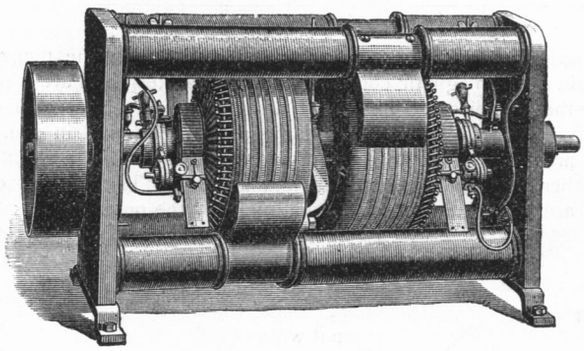
## BALL ELECTRIC-LIGHTING SYSTEM.

ONE of the most peculiar of the many dynamos that have been used or proposed for arc-lighting is that of the Ball Electric Company. From the accompanying illustration it will be seen that two armatures are mounted on the shaft, with one pole-piece for each.



THE BALL DYNAMO.

The armatures are of the well-known Gramme ring type, and are constructed with a large number of separate coils, thus reducing the sparking at the commutators to a minimum. By some it is claimed that the dynamo must be at a disadvantage from the considerable magnetic resistance that the lines of force experience in passing from pole-piece to pole-piece. By others it is said that this is not so, as the lines of force do not close their circuit from pole to pole, but from poles through armatures to magnet-bars opposite; and that from the thinness of the copper windings, and from there being two armature-cores in multiple across a common field, the magnetic resistance is actually less than in other makes of dynamos. The large output of the dynamo in comparison to its weight, and the small amount of copper used upon its field, seem to testify to the correctness of the latter.

Its advantages, which are of a practical kind, lie in the fact that by distributing the rotating wire on two armatures the number of layers can be reduced, the difference of potential between adjacent turns is less, and therefore there is less liability to burn out, while the excellent ventilation prevents overheating; also, if any thing happens to one armature, the other can be used to run part of the lamps.

The mechanical construction of the dynamos is excellent, and, from the testimonials contained in the last circular issued by the company, it would seem that the machine can stand the maximum of rough usage with a minimum of repair.

Besides the high-power lamps of 2,000, 1,600, or 1,200 candle-power, the Ball Company advertise smaller arc-lamps of 800 candle-power, for use in stores, etc., and they also provide incandescent lamps to be used on arc-light circuits. They also furnish complete incandescent-light installations.

## THE "IDEAL" STEAM-ENGINE.

AN improvement in one of the most important steps in the conversion of heat into power, showing the results of scientific methods applied to the design and construction of the steam-engine, is illustrated on this and the next page. This engine, which is known as the "Ideal," is a more highly developed form of the Ide engine, and is manufactured by A. L. Ide & Son of Sprinfield, Ill. It was designed to meet the special requirements of electric lighting, such as high speed, small space, perfect regulation, absence of vibration, and economy in the use of steam; and the results shown by actual use prove that the designers of the engine are progressing in the right direction. The engine is compact, perfectly balanced, and self-oiling; and, as it has a rigid double frame with heavy sub-base, it may be run at a high speed without vibration.

The manner of lubricating the guides, cross-head pin, and piston-rod, is shown in the longitudinal section, Fig. 1. The oil is taken up by the crank-pin disks, when in motion, and thrown by centrifugal force upon the guides and piston-rod. The oil wiped from the upper guide by the cross-head slide passes through a tube in the top slide, entering a funnel in the connecting-rod, and thoroughly lubricating the cross-head pin. The peculiar manner of keeping a constant supply of oil in contact with the crank-pin, main bearings, and eccentric, is shown at Fig. 2. Some of the oil thrown off by the revolving disks is caught in the pockets in the disk-hood (Fig. 1). The oil from the upper pocket is conducted by a tube provided with a regulating-cock to a receptacle on the eccentric-strap, whence it passes, after lubricating the eccentric, to a drip-pan underneath, and thence back to the oil-well for further use. The oil from the other pocket flows through pipes into pockets cast upon the main bearings. From these points it flows into the grooves and channels connecting with the crank-pin, which is hollow. The centrifugal force carries it into the crank-pin, from which it escapes through holes into the bearing. Thus it will be seen that the main bearings receive constant lubrication, while the crank-pin receives a supply of oil from either side. This method of lubrication is constant, and provides for the most important bearings about the engine. Sufficient oil is placed in the basin under the crank-disks to cause it to flow in streams through both

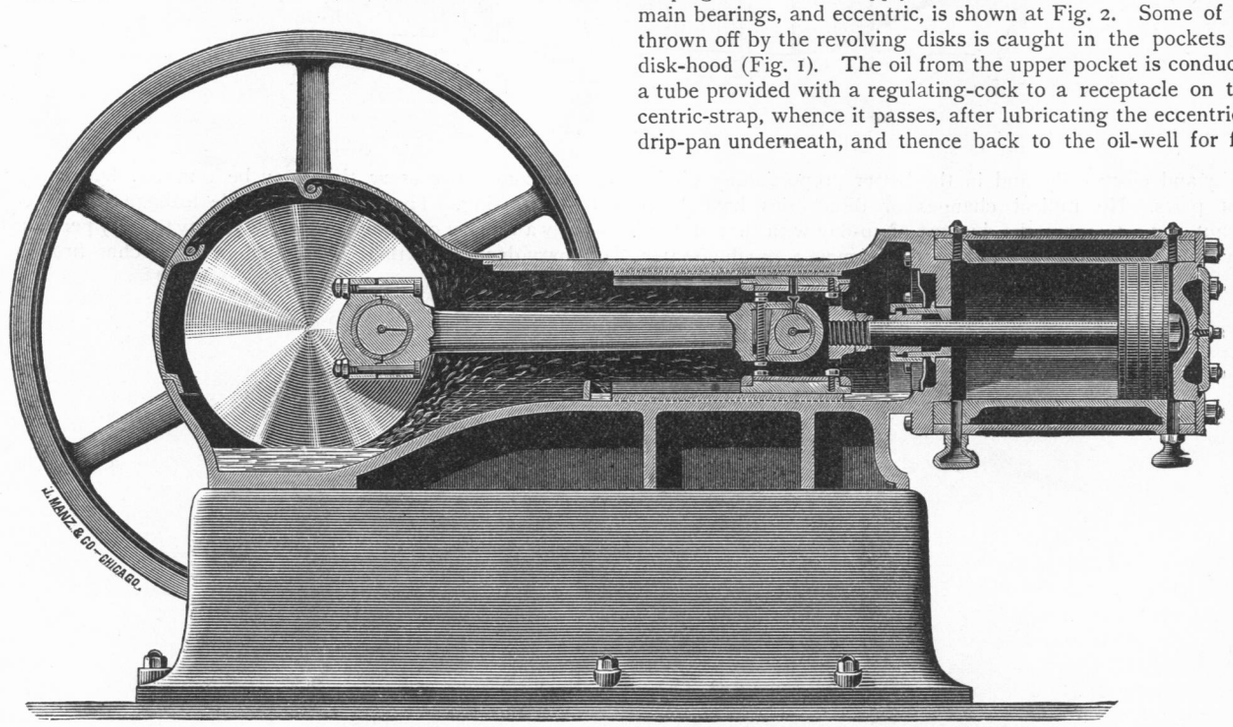



FIG. 1.