

THE OMNIGRAPH—AN INSTRUMENT FOR TEACHING TELEGRAPHY.

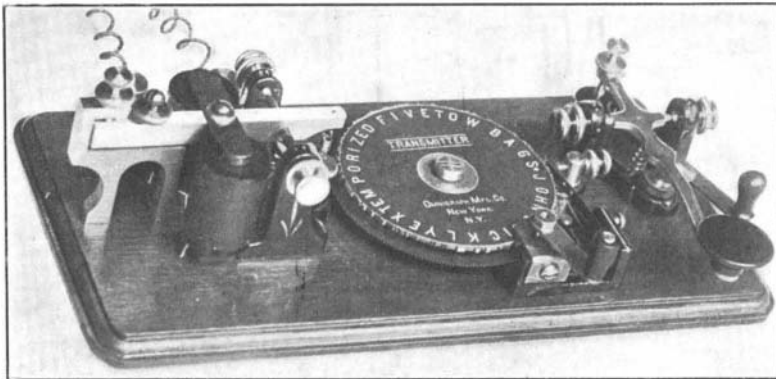
Old telegraph operators will still remember how messages were once received on a tape driven by a clock train. The skill acquired soon rendered it possible to dispense with the tape and to translate the message directly from the sounder. But the acquisition of that skill came only with long practice; for which reason the modern novice must spend hours and hours before the ticking of a sounder becomes instantly intelligible to him. An instrument which is designed to simplify instruction in telegraphy, and to impart in a comparatively short time a complete knowledge of the Morse alphabet, has recently been introduced by the Omnigraph Manufacturing Company, of 39 Cortlandt Street, New York city. Patents have been applied for.

The Omnigraph, as the instrument is called, consists of a baseboard on which are secured an ordinary key and sounder, between which a disk is mounted, formed on its periphery with teeth. A spring contact adjacent to the wheel engages the peripheral teeth of the disk. Although irregular, the arrangement of the teeth is arbitrary. For if the disk be rotated by means of a small crank-shaft geared with the disk-shaft, the spring contact is forced outwardly by the teeth, but drops back by its own elasticity, and thus makes and breaks the circuit. The experienced telegraph operator detecting these makes and breaks at the sounder, recognizes them as the dots and dashes of the Morse alphabet. A close inspection of the disk would reveal to him that the teeth are so arranged as to spell the sentence, "John quickly extemporized five tow bags." If the disk be rotated forwardly, this sentence, thus oddly worded to include every letter in the alphabet, is ticked off at the sounder; if rotated in the opposite direction, the sentence will be telegraphed backward.

The disk is completely under the control of the student. It can be rotated as slowly as desired; or it can be so rapidly turned that its curious sentence will be received at the sounder with a speed that would open the eyes of a good operator. Moreover, the message on the disk is transmitted with a distinctness and faultlessness which

the letter to be transmitted cannot possibly be anticipated. Thus the student learns how to receive a cipher message, the meaning of which he cannot know.

When sufficient proficiency has been obtained in receiving messages from the sounder, the student can learn to transmit messages in the regular method by



THE OMNIGRAPH.

means of the key which forms part of the apparatus.

HYDRAULIC ELECTRIC-CAR BRAKE.

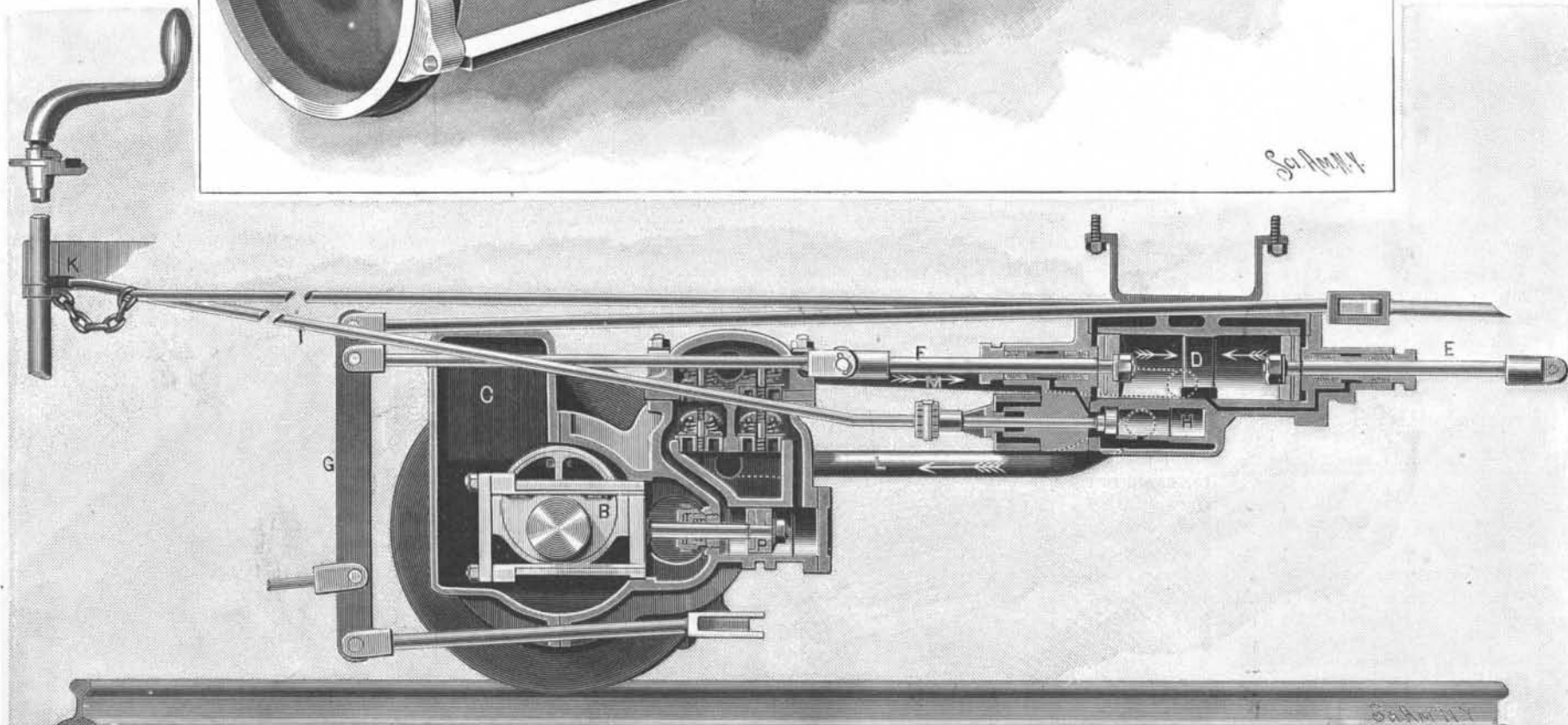
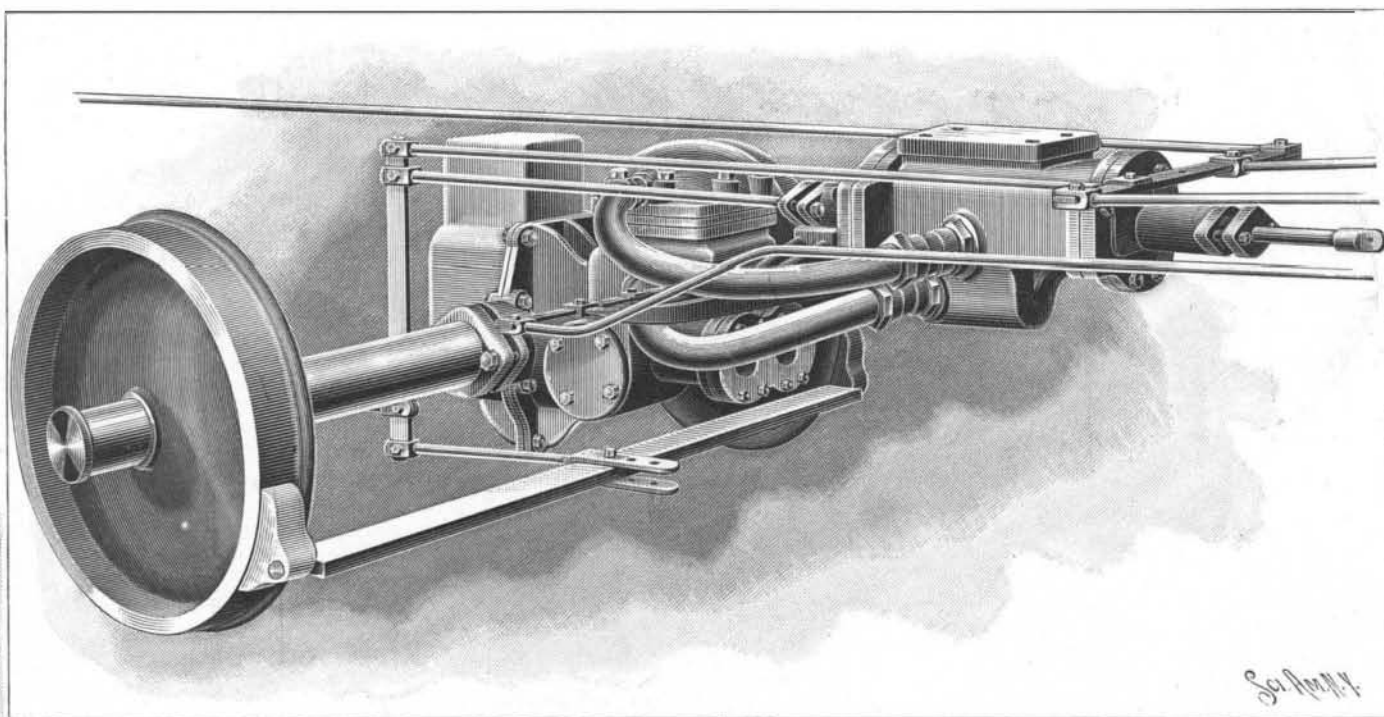
The extraordinary development of city and suburban electric car service is making the question of a proper control of the cars of increasing importance. Not only is the average running speed increasing, but the headway between cars is growing less. Coupled with the growing number of cars and the higher speed, there is the fact that traffic is becoming denser, all of which conditions render it imperative that the cars should be provided with a brake system which will be powerful, and instantaneous in its application, and safe-guarded against any possibility of failure at the critical moment. Although many forms of mechanically-operated brakes, showing more or less ingenuity, have been devised, it is a fact that a great majority of the cars are still

the other a sectional view, showing what is known as the Neal-Duplex brake, which is operated on the hydraulic principle, and has the advantage of being applicable to any standard car, and of being operated by the same brake handle to which the ordinary chain-brake is attached, and available for use at any time. The device consists essentially of a pump carried upon and operated from the axle, and a hydraulic-brake cylinder, which is fastened to the bottom of the car and supplied directly from the pump with a non-freezable oil under hydraulic pressure.

The oil reservoir, with the pump and its valves, is contained in a casting which is made, for convenience, in three separate sections, which are bolted together, and completely shut in the working parts to the exclusion of all dust and dirt. It incloses and is carried directly upon the axle, the escape of oil being prevented by means of stuffing boxes, one of which is clearly seen in the perspective view.

The pump piston, *P*, is driven by means of an eccentric, *B*, which is mounted on the axle, and, of course, is in constant operation when the car is running. The brake cylinder, *D*, contains two pistons, whose piston rods, *E* and *F*, projecting through opposite ends of the cylinder, are connected directly with the ordinary brake levers, *G*. This cylinder is provided with a piston valve, *H*, which is connected directly through the rod, *I*, with an eccentric, *K*, carried on the lower end of the brake-staff, the turning of the brake-handle from a quarter to a third of a revolution by the motorman serving to open or close this valve. The brake cylinder is connected with the pump by means of two pieces of steel hose, *M* and *L*. Normally, when the brake is not in operation, the piston valve in the brake cylinder remains open, and the oil is driven through the hose, *M*, to the brake cylinder and thence back to the suction pump valves, the flow of oil being continuous and perfectly free. By a quarter turn of the brake-

handle, however, the piston valve is closed and the full hydraulic pressure of oil is exerted upon the pistons of the brake cylinder, driving them to the center of the cylinder, as indicated by the arrows, and thereby setting the brake shoes. When the piston is opened by the motorman the free circula-



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the most perfect operator can never hope to attain. At first blush it might seem that the student simply learns one sentence forward and backward, and that the instrument is a good teacher only within very narrow limits. But this disk can be partially rotated forward and backward any number of times, in any place, so that

controlled by the old hand-brake; and while this is fairly efficient, it has the drawback of being slow in its application, whereas in cases of emergency, the gain of a fraction of a second in the action of the brake may be of the most vital importance.

We present two engravings, one a perspective and

tion of oil takes place as before. This brake, which was invented by J. H. Neal, and is manufactured by the United States Steel Company, 145 Oliver Street, Boston, Mass., is the outcome of considerable experience in the operation of the Boston Elevated Railway Company's system, and it has many advantages