(No Model.)

2 Sheets—Sheet 1.

J. WEBSTER.

STEAM GENERATOR.

No. 368,361. Patented Aug. 16, 1887.

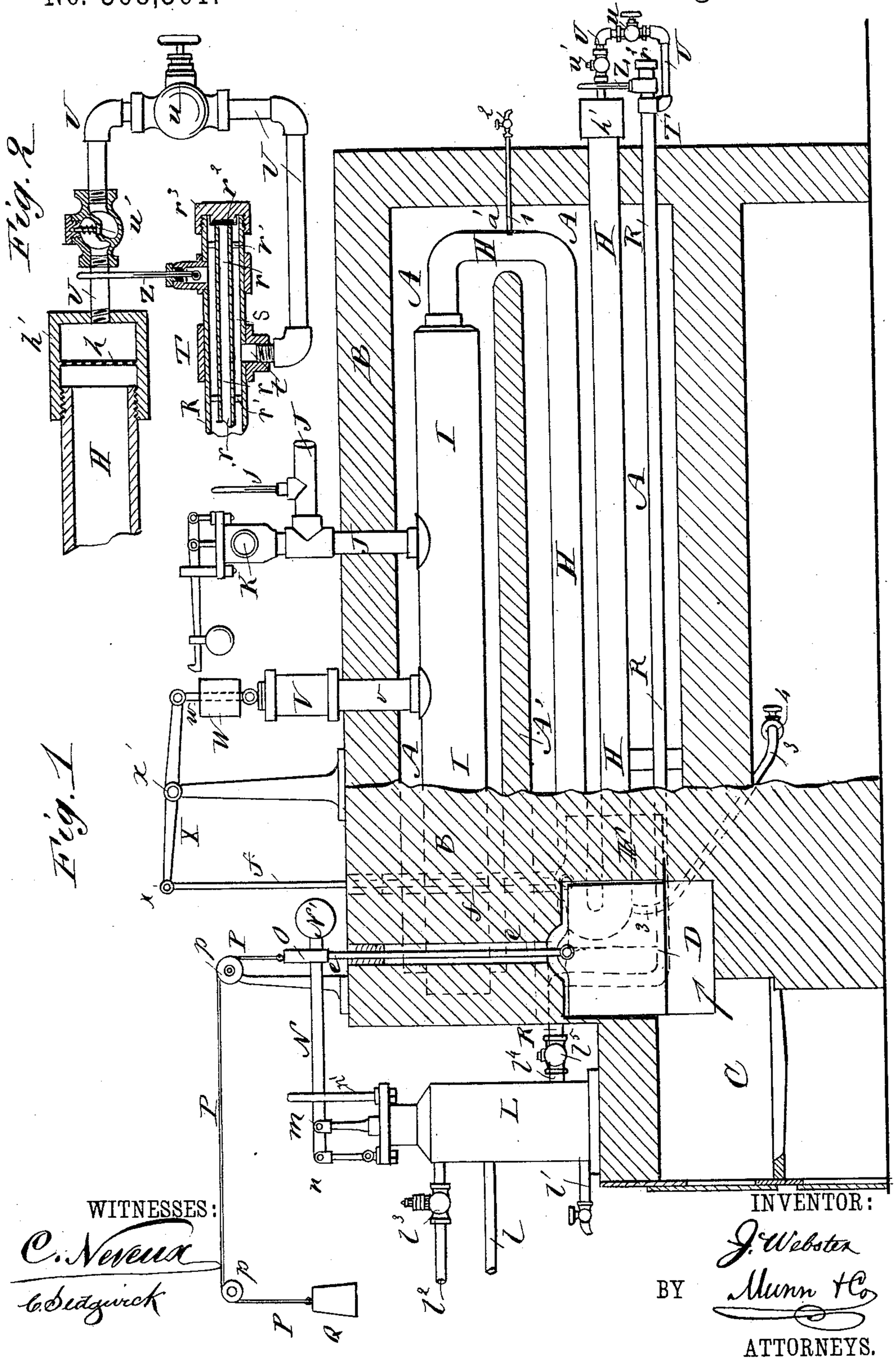

Fig. 2.

Fig. 1.

WITNESSES:

C. Neveux

C. Sedgwick

INVENTOR:

J. Webster

BY Munn & Co

ATTORNEYS.

(No Model.)

2 Sheets—Sheet 2.

J. WEBSTER.

STEAM GENERATOR.

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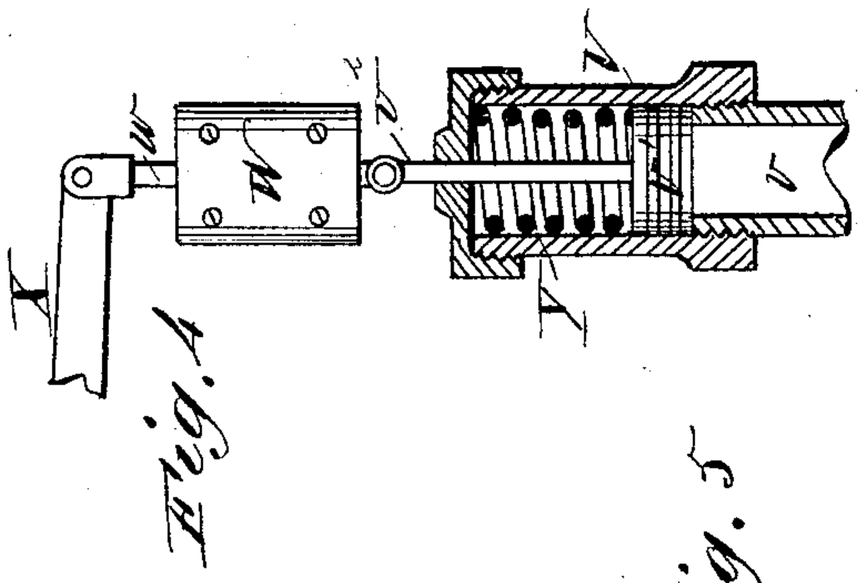

Fig. 4.

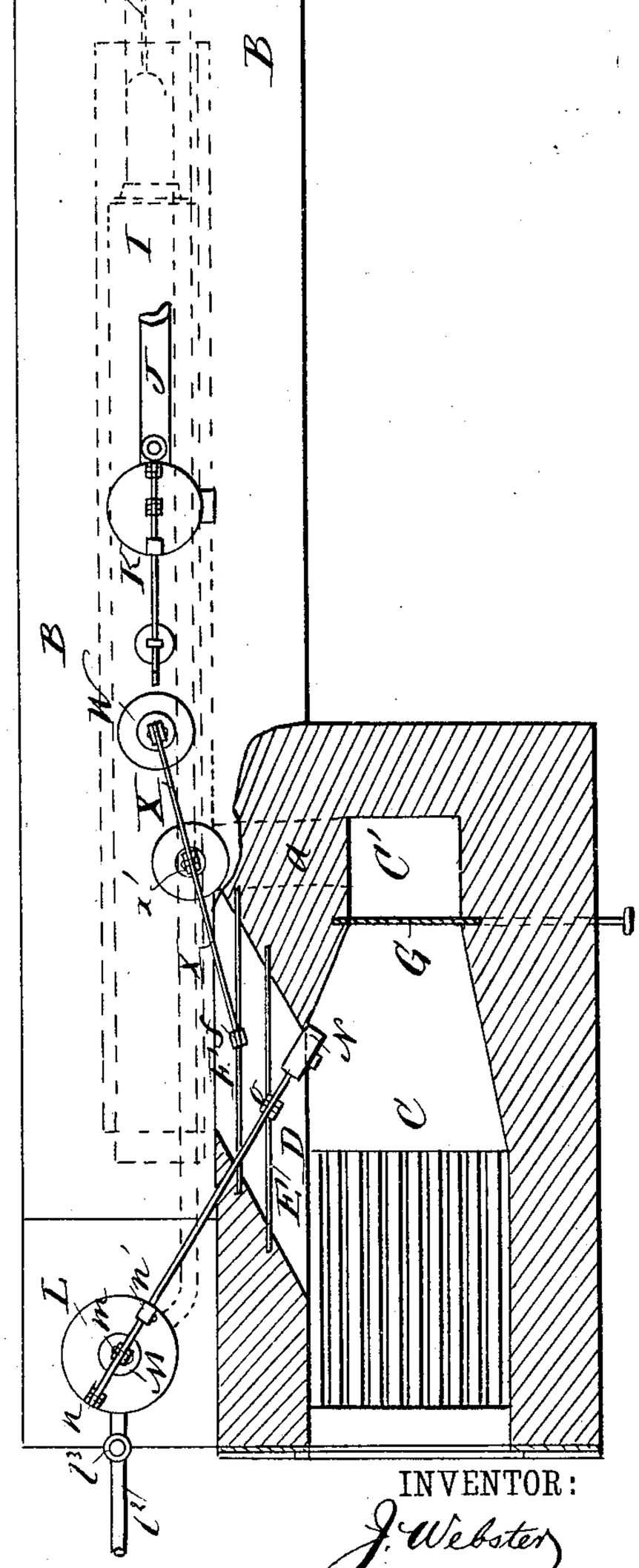

Fig. 5.

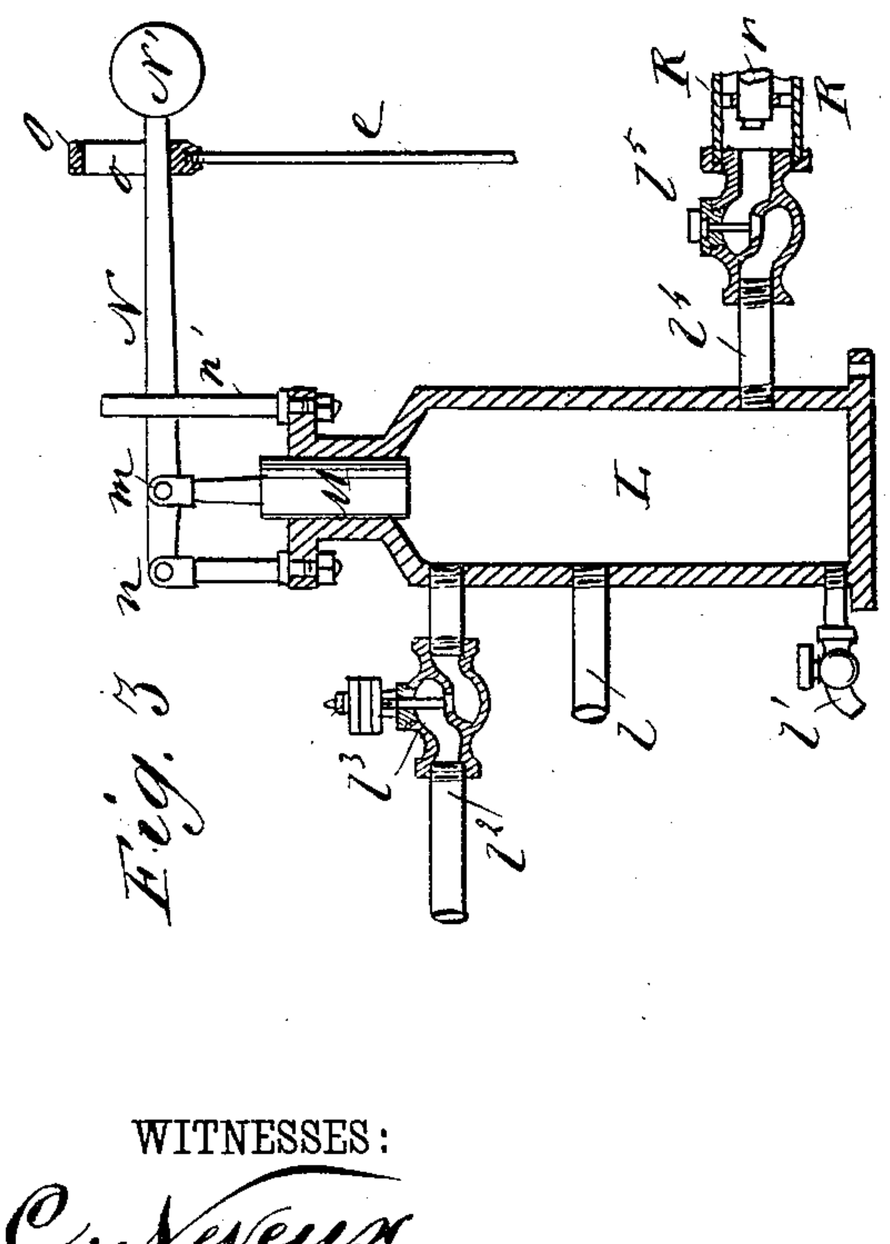

Fig. 3.

WITNESSES:

C. Neveux

to Sedgwick

INVENTOR:

J. Webster

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN WEBSTER, OF BROOKLYN, NEW YORK.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 368,361, dated August 16, 1887.

Application filed May 5, 1887. Serial No. 237,225. (No model.)

To all whom it may concern:

Be it known that I, JOHN WEBSTER, of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Steam-Generator, of which the following is a full, clear, and exact description.

My invention relates to steam-generators of that class in which the feed-water is admitted to the main steam-generating pipes or vessels only so fast as it shall immediately make a flash into steam; and the invention has for its object to provide a simple, comparatively inexpensive, economical, and readily-controllable steam-generator of this character, constructed to cause cut-off of the hot gases of the furnace from the combustion-chamber should the feed-water supply fail or should the steam-pressure become excessive, and thereby prevent burning or explosion of the generator.

The invention consists in certain novel features of construction and combinations of parts of the steam-generator, all as hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters and figures of reference indicate corresponding parts in all the figures.

Figure 1 is a longitudinal vertical sectional elevation of my improved steam-generator. Fig. 2 is an enlarged detail sectional elevation of the connections between the feed-water and steam pipes of the generator. Fig. 3 is an enlarged detail sectional view of the damper-regulating device connected with the feed-water supply to the generator. Fig. 4 is an enlarged detail view of the damper-regulator operated by the steam-pressure in the generator, and Fig. 5 is a plan view of the generator with the furnace in horizontal section.

The combustion-chamber A of the generator is formed by surrounding walls B, of brick, and the furnace C is arranged preferably at one side of the combustion-chamber, with which it connects by a passage or flue, D, in and across which two dampers, E F, are arranged, so that either damper may be closed to exclude from the chamber A the products of combustion from fuel in the furnace, and a damper, G, operative by hand, may be set to allow draft directly from the furnace to the stack C′, should either or both dampers E F be closed. The upper front part of the combustion-chamber is connected by a flue or passage, *a*, (shown in dotted lines in Fig. 5 of the drawings,) with the stack C′, to give draft from the furnace through the flue D and combustion-chamber A during the regular operation of the generator.

I purpose making the furnace C as a self-feeding furnace, having any approved construction preventing sudden inflow of cold air to the generator. The dampers E F have rods or stems *e f*, respectively, which project above the wall B for connection to feed-water and steam-pressure devices, as hereinafter explained.

In the combustion-chamber A a horizontal refractory division-wall, A′, is built and divides the chamber into upper and lower compartments having communication past or at the rear end of the wall A′. In the lower part of the combustion-chamber a steam-pipe, H, is supported, said pipe being doubled on itself or having a return-bend coupling at its forward part. The lower part of this pipe projects rearward through the wall B, outside of which it is connected to the feed-water pipe, as presently described, and the rear end of the upper part of the pipe H is bent upward through the passage *a′* between the two compartments of the combustion chamber, and is connected to a steam-drum, I, which is supported centrally in the upper compartment of the combustion-chamber. A steam-pipe, J, connected to the drum I, and provided with any approved form of safety-valve, K, carries steam to an engine or for use in heating or otherwise. A suitable pyrometer or thermometer, *j*, is connected to the steam-supply pipe J to test the temperature of the steam delivered from the generator.

On a suitable support a feed-water reservoir, L, is placed, said reservoir being preferably a cast-metal chamber, into which the feed-water coming from a hot well or from a pump or other source passes through a pipe-connection, *l*. A blow-off cock, *l′*, permits removal of sedimentary deposits from the reservoir, and a pipe, l^2, provided with a weighted valve, l^3, allows overflow or discharge of water from the reservoir should the water-pressure

therein exceed a normal limit. In the head of the reservoir is fitted a suitably-packed ram or float, M, which is connected at *m* to a lever, N, fulcrumed at *n* to the top of the reservoir, and provided at its free end with a weight, N′, which normally forces the ram down onto the water filling the reservoir. A suitable guide, *n′*, is provided on the reservoir for the weighted lever. The long arm of the lever N passes through a slot, *o*, in a coupling, O, the lower end of which is connected to the stem *e* of the damper E, and to the other end of the coupling is attached a chain or rope, P, which runs over guide-pulleys *p* and carries a weight, Q, sufficiently heavy to normally lift or open the damper E and draw the lower end of the coupling-slot *o* up to the lever N, as most clearly shown in Figs. 1 and 3 of the drawings, thus causing a falling of the lever to lower or close the damper, and at the same time allowing the damper to be opened or closed independently of the lever, as is desirable at times in controlling the draft.

It is obvious that the ram M will normally be held up by the water-pressure in the reservoir when the regular supply of water is fed to the generator; but should the supply for any reason be cut off from the reservoir, and consequently from the generator, the ram will fall, and thereby allow the weighted lever N to fall and close the damper and cut off the products of combustion from the chamber A of the generator, and thus prevent burning of the feed-water and steam pipes and drum therein, and promote durability of the boiler.

The feed-water-outlet pipe l^4, connected with the reservoir L, is provided with a check-valve, l^5, of any approved construction, which will prevent backflow of water to the reservoir, and to the case of the valve l^5 is fitted a pipe, R, which passes through the wall B into the combustion-chamber A, and preferably below the steam-pipe H, and near the bottom of the chamber, and thence through the rear wall, B. (See Fig. 1 of the drawings.) This feed-water pipe R is preferably made double or jacketed—that is to say, a somewhat smaller pipe, *r*, is fitted within it and sustained centrally by suitable spacing-lugs, *r′*. The end of the pipe *r* next the valve l^5 is plugged, and the opposite end of said pipe is closed by a packing, r^2, on a cap or head, r^3, which is screwed onto the rear end of the main or outer pipe, R, and whereby a thin annular space, S, is provided between the pipes R *r*, through which the feed-water will circulate, and in which the water will be quickly and highly heated in the combustion-chamber on its way to the steam-pipe H, through connections next described.

A suitable coupling or union, T, on the rear part of the pipe R is provided with a passage, *t*, which communicates with the water-passage S between the pipes R *r*, and also with a pipe, U, which is bent around to connect with the interior of the steam-pipe H, preferably by entering a cap, *h′*, fixed to said pipe. The pipe U has a globe-valve, *u*, by which the flow of feed-water may be controlled, and a check-valve, *u′*, preventing backflow of water or steam from the pipe H. The interior of the cap *h′* forms a chamber, in which is fitted a water-jet device, shown as a perforated plate, *h*, through the fine apertures of which the hot water entering the pipe H from the pipe U will be jetted or sprayed into the steam-pipe to assure its instant and complete conversion into steam within the pipe, and the steam thus formed traverses the pipe H through the combustion-chamber to the drum I, and in its course is highly superheated, and escapes through the outlet J at a very high temperature and pressure for effective use in steam-engines or otherwise.

To the steam-drum I a pipe, *v*, is connected and opens into a cylinder, V, in which is fitted a piston, *v′*, connected to a rod, v^2, which passes through a cap on the cylinder for a guide, and is connected to a rod, *w*, which carries a weight, W, and is connected at its other end with one end of a lever, X, which is fulcrumed at *x′* to an upright on the wall B, connected at *x* with the upper end of the rod *f*, to which the damper F is attached. A spring, Y, fitted in the cylinder V normally expands to force the piston *v′* downward therein. The gravity of the weight W is about ten to fifteen pounds lighter than the pressure required to open the safety-valve K, and the tension of the spring Y about or nearly equals this ten or fifteen pounds; hence should the steam-pressure in the generator approach the maximum limit the piston *v′* will be raised in the cylinder V and the spring Y will be gradually compressed as the weighted lever X is tilted to partly close the damper F, and should the pressure reach the blowing-off point the damper will be entirely closed to exclude the products of combustion from the chamber A, and whereby the generator will be cooled down to prevent further making of steam or increase in its temperature until the pressure lowers to or below the normal limit. The spring Y prevents spasmodic operation of the damper; but its use is not essential to the successful working of the damper from or by the steam-pressure in the generator.

A pyrometer or thermometer, Z, may be fitted to the pipe R for testing the temperature of the water passing from the space S in said pipe to the flash-steam pipe H.

When the generator is first fired up, water will be filled into the pipe H up to a line about level with a pipe, *l*, which is passed through the rear wall, B, and opens to the pipe H at its inner end, and at its outer end carries a cock, 2, at or by which the water-level may be tested. This flooding of the pipe H allows heating of the interior of the generator without burning it while the fire is coming to a regular working heat, and when this is assured and sufficient steam is in the drum I to start the engine

and pump the water will be withdrawn from the steam-pipe H through a pipe, 3, connected to the pipe preferably near its forward bend, and having a valve, 4, which when open allows discharge of the water into the hot well into which the pipe 3 is arranged to discharge, and when the water is withdrawn and the valve 4 is shut the water will be admitted to the pipe H through the pipes U R only so fast as it will be converted into steam, which will be thoroughly superheated on its way to the outlet J, as hereinbefore explained.

It will be noticed that I provide two draft-dampers—one operated to prevent making of steam and burning of the generator when the feed-water supply fails and the other operated by excessive steam-pressure in the generator—and whereby a twofold safeguard is provided for making a steam-generator of this class practically safe even in unskilled hands, while allowing the generator to be worked to its maximum capacity.

I show the steam-generator with a single vertical ranging set of steam-generating and superheating pipes or vessels H I in the combustion-chamber; but it is obvious that these may be duplicated to any extent for constructing an effective steam-generator of any required capacity.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, in a steam-generator and with a combustion-chamber containing steam-generating pipes or vessels, a furnace, and a flue connecting the furnace with the combustion-chamber, of a damper fitted in said flue, a feed-water reservoir connected to the steam-generating pipes or vessels, a ram or float fitted in said reservoir and adapted to fall with the level of water therein, and a device connected to the ram or float and to the damper, substantially as shown and described, whereby should the feed-water supply fail the damper will be closed automatically to prevent burning of the generator, as herein set forth.

2. In a steam-generator, the combination, with a combustion-chamber containing steam-generating pipes or vessels, a furnace, and a flue connecting said chamber and furnace, of a damper, E, fitted in the flue, a feed-water reservoir, L, a ram or float, M, therein, and a weighted lever, N, connected to the ram and to the damper, substantially as described, for the purposes set forth.

3. In a steam-generator, the combination, with a combustion-chamber containing steam-generating pipes or vessels, a furnace, and a flue connecting said chamber and furnace, of a damper, E, fitted in the flue, a feed-water reservoir, L, a ram or float, M, fitted in the reservoir, a weighted lever, N, connected to the ram, a coupling, O, connected to the damper-stem and provided with a slot, *o*, through which the lever N passes, and a weighted cord, P, connected to the coupling, substantially as shown and described, whereby the damper will be normally held open by the cord and will be closed when the ram falls, and whereby, also, the damper may be worked independently of the lever, as and for the purposes herein set forth.

4. In a steam-generator, the combination, with a feed-water pipe leading to steam-generating pipes or vessels in the combustion-chamber, of a reservoir, L, having a feed-inlet pipe, *l*, and a pressure-resisting overflow-pipe and valve, l^2 l^3, and provided with a ram or float, M, connected to the stem of a damper controlling a flue between the furnace and combustion-chamber of the generator, substantially as described, for the purposes set forth.

5. In a steam-generator, the combination, with the combustion-chamber having steam-generating pipes or vessels, as H I, of a feed-water pipe leading from a supply at one end of the furnace and extending through the combustion-chamber, and connected to the steam-generating vessels at the other end of the chamber, and said feed-water pipe formed with an interior pipe or core providing a continuous thin annular water-circulating space next the outer wall of the pipe where it ranges through the combustion-chamber, substantially as described, for the purposes set forth.

6. In a steam-generator, the combination, with a flash-steam pipe, H, and a feed-water pipe, R, both ranging through the combustion-chamber, of a pipe, U, connecting the pipes H R, and a jet or spray device, as *h*, fitted in the pipe H, substantially as described, for the purpose set forth.

7. In a steam-generator, the combination, with a flash-steam pipe, H, and feed-water pipe R, both ranging through the combustion-chamber, and a pipe, U, connecting the pipes H R, of a supply-regulating valve, *u*, and a check-valve, *u'*, fitted to pipe U, substantially as described, for the purposes set forth.

8. In a steam-generator, the combination, with a combustion-chamber containing steam generating and superheating pipes or vessels, a furnace, and a flue connecting the chamber and furnace, of a damper, F, fitted in the flue, a pipe and cylinder, *v* V, connected to the steam-vessels, a weighted piston in said cylinder, and a lever connected to the piston and to the damper F, substantially as shown and described, whereby should the steam-pressure be excessive the damper will be closed automatically, as and for the purposes set forth.

9. In a steam-generator, the combination, with a combustion-chamber containing steam generating and superheating pipes or vessels, a furnace, and a flue connecting the chamber and furnace, of a damper, F, fitted in the flue, a pipe and cylinder, *v* V, a piston, *v'*, a spring forcing the piston inward, and a lever connected to the piston and to the damper F, substantially as described, for the purposes set forth.

10. A steam-generator constructed with a combustion-chamber, steam generating and superheating pipes or vessels therein, a furnace, a flue connecting the chamber and furnace, dampers E F, fitted in the flue, and said damper E controlled by devices operating to close it when the water-supply fails, and said damper F controlled by devices operating to close it when the steam-pressure is excessive, substantially as described, for the purposes set forth.

JOHN WEBSTER.

Witnesses:
HENRY L. GOODWIN,
C. SEDGWICK.