No. 765,390. PATENTED JULY 19, 1904.

O. F. LEIBERT.

AUTOMATIC STOKING APPARATUS.

APPLICATION FILED JULY 30, 1903.

NO MODEL. 5 SHEETS—SHEET 1.

Fig. 1.

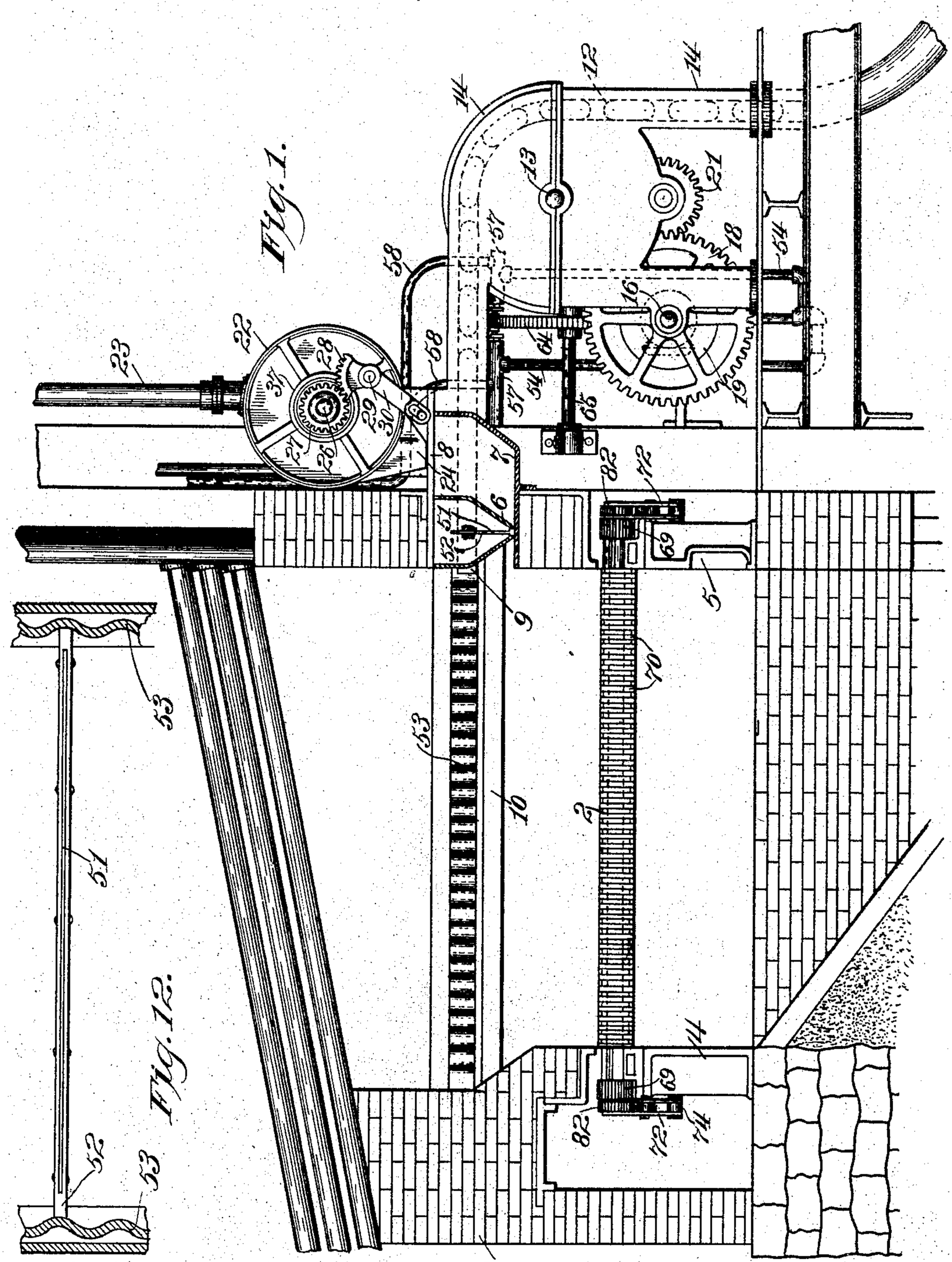

Fig. 12.

Witnesses:
Calderon & Fuss.
Fred. E. Maynard.

Inventor:
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NO MODEL. 5 SHEETS—SHEET 2.

Fig. 2.

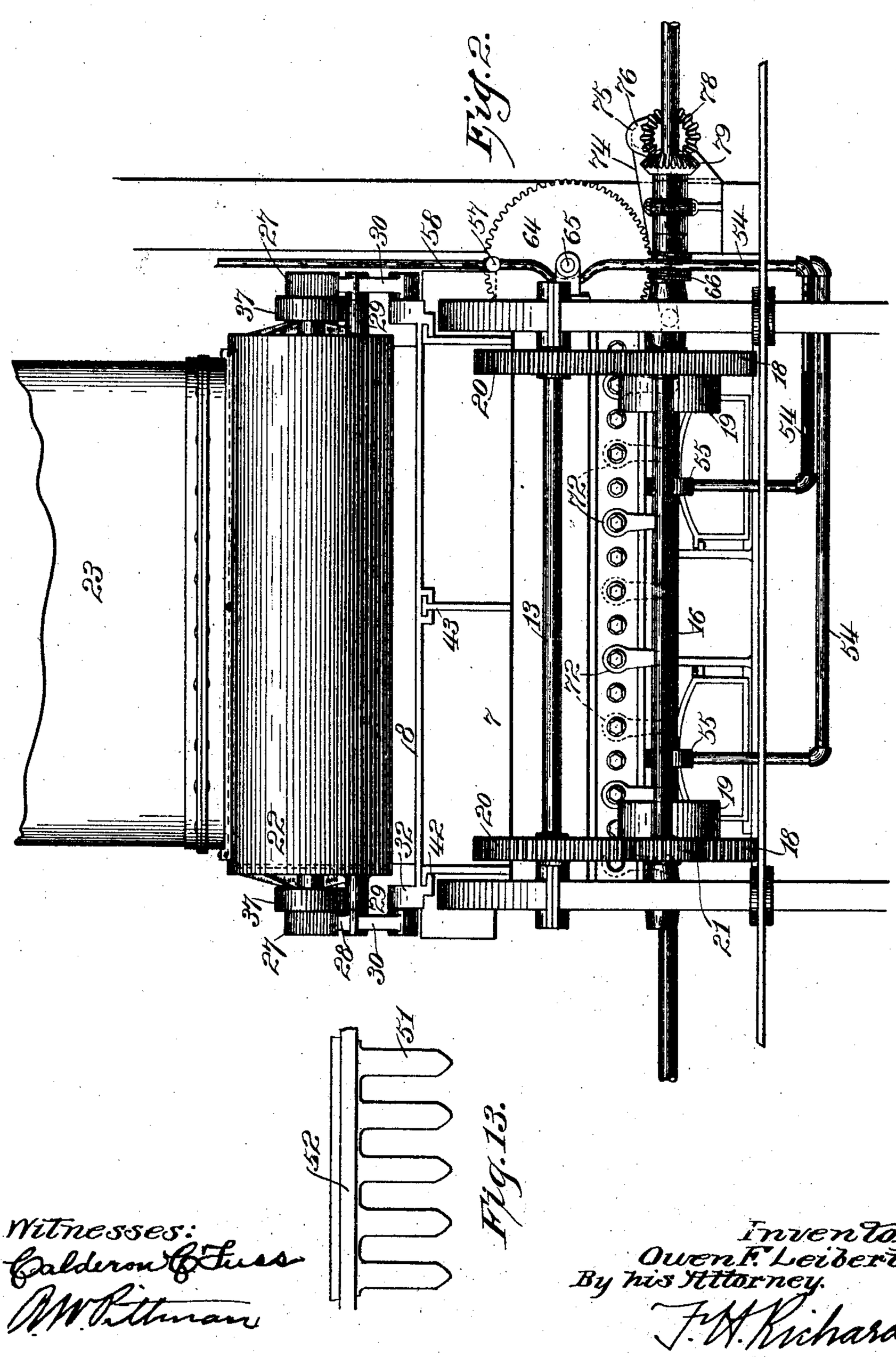

Fig. 13.

Witnesses:
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NO MODEL. 5 SHEETS—SHEET 3.

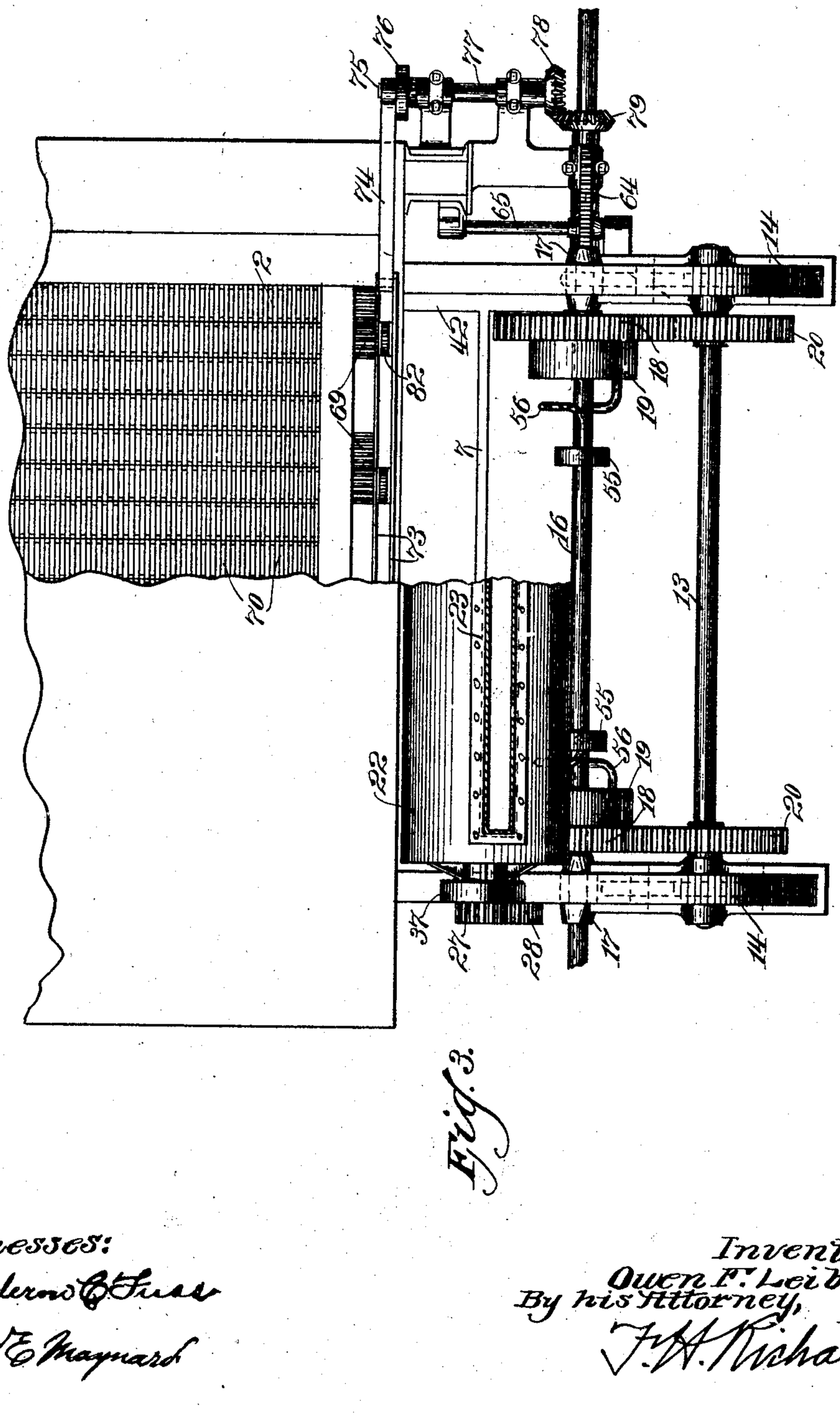

Fig. 3.

Witnesses:
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AUTOMATIC STOKING APPARATUS.

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NO MODEL. 5 SHEETS—SHEET 4.

Fig. 4.

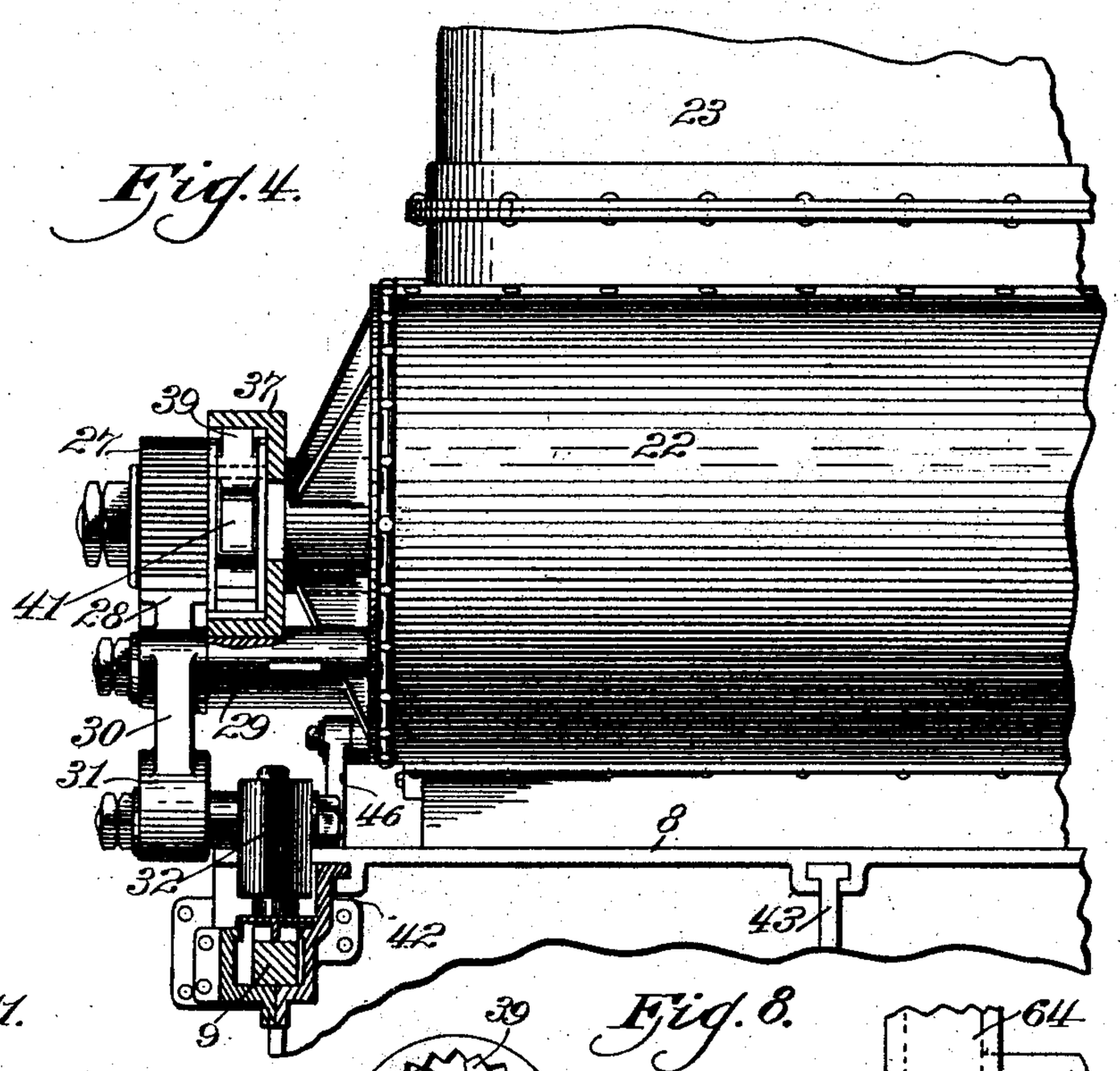


Fig. 11.

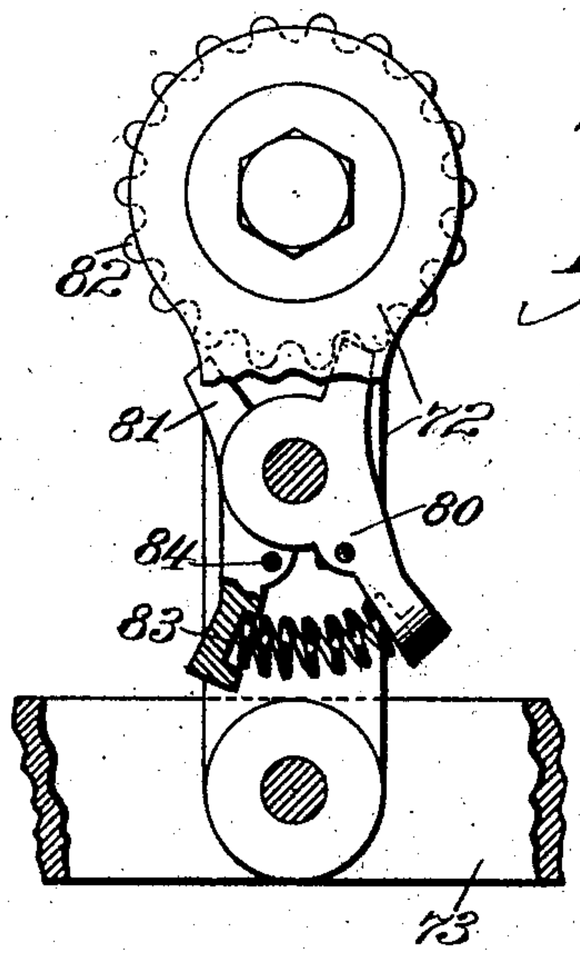


Fig. 5.

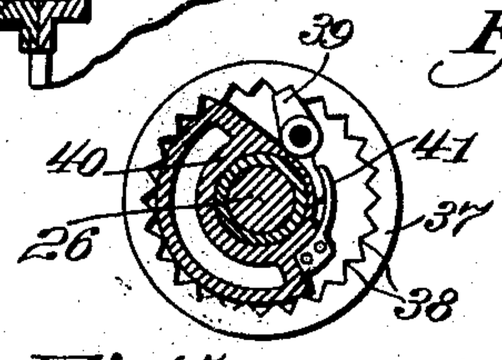


Fig. 8.

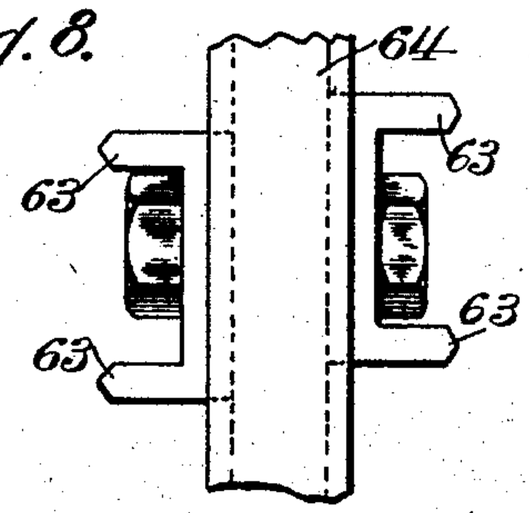
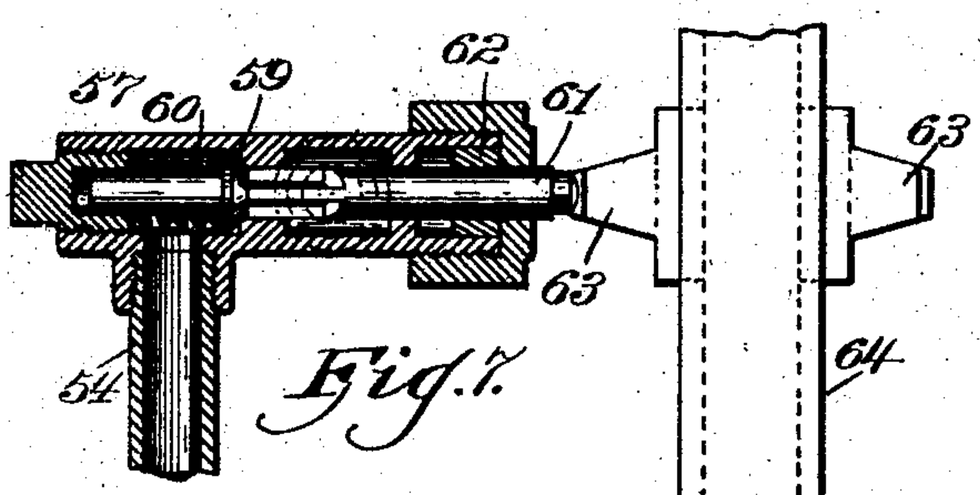


Fig. 7.



Witnesses:
Calderon & Fuss.
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APPLICATION FILED JULY 30, 1903.

NO MODEL. 5 SHEETS—SHEET 5.

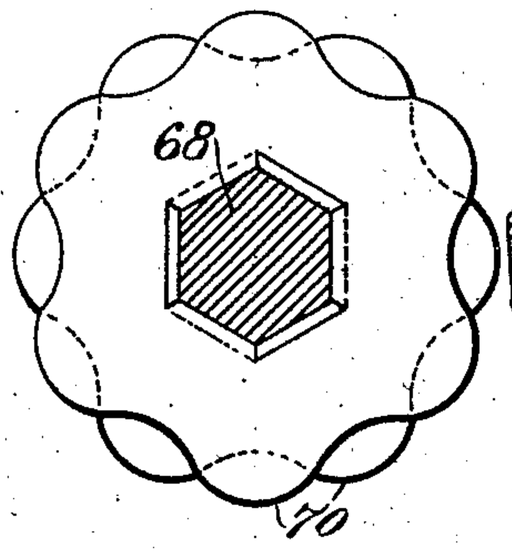

Fig. 9.

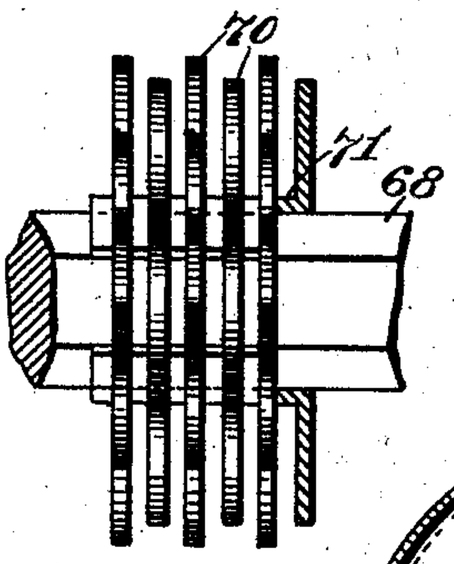

Fig. 10

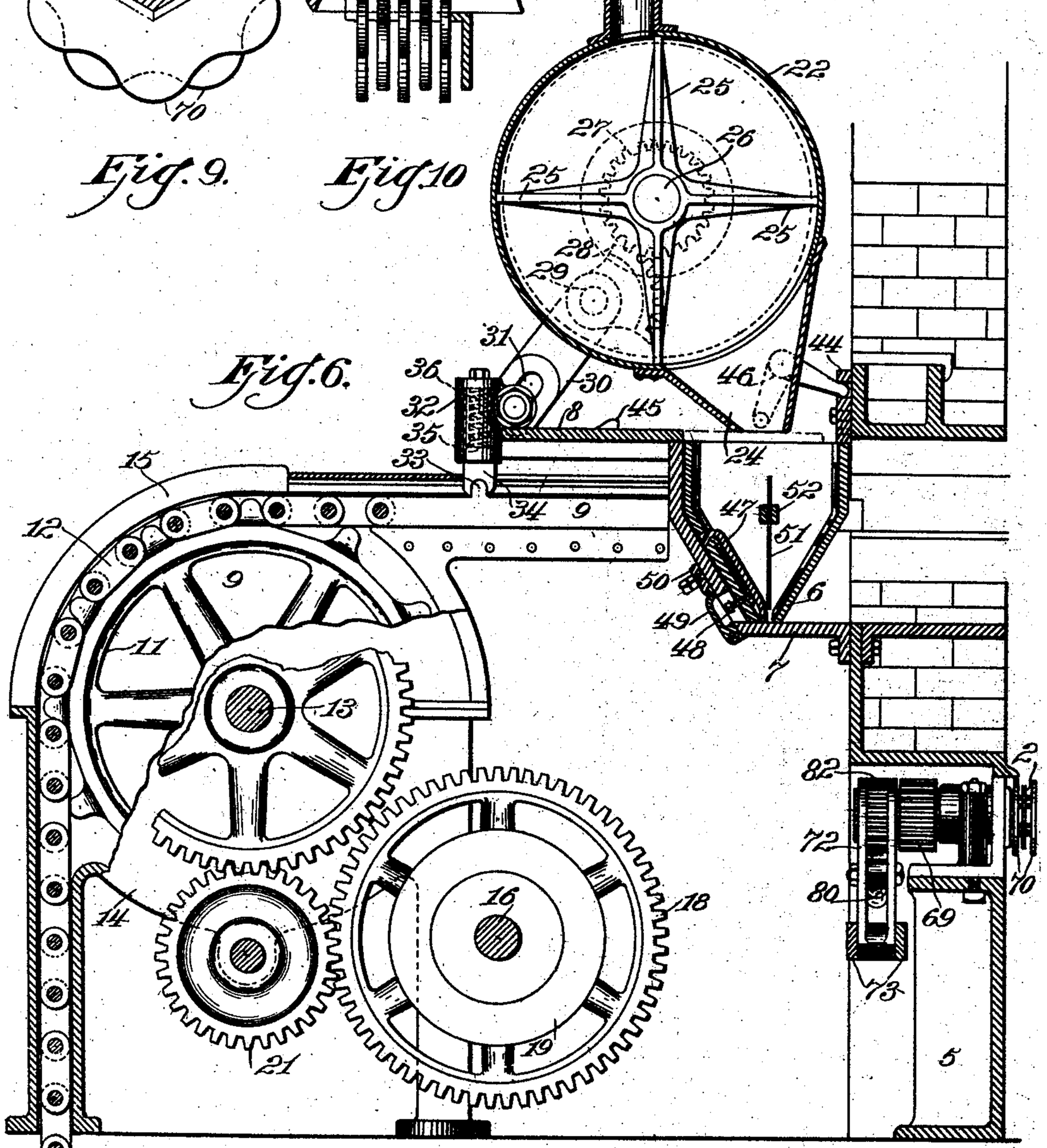

Fig. 6.

Witnesses:
Calderon C. Fuss
Fred E. Maynard.

Inventor
Owen F. Leibert
By his Attorney
F. H. Richards

No. 765,390. Patented July 19, 1904.

UNITED STATES PATENT OFFICE.

OWEN F. LEIBERT, OF BETHLEHEM, PENNSYLVANIA.

AUTOMATIC STOKING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 765,390, dated July 19, 1904.

Application filed July 30, 1903. Serial No. 167,588. (No model.)

To all whom it may concern:

Be it known that I, OWEN F. LEIBERT, a citizen of the United States, residing in Bethlehem, in the county of Northampton and State of Pennsylvania, have invented certain new and useful Improvements in Automatic Stoking Apparatus, of which the following is a specification.

The present invention relates to furnace-feeding devices, and embraces an apparatus for automatically distributing determinate or measured quantities of fuel over the surface of a grate or fuel-bed at regular and determinate intervals, the present organization of devices also including as one of its features an improved form of grate for crushing the ashes and clinker and discharging the same.

The present automatic stoking apparatus includes a device in the nature of a tray or bucket adapted to carry a measured charge of fuel into the furnace and to effect during its movement therein a substantially uniform distribution of its contents over the entire surface of the grate or bed of fuel.

The apparatus also includes means whereby the period intervening between such consecutive distributions of fuel-charges may be regulated in accordance with the demands and purposes of the furnace operation.

In the drawings accompanying the present specification there is set forth an embodiment of the present invention.

In the drawings, Figure 1 is partially an elevational and partly a sectional view, the section being taken from front to rear of a furnace and the figure illustrating the application thereto of a stoking apparatus embodying the present improvements. Fig. 2 is an elevation looking toward the front of the furnace. Fig. 3 is a plan view, parts being broken away. Fig. 4 is an elevational view of the end portion of the fuel magazine or holder, from the pockets or chambers of which the fuel is delivered in succession to the distributing tray or bucket, this figure illustrating means for imparting an intermittent rotary movement to the chamber-forming vanes in the magazine from the reciprocatory tray-support, parts being shown in section to better illustrate their construction. This figure and the remaining figures are drawn to a somewhat larger scale than the preceding figures. Fig. 5 is a detail view of the clutch comprised in the vane-actuating mechanism. Fig. 6 is mainly a section taken in a direction from front to rear of the furnace, illustrating the rotary pocket-forming vanes within the drum or reservoir, the reciprocatory spreading-tray to which the coal is delivered in succession from the pockets of the drum, and the driving-gears and connections for reciprocating the tray and imparting an intermittent rotary movement to the pocket-forming construction within the drum, certain other parts and features being also illustrated, adverted to at length later on. Fig. 7 is a longitudinal sectional view of one of the valves for controlling the passage of the actuating pressure fluid to the clutches whose operative or inoperative condition determines the direction of motion of the gearing indicated in Fig. 6, there likewise being indicated in this figure a valve-actuating device which is controlled in its movement from the main drive-shaft of the apparatus. Fig. 8 is another view of such valve-actuating device. Figs. 9 and 10 are different views illustrating the improved grate construction. Fig. 11 illustrates, partly in section and partly in elevation, means for rotating the grate-bars. Figs. 12 and 13 are detail views of the vibratory shake.

Similar characters of reference designate corresponding parts in all figures.

The present stoking apparatus considered in its entirety may be said to include in a general way as features of the complete organization a coal-measuring device, a tray or bucket for distributing fuel over the surface of the fire, means for carrying the tray into and out of the furnace after the tray has received its charge of fuel, and means for regulating the number of times that the filled tray enters the furnace during a stated period.

In addition to the features above enumerated the present invention includes a form of grate found to be especially advantageous for crushing and discharging ashes and clinkers formed from the burning fuel spread by the present stoking apparatus.

The furnace-grate is designated in a general way by 2 and may be of any proper construction, although I prefer to make the grate-bars

of the construction hereinafter referred to. The furnace may also have any proper setting, (designated in a general way by 3,) the grate as here shown being supported in position upon supports, such as 4 5, within the fire-box of the furnace. This latter, it may be mentioned, may be of any desired type, since the present invention in no wise relates to such construction, but is concerned solely with means for feeding the fuel.

One of the most important features of the present apparatus consists of a holder in the nature of a bucket or tray adapted for traveling above and across the grate, during which movement the contents of the tray drop downward upon the fire. The tray (designated herein by 6) is of any suitable form and is of sufficient capacity to hold a desired maximum charge of fuel, while its length measured transversely to its line of travel is substantially equal to the corresponding dimension of the grate, whereby a uniform distribution of the fuel over the entire surface is secured, it being premised that the travel of the tray is sufficient to effect this result. In this instance the tray is given a reciprocatory motion from front to rear of the furnace and back again, the tray on passing out at the front of the furnace entering a space inclosed by a fixed casing 7, which incloses the space on all sides except at the rear and at the top, which latter is shut in by a sliding covering-plate 8. The tray is supported in its reciprocatory movement by slide-bars 9, (see Fig. 4 especially,) one at each side of the furnace and traveling longitudinally to and fro in guideways formed in castings 10, secured to the furnace side walls.

A reciprocatory movement is given to the supporting slide-bars by toothed or sprocket wheels 11, one at each side and in alinement with the corresponding slide-bar and operative to move such bar through a corresponding sprocket-chain 12, pivotally connected with the bar and engaging with the teeth of the sprocket-wheel. The two sprocket-wheels are indicated as connected to a shaft 13, suitably journaled in bearings supported in this instance from sprocket-wheel casings 14, resting upon and secured to a suitable foundation. The casing 14 for each sprocket-wheel is provided with a guide-face 15 for preventing the disengagement of the sprocket-chain from the wheel during the opposite lengthwise movements of the chain in effecting the reciprocation of the tray backward and forward. Of course suitable guide faces and walls are provided at the front of the furnace for confining the slide-bars and connecting-chains to a longitudinal movement.

The means for rotating the shaft 13, to which the sprocket-wheels are affixed, comprises in this instance a main drive-shaft 16, journaled in suitable bearings, such as 17. Upon this main drive-shaft are mounted spur-wheels 18 18, with each of which is associated a corresponding clutch, (designated in a general way by 19.) The construction and mode of operation of this clutch will be referred to later. Suffice it here to say that when a clutch is in its inoperative condition the spur-wheel 18 with which it is associated is permitted to rotate loosely upon the drive-shaft.

One of the spur-wheels 18 meshes directly with a spur-wheel 20, rigidly secured to the shaft 13, (to which the sprocket-wheels 11 are affixed,) while the other spur-wheel 18 is in mesh with an intermediate spur-wheel 21, which in turn is in gear with a second spur-wheel 20, secured to the said shaft 13 adjacent to the opposite end to that at which the first-mentioned wheel 20 is secured. When in operation, the main drive-shaft 16 is rotated constantly in the same direction, and accordingly as one or the other of the clutches 19 19 is in its clutching position the shaft 13 will be driven in one direction or the opposite, that spur-wheel 18 whose associated clutch is in its non-clutching position rotating at such times idly on the main drive-shaft. The means for controlling the clutching and non-clutching positions of the clutches will be referred to later.

When the tray or bucket 6 is located nearest toward the front—that is, nearest to the front wall of the inclosing casing 7—it is in a position to receive a charge of fuel. The successive charges delivered to the spreading tray or bucket as the emptied tray is brought to its loading position is preferably equal in amount, so that a uniform firing may be carried out, and in order to increase or decrease the amount of such fixed charge spread over the surface of the fire at each excursion of the tray the means for loading the tray may be such as to provide for a regulation of the quantity delivered to the latter. A convenient means for loading the tray consists of a reservoir, the discharge of a given quantity of fuel from which is controlled by the reciprocating tray-supporting slide-bars already referred to.

In the specific construction of loading means disclosed in the drawings a fixed reservoir or drum 22 is employed into which the fuel in proper condition passes through a chute 23 and from which it is discharged by a delivery-spout 24, having its mouth directly above the tray when in its loading position. This drum extends substantially the entire length of the tray and in it is rotatively mounted a pocket-forming structure comprising suitable vanes 25, rigid with a rotary shaft 26, extending axially of the drum. These vanes divide the inner space of the drum into a number of pockets, each of which is designed to contain substantially the amount of fuel corresponding to a given charge of the spreading-tray. Although four such vanes are illustrated, it is manifest that that number may be made

greater or less to increase or decrease the amount of the charge.

The intermittent angular movement of the shaft 26 is effected from one of the reciprocating slide-bars 9, and if the entire space of the drum 22 is divided into four compartments or pockets, as indicated, each angular movement of the shaft 2 is such as to turn the shaft through one-quarter of a full rotation, thereby bringing the pockets or chambers in succession opposite the feeding-spout 24. The connection interposed in this instance between one of the slide-bars 9 and the rotary shaft 26 of the drum comprises a spur-wheel 27, mounted on such shaft, with which meshes a toothed segment 28, journaled on a stud 29, extending from one of the heads of the drum. This toothed segment is actuated to and fro through the instrumentality of a rock-lever 30, rigid with the segment and having a pin-and-slot connection 31 with a head 32, reciprocated to and fro by means of a boss or projection 33 on the slide-bar 9. In this instance also the connection between the pin of the pin-and-slot connection 31 and the lug 33 is a yielding one to allow for any unevenness of motion that may occur and likewise to insure the continued engagement of the driving parts with the lug 33—that is to say, the head 32 is hollow to receive a plunger 34, whose recessed lower end engages with the lug, while between a shoulder 35 on the plunger and the inner upper face of the bore of the head there is interposed a spring 36, operating to force the plunger downward and maintain the recess at its lower end in engagement with the lug. As the slide-bar reciprocates to and fro a rocking motion is imparted to the segment 28, and in order to render the rocking motion of said segment operative to rotate the shaft 26 in one direction only, and hence to effect an intermittent rotary movement thereof in the same direction at each step, a clutch is interposed between the spur-wheel 27 and the shaft 26. In the construction of such clutch illustrated the same embodies an annular shell 37, rigid with hte shaft, (see Fig. 5,) and whose inner cylindrical face is provided with teeth-forming notches 38, with the faces of which is adapted to engage a pawl or dog 39, pivoted to a carrier 40, rigid with the said spur-wheel 27, the engagement of the pawl with the drive-faces being insured by a spring 41. It is evident from this construction that as the slide-bar 9—that is, the tray—moves in one direction the segment 28 will operate to rotate the shaft 26, and thereby bring the next succeeding pocket opposite the feeding-spout 24. As the parts move backward to their original positions the spur-gear 27 will merely rotate idly upon the shaft 26, no motion being imparted to the latter.

The cover-plate 8 for the casing 7 has already been mentioned, and the same is so organized and related to the other parts as to not only constitute a closure for the upper opening of the casing during such time as the spreading-tray is within the furnace, but also as a valve-plate for preventing the descent of the fuel from the feeding-spout 24 during such time as the tray shall be away from its loading position. When, however, the tray approaches this latter position, the cover-plate is withdrawn from under the spout and the descent of the material into the tray permitted. In this instance the plate is mounted to slide over the upper edge of the casing 7 and under the lower edge of the spout 24, moving with the aforesaid head 32 of the actuating mechanism of the shaft 26 and being suitably supported by guides, such as 42 43, to slide back and forth, as aforesaid. A vertically-sliding guide 44 is also indicated sliding against the outer face of the front wall of the furnace and when in its lowermost position closing the clearance-space between the upper edge of the spreading-tray and the top face of the opening, through which the tray moves into and out of the furnace. This slide is a gravity-actuated slide, and as the parts move forward to carry the loaded tray into the furnace a lug or boss 45 on the cover-plate 8, striking against one arm of an angle-lever 46, will thereby lift the slide out of the path of the advancing cover-plate.

Preferably the mouth of the spreading-tray is of adjustable width in order to adjust the thickness of the descending wall of fuel, the construction for this purpose here consisting of a hinged plate 47, whose outer face forms one side wall of the mouth of the tray, the lower or free portion of the plate resting against adjusting-screws 48, accessible through an opening in the casing 7, which may be closed by a hinged door 49, having a keeper 50, as clearly indicated in Fig. 6. In order, moreover, to preclude as far as may be the binding or wedging of the fuel as it descends from the tray, I employ a preferably toothed vibrator or shaker 51, extending from one end to the other of the tray, the same extending downward in close proximity to the tray-mouth and receiving a short vibratory motion in a horizontal direction by the passage of the supporting-bar 52 of such shaker during the excursions of the tray over roughened or corrugated strips 53 at the sides of the furnace.

The clutches 19 19, already mentioned as performing the function of connecting the respective gears 18 18 with and disconnecting them from the drive-shaft 16, may be in their construction and mode of operation like the clutch disclosed in my Patent No. 506,517, issued to me on October 10, 1893. Such clutch is therein described as consisting of a friction-clutch, in which the movable member thereof is operated by pneumatic action or in lieu thereof that of steam, gas, or other fluid under pressure. Reference may be made to such patent for a complete understanding of

the construction. Suffice it here to say that 54 54 are the supply-pipes for the pressure fluid, each corresponding to the supply-pipe H referred to in the patent, and each leading to a corresponding collar 55, with reference to which the shaft may rotate and corresponding to the collar to which the supply-pipe H of the patent is secured. The compressed air, &c., passes directly to each clutch through a corresponding auxiliary pipe 56, corresponding to the chamber or duct J of the patent.

Connecting with each supply-pipe 54 is a suitable valve for controlling the passage of the compressed air to the clutch, and hence the actuation of such clutch and the consequent driving of the spur-gear 18, associated therewith, from the driving-shaft 16. Each valve-body is designated by 57, a supply-pipe 58 being connected with each valve-body for the delivery to the interior thereof of the compressed air from a suitable source of power, while from the valve-bodies lead the supply-pipes 54 54, already mentioned as supplying air to the clutches. The valve construction is indicated in Fig. 7, comprising in the form there shown a valve proper, 59, a valve-seating spring 60, and a valve-stem 61, passing through a stuffing-box 62.

The inward movement of each valve serves to unseat the latter and permit the pressure fluid to pass to and operate the movable part of its clutch. This unseating of the valves is effected through the impingement against their stems of suitable actuators, which are conveyed periodically past their valve-actuating positions, such movement being conveniently effected from the aforesaid main drive-shaft 16. Preferably the interval intervening between the periods at which the actuators come into successive engagement with the valve-stems are adjustable in order that the time elapsing between the successive excursions of the loaded or charged tray into and out of the furnace may be varied. Such a mode of operation and the accomplishments of the results as aforesaid may be readily effected by adjustably mounting actuators in the nature of striking-pins 63 upon a carrying-disk 64 and so organizing such disk with relation to the respective valve-stems that a proper actuation of the latter may be effected. The shaft 65 of this disk is mounted in proper bearings and the disk is given a continuous rotary movement by a worm 66 on the drive-shaft 16, which engages with teeth formed in the periphery of the disk.

Referring now to the grate construction, this comprises a number of bars 68, extending between opposite walls of the furnace and journaled in suitable bearings in such walls carried by the aforesaid supports 4 and 5, each bar has rigid therewith a gear 69, meshing with the gears of the contiguous bars on opposite sides. The support for the fire is formed by a number of disks 70, passed over the bar 68, each disk having its periphery notched or fluted (see Fig. 9) and also having a laterally-extending flange 71, serving the purpose of a separator and determining the space between the contiguous pairs of disks. Preferably the fluted peripheries of the disks along each bar present a staggered disposition, and in order to secure the disks to the bars the latter are made angular in cross-sectional contour, while the disks on one bar enter the spaces between adjacent pairs of disks on the contiguous bar. Thus disposed the fluted or notched disks are analogous to gear-teeth and when the grate-bars are rotated operate to grind and carry the cinders and ashes downward into the ash-pit. The bars may be rotated at will from the main drive-shaft 16, alternate bars being here connected at the front of the furnace, by means of respective lever-arms 72, with a rocker-bar 73, to which such arms are pivoted. A reciprocating motion is communicated to this rocker-bar through a connecting-rod 74, connecting with a crank-pin 75, extending from a crank 76 on a shaft 77, journaled in suitable bearings and provided with a bevel-gear, as 78, meshing with a companion gear 79, secured to the drive-shaft 16. A similar construction operated directly from the drive-shaft serves to impart motion to the remaining grate-bars at the rear of the furnace.

In order that the reciprocating motion of the rocker-bar may effect the rotary movement of the grate-bars in the same sense or direction, each lever-arm 72 transmits its motion to the grate-bar with which it is associated through a pawl-and-ratchet mechanism, the construction of this latter being indicated in Fig. 11, where a double pawl is shown pivoted on the arm 72 and by adjustment being rendered effective to rotate the bar in one direction or the other—that is to say, such double-pawl construction comprises coincidentally-pivoted pawls 80 and 81, engageable with a toothed wheel 82, secured to the grate-bar, the free or untoothed ends of the pawls being pressed apart by a spring 83. Each pawl may be released and permitted to engage with the toothed wheel 82 by withdrawing a locking-pin 84 from a corresponding socket in the arm 72, the other pawl at such time being held out of operative engagement with the ratchet-wheel by its locking-pin. When both pawls are held out of operative relation with the ratchet-wheel, the rocker-bar reciprocates idly without effecting any motion of the grate-bars.

Having described my invention, I claim—

1. In a stoking apparatus, the combination with a spreading-tray having an adjustable mouth, of means for reciprocating the same back and forth above the furnace-grate.

2. In a stoking apparatus, the combination with a spreading-tray having a vibrator for precluding the clogging of the tray-mouth, of

means for passing the same over the furnace-grate, and a loading device for charging the tray with fuel.

3. In a stoking apparatus, the combination with a spreading-tray having a mouth, and a vibrator for precluding the clogging of said mouth, of means for passing the same over the furnace-grate and withdrawing it from the furnace, and a loading device for then charging the tray with fuel.

4. In a stoking apparatus, the combination with a spreading-tray having an adjustable mouth, of means for passing the same over the furnace-grate at determinate intervals, and a loading device for charging the tray with fuel.

5. In a stoking apparatus, the combination with a spreading-tray having an adjustable mouth, of means for passing the same back and forth over the furnace-grate, a reservoir outside of the furnace, and means for discharging the definite and measured quantity of fuel from such reservoir into the tray upon its withdrawal of the latter from the furnace.

6. In a stoking apparatus, the combination with a spreading-tray having an adjustable mouth, of a drive mechanism, a fuel-reservoir, and means actuated from such drive mechanism for discharging a definite measure of fuel from such reservoir into the tray at each withdrawal of the latter from the furnace.

7. In a stoking apparatus, the combination with a spreading-tray having a movement into and out of the furnace, of a casing exterior to the furnace and into which said tray may be drawn, and a reciprocatory cover-plate for such casing.

8. In a stoking apparatus, the combination with a spreading-tray having a movement into and out of the furnace, of a casing exterior to the furnace and into which said tray may be drawn, and a reciprocatory combined valve and cover plate for such casing.

9. In a stoking apparatus, the combination of a spreading-tray having a movement to and fro above the furnace-grate, a fuel-reservoir from which the tray is charged, a drive mechanism for actuating the tray and delivering different and measured quantities of fuel from the reservoir to the tray, and means for actuating such mechanism at predetermined intervals.

10. In a stoking apparatus, the combination of a spreading-tray having an adjustable mouth and having a movement to and fro above the furnace-grate, a fuel-reservoir from which the tray is charged, a drive mechanism for actuating the tray and delivering different and measured quantities of fuel to the tray, a main drive-shaft, and clutches controlled therefrom for rendering said drive-shaft operative and inoperative to actuate the tray.

11. In a stoking apparatus, a spreading-tray having an adjustable mouth.

12. In a stoking apparatus, a spreading-tray having a vibrator for precluding the clogging of the tray-mouth.

13. In a stoking apparatus, a spreading-tray movable along guides in opposite walls of the furnace, a vibrator within the tray, a vibrator-bar, and roughened plates along which such bar travels during the movement of the tray.

14. In a stoking apparatus, the combination with a spreading-tray, of supporting slide-bars movable to and fro in guides at opposite sides of the furnace, driving means for reciprocating said slide-bars, a chambered reservoir for loading the tray upon its withdrawal from the furnace, a main drive-shaft moving uniformly in the same direction, a direct drive-gear and a reversing drive-gear interposed between said main shaft and said driving mechanism for the slide-bars, and clutches for rendering said direct and reverse drive mechanisms alternatively operative and inoperative.

15. In a stoking apparatus, the combination with a spreading-tray, of supporting slide-bars movable to and fro in guides at opposite sides of the furnace, driving means for reciprocating said slide-bars, a chambered reservoir for loading the tray upon its withdrawal from the furnace, a main drive-shaft moving uniformly in the same direction, a direct drive-gear and a reversing drive-gear interposed between said main shaft and said driving mechanism for the slide-bars, clutches for rendering said direct and reverse drive mechanism alternatively operative and inoperative, and means for effecting an operative condition of said clutches at predetermined intervals.

16. In a stoking apparatus, the combination with a spreading-tray, of supporting slide-bars movable to and fro in guides at opposite sides of the furnace, driving means for reciprocating said slide-bars, a chambered reservoir for loading the tray upon its withdrawal from the furnace, a main drive-shaft moving uniformly in the same direction, a direct drive-gear and a reversing drive-gear interposed between said main shaft and said driving mechanism for the slide-bars, clutches for rendering said direct and reverse drive mechanism alternatively operative and inoperative, and means for permitting the passage to such clutches of a pressure medium at predetermined intervals.

17. In a stoking apparatus, the combination with a spreading-tray, of a loading device, sprocket-wheels for effecting the reciprocating of the spreading-tray, means actuated from said sprocket-wheels for discharging a given quantity of fuel into the spreading-tray upon the withdrawal thereof from the furnace, sprocket-wheel-actuating mechanism comprising pressure-controlled clutches, a main drive-shaft, a disk driven therefrom, actuators upon the disk, and valves interposed in the pressure-supply and operative from said actuators on the disk.

18. In a stoking apparatus, the combination with a spreading-tray, of a loading device, sprocket-wheels for effecting the reciprocation of the spreading-tray, means actuated by said sprocket-wheels for discharging a given quantity of fuel into the spreading-tray upon the withdrawal thereof from the furnace, sprocket-wheel-actuating mechanism, comprising pressure-controlled clutches, a main drive-shaft, a disk driven therefrom, actuators adjustably secured to the disk, and valves interposed in the pressure-supply and operative from said actuators on the disk.

19. The combination of a spreading-tray, supporting slide-bars movable to and fro from front to rear of the furnace, sprocket-wheels for reciprocating the slide-bars, a drum, rotating chamber-forming vanes in said drum, a pawl-and-ratchet mechanism for rotating said vanes in unison with the reciprocating tray, a horizontally-movable cover-plate also movable in unison with said tray, a vertically-movable slide lifted as the horizontally-movable slide approaches it, a main drive-shaft, forwardly-driving and reversely-driving gears interposed between said drive-shaft and sprocket-wheels, pressure-controlled clutches for rendering said drive-gears automatically operative alternately, an actuator-disk driven from the main drive-shaft, actuators adjustably secured to said disk and valves interposed in the fluid-pressure supply and with which said actuators are coöperative.

20. The combination of a spreading-tray, supporting slide-bars movable to and fro from front to rear of the furnace, sprocket-wheels for reciprocating the slide-bars, a drum, rotating chamber-forming vanes in said drum, a pawl-and-ratchet mechanism for rotating said vanes in unison with the reciprocating tray, a horizontally-movable cover-plate also movable in unison with said tray, a vertically-movable slide lifted as the horizontally-movable slide approaches it, a main drive-shaft, forwardly-driving and reversely-driving gears interposed between said drive-shaft and sprocket-wheels, pressure-controlled clutches for rendering said drive-gears automatically operative alternately, an actuator-disk driven from the main drive-shaft, actuators adjustably secured to said disk, and valves interposed in the fluid-pressure supply and with which said actuators are coöperative.

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