small quantity of cold water may be injected into the blowing cylinder, to prevent heating when working at a very high speed. The engine is fitted with a governor and throttle-valve.

Sliding Pipes.—The sliding pipes for the depositing reservoirs are shown to a large scale in figs. 7, 8, 9, 10, and 11, plate 48. The sliding pipe itself is of gun-metal, with the exception of the cup or basin at the top, which is cast-iron ; the casing in which it works is also of cast-iron; the float bolted on the top is made of sheet copper, and is of such an area that it will balance the weight of the pipe in water when the float is about three-quarters immersed. In the basin of the pipe there is a cast-iron grating or frame, shown in fig. 8, plate 48, which is covered with a thin copper gauze to prevent any foreign substances getting down the pipe. The packing for the glands is metallic, the rings being of gun-metal, with the best red rubber between. They are adjusted by set screws, as shown in fig. 10, plate 48. There are three steel stops fixed in the gland to receive the sliding pipe when in its lowest position, to prevent its resting upon the gland. A section of one of these is shown in fig. 11, plate 48. The stops rest upon pieces of cork soaked in glycerine. The sliding pipes for the lime-water reservoirs are constructed in a similar manner to those for the depositing reservoirs, but are made entirely of cast-iron, and are not fitted with floats.

It will now be necessary to give a description of the way in which the lime-water is made, and also of the manner in which the softening process is conducted at Canterbury.

Process of Making Lime-water.—First, the lime for this purpose must be chalk lime, not grey lime, and care should be taken that it has been thoroughly well burned; the ordinary chalk lime, as used for building purposes, is not sufficiently burned. The chalk deposit taken out of the water after softening, if thoroughly well burned, would make the best and most suitable lime for this purpose. The purest lime having been obtained and deposited in the lime store, it is taken out in bushel baskets and put into the small octagonal cisterns in the lime-house, shown in fig. 3, plate 44, where it is slacked by adding water in the ordinary way (softened water only is used for this purpose). When it has had sufficient time to slack, being well stirred during the process, it is then laded out into fine wire sieves, placed over the large octagonal cistern, by which means any core or dirt which may be in the lime is prevented getting into the large cistern, which is thus filled with the fine cream-of-lime only. This cream-of-lime is then introduced into either of the lime-water reservoirs by means of the funnel pipes shown in plan, fig. 3, plate 44, and in elevation in figs. 2 and 3, plate 45. The lime-water reservoir is in this manner barely half filled with the cream-of-lime, and the remaining space is filled up partly from the depositing reservoirs, and partly from the main with softened water. Jets of water from the depositing reservoir are first introduced, and when several feet in depth of water have been filled up the communication with the depositing reservoir is cut off; and the valves connected with the air-pipe from the blowing engine having been opened, the air jets are brought into full play. This puts the whole contents of the reservoir in violent and thorough agitation. The appearance of the mixture during this operation is that of rich cream. The 5-inch valve connected with the soft-water main being then opened fully, the jets of water through the bottom series of pipes are continued until the reservoir is quite full. The water-jets are then entirely stopped, and the mixing continued with the air-jets only. After the agitation has been kept up for about twenty or thirty minutes altogether the blowing engine is then stopped, and the contents of the reservoir allowed to settle. The lime then rapidly settles to the bottom, leaving the clear lime-water above ready for use, which is drawn off by means of the sliding pipes, as before mentioned.

Manner of Conducting the Softening Process.—The requisite quantity of *clear* lime-water, say to a depth of about 20 inches, is first put in from one of the lime-water reservoirs. The hard spring water as it comes from the bore-hole is then introduced through the eight nozzles shown at the S.W. end of the reservoir, fig. 3, plate 44. The nozzles are used for the purpose of increasing the velocity, and for the better distribution of the spring water as it is emitted from the delivery pipe, the jets being of such force as to produce considerable agitation throughout the reservoir, and to cause a continuous current. The spring water and lime-water are thus thoroughly mixed. Directly the clear spring water and clear lime-water are brought into contact they assume the appearance of milk-and-water. The pumping is then continued at Canterbury until the reservoir is quite full, which takes about two or three hours. The milk-and-water appearance is maintained until the pumping ceases, the whole mass being pervaded with very minute octahedral crystals, which rapidly subside or settle to the bottom of the reservoir. Just before the completion of the pumping the water is tested with the silver test as follows:—One or two drops of nitrate of silver are put into a small white beaker, and then a small quantity of water taken from the reservoir is poured in ; if there is the slightest excess of lime-water in the mixture it immediately assumes a yellowish tinge in the white beaker, and it would be necessary to pump in more spring water until the exact proportion is obtained, and the nitrate of silver has no effect upon it. In a large reservoir in practice this is very readily