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“Electric-Lighting for Railway-Trains.”

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A PULLMAN train has been running for some years between the Victoria and Brighton stations of the London, Brighton, and South Coast Railway, lighted by glow-lamps supplied by accumulators, the accumulators being charged, whilst the train is at rest, from a dynamo-machine driven by a gas-engine. Although this system answers very well by a particular train, it is not one that could be generally adopted, as the difficulty of arranging the trains in certain positions and for a given length of time, to re-charge the accumulators, would be too great. The Author, therefore, in conjunction with Mr. Houghton, the Electrical Engineer to the Brighton Railway Company, devised a system by which the light is generated by the motion of the train; the dynamo being placed in the brake-van with a number of accumulators to store the necessary amount of electricity, so that the lamps shall continue to give light when the train is at rest. The dynamo-machine is driven from a counter-shaft under the van, and connected by two leathern chain-belts with one of the axles of the van. Two belts have been adopted to reduce the risk of failure; and a dynamo-machine is also being made to be driven by two separate belts, one at each end of the spindle. This diminishes the risk of failure of the belts to a minimum.

A simple apparatus, similar to that provided for moving the cross-slide of a planing-machine, is also provided for tightening the driving-straps, by moving the counter-shaft in a diagonal direction so as to brace up all the straps at one time. Two feeding-screws, geared together by worm-wheels, preserve the parallelism of the counter-shaft.

The cables are passed by preference along the top of the carriages, in a piece of timber having two grooves, one groove for each cable. All the compartments of a carriage are provided with two lamps, each lamp having separate connections, so that the breakage of one lamp does not interfere with the work of the other.

To enable the carriages to be readily separated and attached, the wires are brought down to a suitable height, about 1 foot on either side of the centre of the ends of the carriage; and by a simple coupling, one part consisting of a conical barrel, and the other of a plug similar to an ordinary stop-cock, the barrel being attached to one wire, and the plug to the other, the carriages can be coupled no matter which ends come together. These couplings are held together by four clips or springs which, after the plug is pushed into position, retain it there; but they will yield and allow it to escape should the porters forget to uncouple them when shunting or moving the carriages. Thus the arrangement does not introduce any difficulty or parts that the ordinary porters cannot understand. As the brake-vans are uniform, any one part will fit the other, and any van or coach can be joined to another in the same way as with the ordinary screw-couplings and buffers. This system offers many advantages as compared with the stationary arrangement. The light is turned on and off by the guard.

The dynamos at present in use are of the old Brush type, having an electromotive force of 45 volts, and furnishing a maximum current of 56 amperes.

The two pairs of collecting-brushes are mounted on a rocking-frame, and in their normal position stand free from the commutator. They are so arranged that one pair shall collect the electricity when the train is travelling in one direction, and the other pair when it is going the opposite way. Parallel with, and beneath the axle of, the dynamo is a lever, having at one end a soft-iron armature immediately under the pole-pieces of the field-magnets of the dynamo, and connected at the other end to the brush-frame. This lever carries a small spindle parallel with it, one end having a cross-bar round which passes a strap that in turn passes round the dynamo-axle. The other end of this small spindle is joined to an upright rod, having at its upper end a loop which embraces a curved bar on the brush-frame. Thus when the dynamo-axle begins to rotate it moves the strap and cants the cross-bar, partially rotating the small spindle, and bringing the loop of the upright rod to the one or the other extreme position on the curved bar of the brush-frame. Consequently, when the lever moves on its fulcrum, it causes either one or the other pair of brushes to come into operation, according to the position of the upright rod.

The automatic contact-maker consists of a vessel containing mercury, with a vertical tube of vegetable fibre at each end,

having a coarse-threaded screw, the axis of which is driven by a belt from the revolving dynamo-axle. According as the screw-blade is driven in one direction or the other, the mercury is caused to rise in the one or the other tube; and when the dynamo-axle attains sufficient speed to put the mercury in electrical contact with an adjustable screw at the upper end of the tube, the shunt-circuit of the dynamo is joined up, the field-magnets are charged, and they attract the armature on one end of the before-mentioned lever, depressing the other end, and thereby putting one pair of brushes on to the commutator. The putting on of the brushes joins up the main-circuit in the ordinary manner, and causes the accumulators to be charged. As the speed of the train slackens, and the dynamo-axle does not revolve so fast, the mercury in the tube gradually descends, and when it falls sufficiently to break contact with the adjustable-screw, the shunt-circuit is broken, and the armature on the lever falls from the poles of the field-magnets, thus removing the brushes from the commutator and breaking the charging-circuit.

The lamp-circuit and the accumulator-circuit are joined to the dynamo in such a manner that when the lamps are alight and the train is in motion, the current from the dynamo feeds them, the accumulators regulating the light. When the dynamo is out of circuit, the lamps are supplied direct from the accumulators. If the dynamo does not supply sufficient current for the lamps, the balance is given out by the accumulators. If, however, the dynamo furnishes an excess of current, the surplus is stored in the accumulators.

In a suburban train of eleven vehicles on the London, Brighton and South Coast Railway, there are thirty-two incandescent-lamps of 16-candle power each. These absorb 40 amperes of current.

The accumulators are stated by the manufacturers (the Electrical Power Storage Company), to hold 500 amperes, and when fully charged there is a reserve of electricity sufficient for eight hours. This particular train has been running since the 19th of December, 1883. It was computed that during the first eleven months of the time, the train made 2,352 trips, and ran 27,322 miles. A train fitted up according to this system, on the South-Eastern Railway, has travelled a longer distance.

The various installations of this system have, up to the present time, given every satisfaction. The apparatus can be used for several weeks with no attention beyond lubrication. At the end of that period, the commutator-brushes require adjusting, which

can be done in five minutes, and then the apparatus will be ready for use again for a similar period without needing attention beyond that already mentioned. The weight of the apparatus is about 2 tons.

Three trains have been fitted with this system on the Brighton Railway, and one train upon the South-Eastern Railway.

The Paper is accompanied by a tracing from which Plate 4 has been engraved.