

## Flying-Boat Races

By Glenn H. Curtiss

IT is not difficult to understand why a sheet of water affords an ideal aerodrome. In the first place, the aviator does not have to run along a given course to start, and he can always head into the wind. Then again, in landing, he does not have to be so particular, because the surface of the water is sure to be level; whereas from an altitude, a field which looks level may turn out to be quite impracticable as a landing place. Another advantage of water flying is that the wind is much steadier over the water. Altogether, it is much easier and safer to start and alight on the water than on the ordinary flying ground. In addition to this, if as a result of careless landing and the inexperience of the operator, an accident does happen, it is not likely to be serious.

The hydro-aeroplanes gave us all these advantages in water flying; but the new "flying boat" gives us, in addition, the advantages to be found in a boat with its large surplus of buoyancy, seaworthiness and protection for the aviators. The new Curtiss "flying boat" will ride as rough a sea, either under power or adrift, as any motor boat of its size, and flies as well as any aeroplane of equal proportions; so that the combination gives us the advantages of the motor boat and the aeroplane combined, and there are no limitations to the development of this type of machine.

The many fatal accidents to exhibition fliers, using land machines, has directed the attention of all interested in aviation to the flying boat. This machine offers a means by which aviation may be enjoyed as a sport and developed and advanced as a science, without the dangers which heretofore accompanied flight.

The "flying boat," shown in the illustration, has a hull 25 feet long by 2½ feet beam; carries 250 square feet of plane surface, and an 80 horse-power water-cooled motor with a propeller attached direct to the engine shaft. It has a carrying capacity of 600 pounds, and will carry fuel supply for a flight of 400 miles. It is fitted with dual control, so that either the operator or passenger, who sit side by side, may assume full control of the machine.

In starting from a standstill in the water, the machine, after attaining a speed of about ten miles an hour, rises to the surface, on which it travels as a hydroplane until it reaches a speed of 45 miles an hour relative to the wind, when it will leave the water at a slight inclination of the elevator. It maneuvers quite readily on the water at all speeds, and will turn circles of a short radius, either at high or low speed. The boat is built very strongly, as it must necessarily be, to withstand the shocks of starting and alighting in rough water.

The accompanying illustrations show two of the new flying boats and a hydro-aeroplane in the first race of the kind ever held. The race was arranged for the students and visitors at the Curtiss Aviation School at Hammondsport, on the afternoon of October 28th. All who witnessed the race are unanimous in the opinion that yachting with the flying boat is destined to be one of the greatest of sports.

The sight of three machines jockeying for position was inspiring, while the close finish of the return trip would stir the blood of any sportsman. The three machines were all fitted with the same engine power; but the flying boats proved speedier in the air and faster in making turns on the water, a rule of the contest being that the machines must round the buoy on the water, and must fly only between the starting and finishing points, excepting on the third lap, which was the finish.

## Some Developments in Wireless—I

By John Hays Hammond, Jr.

SINCE the first conquests of space by Hertzian waves, what has been the main development in the perfection of wireless communications? It may be stated that the chief inventive energy has been concentrated on the practical problem of increasing the effective range of intercommunication and the selectivity of the individual system. In 1897, Mr. Marconi transmitted messages to a distance of 8.7 miles. To-day, Mr. Marconi says that the maximum effective distance of transmission is 6,000 miles. It is evident from a consideration of these figures that not merely a quantitative change has been made in the system of transmitting energy, but that vastly improved means of effectively utilizing this energy has been made.

In this connection it is interesting to note that Count von Arco estimates that whereas a few years ago only 50 per cent of the available energy at a station was used in radiant energy to-day, by quenching the oscillations in the primary circuit, 75 per cent of the energy is converted into useful work. This remarkable advance in power economy has been brought about chiefly through the better understanding of the conditions that would allow of more sustained electrical oscillations in the open circuits of the transmitter. The receiving stations, on the other hand, have been rendered infinitely more sensitive to the reception of weak signals by discarding the coherer principle of wave detection. The coherer, whose principle is generally understood, was discovered as early as 1879 by Prof. Hughes, and rediscovered in 1890 by Branly. This instrument was used for several years in commercial practice, but was discarded some years ago for numerous more sensitive detectors. To-day the telephone is used in conjunction with suitable detectors, and has been found to be astonishingly sensitive to small currents. Besides modifications in the apparatus to insure the greater sustainment of electrical oscillations, an important discovery of Lord Rayleigh was recognized as an essential factor in designing a wireless system. This discovery is the physiological law that

resembles an undamped wave of modern production, actuating a single station; the second method, the old style of damped waves, actuating every station in the vicinity. A still graver source of interference is found in a station emitting pure waves that are undamped, but which are so powerful that they cause every nearby aerial to pulsate electrically in their own specific frequency. For the immediate present proper legislation seems to be the most practical remedy for this evil.

The pioneer leaders in the adoption and perfection of the sustained oscillation system are Reginald Fessenden in this country, and Valdemar Poulsen in Europe. These two inventors have employed, however, widely different means to obtain the same result. Poulsen has made use of the principles of Thomson's singing arc, while Fessenden has developed alternating current generators which have the remarkable ability of producing from 50,000 to 200,000 alternations of the electric current per second. Alexanderson, of the General Electric Company, designed these machines and they represent a triumph of constructive skill. The heart of the mechanism is a disk rotating at a speed of 20,000 revolutions per minute. Mr. Alexanderson says: "The diameter of the disk being one foot, the peripheral speed is 1,000 feet per second, or 700 miles an hour; in other words, the disk would roll over to Europe in 4 hours." These machines are to-day on the open market, and their general adoption will be a great factor in eliminating much of the present interference. Ernst Ruhmer, the German scientist, believes that the Fessenden method will undoubtedly be the method used in the future for the production of pure electro-magnetic waves. The limitation of the high frequency alternator, however, is due to hysteresis losses in the iron which limits their efficient outputs to long wave-lengths.

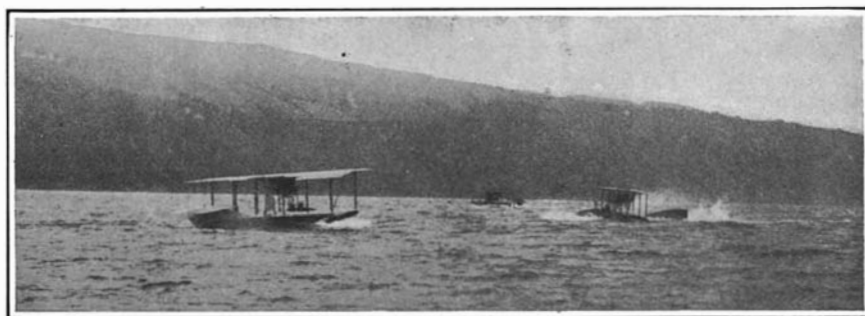
## Present Success in Avoiding Interference.

The near future of wireless will see improvements following along the general lines of increased range of transmission, and better means for procuring immunity to interference. In the pursuit of selectivity, however, I believe a different course of development will be followed from the lines hitherto adopted. True immunity to extraneous interference is immunity not merely to static atmospheric charges or forced oscillation effects of powerful neighboring stations, but it must be immunity to intentional interference. This phase of interference has been already developed in the German navy, and a machine has been constructed on the principle of a siren. The operation of this machine is somewhat like singing a rapidly descending and ascending scale near a piano. All wave-lengths are momentarily emitted and a tremendous source of interference is produced. The Germans do not interfere with themselves, for they simply omit the note they use from the diapason of the siren. A spark gap placed directly in the antennae will also produce an equal disturbance. How are we going to avoid the effect of these intelligence destroyers? By perhaps one method: the use of a system operating through the conjoint action of two or more waves of very different characteristics.

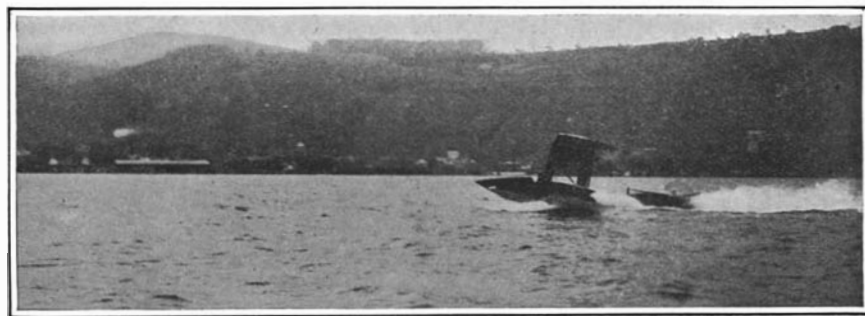
Tesla shows a system in a patent granted in 1903. Each of his individual waves of different frequency closes a certain relay, and before the final indicating device operates, it is necessary that a number of relays be closed, each by a different individual wave. In order, therefore, to create an interference, it would be necessary to determine the combination of the waves used; and since the possible combinations are infinite, the general theory of the system prohibits intentional interference. The use of relays, however, prohibits the practical use of the system.

Prof. Fessenden was granted a patent in the same year on a system utilizing the same fundamental principles of co-operative waves. He, however, obtained far greater immunity to extraneous disturbances by operating the system not by the electrical frequency of his transmitting station, but by the acoustic frequency or note we have already mentioned. That is to say, a chord of musical notes is produced at a sending station and the receiving station contains only such tuned elements as will respond to this chord. With a detector having no appreciable resistance I have operated this system successfully. De Forest, Stone, Ehret and others also have patents on systems operating broadly on the principle of co-operative waves. The future selective system of wireless undoubtedly has its nucleus in this ingenious principle.

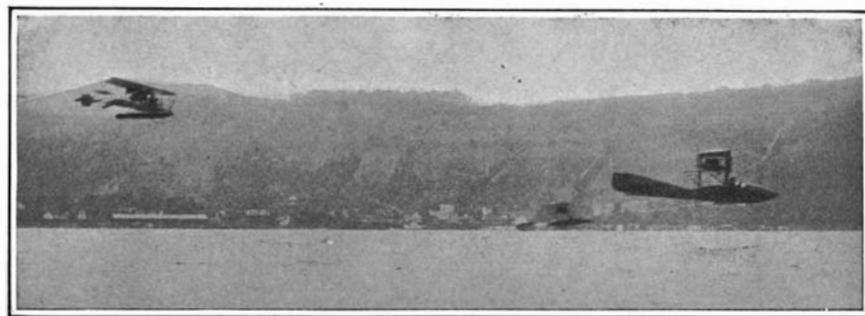
(To be continued.)



Two flying boats and one standard hydro-aeroplane jockeying for position at the start of race.



Forty-five miles an hour on the water.



Finish of race. David McCulloch in his flying boat leads; Lincoln Beachy is second; Francis Wildman is third.

the human ear allows us to hear best, sounds of between five hundred and one thousand vibrations a second. Accordingly, alternators were built of 500 cycles, a thousand electrical impulses per second were produced at the sending station, and the receiving operator heard a high musical note. In this way not only may we consider that the receiving instruments have been rendered more sensitive, but the human ear itself has been made to respond better to incoming signals.

## The Problem of Selectivity.

Another important pursuit in wireless has been the development of means to secure a selective intercommunication between the sending and receiving stations. A certain amount of selectivity has been obtained on the principles of electrical tuning. Many of the requisites in economical long distance transmission resemble the requirements for accurate tuning, and in this way the theoretical development of wireless is well advanced. The chief source of trouble lies in the fact that practice does not care to keep pace with theory, and for this reason, instead of a station emitting either a pure electrical tone or an acoustic tone, it will be found that much of the apparatus in use is of prehistoric refinement. Sing a clear sustained note into an open piano and you will hear a string of the identical pitch vibrating. Sing a rapidly descending scale and you will hear several strings vibrate. The first method