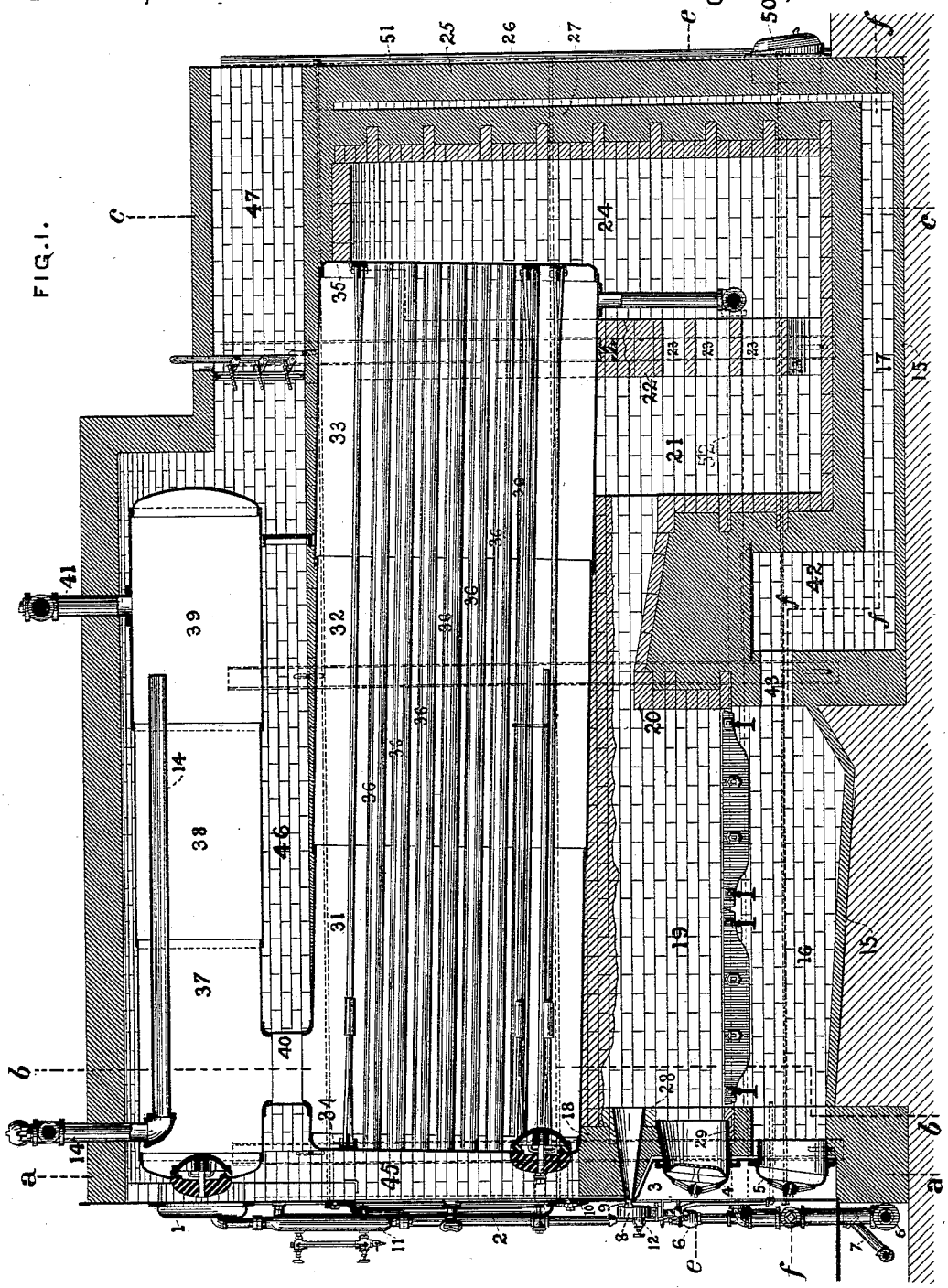
(No Model.) 4 Sheets—Sheet 1.

W. B. LE VAN.

STEAM BOILER SETTING.

No. 457,537. Patented Aug. 11, 1891.

FIG. 1.



WITNESSES:

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(No Model.) 4 Sheets—Sheet 2.

W. B. LE VAN.

STEAM BOILER SETTING.

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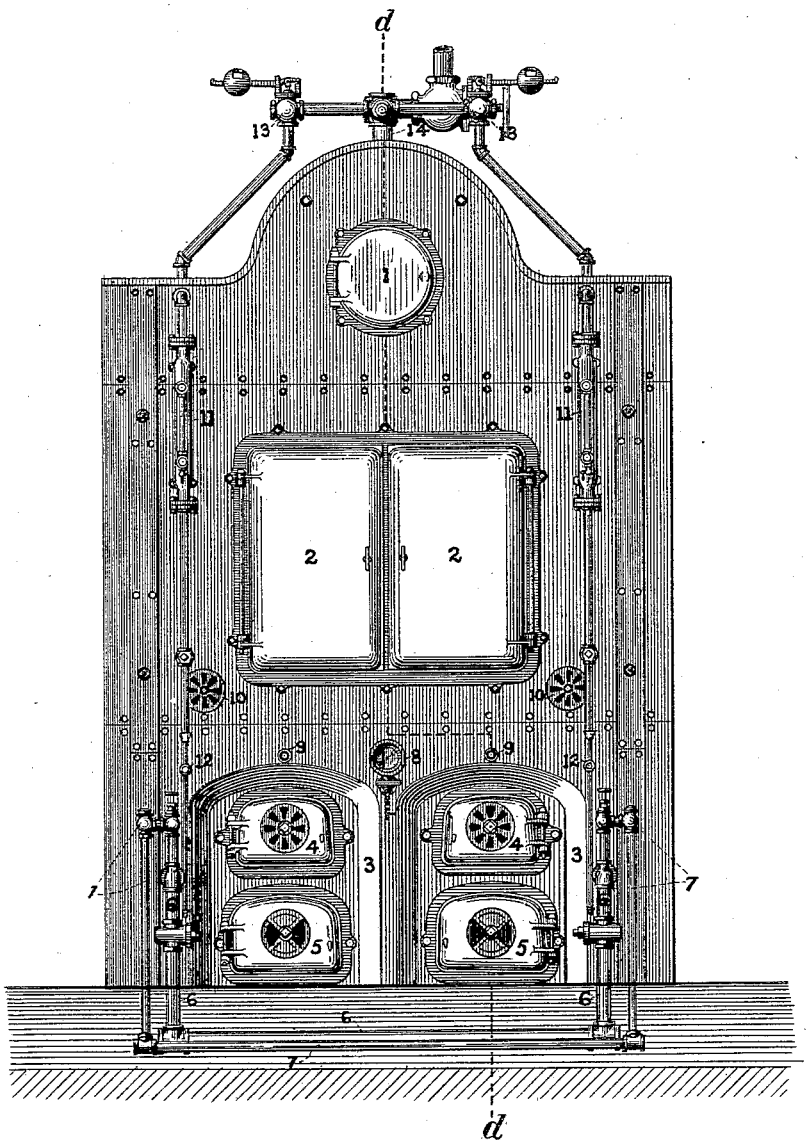
FIG. 2.



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(No Model.) 4 Sheets—Sheet 3.

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STEAM BOILER SETTING.

No. 457,537. Patented Aug. 11, 1891.

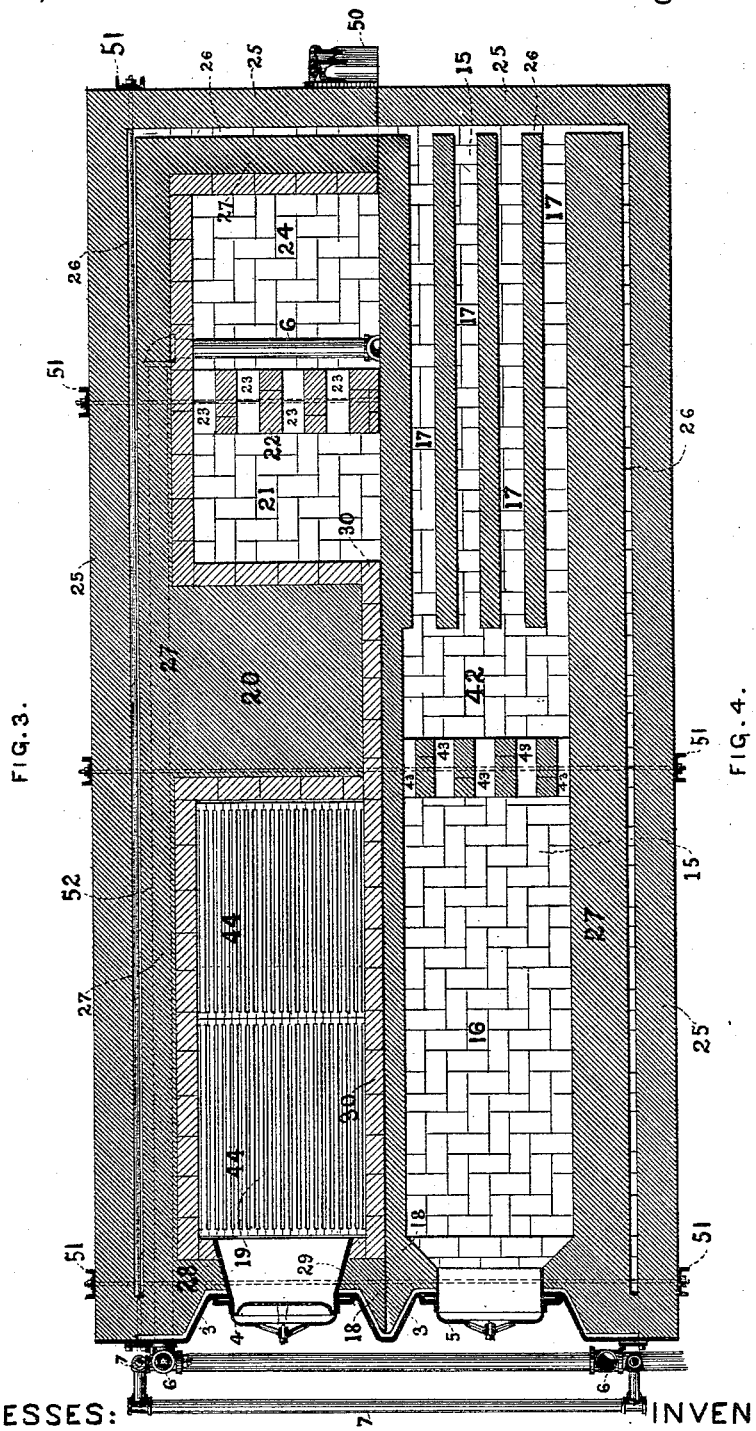

FIG. 3.

FIG. 4.

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(No Model.) 4 Sheets—Sheet 4.

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STEAM BOILER SETTING.

No. 457,537. Patented Aug. 11, 1891.

FIG. 8.

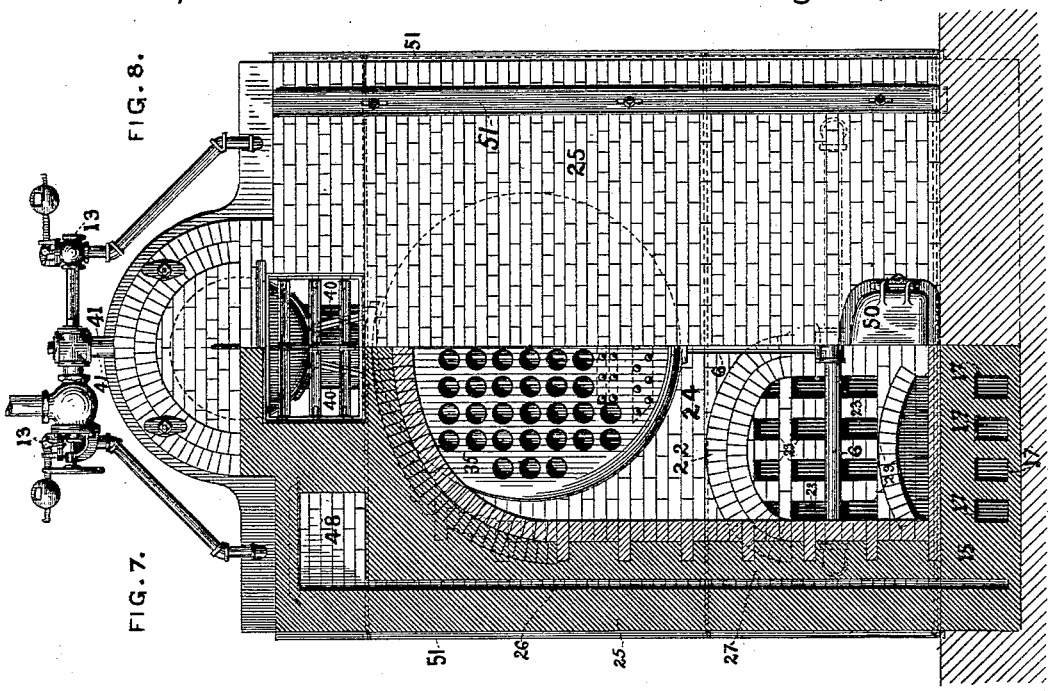

FIG. 7.

FIG. 6.

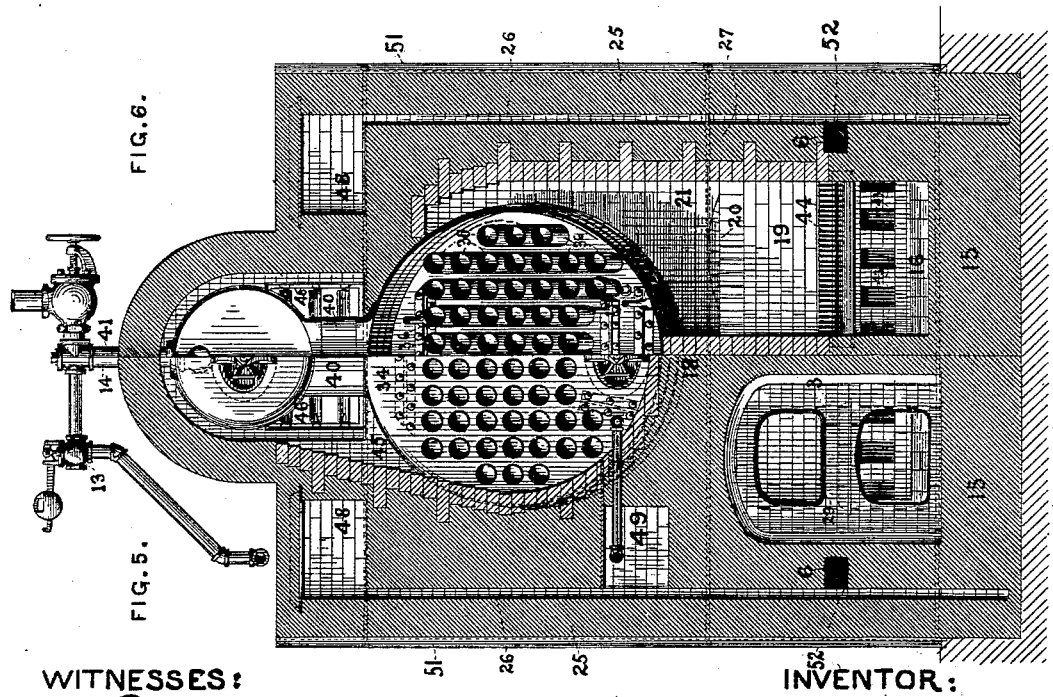

FIG. 5.

WITNESSES:

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UNITED STATES PATENT OFFICE.

WILLIAM BARNET LE VAN, OF PHILADELPHIA, PENNSYLVANIA.

STEAM-BOILER SETTING.

SPECIFICATION forming part of Letters Patent No. 457,537, dated August 11, 1891.

Application filed October 22, 1890. Serial No. 368,961. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BARNET LE VAN, a citizen of the United States, residing at the city of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Steam-Boiler Settings, of which the following is a specification.

My invention more particularly relates to the setting of stationary boilers of the horizontal-flue type; and its object is to afford, in connection with structural strength and simplicity, effective and desirable means for the generation of high-pressure superheated steam, which in operation shall present the advantages of freedom from oscillation and foaming of the water, quick steaming, ample releasing-surface, and steam room through utilization of heat and combustion of the gases, and, most important of all, the maintenance of high temperature in the fire-chambers during the operation of freeing the fires from clinker and ashes—a result not attainable in boiler-settings as ordinarily constructed.

It is a well-known fact that steam cannot be superheated as long as it is in contact with water in the boiler. I therefore have isolated the steam from the water by making the steam-drum of large dimensions and connecting it to the main shell of the boiler by a single neck located at the front end of the boiler and taking the steam from the rear end of the superheating steam-drum, thus allowing time for the surrounding highly-heated gases to evaporate any entrained water or foam in the steam-drum before leaving the boiler. It is also well known that perfect combustion can only be effected by supplying sufficient atmospheric air under the grates and in the combustion-chamber, and if this air can be supplied at a high temperature there is a corresponding gain. Time is also an element in thorough combustion of fuel, for unless the gases primarily evolved from said combustion have time to be thoroughly commingled with air heated to the ignition temperature they pass away only partially consumed in the form of partially-deoxygenated air and carbonic oxide, (CO,) equal to only four thousand four hundred units of heat, instead of thoroughly deoxygenated air and carbonic acid, (CO_2,) equal to fourteen thousand five hundred units, which is the amount of heat which should be evolved before the products of combustion enter the flues.

To this end my improvements consist in certain devices hereinafter more fully set forth, and their nature, with the manner in which they are carried out, will be understood, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section upon the line *d d* of Fig. 2. Fig. 2 is a front view of the fire-front. Fig. 3 is a horizontal half-section through the line *e e* of Fig. 1. Fig. 4 is a similar section through the line *f f* of same figure, showing plan of foundation of the boiler-setting. Figs. 5, 6, and 7 are vertical half-sections upon the lines *a a*, *b b*, and *c c* of Fig. 1, respectively. Fig. 8 is a half rear view of the back of boiler-setting.

In the application of my invention the fire-front is provided with an inlet-door 1, which gives access to the man-hole of the superheating-drum. Duplex doors 2 2 afford an inlet to flues in main shell of boiler and man-hole in front head underneath the flues, and 3 3 are recesses for the reception of the fire-doors 4 4 and ash-pit doors 5 5 and to admit of central projecting and supporting pier 18. The fire-front is also provided with blow-off pipes 6 6 and feed-pipes 7 7, the feed-pipes and blow-off pipes being provided with the necessary stop and check valves, also with a steam-gage 8, sight-holes 9 9, cold-air registers 10 10, water columns fitted with glass tubes, and valves 11 11, blow-through valves for water columns 12 12, safety-valves 13 13, and steam-outlet for safety-valves 14.

Upon the main foundation 15 there are built the ash-pits 16, the hot-air passages or flues 17 17, &c., and the pier 18 between the recesses 3 3, upon which the front end of the main shell of the boiler is carried. Above the ash-pits are fire-chambers 19 and bridge-walls 20, beyond which is the supplemental mingling combustion-chamber 21, separated from the back connection-chamber 24 by the septum-wall 22, the two chambers 21 and 24 having communication through passages 23 23 23 in septum-wall. An air-space 26 is lo-

cated between the outside wall 25 and the inside wall 27 and goes completely around three sides of the setting.

The front wall and backing 28 of the fire-front receives the fire-door frames 29, while the division-wall 30 separates the fire-chambers 19 19 one from the other and affords a support for the main body of the boiler.

In the practice of my invention I provide a steam-boiler having a cylindrical shell composed of a series of rims or plates 31, 32, and 33, which are riveted one to another in telescopic form, successively and continuously increasing in diameter from the front head 34 to the back head 35. A series of fire-flues 36 36 extend from the front to the back end plates 34 and 35, respectively, in the usual manner, and are preferably so arranged as to leave sufficient clear space at the bottom of the boiler for a man to enter underneath the flues, and also leaving space between the fire-flues and the shell of the boiler along the sides of the latter, so as to allow a free circulation of water along the hottest portion of the boiler-shell from the top to the bottom of the same. A cylindrical superheating steam-drum 37 38 39 is connected to the main shell of the boiler at a point adjacent to its front end by a single neck 40, so that the drum shall, when the boiler is in working position, be horizontal, or substantially so, while the main shell of the boiler rakes downwardly toward its rear and larger end 35. The steam-drum is constructed telescopically in a manner analogous to the main shell, its rear rim 39 being the largest in diameter. The steam-outlets 14 and 41 are connected to this steam-drum, the safety-valve outlet 14 being extended on the inside of the drum rearwardly as far back as the rim 39 in order to secure absolutely dry superheated steam. The center portion of brick-work between the recesses 3 3 forms a pier 18, upon which the front end of the boiler rests. The boiler is also supported by the division-wall 30, which separates the fire-chambers, and upon the septum-wall 22, being thus independent of the inner walls 27 27, with which it does not come in contact. By this arrangement cast-iron brackets, such as are usually attached to the main shell of boilers for the purpose of supporting them in place, are dispensed with. The fire-chambers 19 above the grate-bars 44 are dual, being separated longitudinally by the vertical wall 30, which wall ends at or beyond the bridge-wall, as may be deemed advisable.

For the accumulation of heated air and products of combustion, which might otherwise leak out and escape, I provide the lateral chambers 48 on each side of the superheating drum-chamber 46 and extending the entire length of the boiler and communicating with the air-space 26, and they can be supplied, if so desired, with a surplus of air from the registers 10 10 and inlet-space 49.

In the rear exterior wall of the setting I build a cleaning-door 50 to give access to the back connection-chamber and flues for cleaning or repairing purposes.

The entire brick structure is braced and strengthened by means of binder-rods and buck-stays 51 51.

In the operation of this boiler the heated gases evolved from the fuel are applied to the entire exterior of the wetted surface of the boiler by reason of the upward extension of the fire-chambers 19, whence they pass into the similarly upwardly-extended supplemental mingling combustion-chamber 21 to or about the water-level. The division or septum wall 22 deflects the gases to the lower portion of the chamber 21 and retards their flow. Said septum-wall becoming highly heated, in fact incandescent, correspondingly promotes combustion of the highly-heated gases. The gases evolved from the fuel are thus effectually mingled with the proper supply of heated oxygen conducted through the registers 10, air-passages 26, 17, and 43 into the ash-pit 16, and that introduced through the registers located in the fire-doors 4 4, and the gases are consumed before reaching the back connection-chamber 24, the resulting products being delivered, consequently, into said chamber in a very highly-heated state, due to the retardation by and contact with the incandescent septum-wall 22, causing a thorough mixture of the air introduced through the registers 10 10 and the carbonic oxide, (CO,) under which conditions a second combustion takes place, the carbonic oxide taking an additional part of oxygen, forming carbonic acid (CO_2) with great evolution of heat, as hereinbefore mentioned. The superheated products of this second combustion then pass into the flues of the boiler 36 36 36, &c., at the rear end 35 of the main shell and through the same to front flue-chamber 45, thence to superheating drum-chamber 46 and flue 47, leading to chimney.

A very important result of my invention consists in the fact that the gases evolved from the fuel in the fire-chambers 19 are maintained in temperature by the inclosing highly-heated walls even during clearing the fire from ashes, clinker, &c. Thus steam-pressure in the boiler is not sensibly reduced during such cleansing operation.

Another important feature of my invention consists in the arrangement of parts so as to effect the delivery of the feed-water to the boiler through the blow-off pipe, which latter is incased in the inside wall 27, and absorbing heat therefrom affords a heated passage for the incoming feed-water, the result being that the water is delivered to the boiler at nearly the boiling temperature, and also by reason of such arrangement the blow-off pipe is kept free from sediment, which otherwise would tend to clog it.

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

1. In a boiler-setting, the combination of the

furnaces or fire-chambers 19 19, with the longitudinal supporting and separating wall 30, and the pier 18, interlocking with said separating-wall 30 and projecting beyond the front of the fire-chamber, substantially as and for the purpose described.

2. In a boiler-setting, the recessed front 3 3, in combination with the projecting and supporting pier 18, which latter interlocks with the separating-wall 30 and projects beyond the front of the fire-chamber, substantially as and for the purpose described.

3. In a boiler-setting, the chamber 52, formed in the wall 27 to receive the blow-off and feed-water pipes 6 6, arranged and combined substantially as and for the purposes described.

In testimony whereof I have hereunto affixed my name in the presence of two witnesses.

WILLIAM BARNET LE VAN.

Witnesses:
CHAS. B. COLLIER,
GEO. W. REED.