ANOTHER "HEAVIEST" LOCOMOTIVE IN THE WORLD.

The upward growth of the freight locomotive in weight and power continues without any signs of abatement; and although with the appearance of each successive monster freight engine, it would seem to the public eye as though the extreme limits of size and weight had surely been reached, this is so far from being the case that we have lately been assured by one of the most prominent locomotive designers in this country that his firm stands prepared, if there should come a call for it, to produce both express and freight locomotives that will far exceed any of the existing engines both in size, weight and power.

The massive, but very shapely, locomotive shown in our engraving was recently completed by the Baldwin Works for the Atchison, Topeka & Santa Fé Railroad. Its total weight is 267,800 pounds, and of this 237,800 pounds is carried on the five driving axles. The next heaviest locomotive is one which was built not long ago at Schenectady for the same railroad company, and that engine was about 8000 pounds lighter than the one here shown. The tractive power of this engine, that is to say the actual pull on the drawbar as she is working up to her full power, say at a speed of 10 miles an hour, is over 31 tons. It will be seen at a glance that the engine is of the tandem, compound type with piston valves, which seems to be growing increasingly popular. The high-pressure cylinder, which has a diameter of 19 inches, is placed forward of the low-pressure cylinder, which is 32 inches in diameter, the two pistons being carried upon a common piston rod. The stroke is 32 inches. The high and low-pressure valves are also carried on a common rod. The high-pressure valve is of the double, inside admission type. In operation the exhaust from the high-pressure cylinder passes into the interior of the high-pressure valve and occupies the lengthy valve-chamber which thus performs the office of a receiver; the low-pressure valve is an ordinary D-slide valve in its mode of action. In addition to the regular Westinghouse air-brake the engine carries the back-pressure brake; and both of these will be utilized in the heavy mountain service for which the engine has been built.

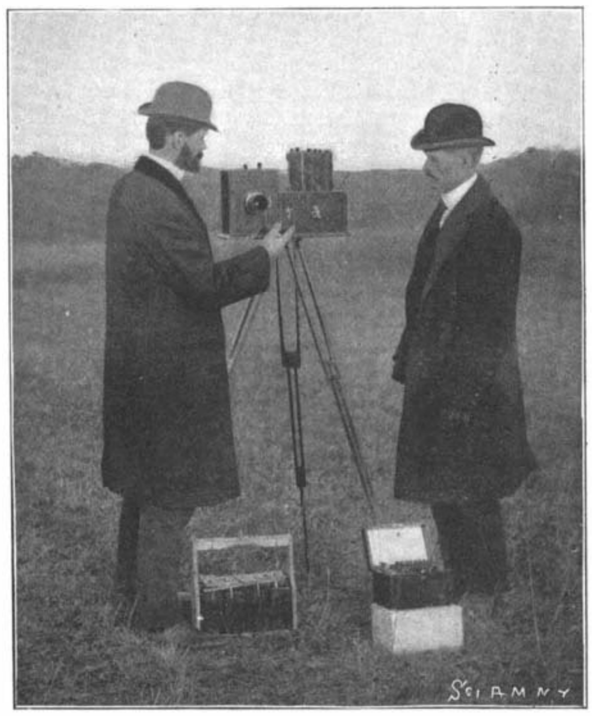
The ten driving wheels are 57 inches in diameter, and the truck wheels 29¼ inches in diameter. The driving axle journals measure 11 x 12 inches and the other axles 10 x 12 inches. The most colossal thing about this engine is certainly the boiler, which is of the wagon-top type and carries steam at a working pressure of 225 pounds. The diameter of the barrel is 6 feet 6¾ inches. The firebox is 9 feet in length by 6 feet 4 inches in width, with a depth at the front of 80 inches and at the back of 78 inches. There are 463 iron tubes of 2¼ inches outside diameter which measure 19 feet in length over sheets. The total heating surface in the tubes is 5158.8 square feet; the firebrick tubes have a heating surface of 23.9 square feet, while the heating surface in the firebox is 210.3 square feet, making a total heating surface of the whole boiler of 5390 square feet. There are 58.5 square feet of grate area.

The tender is built on similar proportions, the tank having a capacity of 7000 gallons of water, and 10 tons of coal. In closing, attention should be drawn to a pair of cranes which are permanently attached to the smokebox, one on each side. This is something novel on locomotives and they have been placed there for the purpose of facilitating the removal of the high-pressure cylinder, when it becomes necessary to inspect either the high-pressure piston or the piston rod packing between the two cylinders.

THE COLLINS WIRELESS TELEPHONE.

BY A. FREDERICK COLLINS.

There are at least five different methods by which articulate speech may be transmitted electrically without connecting wires between two given points. The first and oldest of these is by conduction through land and water. In this system four conductors are earthed, two at the transmitting and two at the receiving end. In this way a portion of the current, passing through the transmitting circuit, is shunted by means of the earth between the instruments and acts upon the receiver, since this path offers the least resistance.



THE COLLINS WIRELESS TELEPHONE.

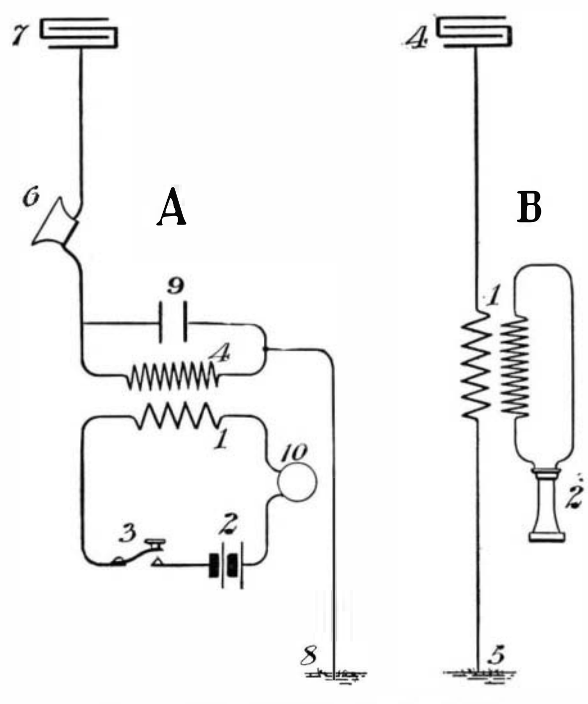


DIAGRAM OF WIRELESS TELEPHONE.

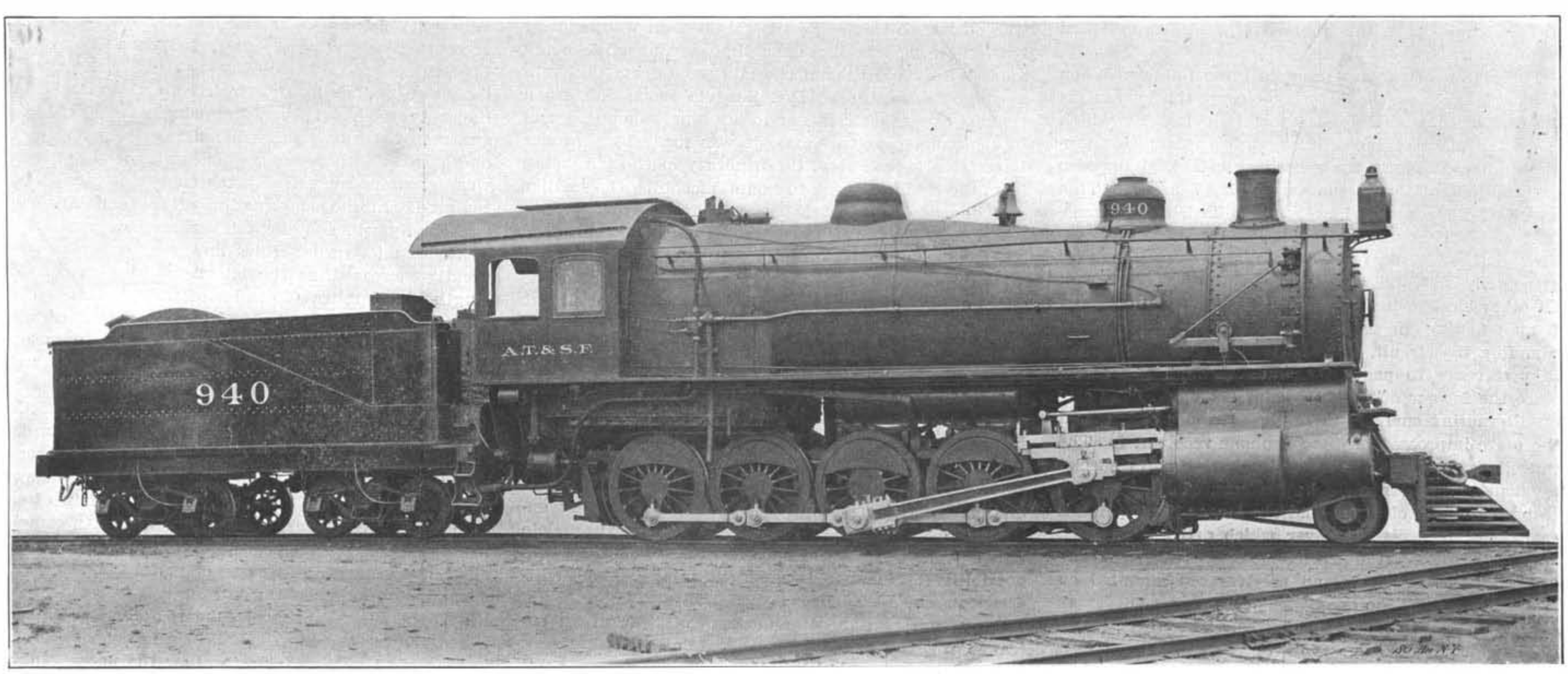
As early as 1825 James Bowen Lindsay operated a system of wireless signals by this method, but by substituting a telephone transmitter for a telegraphic key and a telephone receiver for the galvanometer speech may be as easily sent as a signal. This is usually the first method suggested to the inventor seeking to transmit articulate speech without wires, but a very few quantitative tests will show that the limitations appear almost before its commercial value begins.

The second and most beautiful form of wireless telegraphy is due to the effects of mutual induction or the magnetic lines of force exerted by one coil of wire on another placed in the same field of force by mutual induction. This is the ideal system, since no earth connection either at the receiver or transmitter is necessary to effect transmission, but the action is due entirely to the electric whirls or vortices set up in the ether. In this case the effective distance to which speech may be sent is limited by the number of turns of wire on the coil; their distance apart and the mutual induction will then depend upon the current flowing in the primary. Like the former system, the limits are soon reached.

The radiophone and speaking telephone are two forms employing a beam of light to transmit telephonic messages. A pencil of light is allowed to fall on a mirror fastened to the diaphragm of a telephone transmitter, and by means of lenses the light is focused on a selenium cell at a distance of two or three hundred feet. In series with the selenium cell is a telephone receiver and a battery. When the sound waves of the voice impinge on the diaphragm of the transmitter, its vibrations cause the light to be displaced and its intensity on the selenium cell varied. Now selenium possesses the property of transmitting an electric current with twice the conductivity value when in the light that it possesses in the dark, so that there is a wide divergence of conductivity assured when the constantly varying beam of light falls upon it, and thus articulate speech is reproduced.

The fourth system is that employing Hertzian waves, but as the enormously high-frequency oscillations produced by the disruptive discharge of a high potential current is much too rapid to make itself manifest in a telephone receiver, the oscillation circuit which emits the waves must be damped down by the addition of capacity in the form of Leyden jars or condensers and its relation to inductance sustained by supplementing the capacity with coils of wire until the telephone receiver will respond to a vibration of electric oscillations. This system of wireless telephony offers the most interesting experimental field of investigation, but its functions are so complicated that a very limited distance has yet been obtained with it.

In making some tests in 1899 I found a method by which the disadvantages of the very rapid oscillations set up by a disruptive discharge in free air, as the spark of a Ruhmkorff coil produces, and without resorting to the loading of the oscillating circuit with artificial capacities and inductances. This was accomplished by permitting the discharge to take place in the earth instead of the air. To render this process



THE LATEST "MOST POWERFUL LOCOMOTIVE IN THE WORLD."

Cylinders: High-pressure 19 inches diameter, low-pressure 32 inches diameter, common stroke 32 inches. **Boiler:** Diameter 6 feet 6¾ inches, length of barrel 19 feet, firebox 108 inches long, 78 inches wide by 80 inches deep, total heating surface, 5,390 square feet. **Weight of Engine,** 267,800 pounds. **Drawbar Pull,** 31 tons.