VOL. 13 OCTOBER 1952 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 13 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.

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Forest Service, Washington, D. C.

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SMOKEY THE BEAR

J. MORGAN SMITH
Assistant Director, Cooperative Forest Fire Prevention Campaign [1]

Smokey, the forest fire preventin' bear, has finally achieved stardom. Like other celebrities, he was recently featured in color on the front cover of Newsweek magazine. This same issue carried an excellent story on Smokey and forest conservation which said, "America's best animal friend is a sturdy brown bear named Smokey. Not since the early days of Mickey Mouse and Bambi has any cartooned animal made such an impact on Americans. And the story of how Smokey was born and how he grew is a prize example of wholesome and energetic cooperation between government and business." This was the longest story ever carried in Newsweek.

Several weeks ago, President Truman signed a bill which prevents Smokey from being used in any manner that would be detrimental to his work in forest fire prevention. This marked the first time in history that the Congress of the United States had enacted legislation to protect an animal character from misuse.

Smokey The Bear is the name of a new song which you will soon be hearing on radio, television, and "juke" boxes and in motion picture theaters throughout the land (fig. 1). It was written by two topflight Hollywood song writers, Steve Nelson and Jack Rollins, and tells in entertaining fashion the story of Smokey and the work he is doing in educating the American public to the danger of forest fires. Eddy Arnold introduced the song in a new 4½-minute film Smokey The Bear, which has been released to television stations and motion picture theaters. Gene Autry has recorded the song for Columbia Records, and other leading companies are lining up their top vocalists to do the same.

As the result of Smokey's growing popularity, MGM is now working on a Smokey cartoon feature. Other companies have requested licenses to manufacture Smokey Bear products such as dolls, toys, ash trays, belts, hats, ties, etc. Several leading publishing companies want to put out books on Smokey.

Yes, Smokey has come a long way since he was created in 1945, by the advertising agency, Foote, Cone & Belding, as a symbol which would help focus public attention on the Nation's forest fire problem. Since 1947, Smokey has appeared regularly on posters, car cards, blotters, and other material provided through the Nation-wide Cooperative Forest Fire Prevention Campaign which is sponsored by The Advertising Council and conducted by the State Foresters and the U.S. Forest Service. The Advertising Council is a nonprofit business organization created to help solve

[1] Sponsored by State Foresters and U.S. Forest Service.

SMOKEY THE BEAR

By STEVE NELSON and JACK ROLLINS

1. With a Ranger's hat and shovel and a pair of dungar-ees you will find him in the forest always sniffin' at the breeze. People
2. You can take a tip from Smokey that there's nothin' like a tree, cause they're good for kids to climb in and they're beaut-i-ful to see, you just
3. You can camp upon his doorstep and he'll make you feel at home, you can run and hunt and ramble any - where you care to roam. He will
4. If you've ever seen the forest when a fire is running wild, and you love the things within it like a moth-er loves her child, then you

stop and pay at-ten-tion when he tells 'em to be- ware, 'cause
have to look a-round you and you'll find it's not a joke, to
let you take his hon-ey and pre- tend he's not so smart, but
know why Smok-ey tells you when he sees you pass-ing through, "Re-

ev'-ry - bo-dy knows that he's the Fire Pre- ventin' Bear.
see what you'd be mis-sin' if they all went up in smoke.
don't you harm his trees for he's a Ran-ger in his heart.
member... please be care-ful... its the least that you can do."

Smokey - the Bear, Smokey - the Bear. Prowlin' and a growlin' and a
sniffin' - the air. He can find a fire - before it starts to flame. That's
why they call him Smokey, that was how he got his name.

Illustrated by RUDOLPH WENDELIN

FIGURE 1.

national problems through education by use of various advertising media. Besides Forest Fire Prevention, the Council sponsors other campaigns in the public interest such as Stop Accidents, Red Cross, Better Schools, Care, U.S. Defense Bonds, and Fight Inflation. All of its services are free.

The phenomenal growth of Smokey into a national character

has been due in no small measure to the splendid support which business and industry have given the campaign since its inception in 1942. Last year, through The Advertising Council, over 6 million dollars worth of free advertising time and space was donated to the campaign by American business. For example, in 1951, the transportation advertising industry gave space for the entire months of April and September for display of approximately 100,000 Smokey car cards in busses, streetcars, subways, ferries, and railroads throughout the Nation. An estimated 50 million riders saw these forest fire prevention messages. The space and the labor involved in putting up and taking down the cards were absolutely free. This one contribution alone had an estimated value in excess of $500,000. The advertising firm of Foote, Cone & Belding has had direct charge of Smokey since his birth. Each year, Foote, Cone & Belding puts into the job more than $35,000 of time and effort, at no cost to the Campaign.

Besides business, the American Red Cross, Boy Scouts, Girl Scouts, Camp Fire Girls, and numerous other organizations have supported the campaign in splendid fashion.

Another important factor that has aided tremendously in developing public recognition of Smokey as the Nation-wide symbol for forest fire prevention was the discovery of a real live Smokey about 2 years ago in New Mexico. At that time, the only survivor of a disastrous 17,000-acre, man-caused forest fire was a frightened, badly burned cub bear. The Associated Press' photo, showing the pathetic looking cub having his burned paws bandaged by a doctor, was flashed across the Nation. It appeared on the front page of leading newspapers everywhere and created genuine interest and sympathy on the part of the American public in this forest fire orphan. Overnight he became famous. They named him Smokey, after his mythical brother, the poster Smokey.

Under the expert care of New Mexico game wardens, he was gradually nursed back to health. Then, New Mexico State Game Warden Elliott Barker decided that "Little Smokey" had a definite mission in life and that was to serve as a living reminder to people everywhere of the constant need for care with fire when in our forests and woods. So, one day, after complete recovery from his burns, Smokey crawled aboard his private plane, a Piper Cub, and took off for Washington, D.C., to take up permanent residence there.

His arrival in the Nation's Capital was greeted with great fanfare. He was received in the Presidential Room of the National Airport. Little Smokey appeared on television, in motion pictures, and in parades. Finally, in appropriate ceremonies at the National Zoo, he was presented to the school children of America and today is the living symbol of forest fire prevention and wildlife conservation.

Men, women, and children from all parts of the country come to see the live Smokey. Dr. William Mann, Director of the National Zoo, says that Smokey is the most popular animal in his

collection. He is an honorary member of such organizations as the AAA's School Safety Patrol System and the Washington, D.C., Fire Department. Hopalong Cassidy is one of the many well-known personalities who has called on Smokey.

Little Smokey is no longer a cub. He weighs in the neighborhood of 200 pounds and his fur is a beautiful cinnamon brown. He is now the official model for all posters furnished by the Nation-wide Cooperative Forest Fire Prevention Campaign. The live Smokey and the poster Smokey have become one and the same.

There is no question but that Smokey is making a lasting impression on the boys and girls of this country who are the citizens of tomorrow. Smokey's fan mail from all parts of the Nation bears this out.

One mother wrote as follows: "Our hero Smokey is greatly admired by the small fry and the change of scenes on the bus cards always bring comment from my little daughter. The ads are scanned with avid interest for new pictures of Smokey and heaven help the individual who throws matches and cigarettes out of car windows. To my consternation and amusement, she tells them off. I notice that they don't do it again in her presence. These posters are doing a remarkable job in helping all of us and especially the young to become conscious of waste, destruction, and grief caused by forest fires. We hope to see Smokey for a long time to come."

Statistically the Nation-wide Cooperative Forest Fire Prevention Campaign and other fire prevention campaigns such as the Keep Green movement are bearing fruit. Prior to the start of the campaign in 1942, there was an average of 205,047 forest fires a year for the 5-year period, 1937-41. For the past 5 years, 1947-51, there has been an average of 188,796 forest fires a year on all lands. This means that we have experienced 16,251 fewer fires a year for the past 5 years as compared with a similar period of time immediately preceding the beginning of the campaign. This encouraging progress has been achieved in spite of the fact that public use of forested areas has increased 50 percent over precampaign levels.

This improvement has not been due solely to the Smokey Bear campaign conducted by the State Foresters and U.S. Forest Service. Much of the credit must go to the fire prevention programs carried on by the States themselves and also local programs sponsored by Keep Green organization, Red Cross, Boy Scouts, and others. However, through the channels for mass communication which have been made available to the campaign by The Advertising Council, the American public is hearing, seeing, and reading more about the need for preventing forest fires than ever before.

We still have a long way to go before man-caused forest fires have been reduced to an acceptable minimum. Continued progress can be made in licking this problem if government, business, forest landowners, educators, and conservationists work together in the future as they have in the past.

CLASS IN THE OUTDOORS [1]

JOSEPH F. DONOHOE
District Forest Ranger, Wisconsin Conservation Department

The protection from fires of our forests, fields, and marshes is a basic function of the conservation of our natural resources and wild life. Therefore the forest protection division of the Wisconsin Conservation Department is intensely interested in informing the citizens of Wisconsin and others why and how approximately $1,000,000 a year is spent for the prevention and suppression of fires.

Of course the best way to stop damages to our forests resulting from fires is to prevent the fires from starting. The forest ranger has learned that an informed citizen is a cooperative citizen. That is why he is willing to spend a great deal of effort and time in fire prevention work.

Where forest protection activities are intensified, as in northern and central Wisconsin, the people are pretty well informed, but there is a large segment of our population which has received less information on the subject. How to reach these citizens is something of a problem.

One method was worked out a few years ago by representatives of industrial concerns who depend on our natural resources for their supply of raw materials. It was simply to have a place where young people and adult groups could gather and receive an on-the-spot short course in conservation. This organization is the well-known Trees for Tomorrow, which operates a camp at Eagle River. There, under supervision, groups from high schools and colleges, and groups representing women's clubs, sportsmen's clubs, civic organizations and many others come. The Wisconsin Conservation Department cooperates intensively in the program offered.

The forest protection division participates by presenting a summarized but adequate over-all picture of forest protection activities in the State. This class is held in the out-of-doors, weather permitting. The feeling is that it has been very successful because of the enthusiasm with which it is received and because of the increased demand for holding such classes.

Before the program as now presented in the outdoor class room was completed, a great deal of preparatory work went into it. This work was under the direction of V. A. Moon, northern area supervisor of the forest protection division. For use by the instructor so that he can illustrate his talk, special "props" consisting of maps, charts, and equipment were designed and built.

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[1] From the December 1951 Wisconsin Conservation Bulletin.

The program is presented in three parts. First a talk is given on the history, organization, finances, and administrative set-up. Secondly, the fire detection system, communications, and dispatching of men and equipment is touched upon. The third part consists of a demonstration of the equipment and methods used in the physical work of putting out fires.

The site for the class room is picked ahead of time. It usually is an isolated spot which has to be reached by a logging road. The group or students arrive by bus and in a few minutes class is in session. After a briefing on the importance of forest protection in the conservation picture the instructor reviews the history of the division and then goes into the organization and administrative set-up as it now is and may be in the future. He, glad that he has them, now uses the new "props."

The first one, sturdily built of wood, is a case of four maps, mounted on plywood panels and designed so they can be easily removed or returned as used. This "prop," as well as the others, has been built big enough for easy visibility, strong enough for rough handling, and light for easy transportation. The first panel has a map of the State on which are outlined in contrasting colored lines the territories located in the intensive and extensive protection system as well as territory that may in the future be included in our protection organization. The four areas and the 10 districts that make up the division are shown as well as the locations of division, area, and district headquarters.

The second panel has a map showing a proposed district in that part of Wisconsin not now under protection but which might be included in the future. On the next panel is a map of one of the 10 districts, District 8, which shows the district headquarters, the four ranger subdistricts, the ranger stations, and locations of the lookout towers. On the fourth and final panel a map of a ranger district shows the location of the ranger station and lookout towers and where emergency fire wardens live.

The speaker in explaining uses more props in explaining the *why*, *what*, *how*, and *where*—why fires burn worse on some days than on others; what is needed in the way of manpower and equipment to suppress fire on a given day; how fires are detected; and where they are located.

Two props, a burning index meter and a fire hazard chart, are used in explaining the factors that govern a ranger's activities in fire weather. The index meters that are used at the stations are small enough to slip into a hip pocket, but the one built for the class room is Paul Bunyan size. With it the speaker can show how wind velocity, relative humidity, number of days since rain, and condition of vegetation are used to arrive at an index of how forest fuels will burn. The fire hazard charts, identical to those used at ranger stations, show in a more readable way what the burning conditions for the day are. From this chart the ranger can also determine his manpower and equipment needs in suppressing fires that may start.

The equipment used by the men in the towers when they see a smoke is shown to the group and explained. This consists of a protractor stand, alidade or sighting instrument, and offset. The protractor, mounted on the stand, is hinged so that it can be tipped up for better visibility by the group. The group is shown use of the alidade in determining the line of sight of a fire from the tower and how the reading in degrees is taken from the protractor. The use of the offset in seeing by or around an obstruction which interferes with the line of sight is also shown.

The last prop is a magnified scale map which is used to illustrate how a ranger can plot the information received from the towers and accurately determine the location of a fire. This map is also used to explain why people in forest protection districts have to obtain a permit before burning rubbish, brush piles, etc. When a permit is issued a pin is placed in the map on the location the permit covers. This enables the ranger to differentiate between legal burning and uncontrolled fires.

Because the final part of the class is a demonstration of noisy trucks and tractors, and to better show off the use of short-wave radios, a sound amplifying system is used. This sound equipment, along with a short-wave two-way radio, is housed in a specially built cabin mounted on a two-wheel trailer. This piece of equipment was originally designed for use on large fires where it would be practical to set up a field headquarters. The trailer is equipped with a public address system, the radio, a desk, storage space, and its own power plant.

In putting on the last part of the program emphasis is placed on how, when, why, and where trucks, tractors, water tank trailers, and radios are used. The control trailer or sound truck is used to a good advantage. By using the sound amplifying system the speaker, in describing what is going on, can reach the group which becomes scattered during this period.

A brush pile, one of several which were previously prepared, is ignited, and when the fire is burning briskly, the speaker uses the radio in the control car to summon the first piece of equipment to be demonstrated. His message to the equipment operator is picked up by the sound system and the group can hear what he says and the operator's reply. All of the equipment to be demonstrated is located out of sight and a short distance away from the group.

As the first piece of equipment, a ¾-ton truck equipped with a power take-off pump, a water tank, and a compliment of hand tools and towing a water tank trailer, goes into action, the speaker keeps up a running commentary on what is going on. After the fire is pumped out with water, a crew of men, which arrived with the truck, puts on a demonstration of the use of hand tools in suppressing a fire. A short stretch of control line is constructed by four men working as a team, who use three short-handled shovels and a swede hoe. Then the use of a back-pack water can with an attached hand-operated pump is demonstrated. A man

then shows how the old reliable shovel can be used to throw dir on fire edges, cover burning stumps with dirt, and bury burnin logs and chunks of wood.

To demonstrate the use of the new mobile pack-set radio, th remaining equipment units are called in by an operator who is sta tioned in front of the group. These messages can also be hear over the loud-speaking equipment. Another brush pile is set o fire, the man with the pack-set radio puts in his call, and a fe minutes later a 2-ton truck arrives. This is equipped with a powe take-off pump, water, and a large complement of hand tools, an tows a tilting-bed trailer on which is transported a tractor an water tank trailer. As these items of equipment go to work put ting out the fire the commentator tells the group what is bein done and why.

When this unit of equipment is finished, another is summone by field radio. This one excites the most interest, especially amon male members of a group. The unit consists of a 2-ton truc equipped with a power take-off pump, water tank, and complemen of hand tools, and towing a tilting-bed trailer on which is trans ported a crawler type tractor with a large specially designed fi plow attached. When the tractor and plow is unloaded and start to plow a 6-foot-wide double furrow the group really sits up an takes notice, and when the tractor and plow starts off through th woods, knocking down trees and leaving a wide fire break behin the members of the group like to follow right behind it.

As the tractor and plow is loaded and the truck moves off, an other fire is started and the final unit of equipment is summone This is a large truck which transports a 1,000-gallon water tan The truck is also equipped with a power take-off pump. The un proceeds to put the fire out; two hose lines are used and differe types of nozzles demonstrated, one an adjustable spray nozzle an the other a conventional type. After the demonstration the grou is invited to inspect the equipment and ask questions.

This ends the class; the maps, charts, and other paraphernali are quickly stored in the sound car, the trailer is hooked to truck, and the school room is ready for the road. It has been pleasant, informal, and worth-while session in a room as large a the outdoors. At the same time, fire fighting equipment has bee tested and men trained, something which would have to be don periodically even if there were no students to watch the pr ceedings.

Published Material of Interest to Fire Control Men

A Survey of Forest Fire Causes and Suggested Corrective Measures, J. A. Doyle. Forestry Chronicle. Dec. 1951.

Forest Fire Insurance in North America, With Special Reference to B. C., W. Walters. Brit. Columbia Lumberman. Dec. 1951.

Incidents in Tower Man's Typical Day, by C. Lucas. W. Va. Conserv. Ja 1952.

South Carolina Stresses the Importance of Protecting Little Trees in t New Fire Prevention Program, by J. C. Witherspoon. Forest Farme Jan. 1952.

War Whoops on the Fire Line, by D. G. Guck. Amer. Forests. Jan. 1952.

POWER-SAW MOTOR DRIVES PORTABLE FIRE PUMP

IRVIN H. LUITEN
Field Representative, Public Information Department, Weyerhaeuser Timber Company

In a matter of 90 seconds, Weyerhaeuser Timber Company foresters at Springfield, Oreg., can turn an ordinary power saw into a portable pump for fighting forest fires. They do it by attaching a standard low-speed, high-pressure pump to a power-saw motor.

The attachment is made possible by a coupling and mounting invented by Robert Gehrman, the company's Springfield branch forester.

With a special frame and guide developed by Gehrman, the standard fire pump is mounted to a packboard. The frame and guide are designed so that the pump may be fastened to the saw motor at the point ordinarily occupied by the saw bar. The same nut that secures the saw bar hooks the pump to the saw engine (fig. 1). No extra parts or special tools are needed.

FIGURE 1.—Pump is hooked to power-saw motor with same nut that secures the saw bar. Three-pronged rubber-faced coupling (at center right, below hand valve on pump) meshes with saw chain sprocket.

FIGURE 2.—Cecil Cunningham, Weyerhaeuser Timber Company forest Springfield, Oreg., demonstrates power-saw fire-pump combination. fighting actual forest fire, two hoses, each fitted with nozzle, would used.

Used on Weyerhaeuser's logging operations near Springfie since early 1951, the power-saw and fire-pump combination h proved itself an effective fire fighting tool. Drawing water fro streams, ponds, and lakes in the woods or from water tank trailer a 7-horsepower motor with pump attached will spray a fire throu two hoses and two 5/16-inch nozzles. It will develop 100 poun pressure. A pump attached to a 5-horsepower motor will dri water through two hoses and two nozzles at 75 pounds pressure.

Weyerhaeuser foresters are using the combination as a tw man unit. The pump—along with suction hose and screen, siame valve, two nozzles, a small grease gun, and a hose spanner—fastened to a packboard (fig. 2). This makes a one-man load weig ing 57 pounds. The other part of the two-man unit is a power buc ing saw minus the bar and chain (fig. 3).

Says Gehrman: "There are many advantages to this unit. T pump can be attached to the power-saw engine in about a minu and a half. Your pump operator is the power-saw operator. I knows how to start the engine and keep it running because operates it every day. There is no cooling system to drain or a separate gas tank to bother with. And the pump itself is less cost than conventional forest fire pumps that will handle two ho lines.

"We have operated these units wide open for steady runs of hours and longer, and the power-saw engine and pump function

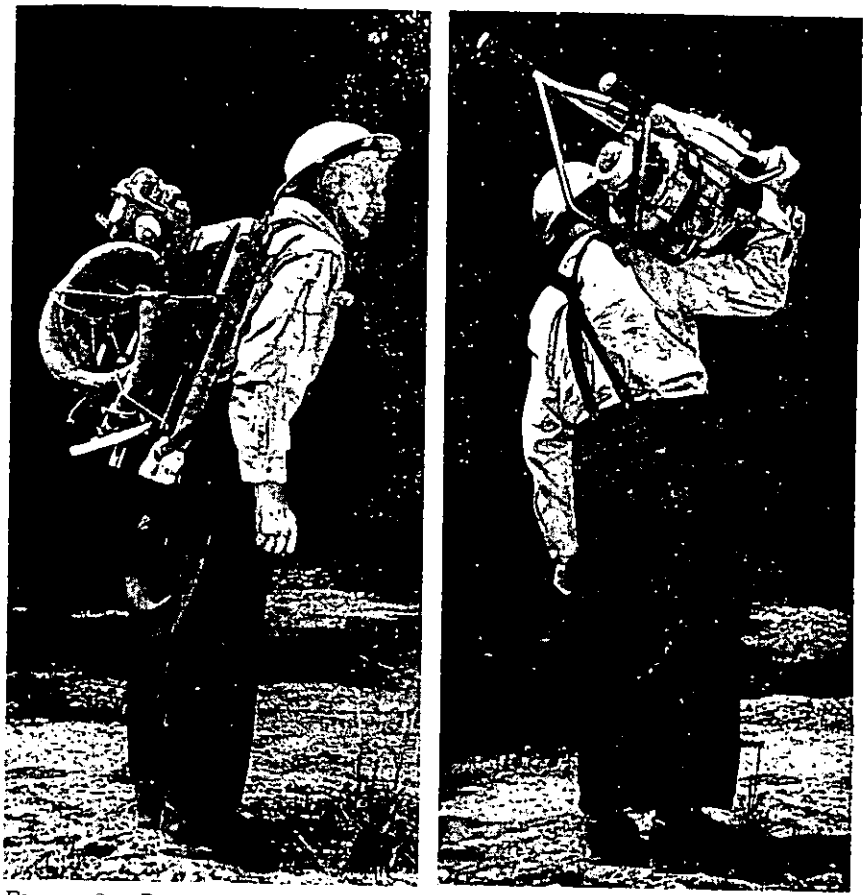

FIGURE 3.—Power-saw fire-pump combination is a two-man load. Robert Gehrman, who invented the coupling by which pump is attached to power-saw motor, demonstrates: **Left,** carrying pump on a packboard; **right,** packing power-saw motor.

perfectly. You could touch the cylinder cooling vanes on the engine at any time without burning your fingers."

Weyerhaeuser foresters have used the pump on 5-horsepower and 7-horsepower saws.

"But," Gehrman points out, "I am quite certain that the same principle of driving a pump through a rubber-faced coupling fitted to the chain sprocket would be adaptable to any power saw."

The power-saw fire-pump combination is now in service on several Weyerhaeuser woods operations and is also being used by several other lumber companies in the Springfield area.

Couplings and mountings invented by Gehrman are manufactured under license by two firms, one in Portland, and another in Eugene, Oreg. (Further information regarding this equipment may be obtained from Dept. of Public Information, Weyerhaeuser Timber Co., 1106 U.S. National Bank Bldg., Portland 4, Oreg.)

REMOTE-CONTROLLED RADIO NETWORK AND FIR COMMUNICATION EQUIPMENT

R. C. FRANKLIN, *Fire Prevention Officer*, and A. D. GALBRAIT
Communications Technician, Angeles National Forest

When FM radio replaced AM on the Angeles National Fore it was decided, after extensive tests, to use remote-controlled se so that a single channel could provide forest-wide communicatio

Figure 1, showing locations and elevations of our fixed statio illustrates the problem with which we were confronted in effecti complete radio coverage. The entire forest is not shown. Ad tional area to the north is mostly at lower elevations, with mo gentle slopes, where no particular problems were encountered.

The central dispatcher and Arroyo Seco and Glendora Rang Station offices are at elevations of 520, 1,100, and 776 feet, l cated at the base of the south slopes of a range of mountains. The three stations have direct communication between one anothe The Valyermo headquarters, 25 miles airline to the northeast fro Arcadia, is on the desert side of the range with intervening pea reaching over 9,000 feet; Newhall Ranger Station, 32 miles nort west, is also blocked off by mountains.

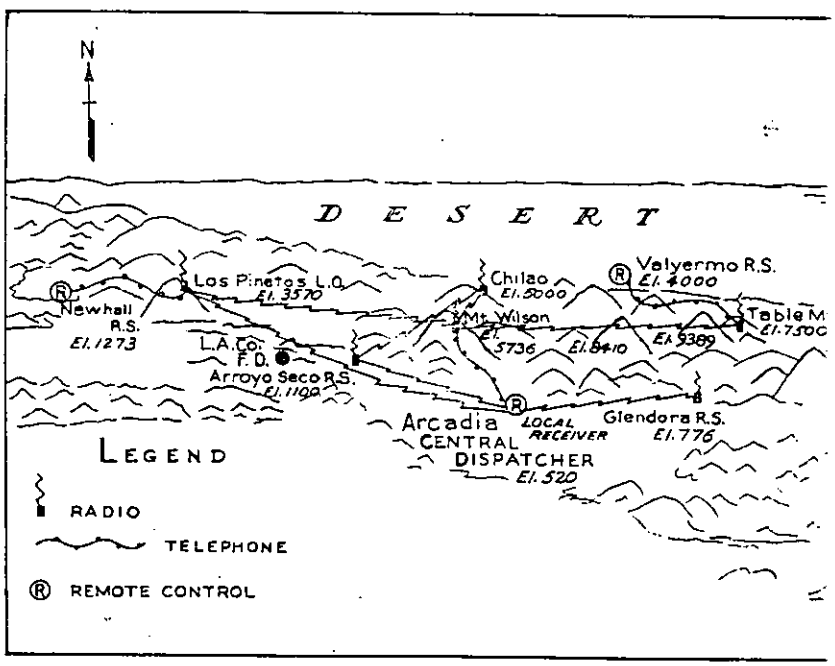

FIGURE 1.— Diagrammatic sketch of Angeles Forest radio network

An unattended transmitter and receiver are located atop Mt. Wilson overlooking Arcadia headquarters and remote-controlled to the dispatcher's office over leased lines of the Pacific Telephone & Telegraph Company. Similar installations were made from Valyermo to Table Mountain and Newhall to Los Pinetos, with Forest Service telephone lines providing remote control. These latter two units are at sufficient elevations so that they work directly to Mt. Wilson. A local receiver is installed at Arcadia for use along the base of the mountains, in areas blind to Mt. Wilson, and serves the dispatcher and two front country ranger districts. The Los Pinetos remote-controlled unit works direct to this receiver as well as to Mt. Wilson. With these installations there are very few blind spots on the entire forest.

As a safeguard against commercial power failure, gasoline-driven generators are installed at the remote control sites. In the event of power interruption these generators start automatically and shut off when regular power service resumes. Automatic time clocks are used to start the generators once a week to keep them in working order.

All special equipment illustrated and described in this article was designed and built by A. Donald Galbraith, Angeles National Forest Communications Technician. Everything has been designed for compactness and simplicity of operation, yet there is equipment to cope with most any communication need.

For use in fire camp a remote-control console is installed in a ½-ton panel truck (fig. 2). The cabinet measures 11 by 20 by

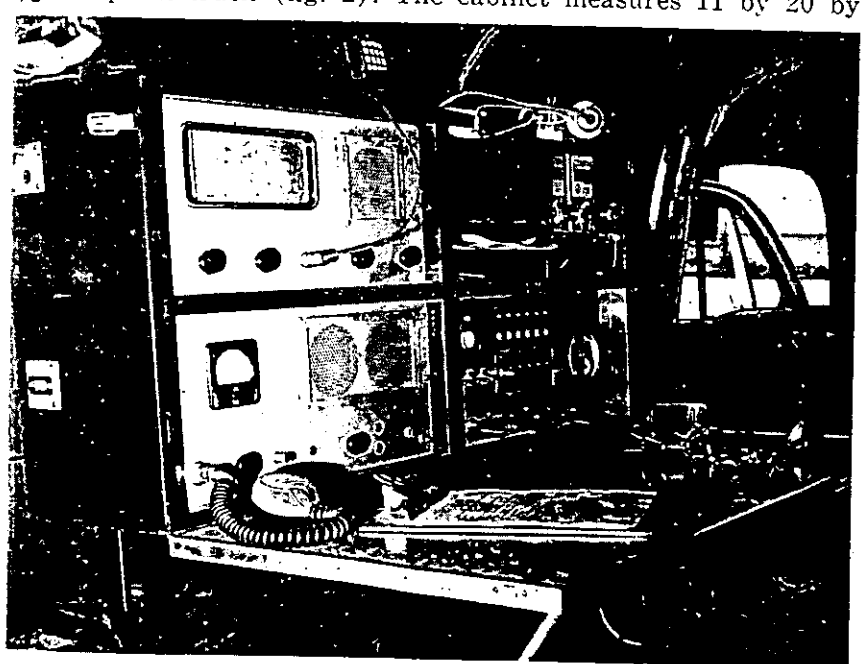

FIGURE 2.—Communication truck with remote-control console.

41 inches. One side is hinged to provide a working desk for tw operators. This unit provides control of a single frequency trans mitter and receiver which can be any standard mobile installatior or a portable one. The transmitter-receiver can be located sever miles distant and connected to the remote-control console by single pair of wires, either telephone line or emergency wire.

The cabinet is held in place by four wing nuts and may b quickly removed and set up in fire camp on a table when it become necessary to use the radio truck elsewhere. Lower left control are for FM transmitter and receiver; immediately above is a gen eral-coverage radio operating on 550-4500 kc. The microphone o top of the console operates a loud-speaker system. To the righ above is storage space for stationery and records. Below this is telephone switchboard with six trunks. From this control consol one operator can handle fire camp radio and telephone traffic mos of the time. Occasionally, at peak periods, it is necessary to hav two men on duty.

When it is necessary to set up fire camp at low elevation in location blind to all of the other fixed stations a portable remot (fig. 3) is used. This is a 30-watt, 6-volt DC unit, with gasolin engine charging equipment. It can be located up to 30 miles fror fire camp and remote-controlled from the fire camp console vi telephone line or emergency wire.

Communication headquarters are usually set up away from th noise of fire camp, and army type field phones are used at th headquarters of the fire boss, transportation officer, timekeepe

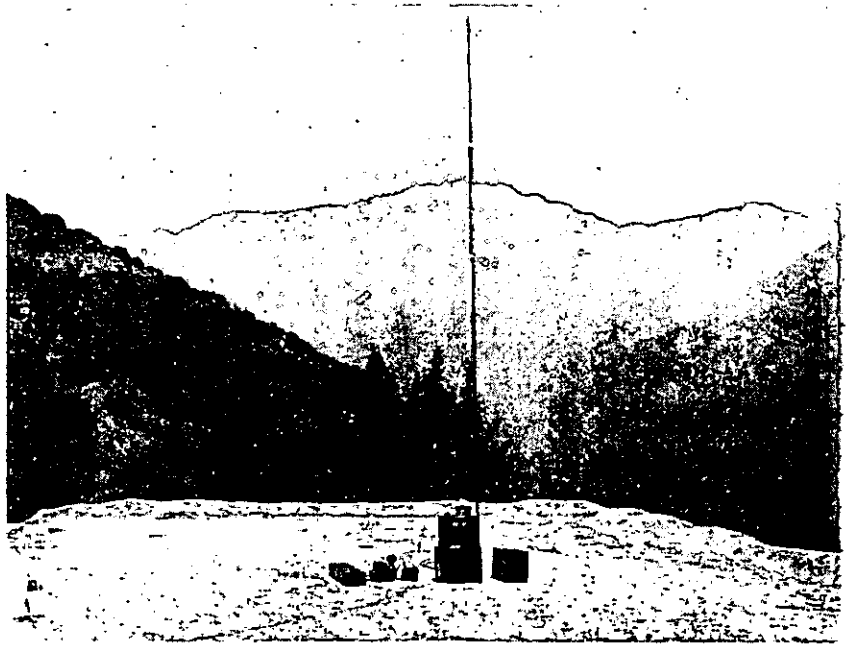

FIGURE 3.—Portable remote unit.

camp boss, etc. Intercommunication between all points in fire camp is then provided by these telephone trunks. Whenever possible a connection with commercial telephone service is made to keep air lanes clear for traffic from the fire line.

Instead of operating radio equipment by power directly from the fire camp AC generator, 6-volt DC power is used. This prevents communication failure should the generator stop. Battery level is maintained either by a separate gas engine charger or an AC charger operated from the fire camp generator.

For further flexibility in fire camp communications a compact, low-drain, dry-battery-operated console (fig. 4) is used as an extension of the main radio, or independently, to perform the same technical functions. This set is used principally by the fire boss and Service and Plans Section at GHQ. It is immediately usable without warm up when turned on.

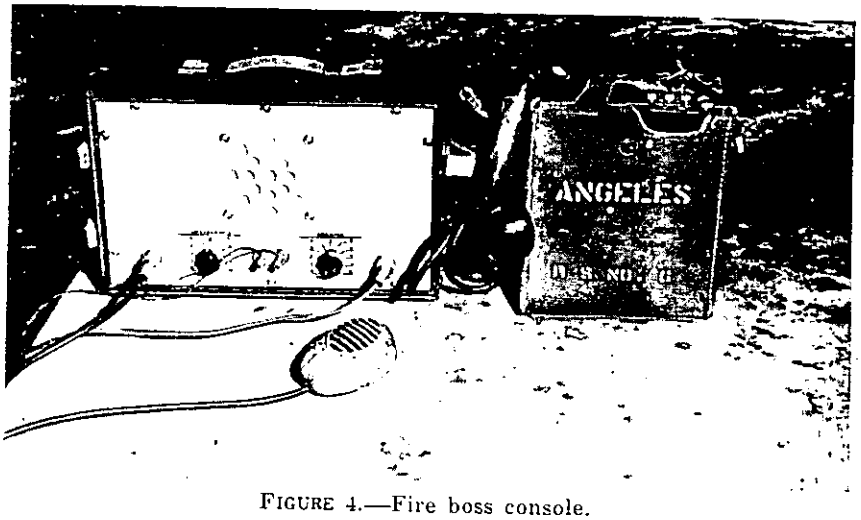

FIGURE 4.—Fire boss console.

Central dispatching is used on this forest and a compact dispatcher console (fig. 5) was designed with controls conveniently located. In addition to the Mt. Wilson set, controls are provided for a local receiver, one frequency of the Los Angeles County Fire Department, an all-wave general-coverage receiver, and eight intercommunication stations connecting the forest warehouses, radio shop, equipment service, equipment development center, and fire crew barracks, all located at Arcadia headquarters.

One battalion headquarters of the Los Angeles County Fire Department, located in the high-value front country area, has a receiver on the Angeles frequency. This enables the two agencies to have communication through cross-band transmissions during joint action fires and for compiling daily weather observations used in determining fire danger indexes.

Radio is used extensively on this forest in fire control work, air and ground rescue operations, flood observations during heavy

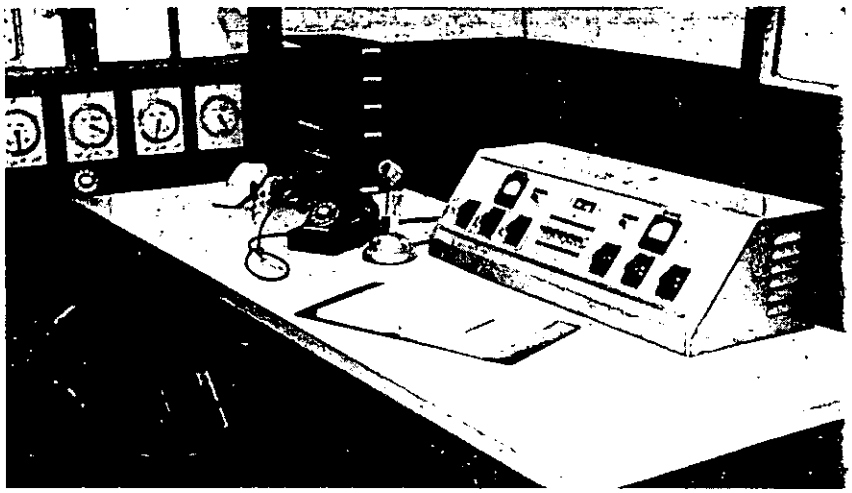

FIGURE 5.—Dispatcher console.

storms, and other emergencies. At present the network consists o 6 fixed stations with 46 mobile units and 30 handie-talkies. Th system has been in operation for a sufficient length of time t test it thoroughly under heavy use during major fires and othe emergencies and has proved its efficiency with a minimum of serv ice requirements.

Flash Fuel Fire Beater

Specialized hand tools are needed for the manual suppression of cheat grass and other light flash fuel fires under some conditions. This is par ticularly the case on rocky sites where a lack of loose soil makes the use of shovels ineffective. Oversized beaters of the fly-swatter type have not been effective because they scatter the fire when an up-and-down beating motion is used.

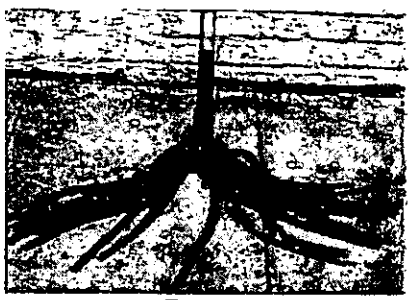

FIGURE 1.

In an attempt to overcome this effect, a cat-o'-nine-tails type of beater has been devised (fig. 1). When used with a sideways action, this beater knocks out the fire in grass. With a sideways force, burning embers are knocked inside of the fire line.

This tool is made from a rake handle cut to a length of from 44 to 48 inches. Twenty-four-inch section of rubber inner tube, truck tube weight, are used for the tails. Thes sections are cut in strips ⅝ to ¾ of an inch wide to a length of 21 inche There should be from 24 to 30 tails. The 3-inch uncut band of rubber a the top of the tails is wrapped around the end of the shovel handle an secured by 3 nails in vertical alignment, reinforced by a dozen wrapping of wire.—PIERRE SARASOLA, *Foreman, Toiyabe National Forest.*

WIND AND DRIFT INDICATOR

W. C. Wood
Foreman, Smokejumper Project, Region 1, U.S. Forest Service

Helicopter pilots in Region 1 use natural heliports that are usually located in remote or back country areas where there are rarely wind socks or wind indicators of any kind. Knowledge of wind currents, their direction and intensity, enables a pilot to land in small spots with less difficulty.

The Aerial Equipment Development Center at Missoula was asked to help find some device that could be carried in the helicopter and thrown out over a proposed landing spot to serve as a wind sock after its contact with the ground. Drift chutes are not satisfactory because of their weight and bulk, and also because they give little or no indication of ground drift after they land.

A streamer-type wind indicator was developed that gives accurate wind direction and indicates, by its degree of movement, wind intensity. This streamer consists of a piece of lightweight orange crepe paper (4 by 84 inches) that is Scotch-taped to a piece of black crepe paper (4 by 18 inches). An 18-inch piece of light thread with a single split shot (oo buck) clinched to its lower end is Scotch-taped to the bottom of the black paper. The streamer is rolled up, thread and shot last, and as many as 12 can be stored under the 'copter's seat cushion without adding appreciable weight or causing discomfort to the pilot.

The pilot, upon approaching the proposed landing site, has only to reach under the seat and with one hand uncoil a few turns of the weighted thread. Immediately above the spot he tosses the streamer out and continues his flight pattern to where he is able to watch the streamer. The weighted string unwraps the streamer automatically during the first stages of the descent. After the shot reaches the ground, the wind blows the lightweight paper away from the anchored shot. The black section serves to identify the weighted end. If wind is absent or negligible the streamer will fall in a heap. If gusts come up the streamer will lay out according to wind intensity.

In the earlier stages of development it was thought that the string could be eliminated. A few models with the shot clinched directly to the black crepe paper were tried. They were satisfactory in all respects except two: On snow courses, high winds would drag the streamer along the snow, and the split shot was more easily torn from the paper, both in handling and after discharge from the 'copter. It is thought that the length of string will allow the streamer more freedom in low brush and grass.

The streamers have been tested on actual helicopter missions on several occasions and pilots report 100-percent success in all tests so far. One pilot enthusiastically reported that even during descent the streamer gave him drift indications according to the attitude in the upper tip of the streamer. The Region 1 contract helicopter is equipped with a dozen streamers for further testing and application.

MAINE FORESTERS PUT FIRE PROTECTION ON STAGE

ARTHUR G. RANDALL
Assistant Professor of Forestry, University of Maine

Forest fire protection was dramatized effectively for some 3,00 people attending the 14th Eastern Maine Sportsmen's Show at th Bangor Auditorium, April 21-26. The theme of the show, spon sored by the Penobscot County Conservation Association, wa Keep Maine Green. The Maine Forest Service exhibited a fir danger station, forest products, and forest tree leaves and fruits

A group of forestry students from the University of Maine known as the "Hot-Shot Fire Crew" appeared each evening an Saturday afternoon as one of six acts on the stage. Over 60 stu dents took part altogether, with 28 appearing in each show. The wore red hats, levis, heavy shoes or boots, and shirts or jacket bearing a distinctive "Maine forester" shoulder patch.

The stage was permanently decorated with a background o evergreen saplings. It was set for the Hot-Shot performance b laying planks, extending for 60 feet parallel to the audience Saplings were inserted in holes drilled 2 feet apart and the plank covered with pine needles. Since the stage lacked regular foot lights, they were improvised by placing red lights in a notche board. Four wash basins were filled with warm water. A canva relay tank was set up and a few inches of water poured in fron buckets. A student narrator explained the action over the loud speaker.

A hunter armed with a shotgun sneaked through the artificia forest, fired two blanks, and was rewarded with a small roll o canvas tossed out by the property man. Excited by his good for tune, he carelessly leaned the shotgun muzzle against his belly while he stoked his pipe. He ostentatiously tossed his match awa to the pious ejaculations of the narrator and stalked off stage. Th property man plugged in the red lights and dropped dry ice i the basins of warm water.

Smoke was a problem, as the dry ice vapor would not rise bu hugged the floor. The solution was a bee smoker, which emitte dense clouds of white smoke. Burning pine needles in it gave genuine forest fire flavor.

A siren sounded the signal that the fire had been discovered an the suppression crew was on the way. The crew tooled up from red box on the stage. The organization was a one-lick system unde a foreman. A line-clearing squad of strawboss with double-bit a and three men using pulaski tools felled the trees standing in th planks. A line-building squad of strawboss and five men used ad hoes and mower-teeth rakes. A line-holding squad of strawbos and five men using paired backpack pumps and lady's shove maintained continuous patrol. These men wore headset flashligh donned before going on stage.

Although, as the narrator pointed out, the size of the stage did not permit use of bulldozer or tank truck, a 1½-inch hose was brought in and water pumped into the canvas tank from a pumper operating just outside the rear door. A second canvas tank was the source of water. If a second hose line was attached to the siamese and both open, the pressure on stage was not great enough to splash the audience.

Overhead lights were turned out and headsets on to show night patrol and the red lights extinguished one by one as mopping up proceeded. As the lights came on again to tumultuous applause, the rest of the crew came back on, prodding the firebug ahead of them.

The Sportsmen's Show was just one project of the Hot-Shot Crew, which stands ready to go to real fires and has two other demonstrations scheduled this spring.

Stainless Steel Water Tanks

The Illinois Division of Forestry has six 1-ton trucks equipped with 16-gage stainless steel water tanks. These tanks, each with a capacity of approximately 110 gallons, have been in service for almost a year and have proved to be very satisfactory. Water taken from them is clear and free from any corrosion particles. It is believed that pump repairs will be reduced because of the clearness of the water.

The tanks were constructed by a local welder at a cost of $142.85 per tank. Each one is 78 by 18 by 18 inches with two baffle plates running crosswise of the tank. A 2-inch filler plug is placed 2½ feet from one end of the tank on top. A 1-inch outlet is placed in the bottom, 6 inches from the end of the tank.—RICHARD THOM, *Staff Forester, Illinois Division of Forestry.*

Rubber Tanks to Help Keep Oregon Green

As an additional weapon against forest fires, an Oregon lumber firm this year is installing about a dozen huge ex-Army rubber tanks at its woods operations.

Each landing is to have one of the 3,000-gallon tanks to give it an extra and sure water supply at all times.

The Williamette Valley Lumber Company and affiliated firms, one of which is the Williamette National Lumber Company, are installing the collapsible tanks to augment a fleet of tanker trucks, bulldozers, portable pumps, and various other equipment items and tools held in readiness in the event of fire.

The tanks are made of heavy neoprene rubber and were manufactured for use in Army filtration plants overseas. They can be set up anywhere and are readily filled, emptied, and moved. The substantial capacity is counted on to give each logging operation a water supply large enough to provide "that extra safety factor."—ALBERT H. WEISENDANGER, *Secretary, Keep Oregon Green, Association.*

SLIP-ON PUMPER UNITS FOR FOREST FIRE SUPPRESSION IN THE DOUGLAS-FIR REGION

L. T. WEBSTER, *Deputy State Forester*, and DON LEE FRASER, *sistant State Forester, Division of Forestry, Washingto*

In considering the optimum type of mobile pumper to put in eration for forest fire suppression, at least two factors shoul considered. These are what fuel types are involved in the ar covered, and what is the length of season during which the mo pumper will be used each year?

If the equipment is to be used in heavy fuel type, such as ar with sizable concentrations of unburned slashing, it is desirabl have tanks and pumpers of larger capacities than would norm be required in areas of average fuel, where volume can be sa ficed in favor of speed and mobility.

In areas where the fire season extends throughout most of year, it may be advisable to build the tank and pumper equipn as an integral part of the unit. In areas where the fire season r 6 months or less and where the truck may be effectively used other purposes during the off season, it is advisable to use a s on type unit complete with power pumper.

The fire season in the State of Washington normally occurs w in a period of 6 months or less each year. Except for a few la volume units, the most efficient mobile pumpers have been de mined to consist of slip-on units placed on conventional truck varying capacities. On this basis, the Washington State Divisio Forestry during 1951 and 1952 has developed, with a view tow standardization, four types of slip-on units as follows:

155-Gallon rectangular slip-on unit to be used on 1-ton Wi four-wheel-drive pickup.—Tank dimensions and fixtures: W 47 inches, length 49 inches, height 16 inches, with bolt-on co baffled into four compartments, with two bolt-down brackets each end, two sling loops on each side of top, 4-inch filler cap, 1½-inch drain plug (fig. 1).

240-Gallon rectangular slip-on unit to be used on Dodge po wagon.—Tank dimensions and fixtures: Width 48 inches, len 49 inches, height 24 inches, with bolt-on cover, two bolt-d brackets on each end, two sling loops on each side of top, 4- filler cap, and 1½-inch drain plug (fig. 2).

210-Gallon rectangular slip-on unit to be used with ¾-ton F or 1-ton Chevrolet standard pickup truck.—Tank dimensions fixtures: Width 48 inches, length 84 inches, height 12 inches, welded cover, baffled into six compartments, with two bol brackets on each end, two sling loops on each side of top, 6- vented, watertight filler cap, and 1½-inch drain plug (fig. 3).

Each of these three units has a WA-7 pump, manufacture a Seattle company, mounted in a cradle on top of the tank

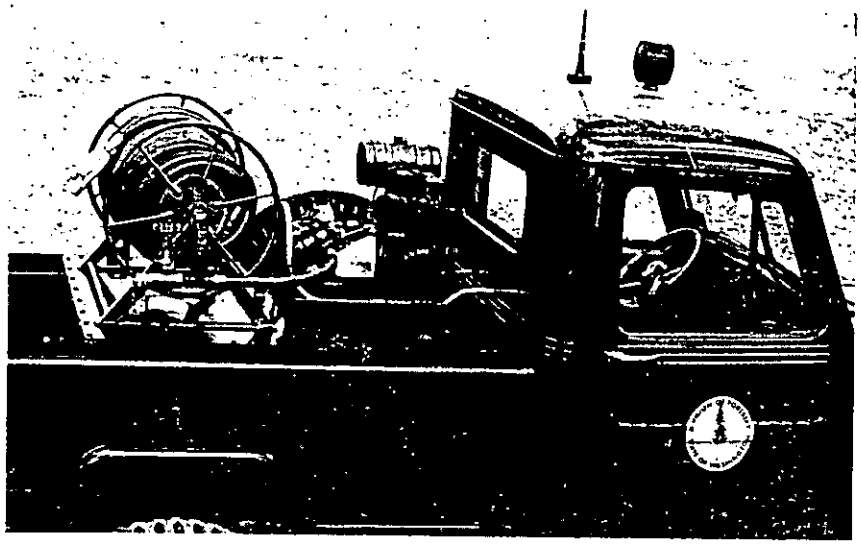

FIGURE 1.—155-gallon slip-on unit.

quick-detachment fittings. A live hose reel carrying a minimum of 200 feet of ¾-inch, semihard rubber hose is mounted on top of the tank adjacent to the pumper. Hose is equipped with a suitable 1-inch combination shut-off nozzle readily adjustable to fog or straight stream. Size of stream may be varied by changing nozzle tip.

These units are designed to operate at pump pressures up to 250 pounds per square inch and volumes up to 25 gallons per minute depending on nozzle orifice and other variable factors.

500-Gallon rectangular slip-on unit to be used on conventional Ford, Chevrolet, or Dodge 1½-ton stake-side, dump, or flat-bed trucks.—Tank dimensions and fixtures: Width 70 inches, length 90 inches, height 18 inches, with cover welded on, baffled into six

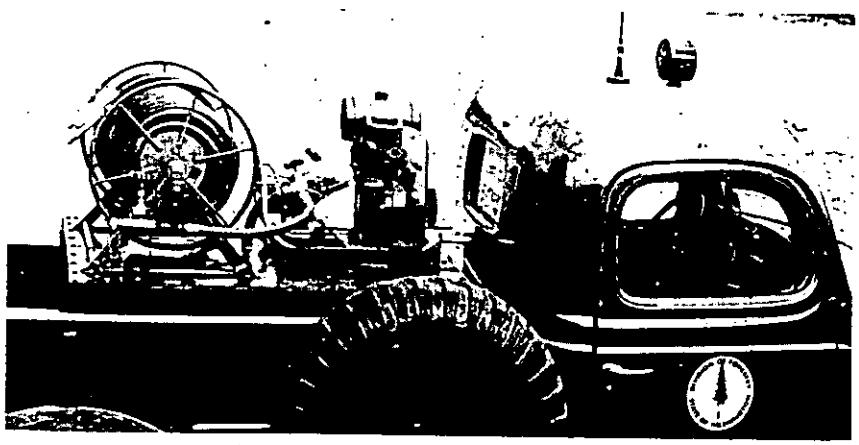

FIGURE 2.—240-gallon slip-on unit.

compartments, with two bolt-down brackets on each end, t
sling loops on each side of top, 6-inch vented, watertight filler ca
and 1½-inch drain plug (fig. 4). A WX-10 pumper, manufactur
by a Seattle company, is mounted in a cradle on top of tank wi
quick-detachment fittings. A live hose reel carrying a minimum
300 feet of ¾-inch, semihard rubber hose is mounted on top of t
tank adjacent to the pumper. Hose is equipped with a suitab
1-inch combination nozzle readily adjustable to fog or straig
stream. Size of stream may be varied by changing nozzle tip.
1½-inch tee with valve is placed between pumper and hose re
to permit laying a 1-inch or 1½-inch hose line direct from truc
This unit is designed to operate at pressures up to 250 pounds p
square inch and volumes up to 40 gallons per minute dependi
on nozzle orifice and other variable factors.

All tank shells are preferably constructed from 12-gage Maya
steel with baffles of 14-gage Mayari steel. Baffles are all plu
welded.

A 1½-inch suction strainer with cylinder 8 inches in diamet
by 8 inches in length, and capped on each end, is used in all uni
The shell on the strainer cylinder is constructed from 1/16-in
tinned steel perforated with ⅜-inch holes on ⅝-inch centers, a
wrapped with 40-mesh Monel wire cloth. A 1½-inch galvaniz
pipe passing through and welded to the center of one end cap e
tends to within 1 inch of the other end cap. This strainer is us
in a vertical position in either forward corner of the tank. T
suction strainer extends through a manhole with bolt-on cover
permit free passage of the strainer to and from the tank for i
spection or repair. This suction strainer is especially importa
when rotary gear pumps are used. Suction line from tank
pumper is flexible, hard hose with slotted screw-type couplin
Discharge line from pressure relief valve to live hose reel
flexible semihard rubber hose. On all of the units under 500 g
lons, a 1-inch tee with valve is installed between pumper and li
hose reel to permit laying 1-inch hose line direct from pump
when desired.

A properly designed bypass valve adjustable within the pressu
limits to be used is installed on the discharge side and adjacent
the pumper. Bypass water is carried through separate ¾-in
garden hose into the tank. The bypass or pressure relief valve
very important as it functions automatically as the shut-off noz
is opened or closed. This eliminates excessive strains on equ
ment and saves materially in hose breakage and replacement.

All units have plywood tool boxes designed to carry hand to
for five to ten men, depending on local requirements. In additi
to this, tool boxes carry gasoline and oil, pumper tools, and 5
feet of 1-inch cotton rubber-lined hose.

A properly designed slip-on unit has the following advantag

(1) If the portable pumper is properly mounted it may
quickly detached and moved to a source of water supply for filli
the tanker, far beyond the normal suction lift of a pumper wh

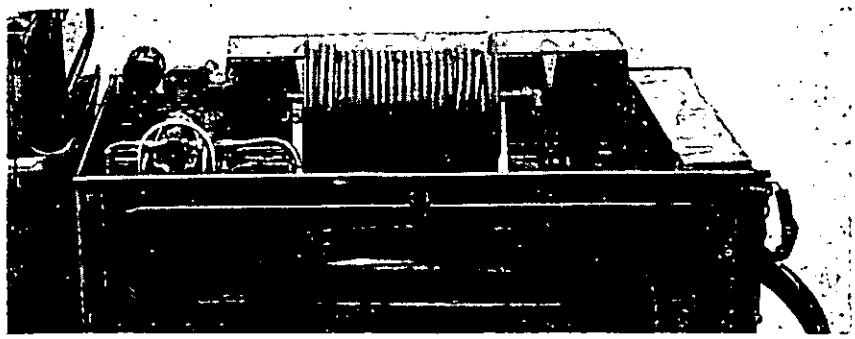

FIGURE 3.—210-gallon slip-on unit.

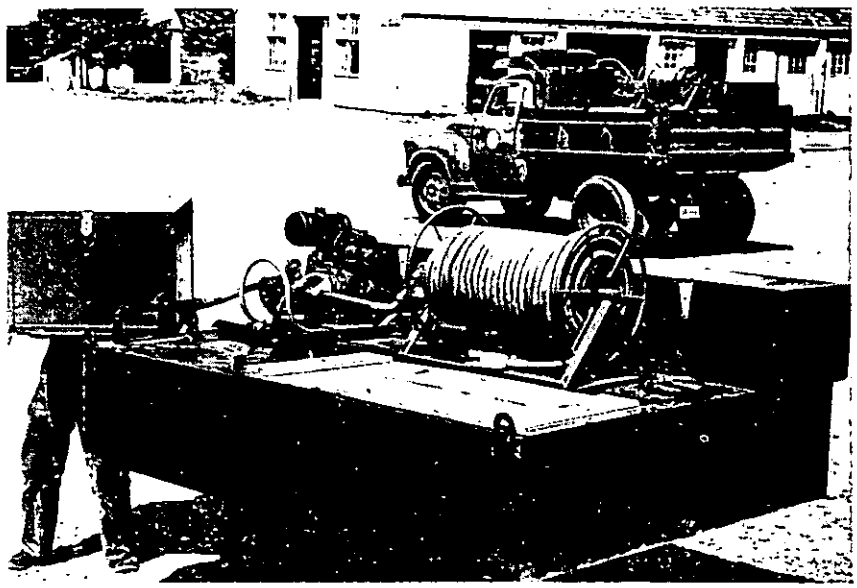

FIGURE 4.—500-gallon slip-on unit.

cannot be detached from the truck. It may also be removed from the truck and used as a separate pumper unit to pump direct from water supply onto fire in many locations where a truck could not get to the water supply.

(2) A slip-on unit does not tie up an expensive truck so that it cannot be used for any purpose other than a tank truck. It is a simple matter to load or unload as needed.

(3) It is a simple matter to transfer a slip-on unit from one vehicle to another in case of truck failure or when a new truck replaces the old one.

(4) A slip-on unit incorporates all of the pumping equipment and tools to make it a self-sufficient fire fighting unit. It is ready to go instantly without the delay involved in assembling various items which may be needed.

TANKER SPRINKLER BAR

ARCADIA EQUIPMENT DEVELOPMENT CENTER
California Region, U.S. Forest Service

In order to alleviate dusty conditions at forest stations, recr tion areas, campgrounds, and fire camps, fire trucks are frequen used for sprinkling purposes. Naturally, it is a slow and inefficie process to settle the dust by means of hand sprinkling with a ho This explains the request by the California Region for a porta sprinkling system which could readily be attached to a tanker.

Such a sprinkling system, which attaches onto either the fro or rear bumper of a truck, has been built at the Arcadia Equi ment Development Center.

It consists of two pieces of 1¼-inch pipe, each 3 feet lon coupled in the middle by a swivel joint (fig. 1). This allows di jointing for carrying in one of the tool boxes. Any size pipe fro 1-inch up would serve the purpose. Four holes, equally spaced the pipe, serve as orifices for expelling water which is sprayed o in fan-shaped patterns by deflectors.

The width of the four sprays, where they hit the ground, ca be regulated by rotating the pipe so that a uniform sprinkling jc results. As shown in figure 2, the over-all width of the sprinkle strip is 8 feet. Should a wider strip be desired, additional sectior of pipe could be added, or longer pipes used which would still f in the tool box.

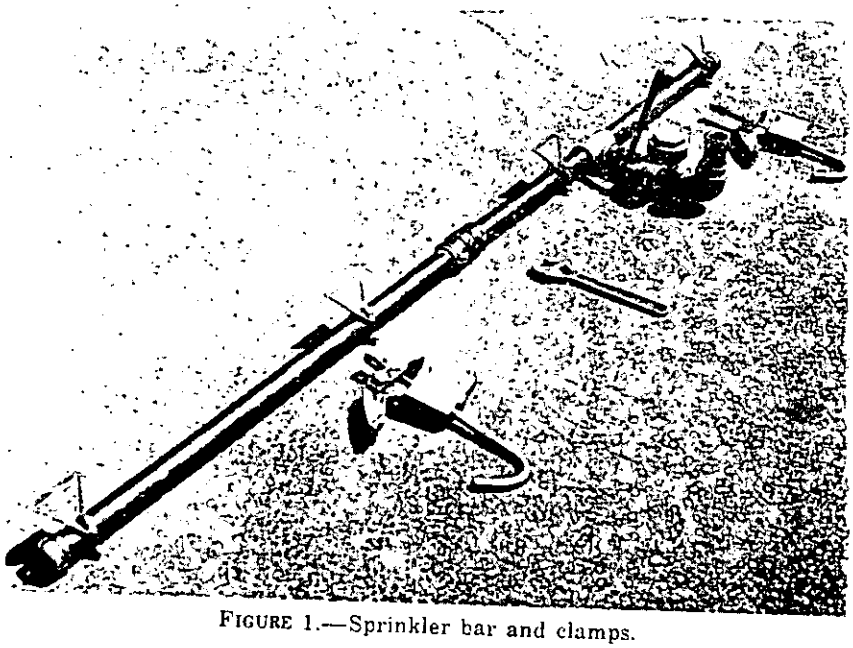

FIGURE 1.—Sprinkler bar and clamps.

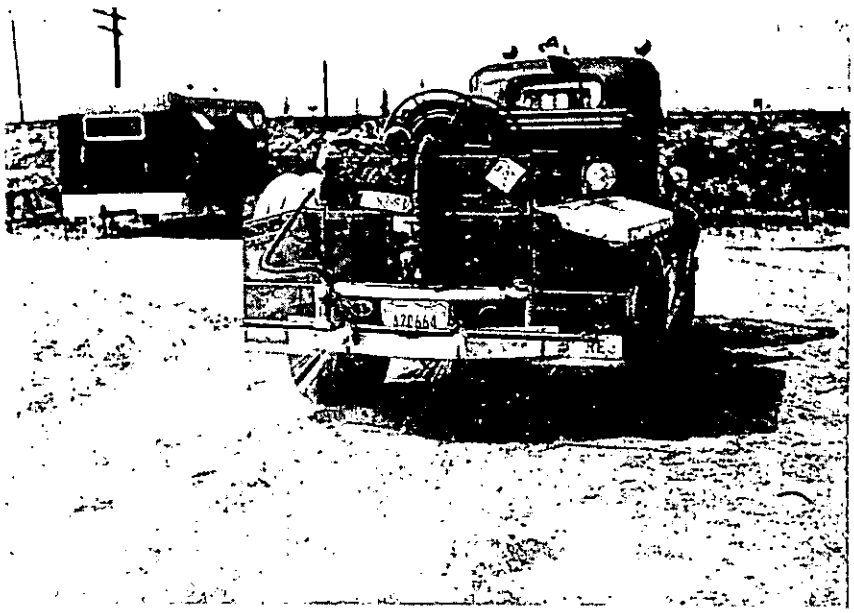

FIGURE 2.—Sprinkling at a nozzle pressure of 125 pounds per square inch.

Two adjustable clamps hold the pipe in place and attach firmly onto any bumper. The clamps on the pilot model are well machined and, therefore, cost more than is absolutely necessary. However, the design proved very effective for holding the unit in place. The J-bolts are made sufficiently long to fit a bumper 8 inches wide. For narrow bumpers, washers cut from ¾-inch pipe are used to take up the slack. If preferred, a simple arrangement of "C" clamps could be used as a substitute for the design shown.

The four holes are drilled 5/32-inch in diameter, which allows a combined flow of approximately 18 gallons per minute when pumping at a pressure of 100 pounds per square inch. The deflectors used are a commercial item which can be purchased for approximately $1.50 each.

A 1-inch swivel inlet provides ready attachment of the 1-inch hose line from the live hose reel. The pilot model is equipped with a quick-throw valve which can be rigged with pulleys and rope for control from the cab. This, however, is optional and may be omitted for the sake of economy. The hose reel shut-off valve could be used as a substitute control.

Drawings or information regarding this item can be obtained from the Arcadia Equipment Development Center, 701 N. Santa Anita Ave., P. O. Box 586, Arcadia, Calif.

PARA-CARGO NETS

W. C. Wood
Foreman, Smokejumper Project, Region 1, U.S. Forest Servic

Until recent years, para-cargo in Region 1 was man-tied a roped for dropping, much in the same manner as for mule tra port. Small bundles required extra time and labor when they w to be dropped in one unit.

A canvas cargo sling was developed for handling these sm packages as one load. This sling consisted of a 6-foot-diame piece of 22-ounce canvas with C-10 webbing straps sewn at rig angles to each other across the canvas and with buckles attach to straps. The perimeter of the canvas was hemmed and fitt with grommets through which a drawstring of ¼-inch rope w laced. Loading of this net is simple and fast. The canvas may spread out on the floor and several small bundles placed in t center according to fragility or size. The canvas is drawn up cover the sides and secured tightly with the drawstring. Tl webbing straps and buckles are fastened to form a loop for a taching the parachute.

The canvas sling is entirely satisfactory in all respects exce cost. The sling requires 4 yards of canvas at a cost of $4.22. Sa vaged or condemned parachute webbing was formerly used on tl straps but is no longer available. Seven yards of C-8 webbing a required at a cost of $1.40. Hardware costs $1.25 and labor approx mately $5.00. The total cost is $11.87. These slings are frequenti not returned from the fires and a cheaper sling is desirable.

Two types of fish netting were used as substitutes for canvas i two experimental models (fig. 1) to reduce cost in materials. Th netting is 1-inch square mesh. The white netting is new nontreate fish netting which costs 90¢ a yard. The dark green netting use is condemned fish netting which costs about 7¢ a yard.

It was hoped that the green used netting could serve as a sub stitute for canvas, but strength tests show it to be too far de teriorated to withstand most parachute openings. Box corners o projections can shear the cord even in loading and handling.

The white netting is much stronger and makes a more satis factory para-net.

Two nets were constructed from the pattern of the canvas para cargo sling. An unusual number of fabricating problems were en countered in constructing these models. Netting does not "lay-out' like canvas and other solid fabrics; hence there is difficulty i cutting to measurements. Netting does not lend itself to easy an fast sewing machine work. The cords and knots of the net be come entangled in the foot and feed mechanism of the sewing machine. It was found that the netting had to be "sandwiched" between two strips of webbing to insure smoother feeding actio through the machine, so an additional webbing piece was required. The small hard knots of the netting deflected and broke machin needles. Folds and hems were difficult to hold in alignment during

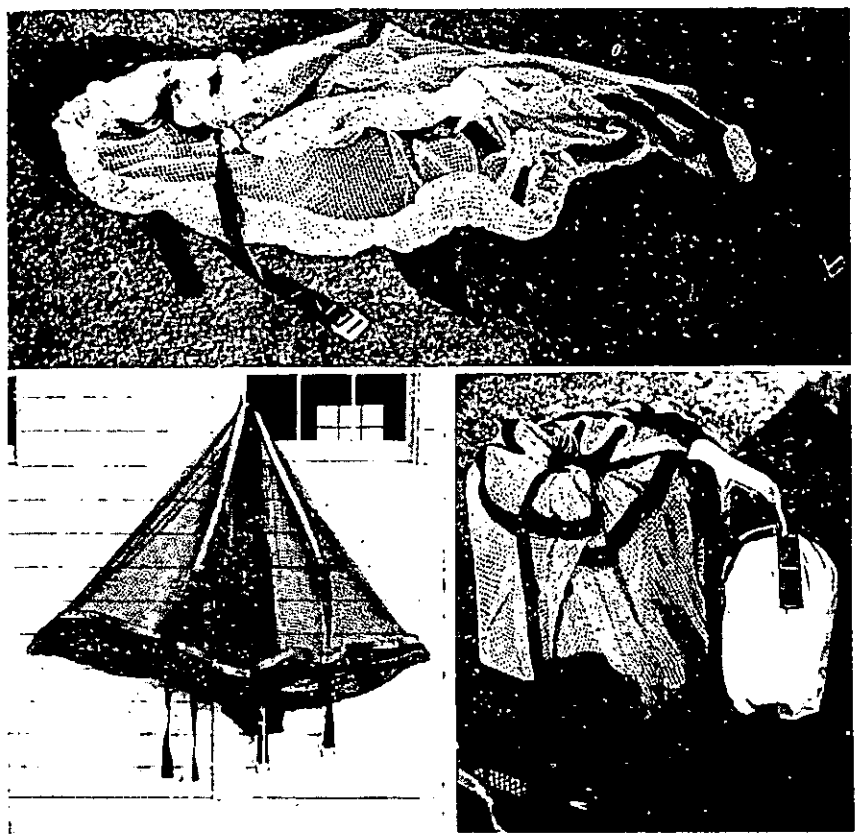

FIGURE 1.—Experimental cargo nets: new, white fish netting; inexpensive, used fish netting (dark green); white netting containing cargo and with chute attached.

sewing and resulted in sloppy work. Labor cost of the net sling was $20 on each of these models or about three times that of a canvas net.

Three test drops at an airspeed of 90 miles per hour were made on the net models with the following results:

Drop	*Description*	*Weight (pounds)*	*Results*
1	White netting with SPF radio box and sandbag.	65	Radio box shifted sideways inside net, but overall performance satisfactory.
2	Green netting with SPF radio box and sandbags.	65	Twelve-inch tear developed at corner of box. Webbing saved box from going out of net. (Damage on the first drop eliminated this sling from a second test.)
3	White net with small boxes, canned goods dumped in at random.	150	Entirely satisfactory, no tears or holes.

From the two drops with the white net sling it appears that t white net is strong enough to serve as a substitute for canv however, cost of construction on this model would rule it out.

A simpler design has been devised which reduces labor on new model to about $1. The new model consists of an 8-foot squa of netting with its sides turned 2 inches and rolled inward to fo complete turns. A 30-foot piece of parachute suspension line threaded through the folded mesh of the rolled hem at 6-inch i tervals in the same manner as though the hem contained gromme or eyelets (fig. 2). Cargo packages may be confined by placi

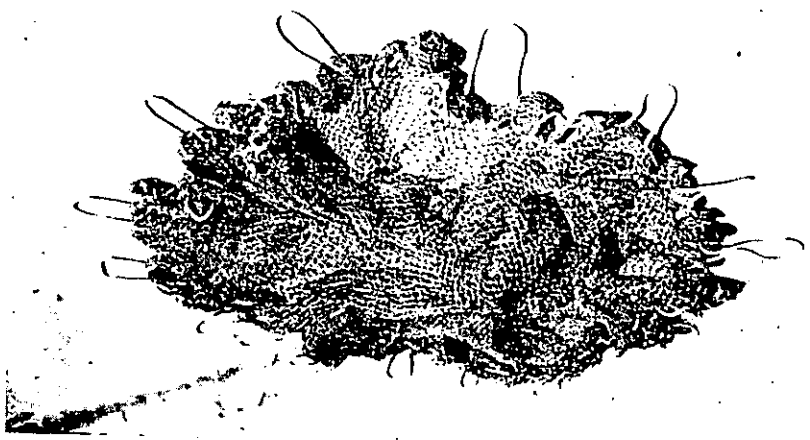

FIGURE 2.—Experimental cargo net which, because of low cost, may be considered disposable.

them in the center of the net and drawing the parachute line u from the corners and sides until the hem is constricted to approximately 6 inches. The cargo chute is attached to multiple loops formed by the parachute line drawstring. Operational tests on this model are forthcoming. These nets have considerable promise for confining light packages and because of the low cost may be considered disposable where return transportation is expensive. We believe, however, that permanent net-slings should have some webbing reinforcement for added strength when 150- to 200-pound loads are contemplated.

One objectionable feature of netting is its tendency to snag and hang up on the slightest projection. Even small screw heads not properly countersunk into the floor of the aircraft will catch on the net. Extra precaution should be taken when dropping netted packages. A flat piece of cardboard may be attached to the bottom of net cargo slings to alleviate this hindrance, but this adds another step to impede the predischarge maneuvering.

MAINSTAYS OF FOREST FIRE PROTECTION [1]

A. A. BROWN
Chief, Division of Forest Fire Research, U. S. Forest Service

Fire is an old friend, and an old enemy of man, depending on how well it is used and controlled. As a friend, it serves everyone, but as an enemy it threatens us all, too. But the responsibility for keeping it under control falls generally to a small group. The acceptance of such a responsibility is a common characteristic of all fire men and is something that all of us here have in common. A good part of the task ahead is to get more people to accept that responsibility toward fire.

I happen to represent men who take on that responsibility in woods and wild lands—the forest fire fighters. They have a common purpose with all other fire fighters but they work in a very different environment so the job differs, too, in many respects. The forest fire fighter is a long way from city hydrants and he is lucky if he can get to his fire on wheels.

We in the forest fire fighting services have been busy mechanizing wherever we can in the last 10 years, and we have much to show in the way of equipment development. In 1950 a total of 1,500 miles of fire control line was worked by the aid of machines of various kinds on or in the defense of the national forests alone. Even so, 83 percent of the forest fires attacked by the national-forest organization are still controlled by men on foot using hand tools and woodsman's methods.

In the U.S.A. forest fire fighting is a big job every year and a costly one. On the national forests there are usually over 10,000 fires controlled each year and on areas protected by State and private agencies there are about 80,000 additional fires. The total number of forest, brush, and grass fires reported each year amounts to close to 200,000.

Much of the threat from forest, brush, and grass fires is to improved property of all kinds. Consequently, what happens in forest fire fighting has a considerable impact on the success of the protection of improved property. In every bad forest fire year, there is a noticeable jump in losses to insured property. There are several reasons that should interest all fire chiefs.

In the United States only about 7 percent of our land area is included within city limits or other units in which organized fire departments operate. The other 93 percent of the land area is in rural country and wild lands. This, too, creates an important distinction in the fire fighting job. Forest fire protection is widely scattered while municipal and industrial protection can be highly concentrated.

[1] Paper presented at the May 3-5, 1951, sessions of the Dominion Fire Prevention Association, Windsor, Canada.

Organized forest fire fighting is much younger than structural fire fighting and most of its development has occurred in the last 40 years. Progress in that development can be described in various ways. It is most usual to do so historically or statistically to show progressive reduction in losses or improvement in performance. I shall attempt instead to discuss what seems to me to be the essential elements in such progress in order to take a little sharper look at the main supports on which a successful system of forest protection must depend. I think you will agree that most of these are important to all systems of protection though they may not have the same relative force.

The main supports which I would like to examine with you might be placed under the following four headings: Public education and legislation, cooperation at all levels, systematic planning, and research and development.

Public Education and Legislation

Perhaps a better term would be "public policy" since legislation bearing on fire is essentially a statement of public policy whether it be local or national in scope. Public policy is expressed and made effective only to the degree that people recognize and understand a problem and resolve to do something about it. This is the necessary background to the development of a conservation program and to the support and financing of the protection of wild land resources. In the United States people became interested in forest fires and in the damage done at the beginning of the century. Conservationists called attention to the significance of such fires and newspapers gave them considerable publicity. This created a favorable background for national legislation which set up the national forests and charged the administrators with the responsibility of protecting them from forest fires.

Our great leader in conservation, and the first chief of the Forest Service, Gifford Pinchot, was the first man to impress the need of conservation of national resources on our public consciousness. Several of our presidents have carried on that sponsorship by promoting and helping to give further legislative expression to national policy. In our conservation movement, protection of forests and other wild lands from deterioration from fire has always been a key feature.

In recent years, public education in the prevention of fires has been greatly advanced by the participation of the National Advertising Council in formulating national advertising programs. These programs featuring "smokey bear" and appealing to the general public, were begun during the last war as a free contribution to wartime public service. They have been so popular and so successful that the National Advertising Council has continued its sponsorship to the present. The objective is simple, but the stake is big. It is a full realization by the general public of the need to keep our national resources productive, and of their own personal stake in forest fire losses.

Cooperation at All Levels

Fires outdoors are no respecter of land ownership boundaries or of jurisdictions. This becomes impressed on every experienced forest fire fighter and has become one of the controlling principles of successful protection throughout the U.S.A. It was first applied by timberland owners who found that their own efforts to protect their holdings were not effective unless their neighbors took similar action. This led to the banding together of timberland owners into timber protective associations. This cooperative principle has continued in the development of forest protection. In time, since there was always some difficulty in getting uniform compliance with agreements to pool funds and efforts, four of our western States have enacted laws which provide for protection assessments against timberlands in order to facilitate the operation of both State and association protection systems. But to an increasing degree the State and Federal governments have come in as partners.

The principle of public participation in financing protection was first recognized by our Weeks law in 1911. In 1924 our Clarke-McNary law was enacted to provide Federal support of State-wide protection under State authorities. Through the operation of this law the Federal stake in forest protection was recognized and protection systems under State Foresters have developed rapidly until they are now active in 43 of our 48 States.

In spite of the accomplishments that have already resulted from recognizing that cooperation between owners and agencies is essential to any form of systematic protection, there are still a good many gaps in the scheme. This is recognized in recent efforts to strengthen wild land protection on a national basis as a part of the provisions now being set up for improving the national defense. Under it there is increased effort to provide for emergency action across State lines and to increase the cooperation between structural fire fighting groups and forest protection agencies.

The need of improved jurisdictional arrangements becomes apparent whenever a major disaster occurs. This was highlighted by the difficulties experienced at the time of the great fires in Maine in 1947. It led to the so-called New England compact by which resources of a group of our New England States are available to meet emergencies in any one of them. The provisions of the compact left the door open for adjoining States to enter into the arrangement and I understand it is hoped that the adjoining Canadian provinces may find it desirable to enter into these compacts in some way along the international boundary.

From first-hand experience in the Northwest I know that wholehearted cooperation across the international boundary has been a long established custom in fire fighting and so few jurisdictional problems have arisen that so far no one has taken the trouble to codify the legal aspects.

Cooperation, of course, extends much further than cooperative arrangements between jurisdictional units. In a large sector of our western country the active cooperation of local residents in

preventing fires, reporting them, and participating in their control, has long been the backbone of a protection system by which forest fire losses are kept to a minimum at a very low protection cost. This again represents cooperation on the ground, which is, after all, the essence of any cooperative arrangement. Much of the value of forest fire prevention publicity is in the degree to which it stimulates cooperation on the part of the general public in the effort to prevent fires or to control them before they become dangerous.

Systematic Planning

All fire fighting has a special emergency character that makes it different from most civilian activities. This is because fires start and spread at unpredictable times and places and it is impossible to schedule the need of any fire fighting activity to the degree that can be done in most forestry activities and on construction jobs. Consequently, the only way that systematic protection can be carried out successfully is through careful planning. Such planning has to address itself to the question of determining the places and times of year when effort will be needed to control fires and to the relative amount of effort that will be required in order that the fire organization may be maintained in reasonable relation to the job that will need to be done.

Planning has to concern itself with providing protection to large areas of land and to getting effective action on fires wherever they may occur. There are many phases to it and I shall not dwell on the different kinds of planning that are involved. I think it is sufficient to say that effective control of fires, regardless of the lands or the effort involved, is impossible unless a great deal of planning has been done to provide fire fighting forces at the right time and at the right place to control all fires that start.

Research and Development

From the very beginning the development of successful forest protection has depended on factual information. It is necessary to know a great deal about the occurrence of fires in every locality, the times of year when they become dangerous, and the damage they do before the requirements of the fire fighting job can be fully appreciated. Fire statistics play a big part in supplying such information but they always require analysis and interpretation before the question of what to do can be resolved.

The need of factual information for every area protected applies not only to the planning and maintaining of the organization but to its day to day operations as well. Study of the relation of weather to forest fires has enabled the development of so-called fire danger ratings which provide a daily guide to the fire control administrator in managing his organization. Fire danger ratings in the U.S.A. are imperfect in many respects and vary a great deal in their significance but have proved so valuable to the administra-

tor that they are in use in all of our national-forest regions and by a majority of the State organizations.

Research in forest fire behavior has also provided the essential base for training fire fighters and in developing the judgment of men in the planning and managing of large fire fighting operations. There is still a long way to go before we can predict just what a fire will do in all circumstances and we particularly need some new research in the behavior of big fires.

The most important thing of all in the research activity is the creation of an attitude of mind where new ideas and new answers to old problems are constantly being sought. The existing fire research group of the Forest Service is very small and their independent efforts might have little significance except as they are backed by strong demands by some of our research-minded forest administrators who are constantly looking for better methods and who are carrying on administrative studies to find out as many things as possible for themselves. Some of the most important research is not academic in nature but consists of the ability to break way from the conventional in order to arrive at a better solution.

Much ingenuity has been directed toward the problem of bringing machine methods to bear on forest fire fighting. Such development has been closely coupled with other forms of research and, in the Forest Service, was under the leadership of Mr. David Godwin for many years. He was responsible for establishing a definite continuing program of equipment development and application under the difficult situations usually encountered in forest fire fighting in rough inaccessible terrain. The benefits of giving special attention to the adaptation of equipment to the job to be done have extended from the improvement and invention of hand tools to backpack hand pumps, tank trucks, plows, tractors, radio equipment, and transportation equipment. Work in the field of equipment is dynamic, and it is never completed. One reason is that there is no ideal answer for all needs in any one piece of equipment. All of it has certain limitations. So careful testing on the ground and careful analysis of performance is necessary to find out where and when a particular piece of equipment will pay its way. We still need a great deal of this kind of work.

In recent years the most important factors that are finding their place in systematic forest protection are the best use of aircraft, including helicopters, the development of light fire trenchers, the standardization of fire tank trucks, the place of chemicals in fire fighting. The feasibility of attacking fires directly from the air is also a most attractive future promise.

Conclusions

This brief summary of the mainstays of successful forest fire protection is in outline only. Each is a story in itself. When all become well established and activity in each is maintained in step

with the dynamic nature of the job, forest protection becomes a highly successful and progressive enterprise.

But on a State- or Dominion-wide basis there may still be a serious lack in the over-all defense against fire, that is, if only city and wild land protection are well developed, and each is on an independent basis.

In the U.S.A. there are great sections of the farm and range country where no means of concerted action has been organized. In some sections volunteer fire fighters extend their protection on the city pattern into the countryside. In others, the wild land protection agencies extend their services also. But well coordinated protection coverage for city, country, and forest is still rare. This lack of coordination also shows up in equipment, training, and methods. If you have seen city firemen out battling a grass fire with ladders and chemical extinguishers or a forest crew trying to protect a structure without a pumper, you know what I mean.

Current national defense plans provide a fine opportunity to advance fire protection on all fronts. If they are properly drawn to meet large-scale fire emergencies, all protection forces will find themselves partners. Such a partnership could be highly profitable if it results in a new unity in a common purpose, more complete coverage in protecting our national wealth, more pooling of the effort in research and development, and more exchange of the "know how" that means better performance down the line.

Do Diesel Locomotives Set Fires?

There is definite evidence that Diesel locomotives do set fires. During the period April 7 to July 11, 1951, Diesel locomotives set 33 fires along the Great Northern Railroad right-of-way, according to information from the Snoqualmie National Forest, Seattle, Wash. In addition, a comparable number of fires were set on the State protective area.

Investigation of these fires, and contact with railroad officials established the following facts:

1. More than one locomotive was involved—two, at least, and possibly four.

2. All fires were started on the east-bound run while the locomotives were laboring on an up-grade.

3. The railroad officials accepted without question the theory that the fires started from sparks.

4. In previous seasons, these same locomotives had not been known to have set fires.

What was wrong? The railroad company was concerned. The one thing they knew about was that a different type of lubricating oil—highly detergent—was being used. A mechanical engineer and an oil company expert were called in for consultation. The fire-setting locomotives were given a complete overhaul, and a different type of lubricating oil was used. The locomotives went back into service. No fires have been reported since.

The explanation in this case would seem to be that the detergent oil was doing exactly what it was intended to do—loosen carbon. When the locomotives encountered a steep grade, pieces of carbon broke loose and were emitted from the stacks.—DIVISION OF FIRE CONTROL, *Region 6, 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.*

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Smokey Says-
PREVENT FOREST FIRES!
SMOKEY