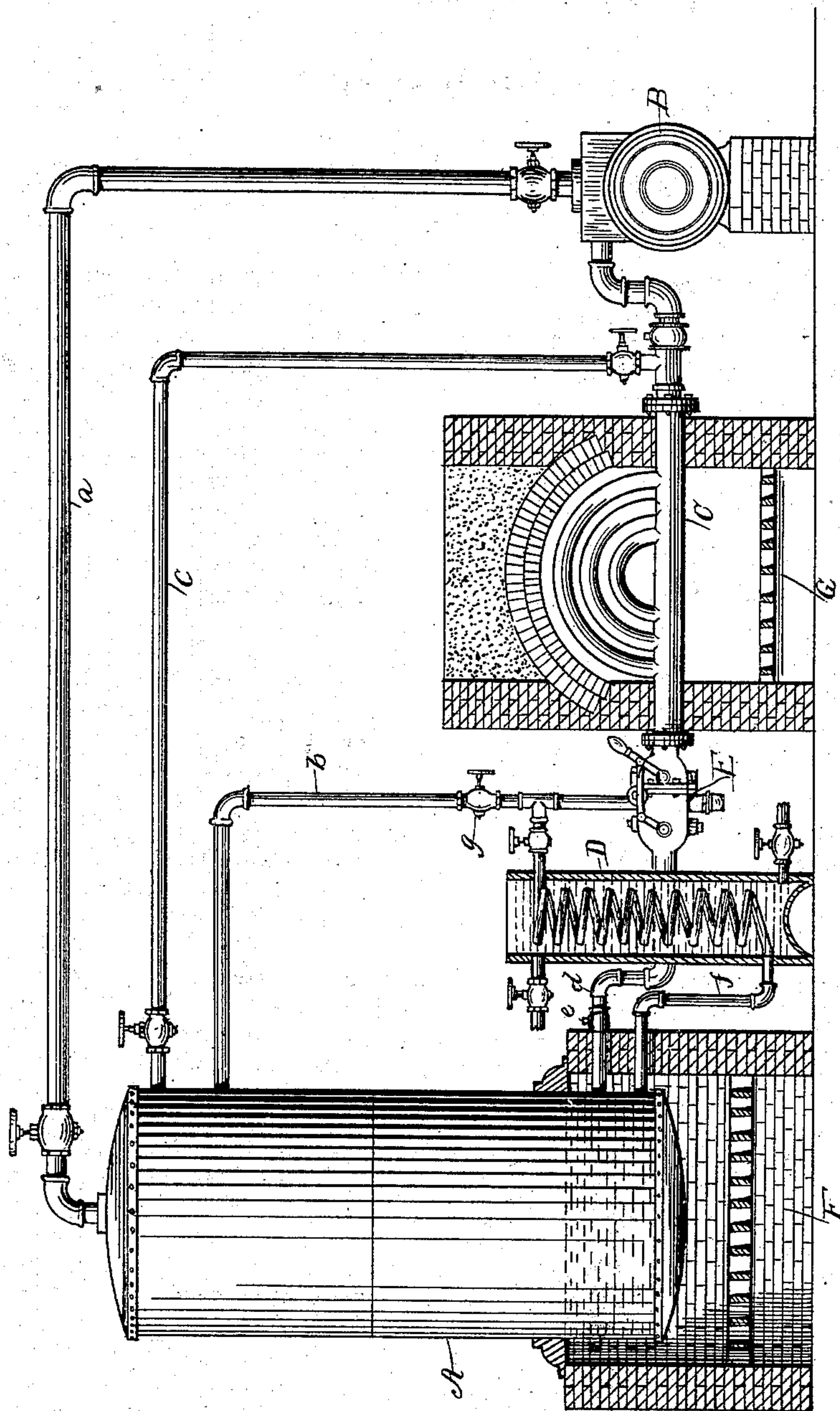


(No Model.)

D. RENSHAW.
UTILIZING EXHAUST STEAM.

No. 274,974.

Patented Apr. 3, 1883.



Witnesses:

J. W. Reynolds, Jr.
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UNITED STATES PATENT OFFICE.

DAVID RENSHAW, OF BRAINTREE, MASSACHUSETTS.

UTILIZING EXHAUST-STEAM.

SPECIFICATION forming part of Letters Patent No. 274,974, dated April 3, 1883.

Application filed January 6, 1883. (No model.)

To all whom it may concern:

Be it known that I, DAVID RENSHAW, of Braintree, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Processes of Utilizing Exhaust-Steam; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawing, and to the letters of reference marked thereon, which form part of this specification.

This invention has for its object the utilization of the exhaust of engines; and it consists in the process of taking direct from the engine its exhaust and first passing it through a superheater, where a high degree of temperature is imparted to it, and then bringing it in contact with water from the boiler whose temperature has been reduced, establishing a partial cooling thereof, by which the high heat of the superheated steam is also reduced, effecting a partial vacuum and adding momentum and velocity to the said superheated exhaust-steam, so that it passes into the boiler from which it was taken upon the principle of the injector; and it further consists in taking the exhaust from the engine and first passing it through a superheater, raising its temperature to a high degree, and then causing it to come in contact with steam of lower temperature, or saturated steam, in an injector, whereby a partial vacuum is effected and its momentum increased, so that it passes into the boiler from which it was originally taken.

Referring to the accompanying drawing, which shows an elevation of the apparatus, A is the boiler, and B the engine.

C represents the superheater, and D the cooling-vessel. E is an injector, which may be of the ordinary construction; but in this instance a double one is preferred.

F and G are furnaces under the boiler and superheaters respectively.

a is the live-steam pipe to the engine, and b the steam-pipe to the injector. It will be observed that the steam passing through pipe b is of much less temperature than the superheated exhaust-steam, so that when the two

steams of different temperatures are brought in contact a partial vacuum, in my opinion, is created, which causes the steam in the vessel of the highest temperature to rush to that of the lowest temperature, and thus form a current from the one to the other, drawing off the exhaust from the engine.

c is a steam-pipe, which may sometimes be used for accelerating the raising of the steam in both the boiler and superheater before the engine is started, communication being had between them through said pipe.

d is a pipe connecting the injector with the water-space of the boiler, which is provided with the usual check-valve at e, and f is a water-pipe from the water-space of the boiler, communicating with injector E below cock g of steam-pipe b. This pipe f is preferably coiled, and the coil located in a cold-water tank, D, through which I prefer to have a circulation. The water in said tank, being somewhat heated by the hot-water pipe passing through it, may be used for any useful purpose. The object of cooling or reducing the temperature of the boiler-water is to partially condense the superheated exhaust as it enters the injector, and thus form a partial vacuum, by which the superheated exhaust is more readily forced into the boiler on the usual injector principle. After a thorough current is established from the superheater to the water-space of the boiler the cooling-vessel may be dispensed with, as the difference of temperature between the superheated exhaust-steam and the water in the boiler will be sufficient to maintain the current from one vessel to the other. The connecting-pipes are all provided with suitable valves for controlling communication between the operating parts.

The operation is as follows: The apparatus being ready for operation, the engine is started and simultaneously therewith the injector. The engine is now exhausting into the superheater, where the exhaust-steam receives an increased degree of temperature on its passage to the injector, which, being at the opposite end of the superheater, the superheated exhaust-steam, with a portion of the water and steam from the boiler, passes into the water-space of the boiler, thus establishing a current

of exhaust-steam from the engine through the superheater to the boiler from which it was taken.

I am aware that methods and processes have been patented for utilizing the exhaust of engines by pumps, water-jets, &c.; but I am not aware that the exhaust of engines has been first introduced into a superheater, its temperature increased beyond that of the live steam in the boiler, and then returned into said boiler by an injector which works under different degrees of temperature.

Having described my invention, and one method of carrying the same into effect, what I claim as new, and desire to secure by Letters Patent, is—

1. The process herein described of utilizing the exhaust of engines by taking it from the engine and first passing it through a superheater, where a high degree of temperature is imparted to it, then conducting it to an injector in which it is brought in contact with water from the boiler whose temperature and pressure have been reduced, causing a partial cooling thereof, thereby causing the su-

perheated exhaust to flow toward and into the boiler on the principle of the injector.

2. The process herein described of utilizing exhaust-steam, consisting in taking the exhaust from the engine and first passing it through a superheater, thereby raising its temperature to a high degree, and then causing it to come in contact with steam of lower temperature, or saturated steam, in an injector, whereby the exhaust passes into the boiler from which it was taken.

3. The combination of means for utilizing the exhaust of engines, consisting of the boiler, the superheater taking steam direct from the engine, and the injecting and cooling devices, substantially as shown, whereby the exhaust of the engine is conveyed back to the boiler from which it was taken, as described.

In testimony that I claim the foregoing as my own invention I affix my signature in presence of two witnesses.

DAVID RENSHAW.

Witnesses:

B. F. MORSELL,
EUGENE D. CARUSI.