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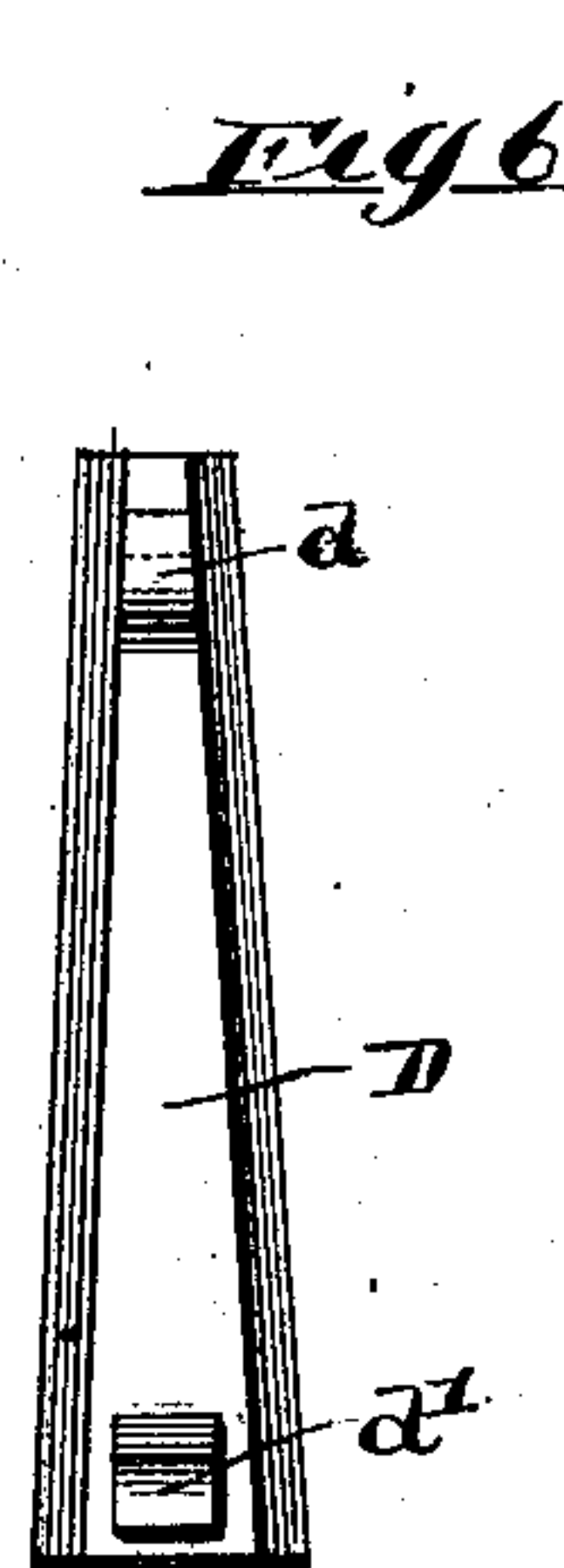
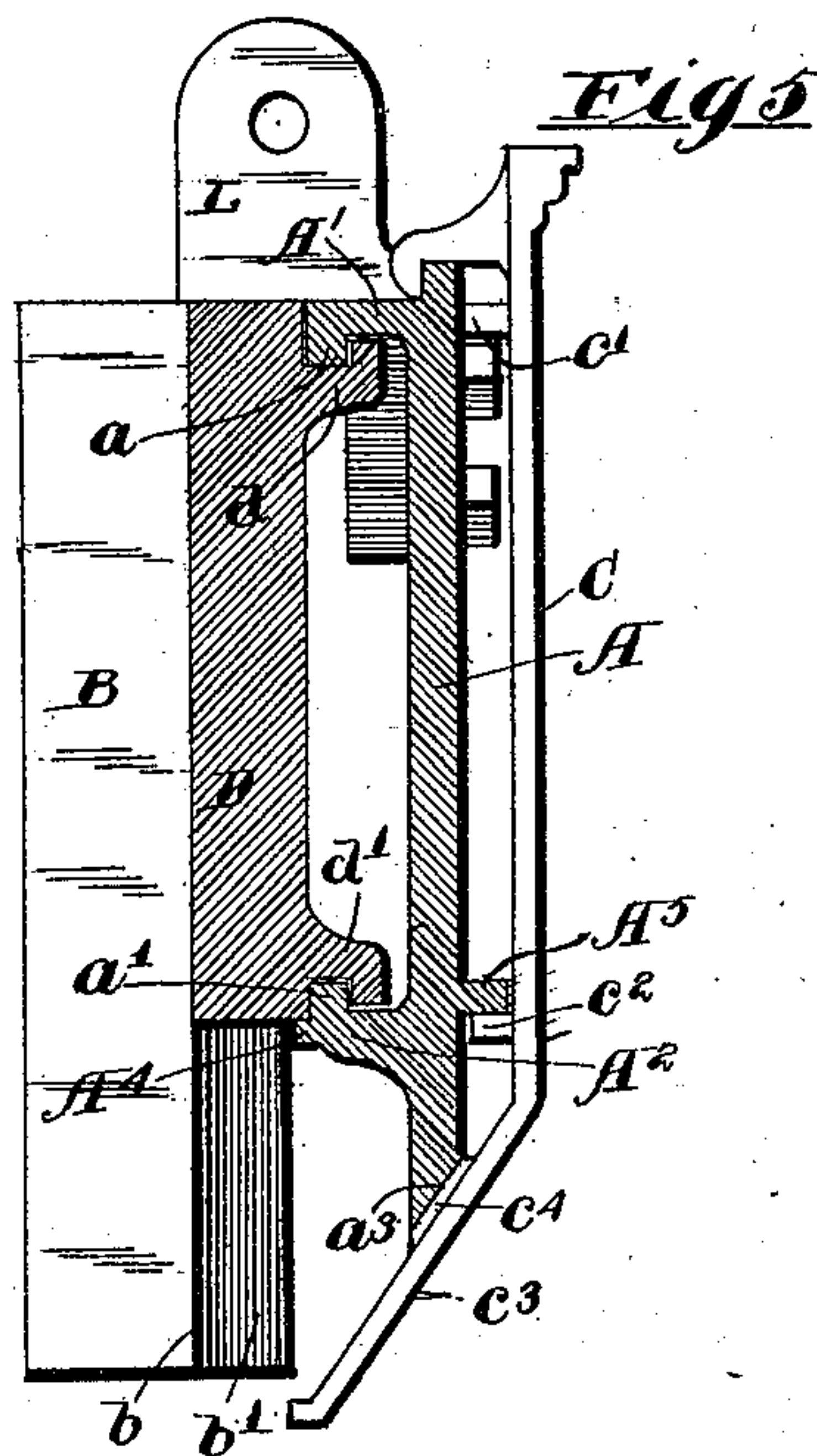
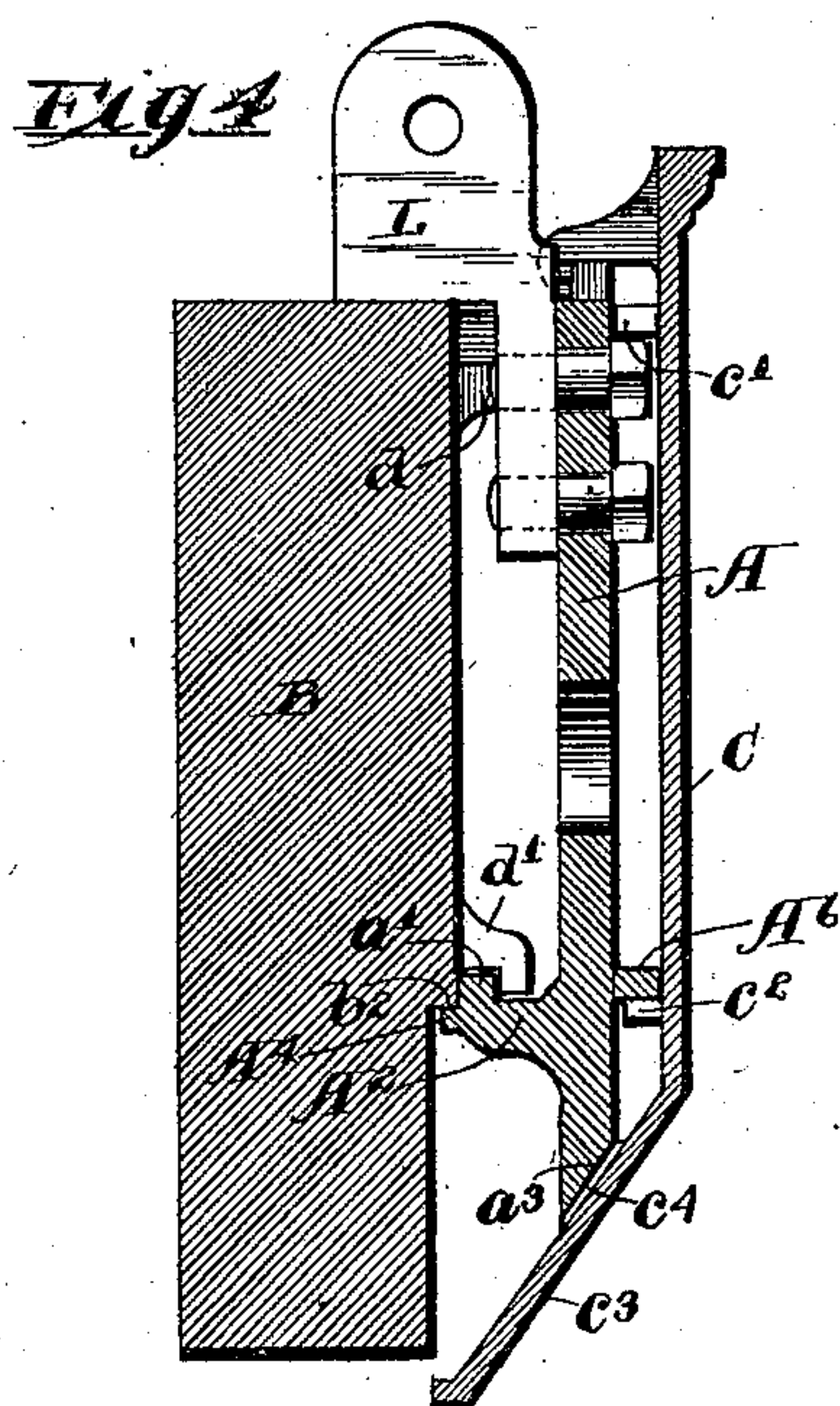
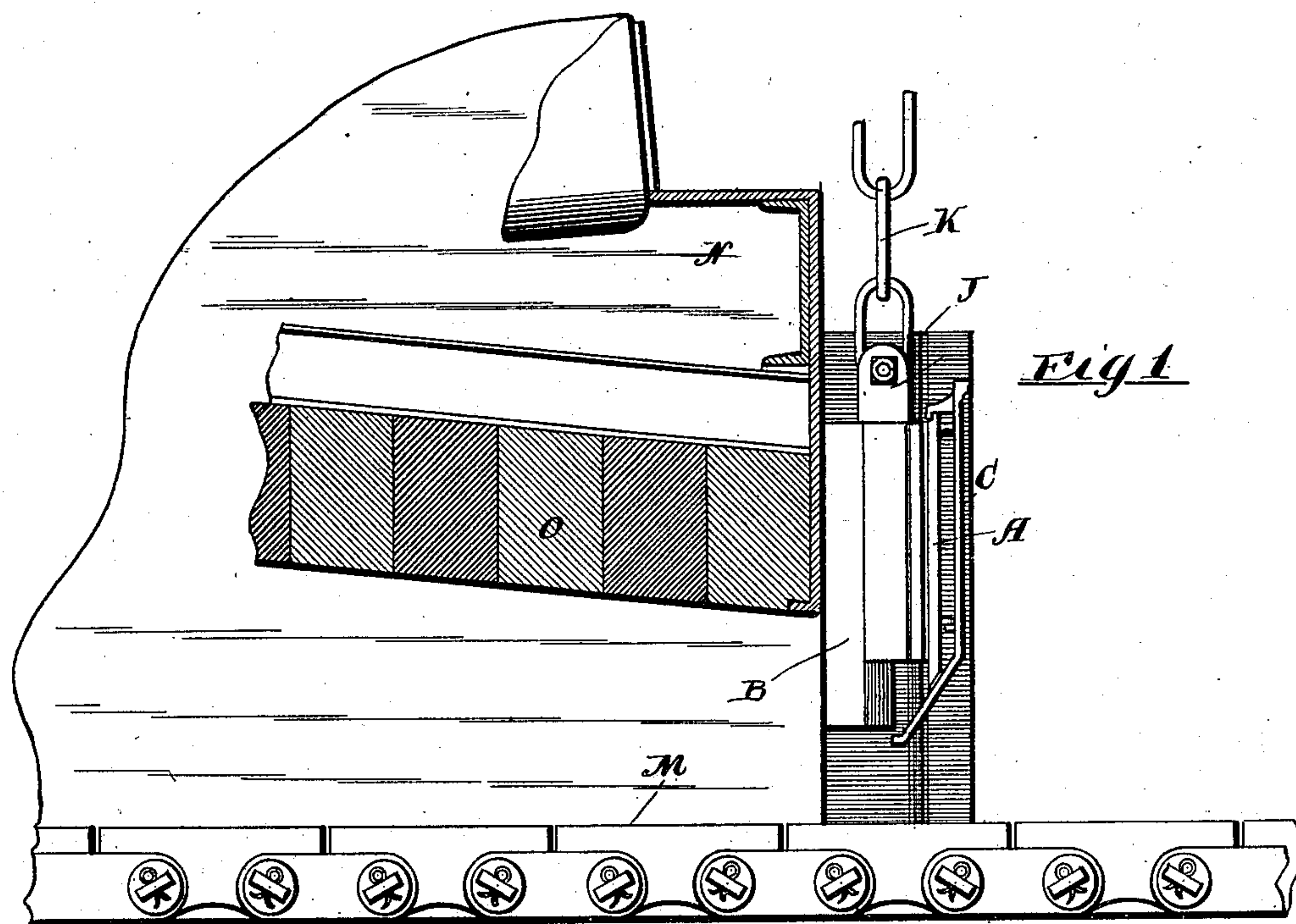
PATENTED APR. 14, 1903.

H. A. POPPENHUSEN.
FIRE GATE FOR FURNACES.

APPLICATION FILED DEC. 21, 1901.

NO MODEL.

3 SHEETS—SHEET 1.



Witnesses:

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William H. Hall

Inventor:

Herman A. Poppenhusen

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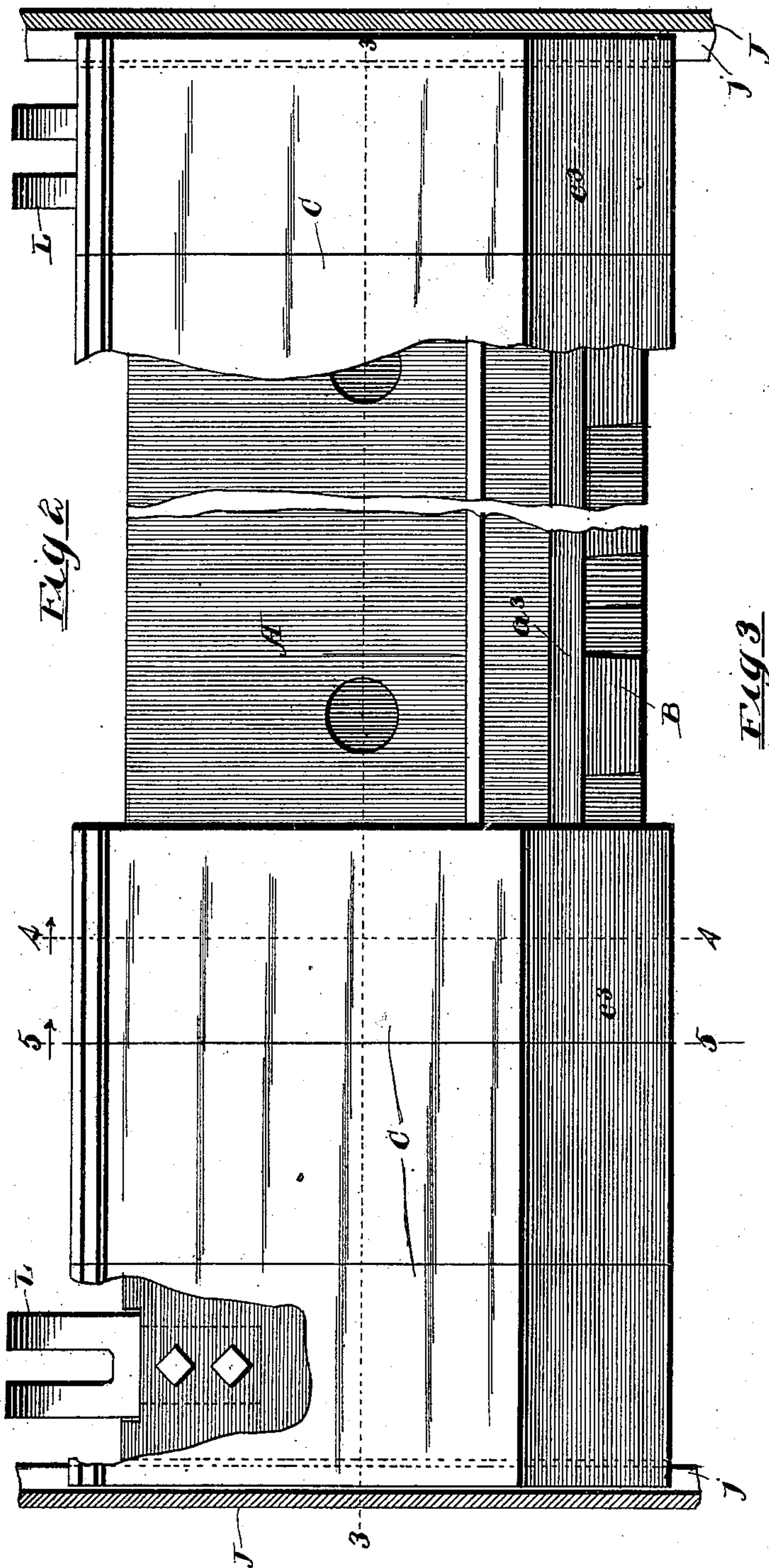
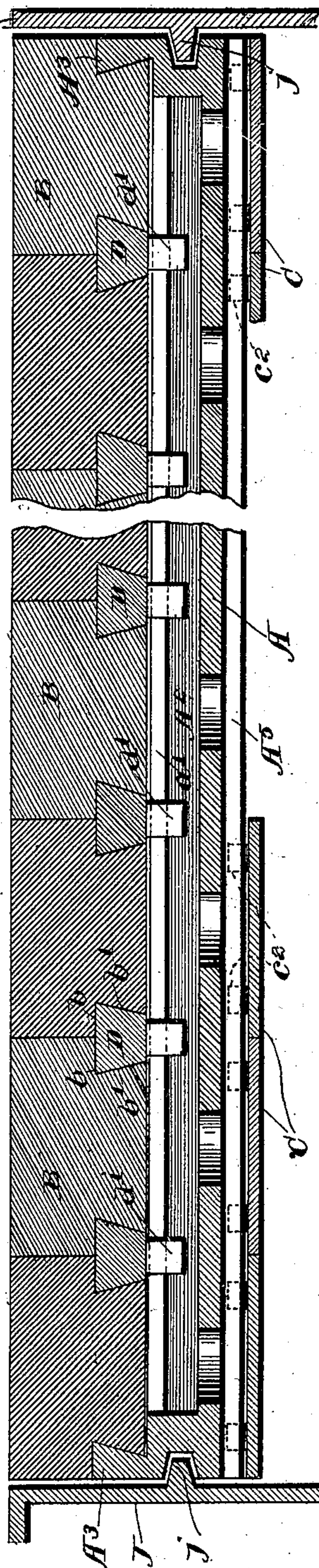


Fig. 2

Fig. 3



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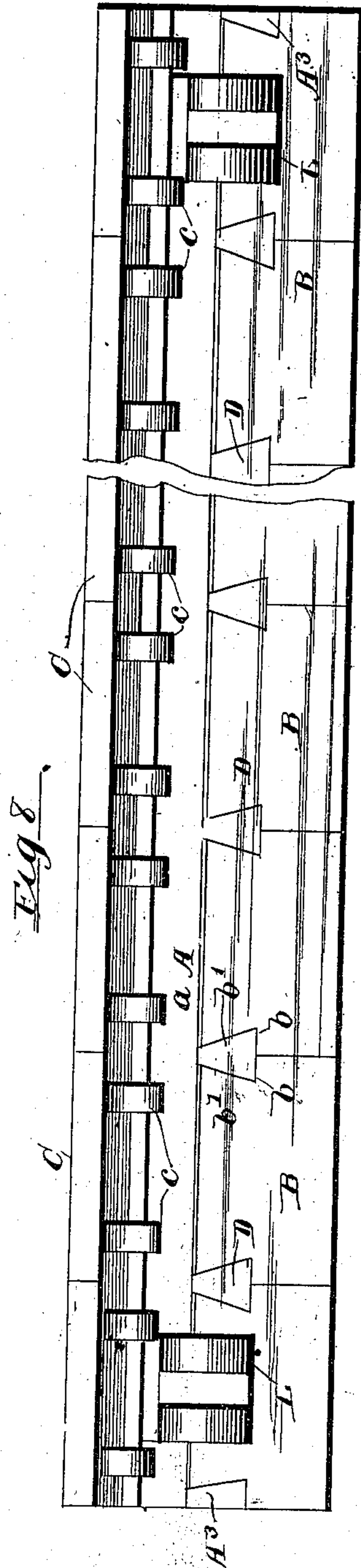
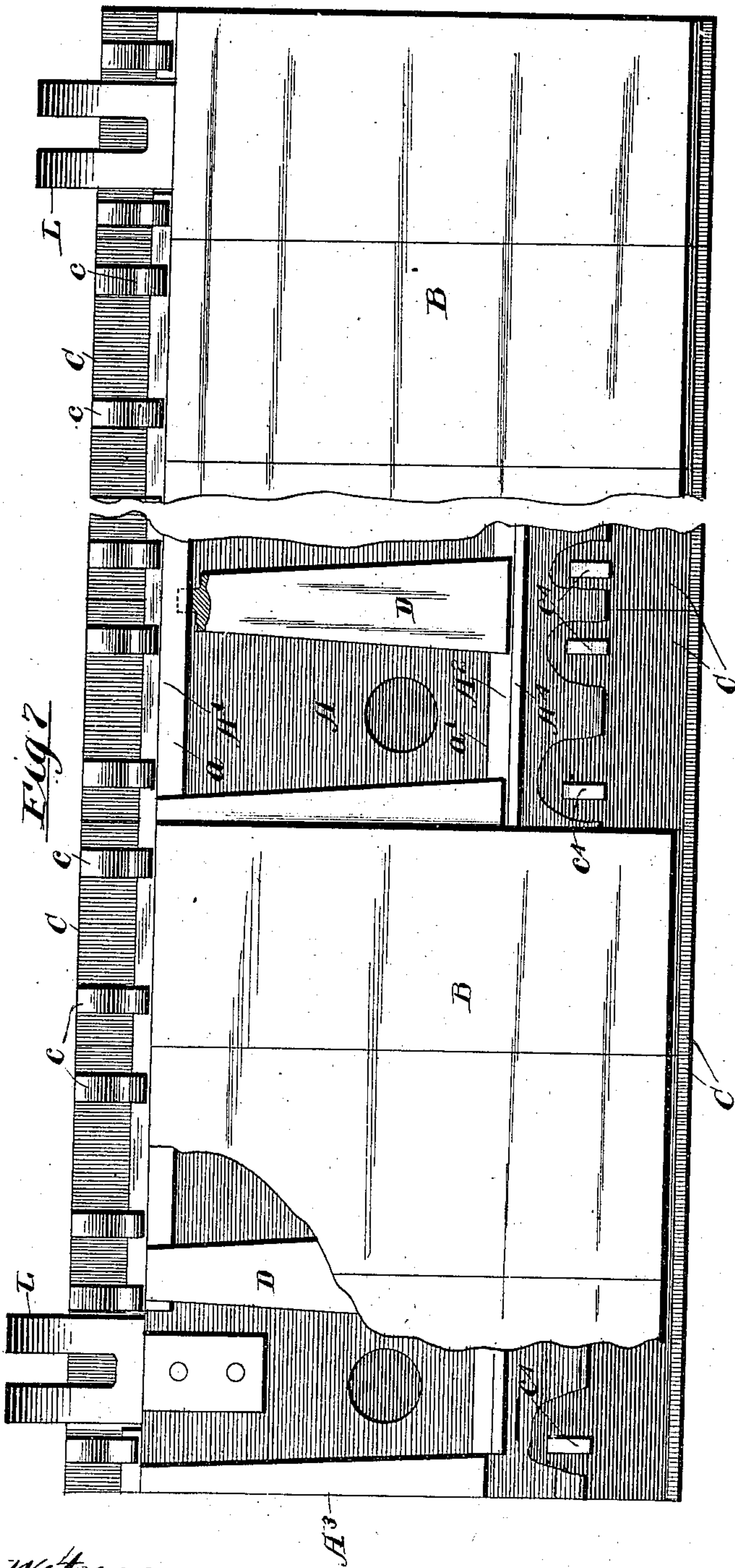
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UNITED STATES PATENT OFFICE.

HERMAN A. POPPENHUSEN, OF EVANSTON, ILLINOIS.

FIRE-GATE FOR FURNACES.

SPECIFICATION forming part of Letters Patent No. 725,362, dated April 14, 1903.

Application filed December 21, 1901. Serial No. 86,791. (No model.)

To all whom it may concern:

Be it known that I, HERMAN A. POPPENHUSEN, a citizen of the United States, and a resident of Evanston, in the county of Cook and State of Illinois, (whose post-office address is Western Union Building, in the city of Chicago, in said county and State,) have invented certain new and useful Improvements in Fire-Gates for Furnaces; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in fire-gates for furnaces, the same being the sliding gates or doors for varying the fuel-openings to furnaces of that kind provided with a traveling grate or other form of stoking apparatus and which is vertically adjustable to control the passage of fuel through said opening.

The invention consists in the matters hereinafter described, and pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a view in central vertical section of the front wall of a boiler-furnace equipped with a chain grate and having a fire-gate embodying my invention applied thereto. Fig. 2 is a face view or front elevation of the fire-gate with parts broken away to show the details of construction thereof. Fig. 3 is a plan section of the gate, taken on line 3 3 of Fig. 2. Fig. 4 is a vertical section taken on line 4 4 of Fig. 2. Fig. 5 is a vertical section taken on line 5 5 of Fig. 2. Fig. 6 is a detail elevation of one of the tile-supporting bars, showing the inner face thereof. Fig. 7 is a view in elevation of the inner face of the gate with parts broken away to show details of construction. Fig. 8 is a plan view of the gate.

The fire-gate illustrated embraces as its main or principal features a frame-plate A, a plurality of tiles B, secured to the inner face of the frame-plate and forming a refractory lining to the gate, and a plurality of covering-plates C, applied over the front or outer face of the said frame-plate.

To provide for the attachment of the tiles B to the frame-plate A, a construction is

provided as follows: On the rear or inner face of said frame-plate are located upper and lower horizontal flanges A' A², Fig. 3, having at their margins vertical flanges a a', giving to the flanges as a whole a hook form, as seen in cross-section. The flange A' is shown as located at the top of the frame-plate and the flange A² at a considerable distance from the lower edge thereof. The flanges a a' are shown as directed toward each other, that on the upper flange being directed downwardly and that on the lower flange A² directed upwardly. Connected with the frame-plate A by means of the flanges A' A² are a plurality of vertical tile-supporting bars D D. Said bars are provided with hook-shaped lugs d d', which lugs are located at a proper distance apart to engage the flanges a a' and to thereby retain the bars in engagement with the frame-plate, while permitting said bars to be moved or to slide endwise along said frame-plate. The lugs d d' are preferably cast upon or made integral with the bars D and are engaged with and disengaged from the flanges A' A² by bringing the lugs between the flanges when the bars are held obliquely with respect to the said flanges and then turning the bars into a vertical position. Said bars are herein shown as made of tapered form and wider at their lower than at their upper ends and are also made of dovetail form in cross-section or wider at their outer parts than at their faces which rest against the flanges of the frame-plate. In connection with this feature of construction in the bars D the tiles B, which are made considerably thicker than the plates C, are provided at their side edges with rabbets b b, Figs. 3 and 8, having lateral contact-faces b', which are adapted for contact with the oblique sides of the bars D, the parts being so arranged that the oblique contact-faces b' b' on each tile engage the adjacent faces of two adjacent bars D, as clearly seen in Fig. 8. The tiles being considerably thicker than the bars D, the side edges of the tiles come in contact with each other in their parts exterior to the rabbets, so that the several tiles when placed upon the frame-plate constitute a continuous surface or lining for the same and cover or protect from the heat of the furnace the bars D, as well as the frame

which supports them. Said plate A is provided at its ends with inwardly-extending integral ribs A^3 , corresponding in shape with one-half of one of each of the bars D. The outer faces of said ribs are flush with the end faces of the frame-plate; but the inner faces are so formed as to correspond with the side faces of the said bars D, so that the end tiles B fit against and engage the flanges A^3 at their outer edges in the same manner that they engage at their inner edges the adjacent bars D. The tiles B are made of such width as to fill the space between the end flanges A^3 of the frame-plate; but the intermediate bars D being movable or capable of being shifted endwise on said plate no exact adjustment of the said bars is required, they being adapted to adjust themselves to exactly the required position with respect to the tiles when the tiles are put in place, it being readily understood that if there are slight variations in the widths of the tiles—that is to say, if some of the tiles are slightly wider and others slightly narrower than the standard width—the movable or self-adjusting bars D will come into proper positions with respect to the tiles.

In order to maintain the upper and lower edges of the several tiles B accurately in horizontal alinement, said tiles are provided on their inner surfaces with downwardly-facing shoulders b^2 , Fig. 4, and the frame-plate A is provided with a ledge A^4 , arranged in position for contact with said shoulders b^2 when the tiles are in proper position upon the frame-plate, said shoulders and ledge serving as stops to limit the downward movement of the tiles. Said shoulders are herein shown as located at points somewhat above the lower ends of the tiles, but may be otherwise located. The ledge A^4 is herein shown as formed upon the outer margin of the lower flange A^2 ; but it may be otherwise located on the frame-plate as desired. When said shoulders b^2 and the associated ledge A^4 are employed, the bars D may be made of the same width throughout their length or provided with parallel sides and the engaging faces of the tiles in the rabbets thereof correspondingly formed. In this construction the ledge A^4 serves to hold the tiles in proper vertical position and prevents the same from shifting during expansion and contraction of the bars and tiles. If the material forming the tiles and bars have equal coefficient of expansion and contraction, the tapered form of the bars and the omission of the supporting-ledge A^4 are not objectionable. If, however, the coefficients of the materials of the bars and tiles be unequal—as, for instance, if the material of the bars have greater expansion than the material of the tiles—the construction wherein the bars are tapered and the supporting-ledge is omitted would be objectionable, for the reason that during expansion and contraction of said parts the tiles would shift downwardly and the bars would tend to shear

or crush the tiles. By the use of the supporting-ledge, however, this result is obviated whether the supporting-bars be tapered or not.

Now, referring to the covering-plates C and the means for sustaining them upon the frame-plate A, said covering-plates are provided each at its upper end with two inwardly-extending hook-shaped lugs c , which are adapted to extend over or behind the upper margin of the plate A or a flange a^2 , which rises above the flange A' on the upper margin of the said plate A and which forms an upward extension of the said plate. By the hook-shaped lugs c the covering-plates C are hung or suspended on the outer face of the plate A. Said covering-plates are, moreover, not necessarily in contact with the plate A, but are preferably separated therefrom by an air-space, being held at a uniform distance from the frame-plate by means of studs c' , located on the inner faces of the plates, near the upper margin thereof, and extending inwardly, so as to come in contact with the outer face of the frame-plate A. The said plate A is provided near its lower edge with a horizontal outwardly-extending rib or flange A^5 , against which the lower parts of the plates C rest when hung in place upon the said plate A and by which said lower parts of the plates are held at a uniform distance from the said frame-plate A. The said plates C are, moreover, provided with studs c^2 near their lower edges, which studs are arranged to extend under or beneath the rib A^5 and by engagement therewith to hold the plates from being lifted by pressure of the fuel thereon as it passes under the plates, and thereby detached from the frame-plate, or from being likewise lifted and detached when the gate is lowered onto a bed of fuel or through accidental causes. The lower end portions c^3 of the plates C are inclined or deflected inwardly, so as to bring their lower ends inside of the plate of the frame-plate A and below the level of the lower ends of the tiles B, as clearly seen in Fig. 5. This construction serves to prevent entrance of particles of fuel to the space between the frame-plate and the tiles and also to facilitate the passage of the coal beneath the gate, preventing said coal wearing the lower ends of the tiles away. The inclined lower parts of the covering-plates are shown as provided with separated bearing-lugs c^4 , adapted for bearing contact with the lower edge of the frame-plate A, which latter is provided with an oblique bearing-surface a^3 , against which said lugs rest. The inclined lower ends of the covering-plates are considerably exposed to the heat from the burning fuel on the grate, and contact of the lugs c^4 with the frame-plate serves to hold the said lower edges of the covering-plates from inward deflection under the pressure of the entering fuel thereon without transmitting any considerable part of such heat to the frame-plate, the trans-

mission of the heat being prevented by the air-spaces between the said parts afforded by said lugs.

The gate herein illustrated is arranged to slide vertically between guide-plates J J, arranged at each side of the furnace-opening. Said guide-plates are provided with vertical guide-ribs j, which engage suitable guide-grooves formed in the ends of the frame-plate A, as clearly seen in Fig. 3. To provide means for attaching supporting or actuating chains, such as are indicated at K, Fig. 1, to the gate, clips L L are bolted to the frame-plate A, as clearly seen in Fig. 4.

Fig. 1 illustrates one practical construction of the parts adjacent to the fire-gate, said figure showing a traveling chain grate M, on which the fuel is deposited outside of the furnace and by which it is carried beneath the gate into the furnace, N indicating the front wall of the furnace and O the fire-arch which forms the top of the forward part of the furnace.

Several advantages are gained by the employment of a plurality of covering-plates C, detachably secured to the frame-plate A, the principal one being that inasmuch as the lower edges of the said plates are exposed to the heat from the interior of the furnace and are liable to become burned, injured, or distorted by such heat any particular part which is so injured can be readily replaced by removing it and substituting another. On the other hand, if a single continuous covering-plate were employed the effect of injury by heat to the lower edge thereof would be liable to result in the distortion of the entire plate, thereby rendering it useless, and in case only part of the lower edge of such a continuous plate were injured by heat the renewal of the entire plate would be necessary, whereas in the construction herein shown any single plate may be removed and replaced by another without disturbing the other plates.

The lining-tiles B and the covering-plates C being supported at a distance from the frame-plate A, air-spaces are afforded between the parts in which air may circulate to keep the same cool and prevent overheating. To facilitate the circulation of the air in said space, the frame-plate A is apertured, as shown in Fig. 4. The said air-spaces, moreover, communicate with the outer air through the openings formed at the top of the gate between the upper margins of the frame-plate A and the covering-plates C.

The covering-plates C, applied over the front of the frame-plate and extending below the lower edges of the tiles in such manner as to prevent contact of the coal passing beneath the gate with the frame-plate, are of especial advantage, because of preventing injurious heating of the frame-plate, which would be liable to occur if the frame-plate itself were in contact with the fuel and exposed to the heating effect of the burning fuel adjacent to the lower edge of the gate.

The projection of the front plates below the lower ends of the tiles also prevents friction on the tiles of the coal passing into the furnace and consequent wearing away of the tiles and enables the thickness of the fuel-bed to be determined by the lower ends of the metal shields without injurious effects to the gate. If the coal were brought into contact with the tiles themselves, the wearing away of the tiles would necessitate the frequent renewal of the same at a considerable expense of material and labor.

Many changes may be made in the structural details shown without departing from the spirit of my invention, and I do not wish to be limited to such details except as hereinafter made the subject of specific claims.

I claim as my invention—

1. A fire-gate comprising a frame-plate, a plurality of vertical tile-supporting bars thereon and having free, lateral sliding movement on the frame and tiles engaged with and supported on the said bars.

2. A fire-gate comprising a frame-plate, a plurality of vertical tile-supporting bars thereon and having free, lateral sliding movement on the frame and tiles engaged at their side edges with said bars.

3. A fire-gate comprising a frame-plate provided with upper and lower hooked flanges, a plurality of upright tile-engaging bars provided with hooked lugs to engage the flanges on the frame-plate, and lining-tiles supported on said bars.

4. A fire-gate comprising a frame-plate provided with upper and lower hooked flanges, a plurality of upright tile-engaging bars provided with hooked lugs to engage the flanges on the frame-plate, and lining-tiles engaged at their side edges with said bars.

5. A fire-gate comprising a frame-plate, a plurality of vertical, tapered bars supported thereon and having free, lateral sliding movement on the frame and tiles engaged with and supported on said bars.

6. A fire-gate comprising a frame-plate provided with upper and lower hooked flanges, a plurality of tile-engaging, laterally-tapered bars provided with hooked lugs adapted to engage said flanges on the frame, and lining-tiles provided at their side edges with rabbets having laterally-inclined surfaces for engagement with said bars.

7. A fire-gate comprising a frame-plate provided with upper and lower hooked flanges and a tile-supporting ledge, upright tile-engaging bars provided with hooked lugs adapted to engage the flanges in the frame-plate and lining-tiles which are engaged at their side edges with said bars and which are provided with downwardly-facing shoulders adapted to rest on said ledge.

8. A fire-gate comprising a frame-plate provided on its inner face with a thick, refractory lining and a plurality of thin metal covering-plates supported on the outer face of the frame-plate and separately removable there-

from and separated from said plate by an air-space.

9. A fire-gate comprising a frame-plate provided on its inner surface with a thick, refractory lining and a plurality of metal covering-plates supported on the outer face of said frame-plate and separately removable therefrom and separated from said plate by an air-space, said covering-plates being provided with hooked lugs which engage the upper margin of the frame-plate to support said covering-plates thereon.

10. A fire-gate comprising a frame-plate and thin covering-plates applied to the outer face of the frame-plate and separately removable therefrom and separated from said plate by an air-space, said covering-plates having hook-shaped lugs at their upper parts adapted for engagement with the upper part of the frame-plate whereby the covering-plates are supported on said frame-plate, and said frame-plate being provided on its outer face with a downwardly-facing shoulder adapted to engage said covering-plates to prevent the same from rising, the coacting parts of said frame-plate and the lower parts of the covering-plates being constructed to permit the latter to be swung away from the frame-plate, while keeping their normal lateral positions, to remove the same from the frame-plate.

11. In a fire-gate, the combination of a frame-plate and a plurality of separately-removable covering-plates applied to the outer face of the frame-plate and fitting edge to edge, said covering-plates being separated by an air-space from the frame-plate and extending at their lower ends obliquely beneath the lower edge of said frame-plate, the covering-plates being provided on their rear faces above said oblique portions with bearing-lugs which bear against the lower part of the frame-plate to hold the covering-plates free from contact therewith.

12. In a fire-gate the combination of a frame-plate and covering-plates applied to the outer face of the frame-plate and separated therefrom by an air-space, said covering-plates having at their lower parts inwardly-inclined portions which extend below and beneath the lower edge of the frame-plate.

13. A fire-gate comprising a frame-plate, lining-tiles applied to the inner face of the frame-plate, and covering-plates applied to the outer face of the frame-plate, the lower marginal parts of said covering-plates being deflected inwardly beneath the frame-plate and terminating at their lower edges adjacent to the lining-tiles.

14. In a fire-gate the combination of a frame-plate provided with a horizontal rib on the lower part of its outer face, a plurality of covering-plates applied to the outer face thereof, said covering-plates being provided at their upper ends with hooked lugs for engagement with the frame-plates and with upper and lower studs, of which the upper studs bear against the frame-plates to hold the covering-plates away from the same, and the lower studs engage the lower face of said rib to hold the covering-plates from rising.

15. A fire-gate comprising a frame-plate, lining-tiles attached to the inner face of the frame-plate, covering-plates attached to the outer face of said frame-plate and having at their lower ends inwardly-inclined portions which extend obliquely beneath the frame-plate and toward the furnace.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 19th day of December, A. D. 1901.

HERMAN A. POPPENHUSEN.

Witnesses:

GERTRUDE J. BRYCE,
WILLIAM L. HALL.