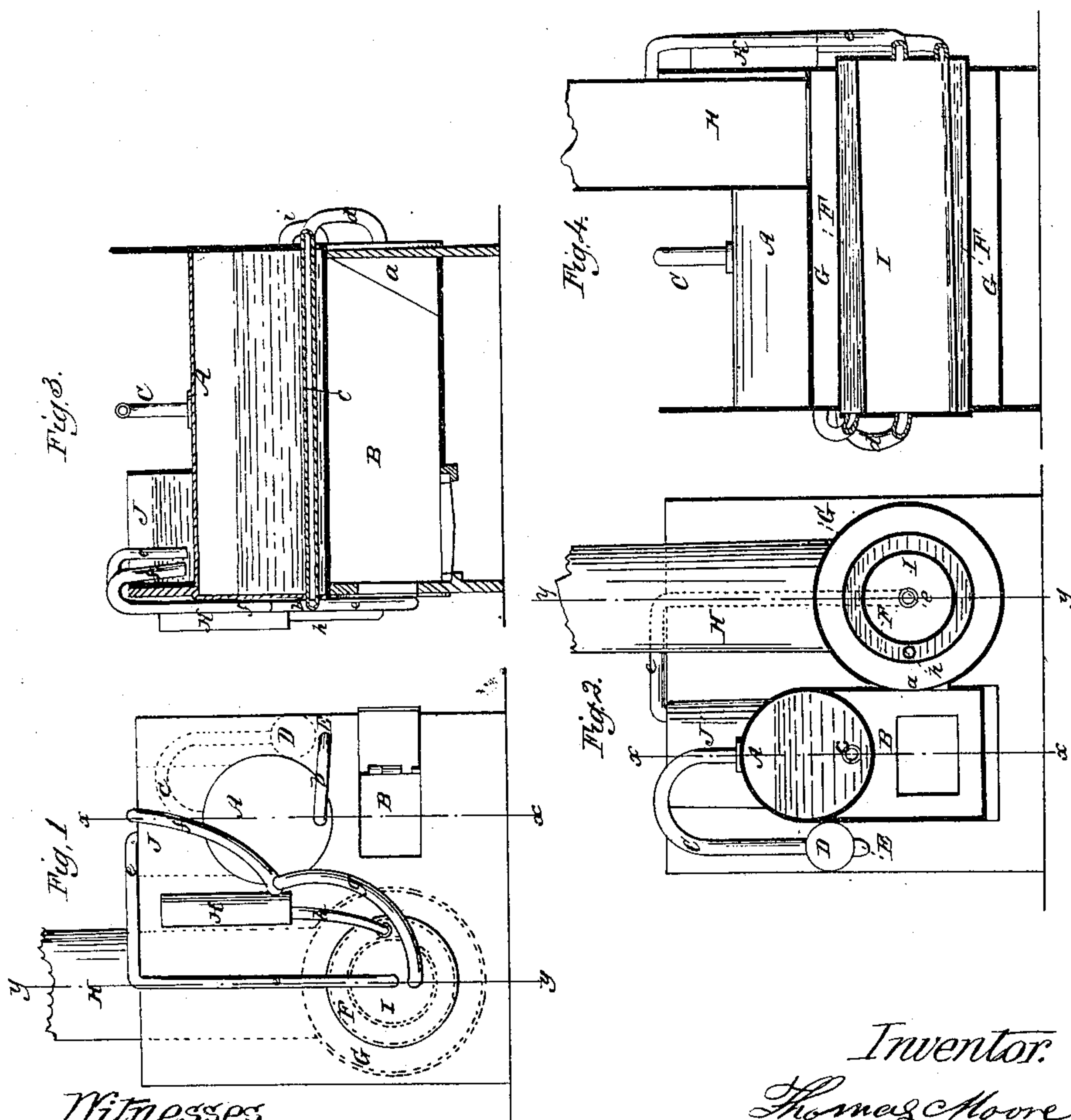


T. MOORE.

APPARATUS FOR GENERATING STEAM.

No. 25,907.

Patented Oct. 25, 1859.



Witnesses.
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THOMAS MOORE, OF MINNEAPOLIS, MINNESOTA.

APPARATUS FOR GENERATING STEAM.

Specification of Letters Patent No. 25,907, dated October 25, 1859.

To all whom it may concern:

Be it known that I, THOMAS MOORE, of Minneapolis, in the county of Hennepin and State of Minnesota, have invented a new and
5 useful Improvement in Apparatus for Generating Steam for Steam Engines or other Uses; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this
10 specification, in which—

Figure 1, is a front view of a boiler and apparatus connected therewith illustrating my improvement in its simplest form. Fig.
15 2, is a vertical section of the same in a plane parallel with Fig. 1. Fig. 3, is a vertical section in the plane at right angles to Figs. 1, and 2, indicated by the line *x, x*, in those figures. Fig. 4 is a vertical section in the
20 plane, parallel with Fig. 3, indicated by the line *y, y*, of Figs. 1 and 2.

Similar letters of reference indicate corresponding parts in the several figures.

My invention consists in the employment
25 in connection with a steam boiler and a steam engine or other apparatus in which steam is used, of a certain system of pipes and vessels hereinafter described, whose object is the condensation of the whole of the
30 exhaust steam of the engine or other apparatus for the purpose of returning the water of condensation to the boiler, and saving the whole of the latent heat of said steam.

35 To enable others skilled in the art to make and use my invention I will proceed to describe its construction and operation.

40 A, is a boiler which may be of any known form, with a fire place B, below. C, is the steam pipe for supplying steam to a steam engine D, or other apparatus in which the steam is to be used and E, is the exhaust pipe from the said engine or apparatus.

45 F, is a heater of cylindrical form, arranged some distance below the boiler at one side thereof, and surrounded by a cylindrical jacket G, into which the waste gaseous products of combustion, escaping from
50 under the boiler, are admitted by an opening *a*, near the back end of the boiler and from whence they escape into the chimney H, which is situated on the top of and near the front of the said jacket. Inside of the
55 said heater F, is a condenser I, surrounded by the water in the said heater. This condenser is connected at one end with the ex-

haust pipe E, by a pipe *b, c, d*, the part *c*, of which passes longitudinally through the water in the boiler, and the said condenser has connected with its opposite end a pipe *e*,
60 which opens into an open tank J.

K, is the force pump for supplying the boiler, having two section pipes *f*, and *g*, the latter of which is for taking water from the tank J, and the former from the bottom
65 of the condenser I, and having its discharge or feed pipe *h*, connected with the heater F, which is connected with the boiler by a pipe *i*, (Fig. 3). The two suction pipes should each be provided with a separate cock that
70 either may be opened or closed independently of the other one.

The operation of the apparatus is as follows: At starting, the boiler is filled with water to a desirable level; and the heater F,
75 which is below the boiler and has its communication therewith by the pipe *i*, always open, is entirely filled. The tank J is also filled with cold water. On the fire being
80 lighted, steam is raised in the boiler to operate the engine or other apparatus while the water in the heater, which is only heated by the escaping products of combustion, is comparatively cool. On the engine or
85 apparatus being set in operation the exhaust steam passes through the pipe *b, c, d*, and a portion is condensed by the loss of heat abstracted from it by the water in the boiler, but runs down along with the greater
90 uncondensed portion into the condenser I, where a very considerable portion of it is condensed, by the heat abstracted by the cooler water in the surrounding heater F. What is not condensed in the condenser I,
95 escapes by the pipe *e*, into the water in the tank J, where it is intended to be condensed. The water for feeding the boiler is drawn at a temperature just below the boiling
100 point from the condenser I, while any remains therein and the additional quantity is obtained at a temperature very little lower from the tank J, and it is delivered into the heater F, by the force pump and from
105 thence, by the circulation produced therein partly by the pump and partly by the generation of steam therein is delivered to the boiler. The water in the heater receives heat both from the escaping gaseous products of combustion in the jacket G, and
110 from the steam in the condenser, and so, not only is it heated to the boiling point before passing into the boiler, but a consid-

erable quantity of steam is generated therein.

By this apparatus, it will be understood that all the latent heat of the exhaust steam is saved by employing it to heat the feed water on its way to the boiler and the same water used over and over again thus not only economizing fuel very greatly by using all the latent heat to heat the feed water but supplying the boiler with purified water and preventing incrustations. No cold water has to be heated except a small quantity which has to be supplied from time to time to the tank to supply the slight loss by leakage and escape from safety valve which is unavoidable.

I have represented the apparatus in its simplest form that is to say with only one heater F, and contained condenser I, but it may be desirable or even necessary to use two or more such heaters and condensers, steam escaping from one condenser to another before the final escape to the tank and the water passing from the tank through one heater after another to the boiler in the opposite direction, the water getting hotter and hotter as it approaches the boiler and the steam being more and more condensed as it approaches the tank. I would not however generally employ the escaping products of combustion on more than one heater as the draft of the fire place might be thereby too much interfered with.

I do not claim effecting the condensation of the whole of the exhaust steam and re-

turning the water of condensation to the boiler as that has been done in connection with steam engine boilers with the almost entire loss of its latent heat in surface condensers and has also been done in connection with boilers for heating buildings. Neither do I claim of itself the heating of the feed water by the escaping exhaust steam. But

What I claim as my invention and desire to secure by Letters Patent is—

The employment in combination with a steam engine or other apparatus in which steam is used and the boiler which supplies it of a system or arrangement of one or more condensers and heaters with connecting pipes and a tank whereby the exhaust steam after passing along a pipe running through the boiler itself is condensed by delivering up its remaining latent heat to water which after having been previously condensed in the same manner is on its way back to the boiler, and whereby the water obtained by the condensation of the exhaust steam is heated on its way back to the boiler and partly converted into steam again by the combined agencies of the latent heat it absorbs from the escaping steam and by the heat it absorbs from the escaping waste products of combustion substantially as herein described.

THOMAS MOORE.

Witnesses:

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OLIVER C. GRAY.