

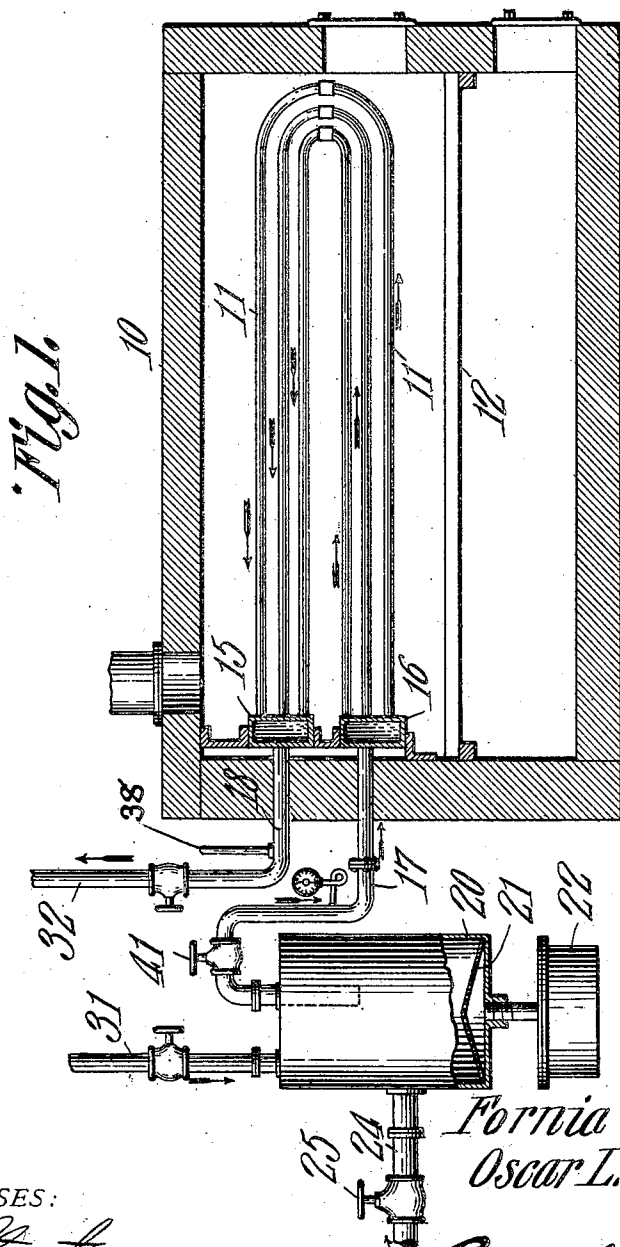
No. 886,044.

PATENTED APR. 28, 1908.

F. DRAPER & O. L. CURTISS.
EXHAUST STEAM REGENERATOR.

APPLICATION FILED AUG. 9, 1907.

2 SHEETS—SHEET 1.



WITNESSES:

E. H. Stewart
Jno E. Parker

Fornia Draper AND
Oscar L. Curtiss
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By *C. A. Snow & Co.*
ATTORNEYS

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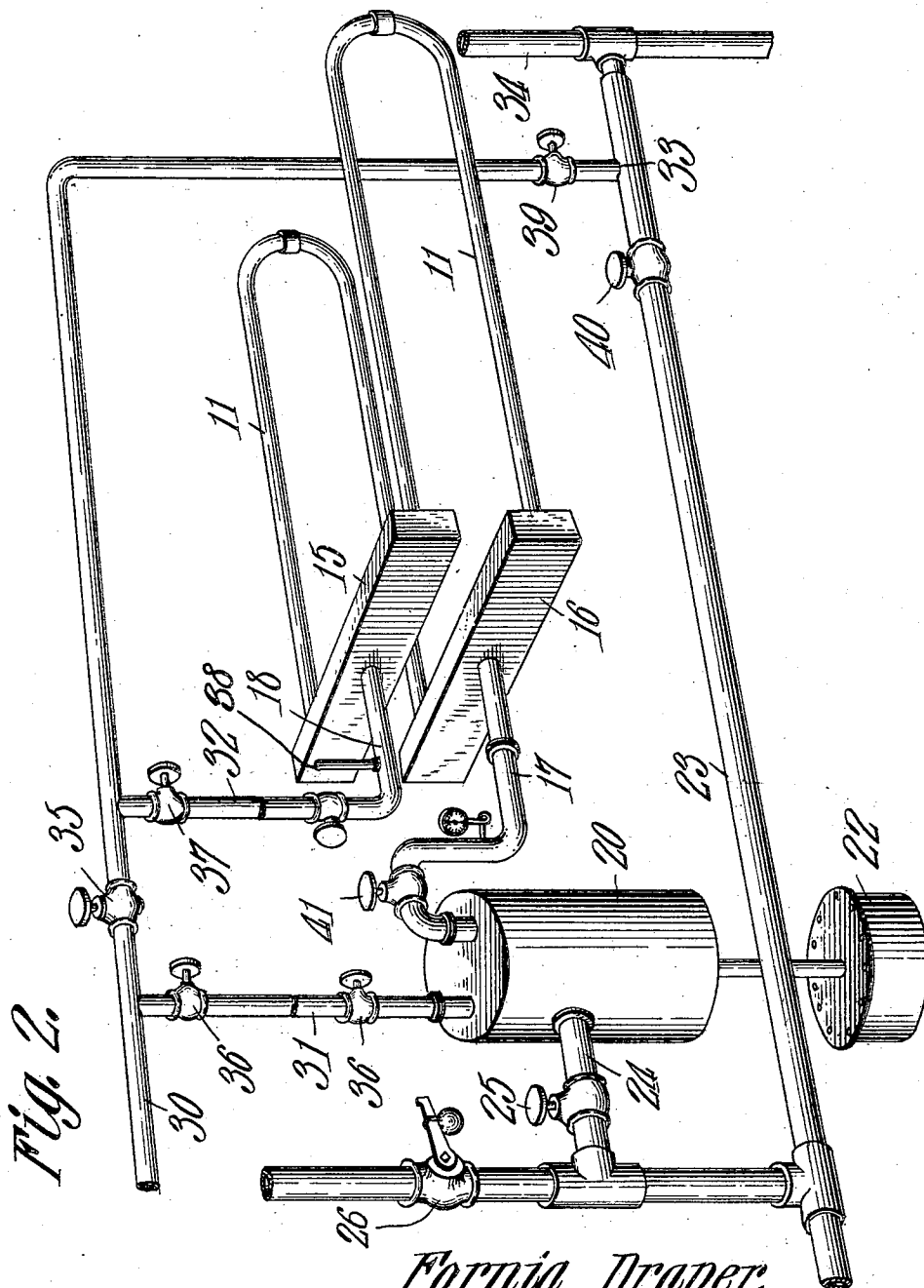


Fig. 2.

WITNESSES:

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UNITED STATES PATENT OFFICE.

FORNIA DRAPER AND OSCAR L. CURTISS, OF CAYUGA, INDIANA.

EXHAUST-STEAM REGENERATOR.

No. 886,044.

Specification of Letters Patent.

Patented April 28, 1908.

Application filed August 9, 1907. Serial No. 387,884.

To all whom it may concern:

Be it known that we, FORNIA DRAPER and OSCAR L. CURTISS, citizens of the United States, residing at Cayuga, in the county of Vermilion, State of Indiana, have invented a new and useful Exhaust-Steam Regenerator, of which the following is a specification.

The principal object of the present invention is to provide a novel apparatus for raising the temperature of steam for cooking and other purposes.

A further object of the invention is to provide a novel form of apparatus wherein the exhaust steam is mingled with live steam from the boiler and partly dried and heated, after which the mixed volumes of steam are passed through a superheater.

A still further object of the invention is to provide for the heating of exhaust steam or live steam to be used for heating purposes or for running an engine at a distance, the steam being dried and its temperature materially increased to lessen condensation.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts, hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings:—Figure 1 is a sectional elevation of a steam regenerating apparatus constructed in accordance with the invention. Fig. 2 is a perspective diagram of the same.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

In the drawings, 10 designates a furnace in which are arranged superheating coils 11, the latter being disposed above grate bars 12 or other fuel supporting or supplying means, any suitable provision being made for effecting the circulation of the products of combustion around the superheating coils for the purpose of raising the same to a high temperature.

The coils are all approximately U-shape and are connected to upper and lower headers 15 and 16, the steam entering the lower

header through a pipe or pipes 17 and after passing through the coils, escaping from the header 15 through a pipe 18 by which it is conducted to the engine or other point where its heat or pressure is to be again utilized. These headers 15 and 16 are preferably arranged to receive the ends of a large number of tubes which make up the superheater, there being three separate series of tubes shown in the present instance.

In front of the furnace is a steam mixing box 20 that preferably is in the form of a vertically disposed tank having a perforated disk 21 at the bottom, and the bottom of the tank is connected to a steam trap 22 of any ordinary construction, and through which the water of condensation is automatically discharged. The exhaust steam pipe 23 leading from the engine or other mechanism is connected to one side of the steam mixing box 20 through a valved branch pipe 24, this pipe having a suitable valve 25 for the purpose of controlling the flow of steam, and leading from the steam pipe is a pressure opened discharge valve 26 which will be moved to open position in case the pressure becomes too great.

Leading from the steam boiler is a main steam pipe 30 which is connected by a branch pipe 31 to the upper portion of the steam mixing box 20, and by a pipe 32 to the upper header 15. This pipe 30 is, also, connected at 33 to the exhaust pipe 23, and from this connection leads a pipe 34 through which the steam may pass to the engine or engines, as desired.

Arranged in the main steam pipe at a point between the two connecting pipes 31 and 32 is a valve 35, and in the branch pipes 31 and 32 are valves 36 and 37, respectively, so that when necessary the valves 36 and 37 may be closed and the valve 34 opened in order to permit the flow of steam toward the point 33. Two valves are employed in each of the branch pipes 31 and 32, the uppermost valves being fully open or fully closed to control the flow of steam in connection with the valve 35, while the lowermost valves serve as regulating valves to govern the quantity of steam passing. Near this connection 33 the main steam pipe is provided with a valve 39 and the exhaust pipe has a valve 40, so that by closing the valve 40 and opening the two valves 35 and 39, the steam may pass direct from the boiler to the point of consumption.

The pipe 17 which connects the steam mixing box 20 to the lower header 16 is provided with a valve 41 by which the passage of steam from the mixing box to the lower header may be controlled.

Under normal conditions the valves 35 and 40 will be closed and steam from the engine will pass through the pipes 23 and 24 into the steam mixing box 20. The steam from the boiler will pass down through the pipe 31 into the box 20 and when mingled with the exhaust steam will partly dry and raise the temperature of the exhaust steam, and while in the mixing box the water of condensation is free to separate from the steam by gravity and to flow down to the trap 22. The mingled live and exhaust steam passes through the pipe 17 into the lower header 16, and thence through the coils of tubes 11 of the superheater to the upper header 15, the steam becoming highly heated while passing through the superheater and thence passing through the pipe 32 and main steam pipe 30 to the distributing or service pipe 34.

Where only a small quantity of the boiler steam is to be used, the valve 36 may be partly closed or where but a small quantity of the exhaust steam is to be used, the valve 35 will be partly closed and the surplus being allowed to pass off through the valved outlet 26. If a portion of the steam is to pass direct from the boiler to the header and another portion is to pass to the superheater, both valves 36 and 37 are opened.

The pipe 18 is preferably provided with a thermometer 38 in order that the temperature of the steam may be determined.

It is found in practice that considerable saving of fuel may be effected by regenerating the steam instead of allowing it to condense and then pumping it back into the boiler, and it will be understood that in some cases the superheating coils may be placed

in the main boiler furnace, or if desired, they may be placed within a separate furnace, as described.

We claim:—

1. In apparatus of the class described, a superheater, an exhaust and live steam mixing chamber having pipe connection with the inlet side of said superheater, an exhaust steam pipe and a live steam pipe both connected to said chamber, said exhaust steam and live steam pipes being equipped with valves for controlling the supply of exhaust and live steam to said mixing chamber and superheater, respectively, and said live steam pipe having a pipe connection with the outlet side of said superheater, with controlling valves, as herein set forth.

2. In apparatus of the character described, a steam superheater, a tank connected to the inlet side of said superheater, an exhaust pipe connected to said tank, a live steam pipe having branches, one connected to said tank and the other connected to the discharge side of said superheater, a valve arranged in the main steam pipe at a point between said branch connection, a set of independent valves arranged in said branches, a pipe connecting the main steam pipe with a distributing pipe connecting with the engine, an exhaust steam pipe connecting with the main steam pipe and the distributing pipe, and a second set of independent valves arranged in said live steam and exhaust pipes adjacent to such point of connection.

In testimony that we claim the foregoing as our own, we have hereto affixed our signatures in the presence of two witnesses.

FORNIA DRAPER.
OSCAR L. CURTISS.

Witnesses:

JOHN PERRY,
FRANK HOLD.