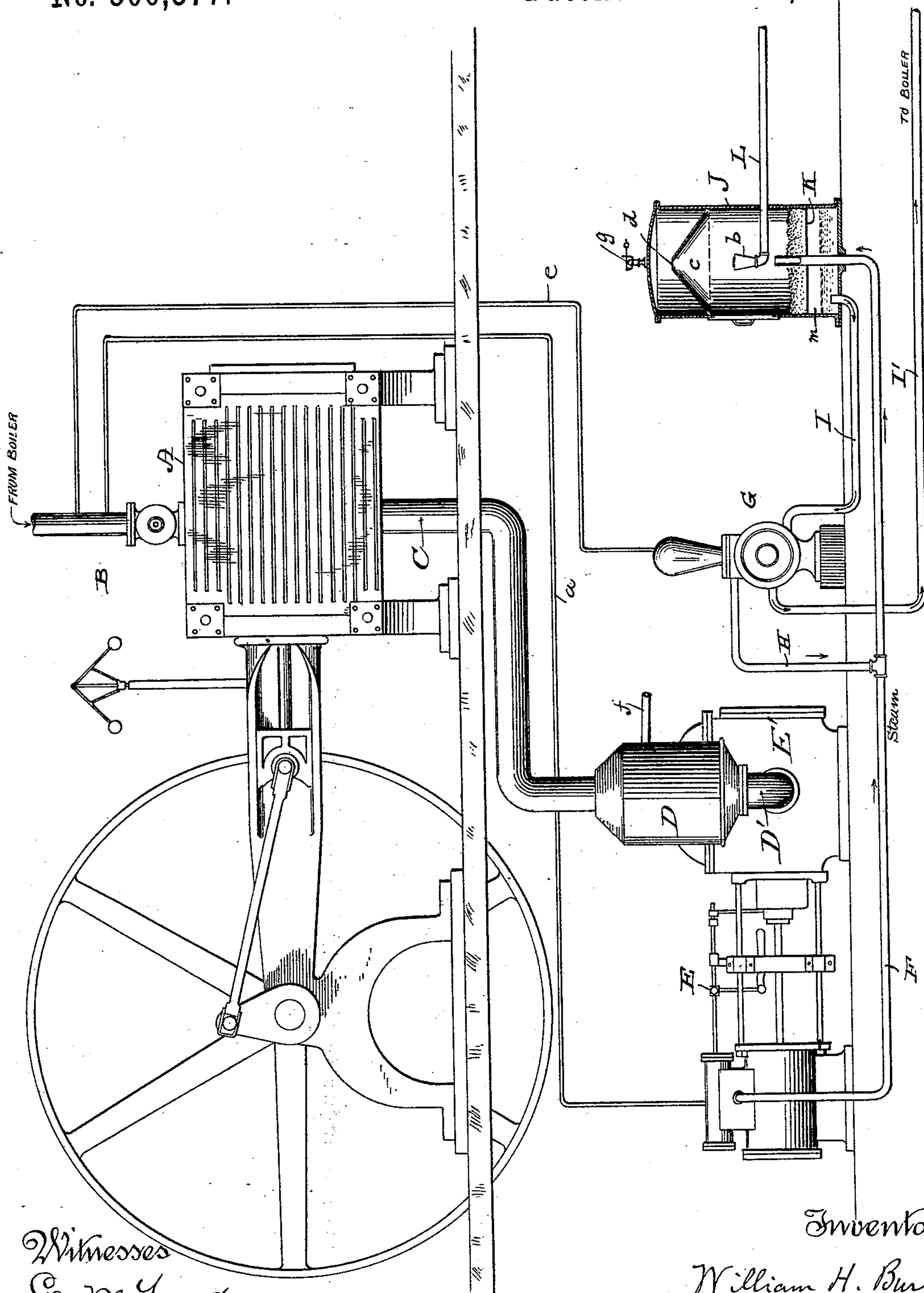


(No Model.)

W. H. BURK.
FEED WATER HEATER.

No. 500,377.

Patented June 27, 1893.



Witnesses
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UNITED STATES PATENT OFFICE.

WILLIAM H. BURK, OF SHEBOYGAN, WISCONSIN.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 500,377, dated June 27, 1893.

Application filed January 13, 1890. Serial No. 336,786. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. BURK, of Sheboygan, in the county of Sheboygan, and in the State of Wisconsin, have invented certain new and useful Improvements in Feed-Water Heaters; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to condensers and feed-water heaters for steam-engines and my invention consists in certain peculiar and novel features of construction and arrangement, as hereinafter described and claimed.

In order that my invention may be fully understood, I will now proceed to describe it with reference to the accompanying drawing, in which the figure is a view, principally in side elevation of a steam-condensing and feed-water heating apparatus embodying my invention; one of the pumps being shown in end elevation and the condenser and heater being shown in central vertical section.

It is well known that, in ordinary practice with condensers, the best results are attained by producing a vacuum of twenty-five inches of mercury, or thereabout, with the temperature of the water in the hot-well (from whence the boiler-supply is taken) ranging from 100° to 110° Fahrenheit. The difficulties met with in this connection are that when the temperature of the water in the hot-well is increased, the vacuum at the exhaust steam side of the piston is decreased, while all increase in the vacuum is accompanied by an opposing decrease of temperature in the hot-well.

The object of my present invention is to produce an apparatus which shall produce the greatest desirable degree of vacuum at the steam side of the piston and at the same time insure the highest desirable degree of temperature of the water in the hot-well. These results I attain by virtue of the construction, which I will now proceed to describe.

In the said drawing, A designates the steam-cylinder of a steam engine, said engine being either of the horizontal type shown, or of any other preferred type.

B designates the steam-supply pipe leading from a boiler to the steam-chest of the engine and C designates an exhaust pipe leading from the steam-cylinder to a condenser D which is

in turn shown as connected by a pipe D' with the pumping cylinder E' of a suitable steam-pump E. This pump takes its steam through a supply pipe *a* which is shown as tapped into the main steam-pipe B, but which may of course lead directly from the boiler, if preferred. The condenser D is supplied with cold-water through a pipe *f* which leads from any suitable source of cold water supply. The exhaust from the pump E discharges through a pipe F into a condenser, heater and purifier J, to be presently more fully described.

G designates a second pump which receives its steam-supply through a pipe *e*, which is also shown as tapped into the main steam-pipe B, but which may, like the pipe *a*, lead from the boiler if preferred. The exhaust from this pump G is thrown into a pipe H, which is connected to the pipe F before mentioned, and passes thence into the condenser and heater J, with the exhaust from the pump E.

I have shown the condenser and heater J, as consisting of a casing through the bottom of which extends the end of the exhaust-pipe F, the said pipe supporting a perforated diaphragm K in the lower part of the casing, above the bottom thereof. A bed or mass of filtering material, consisting of excelsior or other equivalent substance, rests upon this perforated diaphragm. A pipe L, which leads from a suitable cold water supply, enters preferably at one side of the casing and at its inner end carries a suitable rose or spraying nozzle *b*, which extends vertically upward immediately above the inclosed end of the exhaust-pipe F. The peculiarity of this condenser, which renders it particularly adaptable to the general apparatus herein described is a conical scatter-plate *c*, which is located in the upper part of the casing immediately above the nozzle or jet *b* and in the apex of which is formed an opening *d*. A suitable blow-off valve *g* is placed on the top of the casing J. A pipe I has one of its ends inserted into the bottom of the casing and terminating in the space or well *m* between the bottom and the diaphragm K and this pipe leads to the pumping cylinder of the pump G. A pipe I' is also connected at one end to the pumping cylinder of the pump G and extends thence to the boiler.

The operation of the above described apparatus is as follows: Exhaust steam from the engine A enters the condenser D and is thence forced out by the pump E as water of condensation, to any point or receptacle as desired, the operation of the pump E thus serving to preserve the very greatest desirable degree of vacuum at the exhaust steam-side of the piston of engine A. At the same time the pump G is in operation, and the exhaust of the two pumps E and G is being thrown into the condenser and heater J where it is acted upon by the jet of water from the nozzle *b* and condensed. The volume of steam thus thrown into the condenser and heater is so great that the resulting water of condensation is of the very highest desirable degree of temperature, and it is in this connection that the advantage of the peculiar form of spatter plate used by me becomes most apparent. The water from nozzle *b*, striking the under side of the plate *c* is deflected upward through the open apex *d* and flows thence downward in a sheet over the upper side of the plate commingling with the steam in the space between the cap and the top of the casing, and finally pouring over the edges of the plate and falling upon the filtering bed, where it is purified. Thus the steam is very rapidly condensed and the water of condensation at a high temperature, and thoroughly purified, is pumped into the boiler by the pump G.

It will be seen that the arrangement is such that the condensation of steam does not affect the vacuum at the steam side of the piston; the two operations being entirely distinct and independent of each other. The slight waste of fuel which results from the discharge of the condensed exhaust from the receiver is rendered wholly inappreciable by the great saving of fuel which is effected by the high temperature of the feed-water supplied to the boiler by the pump G. I wish it to be understood that other than the precise type of condenser, heater and purifier, herein described, may be used, if preferred, but as a very rapidly acting condenser is necessary, the form described is the best for this and analogous requirements.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. The combination with a steam-engine steam-cylinder, of a main steam supply pipe, a condenser, an exhaust pipe leading directly from the cylinder to the condenser, a cold water pipe leading directly into said condenser and mingling with the exhaust steam therein, a steam pumping engine, a pipe connecting the last named condenser with the condensing end of said pumping engine, a steam supply pipe leading to the steam end of the said pumping engine, a second pump wholly independent of, and disconnected from, the first named steam pumping engine, a steam supply pipe leading to said second pump, an independent condenser and heater, an exhaust pipe leading from the steam end of said pumping engine to said condenser and heater, an exhaust pipe leading from the said second pump to the last named exhaust pipe, a feed-water pipe leading from said second pump to the boiler, a suction pipe leading from the said condenser and heater to the said second pump, a cold water pipe leading into the interior of said condenser and heater, and terminating in a spraying nozzle, and a conical spatter-plate located within said condenser and heater above said spraying nozzle, substantially as set forth.

2. An improved condenser and heater for feed-water apparatus, comprising a casing having a tightly closed top, a perforated false-bottom forming a well beneath it, a bed of filtering material resting on said false bottom, a pipe leading from said well, an exhaust pipe projecting vertically above the false bottom and above the filtering material resting thereon, a cold water inlet-pipe leading into the casing and terminating in a spraying nozzle above and in line with the exhaust pipe, a conical spatter-plate located above the said spraying nozzle, and having an open apex, and a blow-off valve in the top of the said casing, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand, at Sheboygan, in the county of Sheboygan and State of Wisconsin, in the presence of two witnesses.

WILLIAM H. BURK.

Witnesses:

JULIUS KROOS,
GEO. ENDY.