

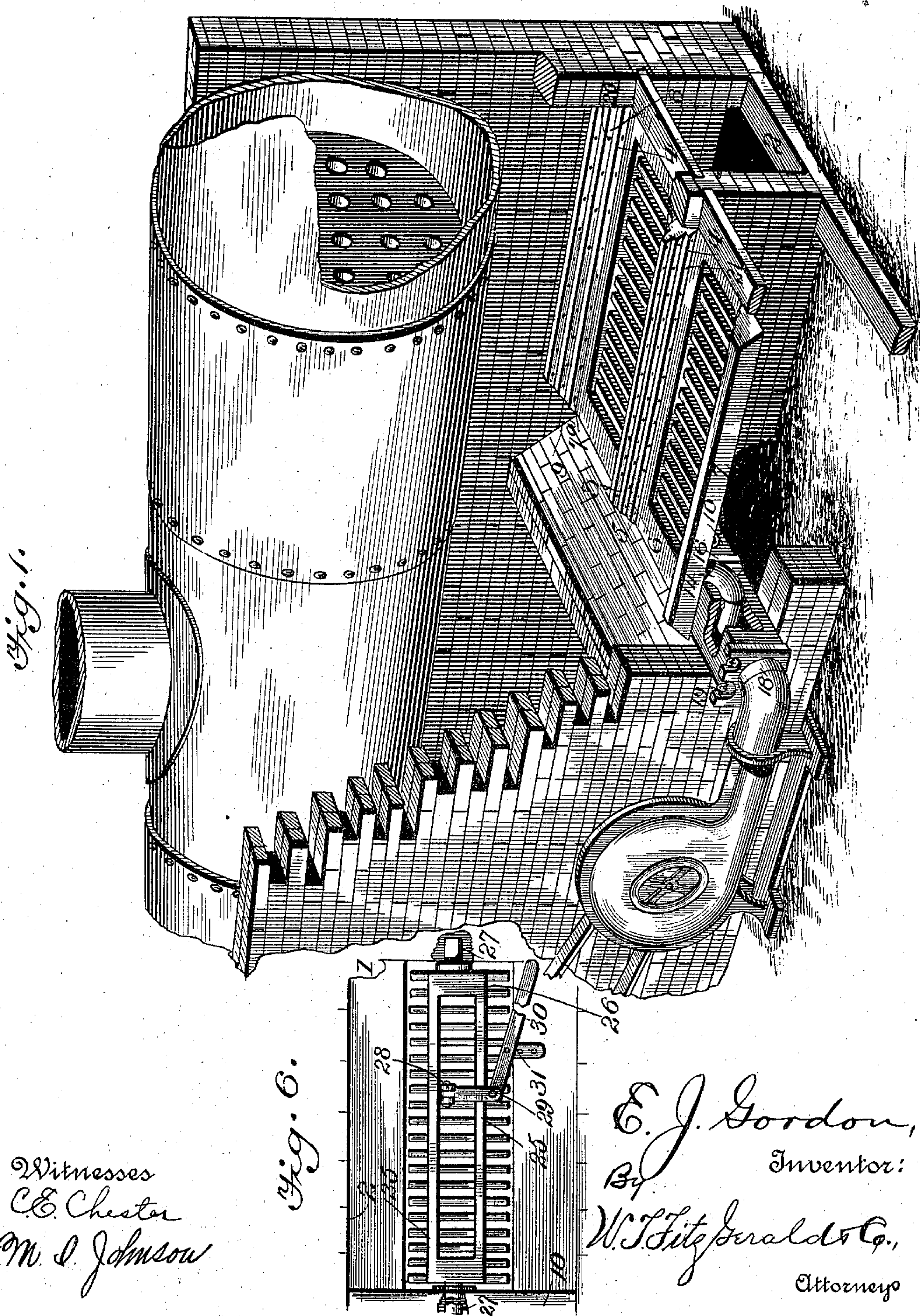
(No Model.)

2 Sheets—Sheet 1

E. J. GORDON.
FURNACE GRATE.

No. 574,030.

Patented Dec. 29, 1896.



(No Model.)

2 Sheets—Sheet 2.

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Fig. 2.

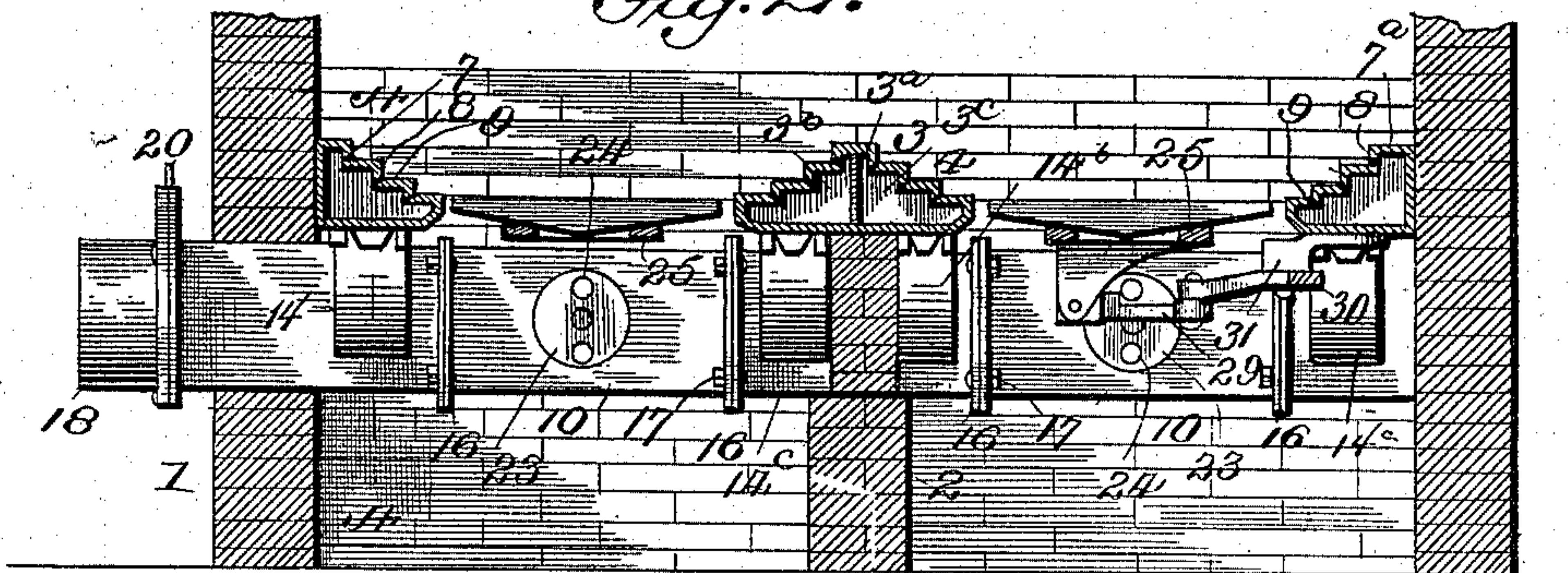


Fig. 3.

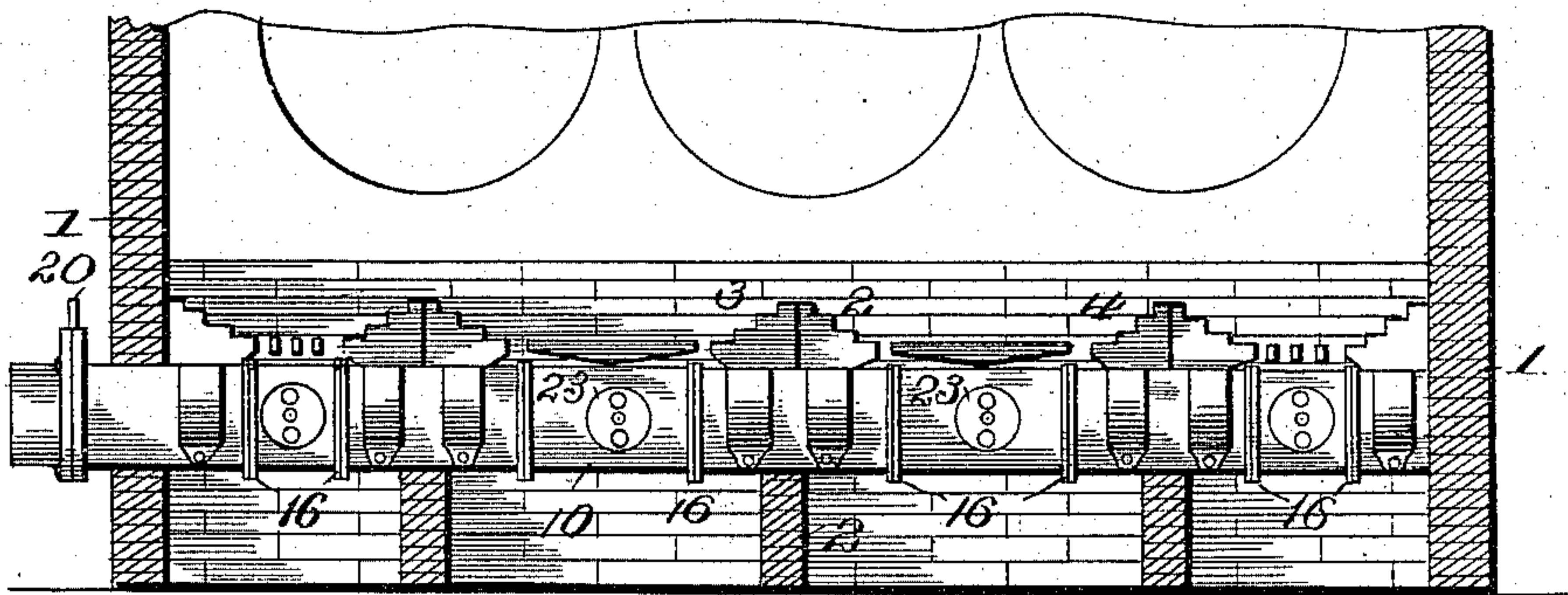


Fig. 8.

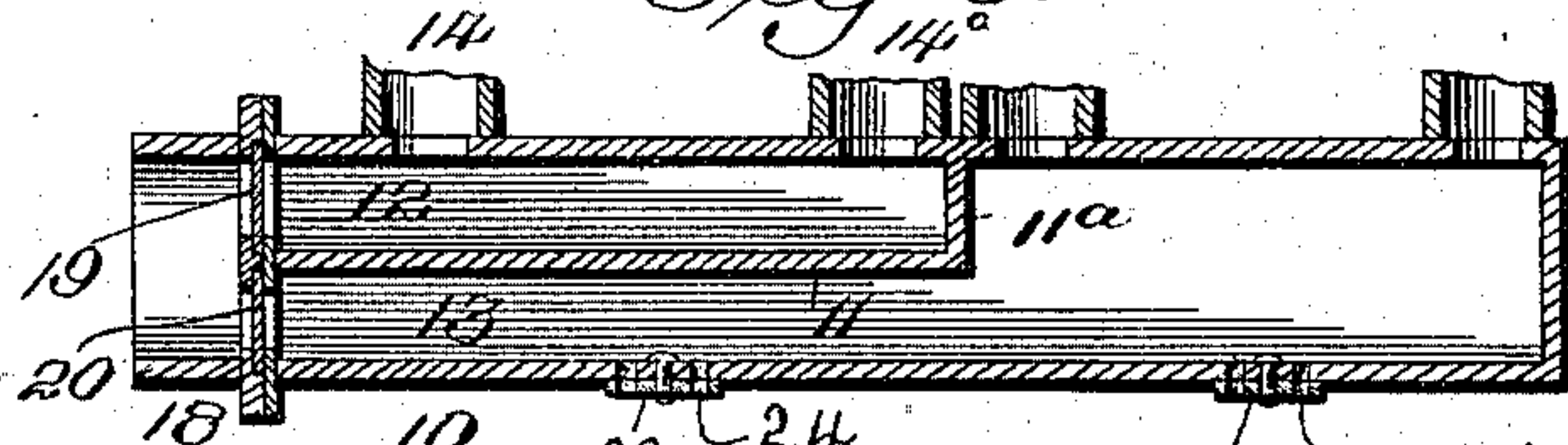


Fig. 5.

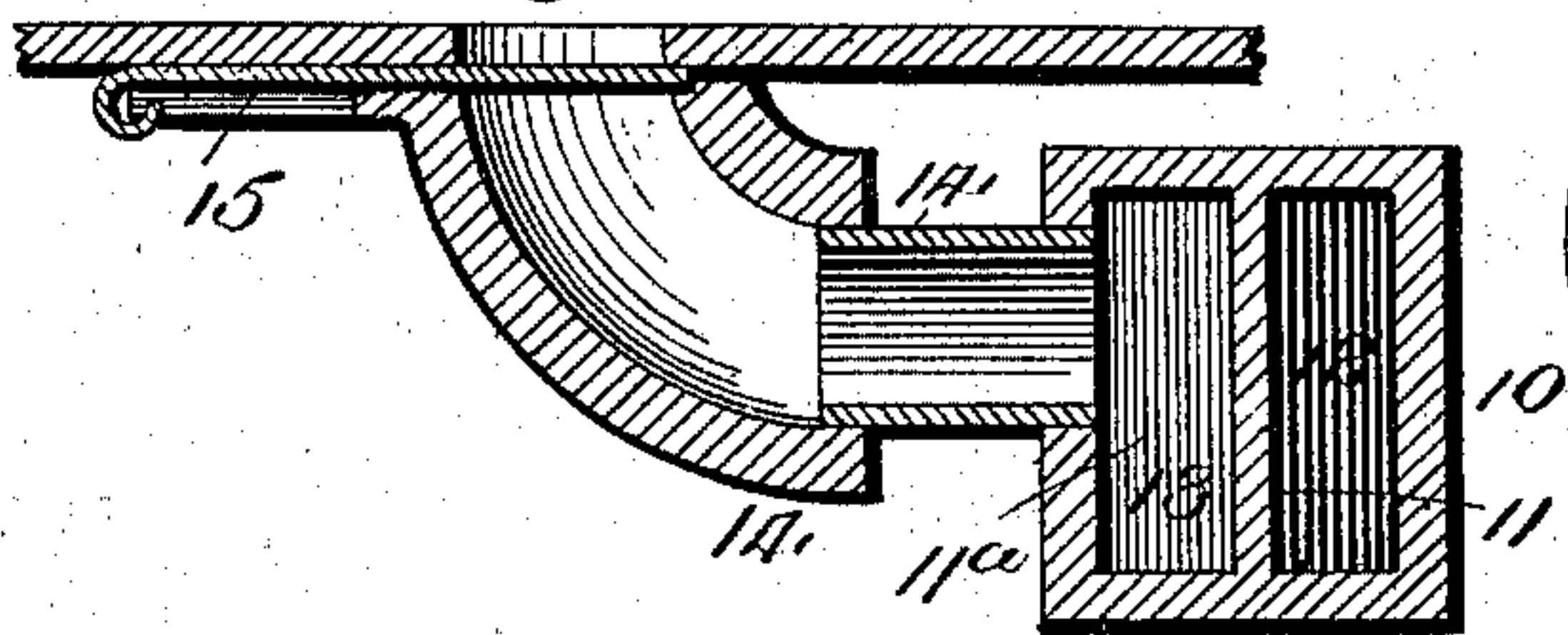


Fig. 4.

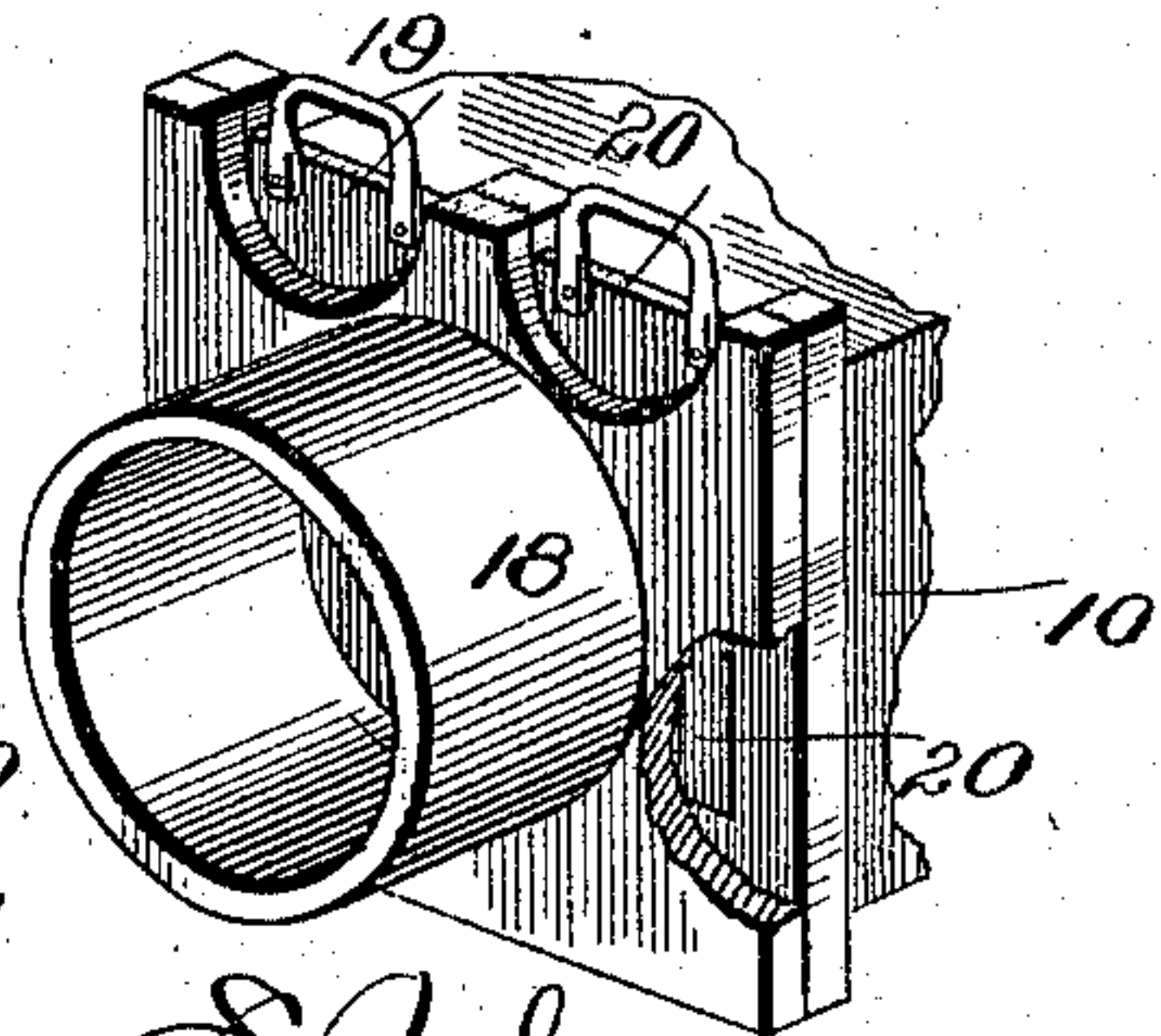
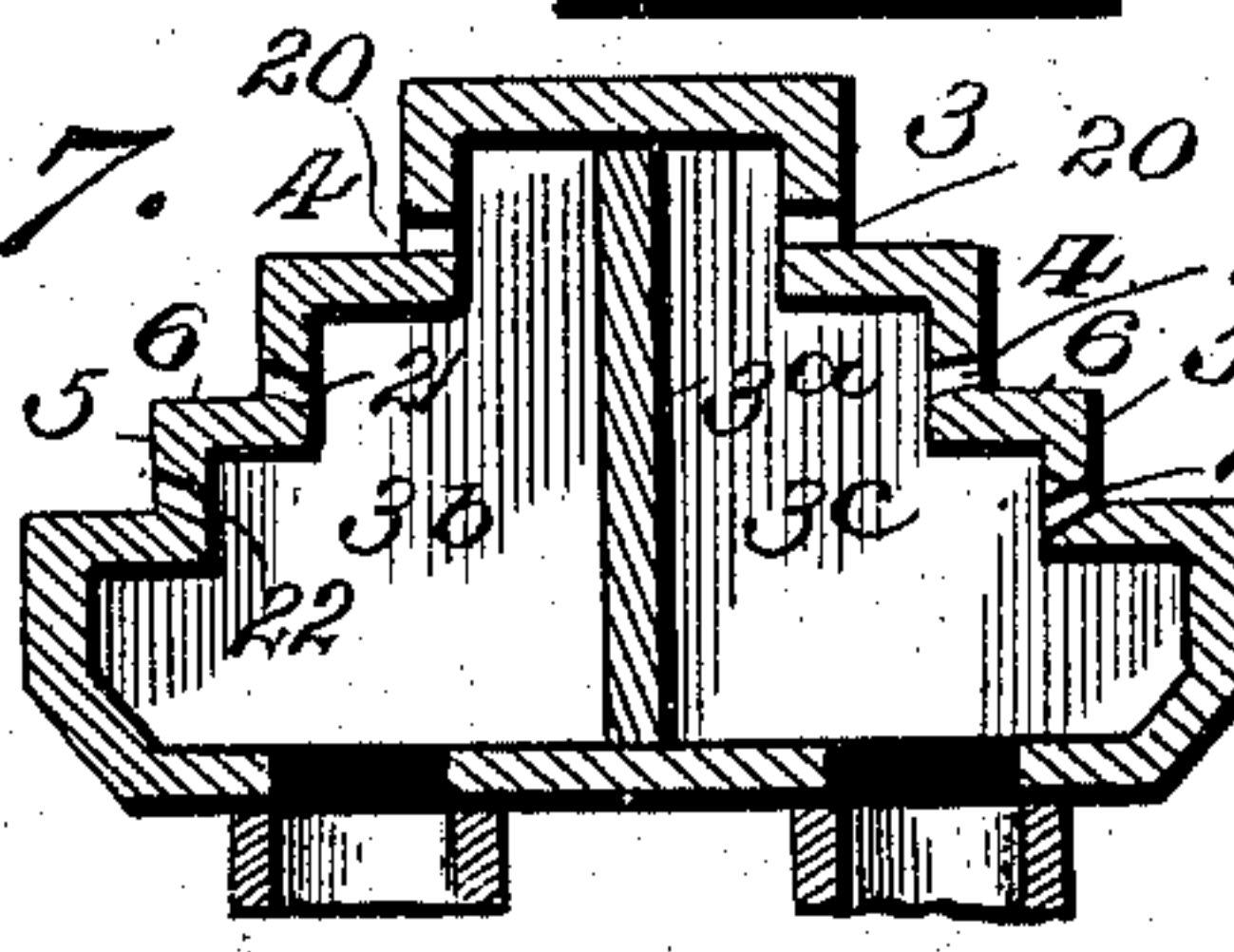


Fig. 7.



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UNITED STATES PATENT OFFICE.

ELONSO J. GORDON, OF GREENVILLE, MICHIGAN.

FURNACE-GRATE.

SPECIFICATION forming part of Letters Patent No. 574,030, dated December 29, 1896.

Application filed January 24, 1896. Serial No. 576,664. (No model.)

To all whom it may concern:

Be it known that I, ELONSO J. GORDON, a citizen of the United States, residing at Greenville, in the county of Montcalm, State of Michigan, have invented certain new and useful Improvements in Furnace-Grates; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention appertains to the construction of furnaces, and more particularly to the formation and arrangement of those parts upon which the fire rests, the object being to provide means for introducing and absolutely controlling the use of an artificial draft, which may be increased or diminished in quantity at will, and may also be directed to a predetermined point.

My invention, embodying all these features, will be fully set forth in the following specification and illustrated in the accompanying drawings, in which—

Figure 1 is an illustration in perspective, showing my invention as applied to use. Fig. 2 is a transverse sectional view of Fig. 1, on an enlarged scale, through the fire-box and furnace-walls, showing the grate-bars of ordinary construction and also my improved hollow grate-bars arranged as a partition for the fire-box and also as a lateral guard or protector for the furnace-walls. Fig. 3 is a sectional view showing the application of my invention to a battery of boilers. Fig. 4 is a perspective view of the outer or receiving end of the air-supply pipe, showing the vertically-sliding dampers or valves and also showing the projecting collar for forming connection with the blast-fan. Fig. 5 is a sectional view of Fig. 2 on line A A, showing manner of forming connection between air-supplying pipe and hollow grate-bar and damper or valve for regulating such connection. Fig. 6 is a bottom plan of one of the fire-supporting grates and the mechanism for tilting same. Fig. 7 is a transverse section, on an enlarged scale, of the central hollow blast-grate shown in Fig. 2 at its point of

connection with the air-supply, showing the blast-apertures leading at varying angles from the hollow or cavity to the point of combustion. Fig. 8 is a horizontal section of the air-supply pipe, on a reduced scale, showing the partition-wall therein.

For convenience in referring to the various details of my invention, figures will be employed to designate the several parts, each figure applying to the same part throughout the several views.

While my invention is applicable and efficient when applied to a series or batteries of boilers, for convenience of reference I will practically confine my description to its application to a single boiler and the necessary grates for efficiently supplying heat thereto.

From the use of my invention it will be clearly apparent that the essential benefits arising from the use thereof will be, first, the conservation and utilization of fuel and the heat produced therefrom, and, secondly, the protection of the furnace-walls due to the fact that the impact of the flame is directed toward and brought in contact with the surface of the boiler, or more especially the lower half thereof.

In carrying out my invention the furnace-walls proper, 1, are constructed in the usual manner, the subwall 2 being intermediate thereof and adapted to provide support for the transversely-disposed grate-bars of the usual construction, and while said bars may be arranged in a stationary manner, yet I prefer to so form and connect them that they may be simultaneously tilted, as shown in Fig. 6, for the purpose of discharging the same of their load. Intermediate the ends of the series of stationary grate-bars is located the longitudinal hollow blast-bar 3, which is substantially triangular in cross-section, as shown, and is provided on its upper sides with the graduated faces 4, having an alternate vertical and horizontal face 5 6, respectively. This hollow bar is supplemented at the opposite ends of the stationary bars by the auxiliary blast-bars 7 7^a, disposed parallel to the central blast-bar intermediate the end of the stationary bars and the furnace walls, as clearly shown in Fig. 2.

The auxiliary blast-bars 7 7^a are practically one-half of the central blast-bar, each being

inclosed, however, upon all sides and adapted to hold air under pressure and direct the same through apertures in the vertical walls, as will be hereinafter referred to.

5 The inner faces of the auxiliary bars 7 7^a are practically an inclined plane, having, however, the series of vertical and horizontal faces or graduations 8 9, similar to the graduations 5 6 upon the central blast-bar 3.

10 The central blast-bar 3 and the auxiliary blast-bars 7 7^a reach the entire length of the furnace, and by means of their practically inclined faces the fire is held positively upon the transversely-disposed grate-bars, as will
15 be clearly apparent.

In order to convey air under pressure to the hollow grate-bars, I provide the air-supply pipe 10, preferably arranged underneath the furnace and at right angles thereto. The air-
20 supply pipe 10 is provided with the longitudinal vertical partition 11, which partition reaches to a point opposite the subwall 2, where it terminates in a transverse wall 11^a, reaching to the rear wall of the air-supply
25 pipe, and it will be understood that by this arrangement the air-supply pipe 10 is divided into two compartments 12 13, and each of said compartments is adapted to communicate with and control the blast of their respective blast-bars, as will be hereinafter
30 clearly set forth.

In order to compensate for the contraction and expansion due to the varying degrees of heat incident to the operation of a furnace,
35 I provide a form of sleeve connection 14 between the air-supply pipe and the hollow grate-bars, (more clearly set forth in Fig. 5.)

In order to regulate the quantity of air passing from the air-supply pipe through its
40 outlet 14, I provide the sliding valve or damper 15, which may be moved to any point to be determined by the amount of pressure desired.

The air-supply pipe 10 is preferably rectangular in cross-section and consists of a series of sections provided with the meeting flanges 16, which may be bolted together by bolts 17, as shown; and it will be understood that in order to prevent any leakage of the
50 air through said point of connection any suitable packing may be interposed between the flanges before the same are locked together. The outer end of the air-supply pipe terminates in the collar 18, which provides a ready
55 means for forming connection with the blast-fan. Controlling valves or dampers 19 20 are mounted in the outer end of the air-supply pipe and are arranged to slide in ways provided therein, and it will be readily appreciated that the draft may be increased, diminished, or entirely shut off at the will of the operator. The central blast-bar 3 and the auxiliary bars 7 7^a being hollow, a series of apertures 20 21 22 take through the vertical
60 walls in the graduated faces thereof, communicating with the combustion-chamber; but it will be clearly understood that said

apertures are arranged at varying angles, and it is due to such arrangement that means are provided for directing the blast to a central
70 predetermined point where each of the series of blasts unite, thus effecting perfect combustion. The opposing graduated faces of the hollow blast-bars perform their function in a similar manner, thus providing that the point
75 of combustion shall be over the central section of the stationary solid bars, causing the heat thus generated to wrap around the sides of the boiler where it is most desired and at the same time protecting the furnace-walls
80 by such control of the flame.

For convenience in effectively directing the blast the hollow grate-bar 3 is provided with the central longitudinal partition 3^a, as shown, thus forming two separate compartments 3^b 3^c
85 in said grate-bar. It will therefore be necessary to provide a separate sleeve or connecting-elbow for each of said parts of the hollow blast-bar 3, as will hereinafter be pointed out.

For convenience of construction the chamber or compartment 12 of the air-supply pipe 10 may be caused to communicate by means of the sleeved elbows 14 14^a with the auxiliary blast-bar 7 and the opposing section 3^b, respectively, of the blast-bar 3, while the
95 compartment 13 of said pipe may be caused to communicate with the auxiliary blast-bar 7^a and the opposing section 3^c of the central blast-bar 3 by means of the sleeved elbows 14^c 14^b, respectively.

In order to reinforce the natural draft and add to the efficiency thereof, I provide the rotary valve 23, having the apertures 24, which are adapted to register with apertures of the same diameter provided in the air-supply pipe
105 when the valve is open, and by means of such registration air under pressure is permitted to escape from the air-supply pipe directly under the stationary grate-bars, thereby rendering combustion more perfect.

It will be seen from the foregoing description of my invention that an artificial draft may be supplied to the fire by means of the hollow grate-bars and the apertures therein, or such artificial draft may be wholly cut off
115 from said bars and dependence alone had upon the natural draft, or such natural draft may be reinforced, as above stated, by means of the rotary valves 23.

The stationary grate-bars may be secured
120 together in any preferred manner, preferably by being bolted to two or more supports 25, which in turn are shouldered into or secured to end sections 26, which latter are provided with trunnions 27. Said trunnions are provided with suitable bearings, and when said stationary grates are thus assembled and held in position they may be caused to tilt or lie at any angle sufficient to discharge the load thereon, thus facilitating the cleaning of the
130 furnace by dumping the contents on the floor underneath the grate-bars. The means I have provided for tilting the grate-bars thus secured together may be described as follows:

Near the central part of the supports 25 I secure shoulder 28, and to the same is pivotally connected the arm 29, which in turn is pivotally connected to the operating-lever 30, fulcrumed upon the seat 31, as shown.

By the construction above referred to it will be clearly apparent that when the free end of the operating-lever 30 is moved in a horizontal plane the grate-bars, secured together in the manner stated, will be caused to assume any preferred angle to their normal position by means of the trunnions and the bearings provided therefor, thus discharging the load resting upon said grates.

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

1. In a furnace-grate the combination with the stationary solid bars, of a central auxiliary hollow blast-bar, having a longitudinal partition and inclined graduated faces, each vertical wall of said graduations having a series of blast-apertures, each series being disposed at an angle which will cause the entire blast to reunite substantially at a central part of the fire, as and for the purpose set forth.

2. In a furnace-grate, the combination with the open-grate surface of the closed horizontal bars on each side thereof having an outer vertical wall and an inwardly-inclined face provided with a series of graduations which rise above the plane of the open-grate surface and having a series of blast-apertures passing through the vertical walls of said graduations at an angle to the vertical plane to reunite the blast from each side over the grate-surface, substantially as described and for the purpose named.

3. In a furnace having blast-bars provided with apertures, and solid bars interposed between said blast-bars, the combination of a

blast-supply pipe having a partition-wall therein, and means for effecting a connection between each of said blast-bars and its respective compartment in the blast-supply pipe, substantially as described and for the purpose named.

4. In a furnace provided with hollow blast-bars, the combination of an air-supply pipe; valves for controlling connection between said air-supply pipe and the solid and hollow blast-bars, and means for supplying air under pressure to said pipe, substantially as described and for the purpose named.

5. In a furnace having hollow blast-bars provided with apertures for directing the blast to a central point of the furnace, the combination therewith of a series of solid bars secured together by transverse holders, said holders terminating in trunnions provided with bearings, an operating-lever so attached to said holders that said bars may be tilted simultaneously and an air-supply pipe having a partition-wall therein and air-controlling valves, as and for the purpose set forth.

6. In a furnace-grate the combination with the solid grate-bars of hollow blast-bars having inclined graduated faces provided with a plurality of apertures arranged by series in the vertical walls of said graduated faces, each series of apertures pointing in a direction which will cause the entire blast to reunite at a given point along the median line of the fire-box, substantially as described and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

ELONSO J. GORDON.

Witnesses:

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FRANK S. WHEELER.