off the valve, just before the pressure is balanced on both sides, in order to leave the valve free to open to its full extent when the air pressure on its face exceeds the air pressure on the back. At the proper time the valve is closed, either directly or by allowing a spring to press against it. The movement to operate the gear may be taken from a special eccentric or from the eccentric which operates the steam valve, either directly or through a wrist plate. A part of the mechanism for operating the valves can be seen in Fig. 27, at the end of the large cylinder on the right. This movement is operated from a special eccentric on the crank-shaft.

Objections urged against this type of valve are their complication and the necessarily slow closing, which must be either too early or too late.

With regard to the first, it may be said that the extra complication of the gear is counterbalanced by the fewer number of valves necessary, on account of the high lift which may be allowed. Both suction and discharge valves should close at a definite point, when the crank passes the dead centre, so that it should be possible to make the valve close at that exact point. It will also be evident that, as the piston velocity decreases up to the end of the stroke, the valve might begin to close quite early, without increasing the throttling or the velocity of the air through the valve. It will be seen that mechanically controlled poppet valves possess many of the advantages of ordinary poppet valves and but few of their disadvantages.

The writer wishes to thank the following firms for their kind assistance:

The Canadian Rand Drill Co., for several electrotypes.

The Rand Drill Co., New York, for blue-prints and an electrotype.

The Ingersoll-Sergeant Drill Co., for blue-prints, steam and air indicator cards, and electrotypes.

The Norwalk Iron Works Co., for a blue-print and an electrotype.

The Clayton Air Compressor Works, for an electrotype.

Fraser & Chalmers, Chicago, for blue-prints and air cards.