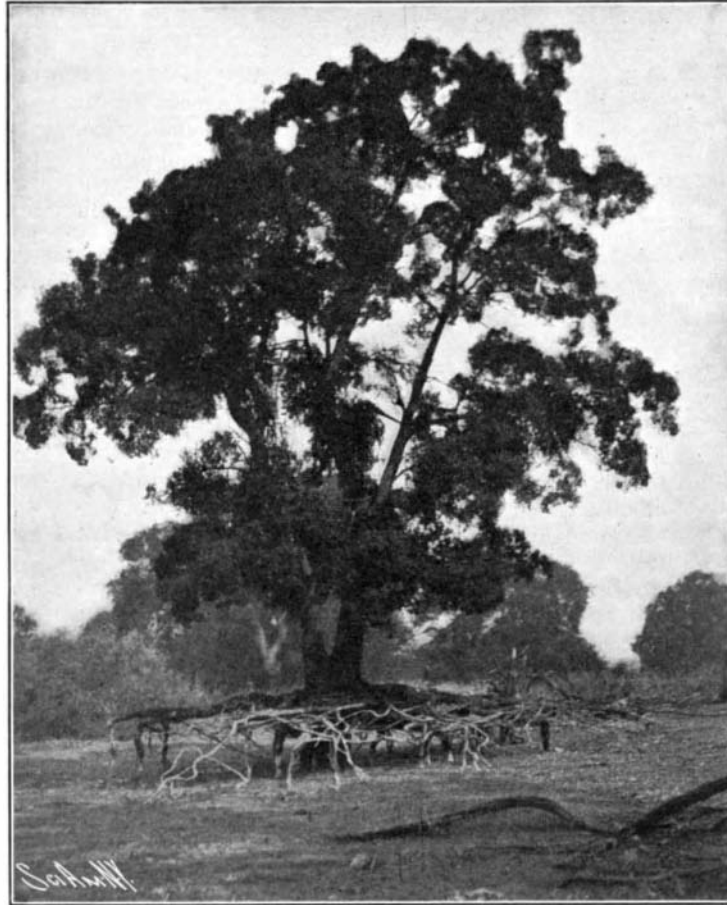


A TREE ON STILTS.

Lake County, to the north of San Francisco, is so named from Clear Lake, which is the largest body of fresh water in the State of California. In this region may be found much fine lake and mountain scenery, for which reason it has been called the "Switzerland of America." Clear Lake is about thirty miles long and ten miles wide in its broadest part. While on a visit there last summer the writer came across the remarkable tree shown in the photograph. It is an oak growing near the edge of the lake, the waters of which have washed away the soil from the roots, and then, receding, have left the tree supported on stilts, as it were. Several other trees on the shore of the lake present a similar appearance, but the one shown was the handsomest and also the most free from surrounding trees or brush.

**A TREE ON STILTS.****FIRE PROTECTION FOR SNOWSHEDS ON THE CENTRAL PACIFIC RAILROAD.**

BY H. I. BENNETT.

Among the difficulties encountered by the early railroad builders of the West was the heavy and long-continued snowfall of the Sierra Nevada Mountains which, in some winters, aggregates 60 feet in depth. The history of the invention of the snowsheds by the engineers of the Central Pacific Railroad is already well known, and reference has been made at various times to the developments in these unique structures, brought about by peculiar conditions which could not easily have been foreseen. The snowsheds were first built, as naturally suggested itself, with steel roofs and in section somewhat similar to that of an ordinary house, but it was found that the unbalanced weight of the snow on one side or the other, especially on side-hill work, caused continual trouble by throwing them out of line down hill. The next step was to anchor the sheds back to the side-hill with heavy rods attached to the framework of the shed and sulphured or otherwise secured to the rock or earth of the cut. It was found, however, that the snow would melt from beneath the rods, and on the adjacent ground and roof of the shed, so that the entire mass for many feet in depth would hang upon the rods, bending them down and pulling the sheds toward the bank, throwing them out of line in a direction opposite to that which occurred when there were no rods. This brought about a further development, that of extending the roof, where it was practicable, into the adjacent banks, forming a shed which prevented the wedge of snow from piling in between the building and the bank. Many sheds of this form are still in use. This was

found to be of such advantage that it suggested the present typical shape, which is that of a flat roof, making the top of the shed somewhat wider than the bottom, so that the melting wedge of snow falls away from the side of the shed instead of pressing against it, and so that the weight upon the base is increased to prevent overturning.

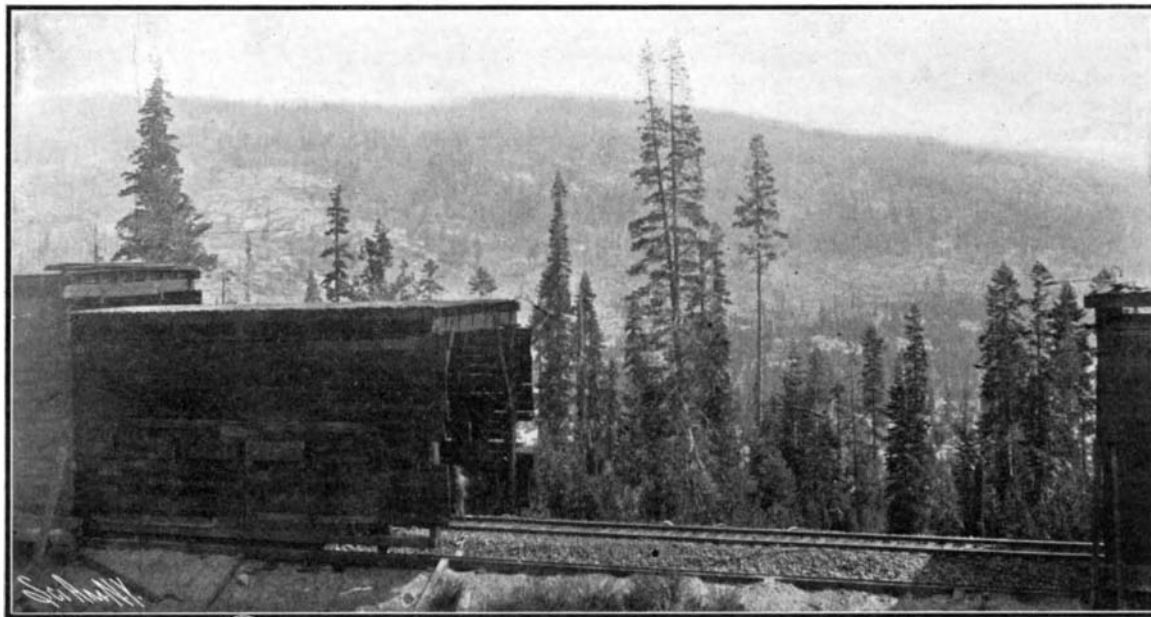
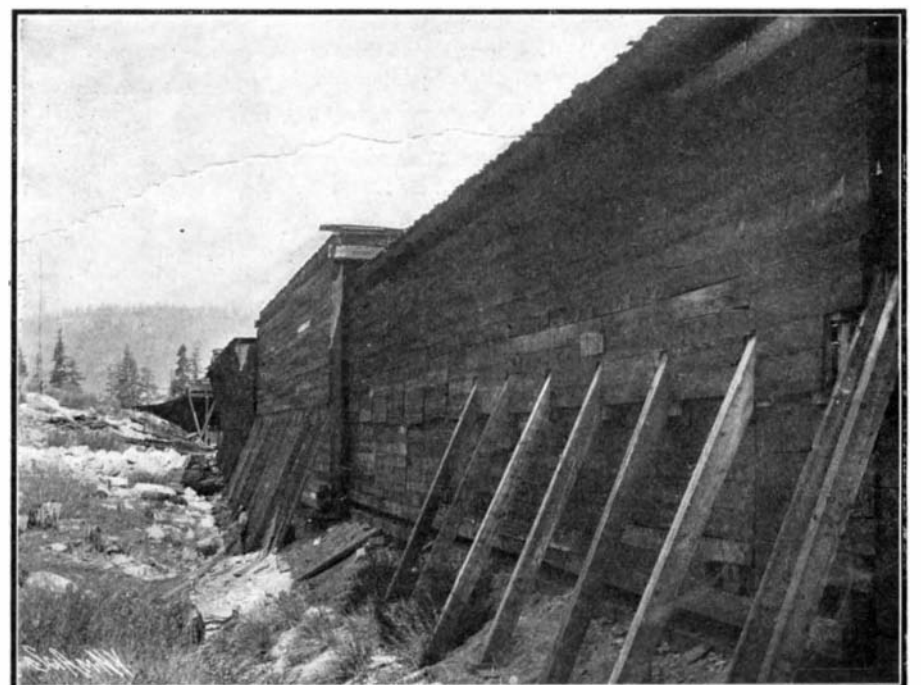
This form of roof of necessity brought the roof covering closer to the stacks of the engines and increased

the liability from fire in the dry-summer season. To obviate this, deflectors are attached to the smokestacks of the locomotives for the purpose of throwing the sparks to the sides instead of straight up against the roof. These deflectors are so hung that they can be thrown to one side when the engines are not in the sheds.

There still remained the danger from brush and forest fires, from which cause most of the fires now take place, although the right of way is kept clear of brush and trees. On the Central Pacific Railroad, there are thirty miles of continuous snowsheds which, with others in isolated spots, bring the total up to about thirty-three miles. With the advent of the snow plow, it was presumed that the sheds could be ultimately done away with, but near the summit of the Sierra Nevada the track is subject not only to blockade from snow, but also from avalanches containing rocks, trees, etc., carried along with the sliding snow. Against these the snow plow is of no avail, and during the long-continued heavy storms only snow plows could use the tracks, to the exclusion of traffic, as otherwise the deep cuts would fill behind the plows almost immediately. It seems, therefore, to be impracticable to dispense with the snowsheds in this section of the country, in which the snow lies upon the ground in some years from November till June.

The stretch of road subject to such conditions is comprised within a distance of thirty-three miles, lying about equally on each side of what is known as the "Summit," or station at the summit of the Sierra Nevada Mountains on the Central Pacific Railroad. Considering this long distance of continuous shed, a danger of great loss and delay due to fires constitutes a continual menace to operation. To take care of this, a very elaborate system of watchmen, connected with each other and with various intermediate points by telephone, and an alarm signal system have been devised. There are seven of such watching or lookout stations at which watchmen are stationed day and night. From

one of these—Red Mountain—several miles from the track and two thousand feet above it, nearly the entire line of sheds is visible. There are maintained at all times three fire trains—one at Blue Canon, one at the Summit, and one at Truckee—and a fourth during the driest part of the summer at Cisco, making one fire train at each end of and two near the middle of the sheds. These trains are always ready, with steam up and crews at hand. Each consists of a locomotive, fire-fighting brigade, and water cars, which, with the prompt notice received, can get to any point within a very few minutes and extinguish a

**Telescopic Shed, Partially Opened.****Looking Through Telescopic Snowsheds.****Telescopic Snowshed Entirely Closed.**

with a huge column of black, boiling mud and stones that shoots in the air to a height of nearly a thousand feet, while the cloud of steam which accompanies it rises in calm weather several thousand feet. The displays of this colossal geyser occur with great suddenness, and frequently the venturesome visitor has to flee to a place of safety. To see it in eruption is the sight of a lifetime. The awful force manifested by the ejection of the vast body of water and stones, the terrific roar of steam and hurling rocks add to the weird grandeur of the phenomenon. No one can look on Waimangu without being awed by its force and sublimity.

Waimangu is really located in the center of the marvelous hot lakes and thermal springs region, Rotorua district, the tourist or sightseer being conveyed thither in a few hours by train from Auckland, the former capital of New Zealand and the principal port of the colony.

So much has been said and written about the hot lakes and thermal wonders, that it would be almost waste of time and ink to describe them lengthily. Pools and springs of every degree of heat are to be found. Some are boiling caldrons, others are spluttering pits of mud and sulphur, sending up clouds of steam and sulphurous fumes, while others again are of the clearest green or deepest, pure blue, beautiful beyond comparison. The curative powers of these hot springs are becoming widely recognized, for they act like a charm on skin diseases, rheumatism, gout, dyspepsia. Thousands of invalids come from far and near, and thousands of tourists come to this district, which teems with natural wonders. The enchantment of this curious region is also added to by the fact that it is the home of the Maori, and is fraught with the legends and traditions of that noble race.

New Zealand may be said to be honeycombed with natural phenomena, and not least among which are the peculiar-shaped limestone formations of the north of Auckland and southern Otago districts, which in many instances are caused by the action of ocean waves, as illustrated by the photograph of the "wineglass." In the Otago district, however, there are veritable land "crops" of such formations, of various heights, the one depicted in the photograph being seventy feet, and known as the "Old Man."

FIRE PROTECTION FOR SNOWSHEDS ON THE CENTRAL PACIFIC RAILROAD.

(Continued from page 464.)

fire without much difficulty; for instance, during a recent summer, the total loss through fire was extremely small—not over \$100 total at the outside; but occasionally, in spite of all precautions, the fire will get under way and destroy some miles of shed before it can be stopped. It has been found that, in such cases, the only effectual way to stop a fire is to tear down a gap of from 50 to 100 feet in length, which prevents the remainder of the shed acting as a chimney and drawing the flame along, as it does when uninterrupted, with great velocity, the heat being so intense that it destroys not only the rails but the ties buried in the ballast.

The recurrence of these fires, with the heavy loss entailed by them through loss of property and delay to traffic, suggested the idea to the maintenance-of-way officers of the Southern Pacific Railroad Company of supplying gaps at suitable intervals along the line which can be closed before the winter storms set in. This consideration brought out the design which the accompanying drawing and photographs illustrate. The gaps or telescopic sheds consist of sections 50 feet long and sometimes two sections 50 feet long of movable shed running on wheels on a track having a gage of 16 feet 8 inches, the rails being supported on sills outside the ballast line of the main track. These telescoping pieces are arranged to run inside a section at one or both ends of the gap, built larger for that purpose. During the winter, the sections are closed and extra braces of sufficiently stout construction are bolted on, and the shed is then continuous and of practically the usual construction. As soon as the heavy storms are over and the snow has practically ceased falling for the winter, the dotted braces are removed and the telescopic shed slid into the adjacent large section, using for the purpose a switch engine, a few men with block and tackle, or a work train.

These movable or telescopic sheds are intended to be placed at distances of from 2,000 feet to a half mile apart in places favorable to their location. They are not necessarily built upon tangents. In fact several of them are upon curves, but the curvature of the track must be unchanged over the gap and within the enlarged section adjacent thereto.

The Southern Pacific Company now has in position some sixteen of these telescopic snowshed sections, and so far they have proved successful in stopping the progress of any fire which has gotten beyond control and will undoubtedly prevent the destruction from this cause of more than one section at a time at the worst. Credit for these snowsheds should be given to Mr. Isaacs, of the engineering staff of the railroad.

Engineering Notes.

Spain produced 175,109 tons of lead in 1903, exceeding the output of all other countries except the United States. Mexico is the third largest producer, and Australia comes fourth in order.

It has been found that a rod of tin-aluminium alloy, when filed and plunged in cold water, gives off gas composed of hydrogen and oxygen in explosive proportions. An unfiled rod, on the other hand, has no action unless the water is boiling. This peculiar behavior of the metals may be explained by the different states in which they exist, says the Engineering and Mining Journal. It is believed that the aluminium and tin form a true alloy only at the surface of the rod, so that by filing an almost infinite number of junctions of the two metals are laid bare, which act as thermocouples.

The construction of the Berber-Suakin railroad in the Sudan is being pushed forward with all speed. The Sudan government is contemplating the establishment of the Red Sea terminus at Sheik Barghut, a port some distance north of the originally intended terminus of Suakin. This decision is influenced by the superior accommodation available at the former point for larger ships than can be handled at the port of Suakin, while navigation can also be carried out during the day or night. The track is being laid from the Red Sea end. This section presents many engineering difficulties, as between Suakin and Sinkat the line rises to 3,600 feet above sea-level. Automobiles are also being introduced at Khartoum, specially designed for passenger traffic in the desert. Great difficulty has been experienced in finding motor cars capable of traveling over the sand. Recent experiments, however, it is anticipated, will have resulted in the employment of an automobile suitable for service under these adverse conditions.

An interesting and powerful type of ice-breaking steamer has been launched on the River Clyde, to the order of the Canadian government, for work on the St. Lawrence River. The vessel measures 245 feet in length by 40 feet 6 inches beam and 18 feet depth, with a gross tonnage of about 1,350 tons. The vessel is of abnormal strength in order to resist the enormous ice pressure to which it will be subjected. At the bows, where the maximum pressure will be exerted, the shell plating is of double thickness, with intermediate frames extending all fore and aft. The keel, stem, stern post, propeller brackets, and rudder are also extra strong and heavy and made of nickel steel. On the stern post is fitted a massive cast-steel knife for the dual purpose of cutting a passage through the ice when driven astern and protecting the rudder stock. Water ballast is provided for in a cellular double bottom and so arranged that the boat can be trimmed in any manner to assist in the forcing of a passage while at work. The craft is propelled with twin screws. Although primarily designed for ice-breaking work, the vessel is at the same time built with fine lines in order to render a high speed to be obtained for other purposes, such as a government yacht.

A special commemorative grand prize was awarded to the Pennsylvania Railroad system for its original series of scientific investigations of locomotive performance conducted at the Louisiana Purchase Exposition. The Committee of Five, composing the Superior Jury, was unanimous in this action. In the Department of Liberal Arts a grand prize was awarded for the model of the terminal passenger station in New York city. In the Department of Transportation Exhibits there were each awarded a grand prize the locomotive testing plant and laboratory, the railway postal and mail car, the model of the West Philadelphia terminal, the model of the New York and Long Island Railroad tunnels, full-sized section of tunnel under the North River, exhibit of maps and drawings illustrating improvements made on the Pennsylvania Railroad. A commemorative gold medal was awarded in connection with the exhibit of the De Glehn four-cylinder balanced compound locomotive. In the Department of Social Economy were awarded a gold medal for the exhibit of the pension, relief and saving fund departments of the Pennsylvania Railroad and the Pennsylvania lines west of Pittsburg; a gold medal for the exhibit of the Pennsylvania Railroad Department Young Men's Christian Association of Philadelphia. The most important of these awards is the first. This award is unique and special, and as such may be regarded as the highest official award made by the exposition. It is not for an exhibit, but is a special recognition of the progressiveness of the Pennsylvania Railroad system in making, at its own great cost, investigations of the highest scientific value, the methods and results of which are a permanent contribution to the advancement of engineering knowledge. The Pennsylvania Railroad system chose an advisory committee of international character to aid in conducting the investigations and selected for test locomotives of foreign as well as of home manufacture, in order that the investi-

gations should be made upon broad lines and under the best conditions to produce useful and authoritative results.

Employment Under the Isthmian Canal Commission.

On November 15, 1904, the President, by executive order, placed the employes of the Isthmian Canal Commission under the provisions of the civil service act and rules, except persons employed merely as laborers, persons whose appointments are confirmed by the Senate, and engineers detailed from the United States army. This order, however, excepts from the requirement of competitive examination a number of positions specifically enumerated. With these exceptions all positions of whatever character or designation under the Canal Commission, whether in the United States or upon the Isthmus of Panama, are subject to the requirement of competitive examination. Vacancies in clerical and other positions in the office of the Canal Commission in Washington will be filled as far as practicable from suitable existing registers of eligibles, but for positions on the Isthmus of Panama examinations will be held at various cities throughout the United States and also upon the Isthmus, as the needs of the service may require. Qualified eligibles on existing registers may, however, be certified to such positions in the absence of registers prepared as a result of special examinations for the Canal Commission. At the present time the number of employes needed in many branches of the work cannot be definitely stated, but as rapidly as the needs of this service are known, examinations will be announced indicating the particular requirements of the positions to be filled, the salary to be paid, and other necessary information.

The age limits for entering the service are eighteen to forty years, unless otherwise expressly stated in announcements of examinations. These limits, however, do not apply to applicants entitled to claim of preference under Section 1754, Revised Statutes.

For the further information of applicants and others, the following statement is published relative to conditions of employment on the Isthmus of Panama under civil service rules by the Isthmian Canal Commission.

The construction of the Panama Canal may extend throughout a time period of eight or more years, according to the details of the project yet to be adopted. (This time estimate is from the report of the last Isthmian Canal Commission.)

The civil service of the Isthmian Canal Commission offers excellent opportunities to qualified persons, both in the matter of salaries and promotion. Under the operation of the civil service law it is contemplated that promotions will be made upon the basis of merit from the lower to the higher positions.

Medical attendance, medicines, and care at hospitals when sick, are furnished to the employes of the Isthmian Canal Commission without cost. Well-equipped hospitals will be maintained at Ancon, adjacent to Panama, and at Colon. In meritorious cases sick leave on pay may be allowed, in addition to the regular leave of absence, not to exceed thirty days for employes who are from the United States, or fifteen days for employes who are residents of the Isthmus.

The Isthmian Canal Commission furnishes quarters to its American employes, or at its option in lieu thereof commutation, which has tentatively been fixed at eight per cent of the salary. The Commission proposes to maintain a civil commissary department on the Isthmus, which is soon to be established and the advantages of which are to be made available to the salaried employes of the Commission.

The Isthmian Canal Commission furnishes its employes free transportation to the Isthmus from either New York, New Orleans, or San Francisco, and, also, free return transportation upon completion of satisfactory service.

The employes of the Isthmian Canal Commission are allowed six weeks' leave of absence annually on full pay. This leave of absence is not granted until after eight months of satisfactory service. In visiting the United States on leave, employes and members of their immediate families are granted special rates to the above-named ports. (The prevailing special rates are \$25 between New York or New Orleans and Colon, and \$70 between San Francisco and Panama.) The special rates also apply when members of the family of an employe accompany him to the Isthmus.

All salaries or wages paid by the Isthmian Canal Commission to employes from the United States are in gold or its equivalent in United States currency.

All inquiries concerning examinations for competitive positions under the Isthmian Canal Commission should be addressed to the United States Civil Service Commission, Washington, D. C.

Further communication relative to service, situation, climate, and conditions on the Isthmus should be addressed to the Isthmian Canal Commission, Washington, D. C., by whom the foregoing details have been furnished.