THE NEW WHIPPLE TEMPERATURE INDICATOR FOR USE WITH PLATINUM THERMOMETERS.

The Cambridge Scientific Instrument Company, of Cambridge, England, are introducing a new temperature recorder, the "Whipple," of which we publish an illustration herewith. This temperature indicator is intended to be utilized with the Callendar platinum recorders. It was Prof. Callendar who drew the attention of the British Royal Society in 1886 to the possibility of measuring temperature based on the determination of the electrical resistance of a platinum wire, and demonstrated that the process was capable of very general application, and that the platinum resistance thermometer which he invented in co-operation with Prof. Griffiths gave consistent and accurate results over a very wide range of temperatures.

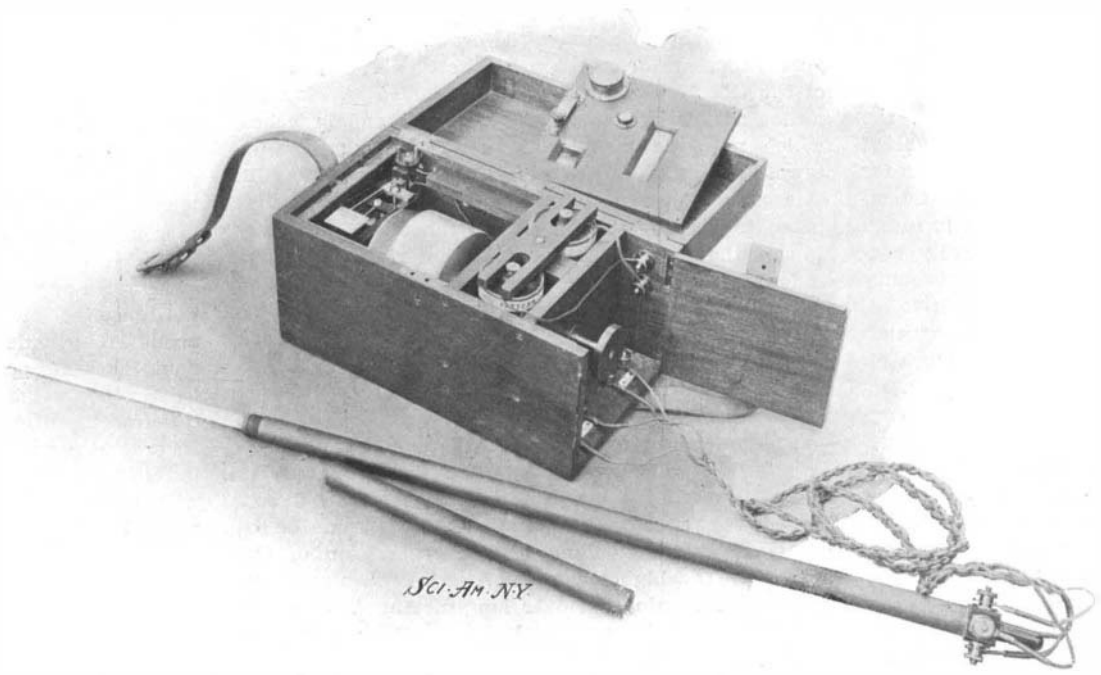
The Callendar and Griffiths platinum thermometer consists of a fine platinum wire, the resistance of which varies with the temperature. The coil of wire, generally called the bulb of the thermometer, is protected from the action of fumes and mechanical damage by means of a glass, steel, or porcelain tube, depending on the temperature it is required to register. Erroneous indication upon the recorder, owing to variations of the temperature, are rendered impossible by an arrangement of compensating leads. By this means the thermometer can be placed in positions where it would be absolutely impossible to read or use a mercury thermometer. At the same time a series of thermometers distributed over a wide area, can be read with infallible accuracy from one central point by means of an indicator and switchboard.

The Whipple temperature indicator is intended for employment with these platinum thermometers. The platinum coil constitutes one arm of a Wheatstone bridge, the other arms being formed by suitable resistances. The bridge wire differs from those generally used in connection with these indicators, since it is comparatively long, and is wound in a spiral round an ebonite drum as shown. Over this drum slides another graduated drum, the calibrations of which, however, are not regularly spaced, but are corrected so that the instruments read directly Centigrade. This last feature is the most prominent characteristic of this device over other types of indicators which have regular calibrations, and the temperatures are recorded in "platinum degrees" only, thus involving careful mathematical deductions to ascertain their Centigrade or Fahrenheit equivalents. Another distinct improvement in the Whipple apparatus is that rapidly varying temperatures may be followed with the utmost facility.

In our illustration the apparatus is shown with its top cover removed to explain the general arrangements of the mechanism. The battery power—dry-cells—is at the right, the calibrated drum in the center and the galvanometer at the left. The traveling contact is fixed inside the outer drum and presses on the spiral bridge below it. It is advanced by turning the large milled head shown at the right. In the illustration the apparatus is shown connected to the Callendar and Griffiths thermometers, which have a range from 0 deg. to 1400 deg.. C.

When the top is adjusted in position only a portion of the temperature scale and the needle of the galvanometer are to be seen through small glazed apertures. The apparatus is very compact and is specially designed with a view to easy portability, the extreme dimensions of the case being 14 inches in length by 8 inches in width and 8 inches in thickness, while its total weight is only about 20 pounds.

The instrument is now used by the British Admiralty for temperature measurements of naval boilers.



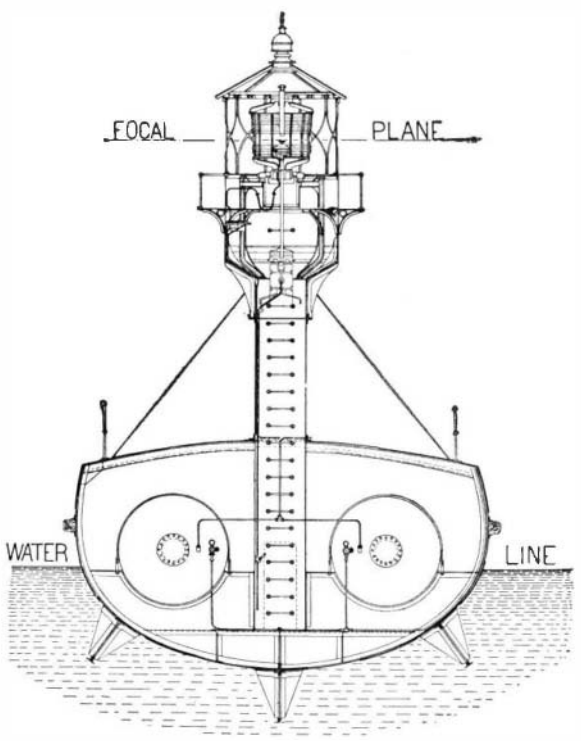
THE WHIPPLE TEMPERATURE INDICATOR FOR USE WITH PLATINUM THERMOMETER.

AN AUTOMATIC LIGHTSHIP.

BY WALDON FAWCETT.

During the past few years a radical improvement has been made over all previously existing systems of lighted signals by the use of gas-lighted buoys, supplied with tanks of compressed gas, which burn continuously day and night without attention for periods ranging from three months to a year, according to the size of the receptacle. The originators of this system have lately taken another step in advance, still further departing from the usual oceanic beacon, by the construction of a lightship which is independent of outside attention in the same degree as are the less powerful lights previously referred to.

The permanent lightship, as it might perhaps be designated, was built at Port Glasgow, Scotland, for a London firm of well-known lighting engineers, and has been stationed off the west coast of Scotland at the Otter Rock, near Islay, where it is subjected to great stress of weather at almost all seasons of the year. The steel hull, which is built of extra strength, is fitted with fin and web keels, three feet in depth, which are expected to co-operate with the extreme beam of the vessel to reduce rolling to a minimum.



CROSS SECTION OF THE LIGHTSHIP AT THE LANTERN.

By means of two steel, water-tight bulkheads, the vessel is divided into three water-tight compartments. The central division of the hold is occupied by two large welded steel gas tanks, which have a combined storage capacity for sufficient gas to supply the vessel for several months. Midway in the vessel is a circular steel tower surmounted by the lantern, which is thus given an altitude of twenty-five feet above the level of the water. The gas connections are carried on the inside of this tower, and there is also provided a ladder which affords access to the lantern for the supply men, who make periodical visits to the unmanned lightship.

The experiments already made with this system of maritime beacons prove conclusively that the light in the Otter Rock vessel can be depended upon to burn continuously and reliably for a number of months. The approximate duration of the light can always be predetermined, and there is no danger whatever of the light's being extinguished either by wind or spray. The gas is stored in the tanks in the hold at a pressure of 150 to 180 pounds per square inch, and a very efficient apparatus is provided for regulating the pressure to the burners. Surrounding the lantern is a platform on which an attendant may stand to light the beacon or adjust the flame. Within the tower is the fitting valve, by means of which connection is made to the tanks for the purpose of charging with gas, and this valve also controls the gas supply from the tanks to the lantern.

The light is given by a cluster of flat flames around a central jet, and the lantern is provided with a special lens which renders the light visible at a distance of from eight to twelve miles. Tanks are used to transport gas from the plant where it is manufactured to the lightship. When a supply vessel reaches the Otter Rock craft a hose is connected to the valve and to the source of supply, the valves at each end of the hose are opened, and the gas flows into the tank.

In order to enable the Otter Rock vessel to render service in warning imperiled vessels when there is a fog and when the light could not consequently be seen the craft is provided with a large bell, mounted on deck, which is made to ring automatically by means of a highly ingenious device which utilizes the gas as it passes from the tanks to the lantern to actuate the bell clapper. The bell is also provided with an ordinary tongue designed to be actuated by the roll of the vessel; but inasmuch as the water is usually comparatively quiet during the existence of a fog, this latter apparatus is of little value at the time when the sounding of the bell is most essential. The apparatus for ringing the bell by means of the flow of gas consists of a vessel covered by a flexible diaphragm. The pressure of the inflowing gas causes the diaphragm to rise, lifting a rod connected with a lever arm, to which hammers and counterweights are attached. When a hammer has struck the bell the movement automatically stops the flow of gas to the space under the diaphragm and the latter falls back into its original position. Powerful springs also keep the hammers off the bell after impact and otherwise assist in the operation of the apparatus. There is never a possibility that force will be lacking to ring the bell so long as there is any gas whatever in the tanks, since it is possible with a con-

AUTOMATIC UNMANNED LIGHTSHIP AT THE OTTER ROCK, SCOTLAND.

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 Nevadas 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 Sagaponack, 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 Lachambre; 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 counterbalance 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 Welsbach'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.