SOME TREES AND FORESTS OF CALIFORNIA.

BY CHARLES F. HOLDER.

An interesting movement is on foot in Southern California, namely, the reforesting of the Sierra Madre. For many years during the white regime and many more under the Indians, the fine range known as the Sierra Madre, the coast range of Southern California, has been burned over and devastated. During the past ten years forest fires have raged in the San Gabriel Valley and burned many square miles of territory contiguous to Pasadena and Los Angeles, seemingly threatening the water supply of this region. That something must be done, if the flora of the mountains was to be saved, was evident, but little progress was made until Mr. T. P. Lukens, ex-mayor of Pasadena, a lover of nature, undertook the work. At first, single-handed and alone, he began experimenting with the best trees, and now as a result, he has planted tens of thousands of pines (*Pinus tuberculata*) on the slopes of the Sierra Madre in Southern California, especially along the line of the valleys beginning with the San Gabriel.

THE CREEPING OAK NEAR MONTEREY, CAL., COVERING 12,500 FEET OF GROUND.

Mr. Lukens has met with great success, and in a few years the result of his labors will be visible from a distance and the water supply will be greatly increased.

The trees and forests of California are extremely interesting, and in their study or observation one is often impressed by their sensitiveness to various factors for or against a fine development.

Trees are susceptible to many influences. Near Monterey is found the remarkable oak shown in the accompanying illustration and locally pointed out as a "curiosity" as the creeping oak. The tree has made an extraordinary growth in former times, and appears to have been depressed by the winds until its many branches reach out from the trunk and appear to be creeping along the ground, while other branches fill the air above them, presenting an appearance difficult to describe, but resembling a mass of snakes more than anything else. The tree covers an acre, or 12,500 feet of ground, and has resisted for many years the raids of vandal wood choppers who covet the mass of timber.

Aside from the oak groves the real forests of California are found in the mountains. The redwoods of the Coast Range are magnified specimens. In former years, fifty years ago, there were giants within five miles of the city of San Francisco that would to-day be of inestimable value; but the sawmill was among the pioneers, and the giant redwoods were destroyed, there being no vigilantes to save or revenge them. The writer saw the trunk of one of these giants in Mill Valley which had been leveled off near the ground and was used as a dance platform. Another was a bower or hall for other purposes. The young shoots had grown up around the edge of the trunk, telling the story of its size. The redwood forests of the California Coast Range are its chief glory, but they are being devastated with a ruthless hand.

In the Sierras the giant sequoias, cousins of the redwood, are preserved, and here are many pines, among the most beautiful of California forest trees. Typical trees are the madrona and suazatteta. In Northern California the latter are found near the sea, low down, but in the south they affect the higher levels.

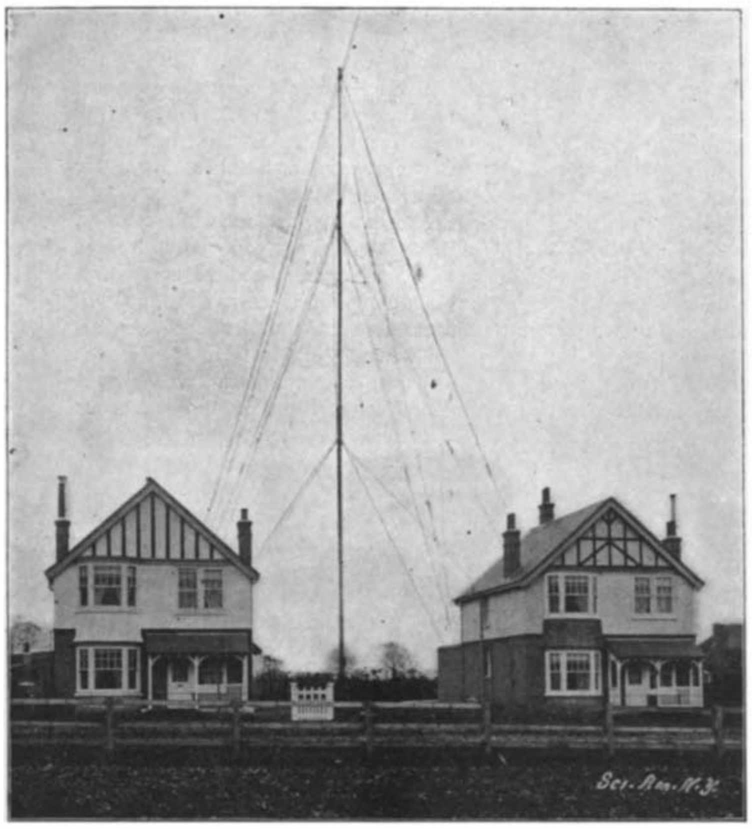
THE MARCONI SCHOOL OF WIRELESS TELEGRAPHY.

BY H. J. SHEPSTONE.

The Marconi Wireless Telegraph Company, of London, England, have opened, at Frinton-on-Sea, in Essex, a school for the teaching of wireless telegraphy, the only institution of its kind in Great Britain, if not in the world. Hitherto the company have trained their men at their works in Chelmsford, Essex, but the demand for competent operators has been so great that the company decided some three or four months ago to open a college for tuition in the Marconi system of telegraphy.

The Institution is unique in that pupils are paid a small premium to attend, although, as Major Flood Page, managing director to the company, explained to the writer, this system will not endure. Only those who have passed through technical schools or show an aptitude for such work are admitted.

The school really consists of two villa residences, the only exterior indication that it is a telegraph college being its tall pole. It is a very conspicuous feature on the landscape, being no less than 165 feet in height. It is erected in the center of the garden, and made firm by a number of wire cables. At the time of the writer's visit to the school the students numbered six, in charge of the principal, Mr. T. Bowden, undoubtedly a very clever telegraphist and electrician. He spent a great deal of time with the famous inventor at his experimental laboratory at Poole, on the English south coast, and has also traveled with Mr. Marconi nearly all over the world, conducting experiments and erecting stations.

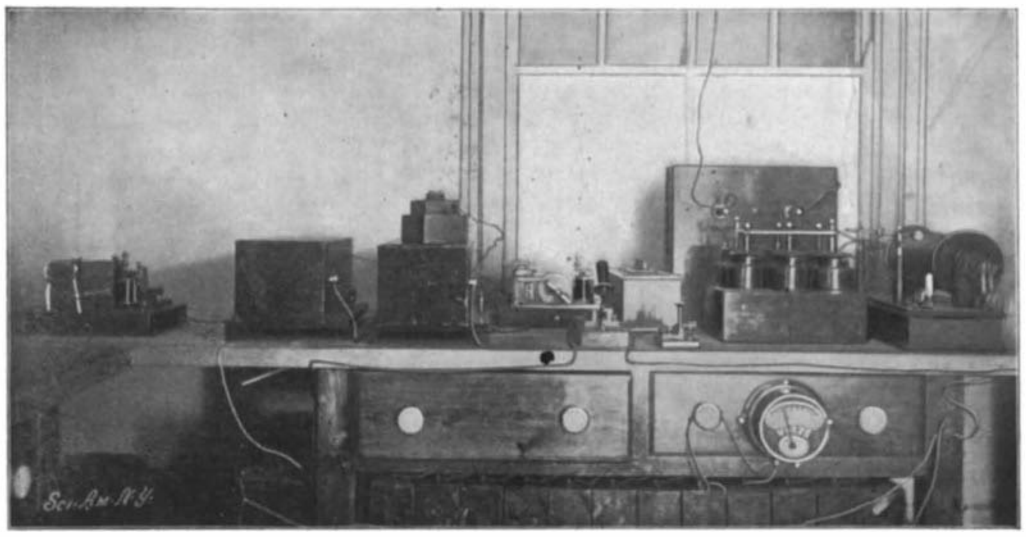


THE MARCONI SCHOOL OF WIRELESS TELEGRAPHY AT FRINTON-ON-SEA, ESSEX, ENGLAND.

The object of the school is not only to teach the would-be operator how to send and receive messages, but also to impart a technical knowledge of the instruments used. Indeed, after passing a course of instruction at the school, the student would not only be capable of taking entire charge of an instrument on board a vessel, but of working and equipping a station anywhere. As all messages are sent by the Morse key, the first thing the pupil has to do is to learn the new alphabet; and the first week is invariably spent in learning Morse until he can read and write it just as well as he can his conventional alphabet.

Then follows a course of instruction in the various instruments, their object and mechanism being fully explained. The pupils are also taught how to repair machines, make new parts, and keep them in proper working order. The pupil is expected to be thoroughly acquainted with the system in the course of a month, though some remain in the school for a period of eight weeks. By that time they would be fully competent to go abroad and build stations on their own initiative in distant parts of the world. After a scholar has thoroughly mastered the new alphabet and the technique of the instruments he is put in charge of the Frinton station, and while in that capacity is absolutely responsible for all messages received and answered. He has also to make out a daily report to the London office and reply to all inquiries. Work commences at 9 o'clock and continues until 5:30 in the afternoon.

The instrument-room proper is in one of the kitchens of the villas, which has been considerably altered to accommodate the various instruments. It is unnecessary here to give a technical account of the apparatus, as the Marconi instruments have been fully described in this paper. It will be seen from an inspection of our photograph that the pole has two spars. From the lower one communication is enjoyed with the company's station at North Foreland, forty miles distant across the North Sea, with a tuned receiver. The writer kept up a conversation for nearly half an hour with the staff at North Foreland, all the dispatches being instantly acknowledged and answered. From the higher spar messages may be sent to the station at La Panne, on the Belgian coast, a distance of eighty miles as the crow flies, right across the North Sea. The company find the Frinton station very useful for testing their instruments before finally placing them on the vessels or dispatching them abroad. The Marconi works at Chelmsford are only twenty miles distant, and after completion the instruments are sent down to Frinton by rail and tested between these two points.



INSTRUMENT ROOM—MARCONI'S SCHOOL OF WIRELESS TELEGRAPHY.

As already stated, the college consists of two houses, the upper portions of which are used as bedrooms. All students are required to sleep at the institution. The company make them as comfortable as possible. There is a spacious dining-room, while the pupils have a parlor to themselves, equipped with a piano and quite a small library of technical books. There is also a small laboratory.

What has astonished English people most is the marvelous amount of work Mr. Marconi has accomplished within the past five years. He landed in England in 1896, with a unique set of instruments which were destroyed by the Custom House authorities, who took them for bombs and infernal machines. Toward the end of that year he took out his first patent. During 1897 and 1898 he made wonderful strides in increasing the distances to which messages could be sent and received, and in March, 1899, succeeded in telegraphing without wires between France and England. On July 20, 1897, he floated the Marconi Wireless Telegraph Company, and in April, 1900, the Marconi International Marine Company, while to-day no fewer than forty-five ships of the British navy have been equipped with the Marconi apparatus, as well as all Lloyd's signaling stations and many of the lightships around the British coast.

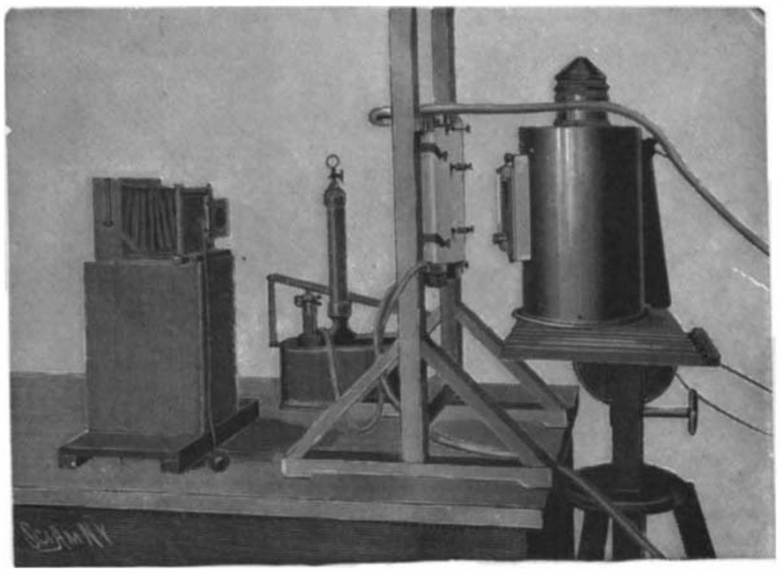
THE EXPERIMENTAL STUDY OF THE MOTION OF FLUIDS.

BY OUR PARIS CORRESPONDENT.

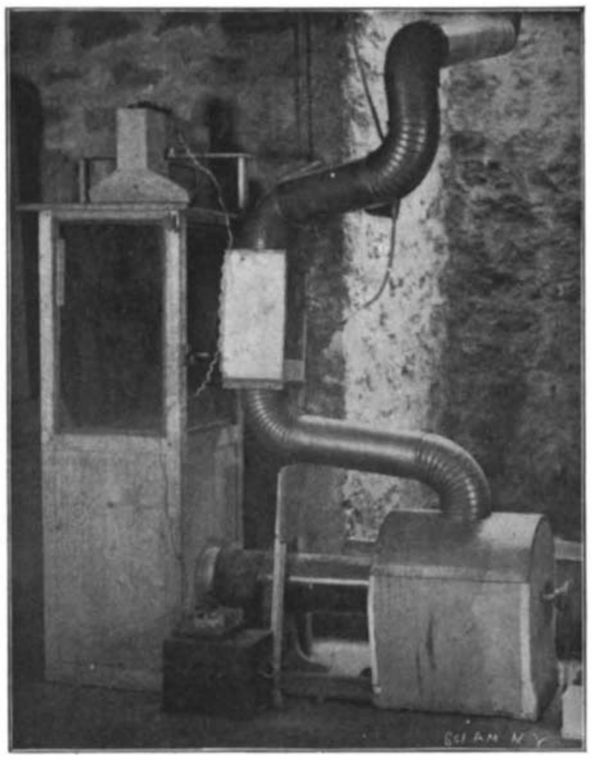
Mathematicians have developed certain interesting theories to explain the movement of a fluid in encountering obstacles. Unfortunately the results of such theoretical calculations have been of little value, because they were not based upon sufficient data obtained by actual observation, or because they applied only to non-existent perfect fluids, the molecules of which glide over each other without friction. If these mathematical theories could be verified experimentally much would be done both for hydrodynamics and aerial dynamics. Furthermore, it would be possible to devise a body which would encounter the least possible resistance in moving through water or air; for the laws underlying the movement of bodies around a stationary obstacle would apply conversely to a body moving through a fluid.

The first attempts to observe the movements of fluids directly by the eye, or indirectly by means of photography, were made some years ago by L. Mach. In these classic experiments of his, the warm and cold air was admitted into an observation chamber by way of numerous small openings. The threads of air streaming through these openings continued their movement in the observation chamber without intermingling. Although the eye could see nothing of this phenomenon, the photographic plate showed that differently heated currents did not mingle; for it is a well-known fact that light does not travel with the same speed in cold and warm air. Still another method of studying the current lines of fluids was adopted by an English physicist, Hele-Shaw. In 1897 he began to study the motion of water circling between the two parallel glass walls of a vessel and encountering various obstacles. Accidentally he found that a mixture of air and water, by reason of the division of the air into a number of globules, rendered it possible to follow the motion of the water with considerable accuracy. Photographs showed not only the places where vortices were produced by reason of the obstacles, but also proved the general law that in all cases, despite the violence of the current, the water is held to the obstacle by adhesion. The varying thickness of the layer thus retained furnishes a means for ascertaining to what extent the entire mass of water is affected by friction.

In order to study the movements of fluids, Hele-Shaw devised the apparatus shown in one of the accompanying engravings. The fluid, the movement of which he examines, is held in a glass box-like receptacle in a suitable stand. Water is allowed to enter the receptacle through a series of fine openings; and colored glycerine is pumped into the receptacle through another series of fine openings alternating with the first. A photographic camera is placed on one side of the stand, and a powerful source of light on the other.

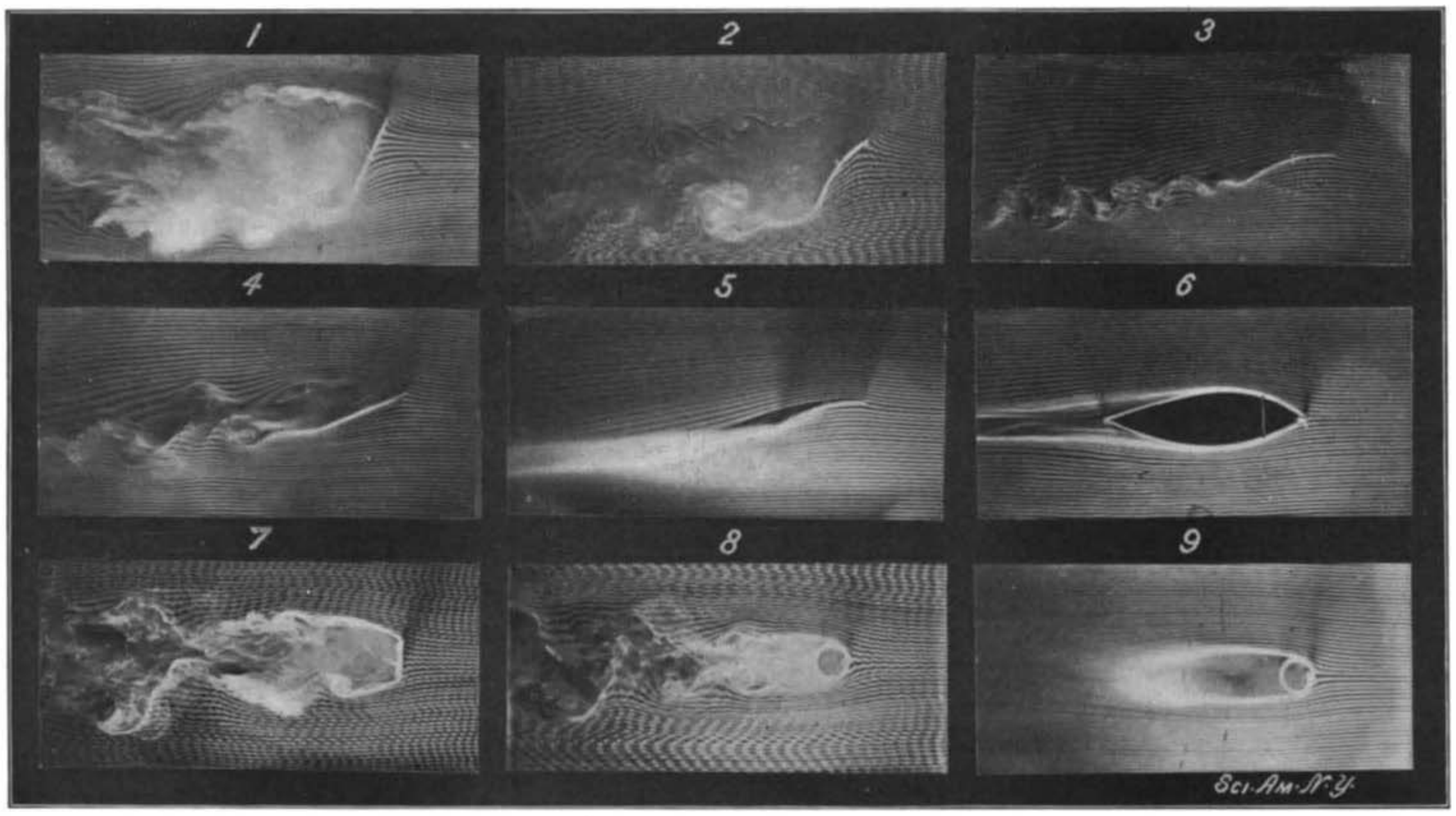


HELE-SHAW'S APPARATUS FOR PHOTOGRAPHING MOVING FLUIDS.



M. MAREY'S APPARATUS FOR STUDYING AIR CURRENTS.

By means of this apparatus Hele-Shaw was enabled to produce photographs corresponding exactly with the theoretical forms of current lines for fluids moving in narrow passages, pictured in Lamb's "Hydrodynamics." This mechanical method, however, is defective in so far as it shows only the direction of movement, and not the velocity at various obstacles.



PHOTOGRAPHS OF THE AIR STREAMS UNDER VARYING CONDITIONS.

More accurate results have been obtained by Marey, an eminent French scientist, who has made the study of the movements of air his life work. His method is to form a series of parallel air-streams within a large chamber, then to charge them with smoke and thus make them visible. When an obstacle is placed in their path the movement of the air is clearly distinguished. To carry this out he uses the large chamber seen on the left of the engraving, 5 feet high and 2 feet in section. In the lower part is an orifice which is joined to the aspirating ventilator on the right, driven by a small electric motor. The air descends through an opening at the top of the chamber, which has stretched across it a frame covered with silk gauze whose meshes are very fine and regular. This serves to direct the air in a series of vertical streams and prevent the formation of vortices, and it thus descends parallel to the walls of the chamber. The smoke is fed into the air by a series of 60 tubes, ¼ inch in diameter and about the same distance apart. Back of the tubes is a small chamber in which the smoke-producing substance is burned, and the streams of smoke thus formed are easily observed and photographed. For this a glass-covered box in which magnesium is burned is placed in the path of the ventilating pipe as seen on the left and near the opening of the main chamber. An instantaneous flash is the best for showing the agitation of the air in the rear of an obstacle, while a prolonged exposure gives the resultant of different movements.

When the ventilator is set in motion the air is aspirated and draws with it the smoke, and the latter descends in a series of vertical cords which may reach as long as three feet if the air of the room is perfectly still. This is not always easy to realize, as often the movements of the operator are sufficient to cause a perceptible deflection of the air-currents. It only remains to interpose in the path of the air the obstacle whose influence is to be studied; this is fixed by very light supports placed against the rear wall. This wall is covered with black velvet so that the smoke-streams, when lighted by the magnesium, are observed as a brilliant white against a black background, and can be easily photographed. M. Marey has devised a very ingenious method of measuring the speed of each stream at different points of its path, and especially in front and in the rear of the obstacle. The smoke-tubes are connected with an electric vibrator whose period is generally regulated at 10 vibrations per second. In this way the smoke-streams assume a wave form which will be noticed on some of the figures. The distance apart of the waves gives a measure of the speed at each point. In the parts where the speed is slower the waves are closer together and *vice versa*. On the wall of the chamber is fixed a rod 8 inches long, parallel to the streams, which serves as a scale to measure the distance covered by the streams in each tenth of a second.

The accompanying figures show some of the most interesting results obtained by this method. In Fig. 1 the air encounters a plane surface inclined at about 70 degrees. It will be observed how the air-streams pass around the obstacle. Part of them mount on the left side, but the greater number follow the slope. In the rear is a region of agitated air which extends far back. The waves are closer together at the contact of the plane, showing a diminution of speed in Fig. 2, which represents a concave surface at an angle of about 45 deg. In Figs. 3 and 4 are shown the different manner in which the air acts in contact with concave and plane surfaces; the figures indicate that concave surfaces are more advantageous than plane surfaces as regards flying, a result which has been already proven by the aviators. In fact, in the rear of the concave surface the air is aspirated with energy and without much agitation, which is a very favorable condition, as this agitation represents a great expenditure of work. Fig. 5 is the same as Fig. 3, but with a different lighting; the former