Can Radio Ignite Balloons?

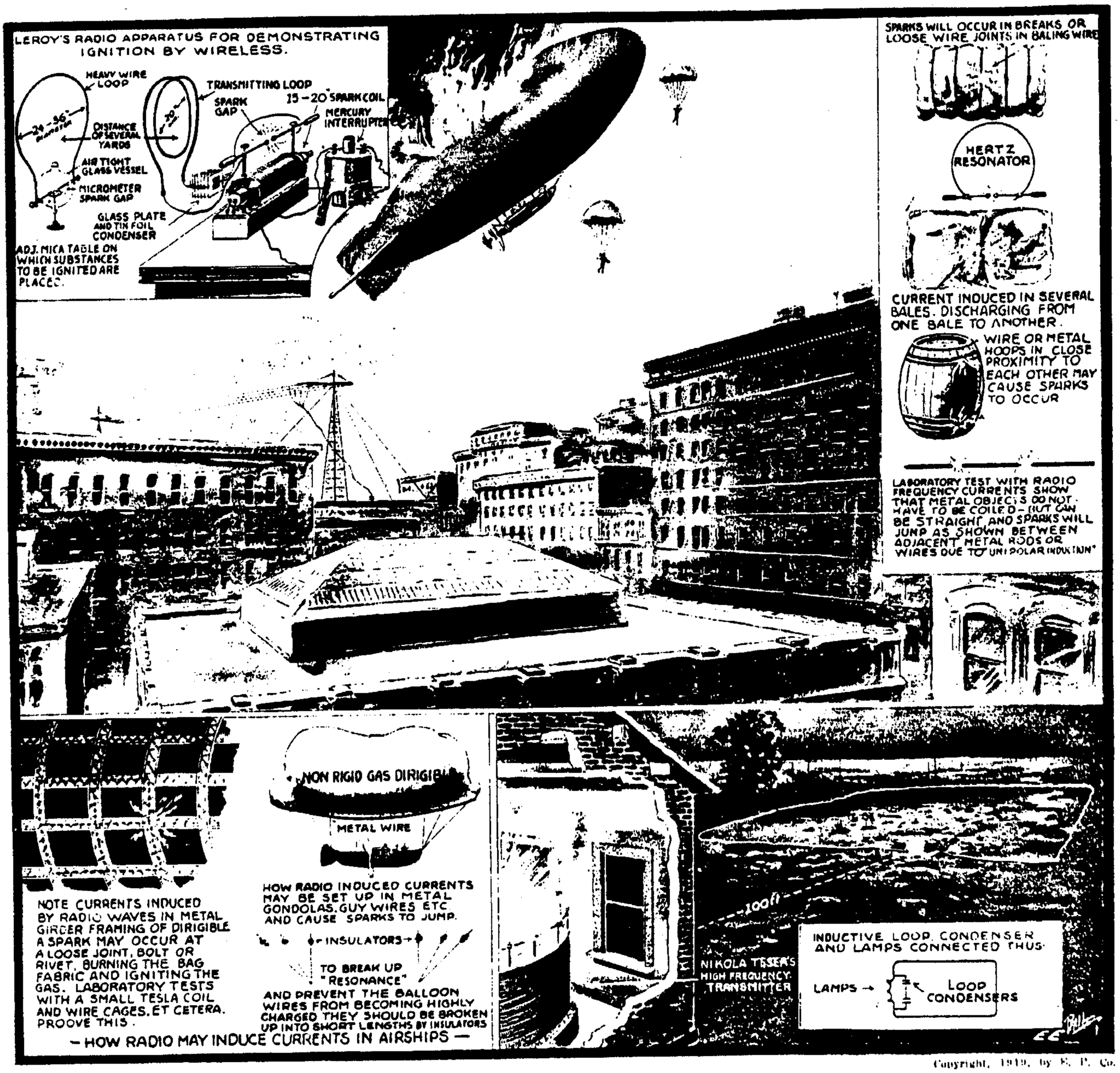
The Opinions of Nikola Tesla and Other Radio Experts

AS a result of the newest theory, that powerful induced currents emanating from the Naval Radio Station in Chicago produced the spark that ignited the Goodyear dirigible airship which plunged in flames thru the roof of a bank building in that city, resulting in death for thirteen persons and injury to twenty-seven others, naval communication officers will aid the authorities in fixing responsibility for the disaster. It was ascertained that technical experts had suggested *this* theory, because the big ship sailed over or near the Transportation building, from the roof of which are projected the antennae of the Naval Radio Station. The building thru the skylight of which the blazing dirigible fell was the Illinois Trust and Savings Bank.

Lieut. F. S. Mason, of the Great Lakes Naval Training Station, district communication service officer, while refraining from agreeing with the theory, said he would cooperate with the investigating officials. Pilot John Boettner, of the ill-fated dirigible, said he had not been aware of the location of the naval radio station. H. M. Byllesby, head of a large engineering corporation and foreman of the coroner's jury of technical men, said experts had suggested the *radio theory* to him.

Col. J. C. Morrow, chief air officer of the central department of the army, the principal witness at the inquest, was a passenger in the dirigible on a trip preceding the fatal one. At that time he said the ship was in safe condition. The pilot he considered competent. He thought the possibility of sparks from the exhaust igniting the gas bag very remote, but said he had not formed an opinion as to the cause of the accident.

(*Continued on page* 591)



Herewith Are Shown Some of the Plausible Reasons Why the Recent Chicago "Blimp" Disaster Might Have Been Caused By a Spark Induced By An Adjacent Radio Station. The Photo In the Lower Right-hand Corner Shows Three Incandescent Lamps Lighted to Full Candlepower, At a Distance of 100 Feet from Dr. Nikola Tesla's Colorado High Frequency Power Plant. The Oscillator Was Worked At Less Than Five Per Cent of Its Total Capacity.

Can Radio Ignite Balloons?

(*Continued from page* 516)

WHAT NIKOLA TESLA SAYS

Probably no other living electrician could be found today who can more authoritatively state just what effect can be produced at a distance by radio currents, than Dr. Nikola Tesla. He has produced and measured the greatest electrical discharges ever developed by man—sparks 70 to 100 feet in length, which manifested their influence 12 miles and more distant. In a special interview with the ELECTRICAL EXPERIMENTER representative, Dr. Tesla said in regard to the present blimp disaster:

"Referring to electrical or radio wave action at a distance, I know from experience that if proper precautions are not taken, fires of all kinds and explosions can be produced by wireless transmitters. In my experiments in Colorado, when the plant was powerfully excited, the lightning arresters for *twelve miles around* were bridged with continuous arcs, much stronger and more persistent than those which ordinarily took place during an electric storm. I have excited loops (coil aerials) and lighted incandescent lamps at a considerable distance from the laboratory without even using more than five or ten per cent of the capacity of the transmitter. When the oscillator was excited to about 4,000,000 volts and an incandescent lamp was held in the hand about *fifty or sixty feet from the laboratory,* the filament was often broken by the vibration set up, giving some idea of the magnitude of the electromotive forces generated in the space. The accompanying illustration shows one of my experiments in which I lighted several lamps at a distance of 100 feet from the laboratory, purely by wireless energy. Such induced currents might easily fire a gas balloon under the proper conditions. When the large transmitter coil, 51 feet in diameter, which I had in the center of the laboratory, was powerfully energized, butterflies were carried around in a circle as in a hurricane and could not get out, no matter how they tried. I was unable to satisfactorily explain the gyrations in the circle, altho I can well understand that the charged coil might, by repulsion, keep them in the center. Perhaps the most remarkable of all the observations was the production of sparks in the sand when one walked at some distance from the building. At night a continuous stream of tiny sparks could be seen between the heels and the earth and between the grains of sand. Another most curious effect was the action on horses, which shows how very sensitive they are to electric shock. When I operated with undamped waves, the oscillator being perfectly silent (no streamers whatever), a horse at a distance of perhaps *one-half a mile,* would become scared and gallop away the instant the switch was thrown on. I suppose the capacity of the body was sufficiently great to derive a rather strong current thru the legs which would frighten the animal. When using damped waves the roar was so strong that it could be plainly heard ten miles away and despite all precautions, such as using cotton in the ears, one would get a singular sensation in the head as if something was bursting, similar to that I observed with Röntgen Rays in 1896 or '97, when I was operating with a powerful apparatus designed for their production.

"In my experiments in New York in the laboratories at 35 South Fifth Avenue and at Houston Street, I have exhibited to thousands of people effects of loops or coil antennae. In one experiment, for instance, I would tune a coil about 30 inches in diameter with which I would collect at

any place in a large hall, *nearly three-quarters of a horsepower,* lighting incandescent lamps, producing long discharges, streamers, etc. One of my exhibits, which was particularly appreciated, was a coil carried on the head which, when resonantly excited, would develop streamers several feet long.

"As regards that deplorable accident to the blimp in Chicago, of course a powerful wireless plant is capable of setting up, at a few hundred feet distance, electro-motive forces of such magnitude that if there is even moderate rise thru resonance, long sparks may result. *In Colorado I drew 1-inch sparks between my body and an iron pipe buried in the ground about 100 feet from the laboratory.* I think it perfectly practicable to produce an explosion by wireless designedly at a considerable distance from a wireles transmitter, and I look upon the accident as very likely having been due to some such cause. By taking proper precautions, however, it is possible to entirely eliminate this danger and I have devoted much thought to the subject, having early recognized the peril to such bags filled with hydrogen. According to my ideas, the accident is not so much chargeable to the plant as to the neglect of proper precautions on the aërial vessel itself. Such a vessel has a considerable span and the guy wires, gondola and other metallic parts constitute a considerable capacity, so that an appreciable amount of energy can be deprived from a wireless plant at a great distance, as it is well shown in the ease with which messages are transmitted to, and received from, aërial vessels.

"Why do the naval and other authorities allow such forms of aircraft to use an explosive gas like *hydrogen?* A short time ago the press was filled with the wondrous stories of how the U. S. Government experts had perfected the manufacture of the new and non-inflammable balloon gas—*helium,* to such an extent that it was very cheap and readily obtainable in quantities. Funny, how these "new" inventions require so long a time to reach the public and those who need them. Helium, extracted from illuminating gas, is not new or wonderful at all. My friend, Sir James Dewar, showed me experiments with it over 20 years ago."

How radio waves, even at distances of several miles, can cause sparks to occur among bales of cotton, baled with wire hoops, etc., is shown in one of the accompanying illustrations. The cotton bale wires have currents induced in them every time a radio message is sent from the ship or in its vicinity. This induced current is practically never strong enough to heat up the wire, but should one of these wires break and form a spark gap, then very often the induced current will cause a spark to jump the gap. That is enough to start a fire. Where wired bales are packed close together in the hold of a steamer, in trains, or warehouses, here also radio waves are liable to cause fairly strong electrical oscillations to be set up by resonance in adjacent loops on the bales, as the diagram shows. Result, a spark occurs, and another fire of "unknown origin" has started.

M. George A. Leroy, a French chemist, in his municipal laboratory at Rouen, France, very ably demonstrated that wireless waves could without doubt cause fires at a distance. His apparatus is shown schematically herewith.

Mr. Leroy's apparatus has been christened by him the "Igniting Resonator." The apparatus he used consists of a glass bulb having four apertures: one at either side and one at the top and bottom, respectively. The substance to be tested with this igniter resonator can be placed in the airtight glass compartment and the two electrodes very accurately adjusted by micrometer screws fitted to them. The transmitter comprises a spark coil giving a 15-to-20-

inch spark, which was connected with a spark gap, glass plate and tin-foil condenser and a loop antenna or spiral comprising a few turns of heavy wire, about 2 feet in diameter. Several yards distant, Mr. Leroy placed his receiving coil or igniting resonator, which included a loop or heavy copper conductor about three feet in diameter. The action on the device was similar to that of the Hertzian resonator, i. e., whenever the spark coil or transmitting helix were excited, allowing a spark to jump the gap, electromagnetic waves were set up in the intervening ether, causing corresponding currents to be induced or set up in the receiving loop. As in the historic experiments of Hertz, this loop will gather sufficient energy from the etheric waves to cause a small spark to jump a gap connected across the terminals of the loop, as the accompanying diagram clearly shows.

Mr. Leroy carried out many different experiments with his apparatus, placing the glass spark chamber of the igniting resonator in a bath of oil or vaseline, which can be heated when desired by incandescent lamps, etc.

One of the most interesting experiments carried out by Mr. Leroy was that with miniature bales of cotton, which were enclosed in jute wrappers and provided with iron wire bands, in the way cotton is usually packed for shipment. "Spontaneous combustions in cotton warehouses and in shipholds loaded with cotton or similar material, are not always what they seem," says Mr. Leroy, in describing his experiments and results with the radio igniter. One of the hoops encircling the bale of raw cotton may break or become loose under the action of shock or from some other cause, and the gap created by the breaking of the wire, forms a miniature Hertzian resonator. When a wireless station situated in the immediate vicinity, or perhaps at some quite distant point, starts in to transmit (and the more powerful the station the more pronounced the effect and danger from fire of course), currents will be induced in the iron wire around the bales or other packages, and sparks may pass between the various metal members. Especially will they be inclined to jump small gaps in the wire which occur in the immediate loop. We may say right here, that to a layman all of this phenomena may seem somewhat far-fetched, and not within the realm of everyday possibilities, but anyone who has experimented with high frequency currents, as generated from even a small size oscillator, will at once be convinced that these effects can and do take place under most unbelievable conditions. Of course, one objection that the average electrical and radio reader will probably think of, is that if the cotton bales, et cetera, are placed in a steel vessel, that this metallic hull will act as a screen, and that the bales will not have any current induced in their wire loops, but while this may be partially so, in some cases it is not always so by any means; especially when the home transmitting station, such as on ship-board, starts in operating. In this case, the steel hull of the boat is charged whenever the transmitting key is deprest.

The secret, if so we may call it, of the production of inflammatory sparks or discharges in metallic bodies such as here described, lies in the phenomena known as "resonance." This means that the nearer the metallic members come in tune with the radio waves, the more pronounced the induction effects produced in any instance. It is of course readily conceivable that a cargo of cotton bales presents many peculiar conditions of resonance, due to the varying capacities and inductances of the various loops. In fact, so obvious and possible is this condition, that a wooden vessel carrying bales of cotton or other material having wire or metal members to hold them, and providing she is fitted with a

wireless station of even a few kilowatts, that the Editors would prefer to stay on land than go to sea on such a ship.

One of the accompanying photographs shows how a great multitude of close oscillatory circuits are provided unwittingly in all-framed or rigid gas airships, and even in the non-rigid gas airships there is usually a sufficient amount of metal present in the gondola, wires and other fittings to form one or more resonant circuits, which may cause a spark at an imperfect joint or other gap. It should be remembered, as laboratory tests have demonstrated beyond cavil, that it is not necessary to have a metal wire coil *in spiral form* in order to have powerful currents induced of sufficient strength to cause a spark to jump from it; a straight metallic wire, bar or even tools, lying within a few yards of a small high frequency coil, will pick up sufficient energy to cause sparks to jump from them, and they will sometimes glow with a vivid brush discharge when viewed in a darkened room.