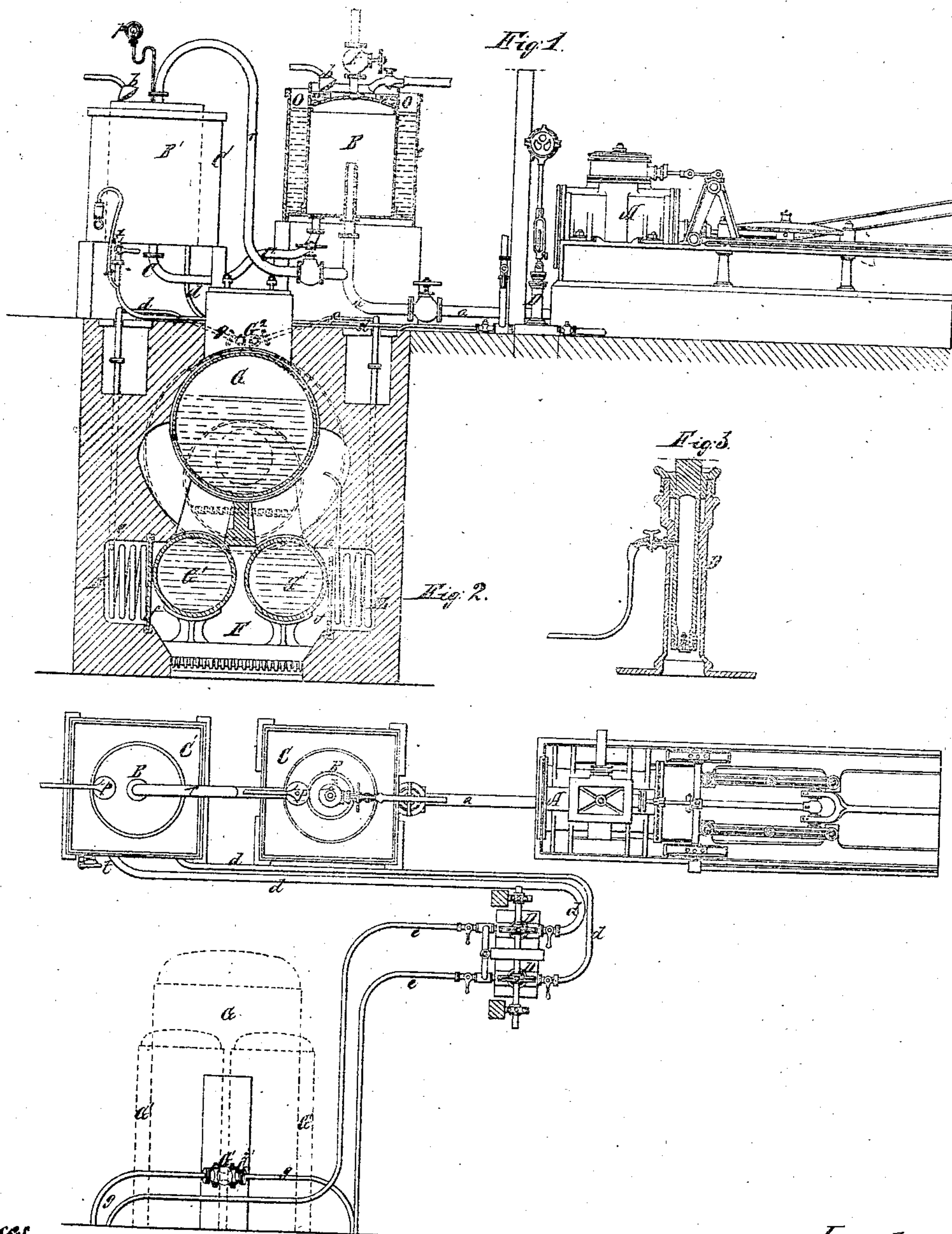


F. Datichy,
Steam-Boiler Water-Feeder,

N^o 27,532.

Patented Mar. 20, 1860.



Witnesses

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UNITED STATES PATENT OFFICE.

FLORIMOND DATICHY, OF PARIS, FRANCE.

APPARATUS FOR REWORKING THE WASTE STEAM OF STEAM-ENGINES.

Specification of Letters Patent No. 27,532, dated March 20, 1860.

To all whom it may concern:

Be it known that I, FLORIMOND DATICHY, now of the city of Paris, in the Empire of France, have made a certain new and useful discovery or Invention for Utilizing and Reworking the Exhaust-Steam of Steam-Engines and other Heated Gas or Vapor; and I hereby declare that the following is a full and clear description thereof.

10 The nature of my invention consists in the employment of certain means or apparatus or their equivalents, for utilizing the waste or exhaust steam, heated gas, or vapor, of steam and other engines, in a manner heretofore unknown.

15 By this my invention or improvement, the exhaust steam from a steam engine is made to pass successively into two distinct reservoirs each of which is situated in a tank or cistern containing water that is constantly kept at a temperature different from that of the steam. The exhaust steam is thus or first exposed to a partial condensation, or converted into a misty state when it is acted upon by pumps or suction, and then forced in this state into a "worm" arranged in the flues at or near the fire-chamber of the boiler furnace, where registers or valves are disposed to regulate at pleasure the degree of heat communicated to the "worm" or "worms." At this moment a strong steam jet is injected into the "worm" whereby the tension of the exhaust steam contained in the latter is increased and said steam violently driven or forced into the boiler or boiler tubes where it is utilized or reworked, a vacuum or partial vacuum being at the same time formed in the pump cylinders, and the suction effected by the effect of the steam blast into the worm. Such description will serve to illustrate in a general way how my invention may be carried into practice, and to enable others how to make and use the same.

45 I will now proceed to describe in detail a suitable apparatus for accomplishing it, reference being had to the accompanying drawing in which—

50 Figure 1, represents a vertical view partly in elevation and partly in section of such an apparatus; Fig. 2, a plan view of the same; and Fig. 3, a view of details, detached.

55 The steam generated in the boiler after having performed its duty in the steam cylinder (A) of an engine, is passed through

a pipe (a) into a cylindrical reservoir or chamber (B). This reservoir or chamber is situated in a square tank or cistern (C) containing or filled with water kept at a constant temperature of about 85 degrees centigrade. To maintain or regulate this temperature, steam and cold water are used, the former being passed directly from the boiler, and the latter being supplied and diffused by a water sprinkler (b) which is connected with the feed pipe of the boiler. This sprinkler is arranged so as to cause the water to fall in a shower upon the upper surface of the reservoir (B) and from thence to pass through the orifices (o) into the cistern (C). By this means not only is the water in the tank or cistern kept at a given temperature, but the reservoir itself is preserved from overheating.

75 The exhaust steam upon entering the reservoir (B) will, it is evident, be partially condensed, whereby the exhaust or escape of the steam from the cylinder (A) will be greatly facilitated. This partially condensed steam is next conveyed, by means of a pipe (c) into a second reservoir (B') also surrounded by or situated in a tank (C') like the former reservoir. The water surrounding this latter reservoir (B') is at a temperature somewhat higher than that of the water surrounding the other, say 88 degrees centigrade, or such a temperature that, while it will evaporize such portion of the steam as is more or less liquefied, will constitute a starting point for the overheating or reheating and giving new tension to the exhaust steam. While in this state, the exhaust steam is rapidly drawn from the reservoir (B') and forced into two worms or coils of pipes (E) lodged in the flue near the fire box of the furnace (F). This is done by means of pumps (D) and pipes (c and d) the pumps being geared with and operated by the engine. In these coils the pressure of the steam is considerably increased by the action of the heat to which the coils are exposed, the heat being regulated at pleasure to any degree sufficient to complete the regeneration of the steam, by means of register valves (f) arranged and operating to more or less close the openings between the fire box and the flues, and whereby the contact of the worms with the flame or products of combustion is increased or decreased at pleasure. A steam jet is now introduced from the boiler through the

pipes (*g*) and cocks (*G''*) into the worms or coils. So sudden and extreme a mixture causes the tension of the superheated steam in the coils to be still more increased, and likewise causes said steam to be driven through the tubes (*c'*) into the boiler or boiler tubes (*G'*) and, in so doing, necessarily produces a vacuum or partial vacuum which will clear the pump cylinders and the several tubes connected with them from steam contained in them. In this way the exhaust steam (that was) is returned to the boiler and placed in a condition to be used over again in the steam cylinder (*A*) of the engine as it was originally employed and to do its original duty, after which and when escaping as exhaust steam again, it is passed as before to the apparatus for utilizing and reworking it, and whereby the regeneration of the steam may be indefinitely repeated without much or any material additional expense of fuel or power.

The several tubes or pipes in the apparatus here represented and described, are all, or most of them provided with cocks for regulating the admission and escape or passage of the fluids or vapors they are employed to conduct. The reservoir (*B*) is also provided at its top or dome shaped cover with a pipe and cock (*h*) for the free escape of steam whenever it is necessary to discharge the apparatus after use. When this is done, the working of the pumps being unnecessary, the eccentric operating them is disengaged by merely turning the screws (*m*) which loosens and disconnects the eccentric from the pump rod. A gage (*p*) is used to indicate the extent of vacuum produced in the apparatus and a pipe (*r*) serves to establish direct communication, when required, between the exhaust steam pipe (*a*) and the second reservoir (*B'*) to heat, to the desired degree, the water surrounding it. Another tube (*t*) furnished with a cock, is applied to the apparatus whereby it may be cleansed by merely introducing water instead of steam through the pumps. This is done at the start of the operation, when the boiler is filled and fed by thus forcing water instead of steam direct into the boiler.

When the engine is started, it is necessary to commence by clearing the several pipes and tubes of air that they may contain. For this purpose the plungers of the pumps are made hollow and have at their lower extremities clock valves for the suction of air which is forced through a small tube communicating with the interior and that may be closed by a cock with which it is provided.

Having thus described my invention and the manner in which the same may be carried into effect, I would observe that I do

not confine myself to the particular construction and arrangement of parts herein set forth, as the apparatus admits of numerous modifications or applications without affecting the principle of my invention. Thus, instead of a worm or coil of pipes (*E*) tubes or pipes may be used and arranged longitudinally in flues running against the boiler. The pumps too may be varied in character and number; likewise the reservoirs and their tanks. Air may be substituted for water in the tanks to effect the condensation as described; and the apparatus generally may be applied to engines driven by heated or other gas or vapor than steam.

I claim—

1. The method herein described of utilizing or reworking the exhaust steam or other escaping gas or vapor of an engine, by subjecting it first to a partial condensation and afterward applying heat to evaporate its liquefied products, and then injecting it, after its temperature and elasticity have been increased, in the form of steam or vapor into the boiler, for use over again as specified.

2. The employment of separate reservoirs maintained at different temperatures to receive successively the exhaust steam, gas or vapor of the engine, and operating first to partially condense the steam and afterward to evaporate its liquefied products and to increase its temperature and elasticity prior to its return to the boiler there to be reworked essentially as herein set forth.

3. The employment, in combination with the exhaust steam receiving reservoir or reservoirs above named, of a worm or coil of pipes, or other suitable heater, arranged in close proximity to the boiler furnace, for increasing the tension of the exhaust steam prior to its return in a vaporous form to be worked essentially as herein set forth.

4. Passing the exhaust steam in a vaporous form from its receiving chamber or reservoir to the "worm" or heater, by means of pumps or their equivalents essentially as described.

5. Causing a jet of steam from the boiler or of working pressure to be injected into the "worm" or heater to raise the tension of the exhaust steam, and to drive it into the boiler and control the suction of the pumps employed in supplying the heater with exhaust steam, substantially as herein set forth.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

DATICHY.

Witnesses:

GEO. HUTTON,
S. REINARD.