

Despite this difference, we find that the ratios for the two groups are about the same during 1949 (1.03 for the States and 0.90 for the national forests) as, in fact, they have been for the last few years. This similarity

TABLE 1.—*Fire occurrence and season ratings, by national forests and States, Northeastern Region, 1949*

Unit	Fires		Ratio of actual to expected fires
	Actual[1]	Expected	
National Forest:	*Number*	*Number*	
Allegheny	23	21	1.10
Cumberland	72	88	0.82
George Washington	39	41	0.95
Green Mountain	4	2	2.00
Jefferson	37	38	0.97
Monongahela	25	36	0.69
White Mountain	7	4	1.75
Total or ratio	207	230	0.90
State:			
Connecticut	435	933	0.47
Kentucky (Kentenia-Redbird Dist.)	30	22	1.36
Maine	677	380	1.78
Maryland	381	622	0.61
Massachusetts	1,616	1,296	1.25
New Hampshire	527	377	1.40
New Jersey	1,465	1,336	1.10
New York:			
Adirondacks District	424	237	1.79
Long Island District	150	251	0.60
Pennsylvania	1,495	1,665	0.90
Rhode Island	303	204	1.49
Vermont	173	107	1.62
Virginia	1,601	1,787	0.90
West Virginia (30 counties)	1,374	1,110	1.24
Total or ratio	10,651	10,327	1.03
Region total or ratio	10,858	10,557	1.03

[1] Only fires that occurred on days when fire-danger measurements were made are included.

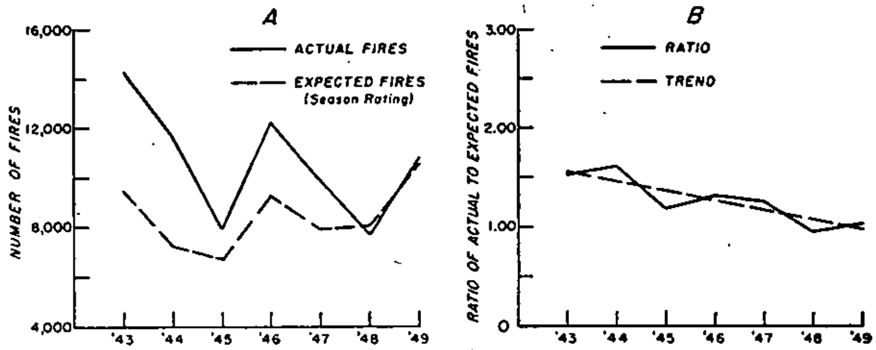

FIGURE 1.—*A,* In the northeastern region the 42-percent increase in number of fires in 1949 over 1948 was due almost entirely to a similar increase in the severity of the fire season. *B,* Irrespective of the slight upswing in 1949, the over-all trend of the ratio of fire occurrence in the Northeast is downward.

of accomplishment is shown graphically in figure 2. Both groups have been successful in reducing the number of fires and one group has done about as well as the other, since the downward trend for each group has about the same slope. The national-forest data are the more erratic because the number of fires occurring in any year is relatively small; for some forests a few fires more or less can markedly affect the ratio.

Of more importance, perhaps, are the trends indicating either increases or notable decreases in the fire-occurrence ratio. Increases point to a greater risk not effectively controlled by prevention efforts. Notable decreases in the number of fires mean that the risk is less either because of fewer fire-starting agents or because the activity of the causal agencies has been curbed by an effective prevention program. A knowledge of these trends should enable administrators to search for a change in the risk pattern, or—in the case of improvement—to evaluate and distinguish the measures that are paying off.

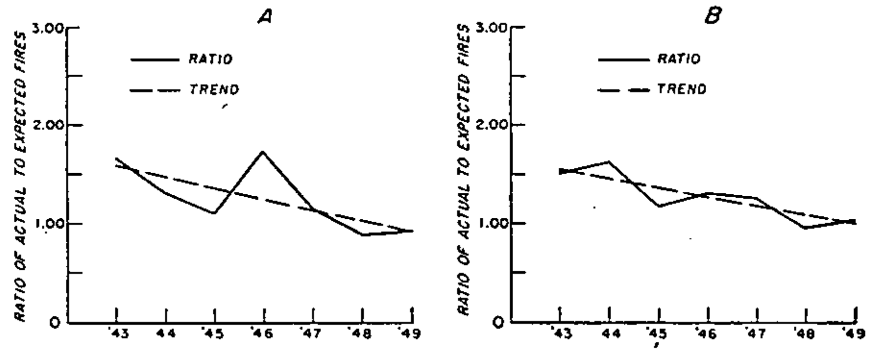

FIGURE 2.—*A,* Records from the national forests in the northeastern region show an over-all decrease in the fire-occurrence ratio within the national forests. *B,* Records from all States in the Northeast, except Delaware, show that the ratio of fire occurrence is decreasing on private lands to about the same degree as within the national forests.

Increases in fire-occurrence ratio seem to be more prevalent in the northern part of the region, as attested by the relatively high ratios (table 1) associated with many of the units from the Adirondacks eastward. Particularly among the northernmost units, Maine, New Hampshire, Vermont, and the Green Mountain and White Mountain National Forests, the number of fires has been at a high level for several years and the over-all trend is upward. This situation is evident in figure 3. Except for the easy years of 1943 and 1945, the number of fires has been much greater in

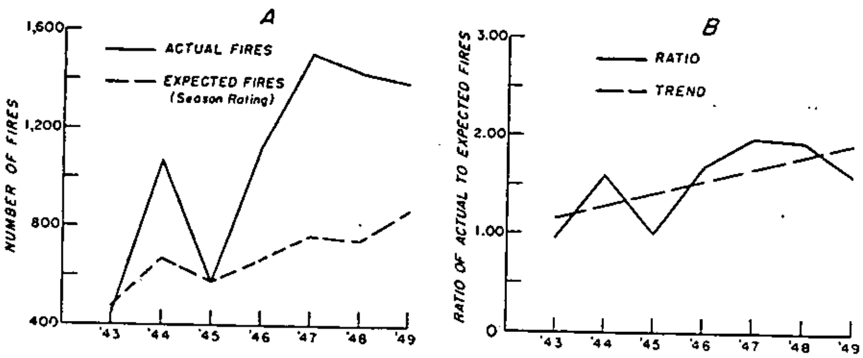

FIGURE 3.—*A*, The number of fires occurring within the northernmost group of States and national forests of the northeastern region has been high for several years. *B*, Because of this large number of fires, the over-all trend of the ratio of fire occurrence is upward in this section of the region.

proportion to the cumulative burning index than expected. However, there is evidence that the upward trend, attributable chiefly to the unusually large number of fires during 1944, 1946, and 1947, has been reversed during 1948 and 1949. It is too soon to be certain, but the reduction in the ratio of actual to expected number of fires was common in 1949 to all States in New England, except Rhode Island. Maine, which formerly had the highest ratio in New England, made the greatest reduction—from 2.58 in 1948 to 1.78 in 1949. All these changes occurred despite an increase in the severity of burning conditions in northern New England.

A notable decrease in fire-occurrence ratio took place in Connecticut. This outstanding record is closely followed by that of Maryland and the Monongahela National Forest, in that order. In Connecticut the ratio of actual to expected number of fires decreased steadily year by year from 1943 through 1949 (figure 4). The decreases have been so uniform and so sustained that they are almost certainly the result of a planned program—the odds being about 200 to 1 that this did not happen by chance. Had the downward trend been caused by a smaller number of fire-starting agents each year, the results would not have been so uniform. At any rate, there is no evidence to indicate that the number of picnickers, hunters, debris burners, etc., decreased in this State while they increased in nearby States. Fire-prevention measures apparently are responsible for changing the habits of the persons who have been causing the fires.

The year 1949, then, in the Northeast was a bad year when gaged solely by the number of fires that occurred. But valid conclusions cannot

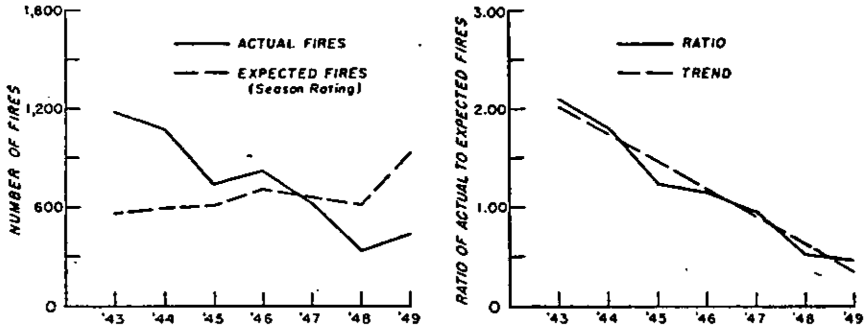

FIGURE 4.—Accomplishments in Connecticut are an example of a notable reduction in the ratio of fire occurrence.

be based on that fact alone. The cumulative burning index for the year indicates that more fires could have been expected during 1949 than in any other year since danger measurements have been made. Regionwide, the evidence indicates that the fire-control organizations handled a bad year without losing ground—with gains just about balancing the losses. When allowance is made for the year's weather, it is clear that the trend toward increased efficiency is continuing.

Heating and Ignition of Small Wood Cylinders

This is the title of an article by Wallace L. Fons published in the October 1950 issue of "Industrial and Engineering Chemistry." A small supply of reprints has been requested for distribution to those interested in the technical details. The work reported in the paper is a part of the more fundamental fire research being carried out at the California Forest and Range Experiment Station at Berkeley.

Although the paper may seem highly technical to the average fire man, it may have considerable significance to future improvements in fire fighting methods. The paper describes the use of an electric furnace with thermocouples and photoelectric potentiometers to measure and record the surface and interior temperatures of wood cylinders up to the time they ignite.

From the tests made, it was found that surface ignition temperature of 650° F. was most significant for twigs and branch wood. This was found to be the minimum temperature at which flames would appear when rapid heating took place. But if part of the material was first reduced to charcoal, it would glow at temperatures as low as 450°. Charred materials thus ignite easier than most other fuels. In fire fighting, fuels must, for the same reason, be cooled to temperatures below 450° to be certain the fire will not rekindle.

The tests demonstrated that ignition slowed up significantly as size of the stick increased even in the diameter range of 1/8 to 3/8 inch used, so long as the temperature to which the sticks were exposed was betwen 800° and 1000° F. At 900° the range in time was from 20 to 44 seconds. At temperatures of 1300° or more, all sizes used burst into flame simultaneously in less than 5 seconds. This is highly significant to fire behavior and illustrates the importance of the temperature and character of the flame front that builds up. These results were at very low moisture contents. Moisture in the wood also slowed up ignition decisively. This effect was more pronounced than would be accounted for by specific heat of the water alone.

The temperature of the wood itself in the range of 50° to 150° F. had relatively little effect on the rate of ignition in the furnace tests.—A. A. BROWN, *Washington Office, U. S., Forest Service.*

TEXAS CENTRALIZED RADIO DISPATCHING SYSTEM

E. R. Wagoner, *Assistant Forestry Educator,* and L. J. Beard, *Head, Communications Sub-Section, Texas Forest Service*

During the winter of 1944 Texas was plagued with a freak ice storm that disrupted telephone communications throughout much of the Piney-woods area of East Texas. Several hundred miles of Texas Forest Service telephone lines were made useless. An outbreak of fires following this storm would have caught Texas without a communications system.

Occurring as it did, during the critical days of World War II, the supply of both telephone and radio equipment was meager. In view of the emergency, however, the War Production Board authorized priorities to purchase a limited amount of radio equipment, but immediate deliveries could not be effected. Five used transmitters that had been operating on the 160-meter amateur band were modified and licensed to operate on 2226 kilocycles. As soon as available 30 commercial mobile receivers were purchased for mobile units.

Texas was the first southern State to make extensive use of aircraft in detecting forest fires. Twelve transceivers were installed in Civil Air Patrol aircraft. This early use of radios was considered a temporary measure as it was not planned, at that time, to replace the telephone equipment with radios. In fact, action was initiated toward moving telephone lines to more accessible locations along highways. The early use of radios sold Texas on the advantages of radios over telephones. The chief advantages were the economy of maintainance and the opportunity of maintaining constant communications with all mobile units.

Because of these advantages it was decided to build up a radio communication system around frequency modulated communications equipment.

Following World War II, the Texas Forest Service, a part of the A. & M. College System, felt that a task force, similar to that used in battle, could be used effectively to suppress forest fires. In building such a force to fight fires it is imperative to have mobility of transportation and communication. With this mobility, any unit or aircraft could be transferred anywhere it was needed in the State, without disrupting communications.

In most southern States, dispatching responsibilities are broken down on a county or a part county basis. Texas, however, has one central radio dispatcher for an entire district which contains three to ten counties. The dispatcher operates the main station, handling traffic with mobile units in his district, and with main stations in other districts (fig. 1).

Before any main station equipment was purchased, engineering tests were made to determine the type of equipment best suited for forestry traffic in Texas. Engineering tests were run with four mobile units and a station house receiver. Frequency modulated equipment replaced ampli-

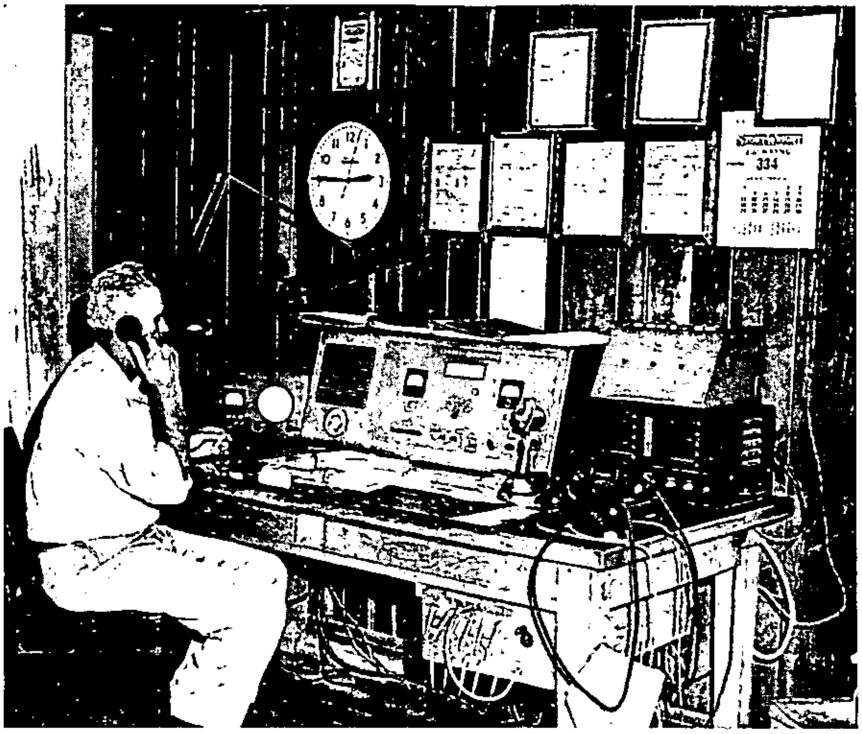

FIGURE 1.—Dispatcher O. H. Hill, District 3, Lufkin, and Texas Forest Service main station equipment for Radio Station KKB 849.

tude modulated. Five Texas Forest Service aircraft were equipped with Army surplus sets.

In 1950 the Service offered 1,400 miles of standing telephone line for sale. Funds derived from the sale of telephone equipment were used to purchase radios for lookout towers. It was found desirable to keep the tower traffic separate from the mobile unit traffic. To do this and avoid clogging one frequency, two tower frequencies were established. One or more towers in each district were designated as key towers. Other towers are called secondary towers. All towers communicate with each other, crossing out fires on 170.425 megacycles. Key tower traffic with main stations is on a frequency of 170.575 megacycles (fig. 2). After a fire is crossed out, it is reported to the dispatcher through the key towers. Ordinarily, the key towers are the only towers communicating with the dispatcher. If for any reason, a key tower is not manned, the dispatcher has a dual frequency receiver which enables him to monitor all secondary tower traffic.

The dispatcher is the key individual in the district communication organization. The mobile unit traffic, the aircraft traffic, and the tower traffic are all directed to the dispatcher for appropriate action. Traffic with cooperating organizations, such as the Texas National Forests, is also handled on 170.575 megacycles.

Radio equipment planned or in use for forestry traffic in Texas include:

One 250-watt base station at Fire Control Department headquarters.
Five 60-watt base stations at district headquarters.
Seventy 60-watt mobile units.
Five 10-watt mobile units converted for aircraft operation.

Two-thirds of the telephone line offered for sale has been sold. As funds become available from the sale of telephone equipment, radios are being purchased for tower installation. It is planned to equip 77 towers with radios to complete the radio communication system.

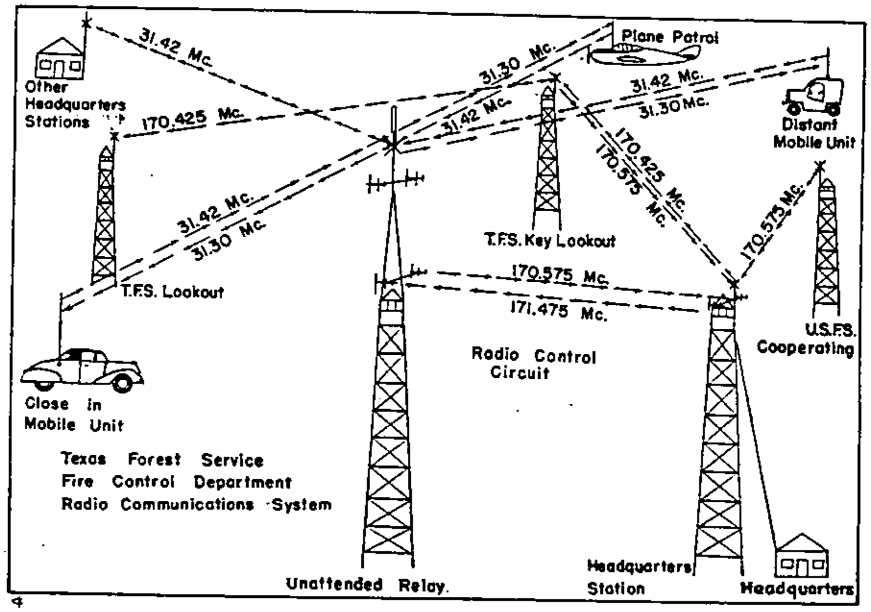

FIGURE 2.—Diagrammatic radio communications system.

Two of the administrative districts in Texas have peculiar shapes. The boundaries of these resemble a figure eight. For example, the distance across the district, that is north and south, is small compared to the distance from the extreme eastern point to the extreme western point in the district. It was difficult or impossible to communicate with mobile units in extreme corners of the districts. For this reason, it was found desirable to install bi-directional antenna at base stations in two districts. This fact alone makes Texas' communication system unique, since directional antenna are seldom used for forestry traffic.

One other district presents an unusual problem in that the district headquarters and base station are not situated at a central location in the district. This problem was solved by installing an unattended automatic relay at the highest point of elevation within the district. The unattended relay station is 18 air miles from the base station. Traffic is relayed to and from district headquarters through the unattended station. The unattended relay is equipped with a folded unipole and a six element beam antenna which is directed to the most remote corner of the district. Each antenna has its associate receiver and is selected by tone signals for transmitting purposes.

The three other 60-watt base stations utilize the conventional unipole antenna.

The Fire Control Department of the Texas Forest Service is organized around the district dispatcher to permit maximum speed of communication and transportation. It is intended that mobile units will be retained in their own district. But in case of an extreme emergency, the Texas system makes possible the transfer of fire suppression vehicles and aircraft equipped with two-way radios as a task force from one district to another without disruption of communication.

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(Continued on Page 13.)

EFFECTIVE SUPPRESSION BY A SMALL HORSE-MOUNTED FIRE CREW

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The Jack's Springs fire started on July 1, 1950, and in the next three days spread over 2,075 acres of noncommercial forest land. The area in which this fire occurred is semidesert characterized by steep canyons. The predominate cover is pinyon-juniper and sagebrush. The soil is sandy. Many dead logs and trees scattered through the green growth on the area caused considerable spotting and quite a roll problem. The suppression job was mainly one of hot-spotting and fuel robbing.

Of particular significance in planning the suppression action was the inaccessibility of the fire. It was 10 miles airline from the nearest roadhead. The distance was not too important because we have often walked men farther and in more rugged country. Walking in the *loose sand*, however, through broken country with temperatures in the 90's increased the fatigue factor so much that it was believed equal to that of more than double the travel distance. For example, the first crew of nine men reached the fire nine hours after leaving their truck; the second crew of 18 men walked 12 hours after leaving the roadhead. They averaged less than a mile per hour travel time. The men were physically exhausted upon reaching the fire and the fact that they did some effective work was mainly because they drove themselves to continued effort. Both crews had hospital cases due to heat exhaustion and sore feet. They failed to hold the fire and it made runs the afternoons of July 1 and 2.

Aerial scouting and information obtained from other sources led to the decision that an entirely different plan of attack was necessary. We could either: (1) Use smoke jumpers, not immediately available. (2) Use from fifty to one hundred men along the 12-mile fire perimeter, hold crews in relatively small working areas, and subsist and bed down right on the line in order to decrease the walking fatigue factor. (3) Use a small, well-trained crew of horse-mounted fire fighters.

Considering values, costs, distances, and other factors it was decided to use the horse-mounted crew. They could travel fast, cover a lot of fire line hot spots, and camp on water and still reach the fire by daybreak; they were economical and easy to outfit; and they were immediately available. A new base camp was established at Jack's Springs, the closest water supply, 5 miles from the fire.

The first attack ground crews were released the evening of the second day. A well-organized crew of four working overhead and six fire fighters, each mounted on a horse, and each self-sufficient, hit the fire at daylight on the third day and had covered the entire fire line by 11 a. m.

Hot spots that flared up, as far as a quarter of a mile away, were reached in fast time and since the men were not exhausted from walking in the loose sand their work was considerably more effective. The fire was held on the third day except for one small slop-over of 5 acres. Again the next day, the mounted crew hit the fire at daylight and by midafternoon had it under control. The fire was then turned over to a five-man mounted mop-up crew.

Of course, all such fires cannot be suppressed by a small crew, yet this experience did point up a few things important to the control of fires in inaccessible pinyon-juniper areas of low timber and watershed value. Some of these are:

1. Fatigue, merely from walking, is an important factor in control of fires in hot, semiarid areas. In this case, the extreme fatigue from walking to the fire and around it resulted in several injury cases. We can assume that the number of such injuries would have increased proportionately had larger numbers of men been used.

2. A well-organized horse-mounted crew could reach dangerous spots anywhere on the line within a few minutes; the men were fresh and ready for a tough job. In this case, men worked in pairs under a boss who scouted out his sector and then used his crew most effectively. The fire boss rode the entire fire line, catching dangerous hot spots as he went or directing crews to them. This small mounted crew replaced fifty to one hundred conventional foot fire fighters.

3. There was a tremendous saving in costs as well as a big reduction in the job of transporting, feeding, and supplying crews. Foot crews would have cost from $3,000 to $6,000 for the 2-day job while the horse-mounted crew actually cost about $500.

4. There was a considerable reduction in actual hours of fire fighting time. The horse-mounted men got their needed rest because they did not need to walk half the night getting into positions on a fire line.

5. Each man was independently outfitted. They arrived on the job fully equipped with tools, hay and grain, and food enough for a week.

The suppression action taken in this type of semidesert country proved to be efficient and economical.

Television for Fire Control

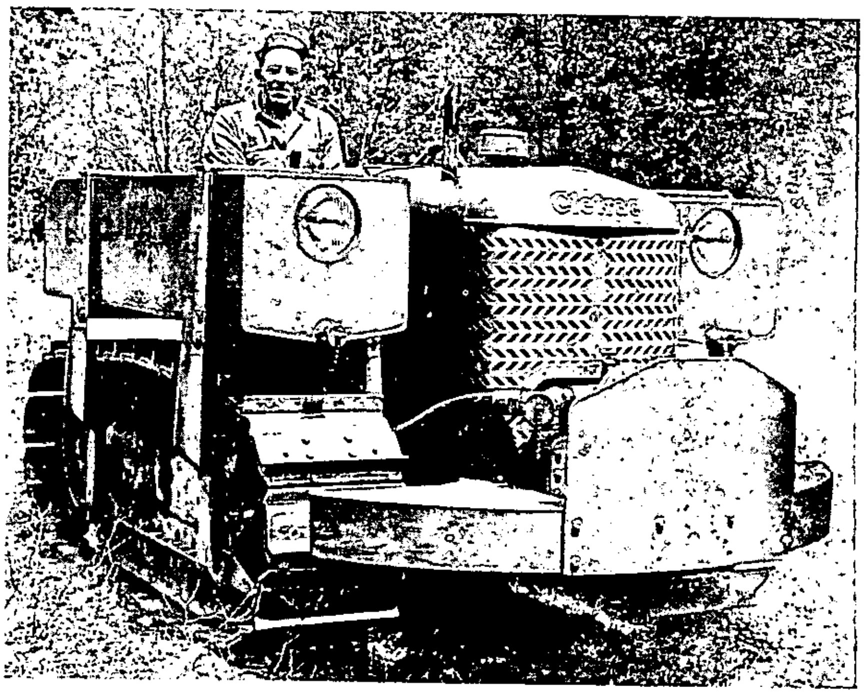
"An uncommon and interesting use of television in fighting forest fires appears to have been applied for the first time in Bechuanaland [Union of South Africa]. In April 1949 two planes, one equipped with a television camera and the other used as a relay, were flown along the front of a vast forest fire stretching for about 20 kilometers. The pictures broadcast gave the Forest Inspector in his office a general view of the advance of the fire and of the various phases of the struggle against it conducted several kilometers away by the forest rangers, farmers and firemen who had been called to the area; this 'first-hand information' allowed for effective command decisions in fighting the fire."—From UNASYLVA 4(3):142. (An International Review of Forestry and Forest Products, published by Food and Agriculture Organization of the United Nations.)

MICHIGAN TRACTOR-TANKER

GILBERT I. STEWART

Supervisor, Michigan Forest Fire Experiment Station

A tractor-tanker unit has been developed by the Michigan Department of Conservation at the Forest Fire Experiment Station, Roscommon, Mich. It is based on a wide gage crawler tractor, model AG-6. Mounted on the front of the tractor is an industrial model pump employing rubber rotors. The pump is assembled into a compact gear housing that develops proper pump speeds, and is driven by a front power take-off. The tractor driver can operate the pump at will by means of a selective clutch. A proved type of bumper and guard, which has been standard with the Michigan Department of Conservation since 1935, is installed at the front of the tractor. This has been improved and altered to provide the proper mounting for the pump.



Michigan tractor-tanker.

Two 135-gallon tanks are mounted, one above each track frame. The entire tank assemblies are borne by the track frames, and no weight of water or tank apparatus is attached to the tractor frame itself. The headlights are recessed into the bodies of the tanks, thus giving a cleaner silhouette to the machine. Tanks are designed especially for this job and may be secured commercially. Features of the tanks include bolt-down tops permitting easy cleaning and interior maintenance; perforated pipes open at both ends of the tanks and run the full length to permit complete flushing of the tank interiors without the tops being removed.

The left tank includes a live reel with a hose capacity of 100 feet; the rear of the right tank accommodates the battery. Valves permit water to be circulated free of pressure within the tank systems, or to be passed under pressure into the live reel at will; the pump is thus primed at all times and ready for immediate use, Shut-off nozzle guns are used with this machine. The pump installation has been designed to permit pumping from the mounted tanks or from a tanker trailer towed behind the machine, or it may be employed for conventional line pumping. Pressures range up to 200 pounds and capacities up to 40 gallons per minute.

Full tool equipment is contained in a sturdy tool box mounted on one tank; a tray on the right tank allows convenient access to shovel, ax, chain, or other accessories issued and used with crawler tractors.

The unit shown is the pilot model completed in May 1950 after almost 2 years of experimental development at the Forest Fire Experiment Station. Total cost is not yet known for volume production but may be estimated at about $600, excluding tractor. During development all necessary tooling, such as patterns for castings, templates, jigs, fixtures and similar accessories for production, was completed. The entire outfit can be manufactured in kit form ready for installation onto any AG-6 tractor. The same type of assembly will be worked out for D2 and D4 tractors.

(Continued from Page 9.)

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MAINE'S NEW FOREST FIRE PROTECTION PROGRAM

A. D. Nutting, *Forest Commissioner*, and Austin H. Wilkins, *Deputy Forest Commissioner, Maine Forest Service*

The Maine Forest Service has recently completed the first year of a new forest fire protection program. It is the outgrowth of object lessons learned from the Maine 1947 forest fire disaster and followed by the enactment of certain forest fire laws in 1949 by the Maine Legislature. The major law provides, for the first time in the history of the Forestry Department, full responsibility for forest fire control over the entire State. This is the foundation upon which the new set-up is being administered.

Some background information is needed if one is to fully understand the reason for the changes. In Maine there are 16,692,000 acres of forested area to be protected against fire. This represents 84 percent of the total land area of the State. It should also be pointed out that 97 percent of the forest area is in private ownership.

The Maine fire of 1947 destroyed 102 houses in this town. Such devastation as this resulted in the new forest fire protection program.

In the economic development of the State, the forested areas fall into two distinct geographical divisions. The northern part of the State is made up of a vast unbroken area of wildland townships except for a potato-growing farming section on the eastern border. It is an area with few roads, almost no permanent population, and rather rugged terrain. Here the problems of forest fire control are different from those anywhere else in Maine. In the early 1900's, there was no State control organization and serious forest fires occurred. Landowners became concerned over their annual fire losses. As a result of their efforts the Maine Legislature in 1909 passed a law creating the Maine Forestry District. It placed forest fire control for this vast northern Maine wilderness area under the State Forestry Department. The forest commissioner was charged with the prevention, control, and extinguishment of all forest fires within the District.

A unique feature of the act is the special levied mill tax which provides funds to administer the forest fire control program for that area. The tax has varied over the years and is at present 5 mills on every dollar valuation in the District. Annual income is $300,000. This money can only be used for forest fire protection purposes. It is believed that there is no other State with a similar law providing for a special forest fire tax on all privately owned land in unorganized towns. The fire record can be considered good since 1909. This is probably due to State centralized control and authority.

The Maine Forestry District for administrative purposes has four divisions, each under a supervisor. The four divisions are subdivided into 25 warden districts, the size and bounds determined largely by watersheds, accessibility, etc. Each district is under the direction of a chief warden. The Forestry District has constructed and maintains 77 lookout towers, 2,500 miles of woods telephone lines, and many camps and storehouses. The District has 2 airplanes and some radio installations. Wardens are provided with ½-ton pickup trucks, patrol boats and canoes, portable power pumps, hose, back-pack pumps, and hand tools. All personnel except supervisors and one pilot are seasonally employed (April to November).

In direct contrast to the District set-up are the organized towns of the State. The term "towns" refers to the 450 organized municipalities, administered by boards of selectment and assessors, the New England town form of government. These towns are in the southern half of the State for the most part. The forest area is 6,430,000 acres. Here the forests are small, broken-up tracts with thousands of ownerships. In general it is an area with many roads, densely populated sections, and high fire occurrence but with some towns of small population closely resembling the Forest District.

From 1891 to 1949 the individual towns have been responsible for their own forest fire control. The State never had jurisdiction and served only as a cooperator. Over the years the State has gradually increased its assistance to the towns because many of the problems could best be met at the State level. This assistance consisted of the construction and maintenance of 20 lookout towers, a number of camps, and storehouses, and employment of 13 state wardens as cooperators in forest fire fighting and for training with trucks and equipment. Since 1945 the State has reimbursed towns one-half of suppression costs up to 1 percent of the town's valuation.

Under this old system, the towns were confronted with problems which they could not handle. This was especially true when forest fires crossed town lines or became very large and expensive. The forest fire disaster of 1947 brought many of these problems out in the open and aroused public opinion to the point that the situation had to be corrected.

To meet the public demand for corrective measures the State Forestry Department conducted an intensive survey. During 1948 the department held 300 public meetings to determine what the people wanted for a program. From the many ideas and suggestions obtained an outline plan began to jell. After further study and contacts with selectmen, fire chiefs, wardens, landowners, and others, five major forest fire bills were drafted for legislative consideration. Resulting laws were finally enacted by the 1949 Maine Legislature and became effective August 6 of that year.

In brief these forest fire protection measures are as follows:

State forest fire prevention and control in organized towns.—This law established a set-up plan from former State cooperation with towns to State forest fire control in all organized towns, cities, and plantations. It provides for an unbroken chain of command from town forest fire warden to commissioner. A maximum amount of responsibility and authority will remain with each local community, but State authority is provided whenever the town system breaks down.

To administer this program, the forest commissioner shall divide the organized towns into major forest fire control districts. These shall be subdivided into as many smaller units as deemed necessary for effective protection against loss or damage by forest fires. The forest commissioner may also establish lookout towers connected by telephone or radio; construct, equip, and maintain office-storehouse headquarters for necessary supplies, tools, and equipment; and provide for any other construction essential for forest fire prevention and control work.

The law further provides for the appointment of full time State forest fire wardens. Their duties shall consist of supervision of State personnel and equipment in their respective districts for the prevention, control, and extinguishment of forest fires. They also shall enforce all laws relating to forests and forest preservation and shall have the same power of arrest to serve criminal processes against offenders as a sheriff or his deputy. In addition these wardens shall be responsible for carrying out a program of forest fire prevention education, prepare and revise annually a forest fire plan for their districts.

State seasonal forest fire wardens shall be responsible to their district warden.

It is important to note here that management of town forest fires shall be the responsibility of the town forest fire warden until, in the judgment of a State forest fire warden, the situation makes it advisable for him to take over. Final authority and responsibility on forest fires shall be that of the State forest fire warden. Town fire department personnel and equipment shall not be moved within or outside the town limits except with the approval of the fire chief or proper town official. Such officials shall have the authority to determine whether town fire department personnel or equipment is needed on a forest fire or to protect buildings.

Only State forest fire wardens shall have the authority to set backfires.

Provisions are also made for the Forestry Department to formulate plans of action to establish manpower pools, equipment reserves, facilities for feeding fire fighters, transportation and communication on forest fires.

Appointment of municipal town forest fire wardens.—The forest commissioner shall appoint a forest fire warden for a 3-year term in each organized town, city, and plantation. Such appointments shall be made with the approval of the municipal officers and does not constitute State employment. A municipal officer, fire chief, fire ward, or any other citizen is eligible for appointment.

The State appointed town forest fire warden shall receive an annual fee of $50 from the State. Payment is contingent upon attendance at forest fire training schools and preparation of an annual forest fire plan for the town. This forms the nucleus for a well-trained force of 450 town forest fire wardens and 1,500 deputy town wardens.

Services by these wardens for work on actual forest fires shall be paid by the town and at a rate determined by the town.

Forest fire fighter pay and aid to towns in controlling forest fires.—In the past many towns of small population have been hit hard by heavy forest fire suppression costs. Many bills went unpaid. Some towns sought reimbursement through the legislature while others borrowed money from banks and made payments prorated over a period of years.

Under this bill the suppression cost burden is eased by the State paying one-half of the suppression costs up to 2 percent of the town's valuation. All suppression costs in an amount greater than 2 percent of the town's tax valuation shall be paid by the State.

No State reimbursement payments shall be made until the town first shows certified payment. All qualifying costs must be approved by the State forest fire warden in charge. Requests for reimbursements shall be presented within 60 days after total extinguishment or become void. Time extension may be granted after major forest fires.

Slash and brush disposal.—This law provides that all slash must be removed a distance of 50 feet from the nearer side of all publicly used roads and on request by adjacent owner 25 feet from property lines. This must be done within 30 days after cutting or 30 days of notification to remove by the forest commissioner or his representative.

This act further provides that no person shall kindle a fire to clear land or burn logs, stumps, roots, brush, slash, fields of dry grass, pastures and blueberry lands, except when the ground is covered with snow, without first obtaining a burning permit. These are issued by State wardens in the Maine Forestry District and town forest fire wardens in the organized towns. Penalties are imposed for violations of this and the slash removal requirement.

A new prevention measure under this act is the hazard clearance around town and private dumps. A cleared strip 10 feet wide to mineral soil must be constructed on all sides of the dump, except when bordering on or near a large constant supply of water sufficient for protection. In addition all grass, weeds, slash, brush and debris, and other flammable material shall be removed for a distance of 100 feet in all directions from the cleared mineral soil strip. Live trees need not be removed except that dead and green branches of conifers or evergreens shall be pruned to a height of 10 feet above the ground.

Town and private dumps may be closed by the State or town forest fire warden if the provisions of this section are not carried out. Many towns have dumps which are near woods and constitute a forest fire menace. To meet this problem towns are being encouraged to relocate to a safer place or construct a suitable public incinerator. In some instances towns are using trenches and covering the debris with bulldozers.

Primary wood-using portable sawmills, spark arrestors, and timber reports.—All primary wood-using portable sawmills must be licensed and require a fee of $25. Failure to secure a license is punishable by either a fine or jail sentence or both. An added forest fire prevention measure calls for a hazard clearance of all slash for a distance of 50 feet in all directions from the mill, sawdust pile, and incinerator. Live trees need not be removed but dead and green branches of conifers or evergreen trees shall be pruned to a height of 10 feet above the ground. The area for the sawdust pile shall be clear of all trees and located not less than 25 feet from an incinerator. The sawdust pile shall be reasonably free of slabs and edgings.

The act further provides that all primary wood-using portable sawmills shall be equipped with a forest fire tool cache not exceeding a cost of $25 for each mill.

For many years the State has been without any accurate information on the annual timber cut. Under this act all owners or operators of primary wood-using sawmills, stationary or portable, shall make an annual report to the forest commissioner of the amount of softwoods and hardwoods sawed within the State.

Conclusion

During 1948 and the spring of 1949, the State Forestry Department had the voluntary authority and expanded aid from State funds to handle forest fire control before the new forest fire laws became effective. Since enactment of the 1949 laws there is reason to believe that the new program has proved itself.

Morale is high among the State and town forest fire warden personnel who are a part of an organization making every effort to establish better fire protection in the State. This has been accomplished by a series of intensive training schools. Emphasis has been placed upon prevention-education work, case history studies of forest fires, demonstrations in handling crews and use of equipment, training of volunteer groups, and other public relations work.

From 1947 on, Maine has experienced four consecutive years of drought with an increasing number of forest fires. Yet better forest fire control and authority have prevented any serious reverses.

The recent Greenfield-Townships 32, 33, and 39 forest fire of 7,300 acres was a good example of coordination and supervision under one authority. Under the old system it would not have been possible to pay all the suppression costs on the Greenfield end of the fire. The new program provided full financial payment to all fire fighters and for use of equipment.

Sufficient funds were provided to increase the warden service, to construct 7 lookout towers and 18 office-storehouse headquarters, and to purchase 20 ½-ton pickup trucks, 25 portable power pumpers, large quantities of hose, knapsack pumps, hand tools, and radio equipment.

Radio communication was undoubtedly one of the most progressive protection measures under the new program. The State Forestry Department now has a State-wide network of 9 lookout tower radio stations. In the organized towns the entire State warden service will shortly be equipped with mobile sets installed in ½-ton pickup trucks. There are also a number of handy-talkie sets. Similar mobile installation is planned for wardens in the Maine Forestry District.

Two other important measures which will strengthen the fire protection program of the State are the preparation of a State forest fire plan and participation as a member of the ratified Northeastern Interstate Forest Fire Protection Compact.

Volunteer public cooperation to control forest fires usually develops only after a disaster has taken place, and is too late to prevent hardship and loss. Such a situation must never be permitted to occur again. It is hoped that under a single authority this new program will provide the necessary forest fire protection in Maine.

Box and Crate Construction for Safety

Safety pamphlets, leaflets, and instructions continually stress the importance of lifting with the legs instead of stooping over a heavy object and lifting with the back muscles, a practice which causes sprained backs, injured vertebrae, ruptures, and other semipermanent and permanent injuries.

On all units I have visited, almost invariably boxes that house heavy objects, i.e., pumpers, grinders, stoves, and other equipment, have an ordinary rectangular box with a hinged lid on top. When one man is required to remove the object from the box it is a physical impossibility for him to lift the object properly because the box is in the way. The effort in lifting is exaggerated simply because the man lifting must keep his knees straight, bend over off-balance and lift the object straight up, throwing excessive strain on leg muscles, knee joints, back and shoulder muscles.

Would it not be a good idea to move the hinged lid from the top of the box to the bottom on the side or end so the object to be removed can be slid out of the box with much less physical effort and strain?

All boxes constructed at the Mendocino warehouse for housing heavy objects of 50 pounds and over now have a cover hinged to the side so that no lifting is required to remove the object from the box.—AL EDWARDS, *Warehouseman, Mendocino National Forest.*

[In other regions a special box has been used for heavy equipment, such as pumpers. The pumper is secured to the bottom of the box. The rest of the box serves as the lid. It is fastened to the bottom with four hasps and is removed in one piece. Devices such as this author presents will undoubtedly pay dividends, in fewer injuries, where heavy equipment is involved.—Ed.]

SALMON HOSE ROLLER

R. Boyd Leonard

Fire Control Officer, Salmon National Forest

The cleaning and rolling of hose after it has been used is normally a tedious job. It is not only time-consuming, but the roll is often untidy and loose. We then experience difficulty in handling and storing, and frequently the rolls come undone when we pick them up hurriedly to send to another fire. The most common method of rolling hose is by hand. To do an effective job by this method takes two men and an estimated 2 minutes per roll of hose.

In order to overcome the difficulties experienced in properly rolling hose by hand, an effective and durable hose roller was designed by Kenneth Call, fire dispatcher, Salmon National Forest (fig. 1). Advantages of such a roller were immediately apparent. It cut down the time required to roll hose and eliminated one man from the operation; neat compact rolls were secured (fig. 2). The roller is simple, inexpensive, and designed to make it easier and faster for one man to roll fire hose. It is constructed of:

4 pieces of 2x4, 2 feet long
2 pieces of 2x4, 2 inches long
1 2x6, 2 feet long
1 ½-inch rod, 24 inches long
1 screen door spring hinge
1 nut and washer
a few nails.

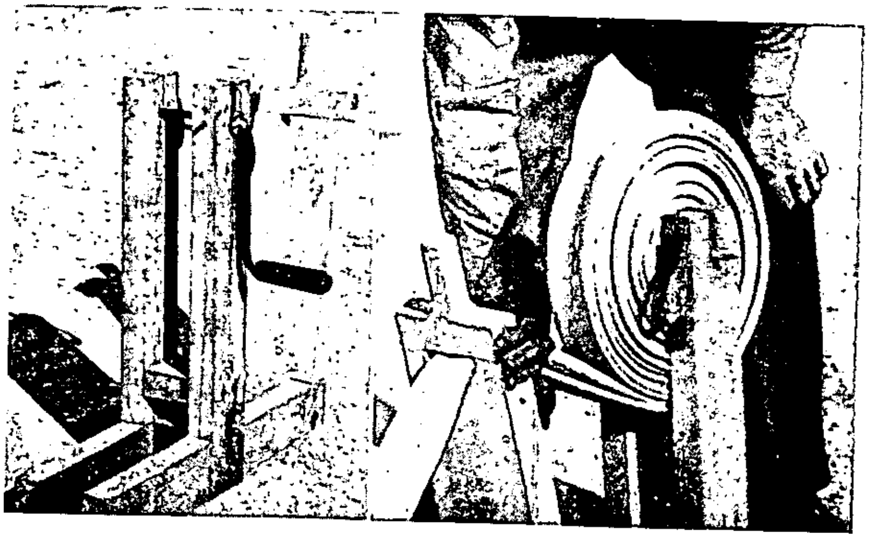


Figure 1.—Salmon hose roller: *Left,* Parts in place; *right,* roll being made.

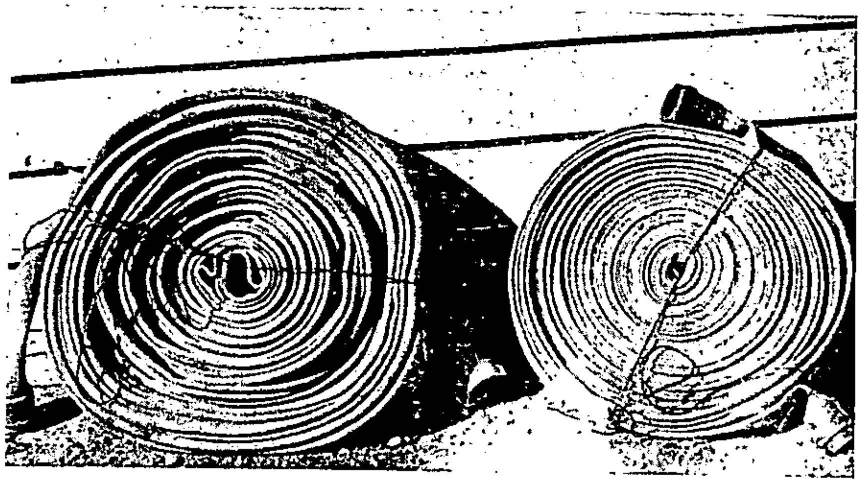


FIGURE 2.—Comparison of hand roll and machine roll.

The hose is doubled before rolling and is held by a hooked finger which is welded near the center of the rod. The clamp opens to allow insertion of the hose in the slot, and two nails slip into the holes across the crank slots to hold the crank down when starting the roll. Before the roll is removed the tying string is doubled and threaded through an eye in the end of the rod. The crank pulls the string through the hose to simplify tying. Once the operation of rolling the hose is started, it is only a matter of turning the handle and holding down the roller with the left foot, unless it is clamped to the floor. In our operations, we desire the mobile characteristic so it can be put away conveniently when not in use.

Case for Crosscut Saws

A safe, convenient, and inexpensive case for crosscut saws can be constructed from a little lumber, a few screws, a piece of scrap metal and a bolt. The Prescott Forest used 1-inch lumber, but ⅜-inch, ½-inch or even ¼-inch plywood would serve as well.

The following was constructed for a 6-foot saw but dimensions can be increased or decreased to fit any size saw.

Cut two boards 7¼ inches by 6 feet 2 inches. Cut two pieces of ¼-inch plywood 1 by 7¼ inches to be placed between the ends of the two boards. Next, lay the saw on one of the boards and cut two additional pieces of ¼-inch plywood to extend along the side of the board next to the saw teeth, from the ends to the point where they touch the teeth. Now, place the two boards together, separated by the two plywood pieces at the ends and the other two pieces along one side. Fasten together with screws.

Drill a hole near the side which is opposite the saw teeth, so it will clear the back side of the saw when encased. Place two 1-inch cleats approximately 1-½ feet apart, at equal distances from the drilled hole. This distance can be varied to accommodate the handles which are placed between the cleats.

Next, a piece of metal, approximately 1 inch wide and long enough to cover the two handles, is shaped to hook over the outer handle and a bolt welded on to the other end. The bolt is then run through the hole, with the piece of metal over the handles, and fastened with a wing nut. This holds the saw in place as well as the handles and makes for convenient and safe carrying or storage. The case can be painted and the name of the forest stenciled on.—DOOLEY B. JONES, *Fire Control Aid, Prescott National Forest.*

A NEW BELT-TYPE, FIRST-AID KIT

Horace E. Hedges

Regional Safety and Training Officer, Region 4, U. S. Forest Service

Early in 1949 the personnel of the Teton National Forest in Wyoming suggested that a larger and more complete first-aid kit be developed for fire line use since the present one-man kit was inadequate except for treating superficial injuries. The standard larger kit is cumbersome, relatively heavy and awkward to carry, and because of these disadvantages often is left at headquarters or main camps. Our experience with many injuries on the 1949 large, hazardous Payette fires further emphasized the need for a better field first-aid kit. Here again the conventional small pocket kit was useful only for treating small cuts or minor injuries. In more serious injury cases, such measures as airplane dropping or long-time-consuming hikes were required to bring in additional first-aid supplies.

This need for a better field kit was presented to the Fire Control Equipment Development Committee, and Region 4 was assigned the job of designing, developing, and assembling a kit for on-the-job crew use. Fire control personnel and the regional safety officer, working together, drew up plans for a belt-type kit which would contain adequate first-aid supplies for four to ten men and which could be easily carried. From these plans, canvas carrying cases were constructed at the regional smoke-jumper loft. They are designed to be carried around the waist, with eyelets for holding an Army-type quart canteen on one side and lunch bag on the other side.

Heavy canvas is used for the outer covering and an oil silk liner protects the contents from body perspiration seeping through the canvas.

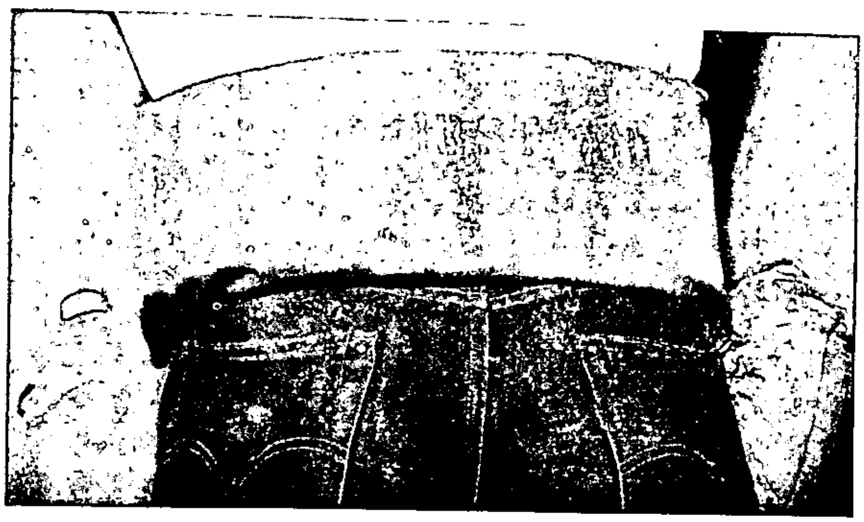


Figure 1.—Kit fits comfortably; belt has special eyelets for fastening canteens or lunch.

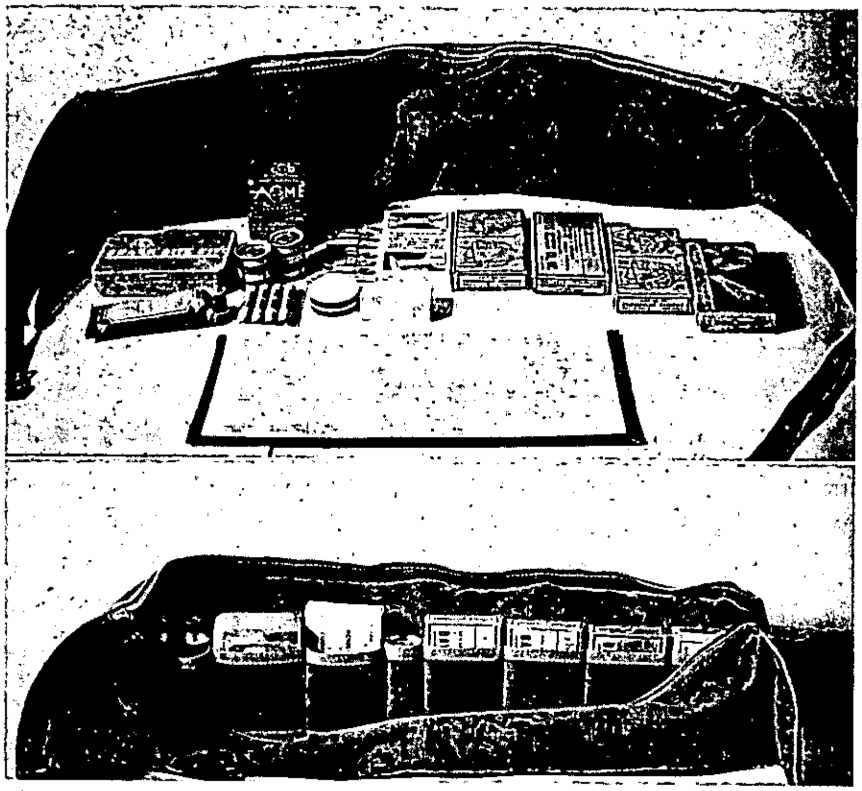


FIGURE 2.—Belt-type, first-aid kit: *Top,* contents laid out and zipper closed; ***bottom,*** contents in specially prepared pockets are held firmly in place.

A 22-inch zipper extends the length of the pocket section of the belt. The total weight of the completely filled kit is 1 pound 11 ounces. It is light enough to be carried without any appreciable inconvenience, and the wearer has both hands free (fig. 1).

The kit contains the following materials: Tube of white petroleum jelly; 2 sterilized gauze bandages; snake bite kit; 3 triangular bandages (not sterile); 2 rolls of adhesive tape; 4-inch bandage compress (sterile); 1 package each of methiolate (breakable pearls), 5-grain aspirin tablets, aromatic ammonia pearls, and safety pins; and a plastic-covered card listing contents and brief first-aid instructions (fig. 2). First-aid supplies are adequate to treat most serious injuries that result from fire or other forest work. A 25-man headquarters kit carries all replacement items of correct sizes for the crew kit.

A number of the belt kits have been constructed and will be given field trials. Following the trial period recommendations from field men will be consolidated and changes made toward further improvements. It is planned to equip fire, road, timber, and other field crews with the belt kits by the 1951 field season. As long as the kit is in an experimental stage all construction and assembling will be done as a winter project at the Region 4 smoke-jumper loft.

THE MINNESOTA FIRE FINDER

Roger Williams

Cartographer, Division of Forestry, Minnesota Department of Conservation

The device described here was developed in 1949 for the Minnesota Forest Service in answer to the need for a fire finder more accurate and dependable than those we had been using, and more economical than some of the commercial instruments in general use. In designing it, our objective has been to produce an instrument simple in operation, durable, low in cost, and small in over-all dimensions for convenience when used in our smaller tower cabins. Distinctive features of the device are the novel system of linkage that permits parallel movement of the graduated circle and the use of materials, unusual for this purpose but especially suitable.

Briefly, the fire finder consists of a triangular base and a triangular platform and movable circular disk, which are mounted on the base, all made of ⅝-inch Masonite die stock. This is a dense, rigid material made from wood fibers, light in weight and easily worked in comparison to metals, and with unusually high dimensional stability when subjected to extreme changes in temperature and humidity.

The triangular base is fastened to the supporting stand by wood screws. Set in its upper face are three stud bolts which extend upward through slotted openings in the triangular platform; this platform may be clamped firmly to the base by tightening the nuts on the stud bolts. Loosening the nuts permits the entire assembly to be rotated about 18 degrees in order to orient it properly.

Set in the upper face of the platform are three ⅜-inch steel pins, and the under side of the circular map board carries a similar set of pins. When assembled, the two sets of pins are connected by three links made of die stock, each link having two holes spaced 2½ inches apart, to receive the pins. The map board may thus be moved in a circle 5 inches in diameter, as it glides on the polished ends of the upper set of pins, which bear on the triangular platform. This permits a total shift of 5 inches for dodging obstructions in the tower cabin. The original orientation of the graduated circle is rigidly maintained in all positions.

The alidade is made of ¼-inch die stock, and turns on a bronze pivot working in a bronze bushing fitted in the center of the map board. Its two hinged brass sights may be folded down when not in use. The front sight carries a vertical sighting wire made of a single nylon filament, such as is used for fishing leaders. The rear sight has a vertical slot 3/32 inch wide. Slots of various widths were experimented with. It was found that with slots much narrower than this, not enough light entered the pupil of the eye, so that some difficulty was had in detecting distant smokes under conditions of poor visibility. Wider slots, on the other hand, per-

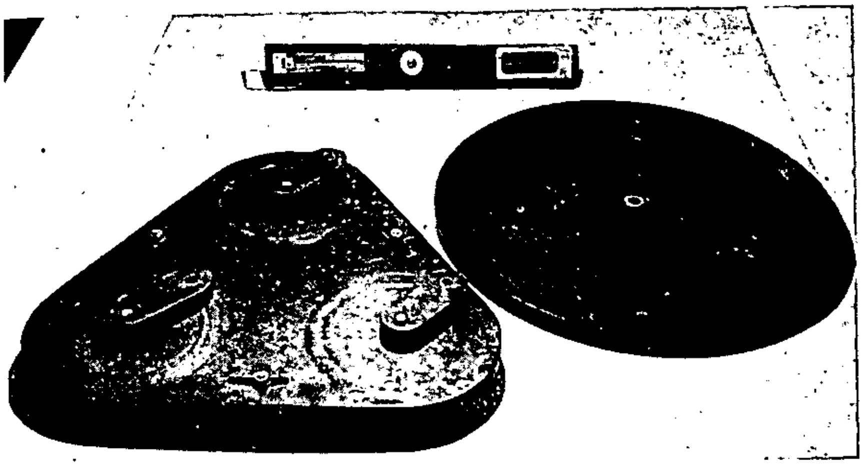


FIGURE 1.—Fire finder before assembling, showing platform with parallel linkage and under side of map board.

mitted some error due to imperfect centering of the eye on the slot. The 3/32 inch width was selected as the best under most conditions.

At the rear sight end of the alidade is fastened an index plate of ¼ inch clear Plexiglas, with a red index line engraved on its under side for reading the graduated circle. The alidade is set so that the index plate rides about 1/16 inch above the circle, and may be pressed down against the circle when reading a direction. The index mark then being in contact with the graduations, all chance of error due to parallax is eliminated.

The azimuth circle is printed on a sheet of Ozaplastic 15 inches in diameter. This is a paper coated on both sides with a plastic material, and sensitized with an Ozalid solution for contact printing. The original was drawn on acetate sheeting, and prints were made in a vacuum frame to eliminate any possible distortion of the image which might be caused by slippage or crawling in the usual rotary printers. This sheet is carefully centered on the axis of rotation of the alidade, and cemented to the board with a resorcinol resin glue. The circle is graduated to single degrees. Since on this large circle azimuths may be estimated to one-half or one-quarter degree, and since no smaller interval than this can be platted on the dispatcher's maps now in use, no further subdivision of the full degrees was considered necessary. If readings to a smaller interval are desired, it is a simple matter to add a vernier scale on the under side of the index plate, reading to 15, 10, or 5 minutes of angle.

Before placing the fire finder in the tower, azimuths to several check points visible from the tower are marked in ink on the graduated circle. True azimuths to these points are being determined by triangulation survey covering all our towers, which is now in progress.

The original model of this fire finder included a map which was cemented face up to the under side of a circular disk of Plexiglas ⅛ inch thick. On the upper side of the Plexiglas was engraved the graduated circle, the incised lines being filled with red ink. The disk and map were then cemented to the map board. The alidade carrying the sights was made of clear Plexiglas so that the map could be read through the forward end of the alidade. However, serious difficulties, and some additional expense, were encountered in assembling the map and disk. Since our towers have for several years been provided with a small crossing map similar to the dispatcher's map, it was decided to eliminate the map from the fire finder, and the present simpler arrangement was adopted.

The instruments are being manufactured in our own machine shop, no special equipment being required other than the tools generally found in such shops. Total cost of materials is about 5 dollars. Plans or additional information may be obtained from Director, Division of Forestry, Department of Conservation, State Office Building, St. Paul 1, Minn.

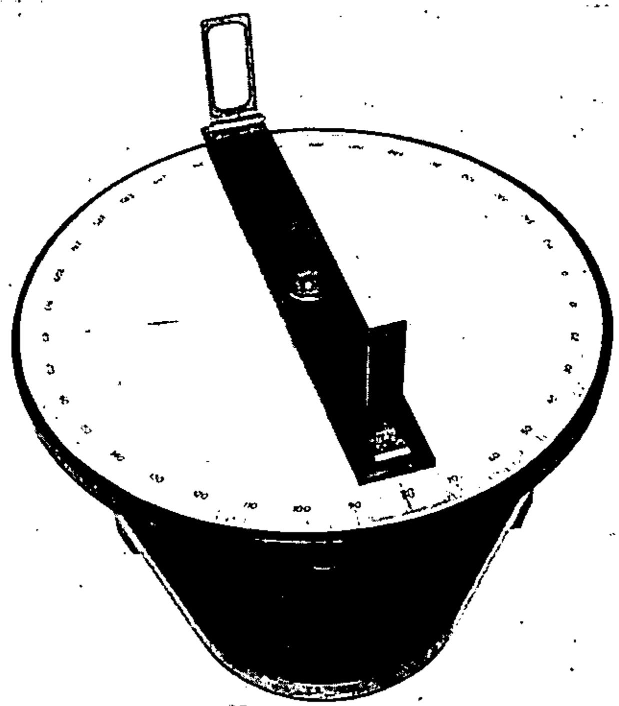


FIGURE 2.—Fire finder assembled for use.

PORTABLE, COLLAPSIBLE FIRE CAMP TABLE

J. W. MATTSSON

Forester, Division of Fire Control & Cooperative Forest Protection, Region 4, U. S. Forest Service

We have constructed a few collapsible fire camp tables, based on plans prepared by other regions plus a few alterations of our own. It was felt that such tables could be used to good advantage and save considerable time and effort. Very often rough tables have been constructed at fire

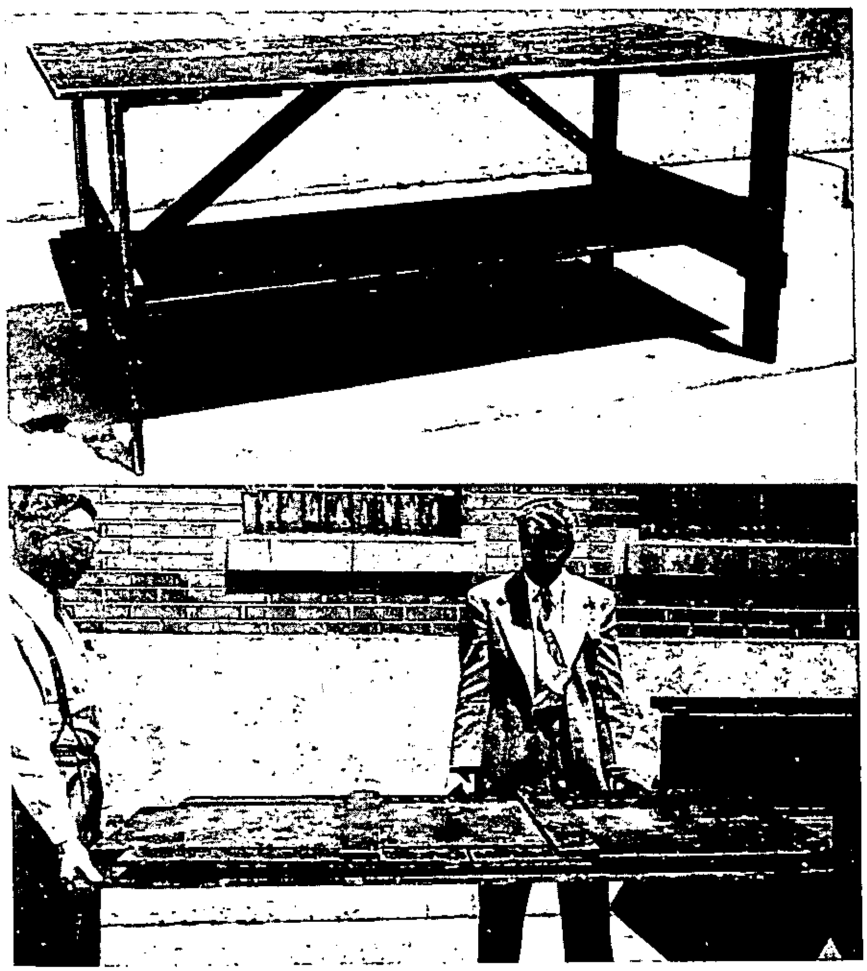


FIGURE 1.—*Top,* table in upright position. Note wide top and shelf below. The diagonal braces insure a rigid table. *Bottom,* fully collapsed table takes up little space in the bed of a pickup.

camps, even when such camps were accessible by truck, at the expense of many man-hours that could have been spent more profitably on direct suppression. These collapsible tables are practical, and are not too difficult or expensive to construct. They have proved their worth for emergency fire use as well as at insect control and other field camps. On a fire their use is multiple; they serve such purposes as work tables for the kitchen, mess, fire boss, camp boss, and timekeeper.

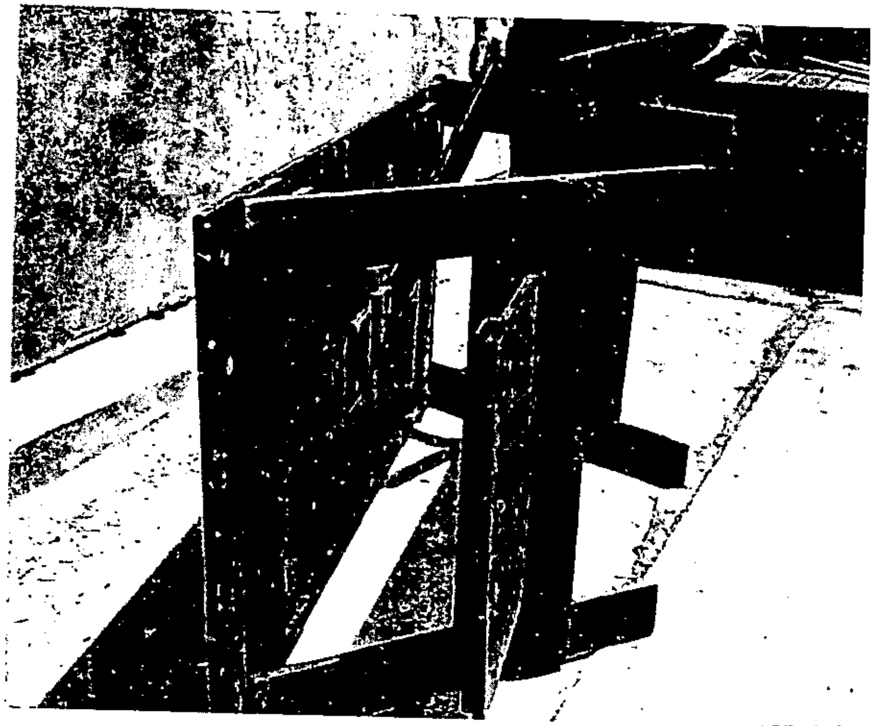


FIGURE 2.—Table partially collapsed showing how diagonal braces are set in. These braces are an important part of the table. They give it the necessary rigidity and solidness.

Construction is rugged enough to take a lot of abuse and the collapsible feature makes it possible to drop the tables in the bed of a truck and load whatever is needed in the way of tools and supplies on top. They can be set up or taken down in a matter of seconds since there are no bolts or screws to remove or replace (figs. 1 and 2).

If such tables are to be used where a smooth surface is desired, it is recommended that ⅛ inch masonite top cover be placed on them. This would increase the life of the table top, provide a smoother writing surface, and also facilitate cleaning.

Figure 3 illustrates the details of construction. Substitutions of materials, of course, can be made if desired. Its construction does not require an expert carpenter. Considerable care, however, should be given to the construction and placement of the diagonal braces and brace blocks to insure a good tight fit.

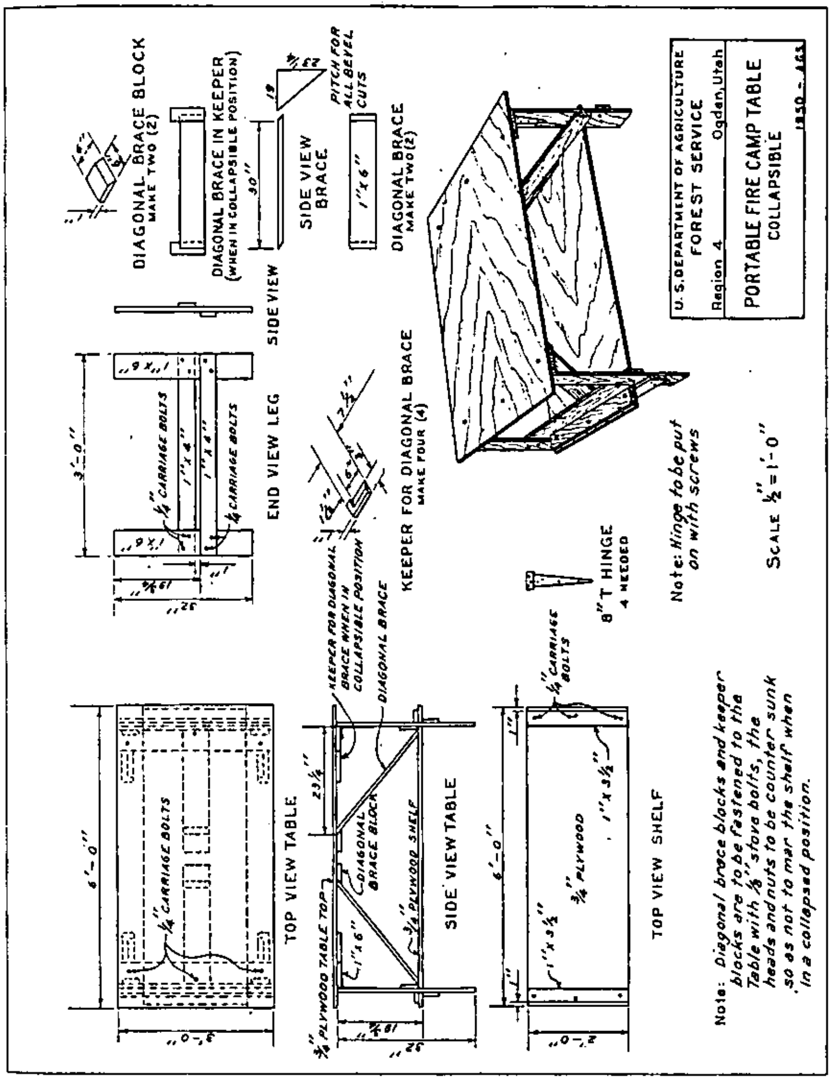


FIGURE 3.—Construction plans for collapsible fire camp table.

GETTING A NEW LOOK IN FIRE TRAINING

JOHN E. BURT, JR.

Deputy State Forester, Utah

How to combat 300 fires a year without funds to employ a full time fire organization has been the problem of both the Federal agencies and the State. Per diem fire fighters is our answer—cooperators from all walks of life, paid only when they fight fire. In order to make these cooperators effective fire fighters a great deal of effort has gone into fire training.

The fire control agencies in Utah have developed an interagency organization known as the Utah Cooperative Fire Fighters. This organization is headed by a coordinating committee, with a deputy coordinator from each agency, and the State forester as State coordinator. Each county in turn has a coordinator and assistants. Through this organization Federal, State, and county agencies can pool their efforts to train and tool fire fighters and coordinate their efforts in prevention and suppression work.

It has been the practice of the coordinating committee to meet early in the year to plan a spring training program to be taken to the field. When the group met in February this year we pointed out that our past training was lacking in certain fundamentals. Too many fires blow up because in our training we failed to put across the idea of proper mop-up. Another weakness was the proper handling of small crews in line construction. Better straw-boss training was needed.

This year the coordinating committee felt that a better job could be accomplished if members of the field organization participated. The State was divided roughly into four districts and three people from each district were invited to assist the coordinating committee in developing a program, including heavy emphasis on mop-up, organization and handling men in line construction, and safety.

The three people from each district, the coordinating committee, and Mr. Von Robertson from the State Education Department met in Salt Lake City on March 16th and 17th. The first day was an indoor session where everyone participated in planning a training outline. The second day was a field day in which we developed the training techniques to put over our training subjects. It was very difficult for most of us, as fire fighters, to think in terms of teaching and here Mr. Von Robertson came to our rescue. Too many times at fire schools we have gotten away from the job of teaching by putting out the fire.

We developed a rough outline of the various teaching steps as we demonstrated them in the field. This was later polished up, mimeographed, and sent to the field force. It consisted of three sections: Basic training fundamentals, planning the actual training program, and putting on the training program.

The three men from each district attending the planning session became a committee responsible for their own district fire school. Members of the coordinating committee participated in each of the four schools, acting as trainers and critics. County coordinators and assistants plus key people from all agencies were invited to attend the four district schools. Each school consisted of a six-hour program as follows:

1. Inside or outside orientation and outlining of program. Getting acquainted and letting the trainee know what he is expected to learn. 30 minutes
2. Field orientation and travel to practice site. Prepare trainee. 10 minutes
3. Assembly of men at practice site. This involves parking cars safely, unloading, and walking to selected area. 10 minutes
4. Training in progressive line construction. Telling, demonstrating, practice and critique. 1 hour
5. Presentation of mop-up. Explain reasons for good mop-up practice. Explain three phases of mop-up, primary, intermediate and final, and point out problems of each. 30 minutes
6. Demonstrate and practice on mop-up problems. Tell how, demonstrate, let trainees practice, put them on their own. 1½ hours
7. Review action taken on practice problems by all trainees. Final group critique. 1 hour

We have found that even with this limited subject matter our time was too short.

The new look came to our training by placing the trainee in the position that he was a teacher who in turn would have to teach someone else, and by following teaching fundamentals. This resulted in each man thoroughly learning the subject. Everyone was very attentive and participated with comments and questions. The summing-up period or critique was the clincher. We first let the trainee criticize the trainers and himself, then the critics made a summarization. From one of our meetings came the very applicable comment that we have had 10 to 25 years experience but we are still using only our first year's experience. This came from Richard Greenland, a district land manager, who feels that now with this training we are adding to that experience.

The four district meetings were very successful because they were planned and organized by the men who had helped develop the program. A great deal of time and effort was spent in this planning and preparation. These meetings were attended by a total of 210 people who represented Federal, State, and county agencies.

The trainees attending these district schools then carried out the same program in their local schools with a great deal of success. More than 500 fire fighters were trained at 20 local schools in May and June.

We hope to follow through on this program next year, choosing another phase or two of fire control and teaching it thoroughly.

Outlines have been furnished all regional foresters and State foresters. Some of the State foresters have been very complimentary in their comments. [The Utah State Board of Forestry and Fire Control, School of Forestry, Logan, Utah, has available a comprehensive mimeographed publication, Suggestions and Guide Points on Planning and Conducting a Cooperative Fire School.—Ed.]

A SIMPLE METHOD OF DESIGNATING MAP LOCATIONS

ROBERT F. COLLINS

Forester, Region 7, U. S. Forest Service

A problem confronting any forest fire control organization is that of identifying a point on a map in a manner that will permit a person on the receiving end of a telephone or radio transmission to locate quickly and accurately the same point on his map.

One solution is afforded by the "thrust-line" method. This method is frequently used by the armed forces in situations where gridded maps are not available. In the most simple form it may be applied as follows:

1. Select two readily identified points on the map in the general area to be worked and as far apart as is convenient.
2. Connect them by a straight line. This is the "thrust line."
3. Designate and label one of the points as the "initial point" (I.P.). All measurements start at this point.
4. Any location on the map may now be designated by a symbol consisting of two parts: Distance along the thrust line from the I.P., either forward (F) or back (B); distance right (R) or left (L) from that point at right angles to the thrust line.

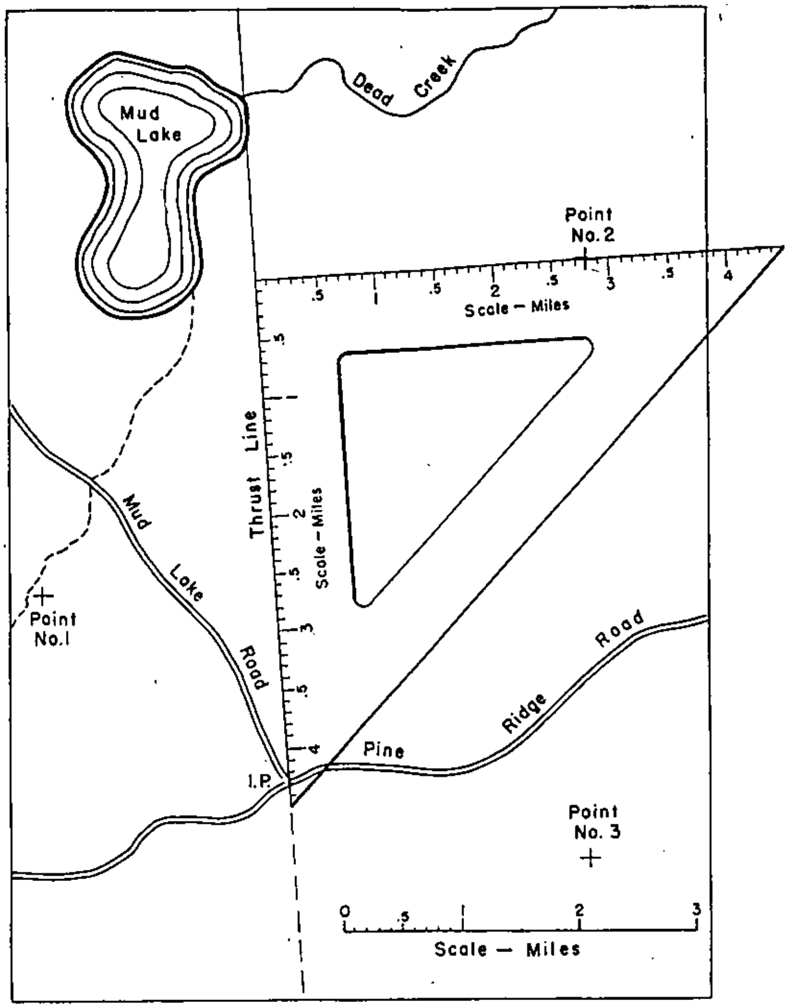
An aid in applying this method is a paper, cardboard, or plastic right triangle having both of the sides graduated in the major map units and tenths of units, the zero of both scales being at the right angle of the triangle. By laying the triangle along the thrust line with the "zero" forward and the required "F" distance at the I.P. the "R" or "L" distance may be plotted directly.

An example of the use of the thrust-line method is shown by the sketch map. Point no. 1 is designated as *F* 1.7 *L* 2.0. Point no. 2 is identified as *F* 4.3 *R* 2.8.

Many variations of this method may be developed to meet the need of special situations. Where a large area of map is to be covered it is best to establish several thrust lines well distributed over the area to be worked. In such cases it is necessary to identify each thrust line by a letter or number and to preface each point description by the identifying letter or number of the thrust line to which it pertains. For example, if the thrust line shown on the sketch map is thrust line III then the identifying symbol of point no. 2 would be *III F* 4.3 *R* 2.8.

In some cases it is necessary to place the I.P. well into the map because there is no easily identified point near the edge. In such cases the thrust line may be extended to the edge of the map and points on this extension shown as back (B) measurements. For example point no. 3 on the sketch map would be identified as *B* 0.8 *R* 2.5. In all cases right and left are determined on the assumption that the observer is facing forward from the I.P.

The thrust-line method is most useful in cases where maps having grid lines or regular GLO subdivision land lines are not available. In an emergency the ordinary service station road maps can be used in combination with the thrust-line method to good advantage.



Sketch map with graduated triangle placed on thrust line to locate point no. 2, *F* 4.3 *R* 2.8.

When two observers are using maps of different scale the same thrust-line symbols apply to both. However each observer must plot locations according to his own map scale.

The principal advantages of the thrust-line method are: It is simple to teach and use. It may be applied to any map. A single identification symbol will apply to all maps of the same area, regardless of scale. It is accurate; chance of error is reduced to a minimum. It is brief; map point description by radio or telephone reduces transmission time to a minimum.

The major disadvantages of the method are: Each location must be plotted. The accuracy of location is dependent on accuracy of plotting.

This method is primarily valuable to fire control organizations as an emergency or stop-gap method pending the receipt of gridded or subdivided maps.

RAILROAD FIREFOG

A. B. EVERTS

Division of Fire Control, Region 6, U. S. Forest Service

The problem of keeping railroad beds clear of grass, weeds, ferns, an other flammable material is a vexing one. Not only does such vegetatio constitute a fire hazard and hasten tie decay, but in some cases, especiall when the railroad undergoes a period of nonuse, it may actually hinde operation by making traction difficult.

This was the situation in which the Puget Sound Pulp and Timbe Company of Bellingham, Wash., found itself in the fall of 1949. Th company had 35 miles of logging railroad which had not been in use fo a year. They also had a bridge to replace. Vegetation across the rail made it difficult for the locomotive to haul material to the bridge site.

At prevailing wage rates, cutting the vegetation by hand would b a slow and costly procedure. Spraying was considered and rejected. How about burning? The problem was put up to Bill Catlow, the company forester. The "machine" that finally evolved was a combination of firefog and a propane-Diesel oil flame thrower, both of which have been previously reported in Fire Control Notes. Bill Cheney, of the W. C. Cheney Manufacturing Company of Seattle, a man with an inclination to try out new ideas, drew up a rough design and company management gave approval. The unit for this large-scale job is shown in figure 1.

Flame Thrower.—Eight 2-inch burners were suspended behind a railroad flatcar in such a manner that the flame from four of the burners was brought to bear between the rails. Two burners on each side pointed outside the rails. Since this was the first unit of its kind and considered to be experimental, provisions were made for adjusting the burners as to angle and for raising and lowering the entire assembly.

Four 125-gallon spherical liquid gas tanks of commercial design were mounted on the flatcar. Two of these contained propane and two Diesel oil. If freezing should occur because of the volume of gas being withdrawn, it is possible to shift from one propane tank to the other. By using this type of tank, it is also possible to take advantage of the price saving of bulk delivery of propane.

The four tanks were subjected to a 400-pound hydrostatic test, and the safety release valves were set at 180 pounds. As in the firefog unit and the flame thrower, the propane gas pressurizes the Diesel oil. Not only does this arrangement eliminate the need of a pump, but the propane gas bubbles in the Diesel oil make a hotter flame than Diesel oil alone.

[1]EVERTS, A. B. FIREFOG UNIT. U. S. Forest Serv. Fire Control Notes 9 (2 and 3): 39-42, illus. 1948.

———PROPANE-DIESEL OIL FLAME THROWER. U. S. Forest Serv. Fire Control Notes 10(1): 30-33, illus. 1949.

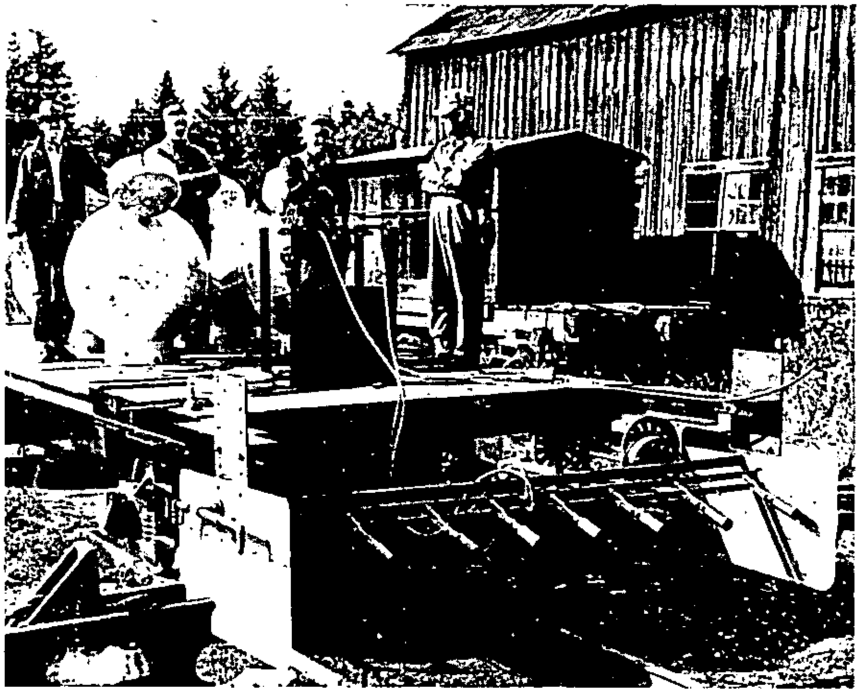


FIGURE 1.—Railroad firefog showing fog plates and tips. The lower 1½-inch pipe carries propane gas; the middle pipe, Diesel oil; and the upper 2-inch pipe, water for the fog tips. The hose connection between the control box and water pipe is not shown.

Once the burners are in operation, except for pressurizing the oil tanks, very little propane gas is used by itself.

Fog Control.—Originally it was planned that the vegetation would be burned while it was dry or curing. Thus, some means of confining the fire to the burned strip were necessary. It was thought that this could best be done with water fog. With a 10,000-gallon railroad tank car behind the locomotive and in front of the burning car, conservation of water was not a problem. Two steel fog plates were mounted as shown. On the outboard side of each of these plates two 15-gallon-per-minute fog tips were provided. Thus, a total of 60 gallons of water per minute would be used in control, and the tank car would provide enough water for better than 2 hours and 45 minutes of operation. If less water was needed, one of the fog tips on each side could be turned off, thus doubling the operating time.

Low velocity, homogeneous-type fog tips were used. Normally, these tips produce a 10-foot circular ball fog pattern, but since they are mounted close to the fog plate, the diameter of the fog pattern is cut in half. In other words, 15 gallons of fog per minute would wet down the vegetation for 5 feet on the outboard side of the plates while an additional 15 gallons would strike against the plate and drip off in a heavy concentration.

At this stage, someone is sure to raise the question about the railroad ties catching on fire. It was believed that, for the most part, the blast effect of the burners would so quickly consume the vegetation that temperatures of sufficient intensity and duration to ignite the ties would be lacking. Nevertheless, it was planned to follow behind the burning car with a speeder to put out all fires that did linger in the ties. Because the burner performed beyond expectations, this problem, as will be explained later, did not materialize.

Controls.—A box with individual valves for the propane, Diesel oil, and water control was provided for the operator at the burner end of the car. Propane and Diesel oil can be mixed so as to produce the type and intensity of heat that will best do the job.

Operation.—When the unit was assembled last October, it was found that the reflected heat was so great that protection was needed for the operator. Accordingly, corrugated sheeting was used to provide this protection (fig. 2).

FIGURE 2.—Railroad burner in operation. Note protection provided for the operator.

It was raining when the unit was ready for test. Even though the vegetation was wet, it was found that the heat was so intense that burning could still be done. Therefore, it was decided that burning would always be done on wet days. Thus, the tie-burning problem was settled and with it the need for fog control, at least in this area of high rainfall. With the thought in mind, however, that other sections of the country might be interested in this railroad burner, the fog control has been included.

In the rain, an estimated speed of 3 miles an hour was obtained. A second pass over the roadbed was made at about 6 miles an hour. Last fall the roadbed was cleared to the site of the washed-out bridge (fig. 3).

This spring, with the bridge repaired, the rest of the roadbed into the logging-operating area was burned.

The fog plates have been removed and in their place 2½-inch burners, one on each side, have been added. These burners, set at 45°, point outward and thus further widen the burned strip. With the fog plates removed, the burner assembly has been lowered much nearer the rails.

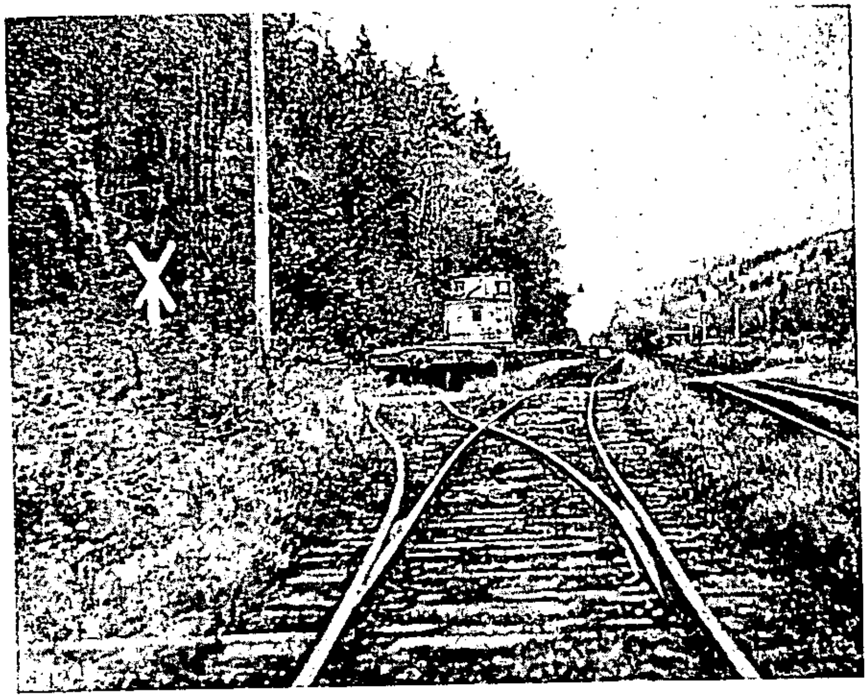


FIGURE 3.—The roadbed after the burner has passed over. All burning was done in the rain.

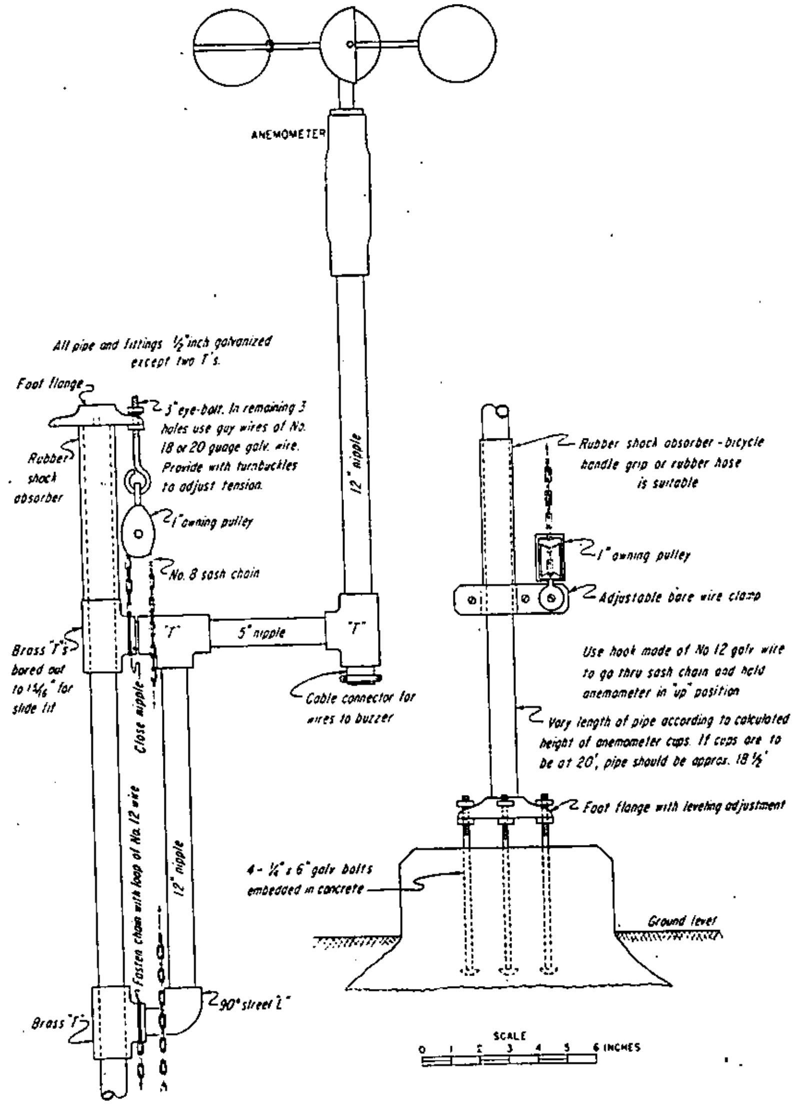
Latest reports indicate that two burnings will be made a year; one in the spring after the grass has had a good start, and again in the fall after it has recovered from the first burning. It is believed these two burnings will keep the roadbed clear of vegetation.

[There is some danger in using propane for pressurizing a liquid fuel tank. Propane gas expelled when liquid fuel tank is refilled is a serious hazard. One fire fighting organization discontinued such use because of the hazard and substituted air pressure.—Ed.]

HANDY ANEMOMETER MAST

A. W. LINDENMUTH, JR., *Forester, Fire Research, Southeastern Forest Experiment Station,* and J. J. KEETCH, *Danger Station Inspector, Region 7, U. S. Forest Service*

For mounting an anemometer approximately 20 to 30 feet above ground level, this design for a mast provides economy, durability, and convenience. One semiskilled worker can set it up using only a pipe wrench, screw



driver, pliers, and standard hardware (except for the small concrete foundation and reamed brass T's). After it is in use, the serviceman will save a lot of time while periodically caring for the instrument because the anemometer can readily be lowered within reach and is easily pulled up to the standard operating height. Total cost for the mast: about $10 for materials plus 2 hours of semiskilled labor.

This equipment has been service-tested and found satisfactory. The figure gives all the necessary erection details, but these few supplemental suggestions are helpful: Use rustproof hardware. One-half-inch pipe is satisfactory for masts up to 21 feet in height. Larger-sized pipe, also larger sliding T's, are recommended for higher masts. A short stepladder is needed when servicing the instrument if the mast is more than 25 feet high.

Plumb the mast. The best way to do this is to screw a 2- or 3-foot piece of pipe into the bottom foot flange: then align this short section with a carpenter's level. Use lightweight guy wires and take up only enough slack to hold the mast erect. If the mast is not plumb or if the guy wires are taut, the mast tends to bow.

Rest Camps for Large Fires of Long Duration

Due to someone's carelessness, a fire started on the Los Padres National Forest July 5, 1950. The best suppression efforts of the Region were stopped or delayed by a country so steep and rugged that it was impossible to use mechanical equipment to construct fire lines. The cover was tinder dry, with the constant threat of having a fire crew trapped and burned to death. Helicopters were used to transport men and food to high, inaccessible places, while other crews fought their way on foot up the steep, rugged mountains to fight the spread. After a few days of such work, the fire fighters would become exhausted and depressed.

Three weeks after the fire started a separate camp was established away from the turmoil of the main fire camp, where these exhausted men could rest, relax, and recuperate before again being sent back to the fire line. For this purpose, a Forest Service public camp ground was taken over and closed to public use. The camp was on the banks of the Arroyo Seco and had plenty of fine shade, two swimming holes, bathhouse, latrines, and running water. The rest camp had its own kitchen, commissary, and Red Cross set up. The camp ground tables were assembled near the kitchen, so that the men could sit down and enjoy a well-prepared meal. Three meals a day were served. Men coming off the line were checked in at the main fire camp, and then sent to the rest camp, where they bathed, washed their clothes, received medical attention, and rested for 24 hours before being sent back to the fire line. In many cases, it was hard to recognize the clean, fresh men who left the camp as the blackened, exhausted men who had entered 24 hours earlier.

The rest camp took a load off the main fire camp, and assisted in other ways in the management of the fire. The maximum number of men in the camp at any one time was approximately 250. After the fire had been controlled, the camp was used to segregate and assemble the various crews for dispatch to their home forests or cities.

The rest camp is an idea which should be considered for any fire of long duration. All of the forest personnel in the main fire camp gave complete cooperation, and the fire fighters who spent time in the camp thought it a wonderful innovation.—T. R. LITTLEFIELD, *Engineer, Division of Engineering, Region 5, U. S. Forest Service.*

NEBRASKA FIREBREAKS

Wilfred S. Davis

Forester, Region 2, U. S. Forest Service

Firebreak building was a fairly popular work project in the days of the Civilian Conservation Corps. It enabled the employment of great numbers of men with hand tools and created swaths from which fire suppression forces could make a stand. But lack of maintenance funds made it difficult to keep up these barriers when the CCC was disbanded, and most of the firebreak systems are today abandoned and overgrown.

The Nebraska National Forest, however, is keeping up a system of firebreaks that has been maintained since 1910. Without such a system, it is doubtful if the forest could survive.

This national forest is located in the vast sea of grass-covered dunes known as the Nebraska sand hills. Every tree on some 20,000 acres has been planted. It is a successful attempt to show that a forest can be grown under the somewhat adverse conditions in the sand prairie, and represents one of the largest single afforestation projects in the world (fig. 1).

Figure 1.—Successful ponderosa pine plantation growing in a flash fuel grass type.

Lightning and man for centuries have caused vast prairie fires to sweep across the sand hills. The chemicals in the ashes gravitated into the major depressions and created potash deposits, which were recovered during World War I and used in the manufacture of explosives. The repeated fires that caused this potash accumulation probably prevented the build-up of surface litter for more than a few years at a time.

When the plantation project was initiated, it was of course necessary to check periodic prairie fires in the afforested area. This soon caused an increase in the grass density between the trees and an accumulation of dry litter, which made it extremely difficult to check fires sweeping in from the outside (fig. 2). Consequently, a system of permanent firebreaks was devised.

FIGURE 2.—Dense prairie grass on the edge of a plantation. There is enough litter on the ground to carry fire even when the grass is green. When the grass is cured, it will support fire of high intensity and rate of spread.

The basic concept of the firebreak system was (1) to provide protection against outside fires, and (2) to divide the planted areas into units of less than a square mile, so as to make interior fires easier to handle. Some of the first firebreaks were made relatively narrow; these proved ineffective in high winds, and wide standards were adopted.

The major exterior firebreaks consist of three plowed and disked 20-foot sand strips separated by strips of grass at least 150 feet wide. The sand strips are disked annually, to prevent vegetation from creeping in, and one of the grass strips is burned annually; two year's growth of grass is required for a clean burn.

The interior firebreaks are single lanes of grass edged by disked strips (fig. 3). The grass cover is burned off every other year.

The annual burning of firebreaks takes place in the fall, usually after the first frost has killed the annual growth of grass (fig. 4). A typical burning crew consists of 3 torch men, 2 guards, 1 tanker or tractor driver, and 2 mop-up men. The fire in grass goes out quickly, but mop-up

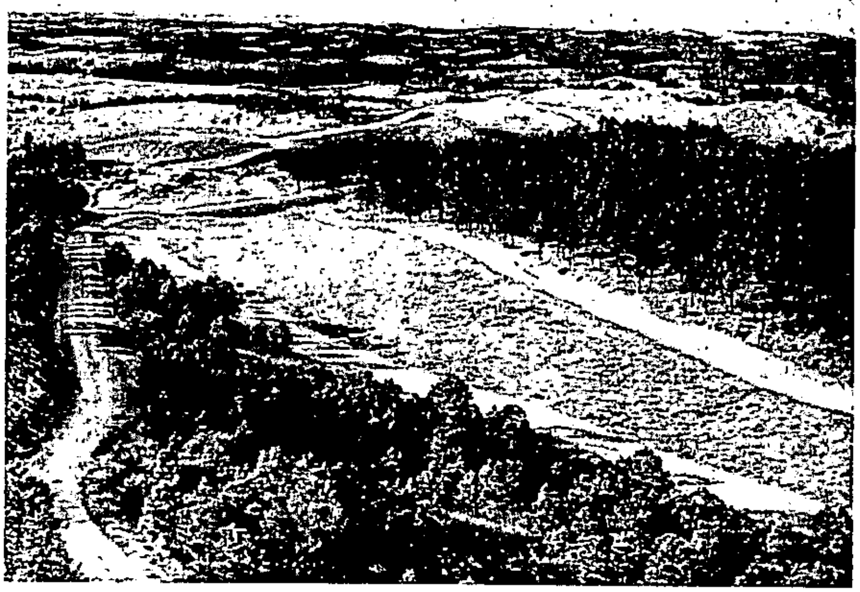


FIGURE 3.—Typical interior firebreak.

is required for smouldering cow chips and burning soapweed (yucca) plants. The crew soon becomes adept in the use of fire, and learns to employ terrain and wind to the best advantage. Three to five miles can be burned each day when the humidity is sufficiently low (less than 30 percent).

The maintenance of the Nebraska firebreak system is a considerable task, involving the disking of 594 miles and the burning of 61½ miles of grass lane annually.

Virtually all of the planted acreage of the Nebraska project was wiped out in the spring of 1910, when a disastrous prairie fire swept through the area. Since the establishment of the firebreak system in that year, however, plantation losses to fire have been small, despite the fact that there have been a number of large "outside" fires. These advance with considerable rapidity; in one instance, a frontal spread of 6 miles in 40 minutes was clocked. However, the planted areas have remained relatively free from fire invasion. Today, some of the older trees ar approaching sawlog size, and natural reproduction is beginning to come in. Thanks to the protection system, of which the firebreak network is a vital part, an afforestation effort extending over nearly a half a century is beginning to bear fruit.

FIGURE 4.—Burning an exterior firebreak in the fall of the year.

Nonmilitary Aircraft

The following interesting information on all nonmilitary aircraft is a result of a Civil Aeronautics administrative study:

"More than half of the Nation's 92,442 registered civil aircraft are owned in 10 States. California continues to lead the list of States in aircraft ownership with 10,508 planes registered there—11.4 percent of the national total. The other nine leading States, in order, are Texas, Illinois, New York, Michigan, Ohio, Pennsylvania, Kansas, Indiana, and Florida.

"The study reveals that 62,496 of the registered aircraft are 'active,' that is, in general day-to-day use, with 29,946 classified as 'inactive,' although still registered. Of the total fleet, 86,533 are single-engine planes; 4,498 have two engines; 23 three engines; 575 four engines; and 1 eight engines. Of the inactive planes, 311 are classified as 'unspecified' because of the lack of data as to powerplant, model, or other characteristics. None of these has an air-worthiness certificate, and could not be granted one without the required data. In addition there are 469 gliders, 15 lighter-than-air craft, and 17 balloons.

"Ten 'Ford Trimotors,' forerunners of the modern multiengined air transport planes, are still registered as 'active.' They were built in 1928 and 1929."—From *CAA Journal, October* 15, 1950.

EMPTY CHAIRS IN FOREST SERVICE HOMES

CARL BURGTORF

District Ranger, Monongahela National Forest

What do we remember about forest fires? We remember the waste an our loss. We prevent fires in an effort to prevent this loss of human an natural resources. We know that not all fires can be prevented so we pla to meet that risk. Our safety plans are made to reduce or eliminate th loss of personnel in fire control. There are many grim reminders an sobering details of fatalities on the fire line, some of which are buried i the records, while others are burned into the hearts of those who wil never forget.

How many empty chairs will fire fatalities leave in our homes in 1951 The year 1949 brought 18 deaths for the U. S. Forest Service directl attributable to fire fighting while 3 others died on fire duty as a resul of heart condition. Judging from the 1949 fatality list the stage was se for death to strike 4 men: one, a T. S. I. crew member, was placed unde a 140-foot snag which fell in the *unexpected* direction; the second was under a 65-foot snag, hollow and on fire, that also fell in the *unexpected* direction; the third was too close to a hollow snag, burning from top to bottom, that was caught in a gust of wind and fell *unexpectedly;* while the fourth was in a crew attempting to cut a 100-foot snag, which was on fire, with a power saw. 15 feet of the top broke off and fell on its victim.

After reading the reports of these four deaths a natural assumption is that snag felling is dangerous work. The next assumption might be that felling snags of uncertain soundness, hollow or otherwise difficult to handle, involves too much risk and should not be done by the usual felling crew operating at the base of the snag. Wouldn't that be a sound decision after four deaths by this cause in 1949?

How can dangerous snags be felled without cutting them off? Why not dynamite them from a safe distance? Experienced men blast miles of ditch line, etc., each year for the Soil Conservation Service without a fatality, so handling the explosives should be little more difficult than handling and hauling a power saw and gasoline. Certain dough type or packaged units of explosives used by military demolition squads might be far superior to regular dynamite.[1] At any rate the problem to eliminate is the need for men at the base of the snag, setting up vibrations with ax, saw, or other tool, trusting to luck for a safe escape. Why set a stage in which excessive risk is so evident?

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[1] JOHNSON, G. B. ARMY EXPLOSIVES FOR HAZARD REDUCTION. U. S. Forest Serv. Fire Control Notes 8(1): 42-44. 1947. This article describes tests of military explosive used for snag felling. The Northern Pacific Region of the Forest Service at Portland, Oreg., has published some mimeographed material on snag felling with explosives.

Fifteen Forest Servicemen died during 1949 from suffocation or burns. They were trapped by forest fires that changed directions *unexpectedly*. As each of these men was killed, or injured to die later, there were others nearby who made successful escapes. Who can say that fate played a hand in their escape. We can't count on fate to save our men so we must put our faith in a realistic training program.

The success of a safety program rests with the individual worker; accidents happen to individuals and in the final analysis, we might say, each worker rides in a driver's seat where he has the power to follow a clear trail or one beset with accidents. Some individuals are "accident prone." Why? Why does performance vary with different people? The answer is obvious; people are different.

When we consider the qualities which, outside of physical or mental capacities, have decided effect on a workman's performance, we find that as a person is confronted with a certain job, he will perform the work within a pattern. This pattern might easily identify each man's workmanship and is influenced by his inherent *skill,* past experience, and *training* and his *attitude* at the time. You have heard of good working habits, safe practices, safety consciousness, carelessness, thoughtlessness, and if you know your workman you may see these characteristics or notice their absence in his work pattern. How simple your safety job would be if you could hand each employee a "pattern package" containing skill, training and an excellent attitude.

The "pattern package" might seem to be as unrealistic as a flying saucer, and yet you have seen excellent supervisors or foremen develop skillful trained workmen with fine attitudes. Of course, these workers did not acquire their work pattern overnight. Trial and error, success and failure, practice with actual performance and thoughtful guidance each had its part in forming this pattern. The trained and skillful foreman in charge of the training program knew what he wanted his workmen to be like. He knew what pattern of performance he wanted from his outfit and he got that pattern by developing the skill, training, and attitudes of his men. The foreman had acquired a personal knowledge of what constitutes a pattern for workmen. Call it a standard of performance if you will, but each man's pattern must fit the standard in the final analysis. Each man must have skill, training, and a good attitude if he is to be consistent in quantity and quality of output.

What has all this to do with fire control? It reaches to the very grass roots of personnel management; it concerns the man driving the tractor, the man on the fire line, the straw boss, the foreman, in other words—the individual. It has usaully been some individual failure that put on the straw to break the camel's back. Seldom has equipment been directly responsible for accidents and in those rare cases it is usually found that some person through carelessness (attitude) permitted his equipment to become involved in situations which demanded results beyond the capacity to produce. "The brakes failed to hold," is frequently read in accident accounts. Most brakes fail to hold when the wheels are off the ground!

A recent Forest Service report indicated that the five chief causes of human failure in accident occurrence have been fatigue, haste, inadequate supervision, faulty instruction, and lack of attention or improper attitude. Fatigue, haste, and improper attitude are factors of direct individual behavior, but inadequate supervision and faulty instruction are the responsibilities of leadership. These causes of human failure have resulted i many deaths.

As supervisors of men we can attack weak points in our organization. set-up. Most of us do. We think about the safety of our men frequent and write reports and prepare records for distribution and filing. W have beautiful records—of accidents. Yet, how frequently do we fin ourselves attacking the symptoms instead of the disease. We think of fatigu and haste, two allies of the grim reaper, and we know that few men g to a forest fire who do not, at some time, get tired, or act in haste—it i that kind of a job. Fire fighters work hard and hurry. They must. Wi it do any good to tell them not to get tired or not to act in haste?

Let's refer to that "pattern package" mentioned before. Will we b attacking the disease instead of the symptoms if we give each man a goo dose of skill and training and check him for attitude?

Some of our leaders may have been taught to memorize such phrase as "be careful" or "don't do this or that." How much better we woul feel if we could step up to each leader, or foreman, and say, "Joe, you have been given skill enough and training enough, and have proved yourself as a leader. You have been taught how to check each job and plan accomplishments in advance. When you 'feel' that too much risk is involved in a situation, after you have checked carefully, take heed—that will be your experience, your training, and your skill telling you that an accident is just around the corner. That 'feel' or pattern of experienced reaction saved the lives of several men last year, Joe."

How many empty chairs in our homes this year will be due to the unexpected?

INFORMATION FOR CONTRIBUTORS

It is requested that all contributions be submitted in duplicate, typed double space, and with no paragraphs breaking over to the next page.

The title of the article should be typed in capitals at the top of the first page, and immediately underneath it should appear the author's name, position, and unit.

Any introductory or explanatory information should not be included in the body of the article, but should be stated in the letter of transmittal.

Illustrations, whether drawings or photographs, should have clear detail and tell a story. Only glossy prints are acceptable. Legends for illustrations should be typed in the manuscript immediately following the paragraph in which the illustration is first mentioned, the legend being separated from the text by lines both above the below. Illustrations should be labeled "figures" and numbered consecutively. All diagrams should be drawn with the type page proportions in mind, and lettered so as to permit reduction. In mailing, illustrations should be placed between cardboards held together with rubber bands. *Paper clips should never be used.*

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