DRIVING DYNAMOS.

We illustrate several systems of driving dynamos devised and carried into execution by Messrs. Mathers and Platt, of Salford Iron Works, Manchester. Figs. 1 and 2 show an arrangement for driving a dynamo by helical wheel gearing. The engine is one of Mather and Platt's usual double-cylinder diagonal engines with cylinders 8 in. in diameter and 10 in. stroke. As will be seen, the bed is of a rigid form and suitable for an engine running at a high speed. The crank is of the ordinary double-sweep form and the crossheads and slides are cylindrical. The engine is fitted with the well-known Mather and Platt patent metallic piston, and it is regulated by a Pickering governor attached to the steam supply pipe and driven from the crankshaft by a pair of bevel wheels.

The engine has long brass bearings, the crankshaft bearing on the driving side being made extra long. The flywheel is formed into an internal spurwheel with double helical teeth, the boss of the wheel being turned and let into the crankshaft bearing, which is bored out to receive it. By this means the strain on the crankshaft is one of torsion only, and the wheels are more rigid and are kept in their proper relative positions so that the teeth are always in full gear. This wheel gears with a pinion keyed on a shaft carried through the engine bed, and which is coupled direct to the dynamo shaft by means of a flexible coupling. It will thus be seen that any slight irregularity or jar in the engine or first pair of wheels is lost in the shaft and coupling before reaching the revolving armature of the dynamo, which is of the greatest importance on account of its weight and speed, and from the fact that any springing of the shaft, however small, is intensified by the unequal magnetic stresses which are at once brought into action. The wheels of the engine and dynamo are in the proportion of 6 to 1, the former making 175 revolutions per minute. In an internal wheel the friction is less than in ordinary spur gearing, as the stresses are more nearly tangential to the pitch line of the wheels. There is very little wear in the wheels, and no parts requiring replacement. When the wheels are once set they require no further adjustment or attention. By using double helical teeth in connection with an internal wheel the number of teeth in gear at any instant is increased, so that a finer pitch can be used, which reduces the noise so as to be almost unnoticeable. The engine is shown in the engravings driving one of Mather and Platt's new compound wound dynamos for 150 to 200 twenty-candle power lamps, giving 100 volts electromotive force at 1050 revolutions per minute. Fig. 3 illustrates the same system of driving applied to a similar dynamo, but the engine in this case is of the single-cylinder oblique type. The cylinder is 10 in. in diameter by 12 in. stroke. The wheels are the same proportion as before, viz., 6 to 1, and the engine makes 175 revolutions per minute. The crankshaft is of the best hammered scrap and is carried in long adjustable brass bearings. The connecting-rod is also of wrought iron having adjustable brasses at both ends and is connected to the crosshead by a steel pin. The slide is of cast-iron bored to suit the circular crosshead. The engine is fitted with a Mather and Platt patent piston, with a steeel piston-rod, and the regulation is effected, as in the first case, by a Pickering governor driven by a strap from the crankshaft. The driving is effected through a shaft and flexible coupling just as in the previous arrangement.

Fig. 4 illustrates an arrangement of short-belt driving applied to the same dynamo and diagonal engine described with reference to Figs. 1 and 2. The engine is the same as before described, except that in the place of the helical gearing the flywheel is turned for belt driving. The proportion of the wheels and the speed of the engine are the same as before. In order to give the strap more grip on the pulley of the dynamo a very effective arrangement is used. This consists of the swivelling arm which carries at one end a pulley riding loose on a stud. The lower end of the arm is formed into a wheel quadrant gearing into a worm carried on a spindle at the end of the bed of the dynamo. By turning a handwheel keyed on the end of the worm spindle, the arm, and with it the pulley, is raised or lowered, and thus the strap is wrapped less or more round the pulley as required, giving a neat and effective strap driving in a small space. By this arrangement a long strap is unnecessary, and less strain is put on the driving side of the strap and also on the dynamo shaft, by giving more pulley surface to the belt. Figs. 5 and 6 show the above arrangement of belt driving applied to the same dynamo, but with the single cylinder engine before described in place of the diagonal engine.

The advantages of these methods of driving are not confined to ship lighting. In mills and workshops it is often desirable to place the dynamo in the engine-room, so that it may require no further attendance than from the man in charge of the main engines. The space is usually in such cases very confined, excluding the possibility of driving by a long belt. The method last described has been very effectively employed by Messrs. Mather and Platt in installations at the Theatre Royal and Comedy Theatre in Manchester for driving two 250-lamp Edison-Hopkinson dynamos. It may also be advantageously used with gas engines for house lighting, as it enables the engine and dynamo to be fixed on a single bedplate.

Figs. 7 to 9 illustrate a new form of dynamo manufactured by Messrs. Mather and Platt. This machine is a modification of the original gramme generator, carried out on the same principle as Dr. John Hopkinson's reconstruction of the Edison dynamo. The mass of iron in the magnets and core of the armature is very largely increased, and the length of the magnetic circuit is shortened. The machine has a double magnetic circuit which, though slightly diminishing the efficiency, greatly increases its compactness and symmetry of form. The cores of the magnets are made of wrought iron, and are let into cast-iron pole-pieces, which have an increased section over the wrought iron. The lower pole-piece is extended to form the bed of the machine, thus securing great compactness, and keeping the centre of gravity of the moving parts as low as possible. The armature of the machine has a free space left along the shaft to secure internal ventilation, and the commutators are large compared with the general dimensions, in order to diminish the sparking by giving as large a surface of contact as possible between the brushes and commutator bars. The commutators of all the machines have forty bars of toughened brass, and are insulated with mica.

In the machines for 100 lamps and for high outputs, there is a double brush on each rocking bar capable of separate adjustment with an elastic forward thruss and butt contact. The machines are all compound wound for constant potential at the terminals, the series coils being external to the shunt coils. These arrangements have increased the efficiency of the machine, so that those of the new type are not much inferior in efficiency to the Edison-Hopkinson machine, which has probably very nearly the highest duty attainable. The perfect ventilation and low resistance of the armature enables these dynamos to carry a large load in proportion to their size without heating. In fact, the load on the armature is determined by quite other considerations than that of heating. Each machine is provided with a switch board carried on the upper yoke, and fitted with a main plug switch and suitable terminals.—*Eng.*

LIGHTHOUSE ILLUMINANTS.

It will be remembered that last year a Committe was appointed by the Board of Trade to consider the important question of the best light for lighthouses, but it fell to pieces owing to the secession from it of the representatives of the Commissioners of Irish Lights. They found that there was a majority, consisting of the Trinity House representatives, who would not admit into the proposed experiments the trial, to its fullest extent, of a system of gas-lighting which had proved to be very useful in Ireland. Mr. Chamberlain, on the dissolution of the Committee, put the whole matter into the hands of the Trinity House for investigation, placing at their disposal a large sum of money for the purpose of making the necessary experiments. The Trinity House, thus relieved from the constraint of their sister Board, proceeded with the work. They selected the South Foreland, where there are two lighthouses, as the scene of their operations. They erected three temporary lighthouse-towers, and placed upon each of them a lantern of the regular lighthouse size. In one lantern they fixed the most modern lenticular apparatus for the electric light, and applied in its focus a more powerful electric light than had ever before been shown in a lighthouse. It is produced by the combined action of three electro-magnetic machines, manufactured by M. de Meritens, of Paris. These machines are driven by the steam engines which work the dynamos for the ordinary lighthouse light of South Foreland. In the second lantern they erected a quadriform gaslight on the system introduced by Mr. Wigham into the Irish lighthouses. Each of the four burners consists of a group of jets, and they produce unitedly a light of very great power. The gas for these lights is manufactured on the premises in special apparatus erected for the purpose.