

No. 615,291.

Patented Dec. 6, 1898.

L. F. LYNE.
STEAM BOILER FURNACE.

(Application filed Mar. 8, 1897.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 4.

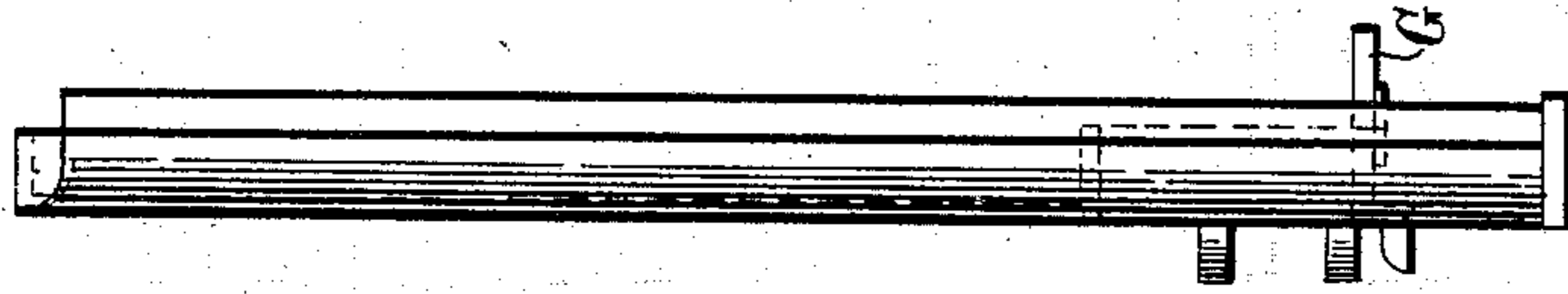


Fig. 3.

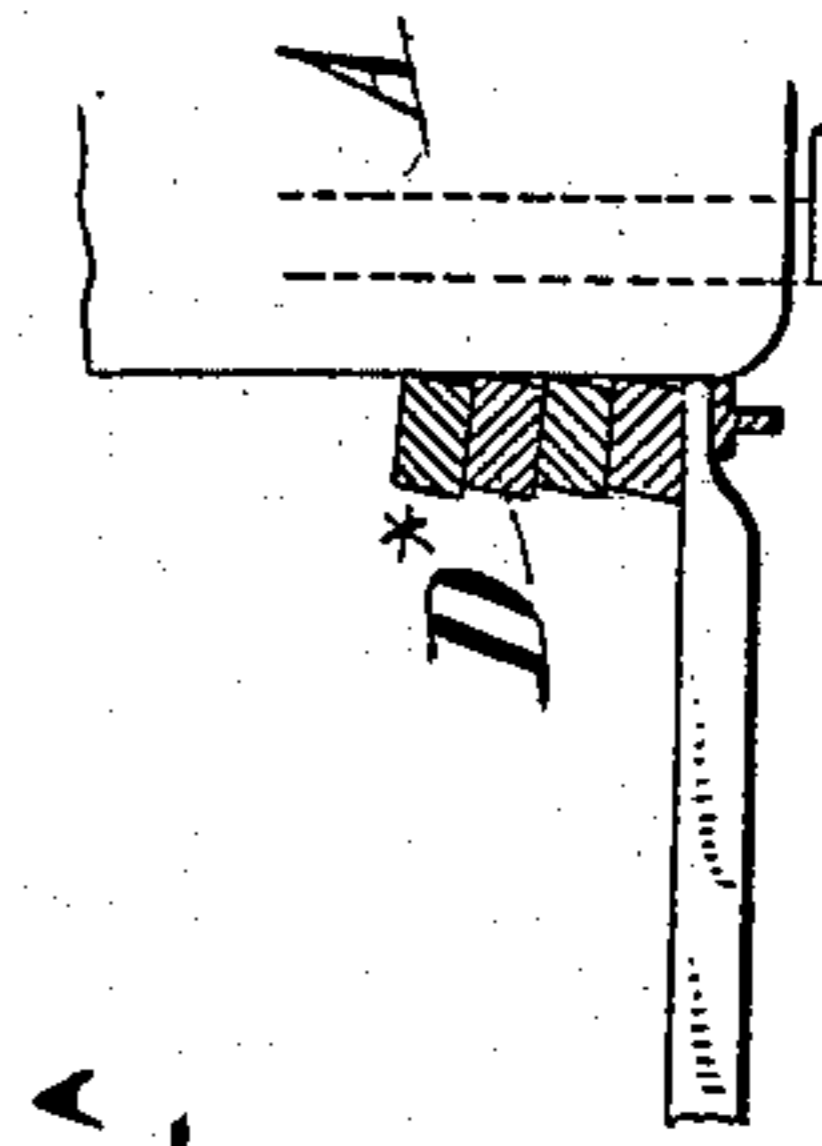
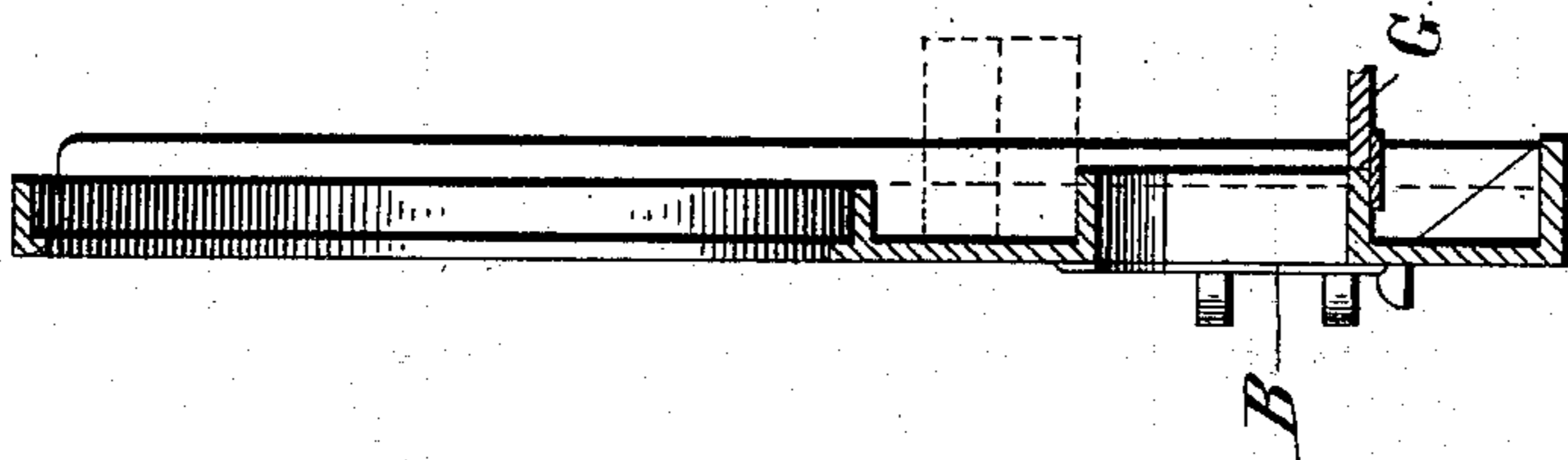


Fig. 5.

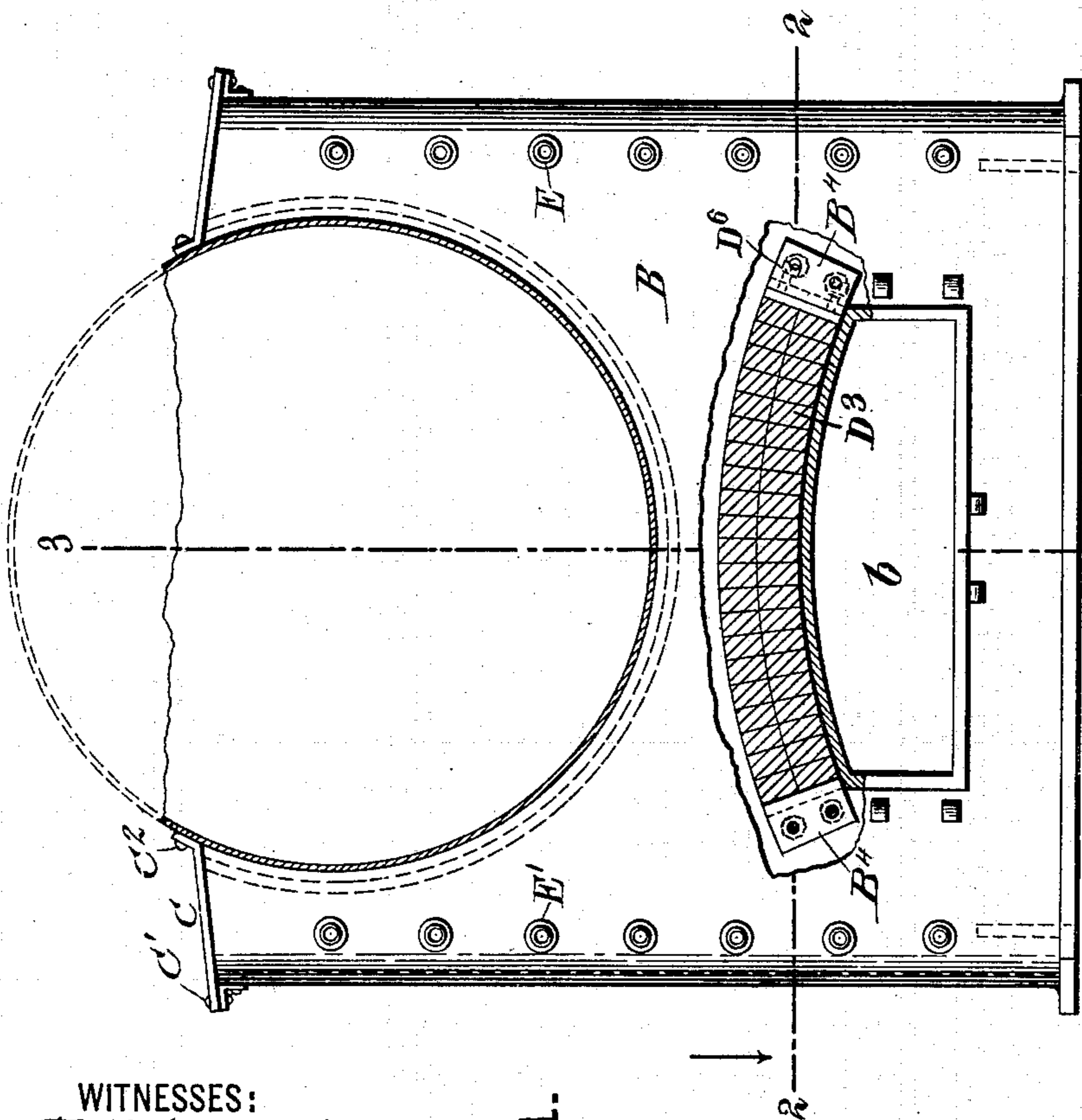
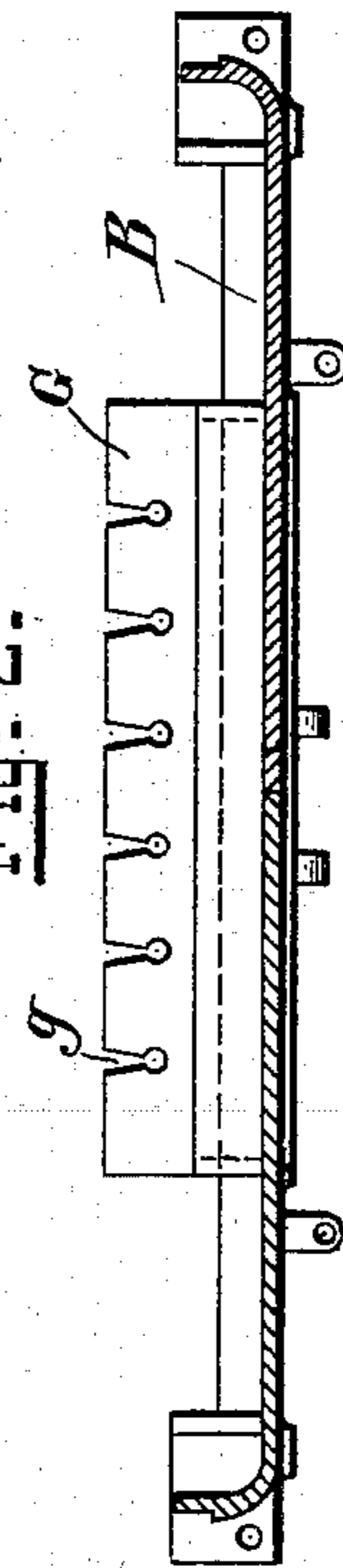


Fig. 2.



WITNESSES:
Fr. N. Roehrich.
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Fig. 1.

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No. 615,291.

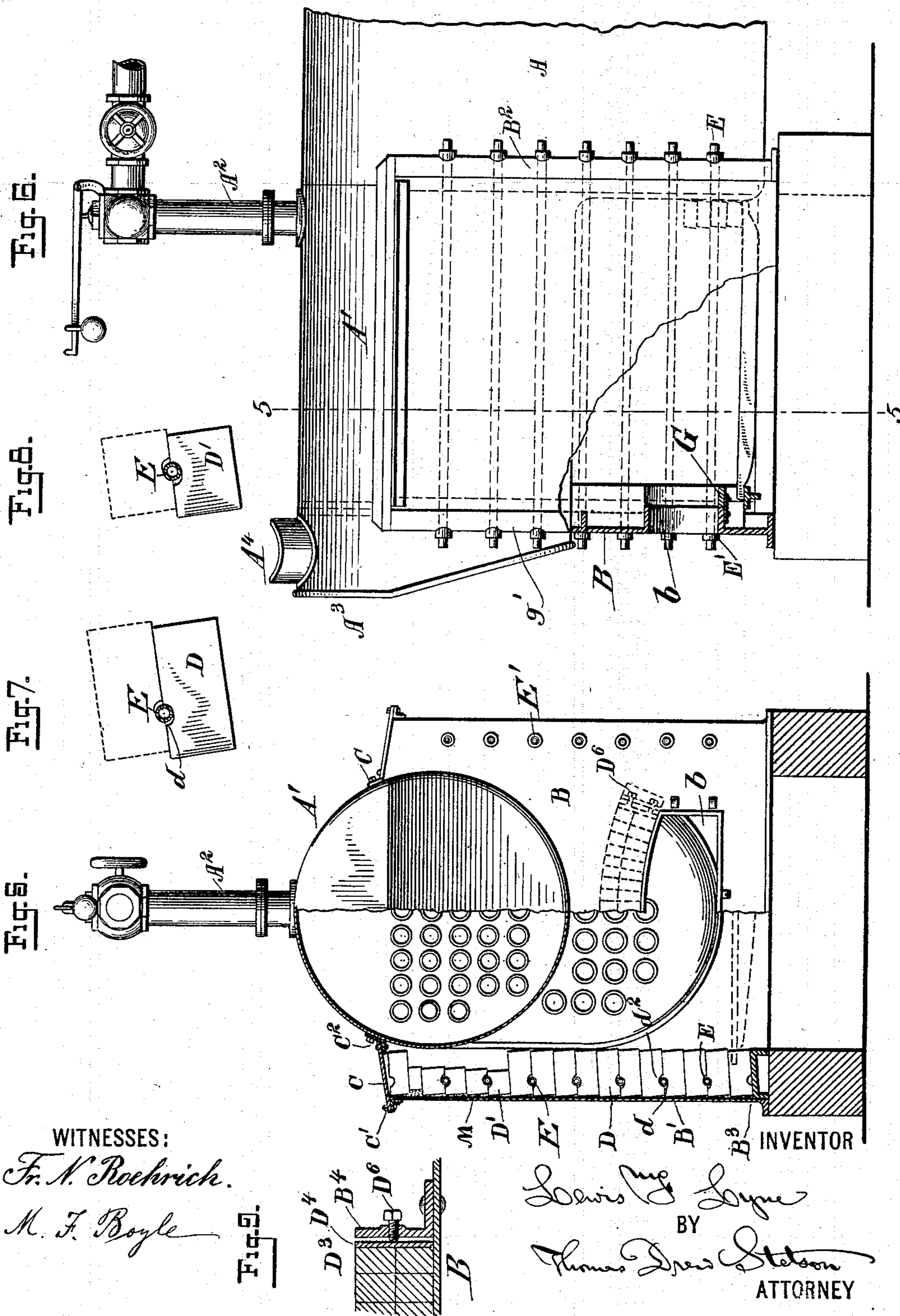
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WITNESSES:

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Fig. 8.

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UNITED STATES PATENT OFFICE.

LEWIS F. LYNE, OF JERSEY CITY, NEW JERSEY.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 615,291, dated December 6, 1898.

Application filed March 6, 1897. Serial No. 626,217. (No model.)

To all whom it may concern:

Be it known that I, LEWIS F. LYNE, a citizen of the United States, residing in Jersey City, in the county of Hudson and State of New Jersey, have invented a certain new and useful Improvement in Steam-Boiler Furnaces, of which the following is a specification.

The invention may apply to all classes of boilers in which the furnace is exterior to and below the boiler, or below a part of the boiler. I will show it as applied to a boiler in which there is a deeper rear portion, but the front portion is cylindrical. The furnace is below this cylindrical part and in front of the deeper, commonly called the "elliptical," part of the boiler. The exterior of the furnace is wider than the boiler.

My invention relates to the construction of the furnace-walls.

The accompanying drawings form a part of this specification and represent what I consider the best means for carrying out the invention.

Figure 1 is a front elevation showing the main portion of the furnace, but with a portion of the metallic plate or casing broken away to show the arrangement of the arch-bricks within. The next three figures show different views of the front. Fig. 2 is a horizontal section on the line 2 2 in Fig. 1. Fig. 3 is a central vertical section on the line 3 3 in Fig. 1. Fig. 4 is a side elevation. The remaining figures are on a smaller scale. Fig. 5 is two different half-figures. The right side is an elevation, and the left side is a section on the line 5 5 in Fig. 6. Fig. 6 is a side elevation with a portion broken away. Fig. 7 is a side view showing one of the full-length notched bricks. Fig. 8 is a side view of one of the half-length bricks. Fig. 9 is a fragmentary view showing a horizontal section through one end of the brick arch over the door. Fig. 6^a is a vertical longitudinal section of a portion at and adjacent to the rear edge of the grate.

Similar letters of reference indicate corresponding parts in all the figures where they appear.

A is the deep rear portion or the main body of the boiler, A' is the cylindrical front portion, A² is a nozzle for steam-pipe, A³ the

breeching, and A⁴ the base, of the stack, all of an ordinary and long-approved construction.

The non-conducting walls around the furnace are peculiar.

B is the front plate of the furnace, and *b* an ordinary door-opening therein.

B' is a side plate, and B² the back plates, the latter covering the excess of width of the furnace beyond that of the boiler. Holes are provided near the edges to allow rods or tubes to protrude and receive nuts, as will appear farther on.

B³ is a casting at the base, inclosed within the plates B B' B² and riveted or bolted thereto. Its upper surface is inclined from the ash-pit downwardly, as clearly shown in Fig. 5.

C C are top plates, which are secured to the boiler and to the casing by removable fastenings C' C². The employment of the detachable top plates C C admits of their removal to afford access to the upper series of fire-bricks, to be presently described. The lower series can be readily reached through the furnace-door.

D D, &c., are fire-bricks set on edge, each having a transverse groove or notch *d* in one of its long edges of sufficient size to receive a cylindrical key or binding piece. These bricks are set at an inclination, as shown in Fig. 5, the lowermost resting on the inclined upper face of the support B³ and the other being superposed thereon, arranged as shown, the lowest brick being laid with its notch *d* upward and the next above being set in the reverse position, with its notch *d* presented downward. It is advantageous to fill the space between the brick wall and the metallic side plates with a composition M of asbestos and plaster, worked in fluid condition or semi-fluid condition. The tendency of this layer to settle and push the lower bricks into the fire I counteract by the ledges which are formed by the outer ends of the bricks in consequence of the triangular spaces left by the inclined arrangement of the rectangular bricks in a vertical wall.

E E, &c., are locking-keys, which are shown as tubes, preferably of iron or low steel, extending through the notches *d d* and secured by nuts E', threaded on their projecting ends.

By locating the notches *d* in the longer edge

of each of the bricks D and near one end thereof each can lie with an end presented toward the fire and thus admit of a longer proportion of the brick being burned away before the keying will become affected.

An internal lip is provided on the front plate B around the fire-door *b*. This may extend inward about half the length of the brick. The front wall of the furnace immediately above the lip around the fire-door is formed of arch-bricks D³. Their lower edges should be in contact with the lip; but they do not depend thereon for support. The arch abuts each side against a stoutly bolted or riveted angle-plate B⁴, of which there are two. (See Figs. 1 and 5.) The bricks above in the front of the furnace rest on this arch.

D⁶ are screws tapped through one of the abutting angle-plates B⁴ and capable of being adjusted to press against an intermediate metal plate D⁴ and take up any looseness in the bricks D³. These screws not only take up any slack, but bind and securely hold the arch-bricks.

G is the dead-plate, mounted in the usual horizontal position at the bottom of the door-opening. Its back or inner edge is provided with deep notches or slits *g*, each having its bottom rounded on a considerable radius. The notches allow the back edge to expand under the high temperatures to which it is exposed, the rounded bottom of each notch avoiding the liability which would otherwise be incurred to the formation of cracks.

The lip around the fire-door reinforces the adjacent portions of the casting, and the dead-plate or hearth G is detachably secured to the lower portion of this lip by a lap-plate and bolts, as shown in Fig. 6. This arrangement admits of the replacement at long intervals of the dead-plate when permanently injured by burning. The slitting of the dead-plate enables it to incur the damaging expanding and contracting effect of the heat which would otherwise be sustained by that portion of the front below the door.

The rear of the furnace is provided with a thinner wall D⁵ of fire-brick laid flatwise, as shown in Fig. 6^a.

I attach importance to the outward inclination of the upper surface of the casting B³ and the corresponding inclination of the bricks D, because it counteracts the tendency of the bricks to creep inward. There is a tendency due to the changes of dimensions with the intense changes in temperature to which the bricks in this situation are subjected to gradually shift their position inward when in a horizontal position in the usual way. If the bricks are inclined to about the extent indicated, gravity will go far to offset the tendency to creep and the several bricks will the more easily be kept in position by the keys and will in many cases be kept properly outward even if the keys are omitted.

The tubular form of the keys E admits of

a circulation of air therethrough, thereby maintaining them at a lower temperature than would otherwise be possible and preventing to a large extent any tendency to their becoming injured by heat even when the bricks are considerably burned away.

I attach importance to the fact that my fire-bricks in my walls are laid on edge, because it allows of deep notches *d d* without seriously weakening them and because the bricks are able in that position to contribute more to the strength of the wall than in their ordinary flat positions; and I attach importance to the fact that the bricks lie with their lengths transverse to the wall, because such position also contributes to the strength.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention. A portion of the walls on each side near the top is made with shorter bricks D', as shown in Figs. 5 and 8. This allows the hot gases to flow up and bathe the shell of the boiler effectively to the proper height. The same mode of keying and binding is shown and may be successfully used in those short bricks; but the keys E may be omitted in those parts, if preferred. When these keys are omitted, the short bricks may be notched or not, as preferred. The rectangular bricks set inclined present at their back ends between the bricks and the metallic casing not a space of uniform thickness, but a series of pockets of triangular section. This form of the space, or, more properly, series of spaces, when properly filled with the plastic packing, insures that the latter is efficiently supported against the force of gravity.

The filling composition may be varied in its nature. Plaster alone will serve usefully. The composition, whatever its make, may, if preferred in any case, extend through the joints between the several bricks; but my experiments indicate that such will not be necessary.

The plate of metal D⁴ between the screws D⁶ and the adjacent bricks of the arch to receive the force of the screws may be omitted.

The keys E may be solid rods instead of tubes. A split cotter or pin may be inserted near each end or near one end of each key, a transverse hole being drilled to receive it.

In this furnace, as in others, the bed or lower courses of the bricks, being more intensely acted on by the fire, are liable to be destroyed earlier than the others. This is especially the case with anthracite fuel. Among other advantages due to the notching of the bricks, as indicated by *d*, and the engaging of them together and with the outer casing by the keys E and the nuts E' is the fact that when such burning out has reached a stage which demands repairs, while the upper courses of bricks are in tolerably good condition, I can by working in the interior of the furnace remove the defective tiers of bricks and replace them by new, sustaining the upper portion of the wall in position by the keys.

I claim as my invention—

1. A rectangular furnace having the walls comprising a vertical metallic casing and a corresponding vertical lining of rectangular fire-bricks, the several bricks being set inclined relatively to the plane of the wall, with their inner edges the highest, and presenting at their outer edges a series of pockets triangular in cross-section adapted to receive corresponding angular portions of plastic packing molded in place to aid in holding up the same without requiring special forms of brick, all substantially as herein specified.

2. In a steam-boiler furnace, a wall comprising a vertical plate or casing B' of metal, and a vertical series of fire-bricks within such casing laid with the lengths transverse to the wall and inclined from the inner end outward so that notwithstanding the vertical position of the wall, the gravity of the bricks shall urge them into contact with the casing, all substantially as herein specified.

3. A furnace-wall comprising a vertical metallic casing and a corresponding vertical lining of rectangular fire-bricks, the several bricks being set inclined relatively to the wall, with their inner edges the highest, and presenting at their outer edges a series of triangular pockets, in combination with a correspondingly-inclined shelf attached to the inner face of the casing and supporting said bricks, all substantially as herein specified.

4. In a steam-boiler furnace, the combination with a vertical casing B', of a perpendicular lining-wall composed of fire-bricks D, set inclined relatively to the wall, the inner ends the highest, the bricks being set on edge and notched as indicated by *d d*, arranged to have the notches partially coincide when in place, and adapted to receive a filling or key, substantially as herein specified.

5. In a steam-boiler furnace, the combination with a vertical casing B', of a corresponding vertical lining-wall composed of fire-bricks D set inclined relatively to the wall, the inner ends being the highest, and with a packing M of non-conducting material interposed in a plastic state so as to fill and take the form of the space between said lining and casing, the bricks being set on edge and notched as indicated by *d d*, arranged to have the notches partially coincide when in place and adapted to receive a filling or key, all arranged to serve substantially as herein specified.

6. In a steam-boiler furnace, a vertical casing B' and corresponding vertical lining-wall composed of notched fire-bricks D, *d, d*, set on edge and inclined relatively to the wall, the inner ends the highest, in combination with horizontal keys of metal lying in the notches and extending each through a number of adjacent notches, and with nuts E' therein so that said keys serve the double function of locking the bricks against displacement laterally and tying them longitu-

dinally of the wall, all substantially as herein specified.

7. In a furnace having a metallic casing and an interior wall of fire-brick, a pair of abutments formed by angle-plates B⁴, fixed on the inner face of the front portion B of the casing near the top of the fire-door opening *b* on each side thereof, and a series of arch-bricks D³ extending across between such abutments, all substantially as herein specified.

8. In a furnace having a metallic casing and an interior wall of fire-brick, a pair of abutments formed by angle-plates B⁴ on the inner face of the front portion B of the casing near the top of the fire-door opening *b* on each side thereof, a series of arch-bricks D³ extending across between such abutments and means D⁶ for adjusting the bearing of one of such abutments, all arranged to serve substantially as herein specified.

9. The combination with a steam-boiler furnace, having a cast-iron front, of a dead-plate or hearth G having deep notches in its back edge rounded at their bottoms to reduce liability of cracking, said plate or hearth being located to protect the front below the door-opening therein, all arranged to serve substantially as herein specified.

10. The combination with a steam-boiler furnace having a cast-iron front provided with a rearwardly-extending lip or flange around the door-opening therein, of a separately-formed dead-plate or hearth G, with deep notches in its back edge rounded at their bottoms, said plate being located contiguous to the lower part of the flange, and means as shown for detachably connecting said dead-plate or hearth G, substantially as herein specified.

11. A boiler-furnace having a vertical casing in combination with a lining-wall comprising a perpendicular series of fire-bricks, and a top plate C, detachably secured in position, substantially as herein specified.

12. The combination in a boiler-furnace supporting the cylindrical boiler portion A', of a lining-wall comprising a perpendicular series of fire-bricks, those bricks adjacent to the portion A' being of shorter length, to present an effective heat-space in the upper part of the furnace and at the side of said boiler portion A', substantially as specified.

13. A boiler-furnace having a lining-wall of parallel-sided bricks laid into a self-supporting wall with the adjacent faces of said bricks sloped upward inwardly, substantially as described.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

LEWIS F. LYNE.

Witnesses:

J. B. CLAUTICE,
M. F. BOYLE.