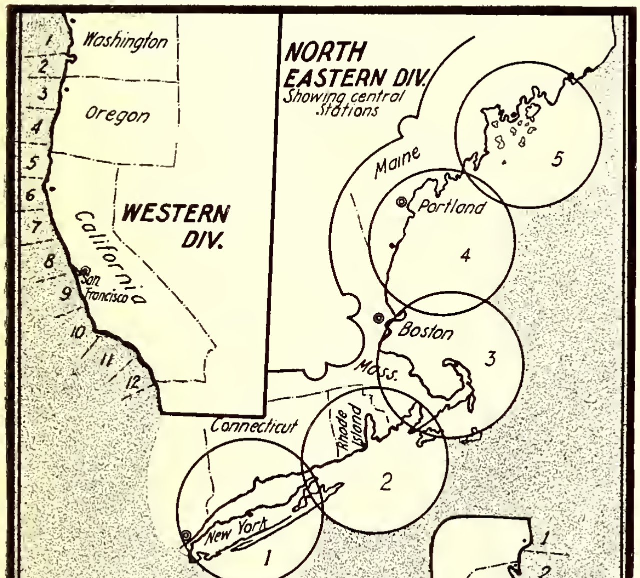
and ground "A" and "G" as usual, through the oscillation transformer "T." As is well known, it is always a considerable problem to properly impress the voice waves on the high-frequency circuit.

This inventor has very ingeniously arranged a talking mouthpiece and diaphragm "2" so that every movement of the diaphragm will cause a varying amount of hydrogen gas to be injected into the arc chamber through the nozzle "3," as will be observed in the sketch. Most wireless telephone arc generators, of course, employ a gas envelope surrounding the arc proper, and this has a decided effect on the arc. Therefore, by taking advantage of this function of the gas, this inventor has provided a very simple method which seems indeed quite practical for controlling the strength or degree of oscillations produced by the arc generator.

The small vessel with spirit lamp under it at "4" is the apparatus for producing the gas, which then passes through a rubber tube to the gas chamber "5," and so on through another rubber tube to the nozzle "3."

A RADIO SCHEME FOR PROTECTING U. S. COAST LINE.

A UNIQUE wireless scheme was recently brought forth by John Hays Hammond, Jr., of wireless torpedo fame, for the protection of the entire United States coast line on both the Pacific and Atlantic shores. This scheme involves the building by the United States Government of about 44 scouting aeroplanes of large size, adapted to carry powerful wireless transmitting and receiving sets. Each of these 44 scouting aeroplanes would cover a zone of its own, as shown on the appended map layout. This sketch will help to convey Mr. Hammond's idea to the reader, and it indeed seems quite feasible.



John Hays Hammond Jr.'s Radio-Aeroplane Scouting Scheme for Our Costal Defense.

Moreover, the cost is not anywhere near as excessive as that involved in building a tremendous navy of dreadnaughts and other ships, some of which cost as high as $15,000,000 apiece.

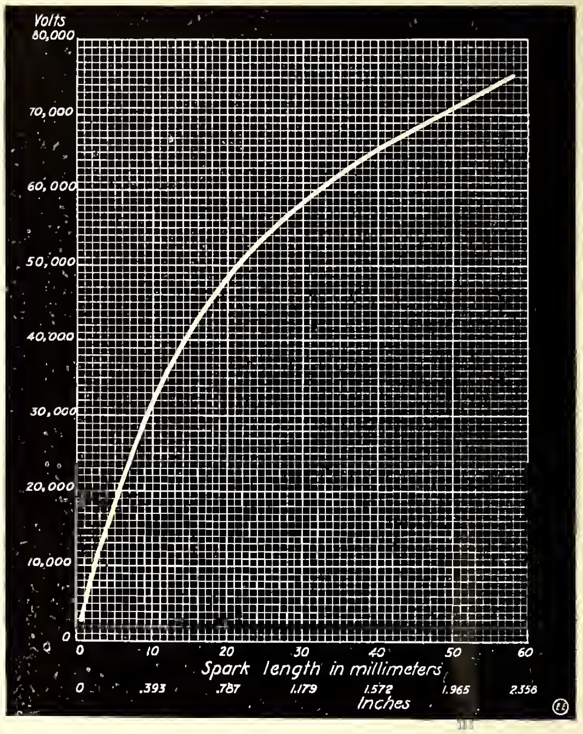
Briefly, it may be said that from the inventor's figures, covering cost of wireless apparatus for each aeroplane, aeroplane sheds or hangars, etc., the total cost of the 44 scouting aeroplanes complete, ready for service in the event of war, would be $398,500. He suggests, also, that the Chaffee system of wireless telephony would be very well adapted for the work, as it is simple in operation, very compact and light, and also requires no knowledge of the Morse telegraphic code, as does wireless telegraphy.

The Chaffee system also gives a large power in small aerials, is capable of being very sharply tuned and is remarkably cheap from a constructional standpoint.

The general operation of this scheme is to provide, of course, a small wireless station at the center of each zone point along the coast, and this would be in communication with the chief military headquarters. It is thus pointed out that the approach of any foreign naval fleets or transports would be perceived a considerable space of time ahead by the aeroplanes and that by transmitting this intelligence wirelessly to the military authorities in charge the enemy could be met by a powerful home fleet in an effort to quickly destroy the hostile vessels.

SPARK POTENTIALS.

Probably every "electrical experimenter" has often wondered how great the difference of potential might be between the secondary terminals of his induction coil or the knobs of his static machine when a spark of given length was passing. Unfortunately, no definite voltage can be ascribed to a jump-spark discharge, partly for the reason that the resistance of the air-gap between the electrodes is far from constant, for the material, size and shape of the terminals themselves play an important part, as do also changes in barometric pressure and various radiations that may traverse the space containing the spark. Inasmuch as most experimenters do not possess the requisite apparatus for measuring these potential differences directly, they must content themselves with an approximate determination based on the measurements of others. It is often stated that the potential difference is directly proportional to the length of the spark, and that it increases at the rate of 30,000 volts per centimeter of spark length. This is only approximately true for sparks of less than 2 or 3 millimeters in length, and where the knobs of the electrodes are large compared to the distances between them. As the length of the spark is increased, the increase in the potential difference is much less than that stated above, so that no idea of the voltage producing a spark of great length can be obtained from measurements made with a short one. Again, the length of spark corresponding to any given potential difference will depend upon the nature of the dielectric filling the space through which the discharge is passing.



Spark Voltages for Ball Gap. Balls Used 2 Cm. (13-16ths Inch) in Diameter.

The accompanying curve, based on data given in Dr. J. A. Fleming's "Radiotelegraphy," will be found to be a reliable and useful one for reference by the average experimenter. The ordinates or vertical distances are the spark voltages which were measured for discharges between polished metal balls 2 cm. in diameter, in air, at 760 mm. barometric pressure, and hence are only really accurate for the same conditons. However, they give the potential approximately for any discharge between metal balls in air through the range covered.

A brief study of this curve will show that for spark lengths up to 50 millimeters, or 2 inches, the potential increase with increasing length is not at all constant. As suggested above, some radiations have a marked effect on the spark length possible with a given potential difference. It is an easy matter to show that sparks will pass much more easily than normally if the gap, and in particular the negative ball, is illuminated by ultra-violet light, such as that from an electric arc light, or contained in ordinary sunlight. The same effect will result if the gap or negative ball is heated When, in any experimental work, including radiotelegraphy, small quantities of electricity are discharged across a gap, the best results will be obtained with highly polished balls of zinc or brass, and if the spark is in the open air the accompanying curve will afford a reliable means of determining the potential difference for distances up to 5 centimeters, the distances being taken between the nearest points on the two balls.

Contributed by E. H. JOHNSON.