

calling for polished faces both for the pistons and the inner surfaces of the steam cylinder heads to reduce the radiations to the lowest possible limits.

The steam distribution valves themselves should be of an extremely reliable type in a pumping engine for water works service and have proper facilities for refitting and adjustment. The engine in most cases being fitted with a variable cut-off mechanism so arranged that it may be easily and promptly manipulated from safe and convenient points while the engine is at work.

The cut-off in the high pressure cylinder is controlled by an automatic governor, and also adjustable by hand. The intermediate and low pressure cut-offs are adjustable by hand only, and in some cases the low pressure both cut-off and exhaust are fixed and not adjustable excepting by changes of a permanent nature.

#### THE VALVE MOTION.

Throttle valves and other starting mechanism should be so that the engine could be promptly and conveniently started or stopped and generally operated by one attendant from the main floor of the engine room or galleries usually provided.

There are also points to be looked after carefully, pertaining to journal boxes, their adjustment and lubrication, arrangements for manipulation with the least possible delay. The materials entering into the construction should be of the best quality practicable to obtain, and by proper attention to this portion of the work very good results may be obtained.

All of the material used in the pumping engine should be subject to inspection, analysis, or tests, subject to the approval of the buyer. But no allowance for any such inspection analysis or tests should be made by the parties doing the work, the buyer bearing all such expense when they become necessary. Any time during the construction of the machinery the buyer should have the privilege of calling for test pieces of the various materials entering therein, the contractor preparing and supplying such pieces to the buyer in the number, shape, finish and size required, with the understanding, however, that the contractor may have a representative present when such tests are made.

Many times such sampling and testing may not need to be done or wholly done, on account of favorable or satisfactory conditions surrounding the execution of the contract in which case considerable incidental expense could be saved the buyer who would of course eventually be made to foot the bill, no matter how arranged. If it could be made clearly apparent by other means than the expensive testing that the