

No. 773,265.

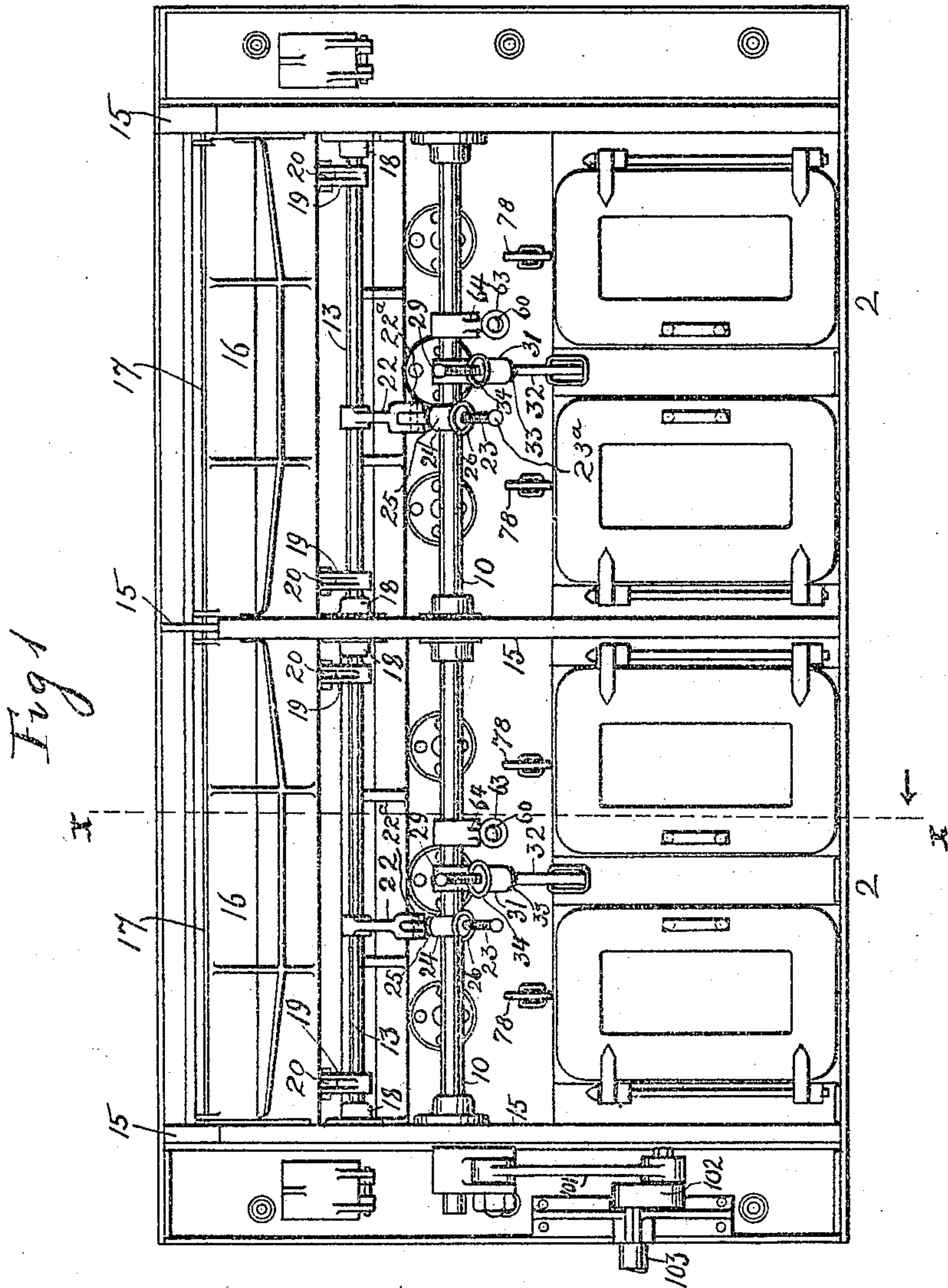
PATENTED OCT. 25, 1904.

W. A. ROSS.  
FURNACE GRATE.

APPLICATION FILED JUNE 12, 1903.

NO MODEL.

5 SHEETS—SHEET 1.



Witnesses  
William P. French  
Frederic H. Carl.

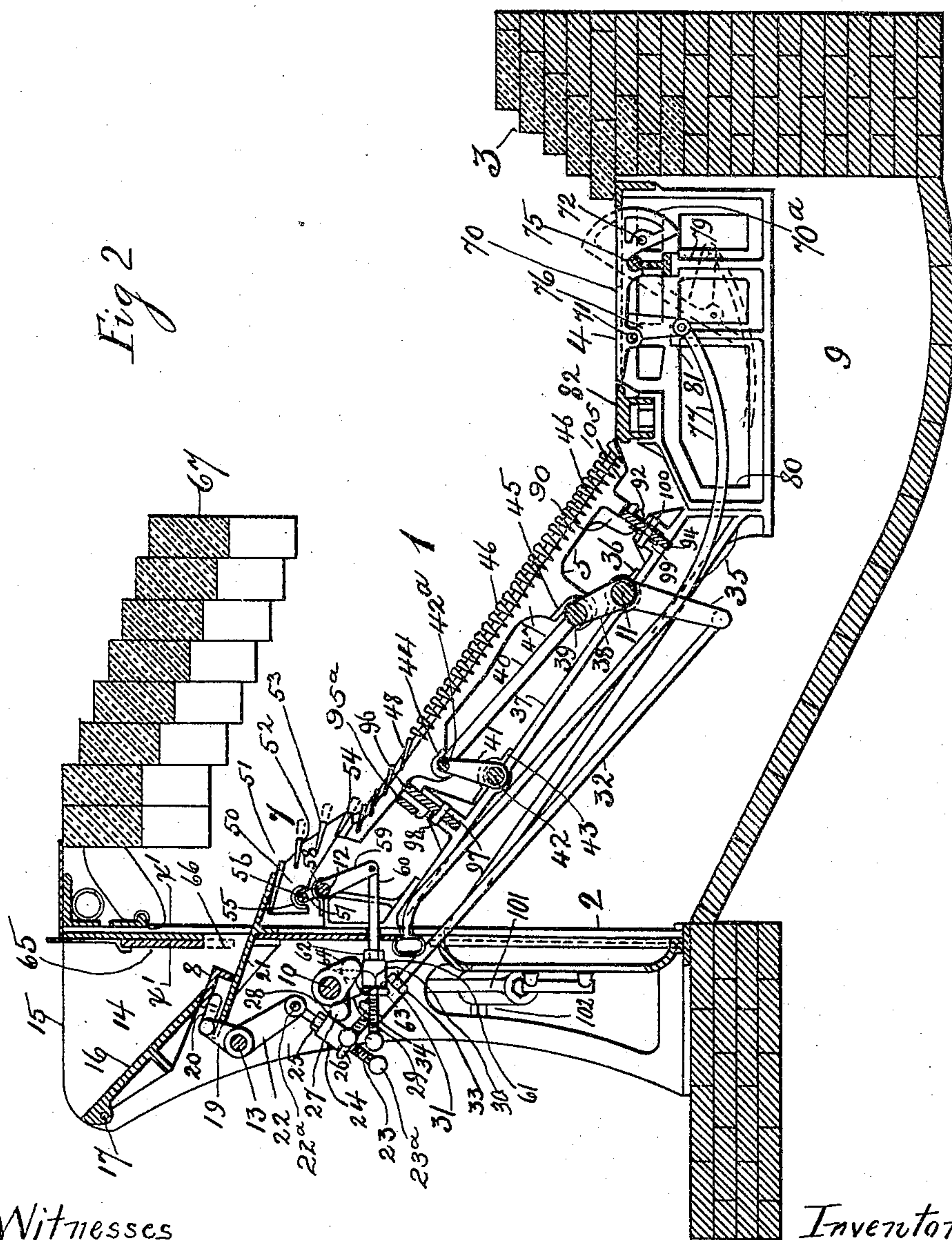
Inventor  
William Andrew Ross  
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5 SHEETS—SHEET 2.



Witnesses

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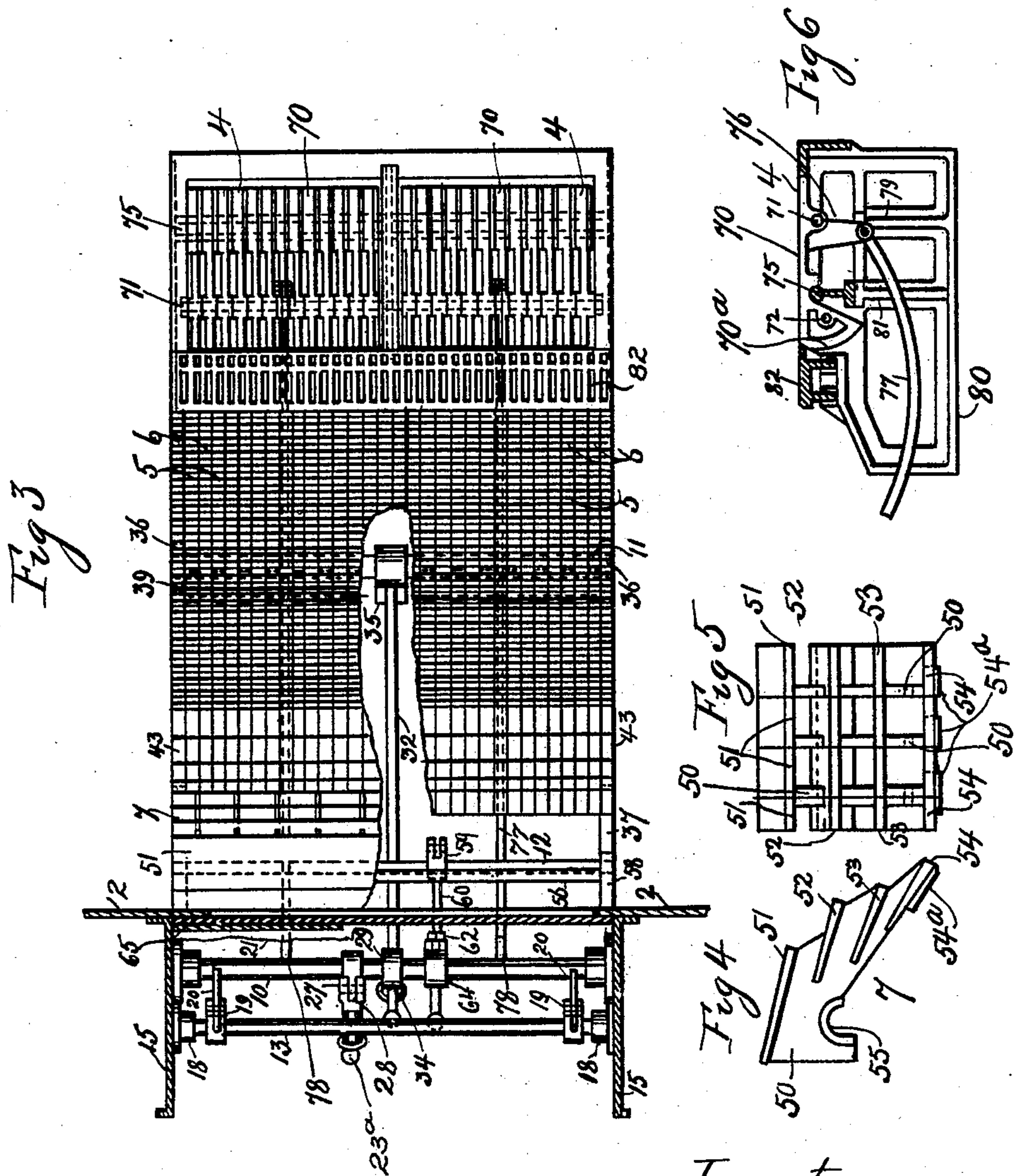
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5 SHEETS—SHEET 3.



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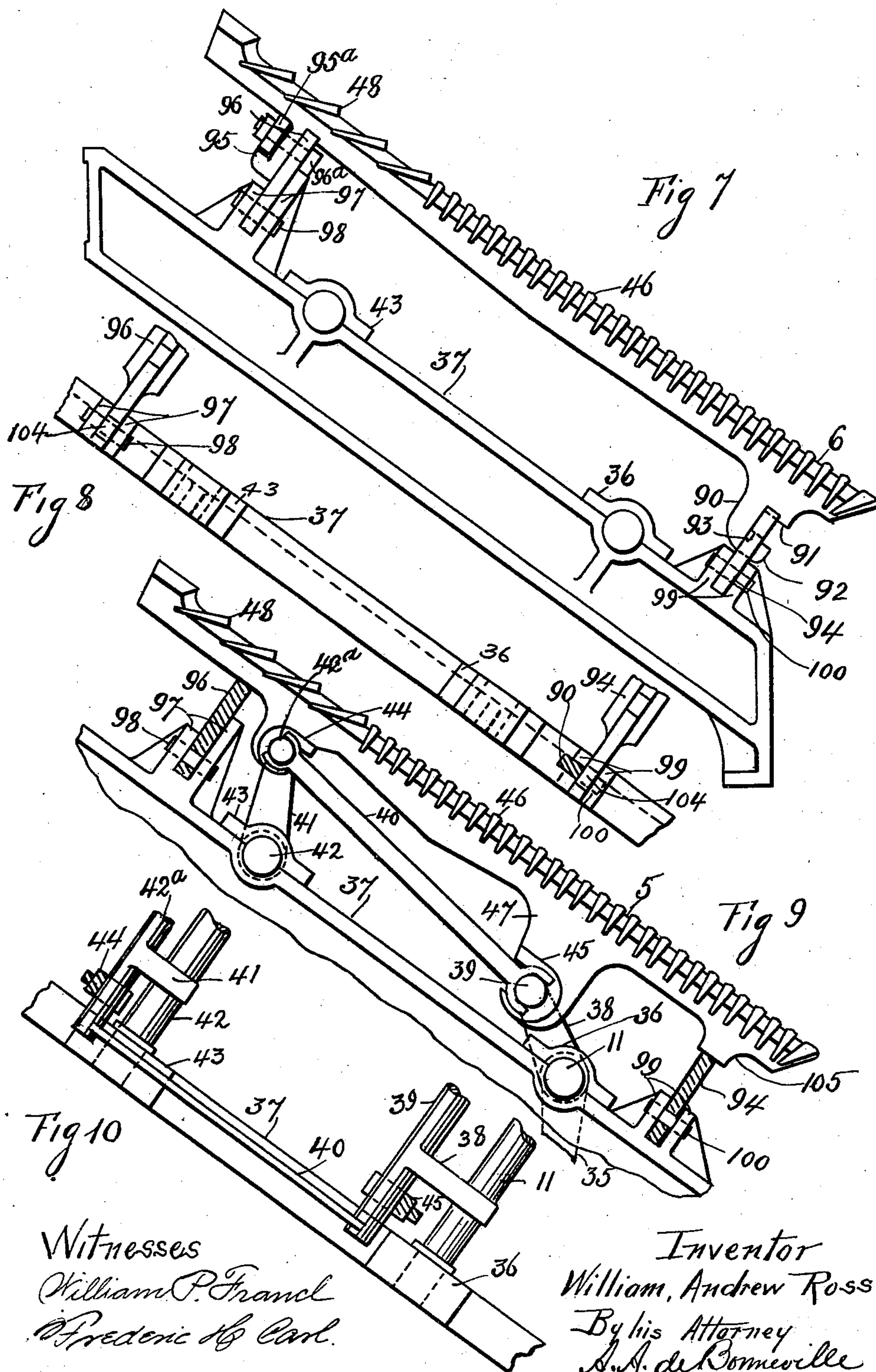
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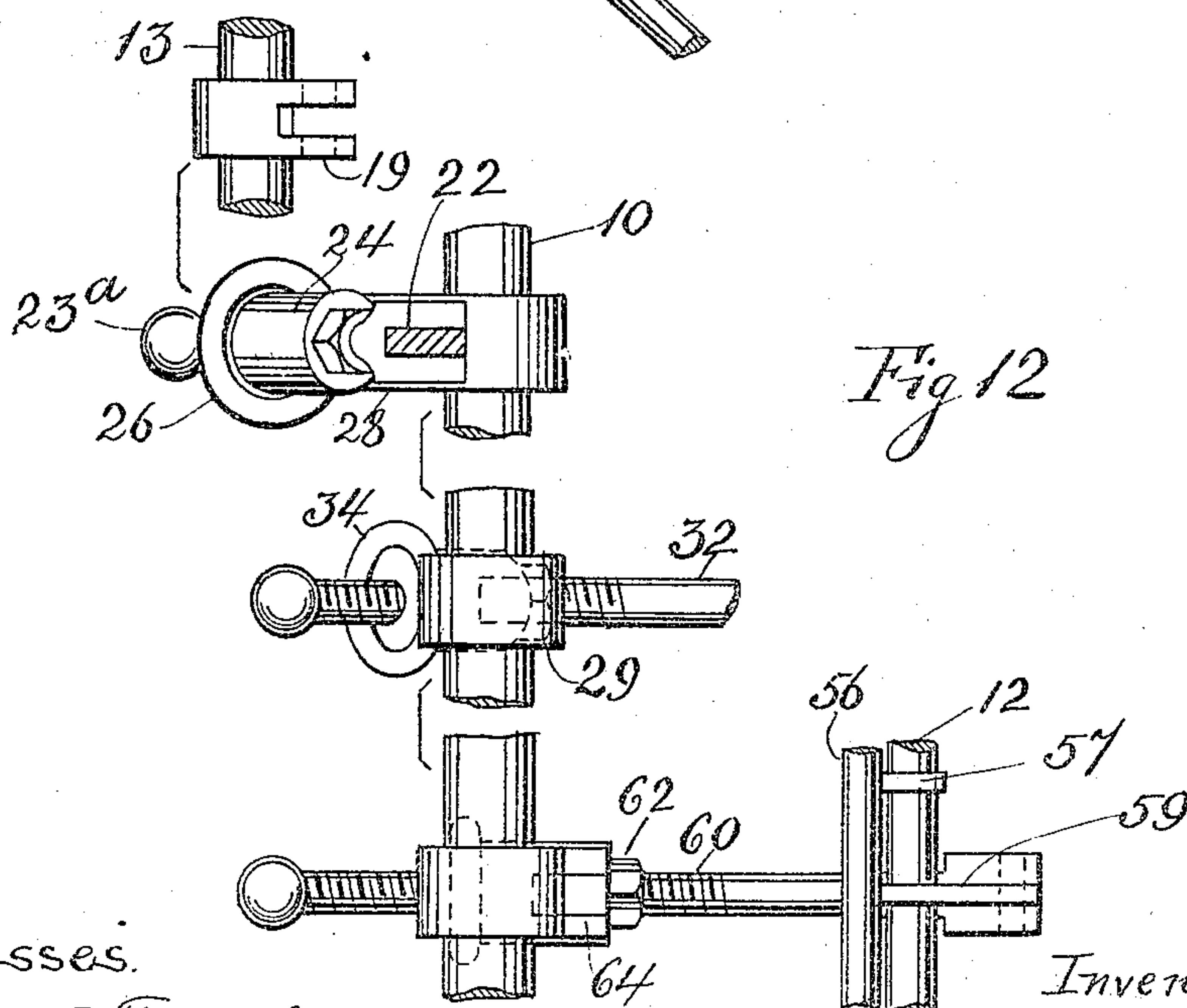
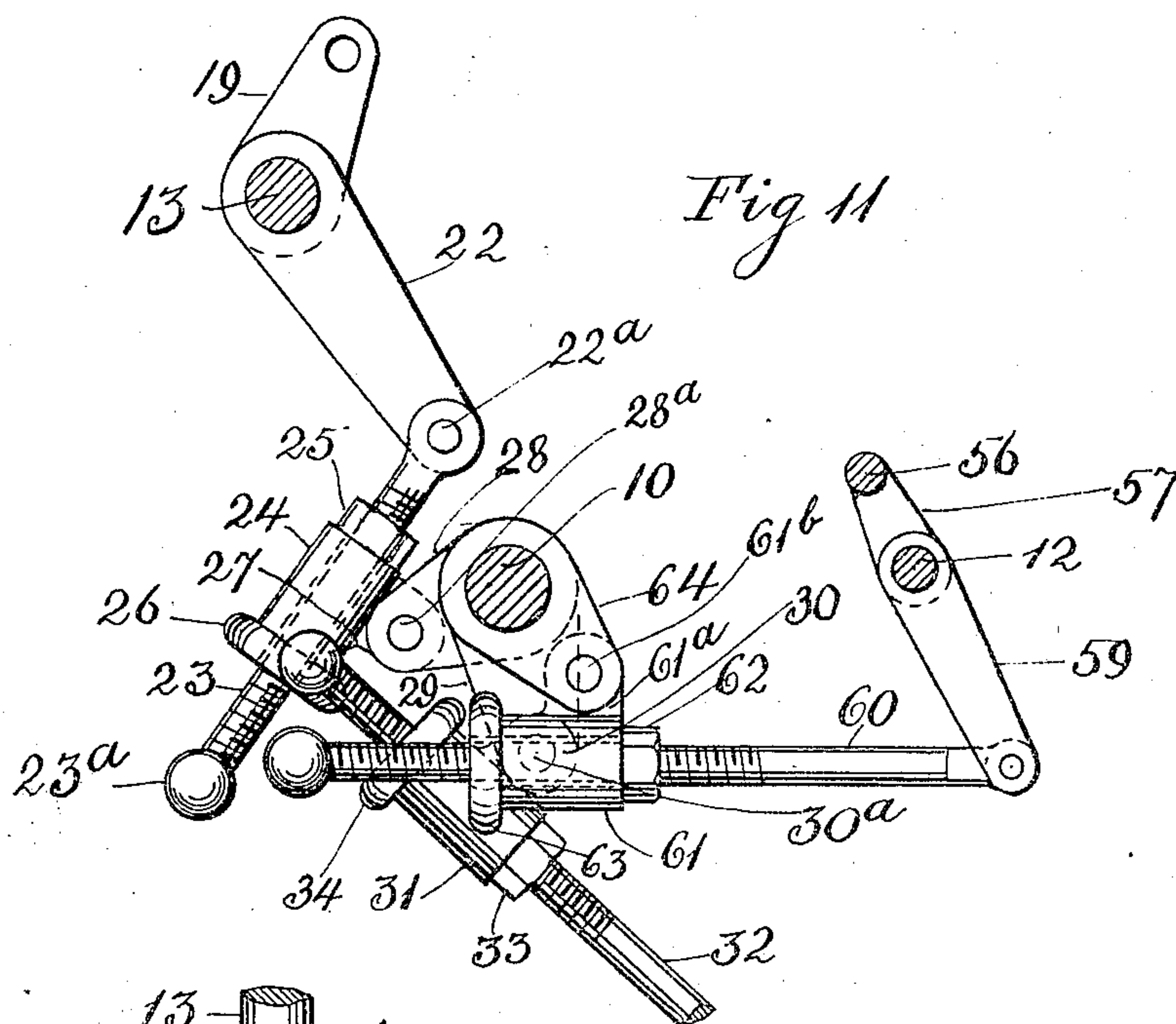
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FURNACE GRATE.

APPLICATION FILED JUNE 12, 1903.

NO MODEL.

5 SHEETS—SHEET 5.



Witnesses.

William P. Franck  
Frederic H. Carl

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# UNITED STATES PATENT OFFICE.

WILLIAM ANDREW ROSS, OF NEW YORK, N. Y.

## FURNACE-GRATE.

SPECIFICATION forming part of Letters Patent No. 773,265, dated October 25, 1904.

Application filed June 12, 1903. Serial No. 161,236. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM ANDREW ROSS, a citizen of the United States, and a resident of the borough of Manhattan, in the county of New York and State of New York, have invented certain new and useful Improvements in Furnace-Grates, of which the following is a specification.

My invention relates to furnace-grates and feeding devices acting therewith, generally known as "stokers." Its object is the production of a furnace in which the alternate grate-bars may be raised and lowered, an auxiliary vibratory or coking grate, a feeding device, an adjustable dumping-grate, and means connected up with the elements to automatically feed the fuel on the auxiliary grate, from thence to the grate-bars, and finally to the dumping-grate.

In the drawings, Figure 1 is a front view of a pair of furnaces with my improvements. Fig. 2 represents a partial section of a furnace about on the line *x x*. Fig. 3 shows a partial plan and section of Fig. 2 on the line *x' x'*. Fig. 4 is an enlarged side view of one of the sections of the auxiliary grate. Fig. 5 represents a rear view of one of the sections of the auxiliary grate. Fig. 6 shows the dumping-grate in a position reversed from that shown in Fig. 2 with one of its supporting-frames. Fig. 7 is an enlarged side view of the stationary grate on its frame and appurtenances. Fig. 8 shows partial plan views of the upper and lower bearers and a side frame. Fig. 9 represents an enlarged side view of the vibratory grate with its appurtenances. Fig. 10 shows a partial plan view of the upper and lower rockers for the vibratory grate-bars with a portion of a side frame. Fig. 11 shows a fragmentary portion of Fig. 2 on an enlarged scale. Fig. 12 represents a plan view of Fig. 11.

A furnace is shown at 1, having a front 2, a fire bridge-wall 3, brick arches 67, an adjustable dumping-grate 4, inclined vibratory grate-bars 5, stationary grate-bars 6, an auxiliary or coking grate 7, a pusher 8, an ash-pit 9, a main driving or oscillating shaft 10, which is linked to the shaft 11 of the lower rocker for moving the said vibratory grate-

bars 5 and to the shaft 12 of the auxiliary grate-rocker for moving the auxiliary grate 7 and to the shaft 13 for reciprocating the pusher 8. A hopper 14 for feeding the grates extends between the frames 15, that project from the front 2. The said hopper is provided with a swinging bottom 16, that swings on the shaft 17 and bears on the pusher 8. On the face of the front 2 there slides the gate 65 to govern the opening 66.

Referring now particularly to the pusher with its appurtenances, the shaft 13 is journaled in bearings 18, secured to the projecting frames 15, and extending above the said shaft are the arms 19, to which are pinned the links 20, that are pinned to the pusher 8, that slides and bears on the feed-plate 21, which latter is fixed to the front 2 and extends between the inner faces of the frames 15. An arm 22 extends from and below the shaft 13, a link 23 being pinned to said arm by means of the pin 22<sup>a</sup>. A sleeve 24 fits loosely on the link 23, so as to slide thereon, if required, between a nut 25 and a hand-wheel 26, both the latter being threaded for the threaded portion of the link 23 and capable of being adjustably located on the said link, thereby allowing a certain amount of lost motion to the sleeve 24 on the link 23 to regulate the length of the stroke of the pusher and its initial and terminal positions. A knob 23<sup>a</sup> is formed on the end of link 23. From the sleeve 24 there projects an ear 27, which latter is pinned to the arm 28, extending from the driving or oscillating shaft 10, by means of the pin 28<sup>a</sup>. From the shaft 10 extends the arm 29, which is pinned to the ear 30 on the sleeve 31 by means of the pin 30<sup>a</sup>. The sleeve 31 fits loosely on the link 32, so as to slide thereon, if desired, between a nut 33 and a hand-wheel 34, both the latter being threaded for the threaded portion of the link 32 and capable of being adjustably located on the said link, thereby allowing a certain amount of lost motion to the sleeve 31 on the link 32 to regulate the movements of the vibratory grate-bars and their initial and terminal positions. The link 32 is pinned to the arm 35, extending from the shaft 11 of the lower rocker. The shaft 11 is journaled in bearings 36, carried on the in-



clined side frames 37. From the shaft 11 there extend the arms 38, that carry the shaft 39, the whole constituting the lower rocker, and on the ends of which are fitted the links 5 40, which latter extend to the free ends of the arms 41, that extend from the shaft 42, constituting the upper rocker. The shaft 42 is journaled in bearings 43, supported on the frames 37.

10 The vibratory grate-bars 5 are provided with bearings 44 45, that fit on the shafts 42<sup>a</sup> and 39, respectively, holding the said vibratory grate-bars in place on the said shafts. The vibratory and stationary bars have the 15 cross-teeth 46 with their edges at right angles to the body 47 of the bars and at their upper ends the overlapping approximately horizontal flights 48. The upper ends of the vibratory bars can bear on the cross-bearer 96, and 20 the lower end has a lug 105, that can bear on the bearer 94.

The stationary grate-bars 6 have each the lower lug 90, which has recess 91 and the projecting hook 92, the latter being placed in 25 an opening 93 in the lower cross-bearer 94, the said lower bearer being secured between lugs 99 of the side frames 37 by pins 100. From the upper end of each grate-bar 6 there extends the lug 95, that bears against the up- 30 per cross-bearer 96, which latter is secured between lugs 97, extending from the frame 37, and is pinned thereto by the pin 98. A plate 95<sup>a</sup> is held on the lug 95, and bolts 96<sup>a</sup> secure the said plate, lug 95, and bearer 96 35 together. The upper and lower cross-bearers are each notched on their upper faces, as shown at 104, to hold the stationary grate-bars in proper position. It will be noted that the 40 arm 38 makes a smaller angle with a line joining the centers of the shafts 11 and 42 than the arm 41, thereby giving the rear ends of the vibratory bars greater elevation when moving backward than the front ends, so as to secure the appropriate vibratory movement to 45 stir up the fuel.

Referring to the auxiliary grate 7, it is composed of sections, each of which comprises an end web 50 with a top table 51, descending flights 52 53 54, and a foot 54<sup>a</sup> extends from 50 each web. A bearing 55 is formed in each web, by means of which the sections are supported on their rocker. The cross-shaft 56 is connected to the shaft 12 by arms 57, constituting the rocker for the auxiliary grate. 55 The shaft 12 is supported in the journal-bearings 58. An arm 59 extends from the shaft 12 and is pinned to the link 60, that carries the adjustable sleeve 61 between the nut 62 and threaded hand-wheel 63. The sleeve 61 60 fits loosely on the link 60, so as to slide thereon, if desired, between the nut 62 and the hand-wheel 63, both the latter being threaded for the threaded portion of the link 60 and capable of being adjustably located on the

said link, thereby permitting a certain amount 65 of lost motion of the sleeve 61 on the link 60 to regulate the length of the stroke of the auxiliary grate and its initial and terminal positions. The sleeve 61 is pinned to the arm 64, that extends from the shaft 10, by means of the ear 70 61<sup>a</sup> and pin 61<sup>b</sup>. The top tables 51 of the auxiliary grate bear up against the lower surface of the feed-plate 21, and are thereby maintained in position on the shaft 56. It will also be noted that the feet 54<sup>a</sup> of the aux- 75 iliary grate slide over the top faces of the upper ends of the grate-bars 5 and 6.

The dumping-grate 4 is represented to consist of the sections 70 with a depending head 70<sup>a</sup>, which are clamped together by the bolts 8c 71 72 and swing on a bearing 75. An arm 76 extends from one section of each dumping-grate and is pinned to a link 77, that terminates in a handle 78, the link operating through an opening in the front 2. The bearing 75 is 85 supported on a pair of front supports 79 of the frames 80, enabling the dumping-grate to dump toward the front of the ash-pit. The dumping-grate can also be supported on the rear supports 81, if it is desired, as shown in 90 Fig. 6, being then reversed to dump toward the rear end of the ash-pit. A fixed grate 82 is supported on the frames 80, that extend to the rear of the stationary and movable grate-bars 6 and 5, respectively, and said fixed grate 95 82 is interposed between the lower ends of the said grate-bars 5 6 and the dumping-grate 4.

To operate the invention, fuel is introduced into the hopper 14, from which it slides by way of the feed-plate 21, being moved by the 100 pusher 8 onto the auxiliary or coking grate 7 and from thence on the grate-bars 5 6, where it is agitated by the vibratory bars, and when the fuel has been consumed the portion of the ashes which has not already fallen into the 105 ash-pit 9 is deposited on the dumping-grates 4, from which latter it is dumped.

It will be noted that when the dumping-grate 4, with its bearing 75, is placed as shown in Fig. 6 the depending head 70<sup>a</sup> forms a 110 dam or barrier to the fuel on the inclined grate-bars when the dumping-grate is moved in a position to dump by moving the link 77. To obtain the movement of the grate and other appurtenances, the main driving or os- 115 cillating shaft 10 is swung through a proper angle by receiving motion from a connecting-rod 101, connected with a crank 102, driven by a shaft 103.

If desired, the swinging bottom 16 of the 120 hopper can be raised to admit the fuel instead of dropping the fuel from a point above, said bottom.

Having described my invention, I claim—

1. The combination in a stoking device for 125 a furnace, of a feeding-plate projecting into the furnace, an auxiliary grate arranged to move under the feeding-plate and bear up



against the said plate, stationary and vibratory grate-bars extending from the bottom surface of the auxiliary grate and inclining downwardly to the rear of the furnace, a bearing, front and rear supports for the bearing at the rear of the furnace, a reversible dumping-grate on the bearing and adapted to dump toward the front of the ash-pit of the furnace, when the said bearing is located on the rear supports, and toward the rear when the bearing is located on the front supports.

2. The combination in a stoking device for a furnace, of a feeding-plate projecting into the furnace, a pusher sliding on the said plate, an auxiliary grate arranged to move under the feeding-plate and bear up against the said plate, stationary and vibratory grate-bars extending from the bottom surface of the auxiliary grate and inclining downwardly to the rear of the furnace, a bearing, front and rear supports for the bearing at the rear of the furnace, a reversible dumping-grate on the bearing and adapted to dump toward the front of the ash-pit of the furnace, when the said bearing is located on the rear supports, and toward the rear when the bearing is located on the front supports, and means to move the pusher, auxiliary grate, and vibratory grate-bars.

3. The combination in a stoking device for a furnace, of a hopper, a swinging bottom journaled to the hopper, a feeding-plate under the swinging bottom of the hopper and extending into the furnace, a pusher bearing up against the swinging bottom and bearing on the feeding-plate, an auxiliary grate mounted under the feeding-plate and bearing up against the latter, stationary and vibratory grate-bars extending from the bottom surface of the auxiliary grate and inclining downwardly to the rear of the furnace, a bearing, front and rear supports for the bearing at the rear of the furnace, a reversible dumping-grate on the bearing and adapted to dump toward the front of the ash-pit of the furnace, when the said bearing is located on the rear supports, and toward the rear when the bearing is located on the front supports, means to move the pusher, the auxiliary grate and vibratory grate-bars, and independent means to dump the dumping-grate.

4. The combination in a stoking device for a furnace, of frames in the rear of the furnace, two pairs of supports on the frames, a bearing adapted to be supported on either pair of supports, a reversible dumping-grate arranged to operate on the bearing, and adapted to dump toward the front of the ash-pit of the furnace when the said bearing is located on one pair of supports and toward the rear when the bearing is located on the other pair of supports, an arm extending from the dump-

ing-grate, a link pinned to the arm, and connected so as to dump the grate therewith.

5. The combination in a stoking device for a furnace, of stationary and vibratory grate-bars extending from the front of the furnace and inclining to the rear thereof, frames extending from the lower end of said grate-bars to the rear of the furnace, a front and a rear pair of supports on the frames, a bearing arranged to be carried on either pair of the supports, a dumping-grate carried on the bearing, a depending head extending from the dumping-grate, means to move the vibratory grate-bars, means to dump the dumping-grate to the rear of the ash-pit of the furnace when the bearing is on the front supports, and to the front of the said ash-pit when on the rear supports, the depending head forming a barrier to the charge on the grate-bars when the said bearing is located on the front supports.

6. The combination in a stoking device for a furnace, of vibratory grate-bars extending from the front of the furnace to the rear thereof, cross-teeth on each with their edges at right angles to the body of the bar, approximately horizontal overlapping flights on the upper end of each bar, journal-bearings extending from the body of the bars, transverse shafts in the journal-bearings and supporting the grate-bars, rock-shafts having free ends in engagement with said transverse shafts and arranged to raise the lower ends of the grate-bars in advance of the upper ends thereof, links connecting the free ends of the rock-shafts, an arm extending below one of the said rock-shafts, a dumping-grate at the rear of the vibratory grate-bars, and a fixed grate between the lower ends of the vibratory grate-bars and the dumping-grate.

7. The combination in a stoking device for a furnace, of stationary and vibratory grate-bars extending from the front of the furnace to the rear thereof, a fixed grate at the rear of the said vibratory grate-bars, frames to the rear of said stationary grate, a bearing, front and rear supports for the bearing on the frames, a reversible dumping-grate composed of sections, said sections forming a depending head and resting on the said bearing, the said dumping-grate adapted to dump toward the front of the ash-pit of the furnace, when the said bearing is located on the rear supports, and toward the rear when the bearing is located on the front supports.

Signed at New York, in the county of New York and State of New York, this 20th day of May, A. D. 1903.

WILLIAM ANDREW ROSS.

Witnesses:

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SIMON SCHAEFFER.