(No Model.)

H. T. LITCHFIELD & D. RENSHAW.

UTILIZING EXHAUST STEAM.

No. 260,034. Patented June 27, 1882.

FIG. 1.

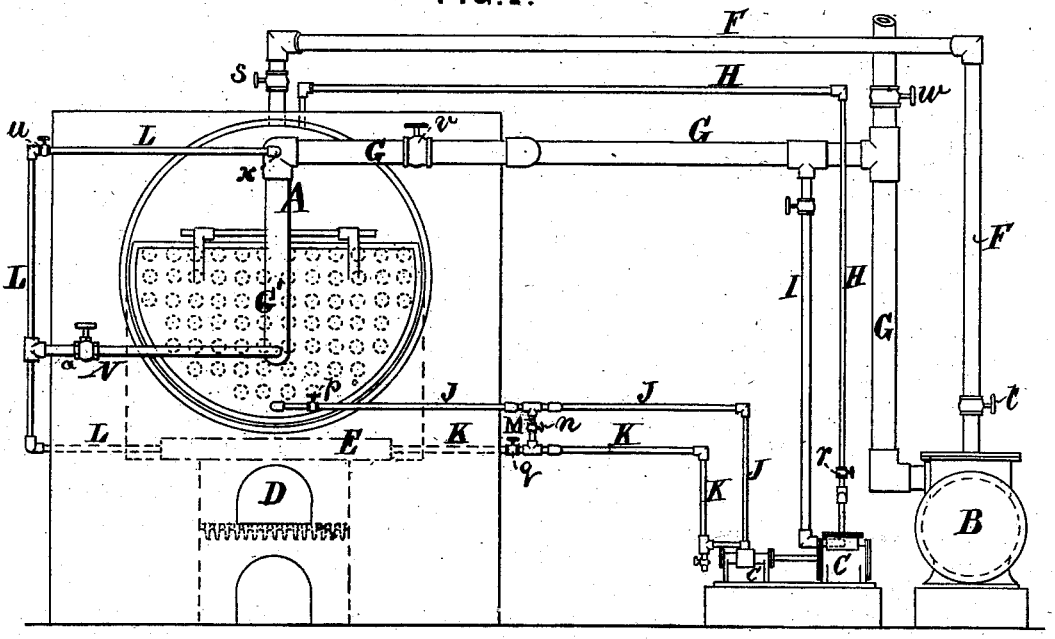
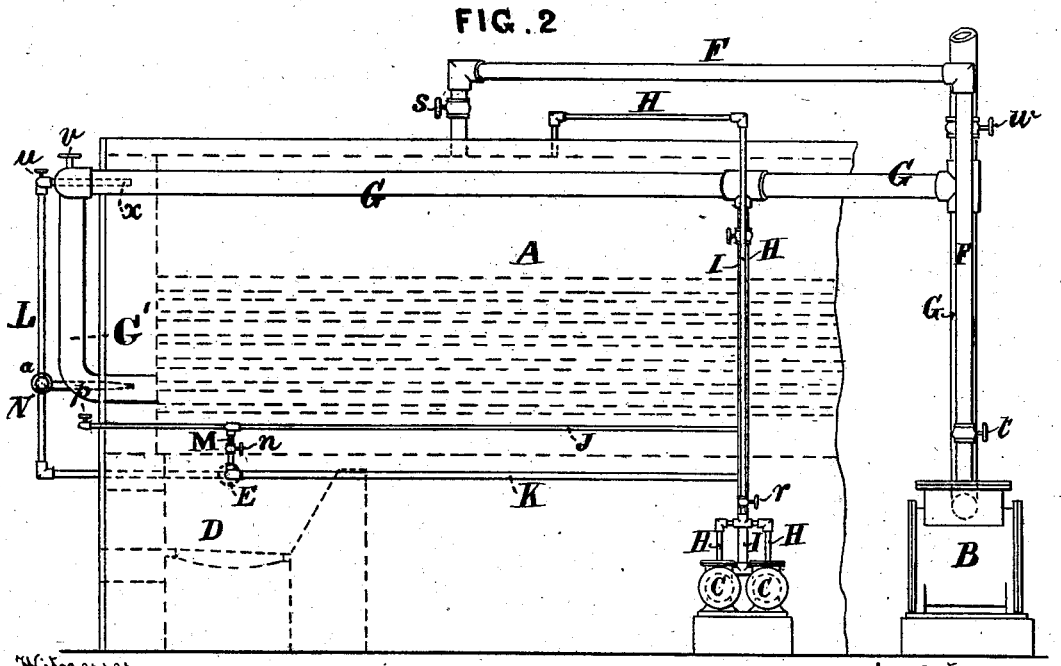


FIG. 2.



Witnesses
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UNITED STATES PATENT OFFICE.

HARVEY T. LITCHFIELD, OF HULL, AND DAVID RENSHAW, OF COHASSET, MASSACHUSETTS.

UTILIZING EXHAUST-STEAM.

SPECIFICATION forming part of Letters Patent No. 260,034, dated June 27, 1882.

Application filed August 4, 1881. (No model.)

To all whom it may concern:

Be it known that we, HARVEY T. LITCHFIELD, of Hull, county of Plymouth, and DAVID RENSHAW, of Cohasset, in the county of Norfolk, and both of the State of Massachusetts, have invented a new and useful Improvement in the Process of Utilizing Exhaust-Steam, of which the following is a specification.

The object of our invention is to force the exhaust of an engine into the boiler from which it was taken without "condensation" or "partial condensation." Its further object is to create within the boiler a circulation of the water by the induction of a forced body of heated water and the steam of the exhaust.

It consists in the process hereinafter described—that is to say, pumping hot water from a boiler, then forcing it through an "add-heater," where it is surcharged, then through a nozzle, where it is brought in contact with the exhaust of an engine, and by its velocity and momentum the combined water and steam are forced into the boiler.

It further consists in drawing the water from a boiler, under pressure, by mechanical means, forcing it through and retarding it in an add-heater, then forcing it through a nozzle, where it comes in contact with the exhaust of an engine and injects it into the water of the same boiler from which it was taken.

It further consists in minor details of construction and arrangement, as will more fully hereinafter appear.

Referring to the drawings, Figure 1 illustrates partly a side and partly an end elevation; Fig. 2, a side elevation, showing the various connections.

A is the boiler. B is the engine, and C is the pump. D is the furnace; E, the add-heater; F, the live-steam pipe, and G the exhaust-pipe; H, the steam-pipe to the pump; and I, the exhaust of the pump, communicating with the exhaust-pipe of the engine; J, the feed-pipe from the boiler to the pump; K, the pipe leading from the pump to the add-heater into the exhaust-pipe G; M, a pipe connecting pipes J and K; N, the lower injection-pipe, when such is desired to be used in connection with the lower end of the exhaust-pipe, as shown at G'. We prefer to use the lower injection-pipe, for the reason that when the water and steam are forced into the boiler through the water a rapid circulation of the water in the boiler ensues.

If preferred, the water may be pumped from one end of the boiler and, with the exhaust-steam, be injected into the other end, thus creating a circulation through the boiler from one end to the other.

All the various pipes and conduits are provided with valves for regulating the flow through them, the object of which is well known.

The following is the method of operation: Steam is generated to the required pressure. The pump is then put in operation. The water drawn from the bottom of the boiler is then "add-heated" and afterward forced into the same boiler. The engine is now started, and the exhaust therefrom meets the injection-water from the pump, and by the velocity and momentum of the water is forced into the boiler. To prevent the add-heater from burning while steam is being raised in the boiler, circulation is kept up through it by opening cocks *n q* and *u* or *a*. When the pump is set in motion the cock *n* is closed.

The mechanical means for drawing, pumping, and forcing the water are so arranged as to give any desired pressure, force, and velocity to the water entering the boiler.

Having now described our invention, its construction, and operation, what we claim as new, and desire to secure by Letters Patent, is—

1. The process herein described of drawing the water from a boiler under pressure by mechanical means, forcing it through an add-heater, then forcing it through a nozzle, when it comes in contact with the exhaust of an engine and forces it into the boiler.

2. The combination, in an apparatus for utilizing exhaust-steam, of the pump, the add-heater, the water-pipes and nozzle, and the exhaust-pipe of the engine with the boiler, whereby the water from the same boiler is

made to force the exhaust of the engine into said boiler, substantially as set forth and described.

3. The combination, in an apparatus for utilizing the exhaust-steam, of the boiler A, engine B, pump C, add-heater E, and water-pipes J, K, M, and L with the exhaust-pipe G, substantially in the manner shown and described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HARVEY T. LITCHFIELD.
DAVID RENSHAW.

Witnesses:
J. H. ADAMS,
B. O'HARA.