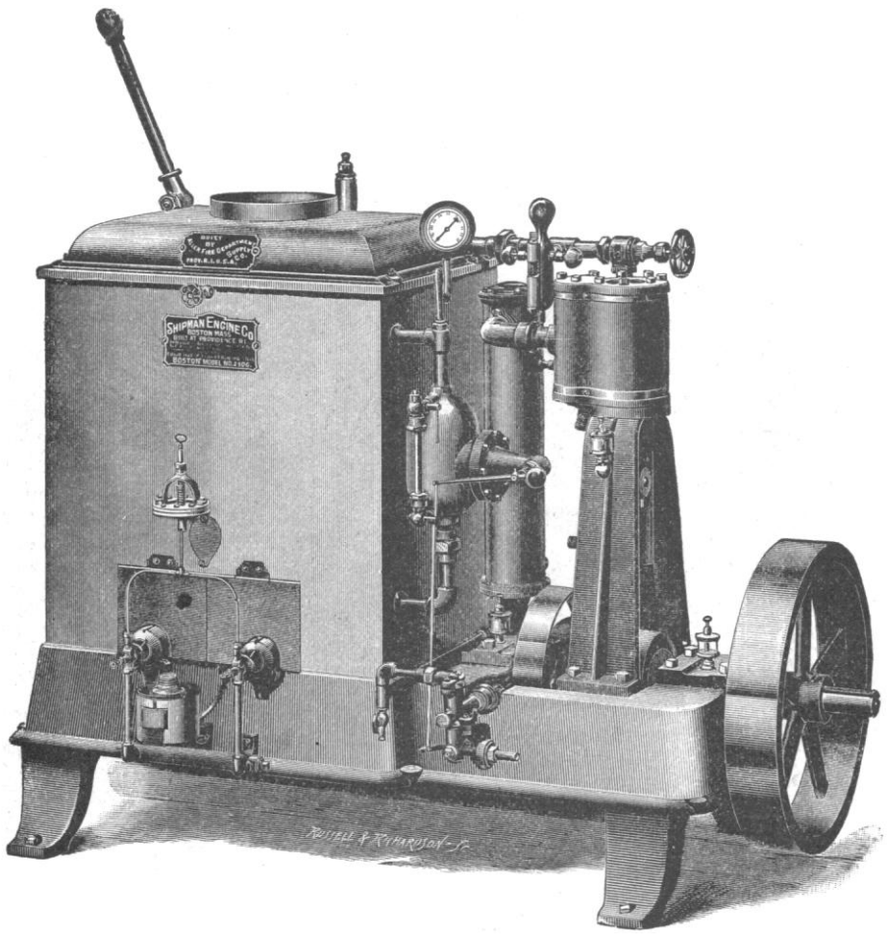
SCIENCE

FRIDAY, FEBRUARY 1, 1889.

OIL-BURNING STEAM-ENGINES.

THE engine known as "The Shipman," an illustration of which accompanies this article, is an automatic steam-engine and boiler complete, using kerosene-oil of a low test for fuel, and is designed for all users of a moderate amount of power. Its essential points are, that it is so thoroughly automatic in fuel, water-supply, and speed, that, when steam has been raised, little if any further attention is required beyond that of opening or closing the throttle-valve when the engine is started or stopped.



FOUR-HORSE-POWER SHIPMAN ENGINE.

In burning the oil, no wicks are used, and there is nothing to gum up or clog. The fire is formed by a mixture in proper proportions of steam and oil. This is fed through one or more atomizers, according to the size of the boiler. A supply of steam from the boiler passing through these atomizers carries with it into the fire-box, in a fine spray, just the amount of oil necessary to generate steam for the work being done by the engine. As the oil enters the fire-box, it is ignited by a torch, and the combustion is so perfect that there is little or no smoke; so the full value of the heating qualities of the oil is obtained.

The amount of steam and oil used by the atomizers is controlled by a perfectly automatic diaphragm-valve, located in the steam-pipe between them and the boiler. Through this diaphragm, the mechanism of which is simple, and to which easy access can be had, passes the steam on its way to the atomizers; and, as the pressure of the steam in it becomes greater or less than the tension of the spring which governs it, a valve attached to the diaphragm-plate is made to close or open, and thus regulates not only the amount of steam and oil being consumed, but also the pressure in the boiler. In this manner the fire is increased or decreased, according to the load on the engine, and the steam-pressure is kept constant. The height of the pressure to be carried is at the option of the user, and can be varied by him almost instantly.

If the engine is stopped, the fire is entirely put out by the diaphragm; but upon starting again, the fire at once relights itself, the steam-pressure having been held, in the mean time, by the automatic action of the diaphragm, which will have allowed just enough oil to be burned to make up for the loss of steam by condensation.

The supply of oil is stored in a tank placed at any convenient distance from the boiler, and is led to it by ordinary piping.

The boiler consists of a hollow oblong back constructed of steel and thoroughly stay-bolted. Into one side of this back are screwed lap-welded wrought-iron tubes one and three-quarters inches in diameter, and thirteen inches in length. These tubes are closed at the outer end by a welded plug. This makes a very compact and quick-steaming boiler, gives large heating surface, and insures safety, it being almost impossible to explode one so that it will do harm. The boilers are tested by a hydraulic pressure of four hundred pounds. As a matter of record, steam can be raised on a four-horse-power boiler, from cold water to one hundred pounds pressure, in ten or twelve minutes.

The water-supply is by a plunger feed-pump, run direct from the engine-shaft, and is kept at a uniform level in the boiler by means of a float connected to a valve in the suction of pump. This float is in a chamber which is connected by piping to the top and bottom of the boiler, and rises or falls with the water. The movement is conveyed by levers to the valve in the pump, which it opens or closes as the water-level changes.

The engine is well built, and of the best material. The piston is solid, and has sectional packing-rings, each section overlapping the other, and being set out by independent springs. This, of course, makes a very tight and true-wearing ring.

The valve is of the piston type, and perfectly balanced.

The governor is an automatic cut-off, working direct from the shaft to the valve; and the speed is very finely regulated, no matter what the load. The shaft is of cast steel, very large, and having extra long bearings in babbitted boxes.

All wearing parts are of extra size, and adjusted for the taking-up of lost motion. Lubrication of the cylinder is by a sight-feed; and the slides and shaft-boxes, by the ordinary oil-cup. Oiling of the crank-pin is effected by a centrifugal oiler attached to the crank-disk.

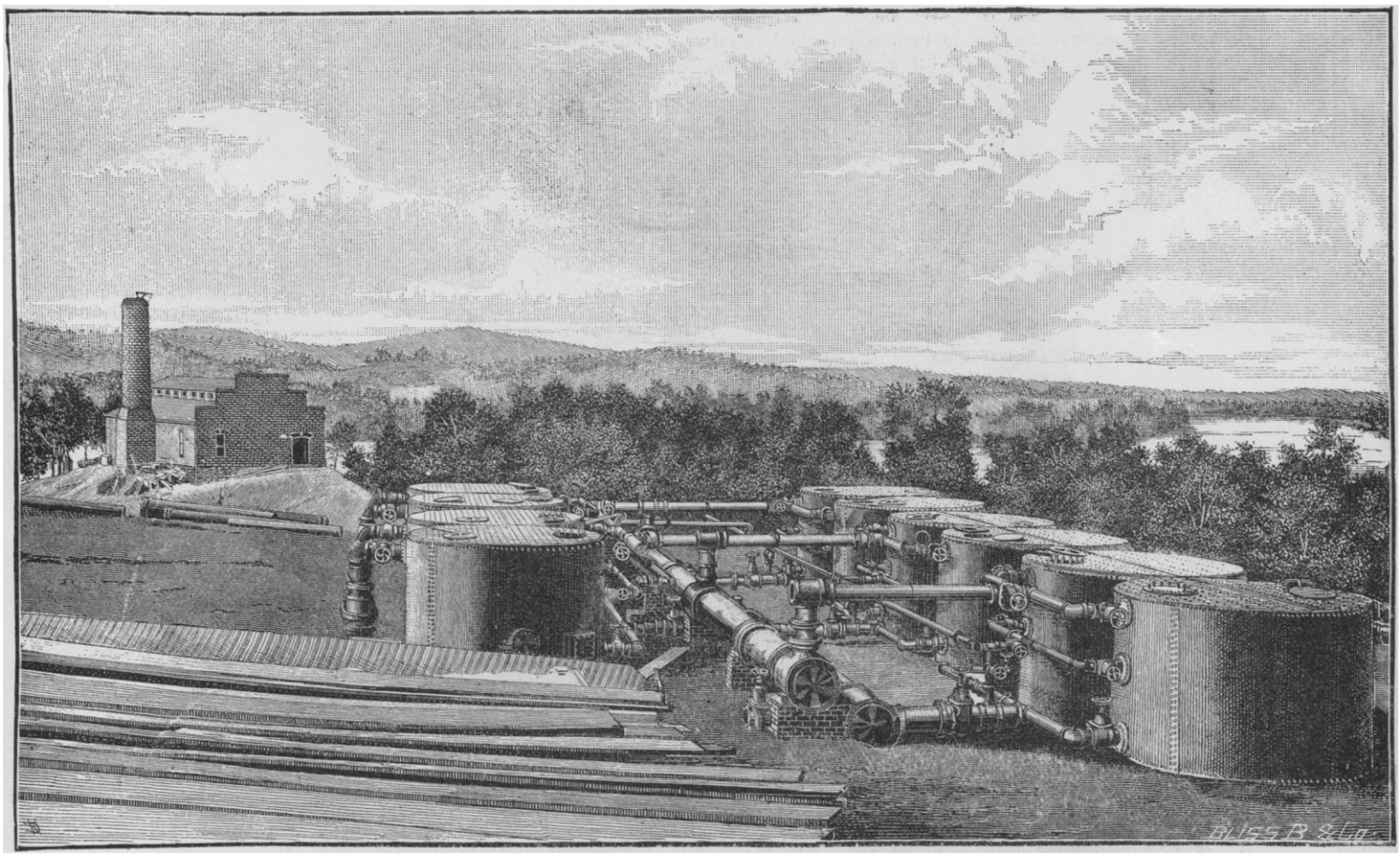
From the above it can be seen that when steam has been raised, and a sufficient quantity of oil and water supplied, the engine requires no further attention.

The question is asked, How are the fires operated when there is only cold water in the boiler? For this purpose a hand air-pump, attached to the boiler, is provided. A few strokes of this pump will start the fires, and it is only necessary to pump slowly for seven or eight minutes to raise enough steam to keep them going. As soon as steam is made, all work with the air-pump ceases, and, as before stated, one hundred pounds can be raised in from ten to twelve minutes. As regards the other advantages of "The Shipman," it can be said that it is compact, light, and durable, and entirely dispenses with the services of a skilled engineer.

The engines and boilers are now built on one or separate bases, of one, two, four, six, and eight horse-power, and the company have in process of construction compound and triple expansion engines of various sizes. For further information, address the Shipman Engine Company, 92 Pearl Street, Boston, Mass.

WATER FILTRATION AND AERATION.

THE rapid growth of the mill industries, and of the arts and manufactures in general throughout the country, bring more than ever prominently to the front the important questions of the purity of the water-supply, and the necessity of taking immediate and active measures to secure this greatly to be desired quality. Particularly is this the case in the southern section of the country, toward which the attention of capitalists throughout the world is being more and more attracted. The more important features of health and cleanliness render it an imperative duty to prepare for the rapidly increasing population of our cities by taking judicious measures to secure to every community that system which, having simplicity and durability to recommend it, will, while being economical, insure a sufficient supply of pure water for individual use as well as for the factories and mills. Our country is blessed with a plentiful water-supply in almost every section, and the very fact of the abundance of this supply necessitates the precautions above referred to; as so large an amount of matter is carried in suspension in most of our large rivers, that some system of filtration must be resorted to. Some of the features that tend toward the perfecting of apparatus for this purpose are the ability to maintain the necessary "head or pressure," simplicity of construction, durability, quickness and thoroughness in cleansing, economy in water to accomplish this cleansing, cheapness, strength to withstand any desired pressure, and capacity to supply the maximum amount of clear water required for the purpose in view. The National Water



NATIONAL FILTER PLANT AT CHATTANOOGA, TENN.