

(No Model.)

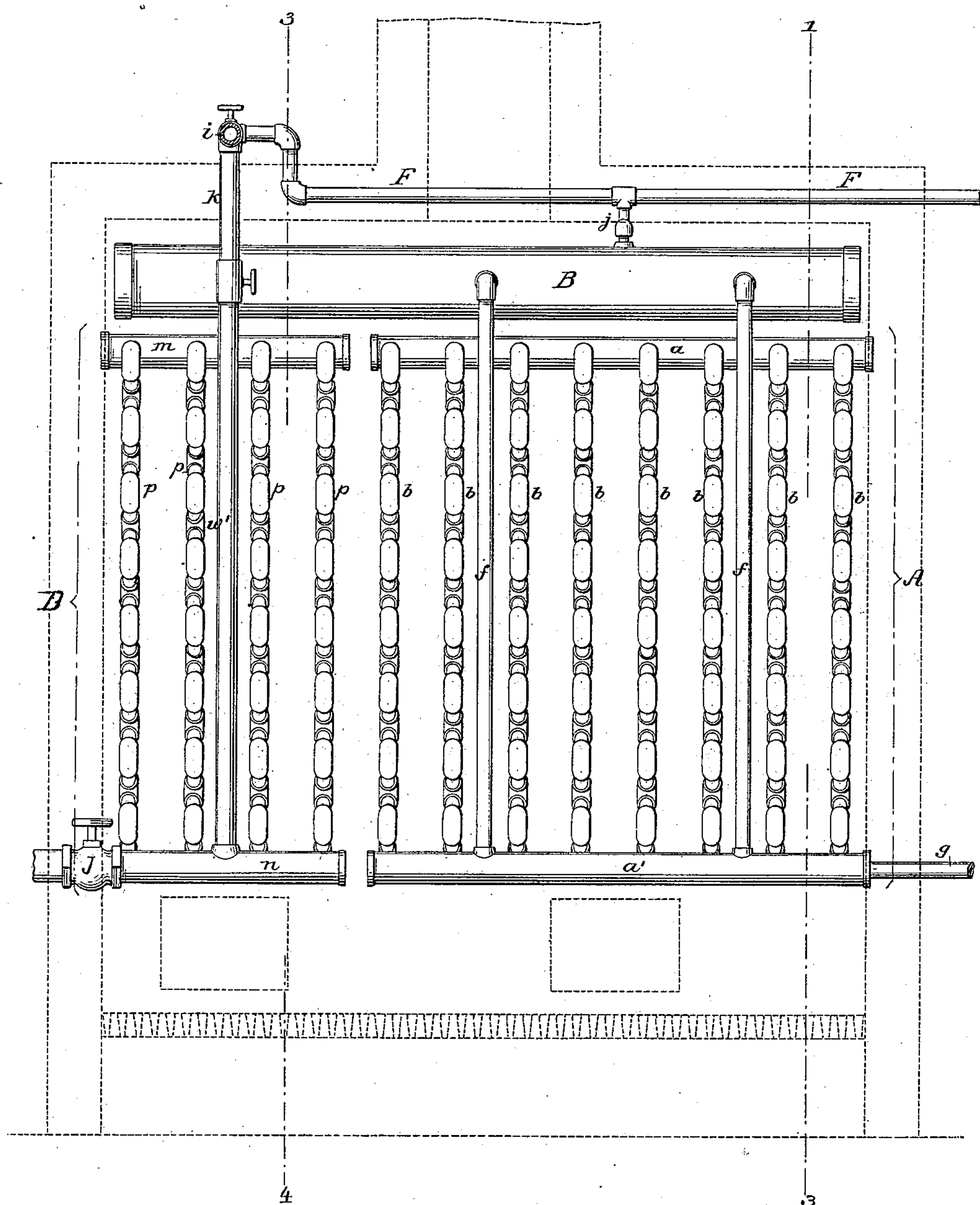
2 Sheets—Sheet 1.

M. FOREMAN.
STEAM GENERATOR.

No. 333,001.

Patented Dec. 22, 1885.

FIG. 1.



Witnesses:

William F. Davis
Henry Bossert.

Inventor:

Milton Foreman
by his Attorneys
Howson & Son

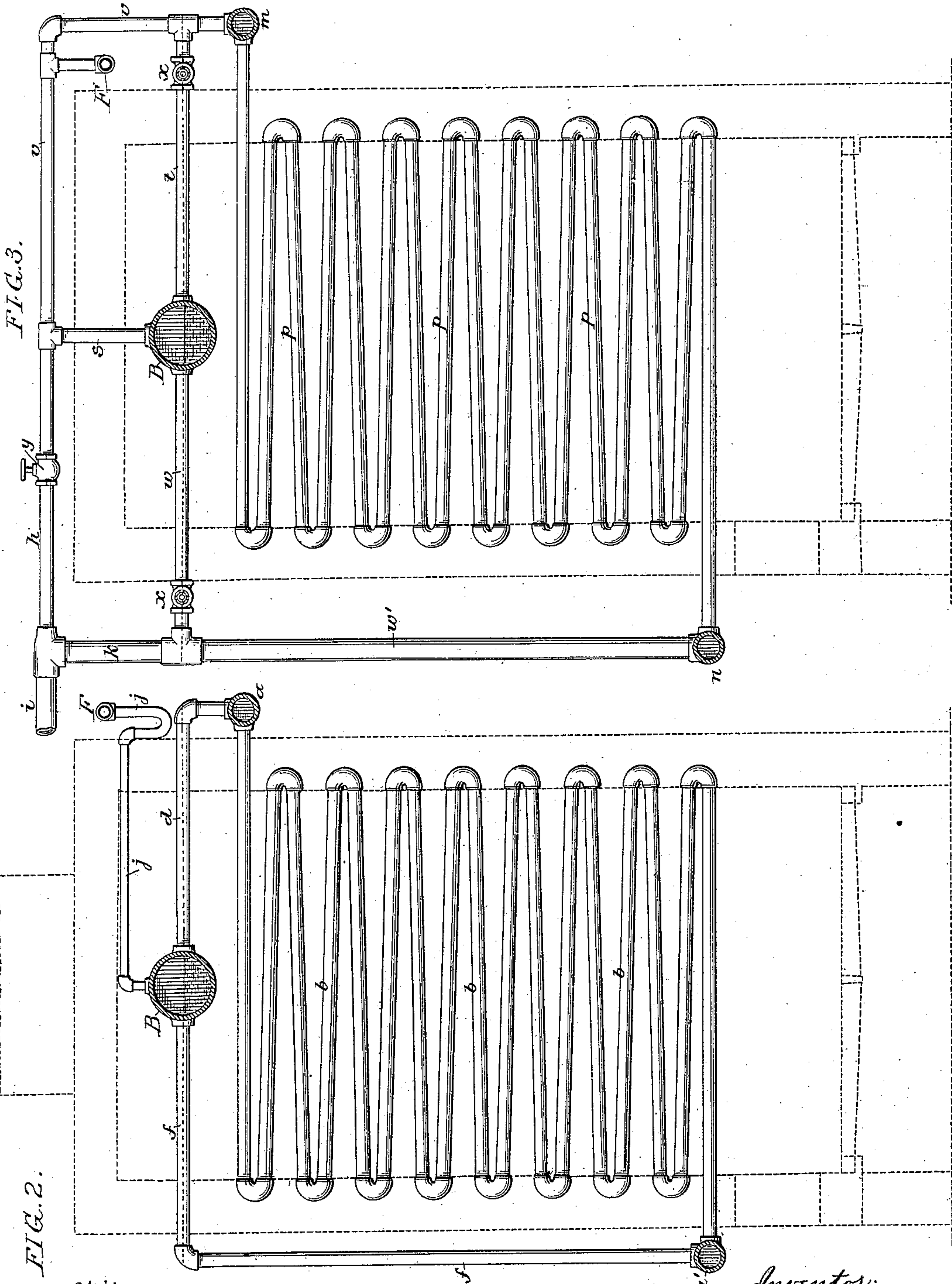
(No Model.)

2 Sheets—Sheet 2.

M. FOREMAN.
STEAM GENERATOR.

No. 333,001.

Patented Dec. 22, 1885.



Witnesses:
William F. Davis
Henry Bossert.

Inventor:
Milton Foreman
by his Attorneys
Horson & Fry

UNITED STATES PATENT OFFICE.

MILTON FOREMAN, OF PHILADELPHIA, PENNSYLVANIA.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 333,001, dated December 22, 1885.

Application filed April 11, 1885. Serial No. 161,931. (No model.)

To all whom it may concern:

Be it known that I, MILTON FOREMAN, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Steam-Generators, of which the following is a specification.

My invention consists of apparatus, fully described hereinafter, for carrying out the process of heating by low pressure high-temperature steam, set forth in my application for patent filed July 30, 1884, Serial No. 138,198.

In the accompanying drawings, Figure 1 is a front view of the apparatus; Fig. 2, a section on the line 1 2, Fig. 1; and Fig. 3, a section on the line 3 4, Fig. 1.

A represents a steam-generator, consisting of an upper manifold pipe, *a*, and lower manifold pipe, *a'*, connecting which are a series of coils, *b*, located within the combustion-chamber of the furnace, the walls of the latter being indicated by dotted lines in the drawings. The upper manifold, *a*, communicates through pipes *d* with the steam-drum B, also located within the combustion-chamber of the furnace, and said drum communicates through pipes *f* with the manifold *a'*, so that when fire is kindled on the grate of the furnace there will be a constant circulation of water upward through the coils *b* and through the pipes *d* into the steam-drum B, and thence through the pipes *f* into the manifold *a'*, and again into the coils, the necessary feed-water being introduced at one end of the manifold *a'* through a pipe, *g*, and the water-level being maintained at about the dotted line, Figs. 2 and 3.

At one end of the generator is the superheater D, which is precisely similar in construction to the generator, but is less in extent than the same, said superheater comprising upper and lower manifolds, *m* and *n*, connecting-coils *p*, and circulating-pipes *t* and *w* *w'*. The pipes *t* and *w* of the superheater communicate with the water-space of the drum B, and are provided with stop-valves *x*, and the pipe *w'* communicates with an outlet-pipe, *i*, through a pipe, *k*. The pipe *i* communicates through a pipe, *h*, having a valve, *y*, with a pipe, *s*, leading to the steam-space of the drum B, and said pipe *s* is in communication with the upper manifold, *m*, of the superheater, through a pipe, *v*. The pipe *i* is intended to communicate with the inlet-branches of a series of

radiators, as set forth in my application above alluded to, and the discharge-branches of these radiators should communicate with a pipe, F, which is in direct communication with the pipe *v*, leading to the superheater, and also communicates through a goose-neck pipe, *j*, with the steam-drum B.

When it is desired to superheat the steam, fire is kindled on the grate of the furnace, the valves *x* in the pipes *t* and *w* and the valve *y* in the pipe *h* are closed, and a blow-off valve, J, at the end of the manifold *n* is opened. Steam formed in the generator A is consequently compelled to pass therefrom through the pipes *s* and *v* into the upper manifold, *m*, of the superheater, and thence down through the coils *p* of the same, the water contained in said coils escaping through the blow-off valve J. When all the water has been blown out of the coils, this valve J is closed, and the steam permitted to escape through the pipe *w'* and its branch *k* to the outlet-pipe *i*. In passing through the coils *b* the steam becomes highly superheated, and as its pressure is not to be increased it must be allowed to expand freely. For this purpose the pipes *w'*, *k*, and *i* are of increased diameter, so as to freely carry off the expanded volume of steam entering the same.

The steam by circulation through the radiators becomes condensed, the water of condensation being returned to the steam-drum B through the pipe F and its branch *j*, and the steam which is not condensed being permitted to again enter the superheater through the pipe *v*, so as to provide a continuous circulation.

When the weather is mild, and it is not desired to superheat the steam, the valves *x* and *y* may be opened, so that the steam is permitted to escape directly from the steam-drum through the pipes *s* and *h* to the outlet-pipe *i*, the pipes *t* and *w* *w'* in this case simply serving as circulating pipes to permit the proper flow of water through the coils *p*; or by closing the valves *x* in the pipes *t* and *w* and maintaining a fire on one end only of the grate of the furnace the generator A may be used alone, if desired. This arrangement of the superheater and generator side by side, or in such relation to each other that the furnace of one may be fired independently of the fur-

nace of the other, is an important feature of my invention, as it permits me to throw the superheater out of the system and use the generator alone when desired, or to use the superheater alone as a generator, to use both generator and superheater as a generator, or to superheat the steam formed in the main generator.

If a circulation through the coils *p* is not desired when the superheater is in use as a generator, the valved pipes *t* and *w* may be dispensed with, the water-supply being introduced into the manifold *n* through a pipe similar to the feed-pipe *g*. When it is not desired to trap the water of condensation from the pipe *F* into the steam drum of the generator, said pipe may discharge its entire contents into the superheater, and when the trap-pipe *j* is used it may be provided with a check-valve, instead of a goose-neck.

So far as the arrangement of pipes and valves is concerned, it is substantially the same as that shown and described in my application for patent before alluded to, the changes being mainly those due to the changes in the construction and arrangement of the generator and superheater. Where this construction is not desired, the arrangement of pipes and valves shown in my said former application may be adhered to.

I claim as my invention—

1. The combination of a steam-generator, a steam-distributing pipe, *i*, and a superheater communicating with said pipe and with the steam-space of the generator, said superheater being arranged as described in respect to the generator, whereby its furnace can be independently fired, as set forth.

2. The combination of a steam-generator, a steam-distributing pipe, *i*, a superheater communicating with said pipe and with the generator, and a return-pipe, *F*, communicating with the generator, as set forth.

3. The combination of a steam-generator, a steam-distributing pipe, *i*, a superheater communicating with said pipe and with the generator, and a return-pipe, *F*, communicating with both superheater and generator, as specified.

4. The combination of a steam-distributing pipe, a steam-generator and a superheater, both communicating with said distributing-pipe, and a communication between the superheater and the steam-space of the generator, said superheater being arranged in respect to the generator as described, whereby its furnace can be independently fired, as set forth.

5. The combination of a distributing-pipe, *i*, a steam-generator and a superheater, both communicating with said pipe, a communication between the superheater and the steam-space of the generator, and valved pipes, whereby both generator and superheater may be charged with water, said superheater being arranged in respect to the generator as described, whereby its furnace can be independently fired, as set forth.

6. The combination of a steam-generator, a steam-distributing pipe, *i*, a superheater communicating with said pipe and with the steam-space of the generator, but located as described in respect to the generator, whereby its furnace can be independently fired, and a valved communication between the superheater and the water-space of the generator, as set forth.

7. The combination, in the generator and superheater, of the upper and lower manifolds, the connecting-coils, the steam-drum, and the circulating-pipes, as set forth.

8. The combination of the distributing-pipe *i*, the superheating-coils *p*, the drum *B*, the upper and lower manifolds, *m* and *n*, the valved pipes *t* and *w*, a communication between the drum *B* and the upper manifold, a communication between the pipe *i* and the lower manifold, and a valved communication between the said pipe *i* and the drum *B*, as set forth.

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

MILTON FOREMAN.

Witnesses:

HENRY BOSSERT,
HARRY SMITH.