VOL. 13 JANUARY 1952 NO. 1

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 13 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.

FIRE CONTROL NOTES is issued by the Forest Service of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by the direction of the Secretary of Agriculture as administrative information required for the proper transaction of the public business. The printing of this publication has been approved by the Director of the Bureau of the Budget (November 7, 1951).

Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., 20 cents a copy, or by subscription at the rate of 75 cents per year, domestic, or $1.00, foreign. Postage stamps will not be accepted in payment.

Forest Service, Washington, D. C.

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON: 1952

CONTENTS

AN INFORMAL STUDY OF POWER-SAW FIRES

L. L. COLVILL, *Assistant Chief,* and A. B. EVERTS, *Equipment Engineer*
Division of Fire Control, Region 6, U. S. Forest Service

The increase in the number of power-saw fires during the last few years is viewed with alarm. In an effort to determine *how* these fires were starting and what should be done about them, an informal study was undertaken.

Forests submitted detailed information on individual fires. Manufacturers, mechanics, fallers, and buckers were interviewed. Carbon tests were made on mufflers and the one known spark arrester for power saws. Bulletins bearing on the subject were studied. One of these, University of California Bulletin No. 577, "Spark Arresters for Motorized Equipment," has been considered by later investigators to be the basic study as to the size and temperature of carbon that sets fires.

This paper deals primarily with power saws, but certain aspects of the study are applicable to all internal combustion engines and their fire-setting potentialities.

A tabulation was made of power-saw fires reported by the forests, including the make and model of the saw (if this were known) and all other pertinent information. Not tallied were a number of small fires immediately put out and on which information was lacking.

Of 29 fires reported, 8 were caused by hot mufflers or exhaust pipes coming in contact with flammable material; 6 by backfires of power-saw engine; and 3 by gasoline spills (how the gasoline was ignited was not determined). The specific cause of the other 12 was not pinpointed.

Seven of the fires were listed as having started from bucking saws, and 1 from falling saws. The remaining 21 did not have indicated which type of operation was responsible.

Sizes of the fires varied from smoldering material to 1,080 acres. Largest single suppression cost was $17,910.

The theory has been advanced that some mufflers are adequate spark arresters. An adequate spark arrester is considered to be one that will trap 90 percent of the test carbon, size A (carbon which passes a 14-mesh Tyler screen and is retained by a 28-mesh Tyler screen), and not set up more than a stated amount of back pressure as measured in water-inches.

Professor Henry F. Gauss of the University of Idaho Engineering Experiment Station recommends that for arresters on tractors the back pressure should not exceed 10 water-inches. The Society of Automotive Engineers Spark and Flame Arrester Committee states, ". . . No allowable back pressure is to be specified since it is felt that each engine manufacturer is best able to determine the back pressure which his engine can stand." Generally, it is believed back pressure in power saws should not exceed 4 to 6 water-inches.

In order to obtain information on the adequacy of mufflers as spark arresters, tests were run on three makes. A measured amount of carbon, size A, was fed into the air stream below the muffler. The amount that blew through was recovered and weighed back. Results were as follows:

	Carbon		
	Fed in (grams)	*Recovered (grams)*	*Efficiency (percent)*
Muffler:			
X	10	10	0
Y	10	9	10
Z:			
First test	10	6	40
Second test	25	18.5	26

Muffler Z was the largest of all mufflers and the one most likely, by its construction, to be effective. Muffler test conclusions are: Mufflers are not adequate spark arresters; all makes of mufflers tested got hot; and raw gasoline spilled on a hot muffler did not ignite.

The University of California study indicated that there is considerable risk from carbon sparks emitted from a 28-hp. tractor, but information was lacking on the danger of fire starting from carbon sparks emitted from power saws. Only one commercial spark arrester for power saws is manufactured, to our knowledge. The following two methods were used to test this spark arrester (fig. 1).

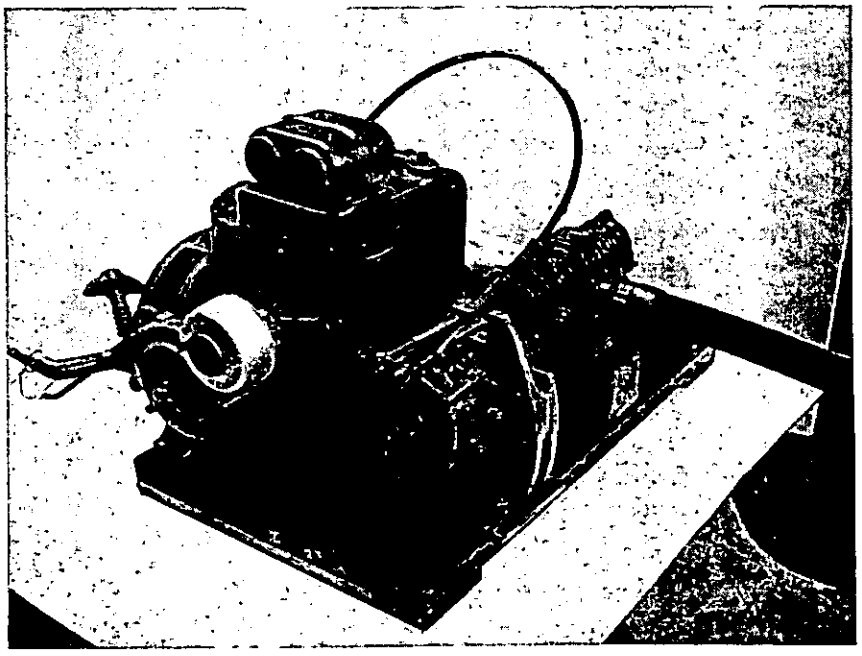


FIGURE 1.—To simulate conditions under which a power saw would ordinarily be working, a rotary gear pump was driven by the engine during the spark arrester tests.

1. Procedure was the same as that used on the mufflers. Back pressure was 6 water-inches. The arrester was mounted in three positions with the following results:

	Carbon		
	Fed in (grams)	*Trapped in arrester (grams)*	*Efficiency (percent)*
Arrester position:			
Vertical and up	25	23.3	93.2
Horizontal	25	22.5	90.0
Vertical and down	25	23.3	93.2

2. An 11-hp., 2-cycle, heavy-duty power-saw engine properly maintained with spark arrester attached was operated continuously for 8 hours under load comparable to field use. The engine speed was increased suddenly at frequent intervals and observation made on quantity, size, and distance sparks were emitted from the engine. The results were as follows:

a. The sudden increase in speed of the engine produced a flurry of light candescent sparks that glowed for a fraction of a second. Most of them were out before reaching the table. A very few of the heavier ones extended a distance of 3 to 4 feet from the engine and were still red when they reached the table but only long enough to be observed.

b. No carbon was trapped in the arrester.

c. The louver separator inside the arrester was hot enough to produce a red glow. The heat did not warp or otherwise damage the spark arrester.

d. The heat coming through the arrester ignited a rag held 1 inch from the exhaust.

e. Drops of gasoline placed on the spark arrester did not ignite.

Following this test, the engine was run with the regular muffler installed and with it removed. The engine was speeded up and then slowed down in an effort to produce sparks. It was observed that the largest number of candescent sparks occurred when the engine operated without a muffler or spark arrester, and no difference occurred in the quantity and size of candescent sparks emitted with the engine operating with a muffler or a spark arrester attached.

Engine backfiring is listed as one of the principal causes of power-saw fires. Several forests reported such fires; in some cases, the backfire ignited spilled gasoline. During laboratory tests attempts were made to cause backfires by alternately speeding up and slowing the engine. Only one or two relatively minor backfires resulted. A backfire seems most likely to occur when the engine is first started, or just before it comes to a dead stop.

Carbonization does occur in power saws. Mechanics for the distributors of three different makes of saws showed mufflers with their ports nearly closed by caked carbon to one of the co-authors.

CONCLUSIONS

1. Power-saw mufflers are not adequate spark arresters.

2. The one spark arrester tested satisfactorily passed the "dry run" efficiency test. The superiority of the spark arrester over the muffler appeared minor when tested on an operating engine.

3. Spark arresters or mufflers will not prevent fires caused by hot exhaust, backfires, or heat from the arrester or muffler in contact with flammable material.

4. Engines which exhaust against a log, or downward onto forest fuels, are more of a hazard than engines which exhaust in other directions.

5. Fire-setting potentialities are inherent in the operation of all makes of power saws.

6. Good maintenance, clean exhaust ports, proper grade of oil, and proper oil and gasoline mixture decreases the fire-setting potentialities of power saws.

7. The amount of carbon, of a size that will start fires, emitted from a properly maintained power-saw engine of the type tested was negligible. The presence of caked carbon in the exhaust port could be hazardous.

8. Some makes of saws are more subject to gasoline leaks than others.

9. Power bucking saws are more of a fire hazard than falling saws principally because of the more hazardous fuel in which they are working and the position of the saw when operating.

10. Based upon the limited statistics available, the authors rate the probable specific cause of any ten power-saw fires as follows:

Exhaust heat coming in contact with flammable material	3
Hot muffler, or arrester, or tail pipe contacting flammable material	3
Backfiring of engine	2
Candescent carbon sparks	1
Miscellaneous, including friction of the chain, short in ignition systems, etc.	1

The information obtained from this study led Region 6 to establish the policy that a spark arrester or a muffler will be required on all power-saws operating on national-forest lands.

SUGGESTED PREVENTIVE MEASURES

A prevention program directed toward reducing the number of power-saw fires suggests three avenues of approach:

Manufacturers.—Continue efforts with the manufacturers to encourage them to work on design changes which will:

1. Eliminate gasoline leaks.
2. Provide muffler insulation so that flammable material cannot come in direct contact with the muffler. In many of the makes of saws this would not be difficult to do. A cylinder of lightweight material, properly vented, around the muffler should provide this safety feature.
3. Change the exhaust so that it will be directed away from log being cut or the fuels on the ground.

Power-saw operators.—Power-saw operators can do much to prevent power-saw fires as follows:

1. After filling tank, move saw before starting. Fill tank on bare ground, if practical.
2. Do not wait for the engine to run out of gasoline before filling the tank. If the engine stops while the saw is in the tree, it is usually difficult to remove as it is frequently hemmed in by wedges. If the tank is filled in place and gasoline is spilled, the combination of sawdust, gasoline, and frequently oil is a hazard which may cause a fire and loss of the saw if an engine backfire should occur when the saw is started again.

3. Use the grade of oil and the oil and gasoline mixture recommended by the manufacturer of the saw. This will minimize formation of carbon.
4. Keep engine clean of sawdust and flammable material.
5. Keep muffler or spark arrester on the saw and in good condition.
6. Keep spark plugs and connections tight.
7. Clear flammable material from in front of the exhaust discharge—such as moss on log being bucked.
8. Keep fire extinguisher or shovel at hand at all times.

Forest officers.—Forest officers can best aid the prevention effort by carrying on a positive educational program to acquaint all concerned with the fire-setting potentialities of power saws by:

1. Informal discussions in the field with power-saw operators.
2. Informal presentation of known facts to the bull bucks, woods superintendents, and managers.
3. Wide distribution to all forest personnel of the facts brought out in this and other studies.

Fire Control Notes Distribution and the 1951 Questionnaire

The revision of the mailing lists for Fire Control Notes has given us an opportunity to analyze its distribution to recipients other than U. S. Forest Service officers. The total number of names is 460, separated as follows: U. S. Department of Agriculture, 22; U. S. Department of the Interior (mostly Indian Service, Bureau of Land Management, and National Park Service), 117; other Federal agencies, 33; State agencies (mostly State and extension foresters), 85; schools and libraries, 98; organizations and private companies and individuals, 67; Canadian government units, schools, libraries, and organizations, 37; Mexico, 1. In addition to these, there are 71 names on the foreign mailing list, and the Government Printing Office supplies 450 copies to 311 addresses on a paid subscription list and 275 copies to its list of depository libraries.

Of the 544 questionnaires sent out 456 were returned. The types of article found most interesting and useful were indicated on 118 questionnaires. The selections, as some replies pointed out, were determined by official responsibilities and personal interests. More than half noted equipment development and use as of primary interest, and more than a third selected methods, techniques, and planning in fire control. Some of the other types of articles of interest dealt with weather, safety, training, prevention and presuppression activities, fire research, fire behavior, distribution and causes of fires, case histories of specific fires and their analysis, and grassland fire problems and their solution. One type of article mentioned, and its value will be recognized by everyone, was that presenting ideas which could be put to use by fire control men in the field without elaborate plans or considerable expense.

Some 97 respondents found the bibliography of fire control literature helpful enough to say so. On the other hand, 19 said no or that they didn't use it.

Several suggestions for improvement were made, such as more coverage of the problems of private companies and how they have been solved; new ideas and methods of prevention, what produces results, and why; additional articles on fire-weather relationships, replanting brush land, fire and reseeding, wildlife destruction, and controlled or prescribed burning; and more short items.

To the question on suggestions for improvement 80 made brief comment, and 39 added other remarks. Most of these, to our gratification, were very complimentary. However, to maintain Fire Control Notes at a high degree of usefulness will require the active participation of many individuals directly and indirectly concerned with fire problems.—W. P. EVERARD and E. A. HANSON, *Washington Office Division of Information and Education, U. S. Forest Service.*

FIRE EXTINGUISHERS FOR USE WITH POWER SAWS

A. B. EVERTS, *Equipment Engineer,*
Division of Fire Control, Region 6, U. S. Forest Service

A rather wide difference of opinion exists among field men as to the efficiency of various kinds of fire extinguishers for use with power saws. This article briefs the results of an informal study on the subject, retaining the key points of difference.

In selecting a fire extinguisher for use with power saws, one must consider the size of the extinguisher and the type of fire to be encountered. An extinguisher carried by fallers and buckers should be small, not over one quart in size. Buckers and, to a lesser extent, fallers work in flammable flash fuels. The types of fires they may encounter involve gasoline, forest fuels, or both gasoline and forest fuels. Only one type of fire extinguisher will effectively handle all three of these fires—a foam extinguisher. The smallest foam extinguisher is the 2½-gallon size, obviously too large to be considered.

In testing extinguishers, we tried to simulate actual field conditions. An old pump was used to represent the power-saw engine. The pump was placed on a layer of dry grass in one test and on shredded paper in still another test. A half pint of Diesel oil was poured over the pump and the ground fuel. Results were as follows:

Dry chemical is one of the most effective extinguishing agents on the market for gasoline and electrical fires, but it is of little value for fires in forest fuels. Dry chemical extinguishes by smothering, and, in order to get this effect, the chemical must be expelled and diffused in a cloud under high pressure, usually by CO_2 or nitrogen gas. Sprinkling the chemical on the fire will not do the job, and the pressurized extinguisher is too heavy to be considered.

Carbon tetrachloride, one quart (hereafter referred to as CTC). CTC is a vaporizing liquid. The speed of vaporizing is in relation to the heat of the fire. CTC is designed for use on gasoline and electrical fires and, like dry chemical, is of little value on surface fires of any depth. In the tests it was possible to get the fire out on the pump by walking around it, all the while working the CTC extinguisher. The fire in the grass and paper was not extinguished; it was checked for a moment and then took off again.

Small chloro-bromo-methane (or CBM) extinguisher. There are at least two makes of this new type extinguisher on the market. They are small, about the size of a two-cell flashlight, and contain not less than 8 ounces of CBM by weight. In tests, this extinguisher did a fair job on gasoline fires but not comparable to the one-quart CTC, principally because of the small amount of fluid. It was ineffective on the surface fuel. In a power-saw fire, where gasoline is involved, fire is apt to be on all sides of the engine. The fire on one side can be extinguished, but as you move to the other side, the fire flashes back again—and somewhere in this process you run out of fluid.

The CTC used in the small CBM extinguisher seemed just as effective as CBM. There is a point of interest here—the manufacturers of vaporizing-liquid extinguishers (with two exceptions) have desired reach or projection in their extinguishers. They have, therefore, concentrated on a straight

stream. In the small CBM extinguishers the discharge pattern is a spray. This pattern, while limiting the reach, would seem to bring about quicker vaporizing, which may account for the seemingly superior effectiveness of CBM over CTC. However, as stated, this superiority was not noticeable to the writer when CTC was used in the same extinguisher.

In another test ordinary water used in the small CBM extinguisher did a better job of extinguishing the surface fire than either CTC or CBM.

Advantages of the small CBM extinguisher are: Initial cost is cheap; they can be refilled in company shop or on the ground (one type only—other type is traded in for a full one); they are effective as a "first aid" extinguisher on a *small* gasoline fire.

The disadvantages are: They do not have enough fluid to handle any but a *small* gasoline fire. They are of very limited value on a fire involving forest fuels. Being CO_2 pressured, they cannot be used in a position much above the horizontal, because the gas will escape while the fluid remains in the bottle. Unless a cap is carried over the valve or the carrying bracket is used, it is possible for the valve to be slightly "cracked" and the extinguisher lose its pressure without this fact being known.

Since neither the CTC nor the CBM extinguisher is very effective on forest fuels, and since a rather high percentage of fires start in this material, a shovel might well provide the best protection. A shovel can be used to throw dirt to smother a gasoline fire and to dig a line to control a ground fire. It can also be used to clear flammable material from in front of the engine exhaust, and at times to prepare better footing for saw operators.

On one west-side operation visited last summer, the writer was told by the fallers that the first job, when moving into a new stand of timber, was to buck out the windfalls. When this was being done, the fallers carried a shovel to dig out under the log so as to protect the saw. If the fallers can carry a shovel to aid them in their work, it would seem logical that they could carry one for fire protection. The buckers, working alone, would have a more legitimate "beef" against carrying a shovel.

Some forest officers in the field stated the small CBM extinguishers were effective for putting out power-saw fires; others, that they were of little value. This is understandable since the effectiveness of the extinguisher would vary with the intensity of the fire and the type of fuel in which it was burning.

One report stated, ". . . had about five power-saw fires, all small. All were extinguished with the . . . (small CBM) extinguisher. The largest of these required about four extinguishers to put the fire out." Four extinguishers will not usually be available to work on one fire. Several others felt that "there is not sufficient volume in the container to put out a fire of any size." Still others suggested the shovel in place of an extinguisher.

The choice, then, would seem to be among the following: Small CBM extinguisher, with CBM or CTC fluid; one-quart CTC extinguisher; shovel; shovel *and* one or the other of the extinguishers.

All things considered, the following policy is being put in effect by Region 6 until information is received that indicates the desirability of a change:

"Gasoline power saws will be equipped with a *chemical-pressurized* fire extinguisher of not less than 8 *ounces* capacity, by weight. A *shovel* may be substituted for the extinguisher when in the judgment of the district ranger it will be equally as effective in putting out fires."

CARRYING CASE FOR SF HANDI-TALKIE

FRANCIS W. WOODS

Communications Officer, Region 4, U. S. Forest Service

Boyd Leonard, Staff Fire Control Assistant, and Carl Gaver, Assistant Ranger of the Salmon National Forest, have developed a very satisfactory case for the protection and transportation of the SF handi-talkie. Considering the initial cost, difficulty of repair, and awkwardness of carrying the handi-talkie, these men have devised this case along practical lines. The case adequately protects the handi-talkie, yet the radio can be carried easily and used without removing it from the case (fig. 1).

The case is constructed of very pliable leather (the first ones in R-4 were of elk and deer skins) and is lined with ¼-inch sponge rubber glued in place. The zipper permits the instrument to be readily put in or taken out of the case. The pocket on the back of the case provides space for one extra set of batteries. Back-pack straps permit the unit to be carried on a person's back in hiking or in rough climbing. The case itself, with an extra set of batteries, weighs 3 pounds 12 ounces.

The men using the unit appreciate the convenience and real time sav-

FIGURE 1.—Carrying case for handi-talkie is constructed of pliable leather lined with rubber and has back-pack straps for carrying. Radio can be used without removing it from case.

ing of not having to take the instrument from the case and find no difficulty in operating the transmitter. This is the way the unit is usually handled. Such a procedure is also a safeguard against laying the case down and losing it as so often happens when units must be removed from a case to be operated.

The first cases were constructed at a cost of $17.50 each. They have given excellent protection on the fire line and in storage and have proved adequate for shipping when properly tagged. During 1951 the cases with units inside have been accepted for commercial express and air shipment.

TESTING OUTFIT FOR UNLINED LINEN HOSE

L. E. Noel

Procurement Officer, Region 1, U. S. Forest Service

A unit for testing 1½-inch unlined linen fire hose returned from the field to the central fire cache has been developed at the Forest Service Warehouse in Spokane, Wash. This unit has been in operation now for over 2 years and has proved very satisfactory as well as saving a substantial amount of money. Prior to 1948, the testing of hose was contracted to commercial firms on the basis of low bid. The lowest bid received in 1948 was $2.65 per hundred feet. Net cost with the Forest Service unit has been $0.81 per hundred feet, and covers cleaning, testing, rerolling, and placing in storage. Total cost of the hose testing unit was $282 plus some salvage material.

The equipment and material necessary to set up the testing unit are as follows:

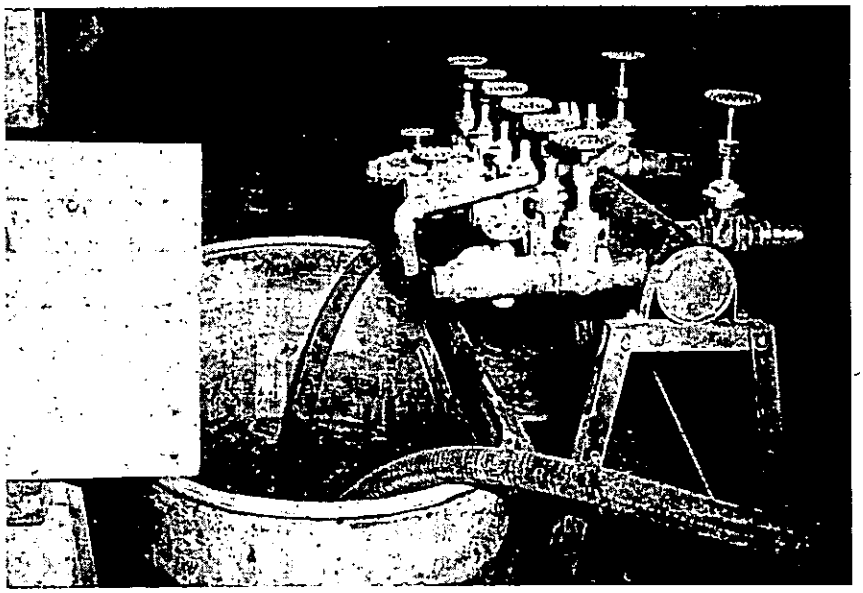
1 Water pump (same as used on Pacific Marine Type Y pumper).
1 Motor, electric, 3 hp., 1750 r.p.m.
1 Pressure manifold (4-inch pipe 48 inches long with plates welded over ends, and angle-iron legs approximately 32 inches high; eight 1½-inch pipe nipples welded to the pressure chamber, six on one side, approximately 8 inches apart, and two on the opposite side approximately 24 inches apart).
8 Gate valves, 1½-inch.
3 Pressure relief check valves, 1½-inch.
1 Pressure gauge (two gauges, of the same type, are preferred in order to maintain a continuous check on gauge accuracy).
1 Pressure relief valve, set to release at desired test pressure, and with ¾-inch pipe for returning overflow to water tank.
5 Table sections, each approximately 4 by 10 feet, with 4-inch sides, metal-lined, and equipped with saw-horse type legs.
1 Water tank, open top, approximately 24 by 60 inches, 24 inches deep.
3 Pieces suction hose, 1½-inch, each 8 feet long.

The one or two pressure gauges and the pressure relief valve, set to release at the desired test pressure, are mounted on the top of the test manifold, and the gate valves and pressure relief check valves are attached as shown in figure 1.

To set up unit for operation, line up table sections to form a drain trough approximately 4 feet wide by 50 feet long, with gradual slope toward water tank, which is at the lower end of the table in a position that will allow all water to return to it. Place the pressure chamber on the opposite side with the six gate valves extending over the tank far enough to allow them to drain into the tank. The end of the suction hose from the pump intake is placed in the water tank to supply the water used in testing the hose.

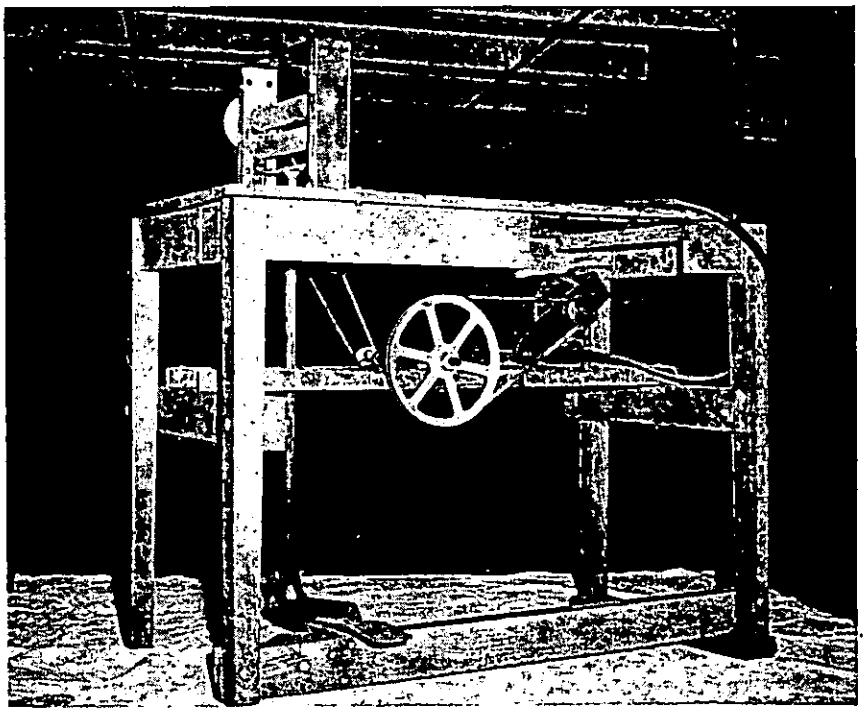
One section of suction hose supplies water from the pump through a gate valve to the pressure manifold. On the same side, the other gate valve with suction hose attached is used to return the water to the tank when actual testing is not in progress. This valve serves as a bypass and eliminates shutting off the motor while changing hose.

After the hose has been tested, it is drawn through a power wringer (fig. 2) located at the upper end of the testing table, and rolled on a reel located approximately 4 feet beyond the power wringer. Any reel of



F-464057

FIGURE 1.—Pressure manifold of hose testing unit and its relation to water tank and table sections.



F-464055

FIGURE 2.—Power wringer which is part of hose testing outfit.

simple construction will suffice for rolling the hose. A very satisfactory type of reel was shown on page 31 of the October 1949 issue of Fire Control Notes. The hose can then be dried, bundled, and stored. It is not necessary to dry hose that has been properly treated to prevent mildew. Hose that has failed under test or has otherwise been found unsatisfactory is, of course, set aside for disposal.

Forest Service Continues Study of Power-Saw Fires

Early in 1950 the Forest Service initiated, in cooperation with State and private foresters, a study of forest fires caused by the operation of power saws. The initial phase of the study involves the compilation and analysis of information obtained from special reports on individual power-saw fires. Results of a preliminary analysis of information submitted for 1945-49 show Region 5 leading all others in number of fires as follows:

	Number of power-saw fires		
Region:	*National forests*	*State protection area*	*Total*
5	18	18	36
7	1	10	11
6	9	..	9
8	3	2	5
9	..	2	2
3	2	..	2
Total	33	32	65

Although there could be some difference in interpretation of causes, in general they line up as follows:

	Number of power-saw fires		
Causes:	*National forests*	*State protection area*	*Total*
Exhaust flame and backfire	16	7	23
Unknown	6	12	18
Spilled or leaked gasoline	7	5	12
Sawdust or forest fuel against hot muffler	3	3	6
Spark from saw chain	..	5	5
Short circuit on electric saw	1	..	1

The data were insufficient to give the number of fires by make and model of power saws.

The distribution of fires makes it obvious that the power-saw fire problem is Nation-wide. We are unable to estimate the number of power-saw fires that were unreported, but figures for 1950 and 1951 now being collected should be more complete. With full reporting on a Nation-wide basis we hope to be able to pinpoint the fire causing characteristics of power-saw designs, operating techniques, and other factors included in this problem.—Division of Fire Control, *Washington Office, U. S. Forest Service.*

FIRE CONTROL AND COOPERATION ON THE PEDLAR RANGER DISTRICT

B. A. EGER

District Ranger, George Washington National Forest

Although this article is confined to the Pedlar Ranger District the cooperation covered is similar to that which exists on all districts of the George Washington National Forest in Virginia.

For more than a decade a cooperative wildlife agreement has existed between the U. S. Forest Service and the Virginia Commission of Game and Inland Fisheries for the mutual management of game and fish activities on the Virginia National Forests. Mostly it has to do with environmental development and improvement for game cover, food, and protection. The work is paid for out of State funds obtained from the dollar stamp required by the State to hunt or fish on national-forest land, matched with Pittman-Robertson Federal funds prescribed by law. The work is planned and carried on by wildlife game managers and their laborers under the joint supervision of Virginia State game technicians and the national-forest district rangers, plus guidance from the Game Commission's staff and the forest supervisor's staff.

These wildlife project crews average a game manager and two laborers. Each ranger district has two or more of these crews. In addition, the State has a county game warden in each county and he in turn may have one or more deputies. To supplement the work of these men there are a number of State "roving" game and fish law enforcement officers.

Since there are three or four counties within the Pedlar Ranger District the Pittman-Robertson workers plus the State game law enforcement men make a sizeable and important part of the ranger's fire control organization. Most of the county game wardens are also appointed State forest fire wardens. Nearly all of them now have FM radios in their cars that hook up with their county sheriff's office and his police officers' cars. The sheriff's office ties into the Virginia State Police network by radio or teletype. The ranger's wildlife crews carry portable radios that can communicate with the national-forest fire towers and so in to the fire control dispatcher at the ranger's office.

All of this by prearranged cooperation and planning gives an efficient network of men over the ranger district for the dissemination of prevention education; enforcement of the State brush burning and forest fire laws; detecting, reporting, and investigating smokes; and in the case of larger fires and emergencies, taking part in the suppression and augmenting the communication system on and around the fire. The wildlife project crews carry a complement of fire suppression equipment and tools and have a definite part and responsibility in the ranger's fire control organization. All of these men are important in carrying fire prevention to hunters and fishermen when they are afield during the open season, which is usually at the time of high fire hazard.

Another cordial and cooperative situation also exists between the Virginia State Forest Service and the U. S. Forest Service. The areas of State and Federal responsibility in and around the ranger district are definitely agreed upon and shown on maps. However, the officers of both agencies work hand in hand in detecting, reporting and suppressing fires. The nearest and most available organized wardens and crews are dispatched to a fire and both agencies cooperate in suppression. If a fire is confined to the State area the State pays for suppression and makes its own report on the fire. If the fire is on the national-forest protective area or goes from State area to national forest, the George Washington pays for the suppression and makes the 929 report.

Most of the State county fire wardens have a pickup with pump, hose, and suppression tools. They also have radios that tie in with the sheriffs' offices and with each other. When necessary all of these facilities are pooled with the national-forest facilities for prevention, law enforcement, detection, and suppression. Many of the Virginia counties now have a county fire truck of the city type authorized and purchased by the County Board of Supervisors. While these fire trucks are primarily for burning buildings they go on call to all grass and woods fires that can be reached and they frequently suppress fires in their incipient stages. Some of these trucks are equipped with radio.

For its own organization the Pedlar District has a widespread system of national-forest wardens, about 30 crews with a mobilizing potential of 250 men. School boys in nearby high schools are organized and trained jointly by State and Federal forest officers. The colleges and military institutions adjacent to the district cooperate by furnishing manpower that is organized and trained by the district ranger. These forces are available to the State district foresters if needed. The fire departments of the towns and cities adjacent to the ranger district have organized and trained forest fire suppression crews and have frequently suppressed or assisted in suppressing fires in the fields and woods near their municipal boundaries.

Thus, the State Game and Fish Commission, the Virginia Forest Service, County Supervisors, State educational institutions, municipal agencies, and local citizens together with the U. S. Forest Service cooperate to organize and equip a fire control force to protect all woodlands and forests within their respective spheres of activity. As a result, the yearly average of fires is going down and the average area per fire is decreasing. Besides, such a coverage of equipment and men in the field has a salutary effect on potential risks. The National forest fire prevention campaign with State cooperation, press releases, and radio broadcasts has helped considerably in making the public more fire prevention conscious.

"PROTECTION TYPE" BASE MAP AND VISIBLE CARD DISPATCHING SYSTEM FOR FAST FIRE ACTION

RIVERS R. ELLIOTT

Assistant Supervisor, Area 8, Minnesota Forest Service

Since the beginning of forest fire control work the need for taking fast action has been prominently recognized. Swift action, as effective as possible with the equipment and personnel available, goes a long way toward favorable control action as a whole. Having the proper suppression force at the right location is equally important. The cooperative fire control and dispatching system here described and now in use in this area has been developed with these factors in mind.

The cooperative fire control organization is planned and projected by township subdivisions within the area and the various ranger districts. Township fire wardens, appointed jointly by the townships and the Division of Forestry, make up a majority of the cooperative personnel and, as a rule, are the keymen in getting direct cooperative fire action under way.

Keymen, other than township fire wardens, are appointed as special fire wardens in locations where cooperative personnel are desirable but not available through normal channels. Special fire wardens are quite often small-town businessmen or employees of industries, railroads, construction or logging companies. In all, 160 cooperating individuals are located in this forest protection area of 85 townships totaling 1,958,400 acres.

It is apparent that such an organization must necessarily be made up, for the most part, of untrained and semitrained people living in the territory to be served, and that certain understandable weaknesses may develop from time to time. In the operation of this dispatching system these probable weaknesses have been carefully considered and it is thought that selecting and dispatching alternate personnel will overcome certain obvious deficiencies such as current unavailability and emergency activities other than fire work.

The fire control and dispatching plan now in use in this area requires two basic units: the base map and the dispatching panel or board (fig. 1).

The base map is the standard ½-inch-per-mile type showing in considerable detail the roads, trails, and physical features of the area as well as the tower triangulation system. The headquarters map includes the entire territory under area fire control administration as well as boundary townships surrounding the area. Ranger district maps cover district units and boundary townships in adjoining districts and areas.

In addition to the standard map features listed this base map carries much of the special information upon which this fire control system functions. On it are shown the locations of the various cooperators. On it are also shown the three fire protection types now being used. These are symbolized on the map by the colors red, yellow, and white. Each color represents a distinct class of fire protection territory determined after combining and weighing all factors entering into the calculation of control probabilities for that particular type. These protection types have been determined by a detailed field survey and study covering the entire protection area.

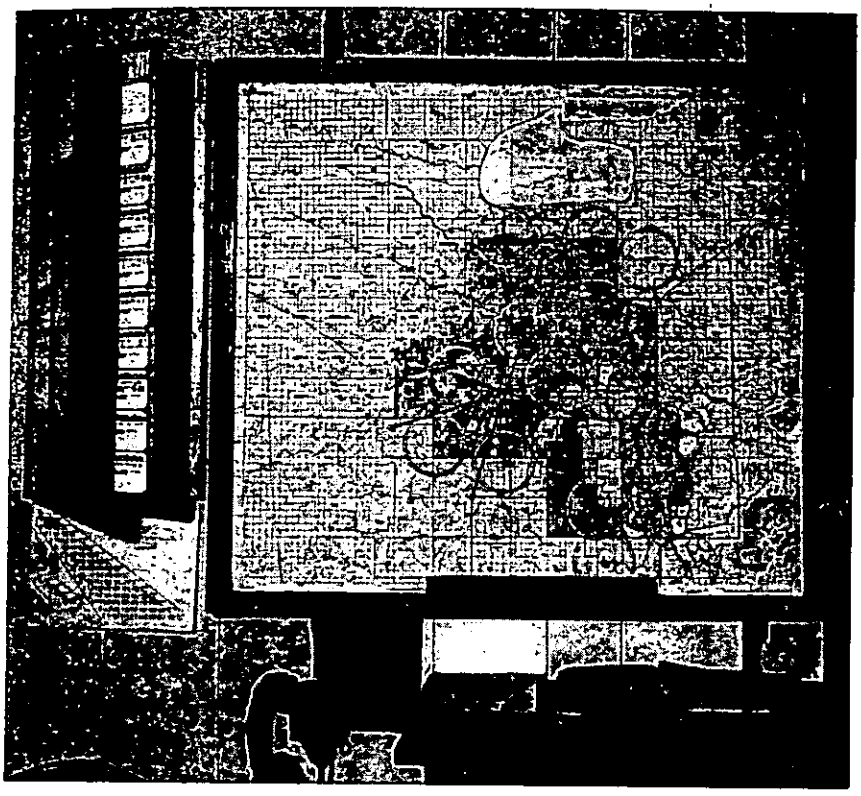


FIGURE 1.—The complete base map and dispatching arrangement. All items are within easy reach.

Red indicates the areas where little or no settlement is present. The lands in this type are largely undeveloped, with few, if any, roads and little or no communication systems. The intermediate protection type is shown in yellow and includes areas of partially developed lands with scattered settlement and with some roads and limited communications. The white color indicates well developed agricultural lands with farm woodlots, good roads, and well established communication systems.

One of the fundamental values of the plan is its use as a guide in effective cooperative dispatching and control work in all three types.

The red type requires that immediate action be taken by a fully equipped suppression force of sufficient size to carry out complete anticipated control on the fire. The location of the fire in this type at once informs the dispatcher that no additional information will be forthcoming from the immediate vicinity of the fire prior to the arrival of the crew. Consequently, planning for complete control must be done at the outset. Dispatching procedure in this type is always direct and forceful. Cooperating personnel within an effective radius of the fire generally are used to supplement forestry overhead on the fire line.

The yellow type demands no less swift action than the red but the initial action may take a somewhat different course. Knowledge of the fire loca-

tion, terrain, and fuel types, together with known location and availability of local cooperators, sources of manpower and equipment, prevailing and anticipated weather conditions, as well as information obtained by telephone or relay, may convince the dispatcher that the initial attack can be successfully carried out without committing any appreciable amount of forest service equipment or overhead. Frequent progress reports from the fire line will keep him sufficiently informed to make any necessary alterations.

For the white type a different fire control action may be found desirable. However, the action is just as swift as in either of the two other categories. Action is begun immediately after receiving the report of a fire in this protection type. The extensive communication network in this type permits the dispatcher to check the exact location of the fire, determine its size, find out who, if anyone, is in attendance, the probability of the fire becoming uncontrollable, the location of the necessary labor and equipment supply, and the probable danger to farm, forest, or other property. The cooperator with whom the dispatcher first talks, usually being a resident of the community, will have sufficiently accurate information concerning the fire's probability as to enable the dispatcher and the cooperator to immediately make a control plan that will be effective with a minimum time lapse and with minimum commitment of regular personnel.

Forestry personnel and equipment are, of course, dispatched at once in all cases where there is any doubt regarding the possible effectiveness of the cooperative organization.

On the base map flat-headed pins bearing an index number show the location of cooperative fire wardens and keymen. Each number corresponds with one on the dispatching panel where the index is arranged by townships in each ranger district. A number is left blank in each township for any possible addition to the cooperative personnel. In so doing it is possible to keep the numbers consecutive for each township and district.

Map numbers do not change except as to location within the township. When a cooperator is dropped from the roster and another appointed, the latest appointee is assigned the number vacated. The numbered pin is then moved to the proper location. If a new appointment is not made the pin is removed from the map.

The area dispatching board is made up of a series of swinging panels, 13 by 34 inches and hinged as a unit to a common wall base. Each panel contains the complete fire dispatching plan for one ranger district and each district unit is essentially complete in itself. Fire dispatching data for the headquarters district are shown on the first panel.

Together the panels comprise the complete area cooperative fire dispatching plan. Under this panel unit system the fire dispatching plan of any ranger district is immediately available to the headquarters staff for use in district dispatching or for reference to cooperative action that may be taken.

Each ranger district panel contains two rows of standard 3- by 5-inch cards showing the location of personnel and equipment (fig. 2). Gummed card holder corners keep them in position. Allowing one card for each township the panel provides for information covering twenty townships. These cards are arranged by columns beginning in the upper left-hand corner with the southeast township of each district. However, any arrange-

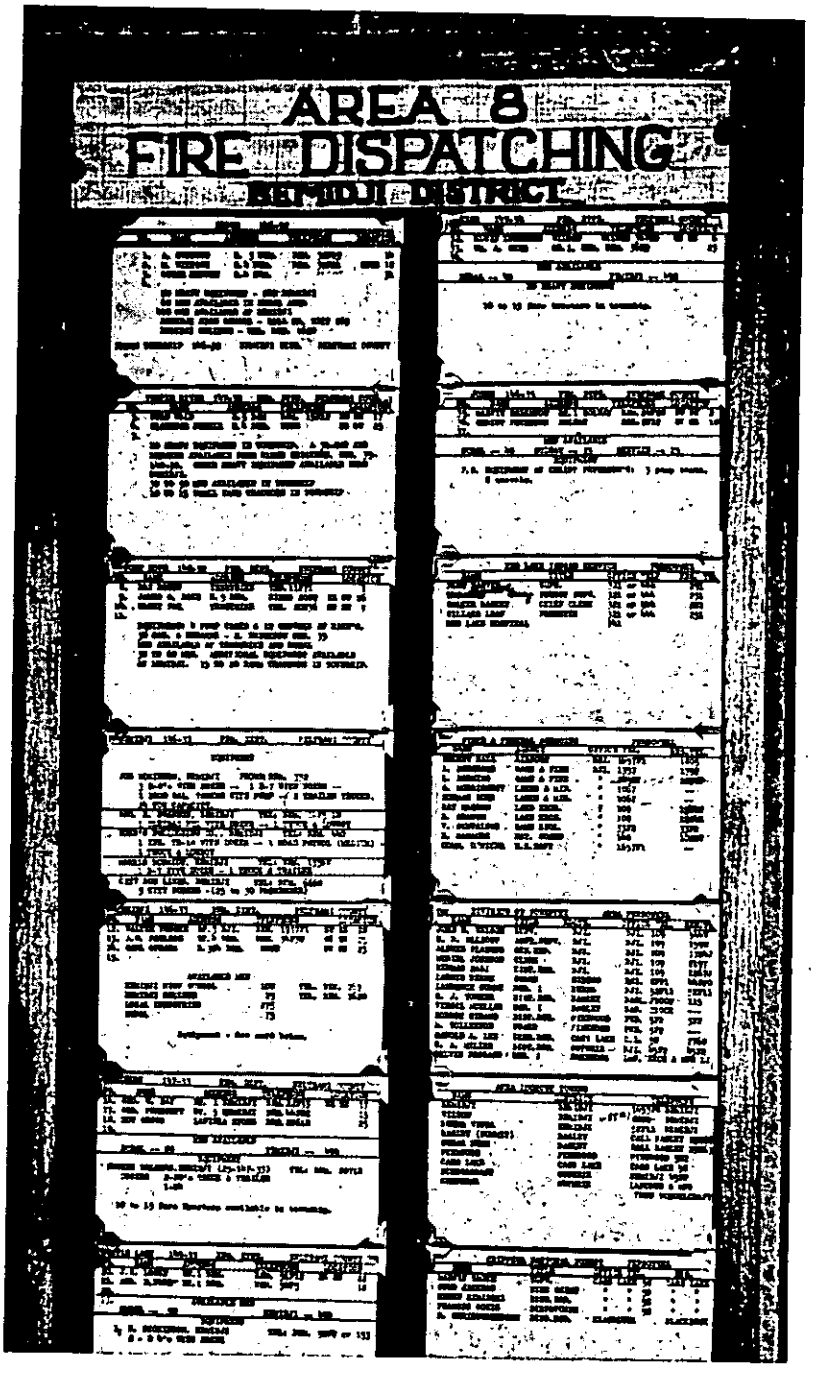


FIGURE 2.—A close-up of part of the first panel of the dispatching board showing arrangement of 3- by 5-inch cards in township sequence.

ment favored by the administrative control unit would work out satisfactorily.

Each card is designated at the top by the township name, township number, ranger district, and county. Cooperative personnel for the township are listed and each cooperator is assigned a number. The map pin with a corresponding number shows the correct location of the individual on the base map.

Each individual card entry shows name, address, telephone number, location of the cooperator and, if desired, the efficiency rating of the individual. Sources of fire fighting labor are shown directly below the personnel entries. Entries covering fire fighting manpower include city, county, and village sources as well as rural communities.

Equipment entries show location, size, and type of heavy and special equipment that may be obtainable for use on fires in the township or unit. A supplemental card showing heavy equipment location for the entire ranger district may be added if desirable.

It has been found that from ten to fifteen entries may be made on a standard 3- by 5-inch card without sacrificing either necessary information or completeness. In most cases a single card may easily carry all desired information pertaining to a township. However, the flexibility of the card arrangement permits additional cards to be inserted with no inconvenience and no interruption of township or unit sequence.

In townships having little or no personnel or equipment the card indicates that prevailing condition and refers the dispatcher to the first alternate location where desired equipment and manpower may be obtained. Special information may be indicated by special pins on the map and special numbers and entries on the dispatching panel.

In operation the complete system provides all basic fire dispatching information, literally at a glance. The entire ranger district fire control organization is spread out in front of the dispatcher, indexed and cataloged. The protection types are clearly indicated, the location of cooperative personnel is accurately shown, and equipment information is readily available. The immediate availability of these items of information, either singly or in combination, contribute greatly toward reaching the desired objective of speed and effectiveness in fire control.

Dispatching procedure, while triangulation reports are being received, is to determine, from the map, the protection type in which the fire is situated and the location of the nearest available cooperator. Reference to the dispatching panel at once gives the name and telephone number of the cooperator, the source of manpower and equipment, and any special information pertinent to the fire location. With this information at hand dispatching proceeds with a minimum of lost motion.

This dispatching and fire control plan has been gradually developed since 1942 when the first protection type base map was put into use by District Ranger C. A. Miller in the Schoolcraft District of this area. At that time it was used primarily as an aid in directing smokechasers and fire foremen in fire suppression work and as a guide for these temporary men in reaching logical conclusions on fire control work in the absence of supervisory forest service personnel.

Use of the complete plan for several seasons has brought about increased efficiency in cooperative fire action, which is, of course, reflected

in the over-all area control work. The plan is primarily a first-action one, but one that merges smoothly and effectively into the larger scale planning necessary on fires that do reach major proportions. Consequently, there is little of a spectacular nature in this dispatching method. It does, however, add considerably to the stability of the area personnel resource and tends to eliminate some of the uncertainties of this type of fire control planning.

Experience has proved that this type of planning and dispatching does, in many instances, reduce that vital time period between discovery and first attack, and at the same time permits the application of all area control power with a maximum of efficiency.

Corrosion in Carbon Tetrachloride Type Fire Extinguisher

A large agency of the Federal Government has recently had trouble with corrosion in carbon tetrachloride type fire extinguishers. This is the one-quart type of extinguisher most commonly known as "Pyrene," although there are several brands of the same type of extinguisher.

Laboratory tests were made of the fluid which the agency was using. A thorough inspection was also made of an extinguisher which had corroded badly. The laboratory reported that the fluid was in accordance with Federal specifications and was as satisfactory as carbon tetrachloride can be for extinguisher use. There are, however, two types of carbon tetrachloride under Federal specifications: Type I, regular uncolored; and Type II, colored. The coloring agent in Type II becomes gummy over a period of time and clogs the mechanism of the extinguisher and accelerates corrosion. The only reason offered for coloring the fluid is to avoid unauthorized use by employees in cleaning clothes, etc. The colored fluid will leave a ring or spot on fabric. As extinguishers are often used in homes, offices, and automobiles where cloth upholstery could be spoiled by using Type II colored fluid, Federal Supply Service will now stock only the Type I uncolored carbon tetrachloride.

Tests of this type of fire extinguisher and the fluid used in charging it reveal that with all the precautions it is possible to take, a good deal of corrosive action still occurs. The main points are summarized as follows:

1. Carbon tetrachloride is a powerful hygroscopic—it absorbs and concentrates moisture from the air.
2. Upon absorption of moisture, the formation of hydrochloric acid, a strong corrosive, begins in the liquid.
3. If this occurs in a can of fluid, the can will usually show evidence, and fluid should not be used from such rusty or corroded cans. If the action occurs in an extinguisher, it will gradually corrode to an unusable condition.

To avoid these troublesome and expensive failures, observe the following:

1. See that fluid containers are in good condition, not rusty or corroded. This usually indicates that contents are good.
2. Never use a part of the fluid from a can and reclose the can. There will be enough moisture in the air space to cause trouble. If you try to save part of a container, you will be pouring some acid into your extinguisher when you use the fluid at a later date.
3. Likewise, never leave an extinguisher partially empty. The air space is just as troublesome as it is in a can. Always refill the extinguisher at once, or empty completely and shake out any remaining drops of the fluid.—[From a U. S. General Services Administration memorandum] Region 4, *U. S. Forest Service.*

FIRE DISPATCHER'S MAP BOARD

ROBERT S. DIMMICK
District Ranger, Shawnee National Forest

The prototype of the dispatcher's map board described here was first put into use on the Jonesboro District of the Shawnee National Forest about 1937. It was recently modified to include features not found in the earlier model which contained only the map with azimuth circles and magnet-secured strings.

The map board measures 4 by 6 feet and consists of a wood frame faced with ½-inch plywood the front of which is covered with 22-gage galvanized iron (fig. 1). Upon this are mounted matched U.S.G.S. maps of the district. At each tower location a 3/16-inch hole is drilled through the

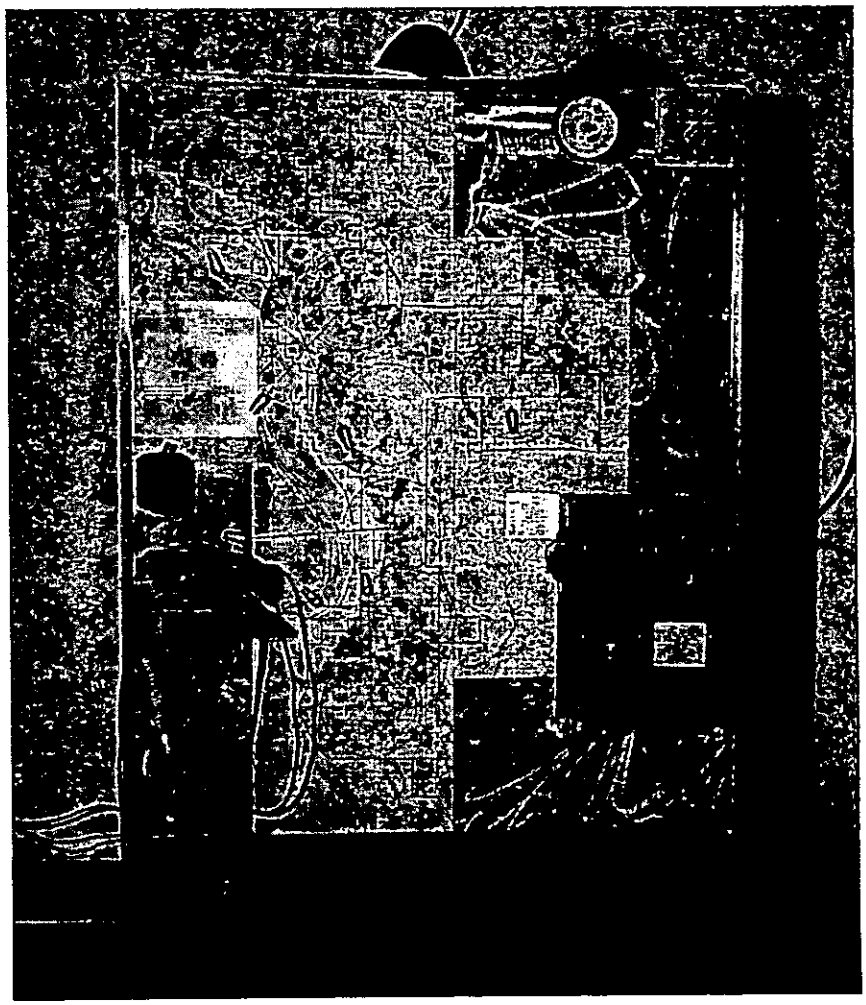


FIGURE 1.—Dispatcher's map board.

metal and plywood, and a metal grommet consisting of an ordinary screw-type binder post is inserted and secured. Azimuth readings are extended with 12-pound test, black nylon fishline held in place by small horseshoe magnets. The lines are retracted by metal weights. The weights should be less than the pull of the magnets, otherwise the magnets will not hold fast.

The map is attached to the metal surface with transfer varnish. Transparent 8-inch, "visitype" full-circle protractors are permanently affixed to the map at each tower location. The entire map surface is given two coats of varnish.

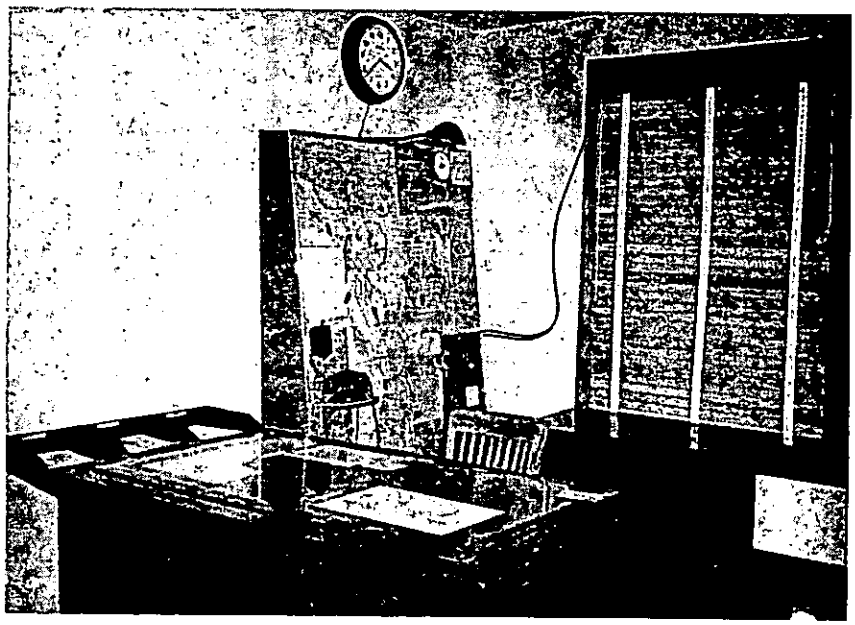


FIGURE 2.—Arrangement of dispatcher's work desk, map board, and accessory desk.

Various tools for dispatching have been installed in the map panel to provide both convenience and compactness. The anemometer buzzer, battery, and switch are located on the lower right side of the frame. Just above these and inserted in the panel is the radio. On the left and at the same height as the radio is the telephone, above which is a two-way key-type switch and a communication directory. The panel is lighted by a flexible-neck student lamp, with original base removed, mounted on the top of the frame. To the right of the lamp is a barometer.

The map board is located to the right of the clerk-dispatcher's work desk so that a 90-degree turn places the dispatcher in a convenient position from which to operate (fig. 2). Another 90-degree turn in the same direction places the dispatcher at a smaller desk upon which is kept the log and dispatching forms.

The arrangement has proved satisfactory at a station where the volume of fire dispatching is not great enough to justify a separate office. The panel not only provides convenience of operation to the clerk but also arouses considerable interest from the visiting public.

A PORTABLE VHF-FM RELAY ASSEMBLY FOR USE ON LARGE PROJECT FIRES

FRANCIS W. WOODS
Communications Officer, Region 4, U. S. Forest Service

Since the war, development of low-drain, dry-battery-powered, FM-VHF radio repeaters and their use in successfully extending the range of handi-talkie type field sets have exposed the need for a portable field repeater for use on large project fires. Several Forest Service regions have worked up satisfactory units. Mr. Woods' solution, as described below, employs a standard lookout repeater radio and battery combination that is commercially available and has proved quite satisfactory. In the near future we hope to have the Radio Laboratory study the portable repeater units of the various regions and by combining the best features of all come up with a suggested Forest Service standard for this type of service.—Washington Office, U. S. Forest Service.

For some time a need has been felt for a VHF-FM relay for large project fires to permit fire line communication reaching base camps or other points that are beyond point-to-point range.

The unit should have the following characteristics: (1) Be readily transportable by pack horse or car; (2) batteries arranged for polarized plugs; (3) control unit and repeater completely assembled; (4) antennas arranged for foolproof assembly and on masts which would permit installations in the same relative position to each other as to the relay and ground; (5) be pre-tuned and to stay in tune; (6) be readily assembled and put on the air by an inexperienced person.

A unit that meets these requirements was put together here last spring. A TF relay with its control unit was assembled in a wooden box 11½ by 28½ by 39 inches; the combined weight was 126 pounds (fig. 1). The

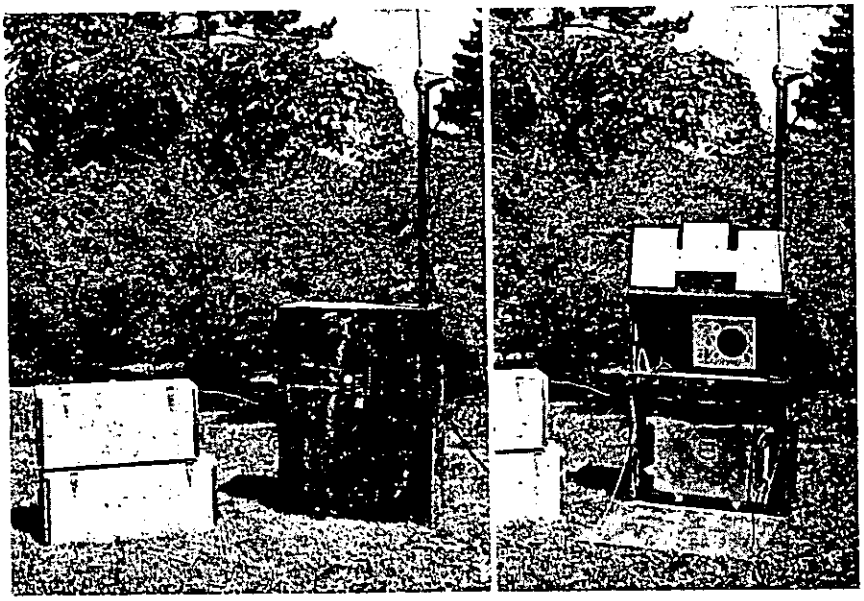


FIGURE 1.—Portable TF relay showing one antenna mast in place for operator. Battery boxes are on left.

two parts were completely wired and the control unit was arranged for easy disassembly. Wires for batteries were wired in place and brought out to two recessed polarized plugs.

The antennas were mounted in a wooden box 4½ by 9 by 72 inches, which weighed 45 pounds complete with all antenna materials (fig. 2). Standard TF battery boxes were used with the batteries assembled and the battery cable terminated in Jones plugs.

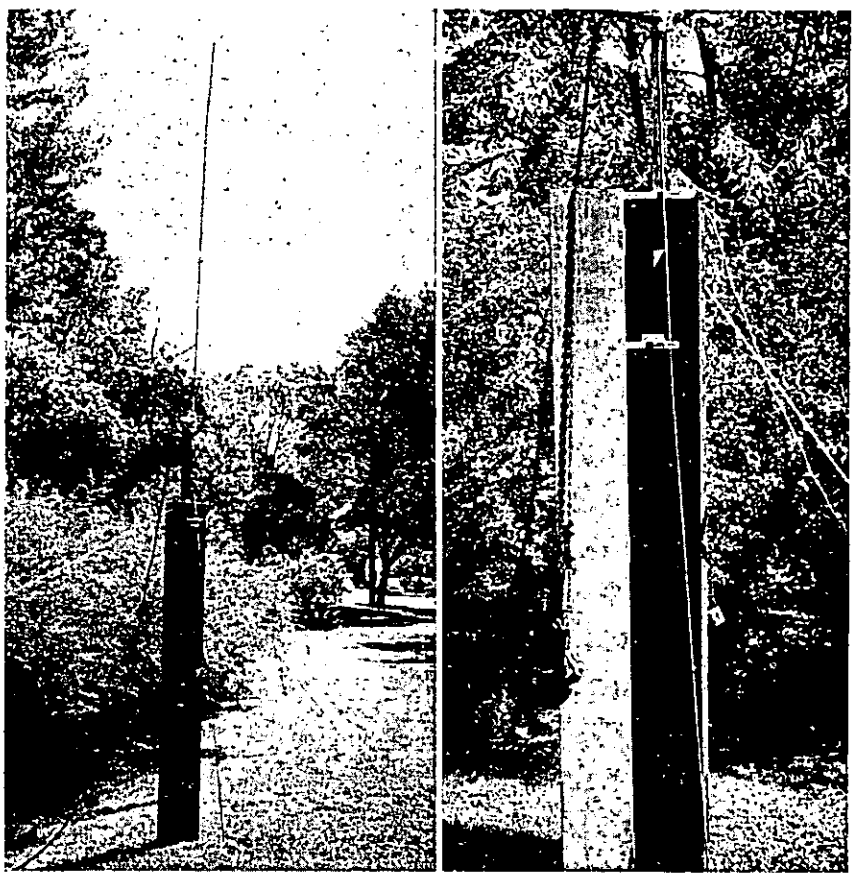


FIGURE 2.—VHF-FM antenna box used both for support for one antenna and shipping box for both antennas and guy ropes and tools.

Two antenna masts, one about 4 feet long and the other about 5½ feet long, were constructed from 2- by 2-inch stock. On one end of each mast a special antenna fitting built to our specifications was permanently mounted. One-quarter wave rods can be screwed into the fittings.

The short mast is painted green as is the relay housing. The long mast is painted orange as is the box which houses the antenna mast, rods, tools and rope for transportation. The relay housing provides a support for the green antenna mast. The antenna shipping box is the support for

the orange antenna mast. Fifty-ohm coax cable is permanently attached to both antenna fittings. One piece of this cable on the green mast is just long enough to reach to a recessed antenna fitting on the top of the relay housing. The orange mast has a 15-foot piece of RG8U for attachment to the other antenna connector on top of the relay housing. The short piece of cable will reach to only one of the antenna fittings, thereby providing a foolproof way to attach the proper antenna fitting to the proper antenna.

The whips are hollow and the tips are adjustable. Two whips are painted green and two are painted orange. Each has a lug soldered so that the tip can be inserted only up to the proper point. This provides an easy way of making sure that the antennas are the right length for the frequencies being used. The green tipped whips are screwed to the green antenna mast; The orange tips, to the orange antenna mast.

Tests indicate that the unit can be set up, tuned, taken down, and reset at another location without serious detuning. The unit illustrated was used once last season and was found to be satisfactory.

The following instructions are attached to the relay housing and have proved adequate and simple enough for use by inexperienced personnel.

INSTALLATION AND OPERATION INSTRUCTIONS FOR THE R-4 REGIONAL OFFICE VERY HIGH FREQUENCY FM AUTOMATIC RELAYS

This unit consists of four packages, the largest containing the radio relay unit itself and its control panel.

The long, slender package contains the antennas and connecting cables, and short supporting masts for the antennas.

The other two packages contain the batteries which furnish power for the unit.

All of this equipment should be handled with care and packed carefully to avoid damage.

Upon arrival at the location chosen for the installation of the radio equipment, unpack the equipment from the conveyance in which it was brought.

Set the relay cabinet on a good solid foundation.

If there is danger of the unit being knocked over or broken, support it with rocks, logs, or ropes so that it cannot be upset.

Open the antenna box. Take out all the material. Assemble the whips by colors, putting the orange tips to the orange bases, and the green tips to the green bases.

Insert the tips into the long rods as far as they will go. Tighten the rods in place with a screwdriver in the box. Don't tighten too much or you will break the head off the screw.

Assemble two orange-tipped whips to the orange-colored antenna bases. Use both wrenches, making sure the fitting attached to the antenna base *is not moved* —this is very important. Attach the two green whips to the green antenna bases.

You now have assembled two antennas, one green and one orange. Place the orange antenna box about 15 feet away from the relay box. Place it upright, making certain that the square hole in the end of the antenna box is up. Tie the antenna box so that it cannot fall down. Place the orange antenna mast with the orange whips attached through the hole in the top of the antenna box. Fit the base of the orange mast firmly in the receptacle in the box. Attach the green antenna mast to the antenna relay box in the same manner.

Attach the fittings on the end of the antenna cable to the fittings on top of the relay box. Attach the short cable to the fitting closest to the green mast. The antennas are now ready for service.

Hook the screen door catch on the antenna feeder to the eye on the green mast. Place the two battery boxes adjacent to the left end of the relay housing. Open the battery boxes and make certain that all plugs are in place, and that the connections between the dry cells are tight and unbroken.

In the event that the battery compartments contain two large, black batteries, remove the battery caps, take a pocket knife or some other sharp instrument, very *carefully* cut out the inner seal, which will be found directly below the battery caps.

It will not hurt if the seal material falls into the battery. Very carefully fill both batteries with ordinary water. Fill them right up to the top of the filler plug. Be careful not to let any water splash out of the battery. If it does, remove it immediately with a handkerchief or some other absorbent material. Replace the battery caps.

Remove the plastic seal and the red guard on the top of the batteries—*this is important.* Take the battery cords out of the battery boxes, close the box lids and insert the battery cables in the appropriate jacks on the end of the relay housing, being careful not to short the plugs.

Open both lids on the relay housing. On the top of the relay unit in the bottom compartment will be found a toggle switch (SPKR handset on). Make certain that this toggle switch is in the "up" position. Find the "on" and "off" buttons on the control units. Then depress the "on" button and hold it momentarily—release it. Turn the black knob to the Squelch Disable position. With the volume control vertical, a rushing noise should be heard from the loudspeaker indicating that the receiver is operating normally.

Place the transchannel switch to position number two. The black knob on top of the relay unit in the bottom compartment should be placed to the *final plate* position. Check this—then push the transtest button, which is adjacent to the final plate knob. The meter on the right-hand side should rise to 9, approximately, on the scale, indicating that the transmitter is operating normally. Release the transtest button. Push the toggle switch on the meter panel down to *unattended repeater.* Place the black knob on the control unit in the upper compartment to AUTOMATIC REPEAT. THIS IS EXTREMELY IMPORTANT. IF YOU FAIL TO DO THIS, THE UNIT WILL NOT RELAY PROPERLY. Close and lock the compartment doors. The unit is now ready for service.

Generator Unit as a Training Aid

Many times it is not possible to choose the best location for a fire personnel training school and still show the training movies because of the absence of power to run the projector. A small portable AC, 2-KW, 115-V generator and gasoline motor will provide power for the movie projector. A unit weighing about 175 pounds was available in 1951 for approximately $225.

This unit has many uses other than just running a movie projector—it can furnish power for a saw, tool grinder, floor sander, lights for a fire camp, etc. It will greatly reduce many construction and maintenance costs at outlying stations in addition to its uses in forest fire prevention, presuppression, and suppression work.

The most desirable type is one with the generator and motor separate. It can then be mounted on a light metal platform and the generator can quickly be detached. Thus, the motor and the generator could easily be packed on a pack animal for transportation to areas inaccessible to motor vehicle travel.—V. A. Greco, *Forester, Gila National Forest.*

Ash Trays on Saddles

On Pine River of the San Juan National Forest in Colorado, Mr. Bob Venuti, wrangler of a select dude ranch requires each rider when he goes on a pack trip to put his cigarette and cigar butts or pipe coals in a tin beer can attached to the saddle horn. The proprietor of the dude ranch saves the beer cans, which have two openings punched in the top, fills them about half full of water and then attaches them to saddle horns. Besides providing a safe container the stunt impresses riders with the need and importance of preventing fires and being careful with smoking material.

THE PINON-JUNIPER FUEL TYPE CAN REALLY BURN

DWIGHT A. HESTER

District Ranger, Grand Mesa National Forest

In the Rocky Mountain Region, we are rapidly losing any illusions that any of our fuel types are of the "asbestos" variety. Aspen used to be considered fairly fireproof until certain crown fires, gathering speed in adjacent conifer stands, rolled through without loss of momentum. The moist, high-altitude spruce type has been even more deceptive on disastrous occasions. But at the lower elevation, in the southwestern part of the region, is the familiar pinon-juniper type, and this never gave any trouble. Most of it is outside the national-forest boundaries, and it is usually grazed so heavily that all fuel is gone except the trees themselves (fig. 1). The records show that our neighbor to the south, the Mesa Verde National Park, had a big fire in such a type in the drought-ridden thirties, but that seemed to be a "one in a million" occurrence.

FIGURE 1.—Typical pinon-juniper type, showing scattered stand, sparse vegetation, and intermingled areas of bare ground.

Then, in 1950, we suddenly found out that under extreme conditions the fuel-sparse pinon-juniper type will not only burn, but will literally explode. Since this type is widespread through the Southwest, perhaps other fire control personnel could profit by our experience.

During the early part of June 1950, the weather was fair and dry in western Colorado. Land managers were not concerned since there had been normal snowfall during the winter, and the early spring had been cold, if dry. The spruce type well above the pinon-juniper still held considerable snow. By June 10 the weather had turned warm, and strong winds came up with regularity during the afternoons. Relative humidity was down to 7 percent. It was during this period that a coal mine, abandoned and burning deep underground for some 20 years, chose to explode. This explosion, according to an eyewitness, occurred at 3:10 p. m., and the fire seemed to be in the crowns at once. By 5 p. m. the fire had traveled about a mile "on the back of a strong wind" and showed no signs of abating (fig. 2).

FIGURE 2.—The fire as seen from a point 15 miles away, 2 hours after origin.

We soon learned that natural barriers, such as ridges, cliffs, and roads, were of no value in heading off this type of fire. The country was too broken and rocky for bulldozers to be used effectively. The shaggy bark of the juniper made fire brands to Satan's liking. Flaming strips of this bark, often 2 feet or more in length, were hurled ahead to wrap themselves around other trees which caught fire with a roar and gave off ropelike strips of bark to repeat the process. Distance between trees and width of natural barriers seemed to have little influence on this type of spread. In one instance, a cleared, 40-foot fire lane was crossed its entire length by the fire without detectable hesitation. Backfiring was not practicable since the only fuel was standing trees which had to be crowned out to burn, and a crowning juniper in a high wind is not to be fooled with.

Not only can the fire explode during the afternoon, it can continue this blowup well into the night.

On our fire, the expected evening wind shift did not take place until about 8 p. m. This occurred as a 90-degree change of direction (a down-mountain draft) with no appreciable change in wind velocity, and the fire really rolled downhill. The rapid rate of spread continued until 11 p. m., at which time the wind velocity fell from an estimated 20 to 30 miles per hour to a gentle breeze.

Judging from the behavior of our fire, I believe that the head of such a fire should not be attacked until the crowning stops, unless there are means available for creating extremely wide barriers. Once the fire is out of the crowns, men can work relatively close to the fire and can work in most of the burn within 2 hours. I believe the best bet is to fell a swath of burning trees at least 100 yards wide, working from the edge toward the interior of the burn. One power saw per 4-man crew seems to be the answer for this work. In this short-tree type 2 men can operate the saw with a reasonable degree of safety, and the other 2 haul away the felled debris. Mop-up usually has to be done with little or no water since much of this type is without "living" water of any kind.

One cannot count on the oak brush above the pinon-juniper type to serve as a buffer. On our fire, the oak brush, although only about one-half leafed out, burned readily and crowned out in most places. As was found in Maine in 1947, hardwoods are not immune to crowning.

Although the bulk of the trees remain standing after the fire, the heat is quite intense and leaves the ground well cooked (fig. 3). Regrowth of

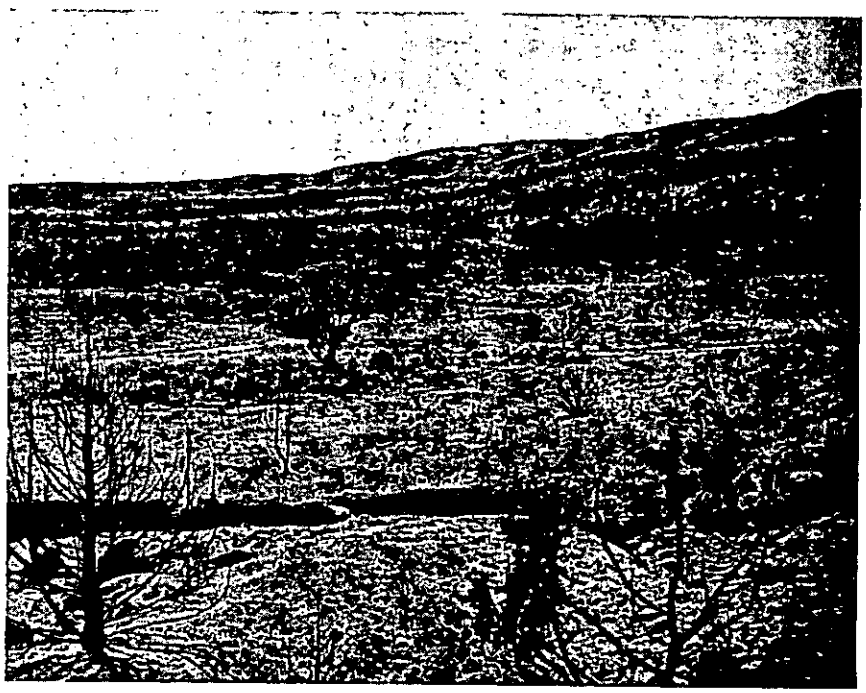


FIGURE 3.—The intensity of the fire denudes the soil to a point where watershed damage of long duration will result. Ditch and gully in foreground were cut before the area burned.

any kind is bound to be slow and erosion will be a problem. On the fire described, the wind started drifting the soil before the fire was out and continued throughout the summer. Only two rainstorms of relatively light intensity occurred during the summer, but small gullies were in evidence by fall.

While our pinon-juniper type can hardly be classified as a high fire risk, it is not fireproof. When conditions are right, it can be quite explosive, resulting in fires that are difficult to control. A burn in this type will be slow to heal and can result in a long-term watershed problem.

Sodium Bicarbonate as a Fire Extinguisher

Ed Melton, former Forest Service pumper crewman, writes us from Fort Ord, Calif., as follows:

"Enclosed with this letter is a 'trick of the trade' that we used when I worked for the F. S. in southern California. We had occasion to use this device several times on vehicle fires, and it never let us down.

"The idea was given me by a lieutenant in the Berkeley, Calif., Fire Department. He had only the highest praise for it.

"The various fire type classifications in the article are standard Underwriters' Laboratories classifications.

"If you care to publish this idea in FCN, it might prove as helpful for others as it was for us, because the fire-extinguishing qualities of common sodium bicarbonate are relatively unknown."

A lot of pumper crews would like to have carbon dioxide or dry chemical extinguishers on their rigs, but cannot do so because the cost of these units is beyond the funds available. However, there is available a good substitute which is simple and inexpensive, and which has been in use for some time: it consists of two or more 5-pound, sealed, paper sacks of ordinary bicarbonate of soda, double-bagged. Sodium bicarbonate is one of the basic ingredients of dry chemical extinguishers, and obtains its extinguishing action primarily by releasing carbon dixoide gas when it comes in contact with burning material.

This chemical is very effective against chimney fires, greasy restaurant kitchen exhaust vent fires, and any class B fire (gasoline, oil, grease). Because sodium bicarbonate is a nonconductor, it is safe to use against class C fires (power-on electrical). As this chemical extinguishes only by smothering, and with no cooling effects, it is not too effective against class A fires (wood, paper) and when using it, caution must be taken to prevent a possible flash-back.

To use the sodium bicarbonate against a chimney fire, open one sack and pour the contents down the chimney. If the fire is so intense that this does not extinguish it, then drop the other bag, still sealed, down the stack. It will burst when it hits bottom, and the draft will suck the chemical up the chimney, usually producing the desired results.

On class B fires, the extinguishing action is obtained by throwing the chemical on the burning surface, starting with the nearest edge of the fire and working back and forth away from you. A small scoop will greatly facilitate spreading.

It is necessary to keep the sacked bicarbonate in a dry place, or it will cake up. Another disadvantage is the same as with the old sand-and-scoop extinguisher: it is difficult to spread the chemical evenly and quickly, and to obtain any appreciable range by hand spreading.

Of course, this method is only a makeshift. If it's at all possible, get a CO_2 or dry chemical extinguisher. If such units cannot be had, then a couple of 5-pound sacks of bicarbonate will offer the next best solution.

To become acquainted with the way sodium bicarbonate operates, try some of it on several oil or kerosene test fires; the results might be found to be very interesting.

For any forestry pumper that operates in a section where there are summer homes, a resort area, or a large volume of motor vehicle traffic, here is an idea that might be well worth considering.

HORSE-PACK PUMP

CLEO J. ANDERSON

District Ranger, Tonto National Forest

In this dehydrated Southwestern Region many of the numerous lightning fires occur in very inaccessible areas. Most of these fires are readily controlled but mop-up is very slow because no water is available. The need for getting a small amount of water to such fires to facilitate mop-up has long been recognized.

This need has in a measure been met by using two water pack cans with ¾-inch hose bibs, 25 feet of lightweight garden hose, and the "trombone" pump from an ordinary back-pack pump (fig. 1). The garden hose

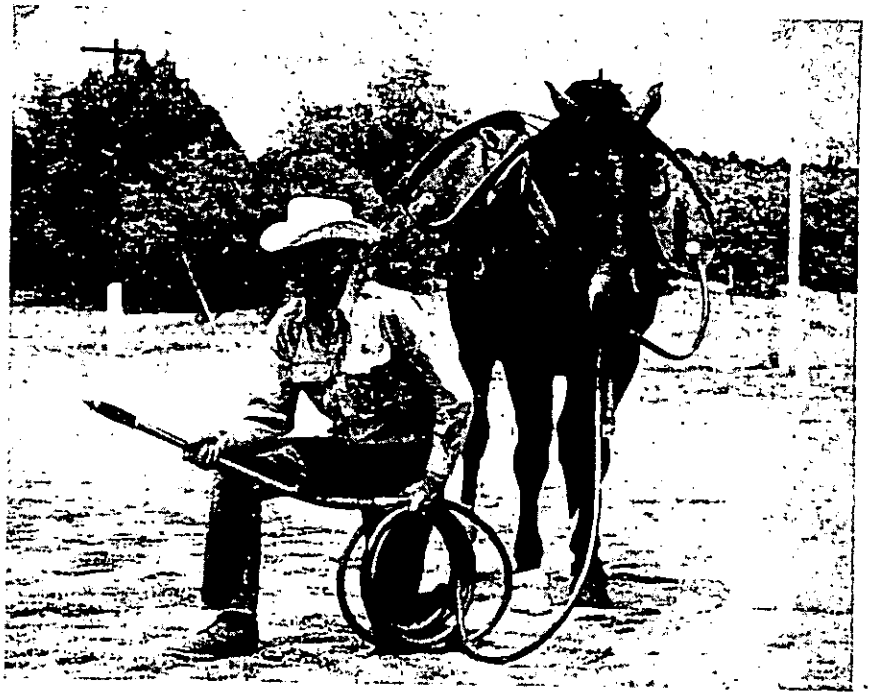


FIGURE 1.—Water pack cans in place with hose and pump ready for use.

connections make it possible to change the hose from one pack can to the other and to detach the pump so that the cans with hose can be used to supply other back-pack pumps. Thus 20 gallons of water per horse can be taken into fires in very rough country where if frugally used it will go a long way toward speeding up mop-up work. The hose is attached to the horse's halter so the pump operator can lead the horse coincident with operating the pump.

This same unit also proved invaluable as a means of packing water into back-country fire camps. This means of transporting and using water on back-country fires may be applicable elsewhere in the country.

FIRE CAMP AIDS AND SUGGESTIONS

CHARLES D. SUTTON

General Foreman, Lincoln National Forest

Under the most satisfactory conditions the average fire camp is not too convenient and equipment and facilities are limited. Over a period of years a review of camp conditions and operations after each project fire has resulted in certain improvements to facilitate fire camp operation.

Serving tables suitable for one or two mess lines were a problem as they were normally nailed together out of precut lumber when camp was set up. These tables were not very satisfactory because they were not rigid, were hard to level on uneven or rocky locations, and were impossible to keep clean. This trouble has been corrected by providing each fire camp outfit with two tables 8 feet long, 18 inches wide and 34 inches high with folding metal legs. The tops are of ¾-inch plywood with a ¾- by 2½-inch rail securely fastened with screws to the underside to prevent sagging and to make the table rigid. The legs are made of ½-inch square or round steel hinged to underside of table and are held in place by two diagonal braces of the same material hinged to center of underside of table. The cross braces between the bottom of the legs are in two pieces with a hole in the ends where they lap in the center. This permits spreading the legs at the bottom and they are held in place by a pin that also holds the diagonal brace in place. The legs are pressed into the ground to level the tables and make it more rigid.

Elevator bolts with the flat heads pulled down flush with the top of the tables are used to fasten hinges for legs and diagonal braces to the top. The tables have been given three coats of good grade red enamel and then varnished. This provides a smooth top that is easily washed with soap and water after each meal and there are no cracks to gather grease and particles of food. At the end of each fire season the table tops are sanded lightly and given another coat of varnish, and after several years of use they are practically as good as new. The legs and diagonal braces fold inside the 2½-inch rail on the underside and the two tables are placed with tops together and held by straps making a light compact bundle that is easily loaded and transported to the fire camp.

The same conditions and problems existed with the knock-down tables used in the camp kitchen by the cooks for preparing food and making lunches. Tables 4 feet square and 3 feet high were made for the kitchen, using materials and design similar to those for the serving tables. For preparing meats or slicing vegetables, two 2-foot lengths of 2- by 12-inch unpainted lumber are sent out with each cook table. These boards and the tables are easily cleaned and as the boards become rough or cut up, they are replaced.

Tables of the same general type and design were made for the time keepers and tool checkers. These tables are 4 by 2 feet and 32 inches high with two small drawers in them (fig. 1). Two light folding steel chairs are packed with each table and it is possible to seat two timekeepers at a table and check two lines at the same time. The drawers provide space for extra time slips, pencils, schedules, etc., which eliminates going to the timekeeper's or tool checker's kit for supplies while checking men in and out.

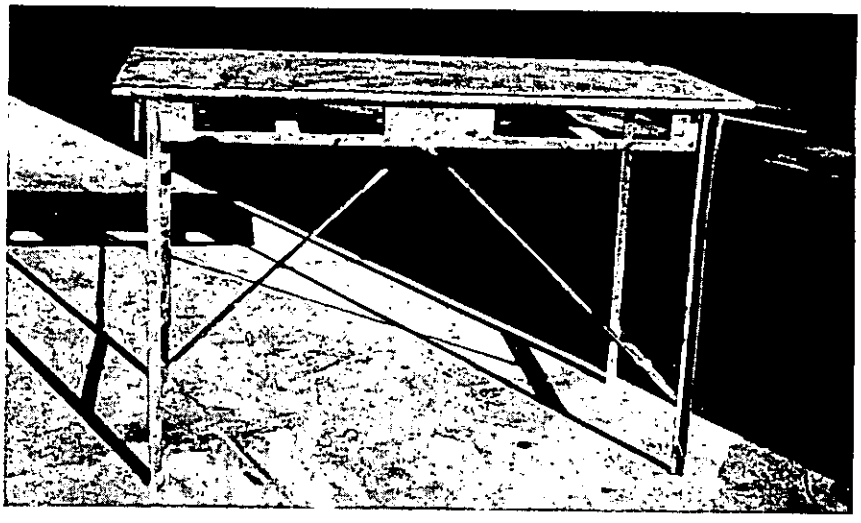


FIGURE 1.—Timekeeper table with drawers removed.

All of the tables are light, rigid, and durable and fold into a compact bundle. With normal maintenance each season they will last indefinitely.

Another problem that consumed much time and often wasted food was slicing bacon, various other cooked meats, and lunch meat and cheese. This was solved easily by purchasing a lightweight hand-operated slicing machine. It was estimated that this machine more than paid for itself on the first fire as 30 percent more sandwiches were prepared from the same number of pounds of lunch meat and cheese that was formerly sliced with a knife. It was much faster: one or two men with the machine could slice as much meat, etc., as four or five with butcher knives. With the bone removed, roasted meat and boiled or baked hams were also sliced by machine, saving much time and providing more uniform servings. The machine was also used for shredding lettuce for salad or sandwiches and cabbage for cole slaw. The slicer saved so much time and food that it is now considered indispensable in a fire camp on this Forest.

Water has always been a problem in fire camps in this dry country. It is often necessary to set up in an undesirable location because that was the only place water was available. This was corrected by using a lightweight, trailer-mounted, 250-gallon water tank. The trailer has a tee on the back end with two ¾-inch molasses stop type faucets that make it convenient for filling canteens and drawing water in vessels for the kitchen. The capacity of the tank and quantity of material necessary to properly chlorinate it is posted on the end of the tank and it is treated each time it is filled, thus providing safe drinking water.

A portable light plant mounted on a trailer has been used for several years in fire camps (fig. 2) and it was found that a few large bulbs are superior to a number of smaller ones. Two of the 100-foot cables were fitted with mogul sockets and 1000-watt bulbs. One of these lights properly suspended over the kitchen and another over the tool checking area, lights

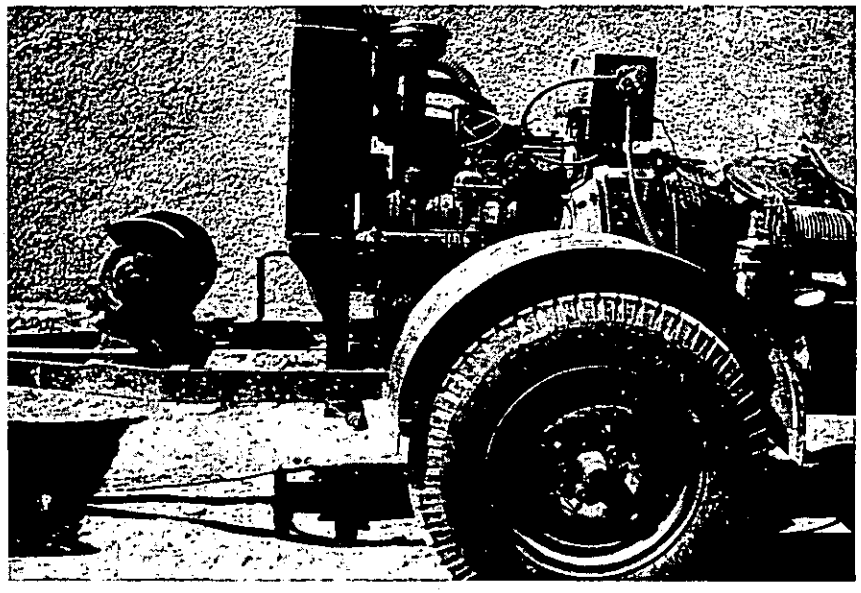


FIGURE 2.—Portable light plant.

the area much more satisfactorily than was ever done with a number of cables, extension cords, and smaller globes.

The equipment and suggestions listed above are simple and inexpensive but have proved their worth in time, labor, and food saved and have added materially to the efficiency of fire camp operations.

Smokey Bear Prevents Disastrous Forest Fire

The story of how Smokey Bear actually prevented a forest fire was told by Ranger "Dutch" Sullaway to the Mt. Shasta Herald, a northern California newspaper.

A party of campers stopped in the small mountain town of McCloud, Calif., after having abandoned their camp. Upon viewing a poster of Smokey Bear carrying a fawn out of a blazing forest fire, one camper turned to the other and said, "Are you sure we put out our campfire?" The other camper was not too sure, so together they went back to where they had been camping.

Sure enough, there were still hot coals and already the fire had crept away and was burning in thick pine duff. The campers extinguished the fire and Ranger Sullaway gave Smokey Bear credit, as did the campers, for preventing a forest fire that had real possibilities of becoming a costly disaster.—From Mt. Shasta Herald, Mt. Shasta, Calif.

HOG RINGS SIMPLIFY CARE OF KAPOK SLEEPING BAGS

R. Boyd Leonard
Fire Control Officer, Salmon National Forest

The annual job of cleaning kapok sleeping bags after a busy fire season is one requiring many man-days of labor. Any method used to reduce time of tearing the beds apart, cleaning, disinfecting, putting back together, and rerolling is generally well worth investigation, since a few minutes saved on each bed adds up to hours when applied to the whole job. Each improvement continues year after year and in time represents a real saving of time and money.

The idea of using hog rings occurred several years ago and was put into practice on the Salmon National Forest.

A commercial tool for clamping the rings in place worked satisfactorily (fig. 1). However, there was no tool available for removing the hog rings when the beds had to be taken apart for cleaning.

Figure 1.—Inserting a hog ring through the eyes placed in the separate parts of a kapok sleeping bag. When in place all parts are fastened securely together with the closed ring.

The tang end of two files or in some cases two pairs of pliers were used originally to force the hog rings open. This proved to be a tedious way of removing the rings and led Kenneth Call, fire dispatcher, Salmon National Forest, to devise a tool that greatly simplified this operation.

The tool is made from two pieces of strap iron ¼ by ¾ by 9 inches. These are shaped to a point on one end and into handles on the other (fig. 2). The handle ends are then wrapped with leather or tape. A short iron stopper is welded to the pointed end about half way from the points to the fulcrum to prevent the points from passing by one another. This makes it easy to get both points into the hog ring at the same time. The sharp points on the tool are dubbed off just enough to prevent them from becoming a safety hazard.

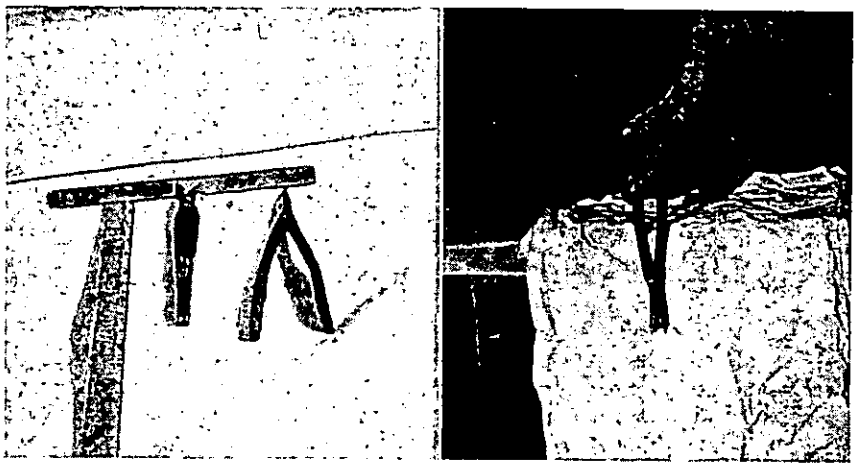


FIGURE 2.—Hog ring spreading tool showing its size and how it operates to spread a hog ring.

The new tool reduced the time required for this one operation to one-half to one-third that formerly needed. It also reduced the possibility of a man jabbing his hand with the end of a file or getting stuck with the sharp ends of the hog ring. The safety aspect alone made the tool well worth while. The first tool proved a success and as a result several have been made with minor improvements over the first model.

To finish the bed cleaning operation the beds are rerolled and a name tag is fixed on with a hog ring. The purpose of the tag is to make it possible for a man to get the same bedroll when for one reason or another the beds are stacked or transported.

A Low Cost Rust Preventive for Fire Tools

A commercial product called "Utility Coating" is available for use in preventing rust and corrosion on metal.

The Toiyabe National Forest has been using this product for several years and has found it superior in many ways to the common practice of oiling shovels, pulaski tools, and axes to prevent rust and corrosion while in storage. It does not wash or rub off and produces a dry hard coating which does not gather dust. The coating can be applied either by dipping the part of the tool to be treated or with a paint brush.

Utility Coating comes in 5-gallon pails and retails at about 15 cents per gallon. For best results it should be put on tools mixed with paint thinner or gasoline using five parts of gasoline to one of Utility Coating. For further information write to Regional Forester, U. S. Forest Service, Ogden, Utah.

SAFETY CHAIN AND LINK

LESTER K. GARDNER

Administrative Assistant, Division of Engineering, Region 5, U. S. Forest Service

Last fall on a fire, one of our mechanics was injured while inflating a tire which had just been mounted on a large truck wheel. Before the tire reached maximum inflation, the rim lock ring dislodged, allowing lock ring and tire to fly apart from the wheel. The lock ring struck the mechanic's right hand and the tire struck him on the side of the face. The accident occurred even though the lock ring had apparently been properly positioned before he started to inflate the tire.

The safety device illustrated in figure 1 was developed by Frank H. Little, chief foreman of the Redding Equipment Depot, Redding, Calif., to prevent reoccurrence of a similar accident. Used in pairs, the safety chains are adjustable to fit all types and sizes of wheels and tires where complete encirclement of the tire and rim is possible. It is not necessary, of course, to use safety chains on the one-piece drop center rims commonly used on light vehicles.

Cost of the model shown in the accompanying drawing was $1.81, or $3.62 per set. A set of chains fits compactly into a small space and may readily be carried in field mechanic's truck, luber units, etc., or used directly in the shops.

Procedure for use of the safety chains is as follows:

1. Assemble tire and lock ring on rim.
2. Encircle tire and rim with safety chains placed opposite each other. When split lock ring is used, quarter the chains away from the split ring ends.
3. Place the chains through the holding links and pull through.
4. Slip the nearest chain link into holding link slot. Allow some slack to prevent chain becoming tight when tire is fully inflated.
5. Inflate tire.
6. Determine that rim lock ring is properly seated, then unhook and remove safety chains.

Application for patent is pending. However, the safety chain and link may be used by the Forest Service and other government agencies which may choose to do so.

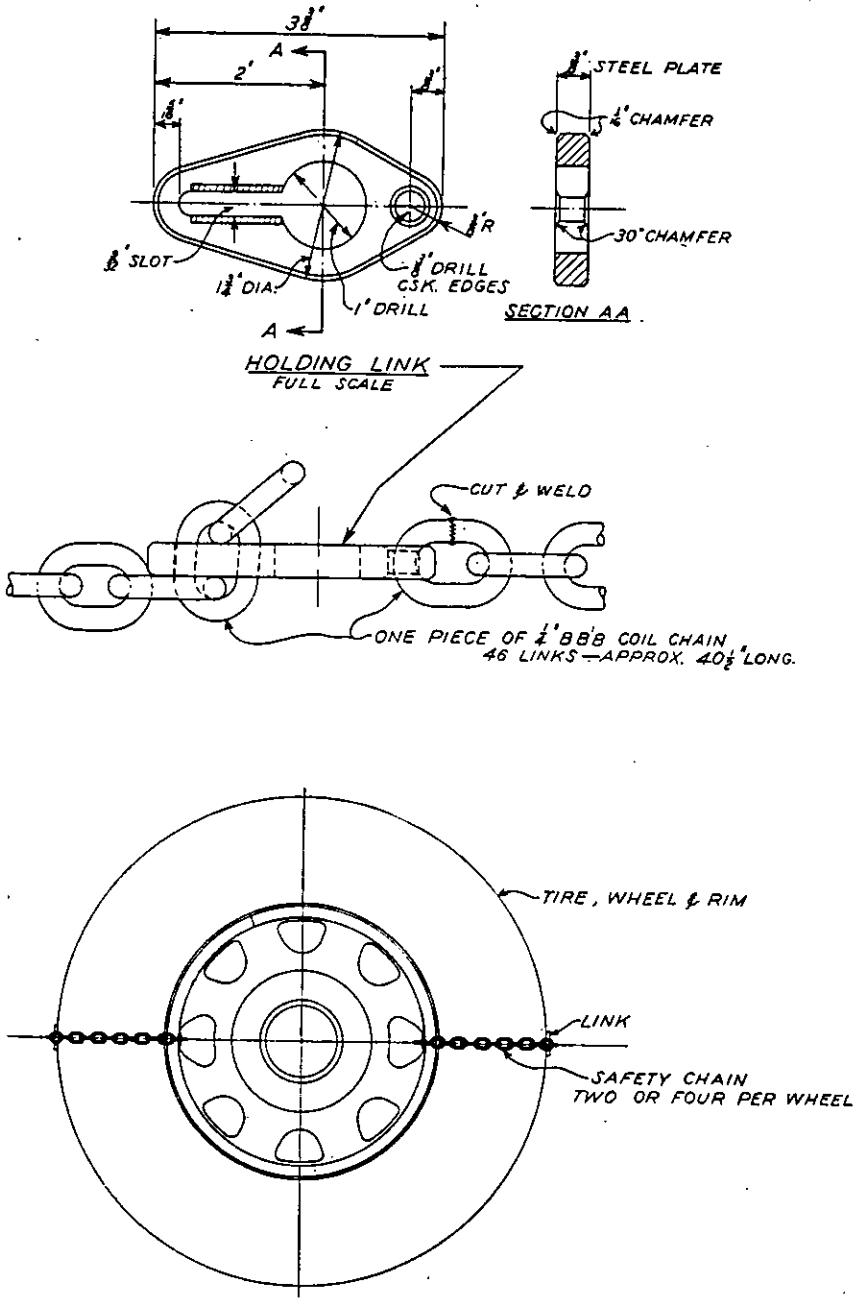


FIGURE 1.—Safety chain and link for use on lock ring type wheels and rims.

U. S. FOREST SERVICE VIEWS FIRE PROTECTION PLANS FOR LOGGING OPERATIONS [1]

A. E. SPAULDING

Assistant Regional Forester, Division of Fire Control, Region 1, U. S. Forest Service

Fire protection on logging operations is everyone's business, and especially that of the operator. He has the most to lose; but the industrial worker, banker, storekeeper, farmer, fisherman, hunter, home builder, and you and I also have an interest in the values that might be destroyed.

Fires in going logging operations may cause staggering losses counted in tens or even hundreds of thousands of dollars. You all know how expensive logging equipment is these days. When it is destroyed by fire, the dollars add up fast. Felled timber, logs, and cold decks are particularly vulnerable in case of fire. Under today's costs and values they pyramid the losses fast when they go up in smoke.

In addition there are logging improvements that may be destroyed, and fires that start in logging operations can and do spread to standing timber and reproduction. Neighboring operations and lands may also be damaged.

Watershed, recreation, and similar values may be seriously affected. The interruption of the woods operation may cause the closing of dependent sawmills or other plants. All such losses have a chain reaction that can affect many people today, tomorrow, and far into the future.

The direct losses of the logging operation may be small in comparison to the increasing losses suffered elsewhere, indirect losses in the economic structure dependent upon healthy logging operations. All such losses are bad enough in peace time, but under the present international situation, they become intolerable. Therefore, fire protection on operating areas is critically important to logging operators and fire control people.

We all recognize that the cutting of green timber usually increases the fire hazard. Green fuel turns to dry fuel; the forest canopy is open and ground fuels are dried by sun and wind. Logging tends to stir up the fuels and concentrate them. The risk of fires starting is increased by the numbers of men in the woods and also by the presence of various types of mechanical equipment such as tractors, trucks, and skidders.

Compensating to some extent for the increased risk are the woods crews, if they are properly equipped for fire fighting, and the logging roads which permit quick attack and may also be used as ready-built fire lines.

Regardless of responsibility for fire control on logging areas, the operator is in the best position to take prompt action. He has men and equipment on the ground, and has, as a minimum, a moral responsibility for quick and effective suppression action on all fires starting close to his operation. He is also in the most favorable position to provide some of the needed supplemental fire protection.

[1] This article is from a paper presented by the author at the 41st Annual Conference of the Western Forestry and Conservation Association.

Nevertheless, advance planning is necessary to make the best use of the facilities of both the operator and the protection agency. This plan should give consideration to prevention, preparedness, and hazard reduction, which are discussed here, and suppression.

Fire prevention should be designed to prevent fires starting from the logging operation, and desirable measures must vary according to local conditions. Yet each operator has an obligation to do all in his power to prevent fires.

The protection agency and the operator should mutually prepare an effective fire prevention plan for each area involved. To facilitate effective application of the plan, the operator should designate a representative to work with the protection agency at all times. Fire prevention during non-operating hours, weekends, and holidays should be provided. The necessary machinery should be set up to strictly enforce the needed prevention measures.

Adequate preparedness for fire fighting requires a good fire plan. This plan should include (1) the actions expected of the operator, (2) a detailed outline of the equipment, tools, men, overhead, and organization, (3) a clear correlation of the duties, responsibilities, and authority of the operator and the protection agency, and (4) the organization of the operator's crew into an independent initial attack force, ready to function. Organization of the crew should include adequate training of men and overhead. A large-scale map should show topography; location of roads, fire lines, and water chances; location of equipment; boundaries of merchantable timber; all areas of especially high hazard; and other important details.

This fire plan should be prepared jointly by the operator and protection agency. The local protection officer and the operator must then take steps to put the plan into effect in accordance with current and expected burning conditions. The plan should provide for adequate action during non-working hours, weekends, holidays, and shutdowns. To reduce the amount of written material, maximum use should be made of maps, charts, diagrams, and outlines.

Hazard reduction is an important phase of protection planning for logging operations. The fire hazard and risk usually increase with the cutting of green timber. This hazard and risk may continue for a number of years following completion of the operation. Slash, debris, or brush resulting from logging should be treated in such manner as to assure as nearly as possible the same degree of protection as was available prior to cutting.

Money spent for slash disposal usually should be considered as money spent for fire protection. In many areas, complete disposal has been replaced by increasing supplemental protection combined with partial disposal or no disposal. Slash and snag disposal methods and needs vary with locality and timber type. Yet the same general purpose should apply —we want to purchase the best protection for the dollars spent.

As used here, protection costs include slash disposal, preparedness, and fire suppression. They should be compared to the potential damage. To buy the most protection per dollar spent, we must have basic information on certain items. We need to know the hazard of slash fuels and be able to estimate the potential cost of their protection. We need to know also, in definable terms, the amount of slash we can tolerate when attempting

to calculate the risk. We need to know the rate of natural hazard abatement.

For the white pine type, the University of Idaho School of Forestry is financing research, under the direction of Dean Jeffers, to provide this and other information. Comparable projects are needed for some of the other timber types and localities. A few such studies are probably under way, some have been completed, and the information provided contributes to better fire protection for logging operations.

A slash and snag disposal plan should be prepared prior to logging. The purpose of this plan should be: (1) To reduce the chance of fires starting; (2) to reduce the chance of fires assuming rapid headway; (3) to make control easier, more rapid and certain; and (4) to provide the methods that will be adequate and least costly. Benefits and damages, irrespective of fire protection, must also be considered in making the plan. Advance planning is needed to provide for supplemental protection if the plan calls for living with a substantially greater hazard for a number of years after logging moves to another area.

In the Northern Region of the Forest Service, there is evidence to indicate that after cutting, the ignition rate more than doubles, and that twice as many fires will reach a size of 10 acres or more. This indicates that the protection load increases with cutting. Higher protection costs can be expected and should be planned for in advance.

Adequate protection roads are of great importance in holding these costs down. Permanent or semipermanent protection roads should be designated at the time the operation is planned. The roads that will be maintained for fire protection purposes following completion of the operation should be constructed to a satisfactory standard to fulfill protection needs.

Slash disposal should be considered in planning cutting areas. This may assist in avoiding the creation of large continuous areas of heavy slash. It may also facilitate handling of slash disposal by suitable methods and reduce the risk to high values.

On a logging operation we have great economic values at stake. The magnitude of the potential loss through fire fully justifies intensive protection, which should include fire prevention, preparedness, slash disposal, and suppression.

Fire prevention should be designed to prevent fires starting on the operation and places on the operator an obligation to do all in his power to prevent fires.

Preparedness should provide organized, trained, and properly equipped fire-fighting crews. We must also have correlation of duties and responsibilities of the operator and the protection agency in the event a fire does start.

Slash disposal is considered mainly as a protection measure. Where slash disposal planning contemplates a substantial hazard for a number of years following logging, supplemental protection should be arranged for. We should consider all benefits and all damages of hazard reduction work and plan our program primarily for buying the most protection with the money invested.

For successful suppression, there must be no holding back on initial attack by anyone in position to help. All operators should prepare their organizations as effective initial attack forces.

MORGAN PLOW HITCH

DONALD J. MORRISS

Supervisor, Pisgah-Croatan National Forests

George P. Morgan, mechanic foreman on the Pisgah National Forest, has invented a remarkably effective mountain fire line plow hitch.

Tests have shown that plows held in the ground by hydraulic lifts require constant depth adjustment by the tractor driver. That presents difficulties in steep country since our operators have only two hands. On the other hand, lines made by free floating plows usually have considerable skip due to frequent changes in grade and soil structure, and the presence of logs, leaves, roots, and rocks. The Morgan plow hitch is designed to eliminate these problems.

Figure 1 illustrates the geared hitch, one of the unit's unusual features. When the tractor starts up hill the draw bar goes down but the plow beam is raised, thus preventing the plow from going so deep that it puts an added strain on the tractor. When the tractor starts down hill the plow is thrown into the ground, thus avoiding the skip which usually occurs with a free floating plow unless it is set unnecessarily deep.

The pressure bar, which is fitted on the pantagraph principle, accentuates this action. It also maintains a constant pressure on the plow at the point which will best hold it in the ground and level. A hairpin bolt holds the bar at an adjustable position between uprights that are pinned to channel irons on the top plate of the plow and may be adjusted forward and back (figs. 1 and 2).

Once the pressure bar is properly set, further adjustment while plowing is not necessary. This is an important improvement since it removes the temptation to throw on rocks while plow is in motion and the even more unsafe practice of jumping on the back of the plow to hold it in the ground.

One man can raise the plow point to the position illustrated by pulling up on the pressure bar. It can be held in this position for deadheading by inserting a bolt in the upper hole at the end of the beam. The plow is raised for loading by a hand-operated, 500-pound, safety wall winch. The crank handle is mounted to the right and behind the tractor seat. In loading position, a lock is dropped over the hitch to prevent side sway. The operator raises or lowers the plow without leaving the tractor seat.

Morgan has added some improvements on the plow itself. Plows will hang under roots and then it is necessary to back up. A plate that curves from near the plow point to meet the upper plate at the back end of the plow near the top of the wings has been added to act as a sled to raise the plow when backing.

The throat of the beam, beginning from well ahead of the plow point, is shaped in a perfect arc. This permits the accumulated leaves, which are too light to roll with the sod, to roll out on each side before they pack sufficiently to pull the plow out of the ground. Two beams, as well as the hitch parts, are cut from a single steel plate with practically no waste of material.

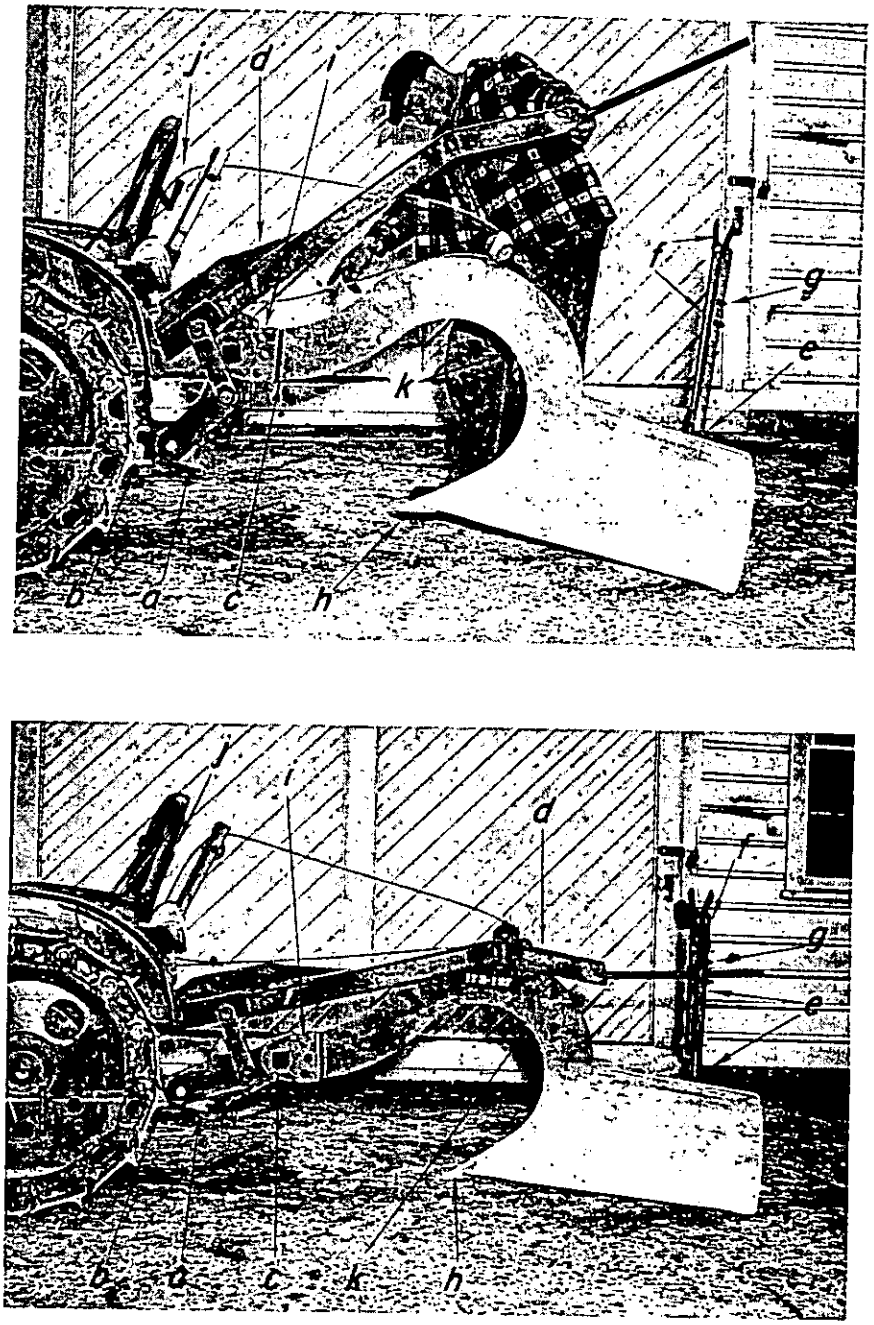


FIGURE 1.—The Morgan plow hitch: *a*, Geared hitch; *b*, draw bar; *c*, plow beam; *d*, pressure bar; *e*, point of pressure; *f*, uprights; *g*, hairpin bolt; *h*, plow point; *i*, hole at end of beam; *j*, crank handle; *k*, throat of beam. *Top*, George Morgan with plow point raised to deadheading position; *bottom*, plow ready for use.

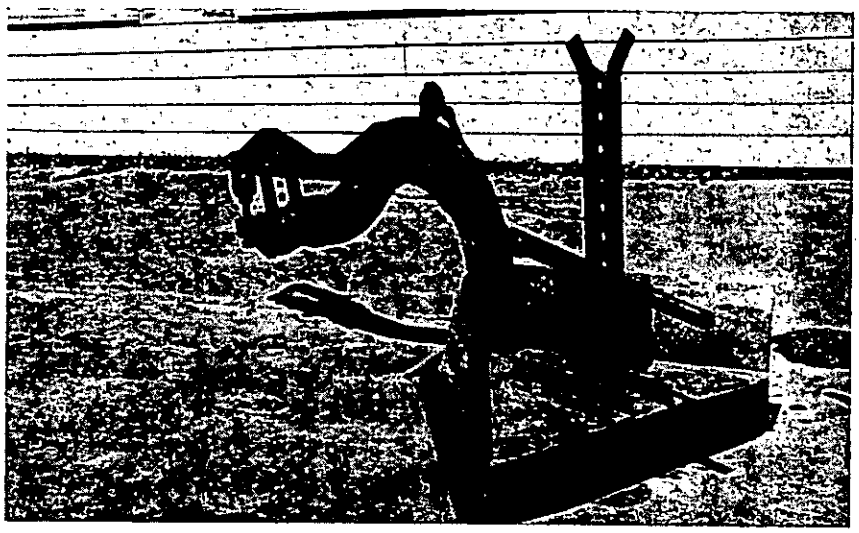


FIGURE 2.—Rear view of plow showing placement of uprights.

The net effect of these features is a plow which follows the tractor like a snake crawling over a stick. Pulled by an 18- to 25-hp. crawler tractor, it makes a good line up a 30-percent slope, down a 60-percent slope.

Further information concerning this equipment may be obtained from the Regional Forester, U. S. Forest Service, 50 Seventh St., N.E., Atlanta 5, Ga.

Published Material of Interest to Fire Control Men

A Forest Fire Prevention Program, by D. Naysmith. Pulp & Paper Magazine, Canada. May 1951.

A New Project on Logging Slash Disposal at the University of Idaho, by D. S. Olson. The Idaho Forester, 1950, published by University of Idaho.

Carbon Tetrachloride Bulbs and Bombs, by O. J. Hodge. National Fire Protection Association Quarterly, July 1951.

Engineering in Forest Protection, by G. I. Stewart. Mechanical Engineering, June 1951.

Fighting Forest Fires from the Sky Newest Answer to an Old Problem, by E. L. Perry. New Mexico Stockman, June 1951.

Fire and Water, in Southern California's Mountains, by E. A. Colman, California. Forest and Range Experiment Station. Misc. Paper No. 3, June 25, 1951.

Fire Casualty Statistics, by Holbert L. Dunn and Evelyn H. Halpin. National Fire Protection Association Quarterly, July 1951.

Forest Policy, Law, and Administration. A booklet published by The Food and Agriculture Organization of the United Nations, Rome, 1950.

Forest Roadside Control of Alder and Willow, by William H. Larson, Chief Fire Warden, Washington Forest Fire Association. Jour. Forestry, October 1951.

The Forest Protection Shop Keeps 'em Rolling, by S. B. McCoy. Wisconsin Conservation Bulletin, June 1951.

Use of Aerial Photographs in Control of Forest Fires, by Keith Arnold. Jour. Forestry, September 1951.

SO YOU HAVE TOO MANY FIRES!

HENRY SIPE

Assistant Forest Supervisor, Cumberland National Forest

The Cumberland National Forest in eastern Kentucky is typical of many forest units in one way: most of its fires are caused by local residents. Lightning and "tourists" are minor factors. The Forest protects a million-acre "checkerboard" where "Uncle Sam" owns the black squares and private parties own the red. About 50,000 persons live on the red squares, and another 50,000 live in towns under 5,000 population within the protective area. When land purchase was begun in 1934, 400 to 500 fires burned each year, doing plenty of damage. Woods burning had been practiced for generations. In the succeeding years, by various methods, we were able to reduce the number of fires substantially. In 1941 we had 192 and in 1950 there were 52, which seemed to be an irreducible minimum.[1]

Indeed, most of this million-acre protective area was practically free of all fires in 1950 except an occasional "accidental" one or a railroad fire. But in certain small sections, the occurrence rate was still very high, mostly from smokers or incendiaries. People over the whole Forest had in past years been exposed to considerable fire prevention pressure. Yet these small trouble spots remained. Law enforcement as always, offered hope, if enough evidence could be uncovered. But the culprits had become wary. What was the answer? It was felt some phase of education had to be selected; but what specific kind?

The results secured is one 12,400-acre unit on the Cumberland had been good.[2] Personal contacts and letter follow-up was the method used. In this area, the number of fires dropped from 10 in 1946 to zero in 1950. To date in 1951, one fire debris burning has occurred. If there is no more than one fire every other year here, the irreducible minimum has been reached.

This personal contact program has been carried out in several other areas with success. They total some 50,000 acres, about 5 percent of the Forest's protected acreage. It was found that many of the local residents had concluded that fires were harmful and should be stopped. But a certain type of person in the community refused to accept the opinion of the majority. In this group were the incendiaries, the careless "smokers," and the intentionally negligent. Here were the trouble makers of the community—the moonshiners, drinkers, and pranksters. Most of the good citizens welcomed any pressure put on these bad actors, but the pressure must come from the "outside." Why? For fear of reprisals. And this fear is not only that your barn may be set afire; you just like to keep the good will of your neighbor, whether he is a good citizen or a scoundrel. So someone charged with the responsibility, and who has the authority, must put on the pressure. Someone who *wants* to prevent fires, must *convert* that want into an *action* program.

[1] See July 1949 issue of Fire Control Notes, p. 33.

But, you say, all our folks have been "contacted." Probably so, but how long ago? Has the contact been kept alive? How about new families moving in? In one area of 175 families, at least 45 families have moved in or out, or to some other part of the section in a 2-year period, about 13 percent turnover a year. We found no substitute for personal contacts on these high risk areas on the Cumberland. Here is how it is done:

On the fire occurrence map, draw a line around those areas where there are too many fires. List them in priority order; worst first. Cut out a section of the map covering the worst area and fasten it to a piece of cardboard about letter size. Cut it in 3 pocket size sections. Then make a looseleaf notebook, pocket size. Likely there will be an employee or a local person who knows the names and location of residents in the area. With his help, put a numbered dot on the map for each family. Then number a notebook sheet for each, write on it the name of the head of the family, address, and brief notes about them. List schools, churches, and stores. The local ranger or guard who has been responsible for fire control in the area, should be with you on much of your work. If he has been unable to "crack" the fire problem, an outsider should be chief contacter.

Now go to the county school superintendent's office. List the names of pupils, parents, and teacher, and the ages of pupils. Talk over school problems with the superintendent and attendance officer. For example, what older boys play "hooky" too often. Next visit the county court house. Look over the civil and criminal order books. You'll be surprised at who is in trouble for what. Talk to county officials. Try to learn which are the best families, and the worst. Visit the schools first if possible. Make a talk even though it's only a 5-minute one. In some way let it be known that you have their names or know who they are. You might call the roll and check those present against your list. Or you might pick out and call by name some pupil you can identify. Take a picture of the pupils and present an enlargement to the school later.

Then start out and make as nearly a 100-percent family contact as possible. Write down names and approximate ages either during or right after the talk, together with any interesting notes. Find out who is related to whom (but watch out for marital troubles). Kinship will explain many things. For example, two men married sisters; they lived 5 miles apart. When we had a "run-in" with one man, the other set a fire. We didn't wise up till we found out they married sisters. Learn, too, who doesn't like whom. Often they'll inform on each other.

Pay particular attention to teen-age boys who are not attending school; maybe inquire casually about draft eligibility. If you have fires that are classed as incendiary, smoker, or unknown, there is a good chance some teen-agers are mixed up with them. Too often, such a footloose boy is overlooked or avoided in our contacts. Often he's not at home or slips out the back door when you call.

You will not be able to see all of the families, but later trips will tend to raise your percentage. Trying to figure out who are "key" individuals, and seeing only them, will be inadequate in these high risk areas. The important point to remember is that you not only want to make an impression on as many local folks as you can, but you want *them* to realize *they* are making an impression on *you,* and that they *think* you will remember *them.* The

[2] See October 1950 issue of Fire Control Notes, p. 1.

various psychological approaches to be used are beyond the scope of this article.

When you return to the office, mail something to each family. We include them on our quarterly Newsletter mailing list. The letter tells current conservation news—local, Forest, State, and Nation. We prefer to write the person's name rather than "Boxholder" because it adds the personal touch. All letters to one post office can be tied in a bundle with the address only on the top one. A Smokey Bear stamp can be used to seal the letters and save stapling. Other types of conservation material can be mailed as needed.

Visit the area twice the first year and if results are OK, reduce the frequency the second year. After the first year you will likely be able to put your finger on the fire suspects. Get better acquainted with these.

If there are fires in the area, of course investigate fully. You'll be surprised how much easier it is, than if you go into an area "cold" or unacquainted. Even though you don't get enough evidence for prosecution, you will likely learn who caused the fires and what's more important, they'll know that you know. Keep them guessing as to possible prosecution.

Go through this procedure for other critical fire areas. A contact program as above outlined is basicly being a good neighbor. If it solves the fire problem, other objectives such as sound cutting practices on private lands loom immediately ahead as even bigger challenges.

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 and 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.*

When Forest Service photographs are submitted, the negative number should be indicated with the legend to aid in later identification of the illustrations. When pictures do not carry Forest Service numbers, the source of the picture should be given, so that the negative may be located if it is desired.

India ink line drawings will reproduce properly, but no prints (blackline prints or blueprints) will give clear reproduction. Please therefore submit well-drawn tracings instead of prints.