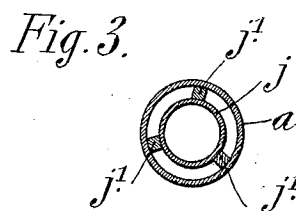
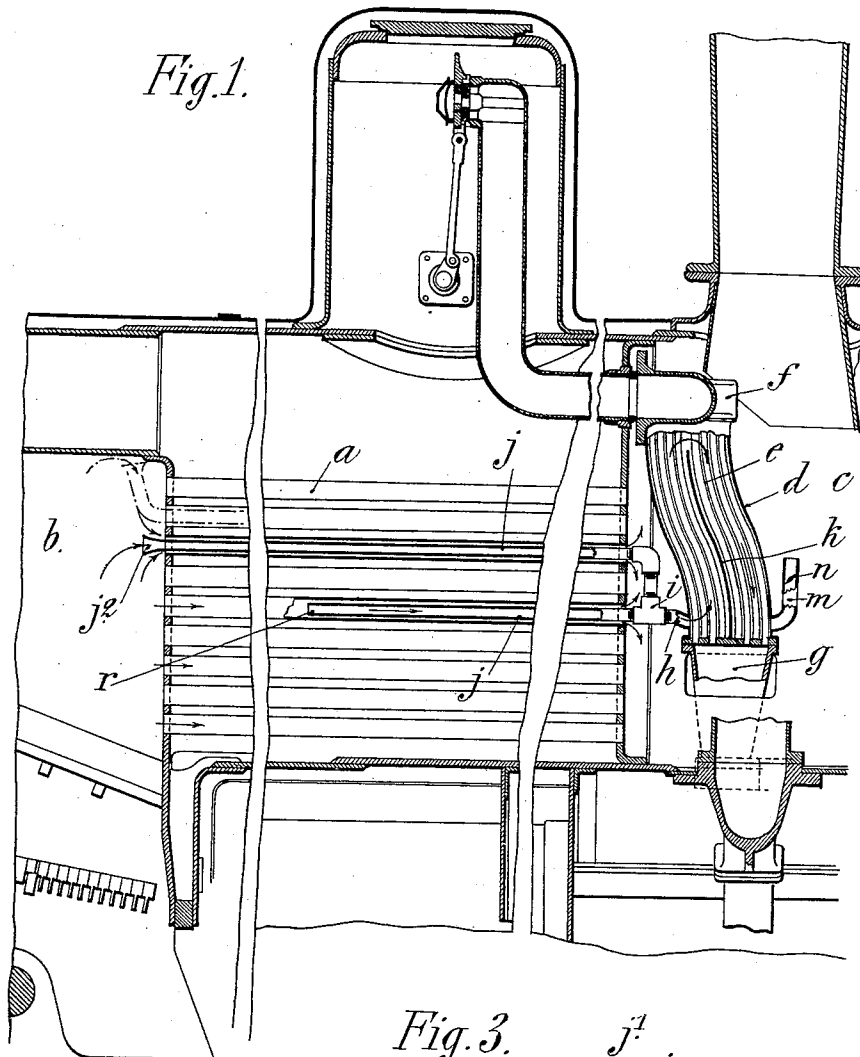


C. CAILLE.
 SUPERHEATER FOR STEAM BOILERS.
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1,057,705.

Patented Apr. 1, 1913.

2 SHEETS—SHEET 1.



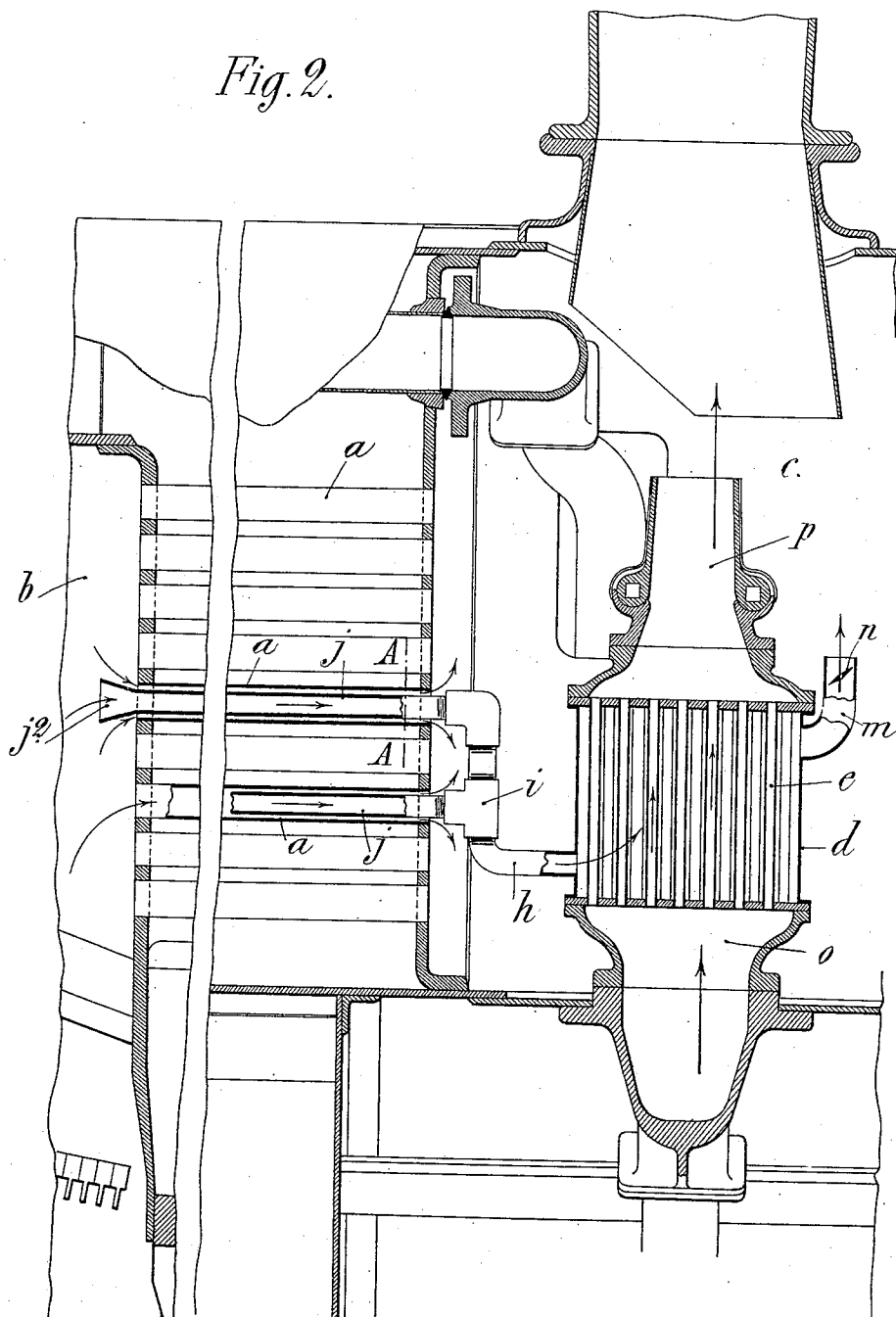
WITNESSES;

John C. Sanders
John A. Lencival

INVENTOR;

Charles Caille
 BY *Wm. M. Mullan*
 ATTORNEY

Fig. 2.



WITNESSES:

John C. Sanders
John A. Percival.

INVENTOR:

BY Charles Caille
Attorney

UNITED STATES PATENT OFFICE.

CHARLES CAILLE, OF LEPPERREUX, FRANCE.

SUPERHEATER FOR STEAM-BOILERS.

1,057,705.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CHARLES CAILLE, citizen of the Republic of France, residing at 24 Rue de la Gaite, Leperreux, Seine, France, have invented new and useful Improvements in Superheaters for Steam-Boilers, of which the following is a specification.

This invention relates to a device for facilitating, with locomotive and other tubular boilers, the raising of the temperature of motive-power steam, exhaust steam or feed-water.

This apparatus is applicable more particularly to re-heating or superheating contrivances placed in the smoke boxes of tubular boilers.

Devices are known by which a part of the flames or the hot gases of the fire-box is directed to the smoke box for the reheating of the superheater.

In the known devices, the tubes, conducting this part of the heating gas, are formed either by a number of tubes of the boiler tube nest or by tubes set into the tubes of the nest, the latter being absolutely isolated and not subjected to the direct influence of the hot gases.

According to the present invention, the tubes, conducting the hot gases to the superheater, are inserted concentrically in the smoke tubes of the boiler and extend on one end in the fire box and on the other end in a pipe connected to the reheating apparatus (superheater of the working steam or the exhaust steam, or reheater of the feed water). But they allow free entrance or exit of the gases in the annular space between their exterior surface and the interior surface of the smoke tubes, in such manner that a part of the gases passes in the smoke tube, reduced in its annular section, and another part is diverted toward the superheater by the central tube. The total section is only reduced by the thickness of the central tube and the hot gases still act upon the smoke tubes proper of the boiler. In fact, there is utilized a central current of the hot gases, the heat of which would otherwise be lost, and it is utilized without reducing the effect of the peripheral current upon the walls of the smoke tube.

Figures 1 and 2 of the annexed drawing show, as representative examples, the in-

vention applied respectively to a superheater for motive-power steam and a reheater for exhaust steam. Fig. 3 is a cross section on a larger scale taken along A—A of Fig. 2.

In Figs. 1 and 2, *a* represents the fire-tubes of a locomotive boiler of which *b* is the fire box and *c* the smoke box. In Fig. 1, *d* is the casing of a motive-power steam superheater. This superheater, located in the smoke box, is, in a known manner, composed of a plurality of tubes *e* connected at their upper ends to an inlet collector *f*, and at their lower ends to an outlet collector *g* connected to the cylinders of the engine. Into the casing *d* debouch one or more pipes *h*, to which are connected by suitable junction-elements *i*, tubes *j*, which conduct hot gases. These tubes *j* are supported concentrically within the fire tubes *a* and are held in place near their ends by feathers *j'* (Fig. 3) formed thereon. The ends of the tubes *j*, which open into the fire-box, are preferably, extended and widened out, as shown at *j''*, Figs. 1 and 2; these trumpet shaped extensions may in practice be covered with refractory material, cement or other substance non-conductive of heat. This covering may extend over a certain length toward the smoke-box of the portions of the tubes *j* situated in the interior of the fire-tubes.

As shown in dot-dash lines in Fig. 1, the mouths of the tubes may be bent upward toward the crown of the furnace in order to keep the said tubes as far as possible free from particles of unburnt coal. A well known collector for preventing the entry of such particles may be supported between the tubes *j* and the pipes *i*.

The flame and the hot gases taken from the fire-box circulate simultaneously in the tubes *j* and in the annular space formed between the latter and the fire-tubes *a*. The gases diverted to the tubes *j* reach the reheating contrivance *d* by means of the junction elements *i* and the pipes *h*.

The evacuation of the gases after their circulation which is directed by means of partial partitions *k* takes place through a pipe *m*. In the latter, a valve *n* can be fitted adapted to be actuated from outside by means of any suitable connection.

In Fig. 2 the invention is shown applied to a reheater for exhaust steam having for its object the avoidance of the spraying of

condensed steam: *d* represents the casing of the plurality of tubes *e* in which the exhaust steam admitted at *o* and exhausted at *p* circulates. The gases and flame taken from the fire-box are, as in the preceding example conducted by tubes *j* supported concentrically to the fire tubes *a* and evacuated through the pipe *m*.

It is evident that water could be circulated through a group of tubes *e*, arranged as in Figs. 1 and 2 and suitably connected to a source of feed water, and subsequently delivered to the boiler.

The tubes *j* which conduct the diverted hot gases, instead of reaching as far as the fire-box, may have their ends within the tubes *a*, as shown at *r* in Fig. 1 in the case of one of these tubes.

I claim:

1. In apparatus of the class described, in combination, a fire box, a smoke box, fire tubes extending between and communicating with said boxes, a heater within said smoke box and comprising a casing and a tube communicating with said casing and extending within one of said fire tubes, said second mentioned tube being open at both of its ends whereby hot gases from the fire box will pass through said second mentioned tube and into said casing.

2. In apparatus of the class described, in combination, a fire box, a smoke box, fire tubes extending between and communicating with said boxes, a heater within said smoke box and comprising a casing and a tube communicating with said casing and extending within one of said fire tubes, said second mentioned tube being open at both of its ends whereby hot gases from the fire box will pass through said second mentioned tube and into said casing, said sec-

ond mentioned tube being of smaller diameter than the fire tube into which it extends.

3. In apparatus of the class described, in combination, a fire box, a smoke box, fire tubes extending between and communicating with said boxes, a heater within said smoke box and comprising a casing and a tube communicating with said casing and extending within one of said fire tubes, said second mentioned tube being open at both of its ends whereby hot gases from the fire box will pass through said second mentioned tube and into said casing, said second mentioned tube being spaced from the inner wall of the fire tube into which it extends, whereby hot gases from the fire box will pass therefrom to the smoke box through the space between the tubes.

4. In apparatus of the class described, in combination, a fire box, a smoke box, fire tubes extending between and communicating with said boxes, a heater within said smoke box and comprising a casing and a tube communicating with said casing and extending within one of said fire tubes, said second mentioned tube being open at both of its ends whereby hot gases from the fire box will pass through said second mentioned tube and into said casing, said second mentioned tube being positioned concentrically with respect to the fire tube into which it extends, whereby hot gases from the fire box will pass therefrom to the smoke box through the annular space between the tubes.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES CAILLE.

Witnesses:

LOUIS FAUTRAT,
H. C. COXE.