generate alternating current power at a central station, employing transmission lines and rotary converter substations along the right of way. It is claimed that the steam turbine has proved itself to be specially adapted for operation in parallel, whether as a reserve power in connection with steam engine driven machinery or for operating central stations or industrial establishments. The fact that the Hartford Electric Light Co. and a large factory in Connecticut have added to their first installations of the turbine is pointed to as a proof of the commercial success of this type of power producer.

—It will be a surprise to many to learn that horseless vehicles were known in the middle of the sixteenth century, and that steam was their motive power long before the same agency made possible the railway. As early as the thirteenth century, Roger Bacon predicted that vehicles would be propelled by machinery, thereby causing himself to be suspected of the Black Art. For three hundred years afterward no one succeeded in manufacturing such a conveyance as Bacon imagined. Then, Johann Haustach, of Nuremburg, invented a machine which would actually move along the road, driven by powerful springs. His best record was a mile and a quarter in an hour. The year 1763 saw the first steam car, invented by Cugnat, a Frenchman. It was a success, and the inventor was instructed to make a steam gun carriage for his Government. The vehicles of Cugnat and Haustuch were both tricycles. The latter applied his power by a ratchet on the front wheel. Scott Russell, who designed the Great Eastern, added to his reputation about sixty years ago by building an automobile which was so useful that it was operated as a coach in Glasgow. It was so cumbersome and so noisy that its use was prohibited. For 45 years automobiles were dead, till about ten years ago they were revived in France, M. Serpollet being the first to bring out a fast-running and handsome carriage. Appearance, safety, speed, durability, cheapness—these are the demands on the manufacturer to-day. The last has not yet been reached, but as the price for the bicycle came down, so will it with the automobile, and a first-class motor-carriage can probably be had before long for $200. One of the most novel uses to which we have heard of the automobile being put, is hunting deer and other big game in Colorado. In one case a band of deer actually followed the carriage. Some of the cowboys tried to lassoo it.

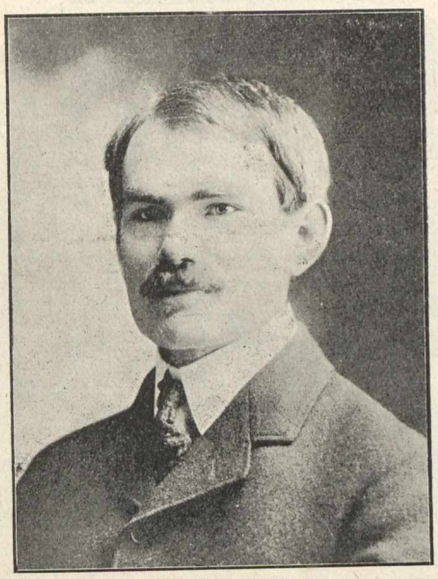
THE DE FOREST WIRELESS TELEGRAPH SYSTEM.

The de Forest wireless telegraph system is the invention of Dr. Lee de Forest, Ph. D., a graduate of Yale University, of the class of 1896. Dr. de Forest's work at Yale was supplemented at the Armour Institute of Technology, Chicago, in whose laboratories the constant and untiring efforts of the inventor were devoted to the problem, and the present invention is the product of years of patient research and experimentation along original lines.

Practically all systems, except the de Forest, use the induction coil for sending, and as receiver the old Branley coherer tube, with the tapping or decohering device introduced by Popoff, and improved by Marconi or Tissot. The disadvantageous features entailed by the use of the coherer are: the necessity of a mechanical decohering device; the complication of apparatus involved; its uncertainty of action, and, most important of all, the time lag, by reason of which the speed of word transmission is limited to the capacity of the receiving instruments, and on account of which great care must be observed by the sending operator not to exceed in speed the ability of the receiving instrument to record his messages. Fifteen words per minute is the maximum speed of the coherer systems. With the advent of the de Forest-Smythe responder, the receiving device of the de Forest system, and the most important element in space signalling, this condition assumes a different aspect, inasmuch as the responder is absolutely automatic in its action, obviating the necessity of coherers, decoherers and induction coils, affording absolute precision and accuracy in operation, simplicity of construction, and rapidity of word transmission, in this instance only limited to the skill of an operator. Under ordinary conditions a speed of forty words per minute can be easily maintained. It is extremely sensitive, even to weak currents, enabling the apparatus to work over long distances.

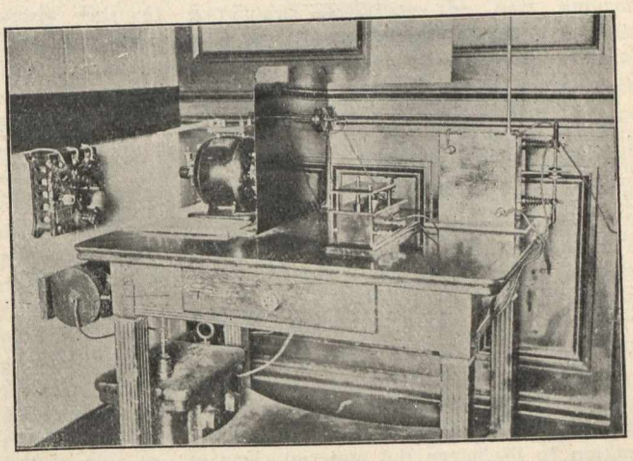
The messages, or aerograms, as they are officially known, are sent with a Morse key, exactly like that used in sending messages by wire. The dots and dashes, which are recorded at the receiving station by waves of electricity, are taken from a telephone receiver. The apparatus required is neither very extensive or complicated beyond the understanding of those who have only an elementary knowledge of electricity.

The de Forest system is based on an alternating current of electricity. Where a direct current is used, at points



Lee de Forest, Ph. D.

where the company has not erected its own power stations, a motor-generator is used to turn it into an alternating current. The current passes through a step-up transformer, which increases the voltage or pressure and reduces the amperage of volume. In one test ten amperes were taken from the lighting wires and transformed into 25,000 volts and half an ampere. The current then goes into the condenser,



De Forest Transmitter.

which is charged with the total voltage. An ordinary telegraph key is connected with the condenser. The condenser and the upright wires from which the messages are discharged are separated and at the same time connected by a