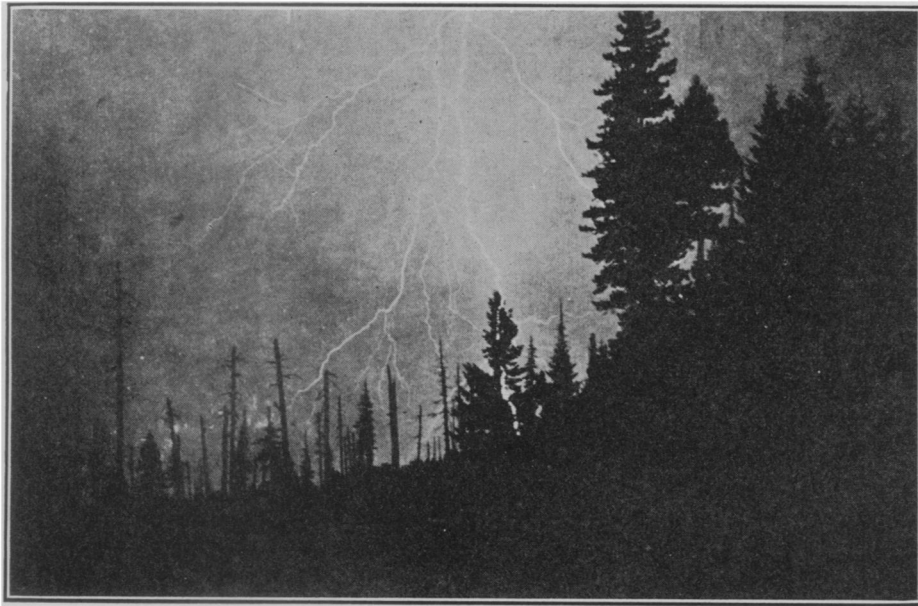


Fighting Forest Fires With Weather Science



Lightning striking in a forest.

By C. FITZHUGH TALMAN

A strange sight witnessed the other day in a logging camp was that of the lumberjacks letting dinner wait while they consulted a scientific instrument. The instrument was one in which a pen, tracing a wavy line on a moving sheet of paper, showed how much moisture there was in the atmosphere. The question that it answered on this occasion was: "Can we smoke this afternoon?"

Farmers, sailors and people in various other walks of life have long been in the habit of conducting their affairs according to the weather. Now the lumbermen have discovered that they, too, must keep close watch of the weather and regulate their undertakings accordingly, unless they are willing to see the timber riches of the country go up in smoke. And Uncle Sam's weather prognosticators have taken a new burden upon their already overloaded shoulders. The blame for a forest fire is now laid at their doors if, before it happened, they failed to predict the occurrence of "fire weather."

There is a classic illustration of the fact that certain types of weather may be more conducive than others to the prevalence of disastrous conflagration. In the valleys of the Alps a warm parching wind called the "Foehn" has long been notorious for causing fires to spread with uncontrollable fury. When the well-known signs of its approach are observed, ordinary precautions against fire are redoubled. In some districts

all domestic fires are extinguished and even the lighting of a cigarette is forbidden while the wind is blowing.

The east winds of Washington and Oregon enjoy a similar reputation among persons concerned in protecting the magnificent forests of those states. When such winds are preceded by a period of even ordinarily dry warm weather, the forest materials become so inflammable that fires quickly got out of hand. The term "blow-up" days is applied by the western foresters to brief spells of

weather during which, in some cases, more damage is done by fire than during all the rest of the season.

In 1910 and 1912 fires in the northwest were extremely disastrous. Hence in the spring of 1913 the United States Forest Service and the Western Forestry and Conservation Commission appealed to the Weather Bureau to make a special study of the meteorological conditions under which the east winds occur, with a view to forecasting them far enough in advance for preparations to be made to prevent fires by shutting down logging operations, refraining from the burning of slash, and taking other precautions familiar to foresters; also to enable the fire-fighting forces to be put on guard and deployed in such a way as to attack fires with the least possible delay. The Weather Bureau complied with this request as far as was then possible. Arrangements were made to secure additional weather reports from Canada in order to enlarge the field covered by the daily weather map. Warnings of dangerous atmospheric conditions in the western forests were first issued at Portland and San Francisco in 1914.

This was the beginning of a service that has now been extended to all the forested regions of the country. The undertaking has been a cooperative one on the part of the Weather Bureau, the Forest Service, various

(Just turn the page)



After the forest fire.

forestry associations and the state forestry commissions. Both of the Federal bodies have assigned experts to carry on elaborate studies in the field, and have devised special instruments for gauging the fire hazard as determined by atmospheric conditions.

Of course the east wind of the northwestern forests is only one example of fire weather. The conditions that favor the occurrence of fires vary from one part of the country to another. Roughly speaking, fire weather may be divided into three types: viz., (1) hot, dry periods, favorable for the start and spread of fires; (2) periods of high winds and gales, favorable for the rapid spread of existing fires; and (3) lightning storms, which themselves start fires. There may also be combinations of two or more of these conditions.

The degree to which changes in the humidity of the air affect the fire hazard varies with different types of timber and ground cover. Studies have been made in the various forested regions to determine what percentage of "relative humidity" will permit fires to spread, and also what percentage constitutes a serious danger. Thus at the Wind River Forest Experiment Station, in Idaho, it has been found that fires do not spread if the relative humidity is above 60 per cent. Humidity between 40 and 50 per cent allows fires to pick up and spread rapidly; while humidity below 30 per cent tends to make even small fires spread beyond control.

The instrument most used in the forests in measuring humidity is known as a "sling psychrometer." It consists of a pair of thermometers, one of which has its bulb wrapped in muslin. Before the instrument is used, the muslin is moistened. The thermometers are then whirled rapidly in the air, and evaporation causes the thermometer with moistened bulb to read lower than the other. Both thermometers are read, and a table gives the relative humidity corresponding to the readings. This device is so valuable to the scientific fire-fighter that, as a recent writer has said, it "has taken its place as a fire tool beside the long-handled shovel and the double-bitted axe."

Another factor in the spread of fires is the amount of moisture in the "duff" or litter of the forest floor. A special form of hygrometer has been designed for measuring this, and experiments show that when the litter contains more than about 10 per cent of its dry weight in water it is no longer inflammable.

Winds play a part in the fire situa-

tion partly through their effects on humidity and partly through the actual spreading of brands and sparks. The winds may themselves be relatively moist or dry, according to the source from which they come, and the drying effect of a wind upon forest materials depends in part upon its velocity.

Lightning is not a common cause of forest fires in the eastern states, where thunderstorms are generally attended by heavy rain, but in the forests of the west they often occur with little rain, or none, and in this part of the country lightning fires are exceedingly common. A single thunderstorm has been known to start more than 300 fires, and a case was recently reported from Idaho in which more than 70 were started in 20 minutes. Such fires frequently occur in remote and unsettled districts, and thus get beyond control before the fire fighters can reach them.

The far-reaching control that weather exercises over forest fires was not realized, even by experienced foresters, when the present campaign of investigation was begun. Recently the records of certain very destructive fires of past years have been compared with the weather records and weather maps of the corresponding dates, and interesting relationships have been brought to light.

For example, the great conflagration that raged in northern Minnesota in October, 1918, in which several towns were laid in ashes and hundreds of lives were lost, began abruptly when, during a period of low humidity, a passing storm whipped together a few neglected brush fires, and it terminated almost as abruptly with a change in the general weather situation. On September 17, 1923, Berkeley, California, came near being wiped out by a fire that started in a brush field and forest at the edge of the city. After many buildings were ablaze, the atmospheric depression that had caused the sudden development of fire weather passed far enough east so that the wind reversed its direction and moisture-laden air from the ocean blew inward. The fire was then quickly brought under control. Not long ago a good-sized blaze in the Olympic National Forest was put out by a drifting fog.

According to official statistics more than 33,000 forest fires occur each year in the United States, burning over an area of 7,000,000 acres, and causing a direct property loss of \$16,000,000 besides a considerable loss of human life. In order to cope with this national scourge, the Federal and

state authorities and private interests expend millions of dollars every year in maintaining a vast system of lookout stations, patrols and fire fighting units. For some years Army aviators have been pressed into service to aid in keeping watch for fires in the national forests. A great campaign of educating the public on the subject of the danger inherent in camp fires, cigarettes and the like has already been fruitful of results. The "fire weather service" is the latest of these measures of protection.

During the present year a moderate increase in Congressional appropriations, supplemented by liberal aid from various other sources, has enabled the Weather Bureau to place the new service for the first time on a fairly efficient basis. The Bureau issues forecasts of fire weather from several central stations, derived partly from the indications of the daily weather maps and partly from the reports of numerous special stations located directly in the forests. The forecasts are distributed by telegraph, telephone and radio broadcasts, and are thus made promptly available to everybody concerned. It is now becoming a common practice for logging operators to close down their camps when warned of the approach of fire weather.

The lumbermen are required by law to burn the branches and tops of felled trees, as this material would greatly increase the danger of fire if left on the ground. The Weather Bureau forecasts serve to indicate the time when this process can be carried on most safely.

The scientific study of fire weather is still in its infancy. Both the meteorologists and the foresters are now devoting a large amount of attention to investigations in this field.

Science News-Letter, October 2, 1926

The eyelids of frogs wink upwards.

Mahogany was once widely used as ship timber.

Practically 400 insects are injurious to oak trees.

October and January head the list of months for bad colds.

The California condor has a wing spread of from 9 to 12 feet.

The farthest known star is about 1,293,572,675 billion miles from the earth.

Resistance of sheet steel garages to fire is being tested by government experts.