Tesla's Egg of Columbus

How Tesla Performed the Feat without Cracking the Egg

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Probably one of the most far reaching and revolutionary discoveries made by Mr. Tesla is the so-called *rotating magnetic field.* This is a new and wonderful manifestation of force–a magnetic cyclone–producing striking phenomena which amazed the world when first shown by him. It results from the joint action of two or more alternating currents definitely related to one another and creating magnetic fluxes, which, by their periodic rise and fall according to a mathematical law, cause a continuous shifting of the lines of force. There is a vast difference between an ordinary electromagnet and that invented by Tesla. In the former the lines are stationary, in the latter they are made to whirl around at a furious rate. The first attracts a piece of iron and holds it fast; the second causes it to spin in any direction and with any speed desired. Long ago, when Tesla was still a student, he conceived the idea of the rotating magnetic field and this remarkable principle is embodied in his famous *induction motor* and system of transmission of power now in universal use.

In this issue of the Electrical Experimenter inventor Mr. Tesla gives a remarkable account of his early efforts and trials as an inventor and of his final success. Unlike other technical advances arrived at through the usual hit and miss methods and haphazard experimentation, the rotating field was purely the work of scientific imagination. Tesla developed and perfected, entirely in his mind, this great idea in all its details and applications *without making one single experiment.* Not even the usual first model was used. When the various forms of apparatus he had devised were tried for the first time they worked exactly as he had imagined and he took out some forty fundamental patents covering the whole vast region he had explored. He obtained the first rotations in the summer of 1883 after five years of constant and intense thought on the subject and then undertook the equally difficult task of finding believers in his discovery. The alternating current was but imperfectly understood and had no standing with engineers or electricians and for a long time Tesla talked to deaf ears. But, ultimately, his pains were rewarded and early in 1887

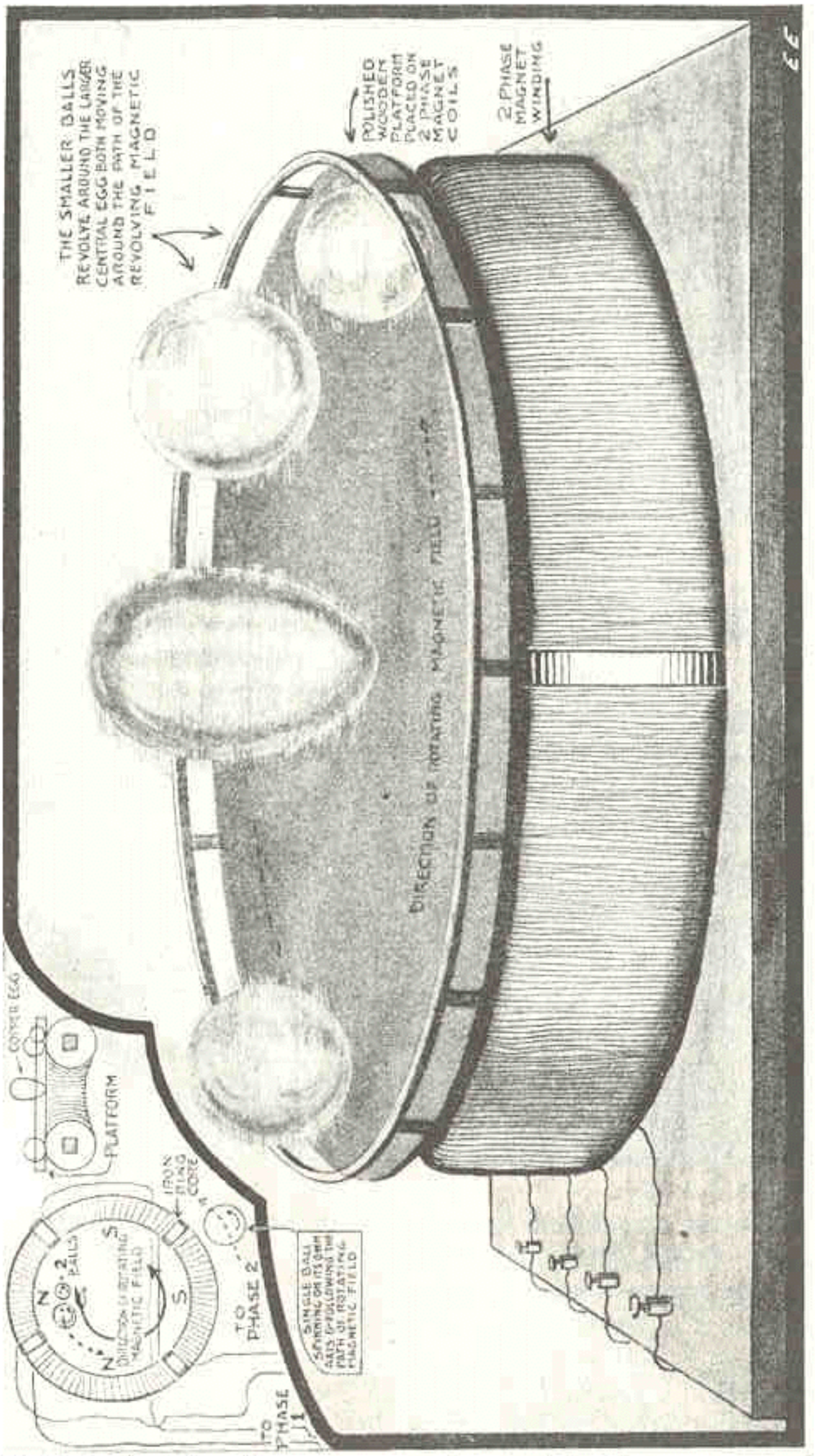

Fig. 2. Illustrating the Polyphase Coil and Rotating Magnetic Field Which Caused Copper Eggs to Spin.
Fig. 3. Insert: Detail of Coil Apparatus Showing Coil Connections to Different Phases.

a company bearing his name was formed for the commercial introduction of the invention.

Dr. Tesla recently told the editors an amusing incident in this connection. He had approached a Wall Street capitalist–a prominent lawyer–with a view of getting financial support and this gentle-

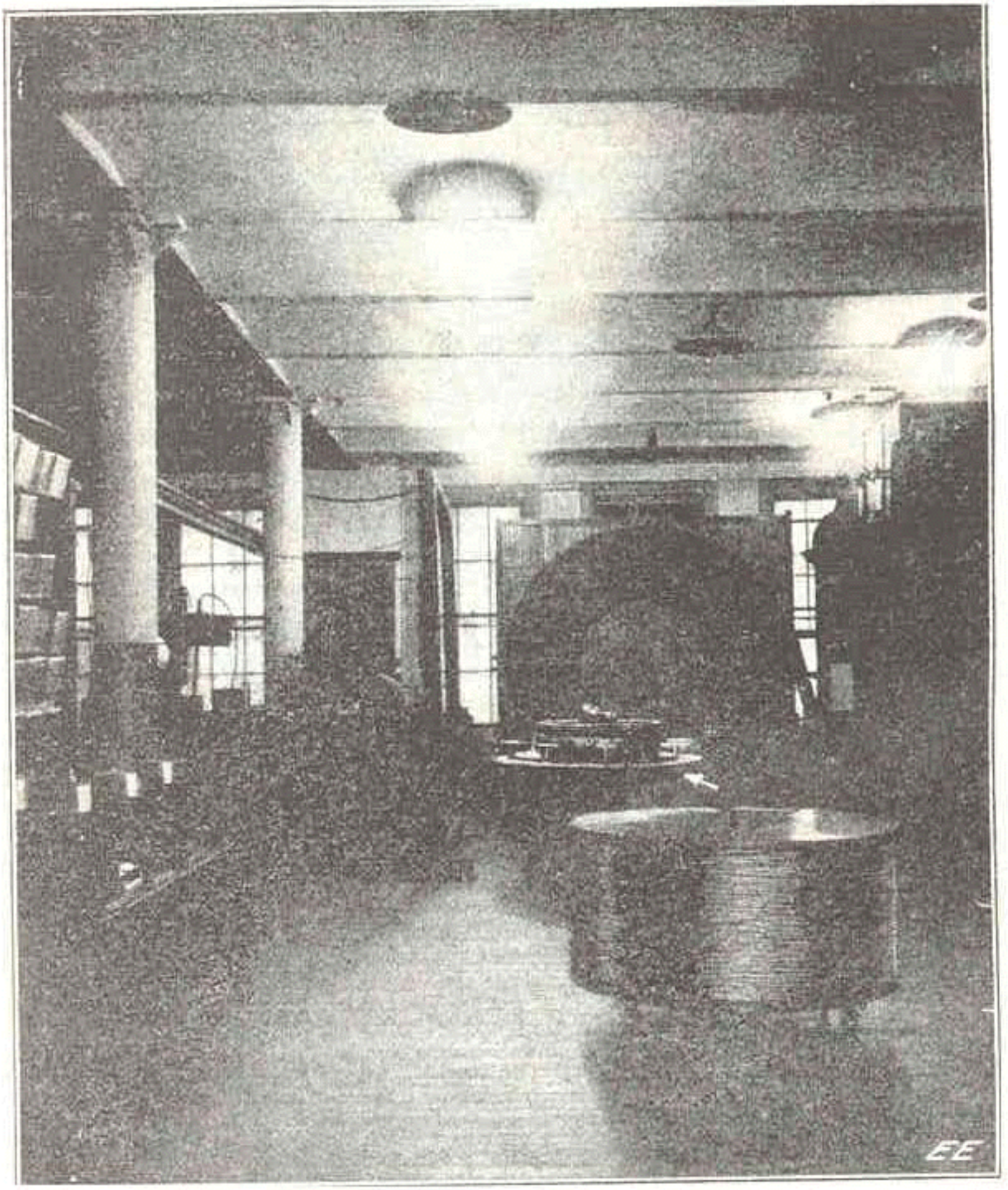

Fig. 1. This hitherto unpublished photograph is extremely interesting as it shows not only Tesla's Electric Egg apparatus in the center of the background, but also a comprehensive view of a corner of his famous Houston Street laboratory of a decade ago. At the left may be seen a number of Tesla's oscillators or high frequency generator, while in the rear may be noted a large high frequency transformer of the spiral type, the diameter of which was at little over nine feet. The electric egg apparatus comprising a two-phase A.C. circular core and winding, rests on a table, and this particular model measured about two feet across. In making the demonstrations. Tesla applied as much as 200 H.P. from a two-phase alternator to the exciting coils, and so intense was the revolving magnetic field created in the surrounding space, that small delicately pivoted iron discs would revolve in any part of the hall, and a great many other devices

could be simultaneously operated from this magnetic field when thus excited. The frequency of the two - phase A.C. energizing the coils, was varied from 25 to 300 cycles, the best results being obtained with currents of from 35 to 40 cycles; This laboratory was lighted by Tesla's vacuum tubes, several of: which may be seen on the ceiling and each of which emitted 50 C.P. The coil resting on three legs and observed in the immediate foreground is the primary of a resonant Tesla transformer which collected energy from an oscillatory circuit encircling the laboratory, no matter in what position the transformer was placed. A low tension secondary of one or two turns of heavy cable (not visible) was provided for stepping down the energy collected by "mutual induction" and supplied the current to incandescent lamps, vacuum tubes, motors and other devices. When the circuit around the hall was strongly excited, the secondary furnished energy at the rate of about three - quarters of one horse-power.

man called in a friend of his, a well-known engineer at the head of one of the big corporations in New York, to pass upon the merits of the scheme. This man was a practical expert who knew of the failures in the industrial exploitation of alternating currents and was distinctly prejudiced to a point of not caring even to witness some tests. After several discouraging conferences Mr. Tesla had an inspiration. Everybody has heard of the "Egg of Columbus." The saying goes that at a certain dinner the great explorer asked some scoffers of his project to balance an egg on its end. They tried it in vain. He then took it and cracking the shell slightly by a gentle blow, made it stand upright. This may be a myth but the fact is that he was granted an audience by Isabella, the Queen of Spain, and won her support. There is a suspicion that she was more imprest by his portly bearing than the prospect of his discovery. Whatever it might have been, the Queen pawned her jewels and three ships were equipped for him and so it happened that the Germans got all that was coming to them in this war. But to return to Tesla's reminiscence. He said to these men, "Do you know the story of the Egg of Columbus?" Of course they did. "Well," he continued, "what if I could make an egg stand on the pointed end without cracking the shell ?" "If you could do this we would admit that you had gone Columbus one better." "And would you be willing to go out of your way as much as Isabella?" "We have no crown jewels to pawn," said the lawyer, who was a wit, "but there are a few ducats in our buckskins and we might help you to an extent."

Mr. Tesla thus succeeded in capturing the attention and personal interest of these very busy men, extremely conservative and reluctant to go into any new enterprise, and the rest was easy. He arranged for a demonstration the following day. A rotating field magnet was fastened under the top board of a wooden table and Mr.