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Wireless and Aeroplanes Aid European "Gun Spotters"

WHILE it has been considered for a long time in military circles that aeroplane wireless was certain to prove extremely valuable eventually, from all aspects, it is only within the past few months that we have heard anything definite in this direction.

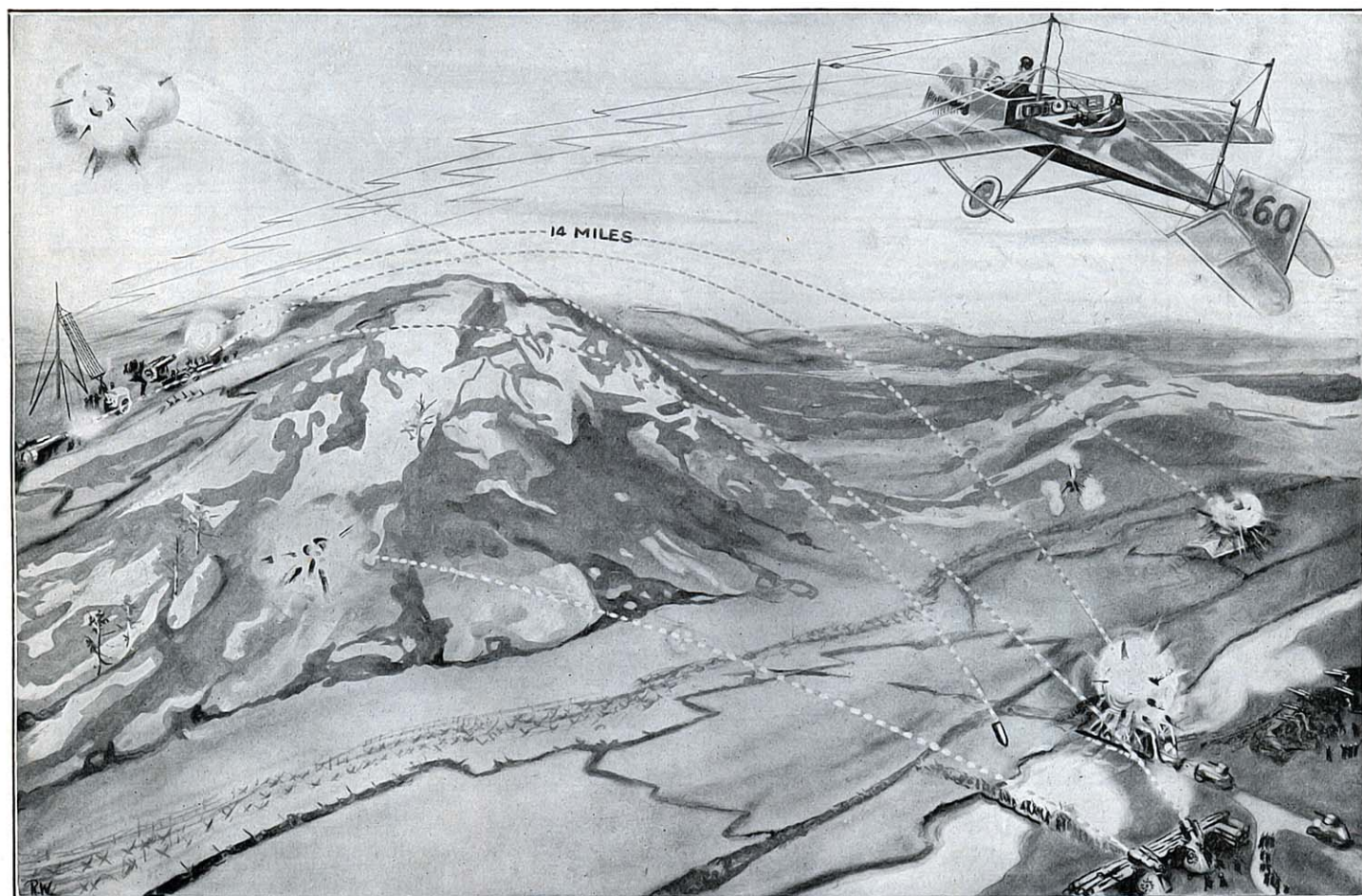
The Allies, according to reports received from the battle-fronts, "somewhere" in France," have found a number of ingenious uses for the radio equipped aeroplane. One

communication with the distant *shell-spotting aeroplanes*. The high-powered battle-planes, each of which is equipped with a radio set capable of transmitting up to 30 or 40 miles, sail forth, and though they fly at a fairly great altitude, the aerial observers are quite able to accurately observe the resultant effects of the shell fire.

One of the reports states that a certain French battery of artillery actually succeeded in dropping four shells in succession on a bridge 14 miles away. The offi-

or Zeppelins at remarkable heights, it seems that the French aviators have a way of obtaining this most valuable information without undue risk to themselves or their machines.

Undoubtedly the aviator may now and then lose his life, or at least be captured by the enemy, but by flying at a great altitude it seems he has been able to safely obtain this much needed information and to signal it to the artillery officers, in a number of cases which are on record.



The French Gun Batteries are Reported to be Planting Successive Salvos on Points 14 Miles Distant, with Machine-like Accuracy. An Aeroplane Fitted with Wireless Apparatus Flies over the Enemy's Position and Signals Back the Result of Each Shot.

of these is to accurately locate (or "spot") and report the effect of shell firing over considerable distances, as clearly shown in the accompanying illustration. The manner in which this scheme operates in the instance reported is as follows:

Behind the French lines there is erected a collapsible radio mast and the proper signaling equipment capable of keeping up

cers in the aeroplane helped to bring about this truly marvelous accuracy of fire by signaling back the exact effect of the bombardment to the commanding officer behind the French lines, via radio.

While this scheme may seem hazardous in the extreme, especially where the enemy is plentifully supplied with modern anti-aircraft guns capable of hitting aeroplanes

It goes without saying that in any such case as here cited, where the range is as great as fourteen miles, that those in charge of the guns cannot very well see the structure to be demolished from their position except in rare instances. It often happens that such firing is to take place over a hill, as shown in our illustration. Firing over
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WIRELESS AND AEROPLANES AID EUROPEAN "GUN-SPOTTERS."

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a hill is a common occurrence on many of the battle fronts of Europe, and it is one of the standard exercises proscribed for the artillerymen of the United States Army.

As aeroplane radio sets have been greatly improved since the start of the present European war, it is now feasible for aeroplanes to maintain reliable radiocommunication over distances of forty to fifty miles. Some of these wireless sets operate on batteries, but the majority of them are designed to be excited from a small dynamo driven by the aeroplane engine. Aeroplane radio sets of American design are being turned out which do not weigh above fifteen to twenty pounds. Specially designed receiving sets are supplied for aviators, combining a leather helmet with the sensitive telephone receivers in-built to form an integral part of the entire head-gear. The antenna on aeroplanes has to be especially well insulated and many freak arrangements of the aerial conductors are to be seen. A single wire depending downward from an automatic take-up reel is extensively favored. In other cases the antenna is spread over the length and breadth of the machine, and suitably supported so as to be clear of grounding on the metal parts of the aeroplane frame and engine.

LIGHTNING MADE TO ORDER.

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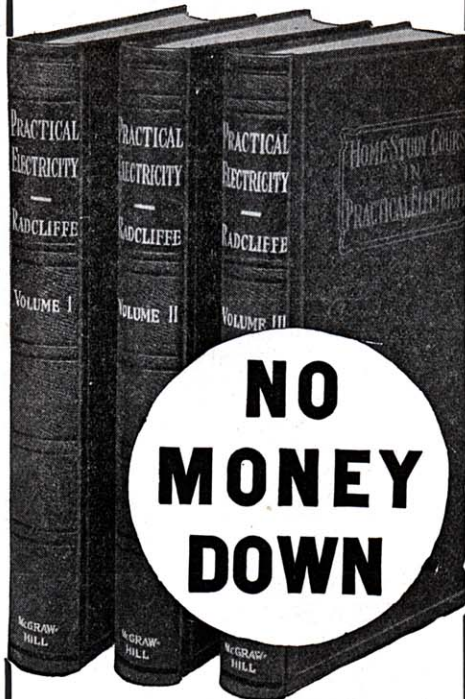
volts and a frequency of one hundred thousand per second! The flame-like discharge measures sixty-five feet across. This experiment was performed for the purpose of showing how the nitrogen of the atmosphere could be made to combine with the oxygen. The large wire cage measured 20 feet in diameter and 30 feet in height. This is not the actual coil which is excited by the primary of the Tesla transformer, but a separate helix which is attuned to a certain frequency of the secondary of the transformer. This is apparent by noting the large circular fence-like wall in the rear, which measures 60 feet in diameter and which is wound full with heavy copper wire.

The primary is carefully imbedded in the ground and connected with the regular oscillating circuit, comprising high tension oil condensers and the inductance incorporated in the primary of the Tesla transformer, also a spark discharger. In all these experiments the primary of the low tension transformer was excited with 300 kilowatts of electrical energy.

A very striking experiment showing the emission of an electrical discharge from a large sphere is shown in Fig. 2. The ball has a surface of twenty square feet which represents a large reservoir of electricity. The inverted circular pan underneath with sharp rim has an opening thru which the electricity can escape before filling the reservoir. The quantity of electricity liberated is so enormous that, although most of it escapes thru the rim of the pan or opening provided, the ball of the reservoir is nevertheless alternately emptied and filled to overflowing, as is evident from the discharge escaping on the top of the ball.

The coil shown in Fig. 3 creates an alternative movement of electricity from the earth into a large reservoir and back, at the rate of one hundred thousand pulsations per second. The adjustments were such that the reservoir fills and bursts at each alternation just at the moment when the electrical pressure reaches the maximum. The discharge escapes with a deafening noise, striking an unconnected coil twenty-two feet away, and creating such a disturbance of electricity in the earth, that heavy

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sparks an inch long were drawn from the water main at a distance of three hundred feet from the laboratory.

One very interesting experiment conducted by Dr. Tesla showed how it is possible to tune several coils to different frequencies with respect to the fundamental frequency generated by the main exciting coil. A photograph showing this experiment is reproduced at Fig. 4. The large coil on the right, discharging strongly, is tuned to the fundamental vibration which is fifty thousand cycles per second; the two larger vertical coils to twice that number; the smaller coils, wound with white wire, to four times that number and the remaining small coils to higher harmonics. The vibrations produced by the oscillator were so intense that they affected perceptibly a small coil tuned to the twenty-sixth harmonic above the fundamental.

The scientific world is keeping its eyes peeled for the next epochal movement in the problem of transmitting energy *via wireless*. And the world expects Dr. Nikola Tesla to do this.

UNCLE SAM'S NEW 40-MILE AN HOUR "ELECTRIC" BATTLE-CRUISER.

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spray burners, as compared to the bulky Scotch boilers as installed on the Cunard liner, the *Lusitania*. The *Lusitania* developed 70,000 H.P. maximum from her power plant, with a resultant speed of somewhat over 25 knots per hour. This vessel measured 790 feet in length with a 98 foot beam.

Not only have the technicians of Uncle Sam's Naval Construction Board evolved something startling in the form of a wonderfully fast battle-cruiser, but they will carry something entirely new in heavy ordnance.

The big gun armament of these battle-cruisers will comprise eight 16 inch, 45 caliber rifles of a new type but recently developed by the U.S. Navy. It is said to be the most powerful gun in the world, firing a 2,400 pound shell with an initial velocity of 2,600 feet per second, or with an initial energy of 100,000 foot-tons.

Hence, when the officer in command presses an electric button that discharges a salvo from this mighty fighter of the seas, there will be represented a force of 800,000 foot tons, from the big gun battery alone—not to mention the secondary battery of six-inch and smaller caliber rifles, which will line the gun decks of the 900-foot armored hull. Thus, the primary battery of 16-inch rifles will develop sufficient energy to lift 2,000,000 pounds, 800 feet into the air. These large caliber rifles can be made to fire once every minute and faster when necessary. They will have about 25 degrees maximum elevation and a possible fighting range of approximately 30,000 yards.

It has been declared by naval experts that so remarkable is this new 16-inch gun, that under favorable conditions it would be possible to plant successive salvos on an enemy ship with accuracy, at a range of 25,000 yards.

The most important functions cared for by electricity on the modern battle-cruiser or dreadnought of the class above described are partly shown in the accompanying illustration with each particular part numbered, so that those interested can readily locate the most important general features of this truly wonderful craft. The key numbers start with the anchor hoist on the forward deck, just in front of the forward 16-inch gun turret. We will consider here simply a few of the more interesting and vital features involved in

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