

If, however, you should decide to construct an additional condensing engine, I would recommend to your consideration the plan of one which I have just put in operation for the New Bedford Water Works.

After many years of study upon this subject and the operations of three engines of large size, which I have built upon this plan, I am convinced that it is superior to any of the pumping machines in use, at least in this country, having reference to the cost of construction and operating simplicity, the small liability to get out of repair, and ease of repairing or replacing any defective part, but especially in its conformity to well-established principles of mechanism.

This machine is not an invention, but corresponds almost exactly to those constructed for the same purpose, more than 80 years ago, by James Watt.

The leading principles which should govern in such a machine are :—

1.—That steam and water cannot be moved at the same velocity without a considerable loss of power. The former is very light and elastic, and the latter seventeen hundred times heavier and inelastic. Hence, all direct acting pumps are wrong in principle.

2.—That water cannot be abruptly changed in its direction or form of volume without great waste of power, and hence, double-acting pumps, which must have two absolute reversals of the water, are much inferior to single-acting pumps, where these reversals are avoided.

That the induction and delivery pipes of the pumps should be in straight lines, or where necessary, in curved lines of large radius, and with no changes, or at least with very gradual ones, in the passage of the water to, through and from the pumps.

That valves, which produce the least distortion of the form of the volume of the water, and without unnecessary changes in its direction should be used.

3.—That in reciprocating engines and pumps, the