ELECTRIC LIGHT ENGINES AT THE MANCHESTER EXHIBITION.

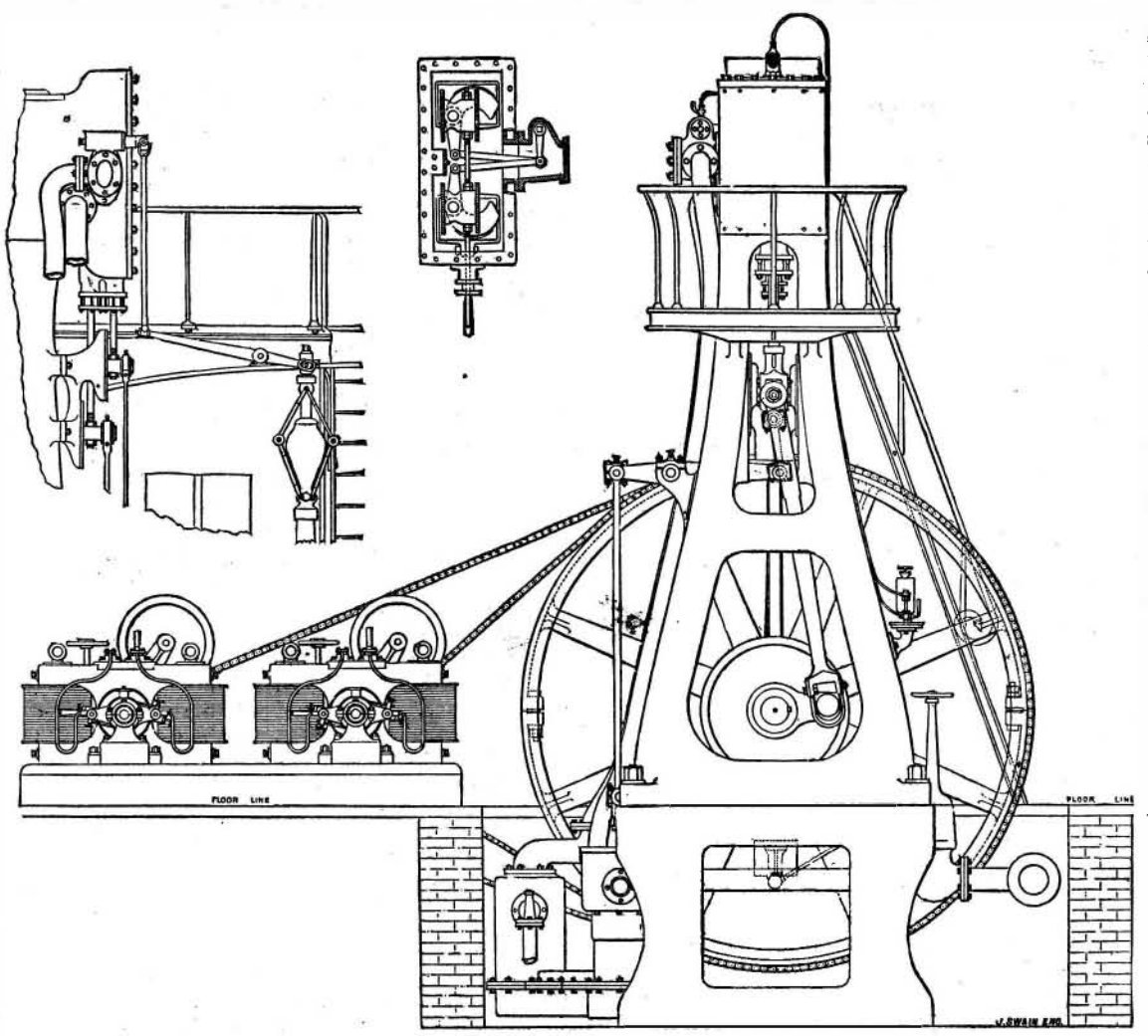
The portion of the electric lighting department adjoining the machinery in motion section has been reserved for the electrical plant for lighting the Fine Art galleries, fourteen in number, which are situated on the north side of the eastern nave. Both engines and dynamos have been constructed by Messrs. Mather & Platt, of the Salford Iron Works, Manchester. The engines have been specially designed for electric lighting work, and embody several interesting and novel features. In their general arrangement, and in the method of driving, Messrs. Mather & Platt have specially held in view the requirements of a central station installation or a large mill installation, where economy of floor space is usually of primary importance. When the engines are worked to their full power, and the dynamos replaced by the next standard larger size, the whole plant would be capable of supplying current for 4,000 lamps of 16 candle power, while the total floor space occupied does not exceed 30 feet by 20 feet. Another essential condition of electric lighting engines is a sensitive, quick-acting, automatic cut-off. This is accomplished by an entirely new form of cut-off valve, recently patented by Messrs. Mather & Holgate, and described below.

The engines are of the vertical high pressure condensing type, with a single inverted cylinder, 20 in. diameter and 30 in. stroke, intended to run at 120 revolutions per minute, and to work with a boiler pressure of 100 lb., and under these conditions will each indicate about 200 horse power. The two engines are entirely independent, each having a separate fly wheel and independent outer bearings, but they are connected together by a bridge to give access to the cylinders and valves. The cylinders, cylinder slides, and crank bearing pedestal are cast in one piece with the trunk or frame, which is of a box section, closed entirely back and front, but open at the sides. The form is very rigid, and looks massive and substantial in design; at the same time, as the frame casting is only seven-eighths inch thick, it is actually not so heavy as it appears. The cylinder is fitted with a liner, which forms the steam jacket. The valve box is bolted on separately, and has double slide valves, so as to get straight ports from the valve box to the cylinder. In the main slide valves the ports are straight on the cylinder side, but the passages are obliquely directed within the block of the valve, so that the ports on the off side are curved, the edges being circular. The main valves are worked in the usual way with an eccentric on the crank shaft. The cut-off valves work on the back of the main valves, with a reciprocating motion, also derived from an eccentric on the crank shaft.

These valves have curved edges corresponding to the curvature of the ports of the main valves, and are carried on pivots fixed in the slide block. The cut-off valves can thus turn about an axis at right angles to the axis of the cylinder, in addition to their rectilinear reciprocating motion. The point of the stroke at which the steam is cut off depends upon the angular position of the cut-off valve, which is regulated directly by the governor through a suitable series of levers. This form of cut-off has given exceedingly good results on smaller engines. Applied to an ordinary horizontal engine indicating 20 horse power, it was found that when 50 per cent of the whole load was suddenly thrown off, the momentary variation in speed did not exceed 4 per cent, which was immediately reduced to 1¼ per cent, and that with the whole load suddenly thrown off the rise in speed was 2½ per cent only.

The piston rod and crank pin are steel, and the connecting rod beat hammered scrap. At the crosshead end the connecting rod is forked, and the wear taken up by a wedge and screw. Its length is three times the stroke. The crank is of steel, and balanced and covered with a cast iron shield. It is shrunk and keyed on to the shaft. The crank pin is also shrunk in. The shaft is 8 in. diameter, bossed up to 8½ in. for the fly wheel, and at the crank end is carried in a bearing 15 in. long, and at the off end in an angle pedestal 12 in. long and 6½ in. diameter. The main bearing is adjustable both top and bottom, and at the sides by wedges and screws, so that the brasses can be fixed in any way while the engine is at work. The fly wheel is 12 ft. diameter and 30 in. wide, and is prepared for two 13 in. belts. It was cast whole, split, and bolted together at the rim, and held with bolts and shrunk hoops at the boss. Its finished weight is 5¾ tons.

All the bearings, the eccentrics, crank pins, etc., are lubricated from one oil tank, to which the oil is pumped from a tank at a lower level, into which it collects from the drippers. The cylinder is lubricated by Mather & Platt's improved sight feed lubricator, requiring one plug valve only. The air pump and condenser are of the ordinary vertical type, fixed below the floor. The pump is single-acting, 12 in. diameter and 15 in. stroke, and is worked by a beam from the engine crosshead. Throughout all, the threads on the bolts are of fine pitch, or gas threads, and in working parts have a nut of ordinary depth, locked with a thin one, and in addition have a split cotter through the end of the bolt.



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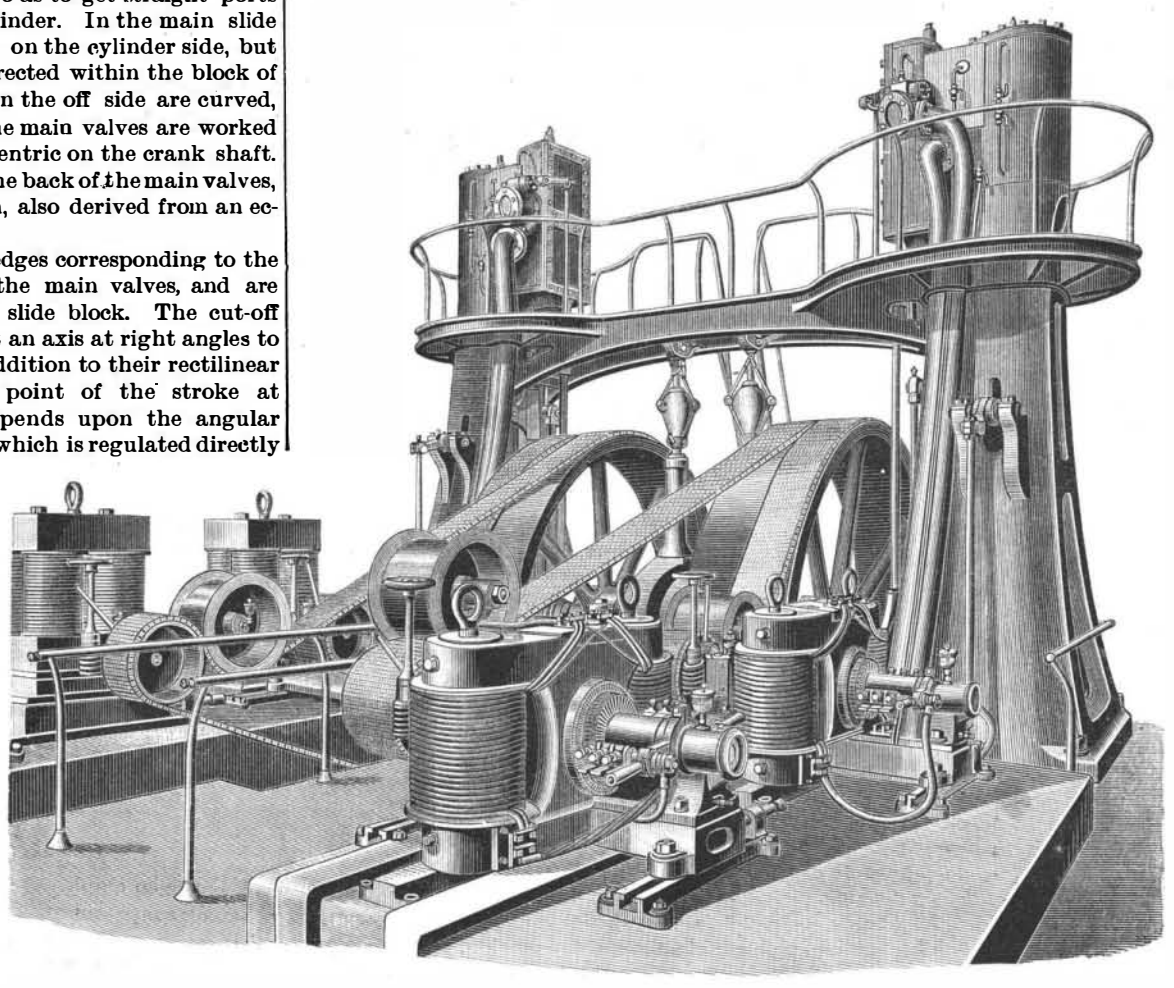
The left hand engine drives two Edison-Hopkinson dynamos, both shunt wound for an output of 105 volts, 320 amperes, at a speed of 750 revolutions per minute, equivalent to 500 lamps of 16 candle power. These machines have a commercial efficiency of 93·3 per cent, and an electrical efficiency of over 95 per cent. The improvement made in these dynamos by Dr. John Hopkinson and Messrs. Mather & Platt since the original Edison type is effectively shown by comparing the two smaller Edison-Hopkinson dynamos with the four Edison dynamos of the type which are at work close by. Although only about one-third the weight of the Edison dynamos, the Edison-Hopkinson dynamos give a larger output and have a higher efficiency.

The right hand engine drives two "Manchester" dynamos, compound wound, for an output of 100 volts, 400 amperes, at a speed of 750 revolutions per minute, equivalent to 700 incandescent lamps of 16 candle power.

The efficiency of the Manchester dynamo is also very high. With the full load the electrical efficiency is 94·8 per cent, and the commercial efficiency 92·8 per cent. These dynamos, as also the Edison-Hopkinson, are driven direct from the fly wheels of the engines with link belts, as shown by the accompanying engraving. In order to increase the lap of the belt on the driving pulley of the dynamo, it is bent on the slack side under a loose pulley riding on a stud carried on an arm projecting from the dynamo bed. This system of using a jockey pulley instead of a large belt is very effective when it is desirable to economize floor space. It was introduced by Messrs. Mather & Platt some years ago for dynamo driving, and has given good results. Careful experiments show that there is very little friction in the arrangement and no undue wear of the belt. The belts employed for driving the dynamo are worthy of notice, as instead of having flat faces, as is usual with link belts, the section is double concave, so that the pins are not bent as the belt is bent over the convex surface of the pulleys.
—*The Engineer.*



ELECTRIC LIGHT ENGINES AT THE MANCHESTER EXHIBITION.

Artificial Clouds.

An exchange says that artificial clouds were recently created for the protection of vines from frost at Pagny, on the Franco-German frontier. Liquid tar was ignited in tin boxes and pieces of solid tar on the ground near the vines. Large clouds of smoke arose and protected the vines for two hours. Although vines in the neighborhood were injured by the frost, all that remained under the clouds were left uninjured. Of course such a procedure can succeed only in calm weather; but it is in calm weather only that white frosts occur.