

sumption for light of but one cubic foot of gas an hour to get very forcible blows upon the bell at the rate of three a minute. As has been explained the lighting is not interfered with in the slightest degree by the operation of the bell-striking device. The gas, after having expended its force in ringing the bell, is supplied to the lantern, and the light burns and the bell rings day and night for months without attention.

#### A REDWOOD LUMBER PLANT.

BY ENOS BROWN.

One of the results of the prosperity which the State of California is now enjoying is the revival of the lumber interests and the remarkable demand for export of the product of its redwood forests. Conditions are quite unprecedented. The redwood is found only in California and in but a comparatively contracted area even there. From Santa Cruz county on the south to the Oregon line on the north it attains full development, but lower than Mendocino county, owing to vicinity of the great markets, the forests have been about exhausted and these localities are no longer considered producers. A considerable acreage in Santa Cruz county has been recently appropriated as public domain.

The available redwood, therefore, is now confined to about 318 miles of coast. The annual product, in this region, is about 320,000,000 feet, and it is estimated, at the present rate of consumption, that enough standing timber exists to last for 150 years.

The redwood is rarely found beyond the reach of the ocean fogs; its extreme limit being thirty-five miles inshore, and then only when some valley-like depression prevents the entrance of fog to that distance. The tree seems to have an affinity for the salt sea fog and attracts it about its lofty branches. There it condenses and falls to the ground in a gentle rain. The ground under the redwood tree is always moist.

The redwood is the *Sequoia sempervirens* of botanists and is distinct from the *Sequoia gigantea* of the Sierras. The first is never found far from the sea, the latter always on the declivities of the Sierra Nevada and seldom at an altitude lower than 4000 feet, and in regions where the rainfall is never excessive. In size they are much alike. The few remaining groves of the *Sequoia gigantea* are in Mariposa and Calaveras counties, California, and some of them are 400 feet in height and of tremendous girth. The timber is inferior to that of the redwood, which is noted for endurance and strength. Its resistance to fire is no fable, but a sober fact. The lumber is becoming more in demand for decorative purposes. Its color, a light salmon when first cut, afterward turns to a deep red. When thoroughly dried there is no shrinkage and it readily yields to the chisel of the carver. Piano cases made from the wood are said to give increased resonance to the instrument. Large quantities are consumed for interior finishing with gratifying effects. In addition to other fine qualities the wood takes on a beautiful polish and even the stumpage, until recently considered worthless, is found to possess valuable qualities. The roots and woody excrescences at the base of the tree give fine effects in wavy outlines, and, when polished, the result is a material much valued for decorative purposes.

In the Eel River redwood district, Humboldt county, there are 80,000 acres of timber lands, which will produce at a low estimate 75,000 feet to the acre. In size the trees range from four to six feet in diameter; if below 18 inches they are left standing. Of the larger sizes from 8000 to 12,000 feet is produced from each tree.

The tree illustrated was a growth of this valley and produced 80,000 feet of merchantable lumber.

Felling one of these enormous trees is an operation requiring great experience on the part of the woodsman. In the first place, a tract is selected containing a goodly number of the proper sizes, as well as being advantageously located for getting the logs to the railroad for conveyance to the mill. The experience of the cutter will indicate the first and next in order to be felled. Each tree must lie in its own bed. A platform is then erected surrounding the trunk from 6 to 8 feet above the ground. With a saw an undercut is made through the trunk, not quite to the center, and from the opposite side a crosscut is sawed, ending a foot or two above the undercut and leaving a section of solid lumber between. The "gunsight," or the place where the tree is to fall, is then calculated to a certainty and the ground cleared of all projections that would prevent the great trunk from falling flat on the earth. The woodsman who cannot calculate within a few feet the exact spot where the extreme top of a tree, no matter the height, will lie when down does not know his business. The rule is that when ten per cent of a tree is "split" when felled, the chopper is incompetent and is discharged. When the exact place where the tree is to fall is selected, the choppers ascend the platform and with axes hew out an angular-shaped piece having the undercut as a base.

When this cut is made the second or cross cut is wedged until the tree topples over and falls to the ground, the solid section of the trunk, not pierced by the cuts, supporting the tree until the center of gravity is passed, and then the mighty frame falls upon its prepared bed almost intact.

The next operation is performed by the "ringers" and "peelers." Every 12 or 14 feet, as required, a ring is cut around the circumference of the bark, and afterward the peelers with crowbars and wedges "peel" the bark from the prostrate trunk. Finally all of the trees are stripped but surrounded with an immense accumulation of debris of bark and branches, which must be removed before the trunks can be sawed into suitable lengths for conveyance to the mill. The ground is cleared by fire, precaution being first taken to plug up the "splits" in the trunk with clay so that the fire may not reach the interior of the tree. A foggy day is chosen and a still one. Fire is started and in a short time the tract is burning with a fierce heat, that quickly reduces the piles of bark and brush to ashes, and leaves an unobstructed field for the removal of the timber which has been scarcely charred by the intense heat to which it has been subjected.

The trunks as they lie are then cut into stated lengths with crosscut saws, and then follows the arduous task of conveying these enormously heavy sections to the railroad. This operation is one of extreme difficulty, involving the transportation of the logs from the high and precipitous hillsides and conveying them uninjured over long distances.

Temporary skidways are laid down and roads constructed. Chutes down which the logs pass have to be planned, and on these, guided by the skillful woodsmen, the unwieldy logs at last reach their destination. The work is laborious in the extreme and is assisted by donkey engines on sleds, which are hauled to the top of the steep banks and into seemingly impossible situations. With the aid of these engines loading on cars is accomplished without special difficulty. Twenty-five miles of broad gage track penetrate into all parts of this district and 180 flat cars are employed in transporting the timber and finished products.

Scotia, the town where the immense manufacturing plant of the Pacific Lumber Company is located, is situated twenty-five miles from the mouth of Eel River. Schools, churches and dwellings are owned by the company, as well as the land upon which they are built. It is a community prosperous and contented. The pond at the mill side has room for 4,000,000 feet of logs, which are drawn upon when the rains of the winter season render logging impracticable. The capacity of the mill is 175,000 feet per day, exclusive of 500,000 shingles and a large number of railroad ties.

#### A New Use for Wireless Telegraphy.

The United States Coast and Geodetic Survey has made some experiments for the purpose of ascertaining the adaptability of wireless telegraphy for telegraphing longitude determinations in localities like Alaska, where there are no telegraph lines. The tests were made between the Marconi station at Sagonack, on the eastern end of Long Island, and the United States Coast and Geodetic Survey schooner. As the vessel proceeded westward messages were sent at half hourly intervals, until the schooner was 63 miles from the station. At that point the last intelligible message was received.

On board the schooner a circuit-breaking chronometer was included in the circuit of the battery and the spark coil. Each second-break of the chronometer was automatically transmitted as a time signal and recorded on a tape at the shore station. The results are said to show that regularly-spaced signals transmitted in this manner can be utilized for longitude determinations at a greater distance than is possible by verbal messages transmitted through the medium of the Morse code.

#### Disappearing Gun Tests.

At Fort Monroe, on the morning of July 24, the first of a series of tests of the disappearing type of gun carriage were begun. The first shot fired resulted in clogging the mechanism of the disappearing gun. It required no little time and trouble to get the gun back into battery. After the difficulty had been remedied, the tests were conducted successfully.

Five deliberate shots were fired, one at an extreme elevation, which severely strained both gun and mount. The projectile was hurled to a distance of eight miles. No effort was made to hit the targets, the purpose of the test being simply to ascertain the speed of firing.

In ten shots fired for speed, two minutes elapsed between the first and second; but only fifteen minutes and thirty-seven seconds were required from the loading of the first shot to the firing of the tenth round. Full service charges of seventy-two pounds of powder were used. The gun tested was Model 1888. The reports of further tests will be awaited with interest.

#### Santos-Dumont's New Airship at Brighton Beach.

At Brighton Beach, Coney Island, the airship which Santos-Dumont is to use in sailing around the Statue of Liberty in New York Harbor is nearing completion. Within a shed about 60 by 120 feet, with a height of 60 feet, the vessel of the Brazilian aeronaut is housed. The entire contrivance, including the frame-work to be suspended from the balloon, the car, and the motor, is the same as that used in the famous flight around the Eiffel Tower. The gas bag was made by La-chambre; the motor by Buchet.

The frame, which is somewhat shorter than the envelope, is made of cypress rods, about one and a half inches square, covered with aluminium thimbles at the splices, with trusses connecting the upper and lower bars. The entire frame tapers at each end and is stiffened with fine wire braces. The motor and the batteries which generate the current for the spark are carried approximately in the centers, together with the gasoline storage tanks. A propeller weighing about 115 pounds is carried at the stern. The aeronaut takes his position at the prow so as to counter-balance the weight at the stern. The entire weight of the frame and its equipment is about 2300 pounds. In order to govern the flight of the ship in respect of its altitude, a rod from which a long and heavy rope will trail is to be employed. The rope is to serve as a steadying agent in rising and as a retarder in alighting. It will also serve as a movable ballast, which, when shifted toward the stern, elevates the prow of the ship and causes it to rise, and when brought forward depresses the prow and causes the ship to descend.

#### King Edward's Automobile.

The Daimler Motor Company has delivered the new 24 horse power automobile made for King Edward VII. It was built at the Coventry works of the company. The most prominent features of the car are freedom from dust and steadiness in running—points to which the King has given personal attention in the designing. The dust nuisance is avoided by the deep body of the vehicle, which is of tonneau shape, and by the fitting of a glass back reaching to the canopy. The sides have storm curtains of royal blue to match the upholstery. The car is to hold six persons, with two in addition upon the driving seat. Although fitted with a powerful motor—a 24 horse power four-cylinder engine being incased in a bonnet at the foot of the car—the aim has been not to provide for high speed, but to secure steady traveling over all kinds of gradients. In the trial runs gradients of 1 in 90 were easily ascended at twelve miles an hour, without any sensible effort. The car at full speed travels at 36 miles an hour on the level. Particular attention has been paid to the brakes, which have under test stopped the car when far more heavily loaded than it will be in ordinary use. The brakes will hold the car, whether running backward or forward. Smoothness of running is facilitated by pneumatic tires of 5 inches diameter.

#### The Current Supplement.

The German Industrial Exposition at Duesseldorf, which is attracting such widespread attention in Europe, is interestingly described in the opening article of the current SUPPLEMENT, and some of its more important engineering exhibits illustrated. From the technological standpoint perhaps the most valuable contributions to the SUPPLEMENT are Auer von Weisbach's account of the discovery which has made his name world famous; Mr. Charles F. Dodge's exhaustive, illustrated discussion of sisal hemp culture in Yucatan; and an essay by Mr. John B. C. Kershaw on the "Electrolytic Production of Chlorates." Of a lighter nature are the descriptions of an "Automatic Danger Signal for Railways;" "Electric Waves and Their Effect on the Human Brain;" "An Electric Coal Cutter;" "Medical Literature;" Prof. Petrie's appreciation of "The Egyptian's Eye for Nature;" "Automobilism in Prussia;" "Why is New Bread Indigestible?" and "Bird Migration and Bird Song." The boy who is interested in electricity will no doubt find much that is interesting in Mr. Del Mar's full description of how to make a dry battery. Of scientific interest is the address of the retiring president of the Chemical Society of Washington, on "Problems in the Chemistry and Toxicology of Plant Substances." On the whole, the current SUPPLEMENT is one of the most diversified numbers that has appeared in some time.

Dr. Jacot-Guillarmod intends to climb some of the highest peaks in the Himalayas. His party consists of two Austrians and three Englishmen. The expedition left Trieste March 3, and reached Bombay on March 30. When last heard from the party was in Cashmere. The first summits to be attempted will be the Godwin Austen, 28,250 feet high, and the Dapsang, 28,265 feet high. The Himalayan mountaineering record is held by W. Conway, who climbed the Pioneer Peak, 21,000 feet in height, in 1892.

## Science Notes.

An effort is being made to secure the establishment of a government biological station on the Great Lakes. The purpose of such a station is to investigate all the problems connected with the fisheries of these lakes throughout their whole extent, principally for the protection of the commercial fish.

According to a report from Consul-General Bittinger at Montreal, a natural soap mine has been discovered in the foothills near Ashcroft, British Columbia. A company has been formed to work it, and already 275 tons have been taken out. The composition of the soap seems to be about one-fifth borax. It is said there are 20,000 tons of the material in sight.

Prof. Henry A. Ward has announced the discovery of a great meteorite in western Mexico. The stone weighs over 50 tons; it is 13 feet and 1 inch in length, and lay buried by the terrific force of its own momentum nearly 20 feet in the earth. Small portions of the meteorite were broken off; the remainder was left intact for the time being. The cost of transporting the stone to the seacoast, 71 miles away, would have been more than \$50,000.

The Geological Survey department has recently issued a number of topographical maps of interest. There are five sheets covering the State of Pennsylvania, which were made by the co-operation of the Geological Survey and the State authorities. Sheets have also been recently issued covering the States of New York, California, Utah and New Mexico. There has been a reissue of the maps covering the State of New Jersey. These are available to persons interested from the department at a cost of five cents per sheet.

A collection of butterflies, said to be the finest and largest in the world, has been recently acquired by the American Academy of Natural Sciences in New York. This collection was made by Dr. Herman Strecker of Reading, Pa., who died not long ago. It was purchased at a cost of \$20,000, which was donated for the purpose by the Very Rev. Dean Hoffman, of New York. Dr. Strecker was a sculptor, and devoted himself to the collection and study of butterflies only as a recreation. There are several standard works on the subject compiled by Dr. Strecker.

Experiments by the government have shown that no matter what the process of cooking, meat loses a great deal of its bulk, owing to the evaporation of the water, which constitutes a large part of all flesh. This loss is greater in small pieces than in the larger ones. In a lean piece of beef weighing from one to one and three-quarters of a pound, the loss of weight was 45.6 per cent, while in a piece weighing from five to five and three-quarters pounds, the loss was only 39.8 per cent. The loss of nutrition is not nearly so great, however, as that of the weight would seem to indicate.

The report of the scientific expedition to the Siamese-Malay State of Talor, which was subsidized by the British government, has just been issued. The expedition is at present investigating the zoology of the caves in the limestone hills near Biserat. The caves are said to be numerous, and many of them extend for over a mile in length, and, in most cases, are very rich in fauna. It is anticipated that considerable light will be thrown on the history of cave-dwelling animals by these investigations. So far sufficient geographical data have been collected to permit the accurate mapping out of the highlands of the greater part of the north of the Malay Peninsula.

The recent discovery in North Wales of several valuable silver urns, gold rings, armlets and spoons, dating from about the year 1600, recalls to mind, writes an English correspondent, some interesting facts concerning the recovery of treasure trove. The year 1882 appears to have been the most prolific in these unexpected finds. In January of that year, while repairs were being carried out in a house at Broughton, the workmen unearthed a large leathern bag containing thirty crowns and several shillings of the reign of Charles II., James II. and Queen Anne. In the following month a discovery of great antiquarian interest was made at Vufarfre, Sweden, when a number of antique silver bowls were brought to light. They proved to be excellent examples of twelfth and thirteenth century work, and were covered with quaint inscriptions. Some months later a clay vessel full of Roman coins was found near Yeovil, Somersetshire, and, at about the same time, two hundred and fifty coins of Queen Anne's reign were found at Watford. The greatest discovery of the nineteenth century took place in December of the same year in an old house in the Rue Vieille de Temple, Paris. Upon its demolition a copper jar was found in one of the walls. It contained seven thousand eight hundred and eighty-two gold coins, worth nearly \$30,000 as bullion, but to the collector their value was untold, for they belonged, numismatically, to the rarest reigns of France. In other parts of the house were found one thousand and ten coins of Jean le Bon; six thousand one hundred and ninety-nine of Charles V. and over five hundred pieces of other mints, the latter being alone valued at \$150,000.

## Engineering Notes.

A recent explosion with one of the fire engines of the London Fire Brigade burning liquid fuel, has proved that it is far safer to use oil with a low than a high flash-point. With the engine upon which the accident occurred, oil with a flash-point of 105 degrees was being used. The tubes of the engine appeared to have clogged, owing to the tendency which the oil has to carbonize rapidly. The fireman noticed that the burner was not acting properly, and was in the act of shutting off the supply when the oil fired back with such force that his hair and clothing were singed and his face and arm scorched. As the result of his experiments, the commanding officer now recommends the use of an oil with a flash-point of 85 degrees, which is both considerably cheaper and safer than the higher flash-point oil. The experiments with liquid fuel for fire engines have not, however, resulted in such an economy as was anticipated, but the advantages of oil over coal in other directions are so numerous, both for stationary and marine engines, that the adaptation of all the engines for liquid fuel is to be carried out.

Last year a mining expedition was organized by several English and German capitalists to explore the mineral districts of German East and British Africa, respectively, for the purpose of developing the rich mineral resources of these districts. For this object some extensive schemes involving the expenditure of millions of dollars are being prepared conjointly in London and Berlin. The main feature of the enterprise is the construction of several railroads throughout the various territories, to connect the Cape to Cairo Railway with the West Coast, and also in conjunction with the railways in existence in the already partially developed portions of the country to cross the continent, probably from Port Alexander on the west to Delagoa Bay on the east. Some of the most wealthy of British and German colonial capitalists are financing the scheme, and in regard to that part of it which applies to German Damaraland, the German government is interested, as concessionaires of the right conceded to an Anglo-German syndicate to search for and work the minerals of the district, including the copper mines of Otavi. Outside, however, of the district worked by the German South-West African Colonial Company, the period of this concession has expired, but the promoters have obtained a renewal of the right from the German government.

Messrs. Barry & Leslie, the well-known English civil engineers, who have been examining the stability of St. Paul's Cathedral, London, have now issued the report of their investigations. When Sir Christopher Wren erected the edifice he made elaborate precautions to insure thorough stability; but so extensive has been the undermining in the neighborhood of the building that its foundations have been impaired, and unless it is speedily renovated the cathedral will within a few years be absolutely unsafe. The whole of the south side of the cathedral has subsided. The evil has been growing for the better part of a century. Sewers have been driven through the gravel soil and have drained the moisture out of the ground. Consequently there is an alteration in conditions, and a subsidence, resultant on the vast weight of the cathedral, follows. The most serious menace to the stability of the structure is a huge sewer in Carter Lane nearby, which is nearly 11 feet in diameter. The whole wall of the south transept has tilted from the perpendicular to an extent varying from four to five inches. This defect has, however, been attended to. Complete renovation will cost, at the very least, \$250,000. The amount of money annually expended for urgent repairs—the building is never free from scaffolding—and cleaning is about \$90,000.

The late Mr. Cecil Rhodes repeatedly endeavored to arrange for his railroad from the Cape to Cairo to pass through the more prosperous and promising Congo Free State, but he was unable to obtain the necessary concession, and therefore selected the alternative route through German East Africa. Now, however, the necessary concession has been granted by the Congo Free State for the construction of the railroad, between the northern borders of Rhodesia, across Congo Free State territory, to Lake Kasali, on the navigable waters of the Lualaba, one of the head reaches of the Congo. It is provided by the contract that 40 per cent of the plant of the railway shall be purchased in Great Britain. Negotiations are in progress with a well-known firm of contractors for dispatching a railway survey party at an early date. The effect of this scheme will be to divert the route of the transcontinental railroad north of Zambesi, from which point, according to the present arrangement, it trends to the east toward Tanganyika and the great lakes. It will now be continued due north of Victoria Falls to the Congo border, whence for a distance of 350 miles it will continue due north through Kantanga to the most southerly navigable point on the Lualaba (Lake Kasali), whence there is navigable waterway to Stanleyville, on the upper Congo. Thence a railway is projected to Mahagi, on Lake Albert, with further water communication on the Nile.

## Electrical Notes.

The employment of the incandescent lamp for the display and illumination of shop windows containing dry goods is generally considered safe, but several experiments that have recently been carried out prove this contention to be a fallacy. A number of 16 candle power incandescent lamps were enveloped in raw cotton, and at the end of a few minutes the material commenced to smoke. Directly a draught of air, such as is caused by the opening of a door, came into contact with the cotton, it burst into flames, and the bulb of the incandescent lamp immediately collapsed. Investigation as to the cause of this peculiarity showed that the thin glass shell of the bulb of the lamp softened under the influence of the heat gathered by the cotton from the incandescent filament, and when the draught of air came into contact with the lamp, the softened glass caved in under the air pressure, so that the filament fired the glowing material. In view of these interesting experiments, caution should be observed not to place cotton or similar fabrics too near an incandescent lamp, as is often done for decorative effect, otherwise great risk of a fire breaking out is incurred. The liability of combustion from this cause is further accentuated where incandescent lamps covered with a colored varnish are employed, as the varnish affords a stronger incentive to combustion.

A method of replacing the ordinary anaesthetics used in dental surgery by the action of high-frequency currents has been brought out by Messrs. Regnier & Didsbury, of Paris. M. d'Arsonval has already shown that high-tension and high-frequency currents have a local anaesthetic effect, and the experimenters wished to see whether this could not be used to advantage for dental operations, and so do away with the inhalations of gas, which are not without danger to the patient. In the case of extraction they found it to work quite successfully. A d'Arsonval-Gaiffe apparatus was used, having a coil which gave a 1.2-inch spark, with a rotary interrupter and an oil condenser. The apparatus is connected to an Oudin resonator, one of whose terminals is joined by a flexible cord to an electrode fixed upon the jaw. The electrode is molded in plastic material and covered inside by metallic powder and a layer of tinfoil. Under these conditions the current gave the patient no sensation other than a slight heating in the region covered by the electrodes. It was found that a tooth with one root was made completely insensible by the application of a current of 150 milliamperes for 3 to 5 minutes, while the larger teeth needed 200 to 250 milliamperes for 6 to 8 minutes. As to the use of the method for more prolonged operations, the experiments are not as yet conclusive, although they are favorable on the whole.

At a meeting of the Royal Institution on February 3, it was announced that the following valuable relics of Michael Faraday, bequeathed to the Royal Institution of Great Britain by the late Mr. Thomas J. F. Deacon, of Newcastle-on-Tyne, had been received: Medals of silver and bronze (numbering 20 in all) and including the Fuller medal of 1828, two Copley medals of 1832 and 1838, two Newton medals of the Royal Society, 1833 and 1838, and the Rumford medal of 1846; two foreign orders contained in a small mahogany box; a book of portraits and autographs, including original letters from the Prince of Wales and Prince Alfred (written in 1856), Louis Napoleon, Emperor of France, Humphry Davy, Thomas Young, Humboldt, John Dalton, Whewell, Mary Somerville and many others; a daguerreotype of a consultation of Faraday with Prof. Daniell; a drawing in colors of the laboratory of the Royal Institution by a niece of Sir John Moore; and a manuscript book entitled "A Class Book for the Reception of Mental Exercises instituted July, 1818," containing contributions by Faraday. The late Mr. Deacon requested that the medals and orders should be preserved, with an inscription showing that Margery Ann Reid and Caroline Deacon (née Reid), nieces of Faraday's wife, often lived with Faraday and his wife during the most brilliant period of his life, and are mentioned in Dr. Bence Jones' "Life of Faraday."

A new electric car has been undergoing severe tests in England, the results of which have been highly satisfactory, as the vehicle has succeeded in covering 100 miles without recharging. The car itself is made by Krieger, of Paris, but the electrical fittings are supplied by a London firm. The electrical installation consists of two compound motors, which drive the front wheels independently. The battery comprises 44 Leitner cells, of 300 ampere hours capacity, and is capable of running the car 100 miles without recharging at a speed of 40 miles per hour on a level road. When traveling down hill the motors are reversed and become generators and recharge the battery. Another interesting feature of this arrangement is that by converting the motors into generators an excellent braking effect is produced, and in the majority of instances is sufficient to hold the vehicle in check, without necessitating the application of the mechanical brakes.

# SCIENTIFIC AMERICAN

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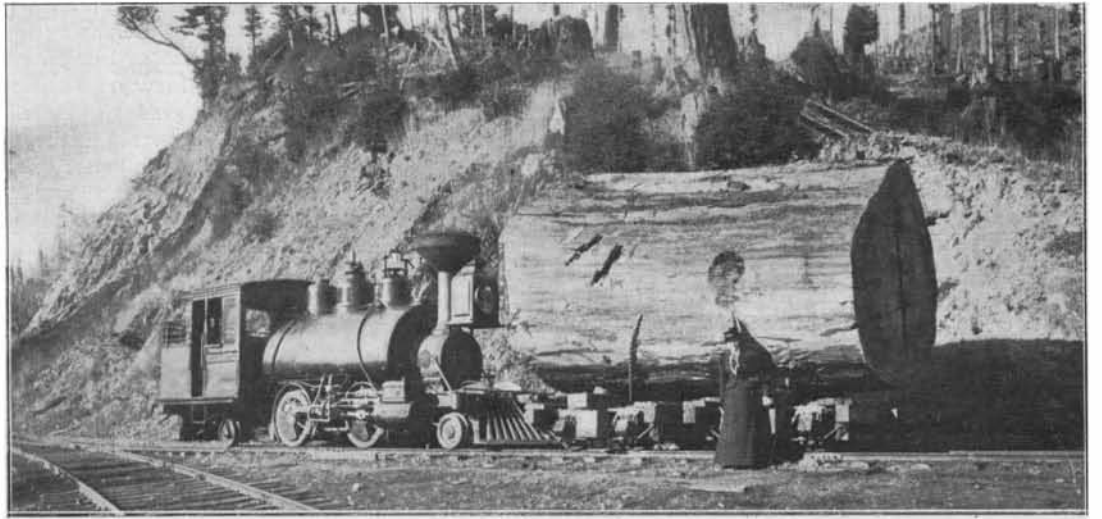
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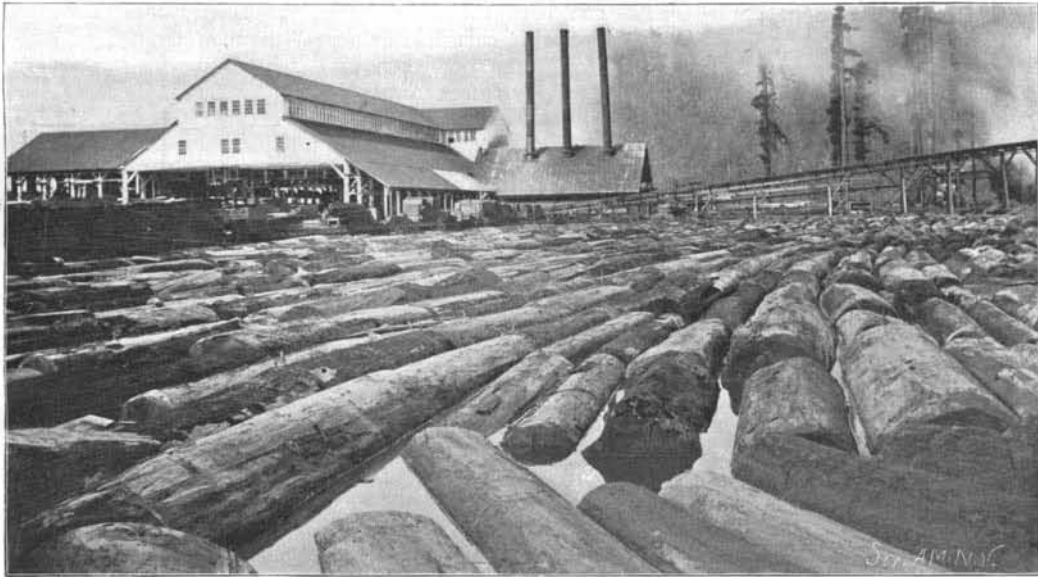
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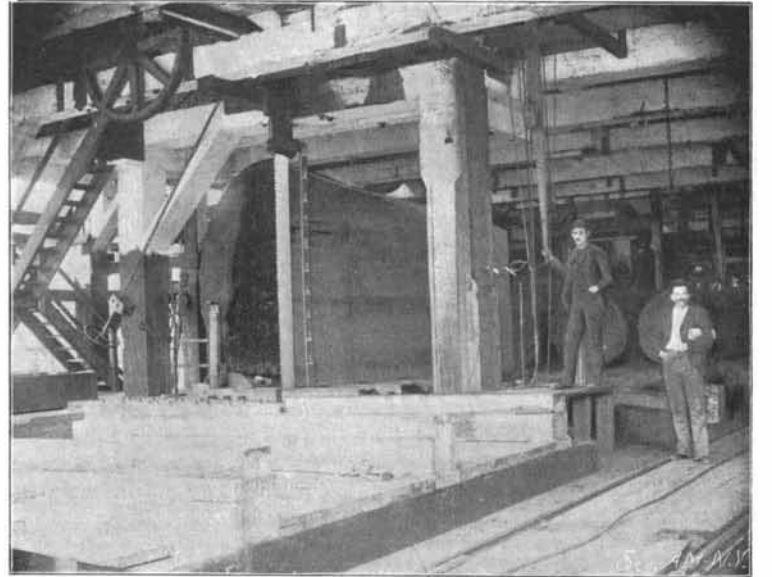
A Redwood Tree 350 Feet High, 30 Feet in Diameter, Produced 80,000 Feet of Lumber



A Twelve-Foot Log, 10,800 Feet Board Measure in the Log.



Millpond Showing 3,500,000 Feet of Lumber for Window Work.



A Fourteen-Inch Bandsaw at Work.



GENERAL VIEW OF A TYPICAL CALIFORNIA LUMBER CAMP.—[See page 70.]