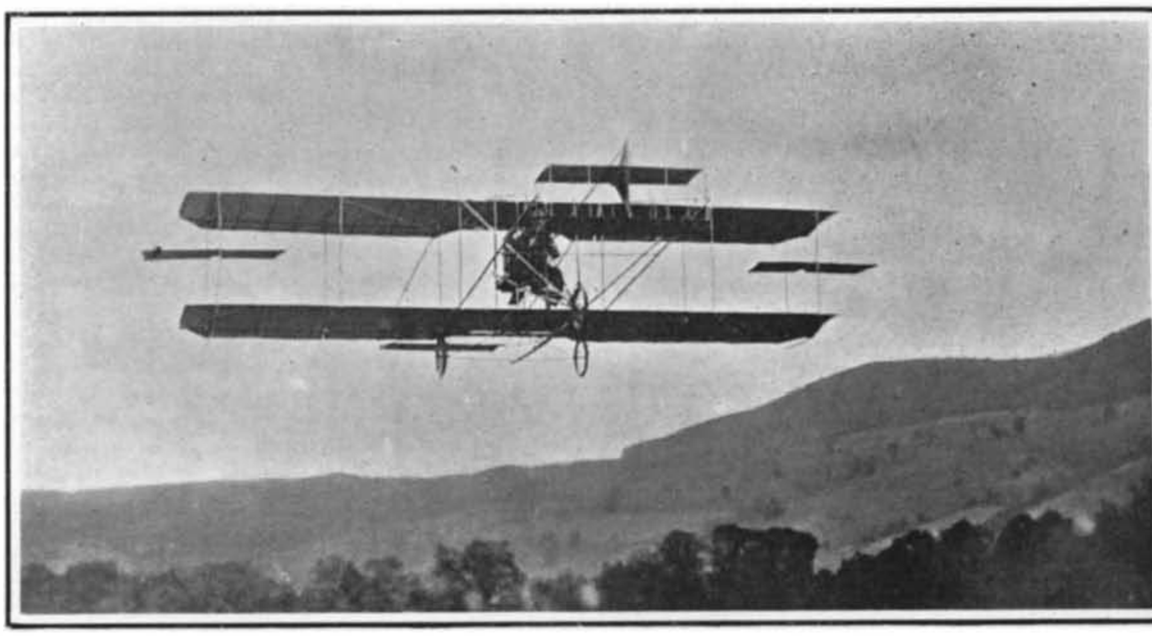
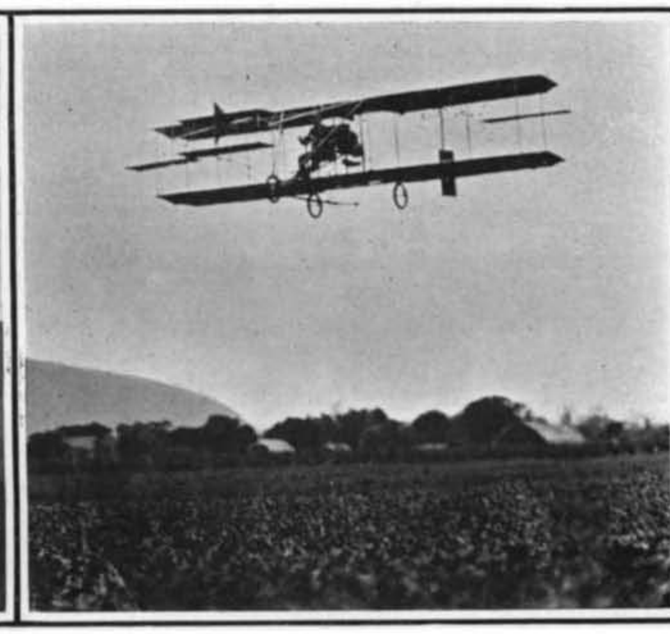
THE AERONAUTIC SOCIETY'S FIRST CURTISS AEROPLANE.

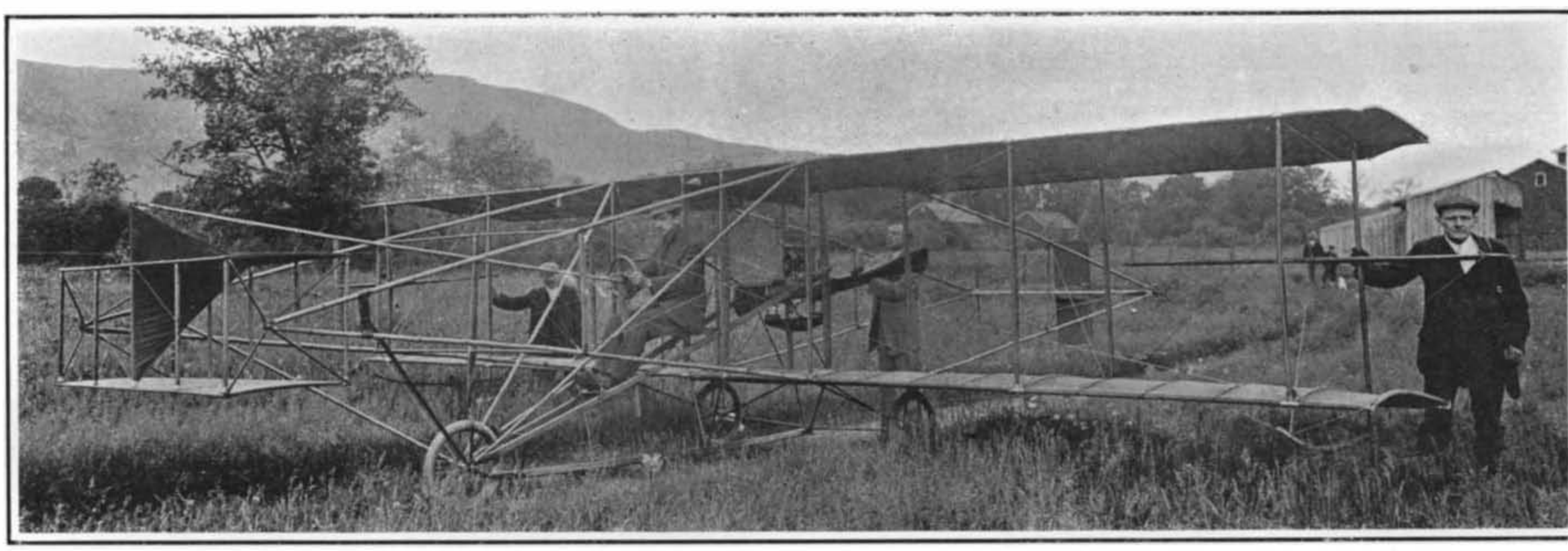
The photographs reproduced on this page show the new biplane which Glenn H. Curtiss has just completed for the Aeronautic Society. This machine, as can be seen from the pictures of it on the ground and in the air, is rather light and small compared with the Wright aeroplane or with most of the numerous biplanes lately constructed abroad. In constructing it, Mr. Curtiss has taken advantage of the practical experience in the art which he had in building the Aerial Experiment Association's four machines last year, while he has also had at his disposal the knowledge of Mr. A. M. Herring, who is now associated with him. The result is a greatly simplified and improved aeroplane and motor.

As with the "June Bug" and "Silver Dart," the planes are attached to a central body portion, mounted upon three 20-inch pneumatic-tired wheels, and carrying the motor and propeller. The two rear wheels are set in forks suitably braced and tied together, while the front wheel is mounted in a strong fork like that used on a bicycle. A single long struck diagonally by a wind gust. If such a gust were allowed to turn it, the gyroscopic action of the single propeller might direct it up or down. Movable balancing planes 2 x 6 feet in size are placed at the ends of the planes half way between them. These are operated by the swaying of the body of the aviator by means of a frame fitting around his shoulders. In fitting the rudders and tail, Mr. Curtiss has made liberal use of bamboo. This material combines strength with lightness, and it is surprising that it has not been used more in aeroplane construction. With the exception of Santos Dumont's tiny monoplane, we know of no other successful aeroplane in which bamboo rods are used to form part of the frame. The frames of the planes are of Oregon spruce, and are put together in sections. The ribs are of light laminated spruce spaced about a foot apart. They project beyond the rear members of the frames of the planes and run through pockets on top of the surfaces. A wire runs through the rear edge of each surface and is stretched over the end of each rib, thus serving to keep tight the cloth, which is also wrapped around the front edge of each plane. The





VIEWS OF THE CURTISS AEROPLANE MAKING ITS INITIAL FLIGHTS AT HAMMONDSPORT, N. Y.



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THREE-QUARTER FRONT VIEW OF THE NEW CURTISS BIPLANE BUILT FOR THE AERONAUTIC SOCIETY.

A double horizontal rudder in front is balanced by a single horizontal tail. The 4-cylinder 25 horse-power motor, with radiator in front and propeller at the rear, is shown behind Mr. Curtiss, who is in the aviator's seat. Note the split vertical rudder behind and the fixed triangular vertical surface in front; also the balancing rudders between the planes at each end.

wood rod extends back from the front wheel to the axle connecting the rear wheels, which are spaced far apart.

The rubber-coated silk used for the surfaces is laced to the frame in panels, there being four 5-foot panels (two on each side of the 6-foot center one) to each plane. There are also 18-inch extensions on the ends of both planes, so that the total spread of the planes is 29 feet, while their width from front to back and their spacing is 4½ feet. On account of notches cut out of the planes to accommodate the propeller, the total supporting surface furnished by them is only about 250 square feet. A double-surface 2 x 6-foot horizontal rudder having 24 square feet of surface is placed 10 feet in front of the planes, while a single adjustable horizontal surface of the same size, located 10 feet behind them, serves as a steadying tail. The vertical rudder is placed at the middle of this surface; it is 2½ x 2½ feet in size. There is also a large vertical triangular-shaped steadying surface at the center of the horizontal rudder. This surface and the vertical rudder serve to keep the machine from twisting about its center vertical axis when surfaces have a slight parabolic curve from front to back, the curvature used being about 1 in 9. The angle of the planes with the horizontal is also slight, being only about 6 degrees as the machine stands on the ground. When in flight, this angle diminishes several degrees.

The motor used is a special 4-cylinder, 3¾ x 4, water-cooled Curtiss aeronautic engine. It develops 26 horse-power at 1,200 R. P. M., which is 1 horse-power per 1⅝ square inches of piston area, or rather more than is usually obtained. High compression is used, though this is by no means abnormal. The cylinders of the engine are of cast iron with a wall thickness of about 5/32 inch. They are surrounded by cast copper water jackets welded to them. The heads of the cylinders are hemispherical, with inlet and exhaust valves set at an angle upon each side of the water outlet, which is in the center. Both valves are operated by a single rocker arm pivoted on top of the water pipe. The inlet pipe extends across all four cylinders with the carbureter placed at one end of it. A gear-driven Bosh high-tension magneto

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LOS ANGELES 200-MILE CONDUIT WATER SUPPLY.

BY DAY ALLEN WILLEY.

The longest artificial water conduit ever planned in America is that which is to increase the water supply of the city of Los Angeles in Southern California, and which is now being completed. While the conduit is notable for its engineering features, it will not only supply water for domestic purposes and for irrigation but the head of water is so great that it will produce electrical horse-power for pumping, manufacturing, transportation, and other purposes, so that the project achieves three different objects.

The extensive arid district in Southern California has limited Los Angeles in the past to obtaining water from only one source. The rapid growth of the city in population and its industrial development necessitated another supply, but the nearest considered available was from the Owens River. This stream, which rises in the eastern Sierras of the State, is over 200 miles from Los Angeles, and separated by a country which includes not only mountains but a large area of absolute desert, presenting many difficulties in the way of constructing such a canal. When the necessary surveys were made, it was found that it would be necessary to build a waterway no less than 215 miles in length. Incidentally, it may be said that the total cost of the project represents about $20,000,000, not counting the purchase of property for reservoir sites and other purposes, which, if included, bring the total cost to nearly $22,000,000. This sum has been provided by the sale of municipal bonds, and such has been the public interest manifested, that all of the money has been raised in the city of Los Angeles, its residents taking its securities.

The canal begins at a dam which has been constructed across the Owens River about 40 miles from a lake into which it has hitherto discharged its water. The dam is of the diversion type, and from it extends the main canal for a distance of 60 miles to the Haiwee, the first reservoir in the series planned. On this section is some very difficult work. In a distance of 22 miles the waterway includes no less than 8 miles of tunnel. Three and one-half miles of conduit are composed of heavy steel pipe faced on the outside with concrete. Ten miles of the canal in the same section have walls molded entirely in concrete. The Jawbone

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IMPROVEMENTS IN THE DE FOREST SYSTEM OF WIRELESS TELEPHONY.

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Dr. De Forest has made an ingenious application of the principle of directive propagation, a refinement of which has also been developed with great success in Europe by Bellini and Tosi.* It was found that if slanting wires were run from a mast to a boom, the intensity of the waves emitted would be much greater in the direction of the plane of the antenna and practically zero at right angles to it. Accordingly, this afforded them an excellent method of directing the waves; and if the whole arrangement were revolved, any desired direction could be given to the wave fronts emitted from the antenna. Dr. De Forest conceived the idea of using this device for sending out danger signals from a lighthouse or other point, and change the direction of the wave by revolving the projecting apparatus so that any boat which received the signals could immediately ascertain its direction from a danger spot equipped with the "aerophore," as the device has been termed, since the apparatus was designed to transmit intelligible signals which differed automatically with the constantly changing direction of the waves as projected. A simple example will illustrate this. When the apparatus is arranged to transmit waves in a northerly direction a certain telegraphic or telephonic signal would be sent out in that direction, and only in that direction. If that message were received on some ship, it would follow at once that the lighthouse was bearing due south of the vessel. For other points of the compass the signals would be different, while a prearranged code would be employed where the aerophore was installed upon a vessel. Thus with the apparatus in operation on both of two vessels, it would be possible as soon as they came within range of each other to determine their bearing, particularly as the signal is first received by an automatic and audible device, such as a buzzer, which would sound in the pilot house and make evident the necessity of picking up the telephone receiver and learning the exact direction of the signals. Dr. De Forest has recently been working on a type of aerophore where an arc light is revolved behind a parabolic mirror, with the movement interrupted successively at the points of the compass where the signal automatically is sent out by wireless, indicating the direction in which the wave is projected. In addition to these signals a microphonic transmitter is connected with a set of bells tuned to the quarters of the octave which are constantly striking, one after the other, several times a minute. These bells have a varying range of penetration, so that when the observer on a boat can hear four bells he knows he is within a certain range of distance of the source of sound. When only three are heard, the distance, of course, must be less, and so on, so that a fair estimate of the distance from the danger point is obtainable.

An improvement that makes possible the satisfactory working of the system is the adjusting of the sending mechanism of all instruments to a "common tune," which differs widely from that of the receiving part of the apparatus, so that when using a single antenna, it is possible to receive the sound whether the transmission apparatus is working or not. When a signal is received, a small lamp is lighted by induction or a buzzer is caused to sound, so that the operator immediately puts on his head telephone in order to find the whereabouts and name of the transmitting station. Aerophore signals will be erected at all the points of danger on the Great Lakes, and will be used on all the signal towers of the Radio-Telephone Company. The device has been tried on the steamship "Wisconsin," and has worked successfully over a limited range.

* See SCIENTIFIC AMERICAN SUPPLEMENT, No. 1745, June 12th, 1909, page 372.

THE AERONAUTIC SOCIETY'S FIRST CURTISS AEROPLANE.

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weighing 12½ pounds, as well as a gear-driven oil pump, is placed at the same end as the carbureter, while the gear water pump is at the other, or rear, end. One of the gears of this pump is on the camshaft. The motor is very light and compact, its weight complete with pumps, magneto, and carbureter being 97½ pounds. As it is claimed to be capable of developing as much as 30 horse-power, its weight without water and radiator is about 3¼ pounds per horse-power. The radiator weighs 40 pounds, and less than 10 pounds of water is carried, so that the total weight of the power plant is under 150 pounds. It was tested by a 10-hour run driving the propeller.

A 6½-foot diameter, 5-foot pitch wood propeller is mounted upon the engine crankshaft. This propeller develops a thrust of 225 pounds when the aeroplane is held stationary, although 150 pounds is all that is needed to fly it. The blades are but five inches wide. The motor is mounted upon the rear part of the main planes, half way between them, the propeller being at the rear. The aviator sits on a seat at the front edge of the lower plane and about a foot above it, this seat and a foot rest being located upon a pair of inclined braces extending upward from the front wheel to the two special uprights at the rear, which support the motor bed in conjunction with the inclined braces. Two other pairs of braces extend upward respectively from this wheel to the front edge of the upper plane and to the parallel downwardly-inclined poles extending forward from the front edge of this plane to support the horizontal rudder. The tail is carried by two pairs of parallel rods extending downward and upward from the rear edges of the upper and lower planes and meeting some 12 feet behind them. A square automobile-type radiator is placed in front of the motor; the cylindrical gasoline tank is located above it just under the upper plane, and the oil reservoir below.

The control of the new aeroplane is practically as simple as that of an automobile. All the aviator has to do is to pull or push on the steering wheel, which is placed vertically in front of him, in order to steer up or down, while turning the wheel and inclining the body slightly steers the machine to the right or left. The vertical rudder is in reality unnecessary for steering, as this can be accomplished simply by inclining the body and thus setting the balancing planes. These are connected by wires with a frame of steel tubing shaped like a bicycle handle bar and fitting around the shoulders of the aviator, so that when he sways slightly to one side or the other one wing tip is inclined upward and the other downward slightly. The aeroplane, in a run of 75 feet, will attain sufficient speed—about 25 miles an hour—to rise. It flies at more than 40 miles an hour. A plunger brake is fitted to the front wheel tire, to aid in quickly stopping it when it alights.

Several successful trial flights were made at Hammondsport, N. Y., by Mr. Curtiss on June 4th, 5th, and 6th. The longest of these was about 3 miles in the shape of a figure 8. He has shipped the machine to the grounds of the Aeronautic Society at Morris Park race track, New York, and after making some further practice flights, he will attempt to set up a record for the SCIENTIFIC AMERICAN trophy at the society's first 1909 flight exhibition, which will be held either the 19th or 26th instant. A new monoplane and several new gliders will also be tried upon this occasion. There will be a wind wagon race, and contests for models, kites, and gliders. The society's new dirigible balloon will also be flown.

LOS ANGELES 200-MILE CONDUIT WATER SUPPLY.

(Concluded from page 460.)

division, as it is called, is uninhabited, and it was necessary to transport much