

(No Model.)

J. STAPLETON.
SMOKE CONSUMING BOILER FURNACE.

No. 402,362.

Patented Apr. 30, 1889.

Fig. I.

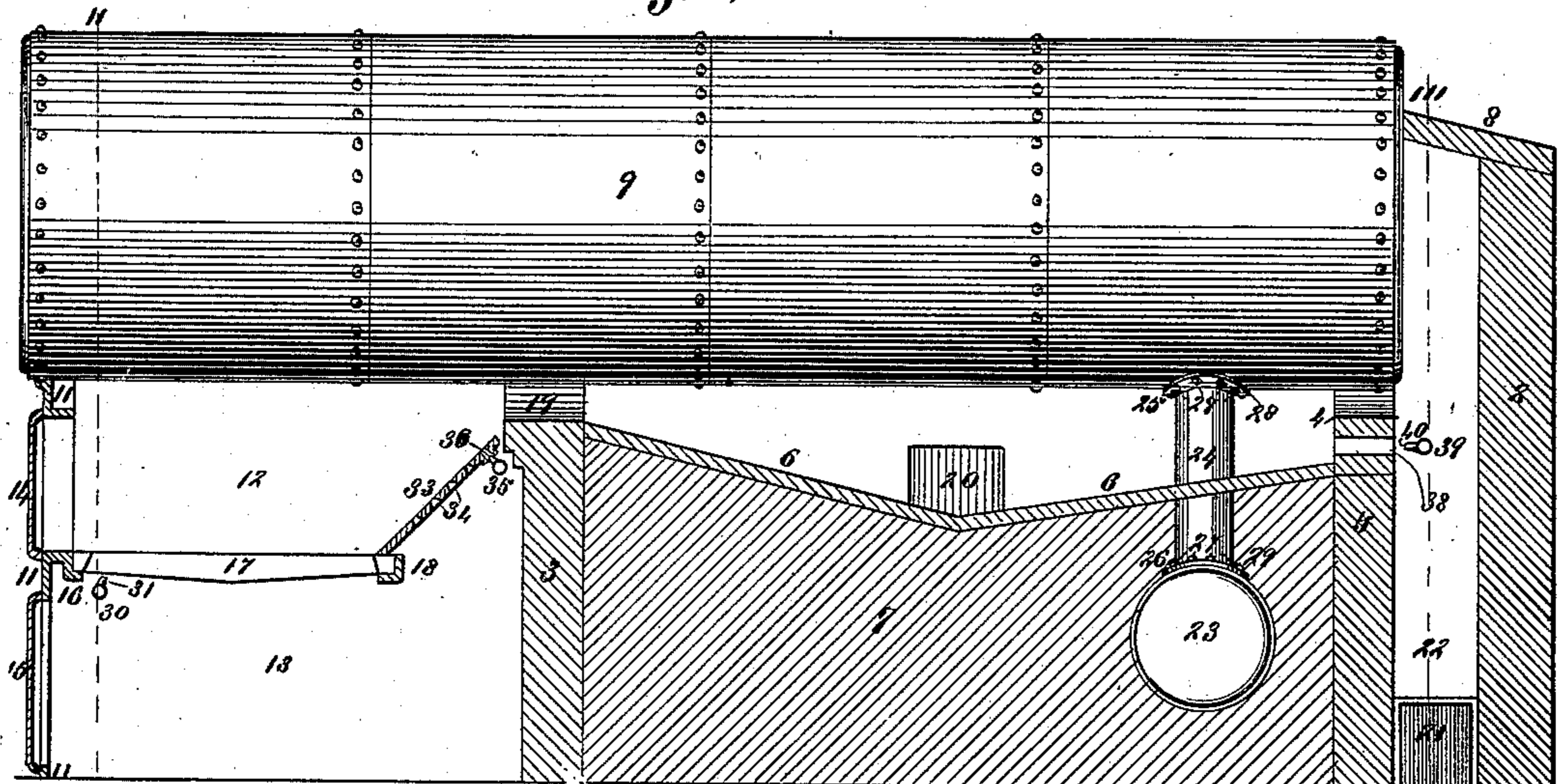


Fig. II.

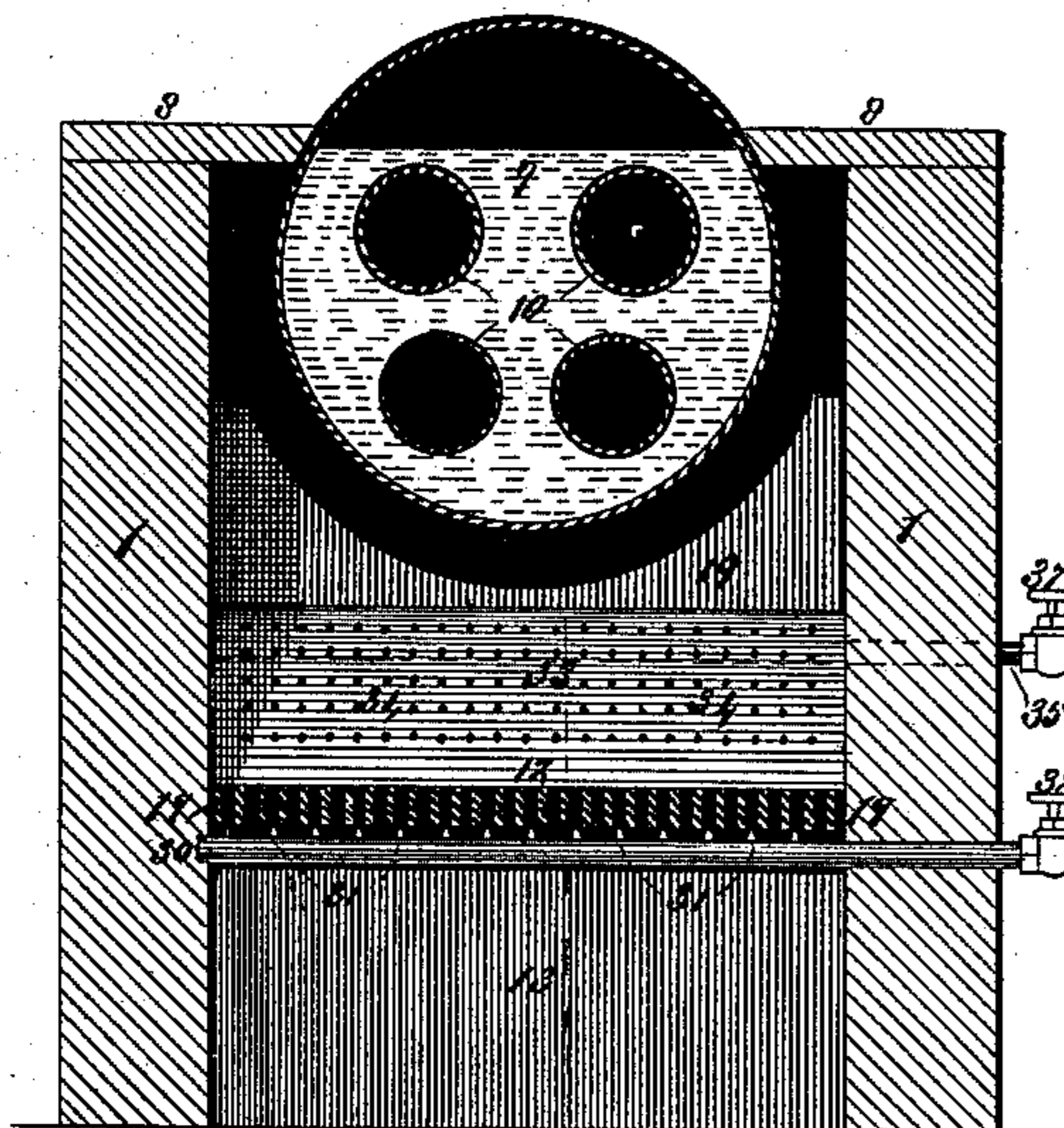


Fig. III.

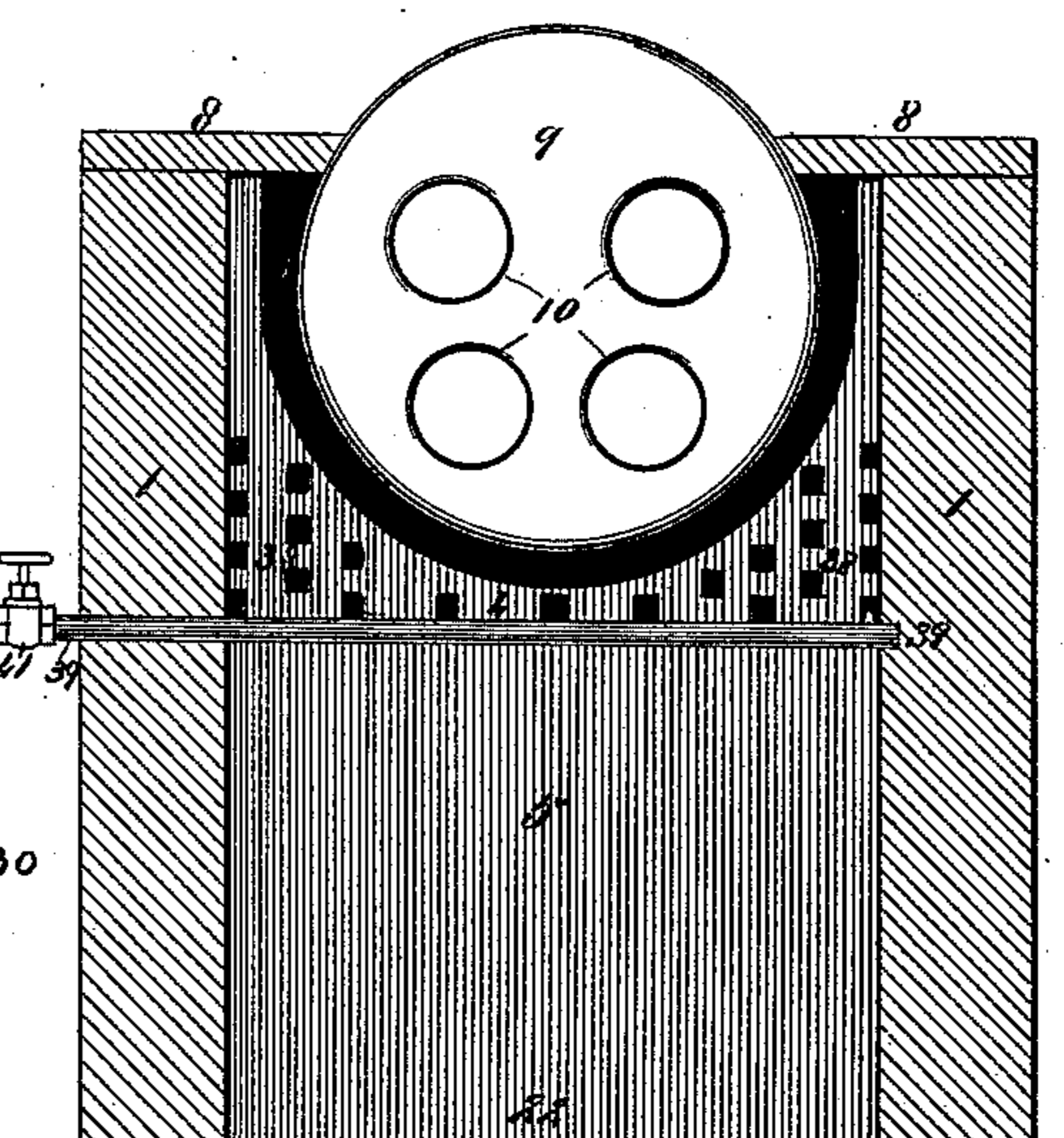


Fig. IV.

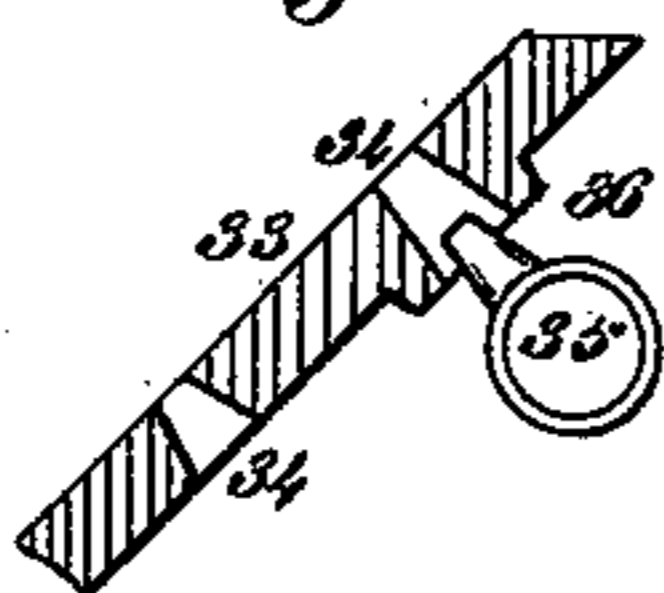
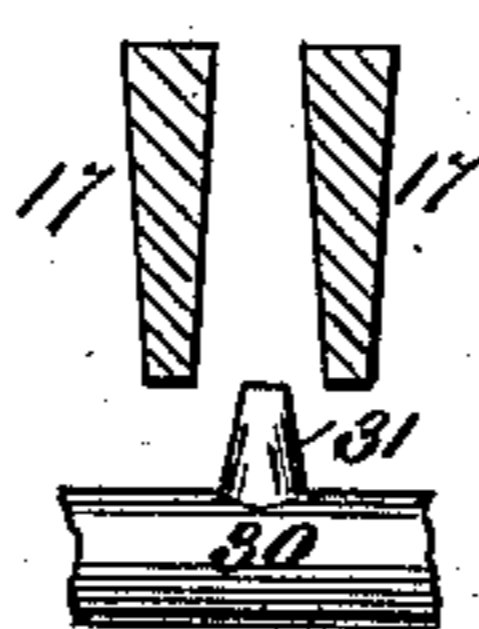


Fig. V.



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JAMES STAPLETON, OF ST. LOUIS, MISSOURI.

SMOKE-CONSUMING BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 402,362, dated April 30, 1889.

Application filed October 23, 1888. Serial No. 288,931. (No model.)

To all whom it may concern:

Be it known that I, JAMES STAPLETON, of the city of St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Smoke-Consuming Boiler-Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

10 This invention relates to a boiler-furnace in which steam-jets beneath the grates and behind the perforated bridge-wall are provided to aid combustion, and steam-jets behind the perforated checker-wall act as a
15 buffer-draft to arrest the too rapid exhaust of the waste products of combustion and aid their combustion by the aqueous gases generated by the superheating of the steam; and the invention consists in features of novelty,
20 hereinafter fully described, and pointed out in the claims.

Figure I is a vertical longitudinal section taken on line I I, Fig. II. Fig. II is a vertical transverse section taken on line II II, Fig. I.
25 Fig. III is a vertical transverse section taken on line III III, Fig. I. Fig. IV is an enlarged detail section of the bridge-plate, and shows the position of the steam-jets that blow through the perforations of the bridge-plate;
30 and Fig. V is a like view of the grates, and shows the position of the steam-jets that blow through between the grate-bars.

Referring to the drawings, in which similar figures of reference indicate like parts in all the views, 1 represents the side walls and 2
35 the rear wall of the furnace.

3 is the bridge-wall between the fire-box and the combustion-chamber; 4, the checker-wall at the terminal of the combustion-chamber 42; 5, the base-wall beneath said checker-wall, and 6 the brick floor of said chamber that surmounts the bed-bank 7 between the bridge-wall and the checker-wall. The brick
40 for these walls and floor, as also the tile 8, that surmount the walls and house in the boiler 9, are preferably made of fire-clay. 10 are the boiler-flues.

11 represents the metal frame in front of the fire-box 12 and ash-pit 13, and on which
50 frame swing the furnace-door 14 and ash-door 15. The said frame supports the front end

of the boiler, and by means of its pendent ledge or angle-bar 16 the front ends of the grate-bars 17, whose rear ends are supported by the angle-bars 18, the ends of which bars
55 are built into the side walls of the furnace.

The bridge-wall is surmounted by an inverted arch, 19, built also of fire-brick, between which and the boiler is an intervening space of about three inches, as also there is
60 between the side walls and the boiler, through which the products of combustion pass on their way from the fire-box to the combustion-chamber, the superheated gaseous air lapping close around the inclosed portion of the periphery of said boiler.

The floor 6 of the combustion-chamber is slanted down longitudinally from the bridge-wall at one end of said chamber and from the base-wall beneath the checker-wall at the other
70 end toward the junction of the two slopes, making a drop of about eighteen inches in the middle, so as to collect the ash at that point, where it is easy of removal through the ash-door 20.

21 is an ash-door at the bottom of the exhaust ash-pit 22 for cleaning out the same.

23 is the mud-drum, and 24 the stand-pipe that surmounts said drum and supports the rear end of the boiler at an elevation of about
80 three inches above the inverted arch of the checker-wall. The said stand-pipe is provided with flanges 25 and 26, relatively, around the top and bottom, through which the rivets 26 pass that secure it relatively around the
85 outlet 28 to the bottom of the boiler and around the inlet 29 to the top of the mud-drum.

30 represents a steam-pipe that may communicate with the boiler or with any other steam-generator, and passes through one of
90 the side walls of the furnace and under the grates, and from which tubes 31 discharge jets of steam between the bars of said grates to create a draft through the fire-box and aid combustion by the affiliation of its aqueous
95 gases with the superabundant carbon, with which the fire-box and combustion-chamber are surcharged. A globe-valve, 32, provides means to regulate the force and volume of the steam-jet.

33 represents a metal bridge-plate that rests on the rear ends of the grate-bars at bottom,

and may be built into the side walls at its ends. The said bridge-plate is provided with perforations 34, that enlarge conically on the under side, so as to provide a free vent for the ash that may sift through them.

35 represents a steam-pipe, which may communicate with the boiler or other steam-generative supply, and which pipe is supplied with jet-tubes 36, that discharge their jets through the perforations 34 in the bridge-plate, and like the steam-jets from the pipe 30, that discharge through the grates, they aid to revivify combustion by the affiliation of the aqueous gases thus provided with the superabundant carbon that has been set free by heat from the fuel, and is smothering for lack of its coadjutant gases. It will be seen, however, that while the jets discharged through the grates are presented directly upward, so that, besides the last-named functions, they also accelerate the initial draft, those through the perforations of the bridge-plate, while they still accelerate its upward tendency toward the boiler, at the same time act as buffers to prevent the too rapid escape of the products of combustion from the fire-box into the combustion-chamber, while at the same time aiding the ignition of the carbon.

37 is a globe-valve in the steam-pipe 35, which provides means for regulating the head of steam to the jets.

38 represents perforations in the checker-wall under the rear end of the boiler at the far end of the combustion-chamber.

39 is a steam-pipe at the back of said checker-wall, which pipe preferably receives its steam-supply from the boiler, but may take it from any other generator.

40 represents jet-tubes that deliver the steam from said pipe through the lower tier of perforations, 38, in the checker-wall. These steam-jets act as buffers to prevent the too rapid escape of the exhaust of the otherwise waste products of combustion, while at the same time presenting them with a relay of the aqueous gases to aid the ignition of the superabundant carbon.

41 is a globe-valve in the steam-pipe 39, which provides means of regulating the head of steam to the last-named jets.

The exhaust ash-pit 22 and its surmounting chamber provides means for the settling, by gravity, of the drift of ash that escapes through the perforations in the checker-wall, and thus prevents the choking of the draft. The door 21 at the bottom of said ash-pit provides the means for reaching said ashes, when sufficient has collected to require removal.

It is well known that not only do most boiler-furnaces waste much more of the products of combustion than they use, but also when the difficulty is endeavored to be overcome by steam-jets within the fire-box the jets, as hitherto devised, cause a too rapid discharge of the exhaust products of combustion, as they too greatly accelerate their pas-

sage through both the fire-box and the combustion-chamber, whereas the jets through the perforations in my bridge-wall cause a buffer-draft, which, while it revivifies the carbon in the fire-box, at the same time prevents its too rapid escape into the combustion-chamber and drives it upward against the boiler, so that the steam-jet, while keeping the current moving right over the coal and igniting the gases, at the same time prevents its escape with its work when but half performed; also the buffer-draft jets from the steam-pipe 39 at the exhaust end of the combustion-chamber again force back the said waste products of combustion as they are about to finally escape, and at the same time revivifying them for further use, as stated. It will also be seen that by the varied relative use of these jets and their relative adjustment by their globe-valves the forward initial draft of the jets from the primary steam-pipe, the secondary partial buffer-draft from those of the secondary steam-pipe at the bridge-wall, and the full buffer-draft from those of the steam-pipe at the exhaust are all correlatively adjustable to vary their application to the varied contingencies of the blast in the fire-box and combustion-chamber.

One-half inch aperture is preferably provided between the top of the bridge-plate and the summit of the bridge-wall.

I am aware that it has been proposed to arrange steam-jets with their nozzles projecting into the tubes of a boiler; and I am also aware that it is not new to arrange steam-jets under the grate of a furnace, and I do not wish to claim the same *per se*; but I am not aware that it has ever been proposed to arrange a steam-buffer draft at the end of a horizontal combustion-chamber and also arrange steam-jets under the grate to accelerate the draft and blow the products of combustion toward and against the buffer-draft in the manner which I have hereinbefore set forth.

I claim as my invention—

1. In a boiler-furnace, the combination, with the fire-box having a grate, the boiler, and a combustion-chamber extending from said fire-box under said boiler, of a perforated checker-wall at the end of said combustion-chamber remote from the fire-box, a steam-pipe arranged under the grate and having jets for forcing the products of combustion into the combustion-chamber, and a steam-pipe arranged behind the checker-wall and having jets discharging through said perforations into the combustion-chamber for retarding the current of the products of combustion and supplying the combustion-chamber with aqueous gases to promote combustion therein, substantially as set forth.

2. In a furnace, the combination, with the fire-box having a grate, the combustion-chamber, a bridge-wall dividing said combustion-chamber from said fire-box, and a perforated checker-wall arranged at the end of said combustion-chamber, of steam-jets arranged be-

hind said checker-wall and discharging into
said combustion-chamber toward the fire-box,
and steam-jets arranged under said grate re-
mote from said bridge-wall and inclined up-
wardly and toward the jets behind the checker-
wall, substantially as set forth.

3. In a steam-boiler furnace, the combina-
tion of the fire-box, the combustion-chamber,
the grates beneath said fire-box, the bridge-
wall between the fire-box and combustion-
chamber, the perforated bridge-plate, the per-
forated checker-wall at the rear terminal of
the combustion-chamber, the steam-pipe 30,
the jet-tubes from said pipe that discharge

between the grate-bars, the steam-pipe 35, the
jet-tubes from said pipe that discharge
through the perforations of the bridge-plate,
the steam-pipe 39 at the exhaust of the com-
bustion-chamber, and the jet-tubes that dis-
charge through perforations in the checker-
wall and provide a buffer-draft at the exhaust
of the combustion-chamber to prevent the
too rapid exhaust from the same, substan-
tially as and for the purpose set forth.

JAMES STAPLETON.

In presence of—

BENJN. A. KNIGHT,
SAML. KNIGHT.