VOL. 15 OCTOBER 1954 Fall No. 4

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 15 Number 4

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: 1954

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FIRE EXTINGUISHERS, THEIR TYPES AND USE. I. CARBON DIOXIDE EXTINGUISHERS

A. B. EVERTS

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

Everyone *should* have a basic knowledge of fire extinguishers and the type or *class* of fires on which these extinguishers are effective. No one type of fire extinguisher is effective *on all classes of fires.*

The fire extinguisher manufacturers have a lingo all their own. They have been using it for years and there is no chance that they'll change it. If we can't change them, then let's learn their lingo so we'll know what they are talking about once and for all. Fires, and the type of extinguishers with which to attack them, are classified as A, B, and C; and this has no relation to *size* classification for which many of us use the same A, B, and C (plus D and E). In the trade, the classification means:

Class A fire.—A fire in paper, wood, cloth, excelsior, rubbish, etc.—or what we call forest fuels. For Class A fires the *quenching and cooling* effect of water is required.

Class B fire.—A fire in burning liquids (gasoline, oil, paint, cooking fats, etc.) in which a *smothering* action is required.

Class C fire.—A fire in *live* electrical equipment (motors, switches, fuse boxes, transformers, appliances, etc.). A *nonconducting* extinguishing agent is required.

Many of you know all this. For those of you who don't, it's worth your time to take a few minutes right now and learn it. From now on you're going to hear a lot about A, B, and C fires—and for the last time we don't mean size. A simple little association of ideas will fix these classifications in your mind:

A—is for Ashes
B—is for Barrels
C—is for Current

Get it? In order to get ashes we have to have a fire in Class A fuels. Class B fuels are the kind that are usually transported in barrels. In order to have live electricity the current has to be turned on. Okay, now you have it.

To be sure, a fire may start as one class and then quickly develop into a second class—or even a third. In this case, it is necessary to use one or more type of extinguishers or methods to control the fire. An example would be a powersaw fire involving spilled gasoline. When only the gasoline is burning, it is a Class B fire, but as the fire spreads to the forest fuels, it becomes also a Class A fire. The extinguisher that is carried by the fallers is intended to extinguish the Class B fire. After the fire has spread to the forest fuels, the extinguisher is worthless. This is when a shovel is needed.

Now a shovel is not classified as a fire extinguisher by the manufacturers—neither is a bulldozer. We can argue with them, but after all it's their lingo we're trying to learn. That's why we

used the words "or methods" in the foregoing paragraph. Using a shovel or a bulldozer or a plow is a method, our old standby of *robbing the fire of its fuel.*

Let's remember then that fire extinguishers are first-aid treatment only. It's the old rule of "get 'em while they're small." There are three basic rules in extinguishing a fire with an extinguisher; we won't quarrel with them because they are our rules too: (1) Locate the fire, (2) confine it so that it will not spread, and (3) extinguish it.

The only rule that need concern us much is the first one—locate the fire. Sometimes a room or building is full of smoke. Unless you *locate* the fire, and use your extinguisher where it will do the most good, your effort (and usually the building) is lost. It has happened.

Now that we have the classes of fires in mind, let's go on to the basic types of fire extinguishers and the classes of fires for which they were designed. There are five basic types. Each major manufacturer has his own design. There are also variations within the type. The basic types are: (1) Carbon dioxide (CO_2); (2) dry chemical (dry powder); (3) water; (4) foam; (5) vaporizing liquid. In this article we will discuss the carbon dioxide extinguishers; the discussion of the others is planned for publication in later issues of Fire Control Notes.

Carbon dioxide is a tasteless, colorless, odorless, heavier-than-air gas. Commercially, it is used for carbonating beverages, pressurizing cans (paint, shaving soap, whipped cream, insect sprays, shoe polish, ad infinitum). In its solid state it is dry ice. When dry ice is confined within a container, it builds up pressure until it converts to a liquid and gas. Within an extinguisher the liquid will be in the bottom half and the gas in the upper half. This characteristic is the reason for the inside siphon tube shown in figure 1. Without it, gas would be released when the valve is opened. What is wanted is the liquid. Thus the gas pressure forces the liquid out through the siphon tube to the hose and horn assembly. This liquid, referred to as dry ice snow, expands upon release 450 to 1, developing a temperature of $-110°$ F.

Carbon dioxide (CO_2) builds up very high pressures: 650 pounds at 50° F., 1,205 pounds at 90°, and 3,105 pounds at 160°. Because of this high pressure the CO_2 extinguisher is the heaviest of all per unit size. The underwriters require that all CO_2 extinguishers be provided with a blowout disk as a safety measure. Usually, these disks rupture at about 2,200 pounds' pressure. If the extinguisher is located in a place where it is subjected to heat, say 130° F., the pressure will build up to 2,265 pounds and the disk will blow. You may not know it, but your extinguisher is empty. One forester was somewhat mystified by just such an occurrence. The extinguisher was located in a hole cut in the wall with glass on the inside and outside. Nice arrangement. The extinguisher was visible and easy to get at from either inside or out. When the hot summer sun went to work on this little "greenhouse," something had to give. The blowout disk did, which, of course, was its

function. The wire seal was unbroken, but the extinguisher was empty. So watch the location of CO_2 extinguishers. Heavier disks, which erupt at pressures above 2,200 pounds, can be secured if necessary. You cut your safety margin somewhat by using them however.

Because of the tremendous and constant pressure possible with CO_2, it often serves as a pressure medium for many industrial uses including other types of fire extinguishers, which will be mentioned in later articles. In many cases the inside siphon tube is removed. When this is done the gas is used for pressure instead of the liquid. This arrangement permits use of a special regulator valve. Liquid CO_2 will freeze most types of valves.

Extinguisher sizes.—CO_2 extinguishers are manufactured in a number of sizes, expressed in pounds. The size indicates the pounds of CO_2 in the cylinder, not the total charged weight. Average list prices are as follows:

Size:	*List price*	*Recharge cost*
2½	$24	$1.50
5	32	2.50
10	52	3.00
15	60	3.50
20	68	4.00

In addition, every 5 years a hydrostatic test is required. Cost per cylinder is $2.50 regardless of size. The date of the test is die-stamped on the cylinder.

Maintenance.—CO_2 extinguishers require very little maintenance. The weight full and weight empty are stamped, usually on the valve. Check weight by weighing, after removing the hose and horn assembly. If the weight is less than 10 percent of the full weight, it is recommended the extinguisher be recharged. If the wire seal is unbroken weighing may not even be necessary (provided there is no chance of the safety disk having blown because of exposure to heat or of someone having put a new seal on a partly discharged extinguisher).

Valves are of two types: squeeze or trigger and perforating disk. The latter type can be turned off and on while in use, but there is a gradual leak even when closed. This type is used where it is desired that the extinguishers *always* be recharged after use—to make sure they are always *full.*

When the extinguisher needs recharging, it is necessary to send it to a recharging plant. Disconnect the hose and horn assembly. CO_2 extinguishers do not need to be protected against freezing.

How to use the extinguisher.—CO_2 is a class B and class C extinguisher. Carry the extinguisher to the fire by means of the carrying handle. Extend the horn toward the fire and release the gas, sweeping the horn back and forth across the burning material at the base of the fire.

On flammable liquid fires sweep the flames off the burning surface, applying the discharge first at the near edge of the fire and gradually progressing forward moving the discharge horn very slowly from side to side. The discharge should not be directed into the burning liquid.

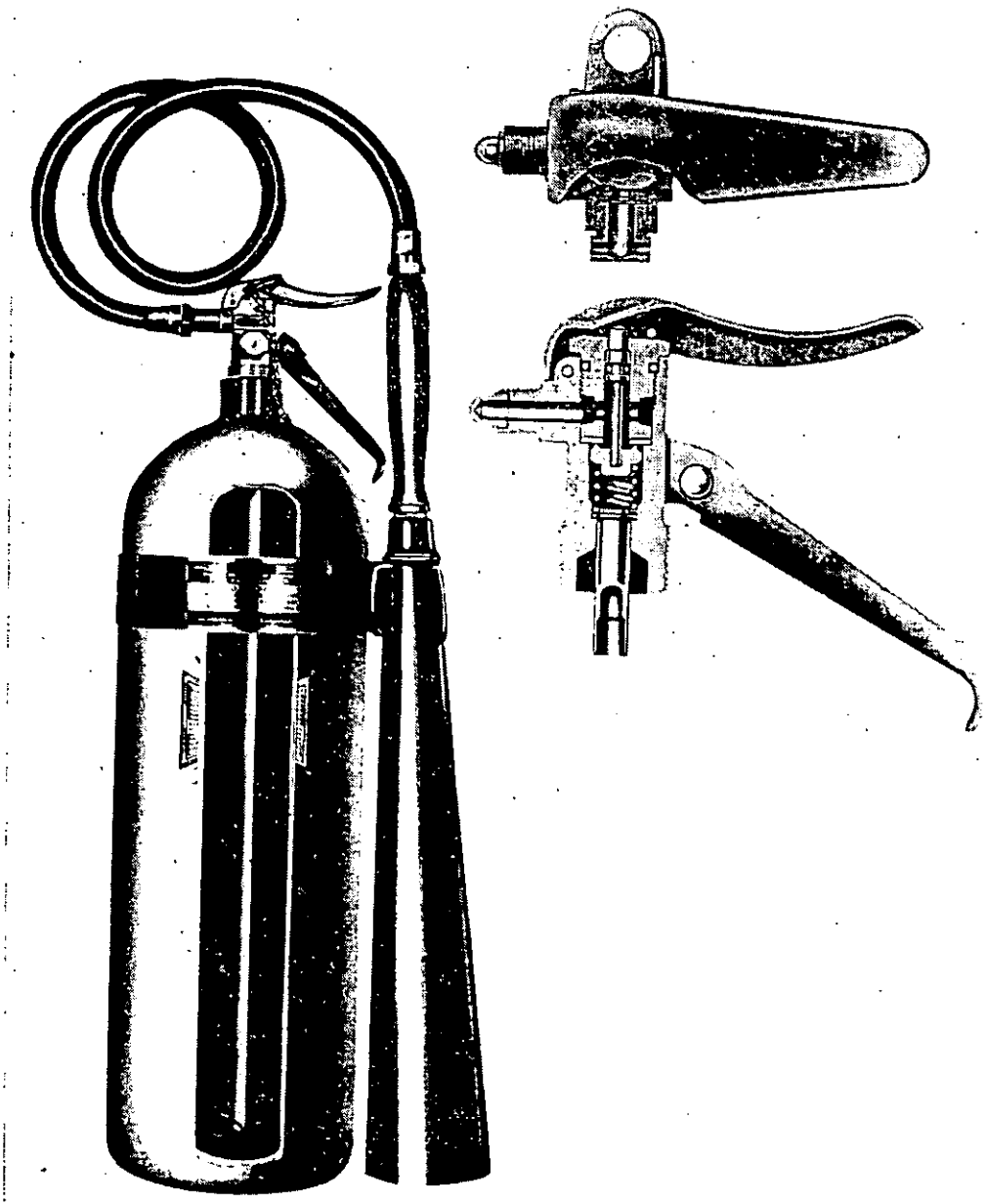

FIGURE 1.—Cut-away photograph of a carbon dioxide fire extinguisher showing the inside siphon tube.

CO_2 has a knock down and retarding effect on small Class A fires. If the burning material is deep seated, a re-ignition can be expected. However, Class A fuels in containers, such as a fire in a waste basket, can be extinguished with CO_2.

Cautions.—The cautions to observe in using CO_2 extinguishers are: (a) Never discharge at a person. (b) Beware of use in small confined places. (CO_2 is not poisonous but it is heavier than air and will replace oxygen. In this respect it will suffocate. One should not enter a room which has been flooded with a CO_2 system until the room has been cleared.) (c) Be prepared for a roar when the gas is discharged—this may frighten some people.

Summary.—In brief the characteristics of a CO_2 extinguisher are: (a) For use on B and C fires, or small Class A fires; (b) heavy per unit size; (c) needs to be sent to plant for recharging; (d) clean in use; (e) will not freeze; (f) range 6 to 8 feet; (g) effective from –40° to 120° F.; (h) relatively safe; (i) maintenance minor.

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Disposable Message Droppers

The Aerial Equipment Development Center was requested, through the employee-suggestion program, to develop an inexpensive disposable message dropper. It was also suggested that such droppers, which would contain a fire-prevention slogan, could become an effective public-relations tool. Some such tool is needed to promote an awareness of fire detection value on the part of private pilots and other aircraft users.

At the present time message droppers of yellow percale cloth streamer with sand-ballasted canvas envelope are manufactured and used by smokejumper units. These droppers are quite satisfactory for normal Forest Service use, but are rather expensive to manufacture. There is a high mortality on droppers even in normal use, and for various reasons a good percentage are never returned to the loft.

Quite frequently the Division of Fire Control has been asked to furnish message droppers to the forests, private pilots, Civil Air Patrol, and other interested flying groups. Because of the cost they can be furnished only in special cases on a cooperative basis.

The objective, then, was for the air development center to develop an inexpensive message dropper containing a fire-prevention message for distribution to flying operators and other interested groups. The dropper should be lightweight and easily carried in an aircraft map case.

Several models of inexpensive paper message droppers were made up and drop tested, and some were field tested on the Custer National Forest during 1953. At the request of the Custer, the air development center furnished test models that were issued to cooperative Flying Farmers. At least two fires were reported with these test models. The message dropper finally selected consisted of a small end-opening envelope with double-pronged metal clasp fastener and a colored crepe-paper streamer fixed to the back of the envelope. One paper company gave price quotations on completely fabricated droppers of this type of $166.89 per M in lots of 1,000, $114.54 per M in lots of 5,000, and $79.44 per M in lots of 25,000.

From drop tests it was learned that the streamer should be wrapped lengthwise around the envelope about four times, and the remaining streamer material then sandwiched between the fold created by doubling the entire dropper. This made a compact bundle easy to handle in the slipstream, and reduced the tendency of the streamer to flare out prematurely and be torn by the aircraft tail assembly.

It is felt that the disposable message dropper would be one means of enlisting the aid of pilots in fire detection. These droppers could be distributed by the national forests to private pilots, Civil Air Patrol, and other interested flying groups with suggestions for their use in the area covered. The saving in suppression costs on one fire could easily overcompensate for the cost of several thousand message droppers.

The message dropper would be welcomed by many private pilots for any emergency situation in which a message dropper might be needed. In the Northwest there are frequent instances where Forest Service and private planes have occasion to drop notes to hunting and fishing camps, logging crews, range camps, and other ground parties.—AERIAL EQUIPMENT DEVELOPMENT CENTER, *Region 1, U. S. Forest Service.*

RAILROAD FIRE CONTROL IN MICHIGAN [1]

D. F. WEIR

Supervisor, Michigan Railroad Fire Prevention

Since the introduction of diesel locomotives on Michigan railroads many forest fires have been traced directly to engine ejection of ignited carbon deposits.

Until 1950 a very small percentage of the locomotives operating in Michigan and many other States were the diesel type. That year marked the start of a rapid changeover from steam to diesel power. Depending on the work load on our railroads, there may be as many as 1,200 engines assigned for operation within Michigan. Approximately 60 percent of these locomotives already are diesel powered. The large saving in operating costs has hastened this switch over by the railroad companies. However, with this rapid increase in the number of disel engines in many States, the number of forest fires also have increased.

The rise in the number of these fires was particularly noticeable in the Great Lakes States during the 1952 and 1953 forest fire seasons. Michigan reported 65 percent of its railroad-caused fires last year were of diesel locomotive origin. Wisconsin and Minnesota reports showed approximately the same percentage. Several other States have advised that the diesel engine has presented their fire control agencies with a new headache.

What is being done to find a solution to the problem? Aware of the fact that the diesel might cause many right-of-way fires, the Forest Fire Section of the Michigan Conservation Department's Field Administration Division began experimenting with spark arresting devices for diesel locomotive exhaust chambers several years ago.

Conservation forest fire officials called a special conference in the spring of 1953. Present were representatives of locomotive-building companies, railroads operating diesels in Michigan, and State and Federal forest fire control agencies in the Great Lakes States. Out of the conference came conclusions as to the causes of diesel engine fires.

The fire-setting potential of a diesel is definitely linked with the type of the train service required of the locomotive. An analysis of Conservation Department forest fire records showed that diesels on passenger and fast freight runs seldom set fires. Blazes reported were usually set by locomotives in local freight and switching services. The type of diesel motor used in the latter service often idles for long periods causing a buildup of carbon deposits in the exhaust chamber. When the engine is laboring hard the rapid rise in the temperature of the exhaust chamber tends to ignite and loosen the carbon.

Railroad companies have been as cooperative in the designing, making, and testing of devices for diesel fire prevention as they

[1] Reprinted by permission from Michigan Conservation Magazine.

were in the past in experimenting with devices to prevent steam engine exhaust fires (fig. 1).

Changes were made in the arrangement of the baffle or deflecting plates in the exhaust of their disel engines. Several types of screened hoods for the exhaust stacks were made and tested. The spark arresting device finally approved looked most promising to forest firemen, for diesels so equipped and operated the last half of 1953 set no fires (fig. 2).

The next step will be to have our railroad companies equip the hundreds of diesel locomotive units now in service with this arrestor or a suitable equivalent if one should be developed.

There is every indication that this will be done. The railroads do not want these fires because they are costly in several ways. They are required to reimburse the State for the cost of suppres-

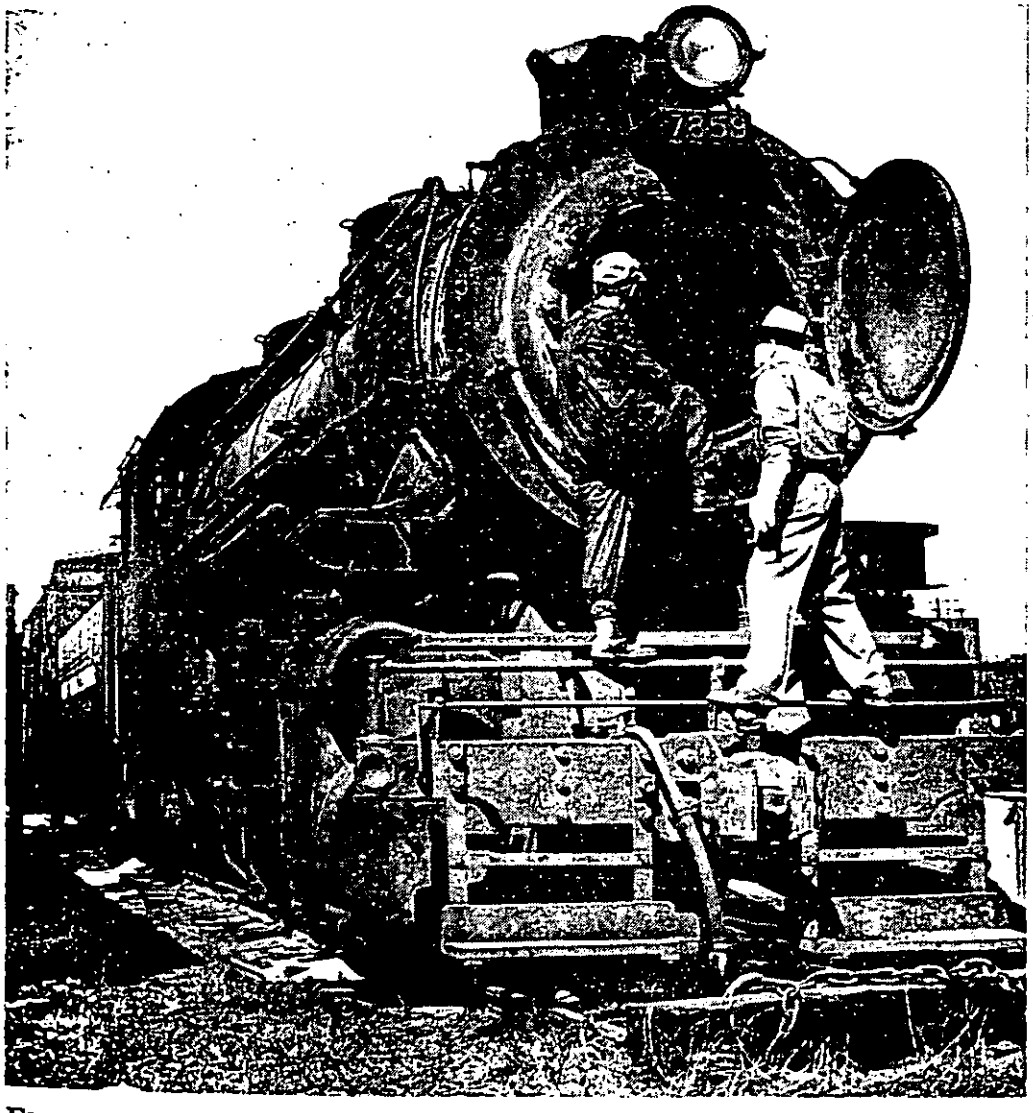

FIGURE 1.—Steam locomotive, disappearing from Michigan scene, has spark retarder inside head of engine.

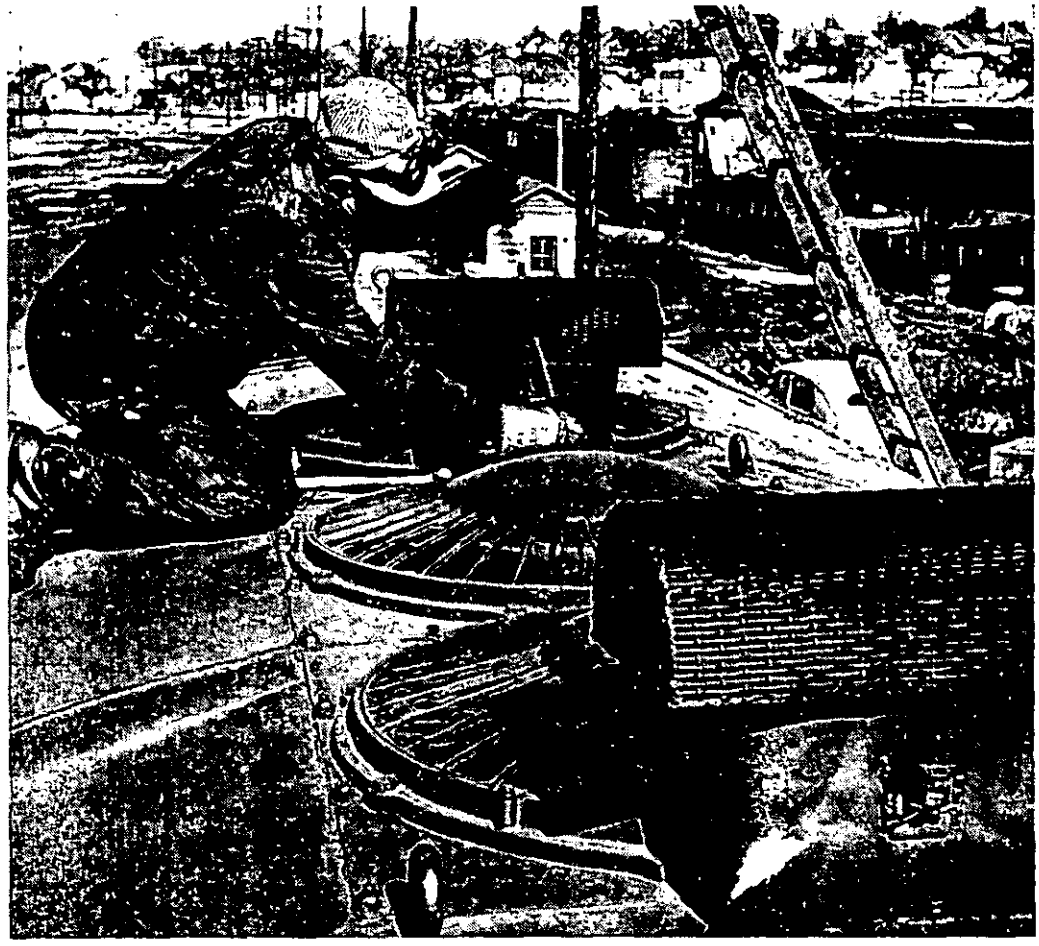

FIGURE 2.—These are the latest type spark arrestors; they are bolted over diesel engine exhaust chambers.

sing such fires and to pay for the damages to State lands and property. Too, unattended railroad-caused fires that spread from the right-of-way to adjacent forested lands do not build good will towards the offender.

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A Satisfactory Grease Gun

Last summer we purchased a manually operated grease gun that has proved so satisfactory we believe others may be interested in it. We also purchased a fill grease pot and extension unit. Total cost, $37.10. The gun is filled under pressure by means of a pump attached to the top of the grease pot, which is so constructed that dirt cannot enter during the filling process. A pressure of 3,500 pounds can be attained by the gun, and one filling will service most any type of equipment. Filling the gun under pressure results in an approximate 20-percent saving on grease. Also, the time required for grease jobs has been cut down 30 percent because the gun is so easily filled and used; it is light in weight and there are no air hoses to drag around.

Grease guns of this type have been used by local garages without need of repair for approximately 7 years. This unit has been inspected by our shop foreman and he believes the initial cost is very low for the value received.—GEORGE W. MCLARTY, *Fire Control Assistant, San Bernardino National Forest.*

TRAINING SESSION IN LARGE FIRE ORGANIZATION

R. W. ASPLUND

Fire Control Officer, Plumas National Forest

Much time and effort has been spent in training personnel in the principles of organization for fire suppression. Methods used include the so-called conference method, self-training by use of written material and job descriptions, and on-the-job training by assignment to actual fires. All have a value and certainly have a place in the training program. However, it is still generally agreed that we are not on top of the task of developing and training personnel to fill the jobs in the fire organization. Many failures in the control of a fire are charged to inadequate training, especially in the top jobs.

Much emphasis is placed, and rightly so, on the necessity for following the Job Instruction Training (JIT) or four-step approach. Good progress has been made using this approach to training in many phases of our work, but the complexity of the fire organization discourages its use. Fire Control Officers of five forests in the California Region put on a Large Fire Organization Training Session in 1951. Basically, the 3-day session followed a combination of the four-step method and the military approach as outlined in the film "Military Training." Approximately 120 forest officers attended as trainees. All jobs in the basic organization were covered. Each trainee was given instruction in only one job with some overlapping to insure a complete understanding of the job.

The first half day of the session was spent discussing the duties and responsibilities of the various functions and the relationship between functions. This was followed by trial problems under the guidance of the instructor. The second day was devoted to a field problem or maneuver with all units functioning. The second night was devoted to a trial problem of greater complexity and magnitude. After the field problem, a critique was held that focused the need for correlating all functions.

The session was operated as a regular fire camp. Trainees were placed in the various service jobs and all were given on-the-ground training. Since some 350 men were involved, with crews coming and going during the 3-day session, the service organization functioned as on an actual fire.

The program was based on actual field maneuvers with problems worked out in advance and marked in the field. Maneuver No. 1 was based on a supposed fire 150 acres in size, with the fire edge marked by lightweight marking twine and notes indicating conditions not apparent. Scouts located the strings that indicated the fire edge at a given time. This along with information as to cover, topography, etc., was sent to the plans section by radio.

Plans section, in turn, made a plan for control, including the manpower and organization to do the job. Instructions were written for the line organization. The line organization, with actual crews transported to the area by the service organization, went to work, and firelines were actually constructed.

Maneuver No. 2 was larger, 500 to 1,000 acres. The session was scheduled so that scouts were getting information on this problem while the line organization was working on maneuver No. 1. This information in turn was relayed to the plans section. The plans section calculated the rate of spread and estimated the simulated fire area at the time the control forces would be available. The plan of attack included control line locations and assignments of men and machines. The line organization in conjunction with the service section executed the control plan during the night. Firelines were actually constructed using prison inmates as labor. Big Beam electric lights were located at control points to simulate the glow or light of an actual fire.

Inmate crews, local suppression crews, civilian employees from the Herlong Ordnance Depot made up the labor. These men all received training in the use of tools and line construction with the crew bosses actually functioning as they normally would on a fire with a crew of pickup laborers. The instructor for each class functioned as the coordinator for each position, and the trainees actually performed their duties, either individually or as a group.

Program Outline

I. Group personnel by equal knowledge level. Only personnel with a background of fire behavior and fire control fundamentals should participate. Give thorough orientation at the start of the session with objectives thoroughly explained. Develop the idea of a game with all instructors and trainees participating.

II. Explain the job by lecture and conference method, 2- to 4-hour sessions. Review the overall organization structure, job descriptions, and relationship between jobs. Use charts, pictures, and simple problems.

III. Give each group or individual trainee the opportunity to participate under close guidance by instructor. The instructor acts as the chief in each category with the trainees assisting (maneuver No. 1).

IV. Have trainees actually do the job either as a group or individually, in turn, under different conditions (maneuver No. 2, night).

V. Hold a critique following each maneuver or exercise with a final critique of the entire session at the close.

Preparation for the Session

Chief instructors (Fire Control Officers) got together and prepared general outline of subjects to be covered and determined the number of trainees to participate. They selected instructors and assistants; prepared outline for each subject with guide for in-

structors; and suggested methods and materials needed. Individual outlines were given to selected instructors with instructions to prepare lesson plans. Chief instructor in each phase (plans, service, and line) assisted in the preparation of lesson plans. All lesson plans were reviewed by the general manager or chairman of the session.

The site was selected well in advance, and these points considered:

1. Isolated area with limited road system.
2. Good campsite—water, sanitation, free of mosquitoes, etc., and plenty of room for classes.
3. Maneuver area—must have plenty of opportunity for varied problems, with some parts easily accessible, and others less accessible and by trail only; typical topography with varied slopes, varied cover types, within travel distance of recent large fires for review purposes.
4. Arrangement for fire fighters (consider costs): (a) Suppression crews, (b) hot shot crews (inmates), (c) military personnel, (d) juveniles (State or county).
5. Arrangements for materials needed: All fire forms for large fires; complete camp setup, grub, trucks and busses, bulldozers, tankers, handtools, fire pumpers, etc.
6. Laying out and marking problem areas. Chief instructors following prepared outlines selected individual problem or maneuver areas—must be logical, the size and pattern of simulated fire must be similar to that which an actual fire would burn in the same area. Use air photos and topographic maps to assist in figuring out the problem in advance.

Maneuver No. 1 covered an area, 100 to 150 acres in size, actually marked on the ground. String lines indicated fire edge with notes to explain circumstances not apparent.

Maneuver No. 2 was a problem simulating a fire that had escaped from initial attack crews and was developing into a project fire. Only a small area, 40 acres or so, was marked on the ground to indicate the fire area at the time planning began. Weather conditions were given, but all other factors were present. Chief instructor must compute the rate of spread in advance in order to assure that the fire may be controlled within the planned area.

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Device for Protecting Cross Hairs on the Osborne Fire Finder

Loneliness is an occupational hazard for towermen. That's why I am always glad to entertain visitors at my tower. However, I soon learned that visitors, especially young ones, can cause damage, being particularly rough on the cross hairs on an Osborne fire finder. After replacing these on three consecutive Mondays (after the week-end rush), I devised a guard that has successfully protected the cross hairs ever since.

Remove the lid from any 2-ounce pocket tobacco can. Cut a slot in the bottom of the can just large enough to allow the upright holding the cross hairs to pass through. With slot at top, slip the can over the upright. A coat of paint will hide the advertising and make a neater looking job. This device need be removed only when taking a sight.—E. C. CAMPBELL, *Dispatcher, Ozark National Forest.*

THE WARDEN SYSTEM ON THE PLEASANT HILL RANGER DISTRICT, OZARK NATIONAL FOREST

B. F. SEIZERT

District Ranger, Ozark National Forest

Soon after the Louisiana Purchase in 1803, English-speaking settlers began to move westward into the Arkansas country. By 1829 the settlement of the Ozarks was in active progress. It seems safe to say that the settlement of land now within the Ozark National Forest began between 1820 and 1830.

The settler found that the forests were rich in the things he wanted—timber, game, soil. Like the Indian before him, he took from the forests most of the necessities of life. He hewed logs for his home and farm buildings. The trees furnished lumber for furniture, wagons, and farming tools. His meat consisted largely of game from the forest.

With the coming of the white man the depletion of the forest began. First the timber was cleared to make room for agricultural crops. In burning slash from his clearings, fires were allowed to run uncontrolled, killing seedlings and fire-scarring the larger trees. Finally, over a longer period of years, the lumber industry developed, taking the balance of choice and accessible timber. All this opened up the canopy of the virgin forest and resulted in a great increase in tree reproduction and herbaceous vegetation. The settler's mistaken remedy for bringing back the open woods, to improve pasture, kill snakes, ticks, and other insects and pests, was to set the woods on fire and then aid the spread of fire over the countryside. This brought on heavy coppice, or sprouting growth, oftentimes of inferior species.

The beginning of the Ozark National Forest was in March 1908, when the public domain within a large area north of the Arkansas and west of the White River was withdrawn from settlement. By 1909 it embraced a gross area of well over a million acres. Within its boundaries resided nearly 2,500 families. The early history of the forest was full of trouble and difficulties. It literally fought for its life. Opposition came from those bent on further exploitation and from settlers honest in their convictions as to their rights and practice. The creation of Forest Reserves in Arkansas, as elsewhere in the west and south, encountered resistance because it interfered with established privileges and customs. It was a new idea. The Federal Government was asserting the right of *all* the people in the protection of some of its remaining natural resources of timber, water, and wildlife.

The greatest single problem in administration was that of fire control. Early efforts to protect the land within the forest boundaries were made difficult by lack of roads, communications, personnel, and equipment. The greatest handicap of all was the lack

of interest, and an often antagonistic attitude of local citizens toward fire protection. With the beginning of the fire season in 1910, special efforts were made to detect and suppress forest fires. Fireguards, lookouts, and supplemental fire fighters were employed with instructions to hire fire suppression forces at an hourly rate liberal for those times. This was, in effect, the start of the warden system. This plan was followed from 1910 to 1913, inclusive, and it resulted in a larger percent of the forest being burned over each year.

Perhaps there were many reasons why this early effort failed—such as the setting of fires to get a job on the suppression crew and thus earn money. It was called "coffee money" or "tobacco money" in those days. But, according to James M. Wait, who first worked for the Forest Service in 1909 and who is now retired, the underlying and basic reason was the fact that the local population had not been convinced that the prevention and control of wildfire meant a great deal to them personally and to their children.

Forestwide protection was given up as a failure in 1913. In January 1914, fireguards were assigned to towers in two different areas. The guards were given specific instructions to use their best efforts, singlehanded, to keep fire from burning over a given area of 8 to 10 thousand acres surrounding the tower. This resulted in fairly good protection for these limited areas and at the same time set up demonstration areas where the public could see the results of fire protection. This was the first real beginning of public education in the value of fire protection on the Ozark.

About 1924 the forest began to receive more funds for the construction of roads, trails, telephone lines, and lookout towers. Public cooperation and good will were fostered constantly. The story of fire prevention for forest benefits was carried to every school and community by the use of movies and slide lectures. In 1925, fire protection was established on the forestwide basis that exists today. (Fig. 1.) At this time a large road-construction project was in operation. Manpower for fire suppression was available from the road camps and only a limited number of trusted friends of the fire protection program were hired as supplemental help for fire suppression. Around such farsighted citizens as these was formed the nucleous which finally resulted in the fire warden system as we know it today on the Pleasant Hill District.

An intensive educational program was started June 30, 1925, when James M. Wait was assigned full time to this type of work. He traveled over the forest in a Model T truck showing slides prepared from local pictures, together with a few movies (fig. 2). His shows were very popular with the younger people. Even today we hear local men, now grown and with families of their own, relate how they would travel by horseback to several different communities to see the Forest Service show over and over again.

These early struggles, while they appeared hopeless at times, nevertheless laid the groundwork in respect and understanding for the objectives of the national-forest program that made possible a successful, interested, and alert warden system in later years.

FIGURE 1.—A secondary lookout point in use about 1926. Note telephone box attached to trunk of tree.

From 1933 to 1942, during the existence of the Civilian Conservation Corps, with abundant manpower available, the warden system was not on an active basis. However, the idea was kept alive by the fact that many citizens were interested enough to cooperate by promoting fire prevention, reporting fires, and helping with their suppression.

The present fire warden organization on the Pleasant Hill District originated about January 1942, and has since developed into a total of 14 fire warden crews (fig. 3). Of these, 10 wardens can be contacted by telephone and 4 by messenger. The 4 without direct communication take independent action on any fire they see. In addition, 6 warden crews on adjoining districts are called upon for initial suppression action.

A warden meeting is held annually to review fire suppression technique, discuss and demonstrate new methods, and emphasize safety. At these gatherings of wardens and Forest Service men, two distinct highlights have developed. As a group and as individuals, the wardens ask what they and their neighbors can do to

FIGURE 2.—Outdoor fire prevention movies about 1927.

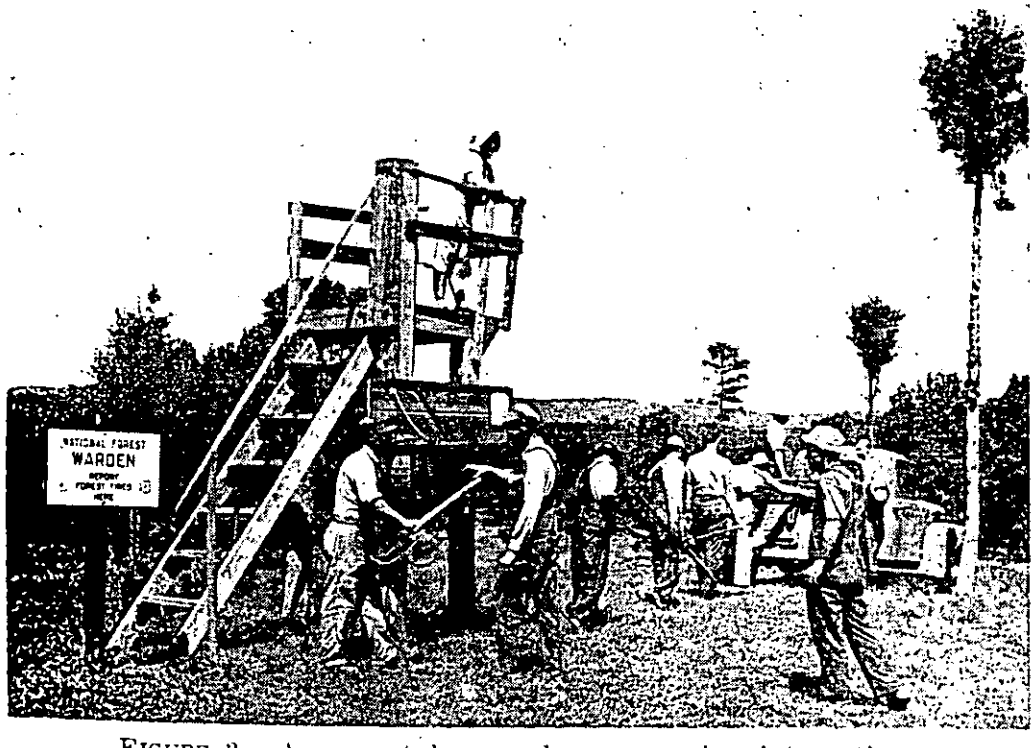

FIGURE 3.—A present-day warden crew going into action.

help the progress of *their* forest. Then there is always a request by Forest Service employees for suggestions on how *they* can be of greater service in their area, particularly in fire prevention. Many worthwhile suggestions are always offered and a general feeling of friendship, sincerity, and mutual respect prevails. It is here that the esprit de corps is given its annual renewal. At the

same time, there is evident a spirit of friendly competition present between wardens and communities, each striving for a better fire record.

The warden of today is much more than just a casual cooperator who will gather a crew to fight a wildfire when called upon to do so by a forest officer. He is a friend, neighbor, and respected advisor of the ranger. He is more than a key member of a fire protection organization, he is a person, a person of standing, looked up to and respected in his local community. Several of these men have business places, such as small stores and filling stations. They make many fire prevention contacts with tourists, hunters, and the local "home folks," in connection with their business. They make, by far, the best and most effective contacts.

A number of the warden jobs have been handed down from father to son, as in the case of C. Wofford Young, who started as a warden in the very early days, and his son, Bud W. Young, who has taken over the job in recent years. Bruce Cox started as a cooperator and warden in 1925 and his son Rual Cox took over the job as warden in 1948. Both take a very active part in our organization. When the first-generation warden steps back and allows his son to take over the active leadership of a suppression crew, it does not mean that he has left the organization. In every case it is apparent that he has maintained his efforts in fire prevention and thus remained a valuable and important member of the warden system. Several of the wardens own substantial areas of timberland. Bruce Cox owns about 600 acres of good pineland. Such men are definitely interested in growing timber as a crop, on their own land, and are also interested in the protection and management of national-forest land. They know the value of fire control to themselves, their children, and their community.

Without exception, every man in this warden organization is taking an active and voluntary part in fire prevention. This ranges all the way from giving a neighbor friendly advice about care with fire to personal contacts with new residents, travelers, hunters, and others—not only to warn about care with fire, but to explain what the prevention and control of fire means. It is an active and often time-consuming job for which the individual knows his only pay will be that deep satisfaction of having done something worthwhile.

Thus, we may trace the development of fire control and the warden system through the history of the Ozark National Forest and the Pleasant Hill District; a development from the use of a "wig-wag" system of communication to modern FM shortwave radio; the use of a tall tree on a mountaintop as an observation point to 100-foot steel towers and scouting by plane; from riding horseback or by wagon many hours to attack a fire with a handful of men equipped with primitive tools such as a wet towsack or potato hook to rapid travel by truck over improved roads with a well-trained crew supplied with modern handtools, knowing that if needed, other crews can be called by radio and that a tractor-plow unit is only a few miles away.

As impressive as these developments have been, there have also been those basic changes without which the other improvements could not have been effective. These are the development of interest and understanding of Forest Service objectives; of mutual respect and friendship between the forest resident, the forest user, and the Forest Service employees and, as a result, the desire of the vast majority of the people living in the forest to offer a friendly and helping hand whenever necessary. Such cooperation was made possible by the untiring efforts and unswerving zeal of a handful of men of conviction, men who really believed what they taught in those early days.

The battle against forest fires can never be won completely. There is always the threat. Fires could burn every acre that has been carefully protected during the past years except for the constant care of the forest resident and the forest user, and the eternal vigilance of the forest fire protection organization—of which the present warden system is the key to continued success.

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Smokey the Talking Bear

Indiana has always been proud of its valuable hardwood timber and interested in protecting its 4,250,000 acres of woodlands from forest fires. In order to protect its woods, streams, watershed areas, and wildlife, Indiana foresters have stressed fire prevention, which is one of the most important phases of a fire control program.

Smokey the bear first appeared on Indiana's fire prevention posters in 1945. He was shown on our roadside signs, in our theaters and schools and could even be heard on the radio. Soon, most people had either seen or heard of Smokey warning about forest fires.

In 1951 Indiana used Smokey *the Talking Bear* as the main feature in a forestry booth at the State Fair. After that personal appearance he was in great demand all over the State. It is now estimated that more than 2 million persons have either seen or heard Smokey talk fire prevention and sing his song. He has appeared at 3 Indiana State Fairs, 3 Sportsman Shows, the 1953 Boy Scout Jamboree, winning first prize in the Conservation Division, Indianapolis; Indiana Conservation Club meetings, exhibits in store windows, and has made 5 appearances on 2 television stations.

One of the most effective methods of using Smokey *the Talking Bear*, we believe, is to localize the material and have different tape recordings for each special event. This has attracted thousands of adults as well as children. The theme in all the script and songs has been fire prevention, asking everyone to break matches, crush cigarette stubs and pipe heels, and to help us Keep Indiana Green.

Smokey appeared as a tree salesman at the Sportsman Show, Indianapolis Fair Grounds, this past February. He was selling tree seedlings to the public, and had his two little cubs with him, Cinder and Cinder-Ella. They were helping Smokey plant trees. Smokey's chatter and song were the big attraction of the show.

Officials of the Division of Forestry believe that Smokey *the Talking Bear* is one of the best investments ever made in promoting fire prevention in Indiana. He has become a favorite with the youngsters, and we plan to use him in the future at the State and County Fairs, Sportsman Shows, and on television. He is doing a real fire prevention job in Indiana.—JOE DEYOUNG, *Forester in Charge of Fire, Indiana Department of Conservation.*

FIRE CONTROL BENEFITS FROM A COOPERATIVE WILDLIFE AGREEMENT

B. A. EGER

District Ranger, George Washington National Forest

There has existed for more than a decade a cooperative wildlife agreement between the U. S. Forest Service and the Virginia Commission of Game and Inland Fisheries for the management of game and fish on the Virginia national forests. Mostly, it has to do with environmental development and improvement of cover, food, and protection. The work is paid for out of funds obtained from the $1 stamp required by the State to hunt or fish on national-forest land, matched with Pittman-Robertson Federal funds prescribed by law. It is planned and carried out by wildlife game managers and laborers under the joint supervision of Virginia State game technicians and the district rangers, plus guidance from the Game Commission's staff and the forest supervisor's staff.

These wildlife project crews are usually composed of 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 deputy helpers. To supplement the work of these law-enforcement men, there are a number of "roving" State officers.

There are 3 or 4 counties within a ranger district on the national forest. Hence, the group of Pittman-Robertson workers plus the State game law-enforcement men make a sizable and important part of the forest ranger's fire control organization. Most of the county game wardens are also State forest fire wardens. Nearly all of their cars now have FM radios that hook up with the county sheriff's office and his police officers' cars. The sheriff's office, by radio or teletype, is hooked into the Virginia State Police network. The ranger's wildlife crews carry portable radios that can communicate with the national-forest fire towers and so into the fire control dispatcher at the ranger office.

All of this, by prearranged cooperation and planning, gives an efficient network of men over the district for the dissemination of prevention education; enforcement of the State brush burning and forest fire laws; detecting, reporting, and investigating smoke; and in the case of larger fires, taking part in their suppression and augmenting the communications system on and around them. 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 serve as fire prevention contacts among hunters and fishermen when they are afield during the open season, which is usually at the time of high fire risks and hazards.

Another highly beneficial cooperative work arrangement 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 the matter of 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 the fire is confined to the State area, the State pays for suppression and makes its own report on the fire. If the fire is within the national-forest protective area, we pay for the suppression and make the report.

Most of the State county fire wardens have pickups equipped with pump, hose, and suppression tools. They also have radios that tie in with the sheriff's office 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 county fire trucks of the city type authorized and purchased by the county boards 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 incipient stages. Some of these trucks are equipped with radio.

For its own organization the Lee Ranger District has a widespread system of national-forest wardens, about 40 crews with a mobilizing potential of 250 men. Schoolboys from nearby high schools are organized and trained jointly by State and Federal officers. Colleges and military institutions close 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 frequently suppress fires in the fields and woods and near their municipal boundaries.

Thus, the State Game Commission, the Virginia Forest Service, county supervisors, State educational institutions, municipal agencies, and local citizens, together with the U. S. Forest Service, cooperate in maintaining a fire control force to protect all woodlands and forests within their sphere of activity. As a result, many fires are prevented and the average size of fires is kept to a small acreage. 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.

FOREST FIRE PREVENTION LESSONS—JUVENILE SIZE

ANNE C. ALLEN HOLST

Chief, Cedar Hill Forest Fire Experiment Station of the Cedar Hill Fire Department, Cowesett, R. I.

We all admit the time to teach them is when they are young, for lessons learned in the formative years are usually retained throughout life. But how can we present the forest fire prevention lesson to 7- and 8-year olds so that they can understand the importance of "doing," as well as of "listening"?

Brownie Scout leaders, Cub Scout leaders, and leaders of other youth organizations have an unparalled opportunity to give the forest fire prevention lesson to our youth. But many of them hesitate to venture an opinion on how effective the lesson is when it is presented by simply lecturing on the causes and effects of forest fires and the reasons why fires must be prevented, and giving out posters and literature. How much DO the children really absorb by this method?

Two Brownie Scout leaders of the East Greenwich (R. I.) Council, who were dissatisfied with the usual method of giving the forest fire prevention lesson to their 7- and 8-year olds, requested help from this station. The leaders wanted a program of "doing," preferably working with the hands, to carry home the lesson to these active, restless, little girls. The program could not entail the spending of any money, because the troop budgets made no provision for such an expenditure. And, the leaders pointed out, the working capacity of 7- and 8-year-old little girls is decidedly small.

After considerable thought, it was decided that a handcraft project would most logically meet the requirements. Materials for the project would be from the natural resource that the children were being taught to save from fire. The finished bit of handcraft, when carried home, would be inspected by the parents with more curiosity than the usual fire prevention literature or poster. And, the bit of handcraft might be placed on exhibition in their homes, where it would be called to the attention of relatives and friends. It was thought that the potential circulation of the children's fire prevention message might be relatively high.

The name for the project was "Conservation Messengers." These messengers were twig dolls made from the small branches of trees. Head, hands, and feet, cut from almost any type of paper and colored, were glued on the five ends of the twig, or branch (fig. 1). The glued-on costume was made from two large oak leaves that had dried to a leathery texture (the project was carried out in the fall.) The fire prevention message, hand-lettered, or stamped on a small cardboard square (cut from laundry shirt-cardboards) was attached to a toothpick handle that was glued or taped to one hand of the messenger.

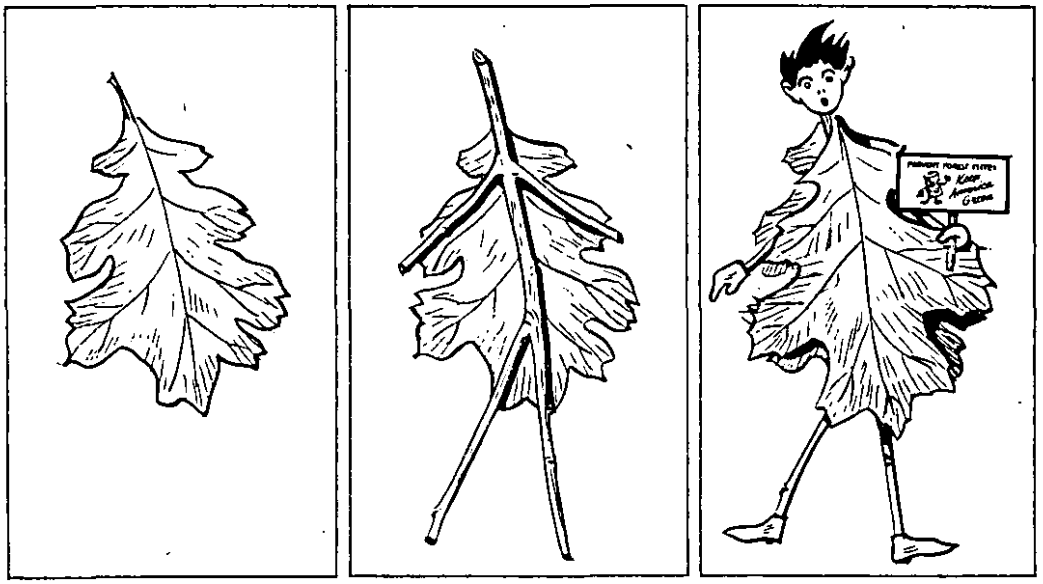

FIGURE 1.

M. L. Holst, station forester, selected and cut the forked branches for the project, to assist the Scout leaders. The station's rubber stamp, reading "Prevent Forest Fires—Keep America Green," was loaned to the leaders to use in stamping the little cardboard placards for the messengers.

This project was so enthusiastically received, by both the Brownie Scouts and their parents, that a real interest in forest fire prevention was aroused. To the Brownie Scouts the little twig dolls became real people, the people who are the trees they must save from fire. Intense pride in their own workmanship was aroused by the easily constructed and very effective messengers; and many of the Brownies made several to give to relatives.

As a followup and also as a prelude to the high-hazard spring forest fire season, the troops were invited to hike to the station the following March, where they were taken along a quiet dirt road for a ride on the gleaming red forest fire tanker truck. The thrill of their young lives was occasioned by the sounding of the truck's siren! Smokey Bear was host, and each Brownie Scout, when saying goodbye, displayed her good manners by taking his paw and thanking him for the lovely ride.

Smokey Bear was painted on carton cardboard with showcard paints and then cut out by the staff artist for the occasion. The time required for this piece of work was most worthwhile, because the children now identify the Smokey Bears on roadside billboards and posters as a very real person and friend—their host when they rode on a real fire truck!

MINNESOTA'S FIRE CONTROL UNIT ORGANIZATION

DON WILSON

Regional Coordinator, Minnesota Division of Forestry

Minnesota, like other States with forested areas, has experienced unusual fire situations that have overtaxed the regular trained personnel as well as equipment facilities. Most frequently lacking was a sufficient number of trained administrators. When such situations arose there was no choice but to quickly shift the nearest available personnel regardless of their experience. In many cases the men were assigned tasks to which they were not best suited, and often they did not become familiar with their responsibilities until too late to be of much value. Even with Minnesota's great advance in forest fire control through increased personnel and equipment, it was felt that sooner or later we might again be faced with extreme conditions and that we should be prepared to meet them.

The responsibilities of the Minnesota Division of Forestry, in addition to forest fire control, includes timber sales and management and forest tree nursery production. The division also maintains a construction crew. Although men in the subdivisions have their own special duties, they are sometimes used locally in unusual fire situations. For this reason they have had various degrees of experience in fire control. Here, then, was the experience and training needed in those unusual fire situations. The only thing necessary was to properly assemble and equip them.

Early in 1952 an organizational structure was set up to carry out the administrative functions necessary on a large fire. The following 16 positions were decided upon:

(1) The *fire boss* would be in complete charge of the entire fire organization and would have three direct assistants, namely, (2) the *line boss* on suppression activities on the line, (3) the *plans and records boss* to gather and assemble information, and (4) the *service and supply boss* in charge of services and supplies. In addition to these heads, there would be on suppression activities four (5, 6, 7, and 8) *sector bosses.* Crew foremen and other specialized personnel on the fireline would be drawn from local sources. In the information section, and working under the *plans and records boss,* would be (9) a *reconnaissance and map officer,* (10) a head *timekeeper,* and (11) a *communications officer.* It is hoped that at some future time each unit will have a man assigned to gather information on weather. Fire scouts in the information section would be recruited locally, since local people are better acquainted with the area than our own men. The service and supply section would also have (12) a *supply officer,* (13) a *transportation officer,* (14) an *equipment servicing officer,* (15) a *property officer,* and (16) a *camp boss.* It is hoped that we may eventually be able to add a safety officer.

Since definite responsibilities are outlined for these 16 positions, each man knows what his duties actually are. In addition each man has acquainted himself with the responsibilities and duties of all the other positions so that he can take over another position in an emergency or even serve in a dual capacity.

The physical features of Minnesota make it possible to roughly classify the forested area as lowland peat, rocky terrain, and level upland. Three complete fire control units were accordingly set up. In the northwestern part of the State we have large areas of lowland, much of it grassland intermingled with timber swamplands as well as timbered uplands. Experience has taught us that in an extremely dry year these grass lowlands are more likely to burn, and that they will also very likely ignite the peat soil and thereby create an extremely bad situation. Our Fire Control Unit No. 1 is made up of men who have had considerable experience in combating this type of fire and who are generally working in or near this section of the State. This facilitates quick action in getting the unit to such a fire.

Our second type of terrain is the semimountainous and rocky region in the northeastern part of the State. In general, this protection area is isolated and subject to lightning strikes, which have resulted in some very stubborn and destructive fires. Fire Control Unit No. 2 is made up of men who have had experience in this type of fire suppression and who are generally working in or near this region.

The remainder of our protection area lies in the south-central part of the State. It is generally level to gently rolling with a variety of soil and timber types varying from sand and jack pine to heavy clay and heavy hardwood stands with scattered timber and open swamplands. Fire Control Unit No. 3 is composed of men who are experienced with the type of fire that might occur on these lands and who normally work in this area.

In assigning men to their respective units much thought was given to evaluating their experience as well as to placing them so that in an emergency travel time would be reduced. Following placement, meetings were conducted at which assignments, responsibilities, organization, and individual training and unit functions were discussed. "Dry runs" were then held in which a fire situation was set up for each unit in the particular type of country to which it would be called. The fire situations were set up so that each unit began its operation as it would on an actual fire, even to the extent of arriving at the solution to the fire problem.

Unit kits have been assembled and are kept at our Grand Rapids Supply Depot. There is a separate kit for each unit and each kit contains everything that it is felt the unit will need to carry out its operation—office supplies and equipment, communication equipment, and servicing and camp supplies.

When fire conditions approach the critical point, each unit member will be notified that his unit may be called out. He will then prepare himself to leave on a few minutes' notice and will plan his regular work so that he is near a telephone or where he

may be reached quickly. When the services of one of these units is needed, the members will be notified by radio or telephone and each member will proceed directly to the fire. At the same time, the Grand Rapids Supply Depot will be requested to deliver the supply kit for this particular unit to the fire area. Local fire control men, who now know that a fire control unit is moving in, will determine the fire camp location, recruit local personnel, and make other advance preparations. When the unit arrives, which normally should be in less than 2 hours from the time it is notified, everything will be in readiness for it to begin work.

It is our hope that conditions will never warrant calling out one of these units, but when and if it does become necessary, we feel that Minnesota is much better prepared to handle the fire situation than ever before.

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For Added Safety and Pleasure in Your Mountain Flying

1. Demand good maintenance; know your equipment and make a thorough preflight inspection. Take nothing for granted and avoid unnecessary worry enroute.

2. Know the limitations of your airplane. Be sure that you are well acquainted with its stall flight characteristics.

3. Do not overload, or try to stretch gasoline or daylight. Carry ample fuel and oil reserves but reduce excess weight to a minimum at all times. Mountain fields are marginal and midday air undependable. Early morning is the best time for greatest safety and pleasure. Avoid mountain field and canyon operation on windy days.

4. Always keep an ace in the hole. Never go beyond where you can safely complete a 180-degree turn. Stay near one side when flying up stream in small drainages for best emergency get-away possibilities. The most difficult position from which to complete 180-degree turn is from center of canyon.

5. When crossing ridges at low altitude, approach from 45-degree rather than 90-degree angle to facilitate turn back if found necessary.

6. When dropping cargo or messages, study terrain from safe altitude before beginning drop operations. Always approach drop spot toward best getaway. Remember—a throttled airplane continues to lose altitude for quite a period after power is re-applied.

7. Guard carburetor heat at reduced power conditions when in cool, high humidity air. Carburetor ice can sometimes form in sunshiny weather.

8. Avoid long power-off glides to assure immediate power availability on landings. A power-on approach with a warm engine is much safer than a long glide and a cold engine.

9. Always "screen" gas from barrels or emergency containers for water contamination. To dispense with this precaution is to invite suicide.

10. Have a memory picture of primary drainages of area to be flown. Fly drainages and passes in marginal weather rather than direct courses. This way flights can be completed that would otherwise be impossible.

Remember—there are basically two rules every individual should know and respect: (1) *The difference between riding on air and mushing through air* (learned in stall flight practice); (2) *when not to fly* (learned by continuous evaluation of capabilities and limitations). *NEVER OPERATE AGAINST YOUR BETTER JUDGMENT.*—CLARE A. HARTNETT, *Airplane Pilot, Region 4, U. S. Forest Service.*

TRACTOR LOADING

W. E. MILLARD

Motor Equipment Superintendent, Central Repair Shop
Michigan Department of Conservation

Michigan has been concerned for several years about the danger of loading and unloading on trucks, by means of loading planks, two-way plows that are attached to tractors. Irons on the rear of the truck bed had to be heavily constructed to accommodate loading planks that were so large they could not be readily handled by one man. Later, two 70-gallon water tanks, a pumper, and a hose reel were added which, when the tanks were filled, brought the tractor gross load up to 6 tons—too much for either truck beds or loading planks.

Semitrailers especially designed for our specific tractor loads were tried. However, they did not prove very satisfactory because the trucks were unable to negotiate trails and bad roads with them as well as with a truck-mounted unit.

Last year, through the efforts of personnel in Michigan's Upper Peninsula, a standard model of a hydraulic truck hoist and hydraulic winch was purchased and installed on a C. O. E. 134-inch wheelbase truck (our standard model for several years past) which was rebuilt to a 158-inch wheelbase. Although this model of lift and winch was developed for a load several thousand pounds lighter than our needs required, it exhibited a great potential in safety.

A manufacturing company in Cedar Rapids, Iowa, agreed to build three units to our specifications, which included heavier cable, larger diameter winch ram and platform lifting rams, heavier channel iron for the hoist main frame, and a longer box weld on the rear of the hoist over the pivot point. These were the points on the original model that needed to be strengthened to meet our needs.

We now have the 3 lifts and loading devices mounted and have completed the construction of the truck beds using 4-inch channel-iron crosspieces, 5-inch channel-iron side rails with a 1⅝-inch hardwood bed. The hydraulic winch, with a ⅝-inch cable, will load the tractor, plow, and tanks filled with water at engine-idling speed. If the engine stalls for any reason, the hydraulic valve locks the ram. The engine can be restarted without the possibility of the tractor running uncontrolled off the truck. A separate valve not only raises and lowers the truck platform but will also hold the platform in any position with or without the motor running.

The tractor is pulled by the winch cable to the front of the truck bed while the bed is inclined (fig. 1, *top*). The bed is then lowered into conventional position (fig. 1, *bottom*), after which the valve mechanism is held in lowering position for several seconds until a distinct snap indicates that the locking linkage at

rear of truck has been pushed forward, off center. This locks the bed so that it cannot be titled by steep road pitches or shifting of the tractor and is, of course, a distinct safety feature. In addition, the winch hook is left attached to the tractor and thereby keeps the tractor snubbed tightly against the chucking blocks at the front of the truck bed, eliminating the possibility of tractor running off the rear of the truck when a severe incline or a chuckhole is encountered. We also advocate that tractor brakes be set and the transmission left in low gear while the truck is traveling.

FIGURE 1.—*Top*, Tractor is pulled to front of truck bed by hydraulic winch; *bottom*, truck bed is lowered and locked into position by valve mechanism.

We believe that for our specific loading and hauling problem a C. O. E. truck, approximately 157-inch wheelbase, is the most satisfactory. Weight distribution on this truck is as follows: Front end of the loaded truck, 5,320 pounds; rear end, 15,500 pounds; front

end empty, 3,360 pounds; rear end empty, 5,660 pounds. The truck bed is 16 feet 3 inches long and 89 inches wide, this width being the same as the front fender overall width and as narrow as construction will permit when using 8.25 x 20, 10-ply tires that must have sidewall clearance from the 5-inch channel wide rail. Total bed height is 48 inches, being equal to or considerably less than the average of comparable conventional truck models. Truck-bed blueprints may be obtained from the Michigan Department of Conservation, Central Repair Shop, Gaylord, Mich.

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The Habit That Causes Forest Fires

Do you have the habit that causes forest fires? If you are a smoker, there is a good chance that you have. What do you do when you finish a smoke? Do you stop and grind out your cigarette with your foot or do you flip it into the street? Fires don't start from cigarettes flipped on the paved streets of towns and cities, but if you follow that practice you are a fire risk every time you go into the fields and forests.

You say you wouldn't think of carelessly flipping away a cigarette when you are back in the brush? We humans are all creatures of habit. If you smoke 10 or 20 cigarettes a day while in the woods, there is an excellent chance that in discarding them you will revert to habit at least once. It may take only one to start a fire.

Smokers are one of the leading causes of forest fires. In 1952, 2,391 fires started by smokers burned 74,000 acres on the national forests. Fortunately, a fire doesn't start every time a cigarette is carelessly discarded. Conditions have to be right for a cigarette to start a fire. This fact was strikingly illustrated during the deer season on the Ottawa National Forest last fall.

The Ottawa, in the west part of Michigan's Upper Peninsula, has an average of only 35 fires a year. The forest provides excellent deer hunting. Each year an estimated 20,000 people hunt here during the season November 15-30. Snow usually eliminates the danger of forest fires at that time, but in 1953 the ground was bare. On the first day of the '53 season, 2 fires started. On the second day the weather changed—a high-pressure area moved in, dropping the relative humidity to the lower twenties—not critical, but dry enough to make fires easy to start. Within 3½ hours in the afternoon that day 9 fires were started—none of them purposely. This was 25 percent of the yearly average.

The only way you can be sure that you don't start fires is to break the habit of carelessly discarding your smokes, whether in town or in the woods. The importance of habit is well illustrated by an old story. A Britisher was visiting his cousin on a wheat ranch in western Canada. The Britisher noticed the Canadian grind the butt of his cigarette into the snow-covered ground. "Why do you do that?" asked the Britisher. "A few years ago I lost my entire crop in a prairie fire," said the Canadian, "and I want to make sure I never start a fire." "But," said the Britisher, "you couldn't start a fire with snow on the ground." "That's true," answered the Canadian, "but I could start a habit."—*Ottawa National Forest.*

INEXPENSIVE BACK-PACK OUTFITS FOR BACK-COUNTRY FIRES

M. O. ADAMS

Forest Dispatcher, Shasta National Forest

For many years the rangers on the Shasta National Forest have been faced with the problem of furnishing fire crews on back-country fires with back pumps for mopup purposes. Many times the crews go into the fire with tools and food and plan on a dry mopup but on arrival at the fire they find a spring or small stream in the vicinity which could be used to hasten the mopup if a back-pack pump was available. Situations like this have resulted in the airdrop of a standard back-pack or a rubberized collapsible pump.

Another type of situation involves the fires in the back country and dry lavas where there has been no water available but where conditions have called for water to expedite control and mopup of the fires and for drinking and cooking. Here again airdrops of water and back-packs have been made to aid the fire crew in their work. The first situation continues to be answered by the airdrop of the rubberized type of back-pack outfit. The answer to the second situation has been obtained as explained here, resulting in a saving of government funds for fighting fire.

During the 1952 fire season this forest had many lightning fires in the back-country and lava sections where no water was available. On one of the fires it was known that the fire crew being dispatched would require water for drinking purposes. Fire crew foreman Hahn was advised that there would be a water drop to the fire. Having been on similar fires in the past and realizing the need for rapid mopup with water, Foreman Hahn had been perfecting a tool that could be airdropped with the standard 5-gallon water can and which would convert the water can into an adequate back pump. Hahn requested that his device be dropped with the water and he would then give the outfit a field trial. The request was granted and additional water was dropped to assist in the mop-up stage of the fire.

After this fire had been controlled and mopped up in the Class B stage, Hahn and Forest Dispatcher Adams discussed the results of the trial, its value and its application to like problems in the future. The results of the experiment and a physical demonstration of the outfit were given to Fire Control Officer Bangsberg who authorized the purchase of enough parts to build six outfits. Since that time back-country dry area fires are controlled and mopped up with the assistance of the inexpensive back pump. It is a trombone type hand pump with attached hose and tank rod. One of these pumps is attached to one of the cans of water to be airdropped. As soon as the parachute is detached by the ground

crew, the tank rod, which has a beveled point, is pushed through the water can cap (fig. 1). The can is then carried by the bail handle to wherever it is needed and the operator uses the pump in the same manner as a regular type pump.

The water cans used in Region 5 are large-mouth honey cans of 5-gallon capacity. These are disposable so that upon leaving the scene of a fire the cans are abandoned and the pump is brought out by the crew and returned to stock. As all fittings of the pump are snap-on, it is a simple process to uncouple the three parts and stow them in a pack sack. The use of this type of pump is now standard on the Shasta Forest and one is always included in all water drops.

The cost of the pump for water can use is about 14 dollars. A regular type back-pack outfit costs in excess of 20 dollars and is subject to much damage when airdropped. The collapsible pumps are even more expensive and the rubberized tank is subject to rapid deterioration in storage and the unit will not hold up under rough usage. This trombone type pump with its small maintenance problem will give years of service and fits the needs of back-country fires.

FIGURE 1.—Tank rod for pump will be inserted into hole in cap.

PACKAGING FIRE TOOLS FOR QUICK GETAWAYS

LLOYD A. HAGUE

Fire Control Officer, Toiyabe National Forest

Packaging fire tools for a quick getaway from the warehouse or ranger station for 25-man crew units has been done in a number of different ways. One method on the Toiyabe National Forest has been the use of an open-top wooden box, constructed of ¾-inch lumber. These boxes, containing only tools and equipment (fig. 1), are designed for quick delivery by truck to the base camp or to the fireline. A typical unit includes the following: 13 baby shovels; 10 pulaskis with sheaths; 2 McLeod tools; 25 headlights; 100 batteries; 10 1-gallon canteens; 12 1-gallon water bags; 3 pack sacks; 10 fuses; 1 25-man belt first-aid kit; 1 timekeeper's kit.

The complete set of tools plus the box weighs approximately 250 pounds. When packed, all equipment is below the top of the box, allowing the boxes to be placed one above the other. Inside dimensions of the box are depth, 16 inches; length, 4 feet 6 inches; and width, 22½ inches. The ends of the box are reinforced with metal-tape binding, and the slat handle and the outside braces at each end are fastened with screws.

On one fire last summer 2 men loaded 5 of these boxes (tools for 125 men) on a truck alongside the loading ramp in 5 minutes. This or similar packaging insures that all necessary tools and equipment arrive complete and with a minimum of effort and a considerable saving in time. These boxes are sturdy enough for use as seats in fire camps, and have proved to be handy containers for returning loose tools to the reconditioning point after the fire.

Another method of packaging, not original but which we have adapted for use, is a 25-man unit for those fires where the fire fighter will be required to pack the tools some distance and possibly to subsist on prepared rations for a day. This 25-man unit consists of 3 elephant bags, all of which are painted on the outside with a large black capital letter to identify them as part of a 3-bag unit.

One bag contains 10 sheathed pulaskis and 15 baby shovels. These are packaged in units of 5 and sharp edges wrapped with scrap canvas to prevent wear and possible puncture of the canvas bag. This bag weighs approximately 120 pounds.

The second bag contains 12 1-man outfits: 1 C-ration (1 man, 1 day); 1 headlamp with 4 batteries; 4 extra batteries; 1 file; 1 canvas water bag; 1 individual first-aid kit; 1 soap and towel. These items are in individual packsacks. In addition, the bag contains one timekeeper's outfit for 25 men. This bag weights approximately 130 pounds.

The third bag contains 13 similarly equipped packsacks and weighs approximately 140 pounds.

FIGURE 1.—*Top,* Box and contents for a 25-man unit, for delivery by truck to base camp or fireline; *bottom,* a 25-man unit in 3 elephant bags, for use where fire fighters must pack tools some distance and perhaps subsist for a day on prepared rations.

A "PREFIRE" RATHER THAN A "PRESUPPRESSION" ORGANIZATION

PAUL STATHEM

Region 5, U. S. Forest Service

Fire control has long been one of the more important problems of unit managers in the National Forests of California. People working in fire control have a tendency to operate in a sphere of their own, calling upon other functional groups for assistance only when actual fires created work loads beyond their ability to handle, with the resultant interruptions to other important work.

Resource managers are continually looking for ways and means to correlate more effectively the overall unit programs, even planning resource management work in a way to facilitate accomplishment of the objectives of the fire control organization, minimum areas burned by wildfire.

Management of the resources enables the unit manager to exercise a number of controls. Timing of use, types of use, intensity of use, place of use, et al., are all more or less within his prerogative. The full use of these can assist in making possible overall correlated use essential to "the greatest good to the greatest number in the long run."

The material importance of fire control is readily apparent by comparison of functional budgets. One possible way for the unit manager to increase the effectiveness of overall unit management might be to restudy the fire problem to determine if the most effective use is being made of facilities available. It is apparent from time studies that any increase in the efficiency of the fire group can, as a minimum, make more time available for other resource management work.

This paper suggests that the possibilities of a "Prefire" rather than a "Presuppression" organization be fully explored by unit managers, "Prefire" being defined as all activities of a unit organization performed before a fire occurs, including *prevention* and *presuppression efforts.*

Presuppression includes those fire control activities concerned with the organization, training, instruction, and management of a fire control organization . . . to insure effective fire suppression. So says the Glossary of Terms of the Forest Service. Rather positive in one approach; quite negative in another, in that it accepts the fact that fires will occur. Undoubtedly, they will, but there is no basic reason why a great many of them have to occur.

A land manager accepting the premise that fires—man-caused fires—are going to occur in current numbers anesthetizes his reasoning powers to the extent that such fires undoubtedly will occur. With such an assumption on his part, his creative thinking must be devoted to developing an organization to attack them hard and fast, and putting them out, not preventing them from occurring.

Historically, in at least some areas of the Forest Service responsibility, the priority need was to learn techniques involved in

putting fires out. This was a "must" if the objectives of good land management were to be attained. Uncontrolled wildfire was not compatible with good land management practices on wildland areas. Burned areas had to be reduced.

It was logical the first step should be to develop an organization to keep them small, to prevent the large fire from occurring. Consequently, time and effort were directed to this immediate problem. The result has been what is commonly referred to as the presuppression organization, the fire organization hired and trained to put out the fires during fire season. The development of such an organization has not been easy. Many years of basic research were involved. Adequate transportation systems, communication systems, and physical plants had to be scientifically planned and constructed, according to the actual demands indicated by fire occurrence and severity statistics. Great strides have been made in effectively recruiting, training, and employing the personnel needed to implement the planned physical phases of the job.

Measurement of the success of the job has largely been in terms of comparison of current burned areas with 5- or 10-year averages. However, acceptance of historical burned area averages as a mean from which to deviate may or may not be sound in measuring the effectiveness of a *fire suppression organization.* By the same token, measurement of occurrence on a similar basis is not necessarily sound as a true indication of satisfactory performance of a prevention organization.

The prevention of fires—what I like to consider as *the other essential part of a well-balanced prefire organization*—is just as subject to scientific analyses and measurement as the presuppression job. By analysis the size, timing, and complexity of the job can be measured. This analysis can give the total "risk potential" for any area analyzed. Thus, true measurement of the success of a prevention program would involve measuring reduction of the potential.

Even though this sounds complicated, it is simple in application. Dumps can cause fires. They can be treated to reduce their ability to start fires. The action necessary to be taken can be measured on the ground. Until such a time as we have more complete control of those factors influencing occurrence such as wind, temperature, humidities and fuel moisture, measurement of the reduction of the potential is more reliable than actual starts. A unit manager could be lucky and abate few if any of the risks and still have a favorable season. Along comes the tough season in terms of adverse weather and the luck tends to be commensurate in an inverse ratio with the effectiveness of the prevention effort.

There are some who will argue that to change to a prefire organization from a presuppression organization costs additional fire money. Experience has indicated this is not necessarily so unless one accepts the premise that the prevention job will be ineffective—that there will be the same number of fires to fight with the fire fighting organization. The need is to consider the *overall* job, recognizing that the prevention job will be effective and that

there will not be as many fires to fight. On this basis, costs of the overall job may actually be less than those current. The acceptance of the philosophy that a man on prevention work is not available for first attack is erroneous. He is, perhaps, less effective, depending upon transportation and communication facilities used in the specific job. Personal experience, however, has indicated he is often more effective inasmuch as prevention work, on a priority basis, is among the risks, the places where fires occur, not off in some remote area not subject to risks.

Since the principles of determining a presuppression organization are well established, there is no need to discuss them here. The approaches to the development of a prevention organization, while not as well defined, can be briefly summarized.

Fire prevention includes four phases of activity: (1) Mass media approach, (2) pinpoint approach, (3) hazard reduction, (4) law enforcement. Each activity has its place in an overall program. Causes by classes as carried on form 929's can be broken down into priorities of effectiveness of approach; i. e., railroad fires are susceptible to "pinpoint" and hazard reduction approaches, smoker fires to mass media, etc. A logical breakdown is as follows:

Cause:	*Mass media*	*Pinpoint*	*Hazard reduction*	*Law enforcement*
Railroad	....	1	1	2
Lumbering	....	1	1	2
Campfires	1	2	2	2
Smokers	1	2	....	2
Debris	....	1	1	2
Incendiary	....	1	....	1
Miscellaneous	1	....	....	2

The "miscellaneous" class is subject to various approaches, depending upon specific causes. "Children playing with matches" calls for mass and pinpoint approaches; blasting, for pinpoint, etc.

Need for a prevention effort cannot be predicated upon fire occurrence history alone. History is one factor. Risk analysis is a much more important factor. Success of a prevention job must be measured by comparison with potential starts, not necessarily by a reduction or increase in numbers of fires.

This calls for an evaluation of fire origin potential by various uses, an evaluation that enables measurement in tangible terms. Attention can then be given to prevention effort necessary to meet the potential. As an example of this we can use a dump. Prevention effort needed to meet the specific problem can be measured in terms of hazard reduction and supervision of use of dump. Thus we come out with an indicated work load for the specific area. Collectively, all the risks on a district add up to a specific load of work. Administratively, this can be assigned in specific job lists. The fact that the dump has or has not caused a fire is not the important point. The measurement and correction of its fire causing potential is.

Analysis of the "risk potential" of the causes in the tabulation, unit by unit, determine the job to be done. Presumably this varies

materially between work units. This points to the fallacy of a more or less common practice of one prevention man per ranger district unit. Risk potentials just are not that universally distributed.

After the risk potential has been determined, the next step in the program is the determination of the medium or media to be applied to the specific problem. Four media have been indicated. Each has several possible avenues of approach. These are not necessarily constants even for any given risk potential. In one area, the way to a group of people may be through a local radio station. In another it may be through a local newspaper or even a "house organ." Both may be directed toward a specific risk potential. Both may accomplish the job. Both are in the mass media group. It is essential that the administrator determine the best media, and the best avenue within that media, in planning his program.

Ours is the responsibility for determining the best vehicle of approach. When that has been determined, recognition should be given to the fact that in the actual use of the media, there are specialists who know how they may best be applied. A newspaper editor is much better equipped to tell us how to tell our story in his columns than are we. A radio station program director knows best how the use of radio may be applied to our problems. The display and effective use of posters is a skill within itself. Advertising managers must have this skill. As administrators, we must recognize the line between our abilities and those of qualified individuals in the fields of the media we expect to employ. Just as we use the skills of our staff in related specific fields of land management, so must we solicit and use the skills of those best equipped to help us in the field of prevention. In effect, they should be considered as "staff" in getting the job done.

Balance in the application of the media employed is essential. We are sometimes confused in our thinking in the overall field of prevention because of lack of balance. Local pressures are implied to specific phases of our program because of emphasis needed on overall regional problems. "Smokey Bear," with all his appeal, cannot help a railroad problem involving starts from equipment. Unfortunately, the equipment can't read. This problem's needs are: First, a study to see if the equipment can be made more effective from a nonfire starting point of view; secondly, actual physical hazard reduction to stop potential starts. We must guard against any philosophy that the prevention job is being done when numerous posters have been displayed. Examination of the causes of fires indicates that only some of the specific risk potentials are subject to control by this mass medium. In areas of mass use, as in the forests of Southern California, the mass medium is much more pertinent than in the back country of the Sierras. In other areas, pinpoint is.

Balance is obtained only after risk potentials have been evaluated and job loads determined, unit by unit. Then, and only then, can we plan our program to keep the application of the various media in balance with the job at hand.

Priorities materially influence the effectiveness of prevention. They are essential if we are to make the best possible use of facilities at our command. They are determined primarily by values at stake, risk potentials (including weather effects), and tools at our command. A heavily used dump in a flash type country is much more of a risk in the early summer before it has been treated than is a miner's cabin up in the red fir country. The cost of an early summer fire in the flash country can be expected to be much more than one in the red fir country. Common sense dictates that preventive action be taken on the dump problem first. A dump below a low value watershed area is not as important as one below a high value timber area. The one threatening the timber would receive first priority. All risk potentials can be listed according to their priority in any given unit. This priority list, when compared with the tools at your command, including financing, determines the job to be done on the unit. It determines when and where and how often.

Measurement of accomplishments, then, becomes essential in an effective prevention program. The apparent tendency is to measure accomplishment by numbers of starts. Certainly this is a good indicator. It is not, however, the complete answer. Too many uncontrollable factors enter the picture. Perhaps weather conditions have been favorable. Use has changed. Or the use has changed into another cover type. The only reliable measurement that can be applied is actual measurement of the reduction of the risk potential, excluding the effect of the uncontrollable factors. This must be done constructively, taking into consideration (1) the existing risk potentials at the start of the program; (2) the application of the proper media to the indicated risk; (3) the balance of the program considering the potentials; (4) the full use of all available skills, in and out of service; and (5) the priorities of the jobs considering all factors involved. When such a measurement has been made, a sound conclusion can be reached concerning the effectiveness of the job.

Analyses of the media being employed by the Forest Service indicate a real need for research in several of the fields. Take for example our present policy on prevention signs. No real satisfactory answers are given to questions concerning their value. There seems to be little real enthusiasm for them among most field officers. One gains the impression that they are placed more from habit than from factual analysis of their value.

A similar reaction can be obtained concerning clearing on railroad and road rights of way. Areas are cleared because we know that is one way of preventing fires. That there may be other more effective ways is not accepted too readily by administrative men as their problem. Their position is when we know a better way we will apply it.

We must recognize, in addition, that the most effective approach from a prevention point of view may not necessarily be the best approach from an overall land management point of view. As an example, consider the railroad right-of-way clearing on the San

Bernardino National Forest, admittedly, quite effective in preventing fires. On the other hand, we prevent fires primarily to maintain cover on the watershed. Protection is good land management. How do we reconcile this with the fact that we are denuding each and every year roughly one thousand acres in this very important watershed area in our prevention of fires? Is this good land management unless we are sure there is no other satisfactory solution to the problem? What about fire retardents? Fire resistant species? Benefit ratios in terms of average overall denuding of the area? All of these add up to some of the answers we as land managers need.

These examples are pointed out only to emphasize the need for research in the prevention field.

In brief, then, a fire prevention program on any unit of the region to be effective must:

1. Consider the various approaches, recognizing the proper media to be applied to each risk potential.
2. Measure the job in tangible terms. Risk potential is the most important factor in the measurement.
3. Apply the media as the job measurement has indicated. Use of all skills, in and out of service, is essential.
4. Be kept in balance. Balance is determined primarily by types of risk potentials.
5. Recognize priorities of accomplishment, considering values, risk potentials, available time, etc.
6. Be measured in terms of reduction of risk potentials. Measurement considers all of the above five elements.
7. Recognize that there are some unknowns. Continuous searching for new and better ways is necessary.
8. Achieve a proper balance in the "Prefire" organization between prevention and presuppression to buy the most for the people's money.

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Butt Stations for Emptying Auto Ash Trays

Fire Control Assistant William O. Cotter of the Pacific District, Eldorado National Forest decided that there were too many smoker fires on the District, 23 during the four previous seasons. The District is cut in half by U. S. Highway 50 and each year thousands of motorists pass through apparently merrily flipping cigarettes along their way.

To prevent as many of these smoker fires as possible, Cotter came up with the idea of installing "butt stations" through the District at places where the motorists were stopping. The places selected were service stations, ranger and guard stations, work and construction camps, resorts, and drinking fountains. Each "butt station" consisted of a gallon can, painted bright red, hung on a post under a small rustic, routed sign with the wording "Empty ash trays here." Material needed for each "butt station" was a 4- by 4-inch by 5-foot cedar or redwood post; a gallon fruit can; two 4-inch wood screws; a 2- by 8- by 14-inch routed sign, either cedar or redwood; and about ½ pint red paint and 1 pint tobacco brown paint.

The help of the various operators was solicited. When a motorist stopped for fuel or drink he was asked by the operator if his automobile ash trays might be emptied. A little fire prevention talk was also included whenever

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PAPER SLEEPING BAGS

A. B. EVERTS

Equipment Engineer, Region 6, U. S. Forest Service

Paper sleeping bags have been in use for several years, and general conclusions regarding them can now be fairly well drawn. Some of the key points considered in the specifications and the opinions of several regions are set forth here.

The purpose of the bag, of course, is to replace the sleeping bags or bedrolls used by fire fighters. The standard kapok sleeping bag used in several regions costs about $24 f. o. b. San Francisco. The cost of reconditioning used bags (laundering, cleaning, repairing, fumigating, handling) is usually $2 to $2.50 each. In this region, when wet bags come in from late fall fires, the cost is even higher. If a suitable one-tripper paper bag costing not more than $2.50 could be developed, it is believed the project would be very much worth while. Volume purchases and competition among paper companies would probably insure a fair price. Advantages of the paper over the kapok bag are much lower initial cost; purchase cost less than cost of kapok reconditioning; less weight and less storage space; no return handling and freight costs; loss or theft no problem.

Region 1 of the Forest Service was assigned the project of developing, testing, and writing specifications for the proposed bag. After making heat tests on several samples submitted by manufacturers, the specifications were written. However, before issuing bids the specifications were shown to paper manufacturers; several suggested changes that would decrease manufacturing costs. Region 6 issued the first consolidated Service-wide bid.

Specifications call for simplicity, i.e., fancy trimmings are ruled out. This excludes tapered bags, drawstrings and the like, all of which would increase the cost. Briefly, the specifications are as follows:

Size and weight: Length, 6½ feet; width, 3 feet; protection flap, 32 by 36 inches; draft curtain, 18 by 44 inches; weight, 5½ pounds (plus or minus ½ pound).

Material: Bottom and top of bag, ¼-inch thick cellulose paper with 2 retaining layers of 40-pound creped (2 ways) and dry waxed craft paper. Cellulose paper may be bleached or unbleached. Retaining paper to be treated with heavy dry wax. *Flap* to be of reinforced paper, water repellent by treatment or asphalt inner layer. *Draft curtain,* flannel or other warm cloth. *Thread,* soft cotton twine used by industry for similar application, not less than 6-cord.

Construction: Sewed with twine or coarse thread, coarse stitch (approximately 3 per inch). Draft curtain (cloth) sewed into mouth of bag along top. Paper flap attached to the bag by sewing to bottom section.

In 1953, 7,000 bags (fig. 1) were purchased on bid for shipment to 17 designated places. The successful bidder was a San Francisco firm and the prices ranged from $2.04 each at the bidder's plant to $2.88 Denver; $2.23 Gallup, N. Mex.; $2.16 Portland, Oreg.

Because the paper bag is not as warm as the kapok bag and provides less padding, the 1953 bids requested manufacturers to state the cost of supplying ½-inch thickness instead of the specified ¼-inch for the bag's top and bottom. The increase in cost was given as 51 cents each and the weight of bag would go to 6¼ pounds. In general, the paper bags are considered warm enough for summertime fires. For early spring and late fall fires, a blanket can be added. Region 1 is considering using 4- by 7-foot disposable blankets that cost 60 cents each. Region 6 has straw ticks available in their fire caches for use as extra padding where straw is easily available.

Comments on use of the paper bags follow:

Southern Oregon-California smokejumpers: "A total of 63 fire jumps were made with these bags in various types of weather . . . at elevations up to 8,000 feet. Comments varied . . . from very satisfactory to complaints of their being too cold. Most users were under the impression that the bags would prove much more satisfactory if they were made narrower and with a drawstring." (Costs would go up. Why not a blanket?)

On many fires smokejumpers now pack out their own equipment. When eider-down bags are used, they of course have to be packed out. Because paper bags decrease the weight and bulk of "come out" equipment, there are plans for increased use of them in Region 6 this year.

Rogue River Forest: ". . . One paper bag will outlast the average fire . . . suitable for air cargoing . . . eliminates property accounting from theft and loss. Less weight . . . no packout job. Paper bags more roomy."

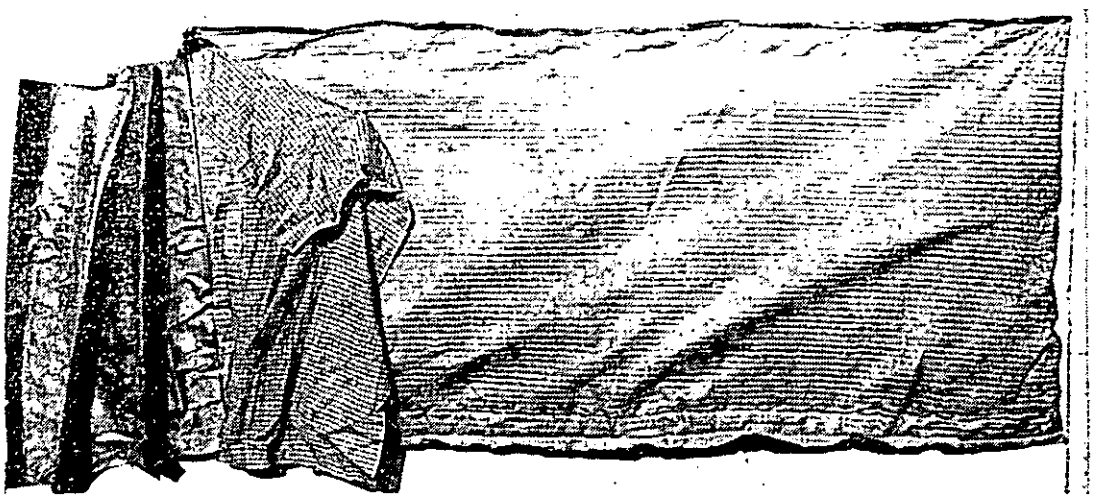

FIGURE 1.—Paper sleeping bag furnished under the 1953 bid specifications. The cloth draft curtain is shown outside the bag for illustrative purposes. The curtain drapes around the shoulders and helps prevent draft.

Region 5: "Eighteen-hundred bags were dispatched . . . most of them dropped to crews on fires in the back country . . . another 700 to 800 were used on the Angeles Forest. Some 200 were dropped to fire crews in the south-central Sierras . . . reports indicate . . . bag is completely satisfactory . . . believe it is time to step up use . . . plan to furnish 1 or 2 blankets . . . when used on postseason fires."

It seems apparent that paper sleeping bags are here to stay; we understand that the General Services Administration is planning to purchase from 18,000 to 30,000 bags this year.

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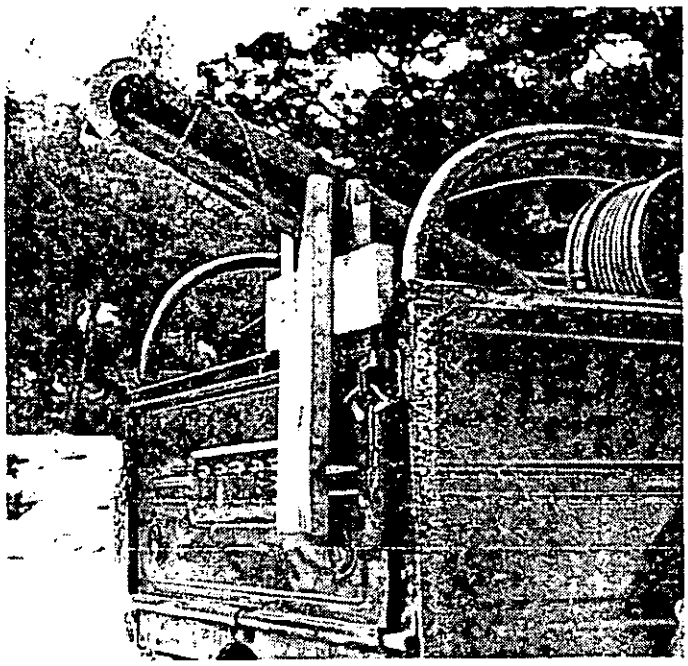
A Rack for Transporting Power Saws Safely

A safety rack for transporting power chain saws in pickups (fig. 1) can be built for approximately $2 in about an hour. Its principal advantages: Can be used on any type of pickup; gives protection to and prevents wear on the saw blade; makes easier saw loading and unloading; does away with the wrapping of saw blades to protect employees from injury. A small rope should be attached to the rack and tied to the stringer of saw blade to keep the saw from silding forward while being transported.—GEORGE W. MCLARTY, *Fire Control Assistant, San Bernardino National Forest.*

FIGURE 1.



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Continued from page 37.

practical. The operators were more than glad to cooperate in this project since many of the motorists thoughtlessly dumped their ash trays on the ground where they stopped.

During the first month Cotter collected from the stations a large trash can full of butts. These were later used as a fire prevention display at the Eldorado County Fair. The local and neighboring city papers "plugged" the "butt stations" with news items and cartoons. The efforts paid off well. No smoker fires occurred on the District during the season.—T. B. GLAZEBROOK, *District Ranger, Eldora National Forest.*

MARK YOUR FIRES TO FIND THEM

MERVIN O. ADAMS

Forest Dispatcher, Shasta National Forest

Have you ever been unable to find small lightning fires after they have been discovered by lookouts, because of tall timber, rough country, or very little smoke? Because fire control men on the Shasta National Forest had faced that problem time and time again, they incorporated the aerial marking of fires in their regular search procedures four fire seasons ago.

The Shasta is located in the northern end of Region 5, with ground elevations ranging from 1,000 to 9,000 feet. The eastern side is a volcanic plateau and mountain covered with pine forest and extensive brush fields. Much of this section is made up of rough, inaccessible lava flows. The western half of the forest consists of rough coastal mountains covered with a stand of mixed conifers.

In this rugged terrain there has been an average of 117 lightning and 99 man-caused fires per year during the past 15 years. The greatest number of man-caused fires (179) occurred in 1942, and that same year the largest lightning-caused fire destroyed 17,000 acres of second-growth pine. Two man-caused fires destroyed more than 12,000 acres each of forage and timber. One lightning and one man-caused fire started in the inaccessible areas.

When one considers the type of terrain, fire occurrence, the many areas blind to lookouts, and a fire season that goes 60 to 90 days without measurable rain, it is readily apparent that unless fires are located and manned rapidly, major fires can be the result. Since the Shasta fire control organization must meet these problems each year, it makes extensive use of airplanes for detection, fire scouting, smokejumping, paracargoing, and guiding crews in to fires. Planes are also used to move fire overhead rapidly from one side of the forest to the other, saving many hours of ground-travel time.

During the past 4 years the fire control force has endeavored to speed up initial-attack time and reduce burned area by marking fire location from the air with toilet tissue. All observers, during patrol or other flights, carry six rolls of toilet tissue in addition to the regular maps and message pods. Following any lightning storm that hits most of the forest, the number of rolls of tissue is increased to 12 to be taken along on the flights.

When a fire is discovered by aerial observation only, the pilot lowers the plane from search level to 300 feet above the ground, where he checks wind drift and makes a run over the fire area. The observer by this time has prepared a roll of tissue for dropping and has opened a window or cargo hatch. On signal from the pilot, he drops the roll of paper which unrolls until it reaches treetop level. By this time the paper has become a vertical streamer that drapes itself over the limbs of trees near the fire. A second roll is usually dropped so that ground crews can see the marking from any direction.

The same procedure is used when a plane helps a ground crew search for a fire, except that the plane makes a series of tight circles over the fire, then drops the tissue both for a mark and to help the crew get a compass bearing. The ground crew signals its location to the plane crew by using military signal mirrors. This enables the plane to fly directly from the crew location to the smoke. When this is accomplished, the plane crew drops a message to the ground advising the men of the best route to travel, the size and condition of the fire, and any other information that is needed.

In 1951 two separate ground crews searched a dense stand of timber unsuccessfully for a fire that lookouts kept reporting. A plane was sent out and upon arrival over the fire marked its location by the paper method. A third ground crew located this paper marking and, on further search, the fire in the top of a lightning struck tree. The tree was felled and the fire was put out. Another fire was burning very slowly in brush and scattered timber. Previous searches had been unsuccessful. Again the plane was dispatched and marked the fire. Ground crews then went into the area, finding the paper markings first and then the fire.

During the 1952 season the planes continued to mark fires but endeavored to improve their method and widen the uses. Once while on an aerial search of blind areas in the early morning hours, the plane discovered a small fire. The fire was marked with tissue and, because of the remoteness of the area, smokejumpers were dispatched. On arrival of the jump ship in the fire area, the smoke had disappeared and the men in the plane could not detect the fire location. Had it not been for the paper marking, this fire would not have been jumped; a large and costly fire would have resulted.

On another fire in the lava area of the forest, at the point where the crew would have to enter on foot, the plane dropped paper to mark the takeoff point. The fire crew then followed a compass bearing from that point to the fire.

Lookouts had repeatedly seen a fire in dense lodgepole pine, but by the time ground crews arrived in the area the smoke would disappear. After a 30-minute search, a plane discovered the fire burning in punky material in a mass of down logs and marked its location. The plane then flew a beeline from the ground crew location to the fire. This gave the ground crew a line of sight while the plane, from its higher elevation, flew on course by keeping the paper marking in sight. The timber was so dense that this procedure had to be repeated many times, but the crew was worked in to the fire with a minimum of delay.

When using tissue to mark fires, the dropper must see that the roll is round. If it is pressed out of shape, it will not unroll properly; the paper will be broken into small pieces and carried away by the wind. It is essential, therefore, that the dropper restore misshapen rolls to their original shape. If the roll is a type that has a glued end, the dropper must see that the glued strip is torn off. The best procedure for dropping is to unroll a 3-foot strip, fold it accordion style, and press it against the roll by the palm of

the hand. This will start a rapid unrolling. Ground crews should recover dropped paper and destroy it before leaving the fire area so that markings for controlled fires will not be confused with those for uncontrolled fires.

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Organization Problems on Large Commuter Fires

In the Pacific Northwest during the past several years large drainages have become more accessible because of the completion of timber-access road systems. In addition, a greater number of local family men than in past years have been the labor source for our woods and fire suppression work. Both of these trends have intensified the organization and control problems involving cooperator personnel and equipment on large fires.

It used to be that practically all the folks on a large fire in this region stayed in one of the fire camps until release time. Recently, however, most of the local loggers and other cooperators on large fires either insist on or express a preference for returning to their homes at night. To arbitrarily refuse this request would endanger the successful control of the fire. For several fire seasons there have been many instances of local cooperators driving more than 60 miles a day round trip from their homes to the fire, and there were frequent cases of 40-mile-a-day round trip travel distances. Of course, excessive travel for commuting purposes can and should be discouraged when it reaches a point of diminishing returns.

The effective assignment of personnel and equipment on commuter fires is now a problem of considerable size. The commuter cooperator needs to know at the end of his shift whether or not he and his equipment are required for the next work period, and if so, where and at what time. In order to answer these questions for a large number of day-shift commuters in a changing fire situation, it is essential to complete the planning for the next work period by about 5:00 p. m. This will usually allow time for the information to be given to the commuters before they leave the fire area for the night. Even for the first work period of a large and moving fire, it is well worth while to put additional personnel on the job of planning so that commuter crews and equipment can be quickly and effectively assigned for that day. Better planning can then be done for the second work period.

Our usual key overhead personnel on large fires consists of fire boss, plans chief, line chief, service chief, and division bosses. The fire boss is responsible for the fire suppression force; he is usually assigned a working staff for plans, line, and service. The planning chief is responsible for the preparation of the fire suppression plan, and the main job of the line chief is to see that the fire suppression plan is efficiently executed. The service chief, of course, has the overall problem of service and supply. Close coordination of all three branches of the top-level organization is particularly important on large commuter fires, because most of the commuter problem involves the quick and efficient assembly of estimates and calculation of the next day's requirements.

In order for a fire boss to discharge his responsibilities on large commuter fires more effectively, it would seem desirable to set up a new staff job. Duties described for this job should include the handling of the line up, dispatching, and notification of the commuters. This additional help should improve the functioning of the fire organization.

It is essential that the fire boss, his immediate staff, and the division bosses recognize the unusual importance of making early decisions concerning manpower and equipment requirements for the next work period on commuter fires. Once this is recognized, the next step is to be sure that the fire organization is set up to give a complete and speedy notification to commuter crews. This should lead to better morale, less lost time, and fewer headaches with our new problem, commuter fires.—BERT E. HOLTBY, *District Ranger, Mt. Hood National Forest.*

The primary function of our radio system is the transmission of intelligence. Does our system fulfill its function adequately? Some radio systems demand brisk, crisp message handling—others prefer the casual approach—many have little or nothing in the way of set routine. Yet, any of these types of operation may or may not be efficiently transmitting intelligence. When good equipment has been installed in a satisfactory location, the remainder of the problem is in the hands of the radio operator.

One basic precept to follow is that every message not transmitted with complete clarity will be garbled in reception and that every message which might be misunderstood at the receiver will be misunderstood. Thus, every message should be handled individually and distinctively. Except in unusual cases, repetition and explanations should not be required.

Speech.—Until recently, very few communications radio operators have been specifically chosen for their voice qualities as is done in the radio broadcast industry. While it cannot be expected that the communications operator's speech should be equal to that of a broadcast announcer, each operator should strive for that goal. Further, each operator should be familiar with the full scope of operations and be fully conversant with all terms employed in the performance of his duties. Similarly, if each mobile operator is familiar with the standard operating terminology, needless explanations can be avoided.

Speech training practice by the individual operator will add much to improving efficiency of message transmission. A tape, wire, or disk recorder provides an excellent medium for speech analysis. A little diligence can transform an average or poor operator into a good operator. Among the speech factors to be considered are voice level, voice quality, pronunciation, and enunciation.

While FM does provide the best medium for voice transmission, it alone cannot improve poorly spoken messages. The message which is received with maximum clarity is that which is spoken in a normal voice, slowly and distinctly. A low voice level into the microphone will result in a low voice level out of the speaker. A loud voice, i.e., a voice louder than that necessary to produce full modulation, will not produce greater speaker output since it will be limited in the transmitter. In fact, shouting, or a loud or emotional voice is more difficult to receive than a normal voice primarily because of the added voice distortion.

Pronunciation.—Unless corrected by training, many people normally tend to speak too rapidly, to slur words and phrases, and to fail to open the mouth sufficiently when speaking. Radio operators should take special care to speak with the mouth open, to avoid a nasal or guttural tonal quality, to pronounce each individual syllable of each word, enunciating clearly, to maintain a fairly

[1]Reprinted by permission of Motorola NEWSGRAM, Nov.-Dec. 1953.

constant voice level, and to speak slowly so that each syllable will be clear and distinct. Breath control and proper use of the throat, mouth, and lips are all important parts of each of these functions.

Difficult words should always be spelled out. The phonetic alphabet should be employed whenever it is necessary to distinguish letters clearly. For example, "Baker" and "Peter" are much easier to differentiate at the receiver than are "B" and "P."

While a speech clinic at a local educational institution can be of great value in speech improvement, attention to the fundamentals and continuing practice, striving for improvement, can achieve adequate results.

Practices.—It is, of course, necessary to have suitable performance specifications in the radio transmitters and receivers and adequate maintenance plus proper level settings for the system. Yet, this is not fully adequate as far as equipment performance is concerned. The base station dispatcher should be located in an area free of ambient noise. Background noise interferes with both transmission and reception. With these considerations taken care of, other practices can improve message handling.

Each operator should be instructed in proper microphone usage. While the distance between the operator and the microphone may vary somewhat in different installations, the operator should be aware of the best distance for his voice. Low microphone sensitivity settings make it difficult to achieve full modulation; high sensitivity may pick up too much background noise. The operator should speak across the face of the microphone, avoiding breathing into or blowing into it. A palm-held type microphone should be held with 1 to 2 inches of the lips and at an angle of about 30° with the lips. The push-to-talk or transmit switch should be held down firmly during the entire message transmission, and speech should not be started unless the switch is "on."

Codes.—Code systems have come into widespread use to shorten message transmissions. Probably the best known code is the "10 Signal" system employed by law enforcement agencies. Other codes such as specific numbers assigned to vehicles, to routine operations, and to specific working areas can do much to simplify message transmissions to mobile units. A practice as simple as a momentary depression of the "transmit" switch to acknowledge message receipt without voice transmission has been employed. A code system for a specific application can be easily developed and can save considerable "air time," improving message handling efficiency. Even on an uncrowded channel, adoption of a code system prepares the staff for the expansion of the system when transmit time may be more valuable. It also provides a solution to channel sharing problems with other radio systems if they arise.

The code system achieves the result of transmitting sufficient information without the time wasting processes of calls for additional information and wordy messages containing more data than required for a mobile unit to complete its assigned tasks. With or without codes, messages should be kept brief and concise, but not at the expense of making the messages incomplete.

Checks.—A rough rule of thumb, if it is necessary to repeat messages or if messages are consistently misunderstood, the operator responsible should have further training. If you are an operator, check yourself. Find out if you can improve your system in its primary function.

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Improving Readability of the Fire Finder Circle

A fire finder that has become worn or discolored through use sometimes slows down and makes less accurate the azimuth readings as taken by a towerman.

A solution for this problem, as determined after attempting a number of different remedies, was as follows:

1. The azimuth circle was thoroughly scoured with ordinary cleansing powder and hot water. It was then rinsed and dried.
2. The indentations of the graduations on the azimuth circle were inscribed with a hard red crayon pencil. The surplus crayon was wiped off with a dry cloth.
3. The entire azimuth circle was covered with a thin coat of liquid plastic applied with a lint-free cloth.

The result was clearly legible readings. Fire finders in our towers have been treated this way and the result has been more rapid readings. The improvement has been used during the past fire season and has the enthusiastic approval of all personnel concerned.—LAWRENCE BATTEY, *District Ranger, Lower Michigan National Forest.*

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Headlight Attachment for Hard Hats

Almost everyone is aware of the difficulty encountered in keeping headlights attached to hard hats during night work. Region 1 has worked out a rather simple modification to solve this problem, and we are passing the idea along for your consideration.

The modification is easily accomplished by drilling or punching two 1/8-inch holes, one above the other and 1 inch apart, at the front and rear center of the hat just above the brim. A short length of a common leather shoelace, approximately 12 inches long, is put through these holes, leaving both free ends extending outside the hat. A simple overhand knot is tied in each free end to prevent the loss of the string when the light is not in place. The front "keeper" string may be tied around the padded, metal light base to hold the lamp firmly in place and still allow swiveling action. The rear keeper string can be tied around the elastic web and the light cord with just enough slack to allow freedom of the cord when the wearer turns his head.

This modification can be made in the field on aluminum or other types of hard hats by simply filing a flat point on a common 10d nail, and punching the holes with a sharp blow from a single-jack hammer. The hat must be placed on a firm, soft wooden base to prevent buckling or fracture. A 2-inch sapling could be sawed off and used to improvise a punch base for this operation in fire camps and other outlying stations. Drilling is a more desirable method if facilities are available.

Basic design and impact deflection of hard hats are not affected by this modification, as might be the case with the installation of metal clips or other rigid fittings. Also, no loss in strength is incurred. Shop tests consisting of severe blows inflicted on hard hats mounted on dummy heads showed no damage that could be related to this modification. Nesting for shipping or air delivery is not affected by the addition of the keeper strings.—AERIAL EQUIPMENT DEVELOPMENT CENTER, *Region 1, U. S. Forest Service.*

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.

One careless match . . . Yours?

Remember–**Only <u>you</u> can**

PREVENT FOREST FIRES!