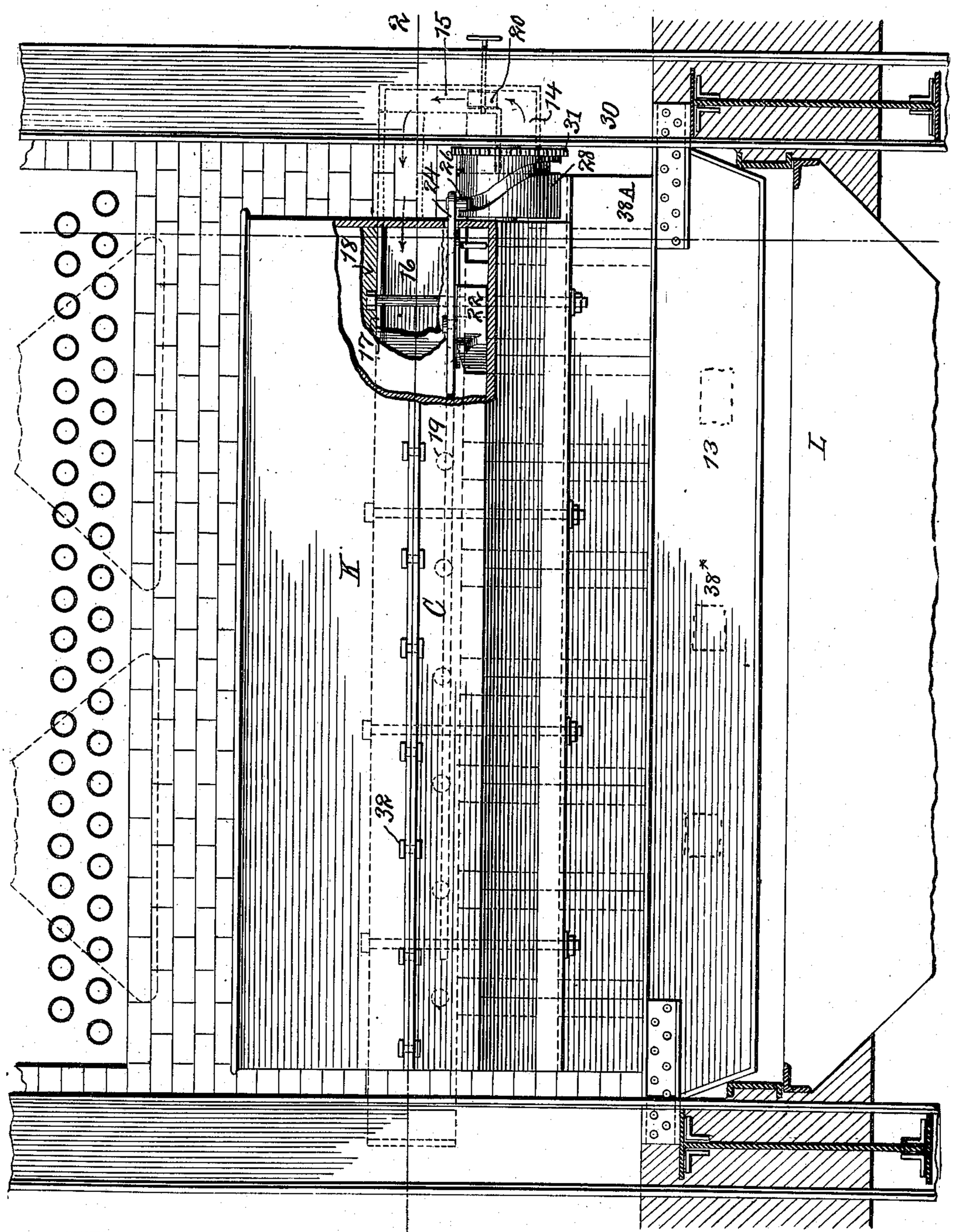
No. 885,635. PATENTED APR. 21, 1908.

T. E. MURRAY.

AUTOMATIC STOKING DEVICE FOR FURNACES.

APPLICATION FILED NOV. 2, 1907.

6 SHEETS—SHEET 1.



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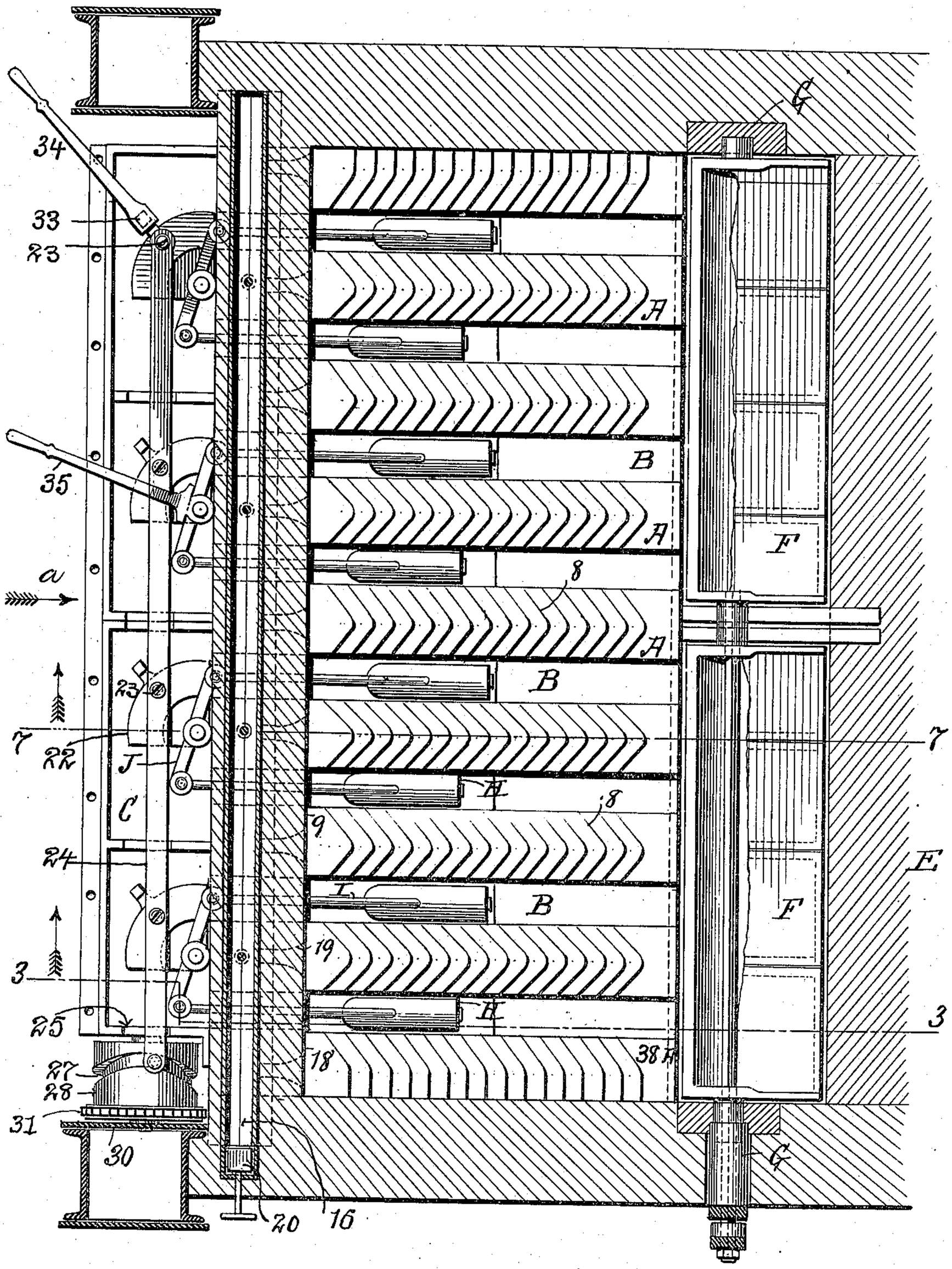

Fig. 2.

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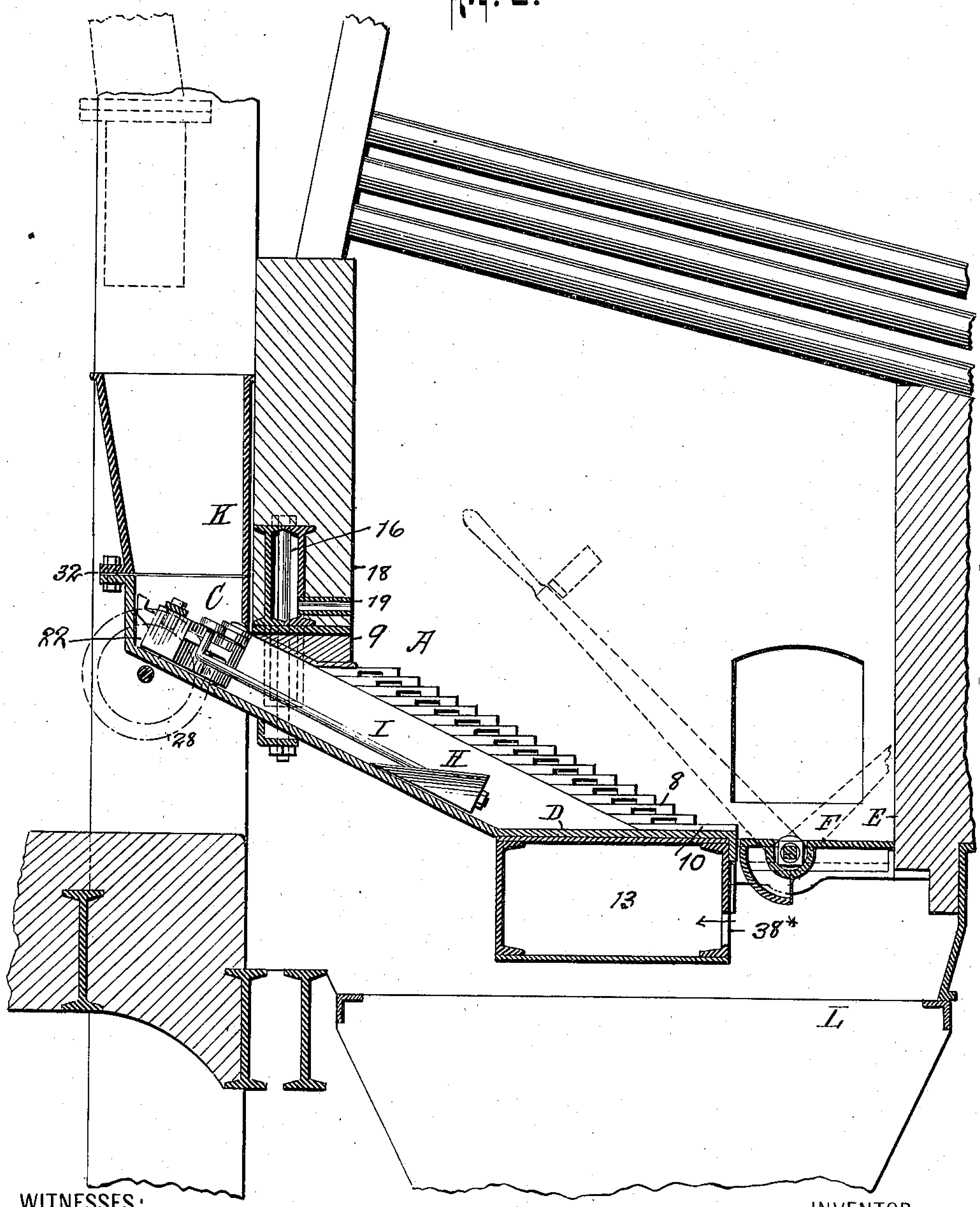
6 SHEETS—SHEET 3.

Fig. 3.



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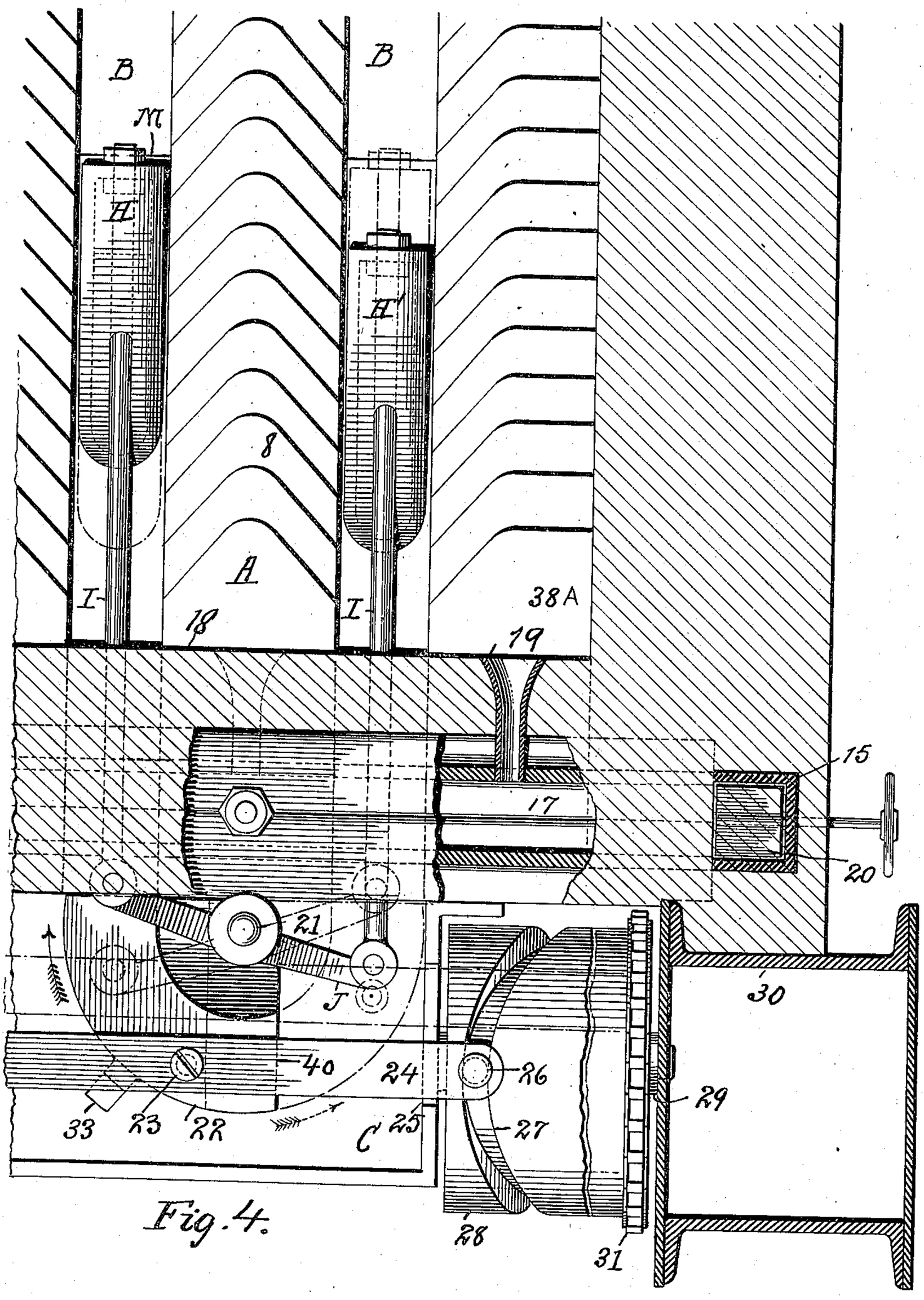

Fig. 4.

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6 SHEETS—SHEET 5.

Fig. 5.

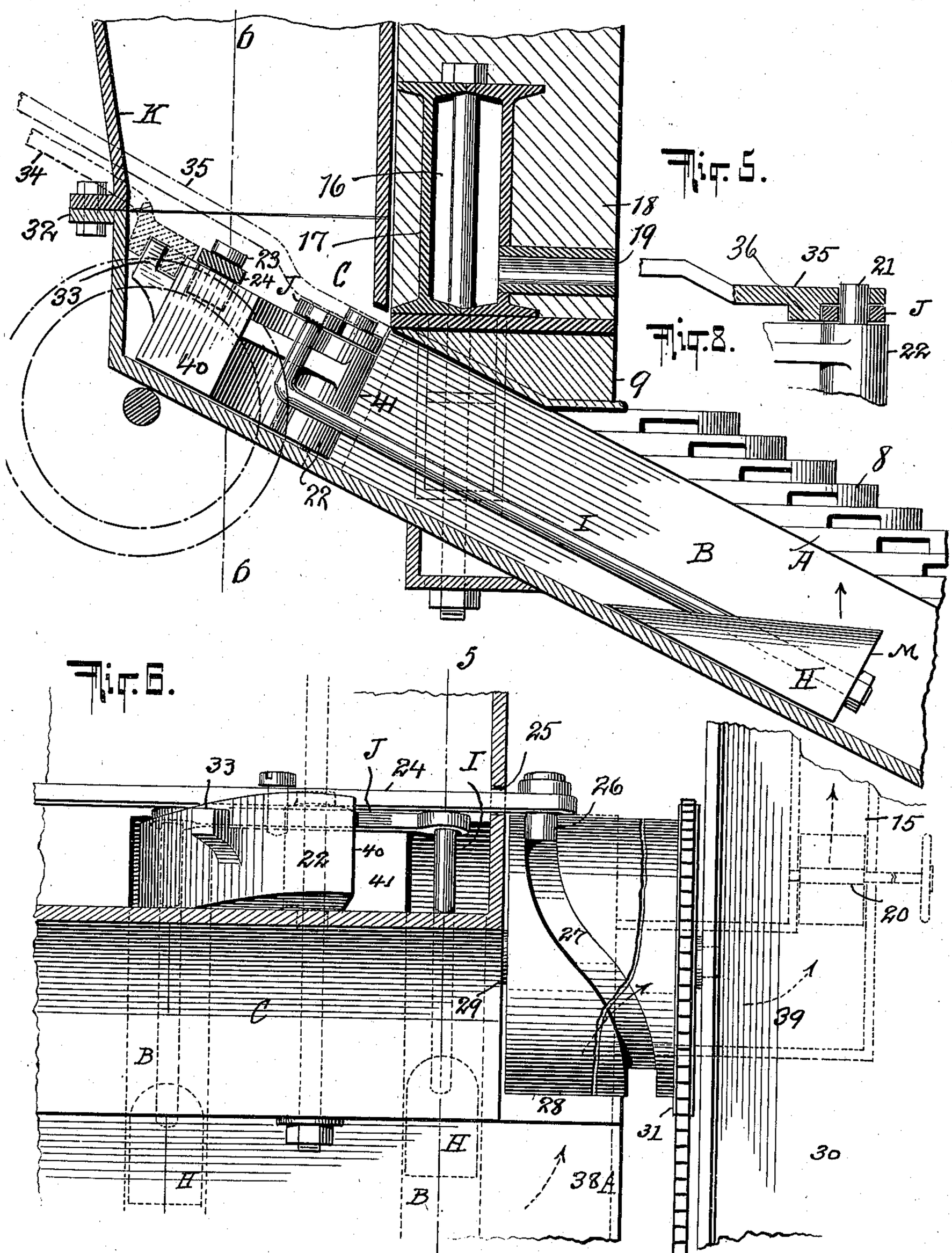

Fig. 8.

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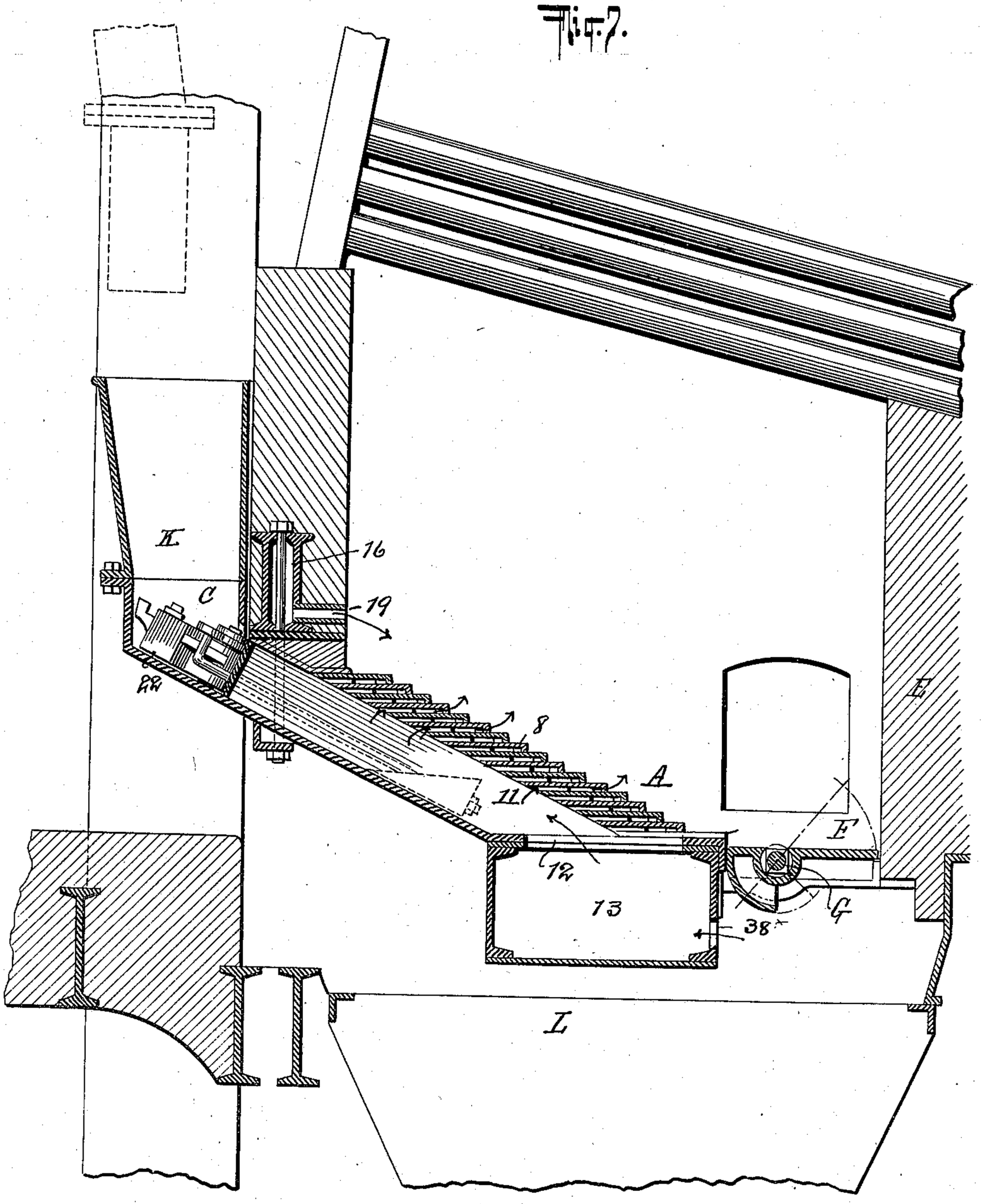
6 SHEETS—SHEET 6.

Fig. 7.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC STOKING DEVICE FOR FURNACES.

No. 885,635. Specification of Letters Patent. Patented April 21, 1908.

Application filed November 2, 1907. Serial No. 400,375.

To all whom it may concern:

Be it known that I, THOMAS E. MURRAY, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new and useful Improvement in Automatic Stoking Devices for Furnaces, of which the following is a specification.

The invention relates to automatic stoking furnaces, and consists in the combination of the inclined grate, two inclined troughs disposed parallel to said grate, in juxtaposition thereto, and receiving fuel at their elevated ends, and means for moving said fuel into and down said inclined troughs alternately: also in the combination of an inclined grate, an inclined trough parallel to said grate and in juxtaposition thereto, and receiving fuel at its elevated end, a pusher block in said trough and means for reciprocating said block whereby said fuel is moved down the incline when the block travels in one direction and raised upwardly to flow over the grate when the block travels in the opposite direction: also in the form of the pusher block whereby it is caused to push and lift the fuel alternately; also in the means for operating said pusher blocks and for moving the fuel from a receiving box into the inclined troughs in the manner described; also in the arrangement of ducts for supplying air both below and above the grate and also in the various combinations more particularly recited in the claims.

In the accompanying drawings—Figure 1 is an end view taken in the direction of the arrow *a*, Fig. 2. Fig. 2 is a horizontal section on the line 2 2 of Fig. 1. Fig. 3 is a section on the line 3 3 of Fig. 2. Fig. 4 is an enlarged partial section on the line 2 2 of Fig. 1, showing the elevated ends of the grates and fuel troughs, mechanism for reciprocating the pusher blocks, and with the wall of the furnace broken away to exhibit the air duct for delivering air above the grates. Fig. 5 is a section on the line 5 5 of Fig. 6 the pusher H being shown in side elevation. Fig. 6 is a section on the line 6 6 of Fig. 5 the block 40 being shown in side elevation. Fig. 7 is a section on the line 7 7 of Fig. 2. Fig. 8 is a section of the end of hand lever 35 showing said lever applied to the segmental-block pivot pin 21.

Similar numbers and letters of reference indicate like parts.

The grates A, of which there may be any desired number, are formed of hollow twyers 8 disposed step fashion one above the other as shown in Fig. 7, so as to present an inclined surface extending from the furnace wall 9 downward to the transverse supporting plate 10. Each grate forms the upper wall of an air tank 11, Fig. 7, which at its elevated end is closed and which at its lower end communicates by opening 12, Fig. 7 with a transverse air duct 13. Said duct may receive air blast from any suitable device delivered through apertures 38*, Fig. 3. The air trunks 11, at their elevated ends, are closed. The end trunk 38^A communicates by a pipe 39 with the vertical passage 15 (Fig. 4, also dotted lines Figs. 1 and 7) and this with the transverse passage 16 formed between the web girders 17 embedded in the furnace wall 18. Extending through the web of the inner girder and transversely through the furnace wall 18 are flared ducts 19 (Fig. 4) the outlet of each duct being directly over the elevated end of a grate A. In the vertical passage 15 is a valve 20 operated by a hand wheel. By reason of this construction, part of the air entering the trunk 38^A goes by the vertical passage 15 to the transverse passage 16 and thence through the flared ducts 19 to the fire space above the grates. It will be apparent that by means of the valve 20, the flow of air from ducts 19 to the fire space can be regulated as desired. The object of admitting air above the grates is to improve the combustion and consume smoke.

Between the grates A are inclined troughs B, the grates and troughs being parallel and in juxtaposition. At their elevated ends these troughs all communicate with a transverse box C extending across the front of the furnace, into which box the fuel passes from the detachable hopper K. At the depressed end of each trough is a horizontal fuel receiving platform D, Fig. 3, and in the space between the platforms D and the furnace wall E are pivoted grates F. These grates turn (dotted lines Fig. 7) on pivots G and may be operated to dump ashes, etc. into the ash receptacles L, by means of a hand lever (dotted lines Fig. 3).

Fuel supplied to the hopper C may enter all of the inclined troughs B, and is caused to descend the inclines to the platforms 10, whence it passes to the dumping grates F. Because the troughs are between and beside the grates, the fuel traversing them will also rise over the twyers 8 and combustion of

said fuel on said twyers will be maintained by the air passing through them.

In order to cause the fuel to move down the inclined troughs B, I provide the following mechanism:

In each trough is a substantially wedge shaped pusher block H. The lower face M of the block is preferably in a plane at right angles to the plane of the bottom of the trough, upon which bottom said block may rest. The upper surface of the block is preferably rounded. Viewed edgewise (Fig. 5) the block has the contour of a right angled triangle of which the hypotenuse is horizontal; and one side is parallel to the bottom of the trough and the other side at right angles thereto. The reason for this shaping of the blocks H will be explained further on.

Extending through each block and secured thereto by a nut is a rod I, the end of which is bent upwardly and received in an eye on the end of one arm of a pivoted lever J, Fig. 4. Each pivoted lever J thus connects with a pair of blocks as H, H′, Fig. 4, which blocks are disposed in the troughs B, which alternate with the grates.

It will be obvious that by vibrating the lever J on its pivot the blocks H, H′, will be reciprocated and caused to move lengthwise the troughs in relatively opposite directions. It will also be seen that as one block as H′ moves upwardly from the position shown in full lines Fig. 4, to the position shown in dotted lines the other block H moves downwardly from the position shown in full lines to the position shown in dotted lines. As each block H or H′ moves downwardly it pushes the fuel in front of the face M down the incline. It also follows that in the plurality of troughs here illustrated, half of the total number of blocks are descending, while the other half are ascending the inclines.

Recurring again to the shape of the blocks H. When said blocks are ascending the incline their wedge form and upper rounded surface permits them to be drawn through the fuel with little resistance. And, furthermore, the action of the moving wedge is to lift the fuel in the trough in a vertical direction (arrow Fig. 5) and thus to cause it to overflow upon the adjacent grate-surfaces. Hence, considering the reciprocation of any one pusher block H, when that block moves downwardly its inclined trough forces the fuel ahead of it down the incline, and when it moves upwardly in said trough (and while it is drawn through the fuel) it raises the fuel vertically, and so that said fuel flows over to and upon the grates.

The mechanism for feeding the fuel into the troughs B and for vibrating the pivoted lever J is as follows: The fixed pivot pin 21 of each lever serves also as the pivot of a segmental block 22, here in the form of a quadrant. (Fig. 4.) All of the blocks 22 are pivoted in their upper faces by pins 23 to a longitudinal bar 24, one end of which passes through an opening 25 in the end wall of box C and carries a roller stud 26, which enters the circumferential groove 27 of a rotary cam 28. Said cam is carried by a shaft 29, Fig. 4, journaled in box C and in one of the supporting columns 30 of the furnace, and may be provided with sprocket teeth 31 to receive a belt leading from a motor (not shown) whereby said cam is rotated. As the cam is rotated, and through the agency of the connecting bar 24, the blocks 22 are vibrated as shown in Fig. 4, from the position shown in full lines to the position shown in dotted lines, or vice versa, as indicated by the arrows. The vertical faces of each block 22 then strike alternately the turned up ends of the rods I, which are connected to the ends of the lever J, thus vibrating all of said levers J and hence reciprocating the pusher blocks in their troughs in the manner already described.

The segmental blocks 22 serve also to move the fuel from the receiving box C into the troughs B.

Assuming a given block to be in the position shown in full lines, Fig. 4, it is obvious that fuel placed in the hopper K will descend in front of the vertical face 40 of said block, and when said block is turned on its pivot said fuel will be pushed by face 40 into the opening of the trough shown at 41, Figs. 5 and 6.

Any pair of pusher blocks may be operated by hand in the following manner. The hopper K is removable, its outer wall being secured to the flanged upper front edge of the box C by bolts and nuts 32, Figs. 1 and 5. On the curved face of each segmental block 22 is cast an upwardly projecting polygonal lug 33. The hopper being taken off and the pivot pin 23 connecting the segmental block to the bar 24 being removed, a lever 34 having a polygonal opening at its end receiving said lug is applied to said lug, as shown in Figs. 2 and 5, and by means of this lever the segmental block is vibrated to reciprocate the pair of pusher blocks associated therewith.

Another way of accomplishing the same result is by means of the hand lever 35, having at its end a circular opening receiving the head of the pivot pin 21, and provided with downward projections 36 bearing on the lever J, on each side of said pin, Fig. 8. The pivot pin 23, securing the segmental block to the connecting bar 24 is removed as before.

I claim:—

1. In a furnace, an inclined grate, two inclined troughs disposed parallel to said grate in juxtaposition thereto and on opposite sides thereof and receiving fuel at their elevated ends, pusher blocks in said troughs,

rods connected to said pusher blocks, a pivoted lever, to the arms of which lever said rods are respectively connected and means for vibrating said lever on its pivot to move said blocks in relatively opposite directions.

2. In a furnace, an inclined grate, two inclined troughs disposed parallel to said grate in juxtaposition thereto and on opposite sides thereof and receiving fuel at their elevated ends, pusher blocks in said troughs, rods connected to said pusher blocks, a support, a lever pivoted on said support to the arms of which lever said rods are respectively connected, a segmental block pivoted at its apex and disposed in front of said lever, and means for vibrating said block on its pivot to cause it to strike said lever arms alternately and thereby to reciprocate said pusher blocks in said troughs, in relatively opposite directions.

3. In a furnace, an inclined grate, two inclined troughs disposed parallel to said grate in juxtaposition thereto and on opposite sides thereof and receiving fuel at their elevated ends, pusher blocks in said troughs, rods connected to said pusher blocks, a support, a lever pivoted on said support to the arms of which lever said rods are respectively connected, a segmental block pivoted at its apex and disposed in front of said lever, a bar pivoted to said block, a stud on said bar, and a rotary cam having a groove receiving said stud: the said cam by its rotation causing said bar to vibrate said block on its pivot and the said block striking said lever arms alternately to reciprocate said pusher blocks in said troughs in relatively opposite directions.

4. In a furnace, an inclined grate, an inclined fuel-receiving trough disposed parallel to said grate and in juxtaposition thereto, and means in said trough for alternately pushing the fuel therein down the incline and raising said fuel vertically upward.

5. In a furnace, an inclined grate, an inclined fuel receiving trough disposed parallel to said grate and in juxtaposition thereto, and in said trough, a reciprocating pusher block wedge-shaped in longitudinal vertical section and disposed with the edge of the wedge toward the top of the incline.

6. In a furnace, an inclined grate, an inclined fuel receiving trough disposed parallel to said grate and in juxtaposition thereto, and, in said trough, a reciprocating pusher block having the form of a right angled triangle in longitudinal vertical section with one of its sides parallel to the inclined bottom of the trough and its hypotenuse in a horizontal plane.

7. In a furnace, an inclined grate, an inclined fuel-receiving trough disposed parallel to said grate and in juxtaposition thereto, a pusher block in said trough and means for reciprocating said pusher block: the said block having one face placed at an angle to push the fuel before it when said block is moving down said inclined trough, and another face placed at an angle to raise said fuel in a direction vertically upward when said block is moving up said inclined trough.

8. In a furnace, an inclined air trunk, a grate forming the upper wall thereof, a duct for conveying air from the elevated end of said trunk and for delivering the same above the elevated end of said grate and a valve in said duct.

9. In a furnace, a plurality of inclined grates, a plurality of pairs of inclined troughs the members of each pair being respectively disposed parallel and in juxtaposition to and between said grates, pusher blocks in said troughs, mechanism for reciprocating the pusher blocks in each pair of troughs in relatively opposite directions whereby the fuel is both raised and pushed down during the operation of the stoker and means for simultaneously actuating said reciprocating mechanisms.

10. In a furnace, a plurality of inclined grates, a plurality of pairs of inclined troughs, the members of each pair being respectively disposed parallel and in juxtaposition to and between said grates, pusher blocks in said troughs, mechanism for reciprocating the pusher blocks in each pair of troughs in relatively opposite directions, means for simultaneously actuating said reciprocating mechanisms, and means for actuating one of said reciprocating mechanisms independently of the others.

11. In a furnace, a fuel-receiving box, an inclined grate, an inclined trough parallel to and in juxtaposition to said grate and communicating at its elevated end with said box, means in said box for moving the fuel from said box into said trough and means in said trough for alternately pushing the fuel therein down the incline and raising said fuel vertically upward.

12. In a furnace, a fuel-receiving box, an inclined grate, an inclined trough parallel and in juxtaposition to said grate and communicating at its elevated end with said box and a pivoted segmental block in said box and means for vibrating said block: the said block being constructed and arranged to receive the fuel in front of one of its faces and by its vibration on its pivot to move said fuel from said box into said trough.

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

THOMAS E. MURRAY.

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