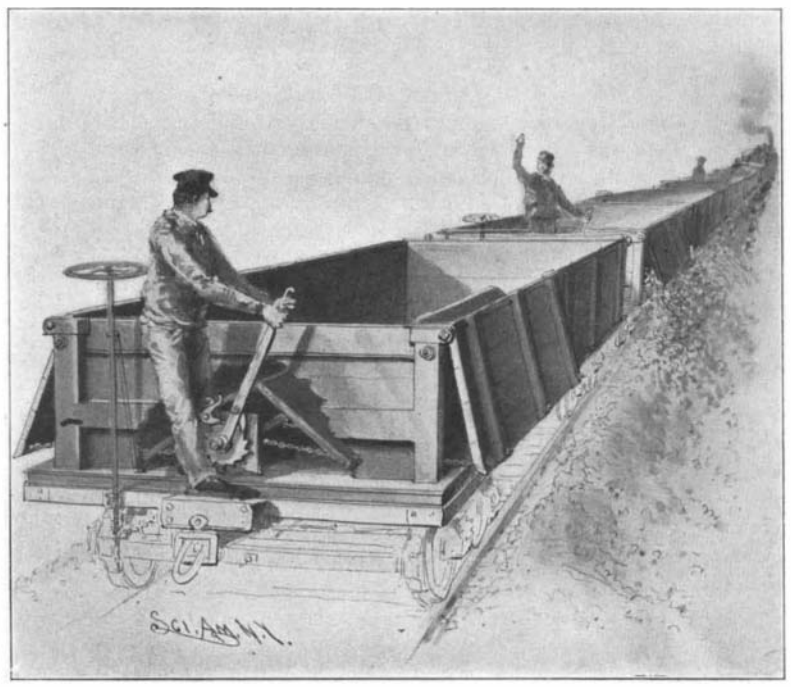
DUMPING-CAR WITH CONVENIENT LOCK AND RELEASE.

An improved device for railroad dumping cars is covered by a patent recently granted to Mr. A. J. Twiggs, of Augusta, Ga. The invention relates particularly to cars having peak-shaped bottoms and side doors which open outwardly to allow the contents of the cars to slide out to the sides of the track. The improvement may be placed on any flat car at moderate cost, and consists in a new locking means which may be readily operated to lock or open these side doors. A winding shaft passes longitudinally through the car below the peak bottom and to this shaft the side doors are connected by chains. The shaft is provided at each end with a ratchet wheel adapted to be engaged by a pawl fulcrumed upon an operating lever which is hung loosely on the winding shaft. The ratchet is locked against return movement by a dog pivoted on the car body. The dog is provided with an upwardly extending tripping arm which is adapted to be engaged by a latch. When operating the ratchet this latch is thrown out of engagement with the tripping arm. The tripping arm is so disposed relative to the ratchet pawl that, with the latch thrown up, when the lever is moved to the left this arm will be engaged by the fulcrum end of a pawl and the dog will be thus swung out of engagement with the ratchet wheel. Further movement of the lever causes the dog to lift the pawl also out of engagement with the ratchet teeth, thus unlocking the shaft. The chains are then free to unwind from the unlocked shaft and the pressure of the load against the side doors of the car causes the doors to swing open. When it is desired to close the doors the lever is swung forward, throwing the pawl into engagement with the ratchet wheel and permitting the dog to fall to its normal position. A short up-and-down motion is now given to the lever which intermittently turns the ratchet wheel, winding up the chains on the shaft and drawing the doors to their closed position. The latch is now thrown into engagement with the tripping arm and the doors are thus securely locked.



IMPROVED LOCKING DEVICE FOR DUMPING-CARS.

GERMAN TESTS OF THE PUPIN SYSTEM OF LONG-DISTANCE TELEPHONY.

In Supplement No. 1308 we gave a thorough explanation of the earlier experiments of Dr. M. I. Pupin, of Columbia University, in long-distance telephony.

A practical demonstration of his theory concerning the action of uniform and non-uniform conductors, together with the effects produced by the non-uniform conductors upon the amplitude of the waves, showing at the same time the limit to which such non-uniform conductors may be used, is also given. Dr. Pupin's investigations were directed mainly toward lessening the electrostatic capacity of cables, aerial, subterranean, or submarine. To do this within the circumscribed limits of a laboratory, it was necessary to construct a line with an ohmic resistance equal to that of a cable of a given length, and this he accomplished by the use of a line of tin foil carefully insulated and folded many times upon itself. When finished, the line possessed a resistance equal to that of 250 miles of cable. This cable, with the means employed to make of it a non-uniform conductor, we also illustrated in the same issue. The theory then, and so much of its application as was possible within the walls of the laboratory, we owe to Dr. Pupin; for a more extended application of the theory we must look to others. We all know that telephone lines over long distances, such as from New York to Philadelphia, Albany, Boston, or Buffalo, are simple, open, free copper wires suspended from ordinary telegraph poles. This method of construction is not followed from purely economical reasons. A line of this length, if formed into a cable of ordinary construction, would not deliver an audible word at the receiver.

Peculiar effects are apparent the moment these wires are insulated and formed into a cable. The so-called electrostatic capacity of the cable operates to damp the telephone currents, and by attenuating the waves prevents them from reaching the terminus.

The greatest difficulty is experienced in sending a message through an ordinary cable 30 miles long. A cable 50 miles long presents insuperable difficulties. Many attempts have been made to reduce the capacity of the cables, such as placing layers of paper between the insulating materials of correlative wires, thereby to hold a film of air about them and thus lessen the effect of the various electric currents passing in such close proximity.

Such experiments have proven in a measure successful, but only for moderate distances; a few miles added to the length renders them ineffective.

By a practical application, however, of Dr. Pupin's discovery, cables five and six times as long as those now in use may be successfully operated.

The damping of the telephone currents depends upon three factors; the resistance of the conductor, the capacity of the cable, and its self-induction. An increase in the first two produces a like increase in the attenuation or damping, while any augmentation of the self-induction diminishes the damping.

Accordingly, we may reduce the attenuating effect of the cable, regardless of its capacity, to any desired point, provided we are able correspondingly to increase the self-induction. The phenomenon of self-induction was known to both Heaviside and Thompson, who even knew that the induction coils should be distributed along the cable; but it remained for Pupin to work out the law according to which the coils were to be placed, and fix their exact position upon the cables, thus furnishing the first practicable and trustworthy application of the system. Pupin discovered that, in order to accomplish the desired result, the coils must be inserted at distances corresponding to a fractional part of the wave length of the alternating current passing along the cable (conductor).

With these data before them, Siemens & Halske, of Berlin, made many experiments in their laboratory which gave most astonishing results. By the permission of the German Imperial Postal Department, this firm proceeded to equip the subterranean telephone cable with Pupin coils, the cables consisting of 28 double copper wires 1 mm. thick each, which connect Berlin with Potsdam over a distance of twenty miles. The insertions of the induction coils took place at the coupling boxes, one case of coils such as we show in Fig. 1, being laid at every other coupling box. In this manner, just half of the 28 double lines were provided with spools. Each case, or metallic box, contained 14 coils, the detailed construction of which is shown in Fig. 1, duly sealed and filled with insulating material such as paraffin. The ends emerging were then joined to the corresponding ends of the main wires inclosed in the sleeve joint, which was likewise poured full of insulating material. The distance between each successive case of coils was 4,265 feet. Measurements showed that, after the connecting in of the spools, the self-induction had increased two hundred fold, while the damping constant had been reduced to one-sixth. A great improvement in the talking efficiency of the line was to be expected, and the results confirmed the expectation.

When one of the loops provided with the Pupin coils was compared with one left without such assistance, the difference in the intensity of sound was astonishing. Standing at a distance of 15 inches from the receiver of an ordinary line, the words could scarcely be distinguished, while the receiver of the Pupin line projected the sound waves with such energy that the words were distinctly audible across the room, 33 feet distant. More startling was the effect of the Pupin system when several of the loops were connected. Three loops formed a continuous line of 60 miles in length. Over this length of unassisted wire the voice of the speaker could hardly be heard, and when five loops were connected, making a line 100 miles long, it gave out altogether, failing to deliver a word at the receiver; whereas the Pupin line delivered the voice with about the same intensity of tone as that received over the single 20-mile wire, thus showing a five-fold increase in the speaking property of the line due to the Pupin coils. Thirteen Pupin loops were now connected,

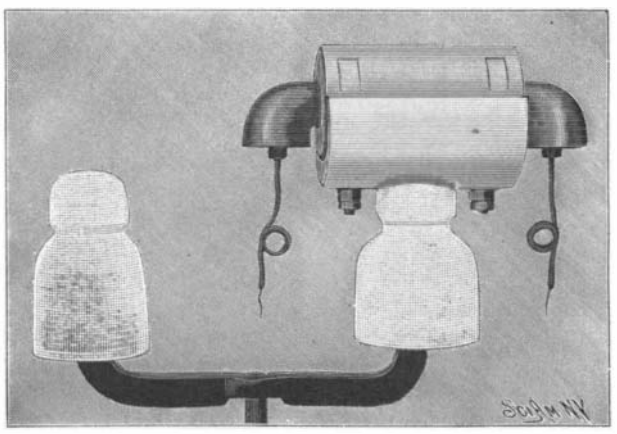


Fig. 2.—INDUCTION COIL FOR AERIAL CONDUCTORS.

making a line 262 miles long, and the speaker could still be heard, though his voice sounded very low. Compared with open wires, it was found that an assisted wire of 1 mm. (0.39 inch) diameter in a cable was equal to an open unassisted wire of the same length but of twice the diameter. Having obtained such favorable results with the cable, the most obstinate

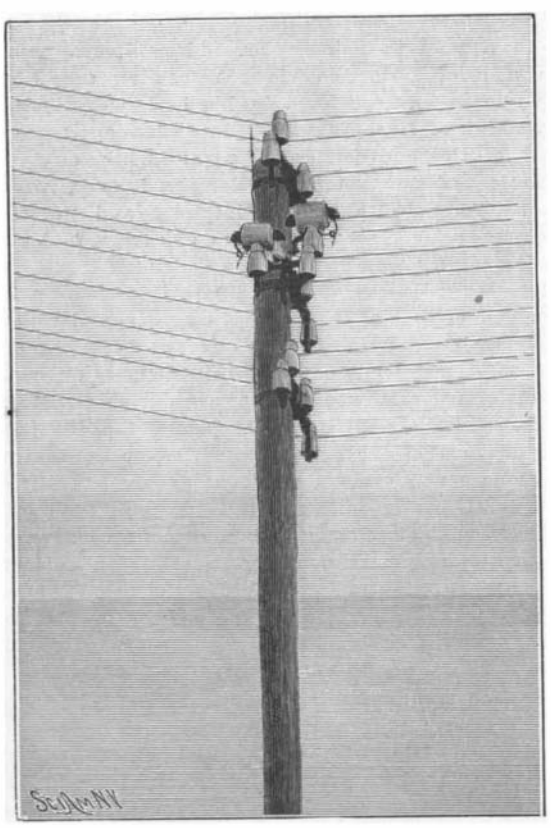


Fig. 3.—AN AERIAL LINE EQUIPPED WITH PUPIN COILS.

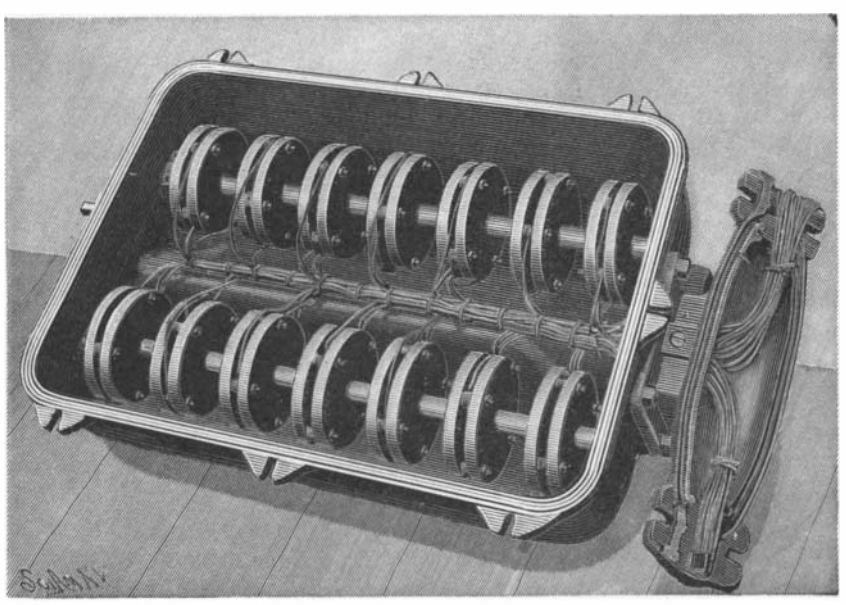


Fig. 1.—THE INDUCTION COIL BOX.