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Patented July 4, 1911.

2 SHEETS-SHEET 1.

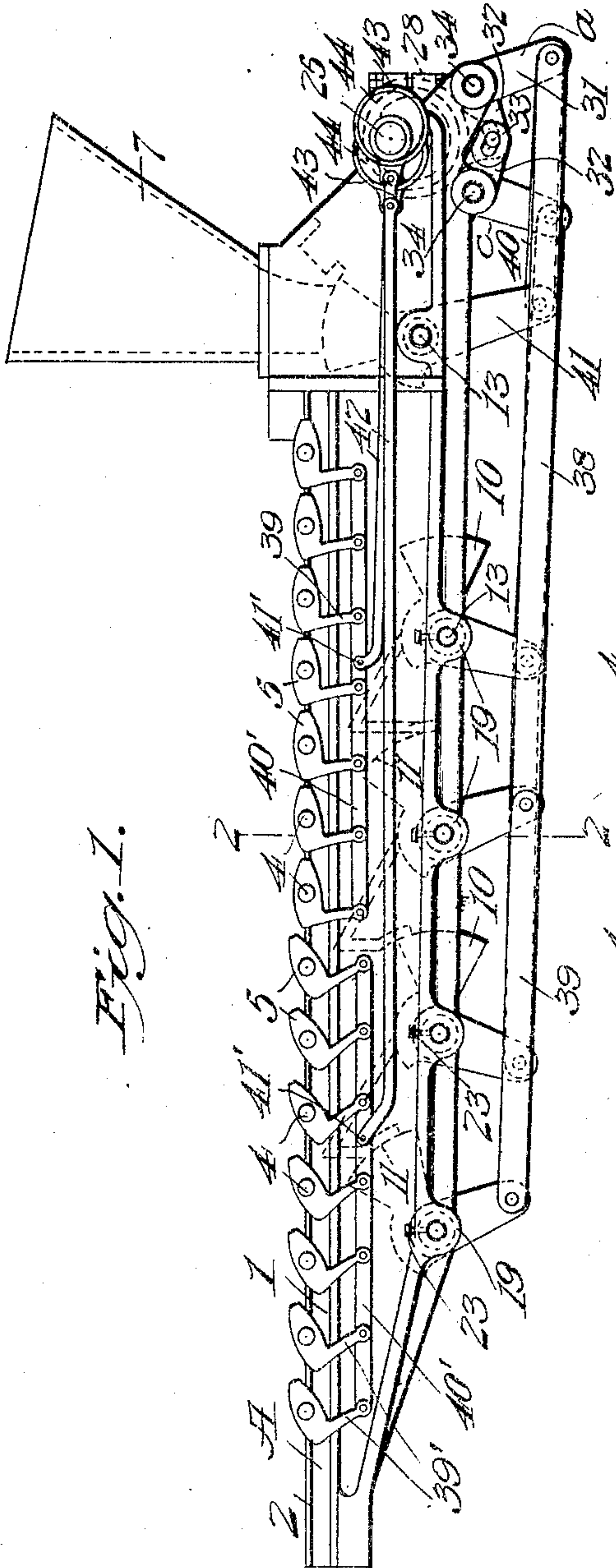


Fig. 1.

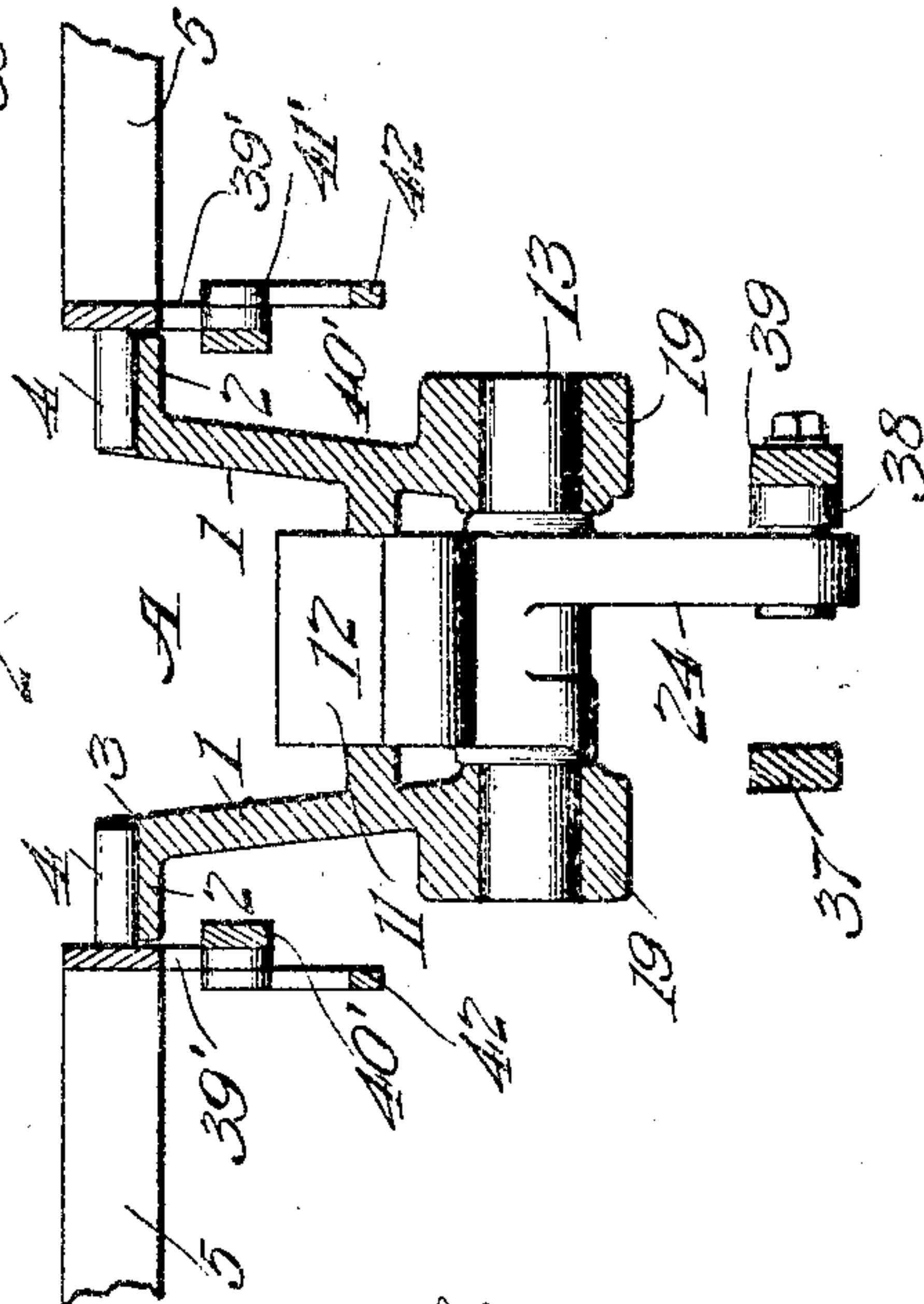


Fig. 2.

WITNESSES

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UNDERFED STOKER.
APPLICATION FILED NOV. 23, 1910.

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2 SHEETS—SHEET 2.

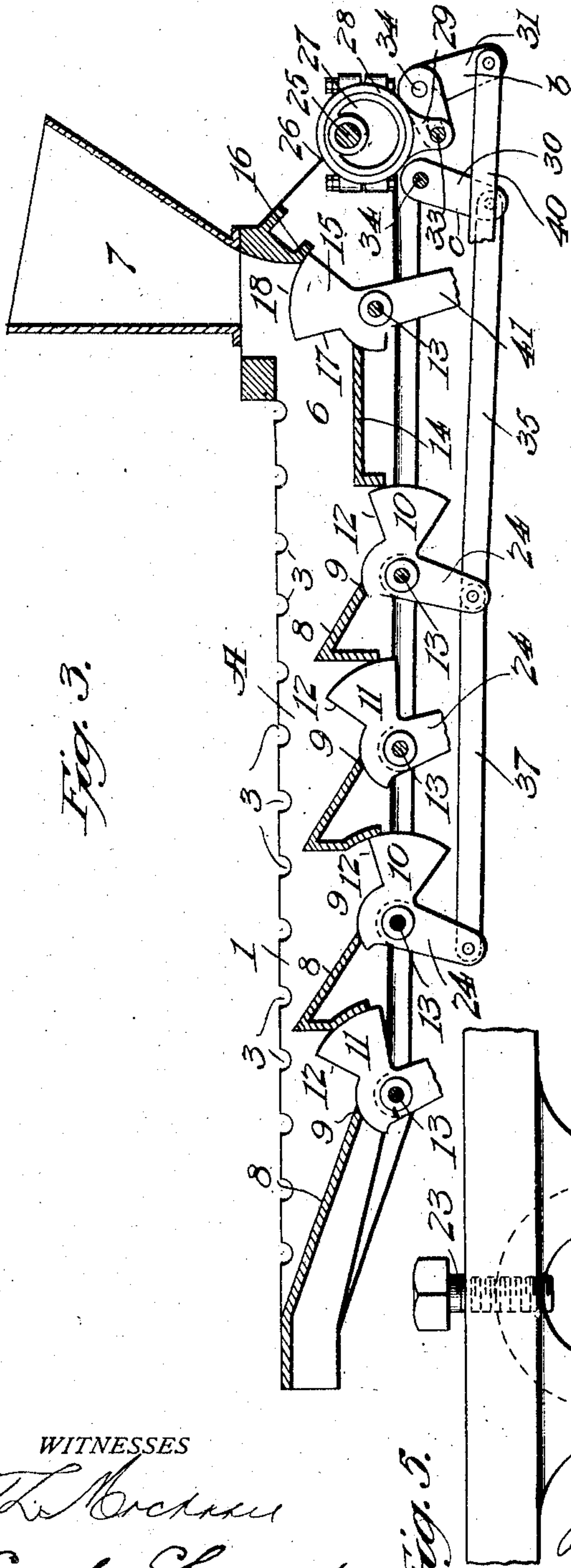
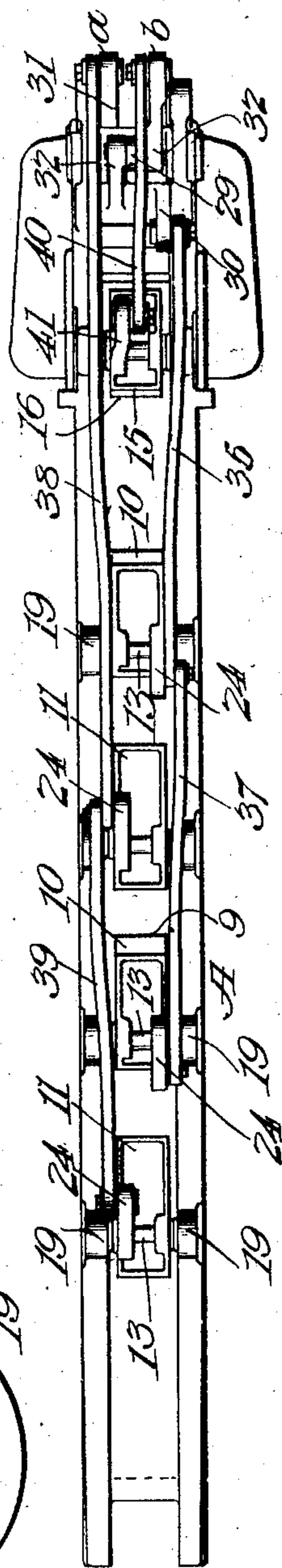


Fig. 3.

Fig. 4.



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Fig. 3.

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UNITED STATES PATENT OFFICE.

WALTER F. SMITH, OF BALTIMORE, MARYLAND, ASSIGNOR TO THE SMOKELESS STOKER COMPANY, A CORPORATION OF DELAWARE.

UNDERFED STOKER.

997,019.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WALTER F. SMITH, a citizen of the United States, residing at Baltimore city, State of Maryland, have invented a certain new and useful Underfed Stoker, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to an underfed stoker for furnaces or the like of that type consisting of a sunken magazine, extending longitudinally of the grate or hearth and having a plurality of oscillating conveyers or rockers that progressively feed the fuel backwardly from a front hopper to the rear portion of the grate, and at the same time crowd fuel out of the magazine laterally to the grate surface or surfaces at one or both sides of the magazine.

The invention has for one of its objects to improve and simplify the construction and operation of devices of this character so as to be comparatively simple and inexpensive to manufacture and install, thoroughly reliable and efficient in use, and readily operated.

Another object of the invention is to improve the arrangement of the magazine at the throat so that fuel fed from the hopper to the magazine by the initial or starting conveyer will readily pass from the throat to the first conveyer without the fuel jamming in front of the latter, the first conveyer being mounted under the plane of the bottom of the throat.

Another object of the invention is the provision of a plurality of conveyers or rockers having a novel operating mechanism consisting of an eccentric, levers and links so arranged that alternate rockers or conveyers move simultaneously in opposite directions, there being uptakes or inclined planes between adjacent rockers so that the fuel will be progressively elevated while it is progressively moved backwardly.

A further object is to provide a novel mounting for each rocker in the form of a fixed shaft on which the rocker freely swings, the shaft having its ends fixed in bearings of novel construction depending from the side walls of the magazine.

Another object is the employment of rocking grate bars which are connected together

for synchronous movement in the same direction and operatively related to an eccentric on the same shaft of the eccentric for the conveyers or rockers in the magazine.

With these objects in view and others, as will appear as the description proceeds, the invention comprises the various novel features of construction and arrangement of parts which will be more fully described hereinafter and set forth with particularity in the claims appended hereto.

In the accompanying drawings, which illustrate one embodiment of the invention, Figure 1 is a side view of the fuel-feeding magazine. Fig. 2 is a transverse section on line 2-2, Fig. 1, and drawn on an enlarged scale. Fig. 3 is a central longitudinal section of the magazine. Fig. 4 is a bottom plan view of the magazine. Fig. 5 is a detail view of the bearing for one of the conveyer shafts.

Similar reference characters are employed to designate corresponding parts throughout the views.

Referring to the drawings, A designates a trough-like magazine which extends longitudinally of a furnace or other grate or hearth and may be disposed at the center, one side or at any other intermediate point, according to whether one or more magazines are to be employed for a single grate bed. This magazine consists of side walls 1 which have laterally-extending longitudinal flanges 2 that are provided on their top surfaces with semi-cylindrical bearings or seats 3 for receiving the journals 4 of rocking grate bars 5 so that the arrangement, as shown clearly in Fig. 2, is such that the magazine is sunken below the surface of the grate bed. At the front of the magazine is a throat 6 which extends through the front wall (not shown) of the furnace and receives fuel from a hopper 7 supported on the front end of the magazine at a point exterior to the furnace. Between the throat 6 and rear end of the magazine are spaced uptakes or fuel elevators 8 that have their upper ends disposed at successively higher levels beginning with that uptake nearest the front. These uptakes constitute portions of the bottom of the magazine, and between adjacent uptakes and also between the front uptake and throat are openings 9 in

the bottom of the magazine for accommodating the oscillating conveyers or rockers 10 and 11, the rockers 11 being arranged alternately with respect to the rockers 10. Each rocker includes a fuel-receiving shoulder 12 on which fuel lodges so as to be pushed up adjacent the uptake as the rocker or conveyer is oscillated. The shoulder 12 is the radial face of the sector portion of each conveyer and extends from the arcuate face of the sector portion to the hub of the conveyer, which hub has an arcuate face. It will be observed that the pivotal axes of the conveyers or rockers are located vertically under the front lower edges of the uptakes or inclines 8 and the curved or arcuate surfaces of the hubs are in close contact with the said edges of the uptakes so that the uptakes wipe or scrape off from the hubs the damp bituminous coal that tends to adhere thereto. The curved or arcuate surfaces of the sector portion of the conveyers are in close proximity to the rear walls of the uptakes and rear edge of the bottom plate of the throat so that the coal is scraped off the said surfaces during the downward movement of the conveyers to coal-receiving position. It will thus be seen that the conveyers are constantly kept clean so that there is no danger of their becoming jammed and stopping the mechanism. It is also to be noted that the conveyers are located wholly behind the bottom plate of the throat and behind the uptakes so that they are in the best position to receive fuel as it is moved rearwardly by the alternate rocking of the two sets of alternately arranged conveyers, and as the uptakes have their rear ends elevated successively from the front to the rear, the fuel feeds laterally out of the magazine simultaneously with the rear movement of the fuel.

The shafts 13 on which the conveyers freely oscillate are located below the bottom plate 14 of the throat. This is particularly so with reference to the first rocker 10, and the shoulder 12 of this rocker is disposed below the bottom 14 of the throat so that fuel will drop from the latter upon the shoulder 12 on the first rocker or conveyer, with the result that jamming of fuel in the throat will be prevented, as would be the case if the first rocker occupied an elevated position.

Immediately under the hopper 7 and at the front end of the throat is an oscillatory conveyer or rocker 15 that acts as a starter for moving the fuel longitudinally of the magazine, and this conveyer oscillates back and forth in an opening 16 at the front of the magazine and has a shoulder 17 behind which the fuel drops from the hopper when the starting conveyer is swung forwardly. The surface 18 of this starting conveyer operates as a cut-off valve to pre-

vent fuel from passing into the magazine during the rearward swinging movement of the conveyer. When the conveyer 15 is in its forward fuel-receiving position, the shoulder 17 is approximately on a line with the front wall of the magazine and the fuel from the hopper drops behind the shoulder 17, with the result that when the conveyer or rocker swings rearwardly, the body of fuel in the throat of the magazine is moved horizontally and the conveyer has no lifting effect whatever on the fuel in the hopper. Thus, considerably less power is required to force the fuel backwardly through the throat of the magazine with the present device than with those stokers in which the rocking conveyer at the inlet of the throat is horizontal when in receiving position, from which it swings upwardly and rearwardly to force the fuel through the throat. While the front rocking conveyer 15 is forcing the fuel rearwardly through the throat, the foremost conveyer 10 is swinging downwardly and hence offers no material resistance to the rearwardly-moving fuel, and as the surface 12 of the conveyer 10 falls considerably below the bottom of the throat, the fuel drops off the bottom of the throat and on the conveyer 10. At the end of this feeding movement of the fuel under the conveyer 15, the latter is swung forwardly to permit another charge of fuel to pass into the throat, and at the same time the fuel supported on the conveyer 10 is elevated and moved rearwardly on the first uptake 8, the fuel in the throat remaining, for the time being, stationary. By this alternate action of the conveyers, there is no compression of the fuel in the throat and as the result, the throat is constantly kept clear. Where soft coal is used as a fuel, it is extremely important that at no point, and especially at the throat of the magazine, should the fuel be subjected to compression, because the magazine becomes clogged and the fuel has to be cut away by the use of a chisel and hammer, the furnace being, of course, first shut down.

The shafts 13 of the conveyers extend transversely under the magazine and are held rigidly in fixed position while the rockers oscillate thereon. On the side walls of the magazine are depending bearings 19 which may be cast integral with the magazine or otherwise attached, and each bearing, as shown in Fig. 5, has an opening of larger diameter than the end of the shaft 13 that enters the same. The opening of the bearing is provided with inwardly-extending lugs 21 that are arranged on the opposite side of a vertical plane and below a horizontal plane passing through the center of the bearing, and these lugs have inner arcuate surfaces 22 concentric with the center of the bearing so that the shaft 13 will

fit snugly on these lugs. In the top of each bearing 19 is a vertically-disposed set screw 23 which screws down on the top of the shaft 13 for jamming the latter firmly on the seats formed by the lugs 21. By making the bearings in this manner, the shafts can be readily taken out by merely loosening the set screw and moving the shafts longitudinally from their bearings and rockers. In this manner, the rockers or conveyers can be easily renewed when occasion requires.

Each rocker or conveyer has a depending arm 24, and these arms are connected with a mechanism for transmitting oscillatory movement to the conveyers. This mechanism comprises a rotary shaft 25 disposed in bearings 26 at the front of the furnace and on the shaft is an eccentric 27 which imparts movement to a strap 28 surrounding the eccentric, said strap having an arm 29 which is operatively connected with oppositely-disposed bell crank levers 30 and 31. These levers are provided with short arms 32 that are connected with the arm 29 by a pin 33 so that the levers will oscillate as the eccentric rotates. The levers, which swing on shafts 34 mounted in the bearings 27, have downwardly-extending arms, the front lever 31 having two downwardly-extending arms *a* and *b*, while the other lever 30 has one downwardly-extending arm *c*. The arm *c* of the lever 30 is connected by a pitman 35 with the arm 24 of the first rocker 10, and a connecting rod 37 connects this rocker with the other rocker or rockers 11, so that all such rockers will oscillate simultaneously. The arm *a* of the lever 31 is connected by a pitman 38 to the arm 24 of the first rocker 11, and the arms of all the rockers 11 are united by a connecting rod 39. The other arm *b* of the lever 31 is connected by a pitman 40 with the arm 41 of the starting or feeding rocker 15 so that this rocker will move on its feeding movement to feed fuel rearwardly through the throat at the same time the rockers 11 move on their feeding strokes or swing upwardly. Since the levers 30 and 31 are oppositely disposed and connected with a common eccentric, it is obvious that one set of rockers 10 will swing simultaneously in the opposite direction to the other set of rockers 11, so that at a plurality of points along the magazine the fuel will be receiving a rearward impulse by one set of rockers while the other set are recovering or moving to a position to permit fuel to feed upon them preparatory to the next impulse, and simultaneously with this action the fuel is conducted through the throat from the hopper by the front or starting rocker 15.

It will be noted that the operating connections between the various rockers and eccentric mechanism are located directly under the magazine and within planes coin-

cident with the side walls of the hopper, so that these operating connections will be protected from ashes, cinders and dust.

As shown in Fig. 1, the grate bars 5 are provided with arms 39' and are connected together by a rod 40', and this rod is in turn connected at 41' with a pitman 42 which extends forwardly out of the furnace and connects with a strap 43 extending around an operating eccentric 44, such eccentric being mounted on the shaft 25 for the magazine eccentric. The grate bars may be arranged in a plurality of groups, each having an eccentric 44. In Fig. 1, two groups of alternately arranged grate bars are shown and their eccentrics 44 are arranged one hundred and eighty degrees apart so that the grate bars of one group will rock in the opposite direction to those of the other group. By this continuous rocking of the grate bars, the fire will be kept clean while the automatic stoking goes on.

From the foregoing description, taken in connection with the accompanying drawings, the advantages of the construction and of the method of operation will be readily apparent to those skilled in the art to which the invention appertains, and while I have described the principle of operation of the invention, together with the apparatus which I now consider to be the best embodiment thereof, I desire to have it understood that the apparatus shown is merely illustrative, and that such changes may be made when desired as are within the scope of the claims appended hereto.

Having thus described the invention, what I claim as new, is:—

1. An automatic stoker comprising a magazine having a throat, a laterally movable conveyer at the front end of the throat for forcing fuel rearwardly therethrough, a hopper located to deliver fuel behind the conveyer when the latter is in its forward position, a second conveyer located at the rear portion of the throat and having a fuel feeding portion movable to a receiving position below the bottom of the throat, a flat horizontal stationary plate forming the bottom of the throat between the said conveyers, and a mechanism for moving the conveyers simultaneously in opposite directions.

2. An automatic stoker comprising a magazine having a throat, a rocking conveyer at the front end of the throat having an upwardly-extending shoulder movable back and forth across a vertical line passing through the axis of the conveyer to force fuel longitudinally of the throat, a hopper for delivering fuel behind the shoulder, a flat plate forming behind the conveyer the bottom of the throat, a rocking conveyer mounted at the rear edge of the bottom plate of the throat and having a shoulder movable

upwardly and rearwardly from fuel-receiving position below to a point above the bottom plate of the throat, and means for moving one conveyer to fuel-receiving position while the other conveyer is feeding fuel.

3. An automatic stoker comprising a magazine having a throat, a rocking conveyer at the front end of the throat having an upwardly-extending shoulder movable back and forth across a vertical line passing through the axis of the conveyer to force fuel longitudinally of the throat, a hopper for delivering fuel behind the shoulder, a flat plate forming behind the conveyer the bottom of the throat, a rocking conveyer mounted at the rear edge of the bottom plate of the throat and having a shoulder movable upwardly and rearwardly from fuel-receiving position below to a point above the bottom plate, arms on the rockers, links connected with the arms, and means for moving the links simultaneously in opposite directions.

4. The combination of an automatic stoker, with grates disposed laterally thereof to receive fuel, said stoker comprising a magazine having a throat at its receiving end, a hopper from which fuel descends into the throat, a rocking conveyer disposed at the front end of the throat and having an approximately radial fuel forcing shoulder movable through an angle intersected by a vertical line from fuel receiving position in line with the front wall of the throat to a position wholly under the hopper to cut off the descent of fuel therefrom, a flat plate forming behind the conveyer the bottom of the throat, a second conveyer arranged wholly behind the rear edge of the said plate and having a fuel forcing shoulder movable from fuel-receiving position below the plate to a position above the same for forcing rearwardly the fuel received from the throat, and a mechanism for simultaneously moving one conveyer to fuel-receiving position while the other is moving on its feeding stroke.

5. The combination of an automatic

stoker, with grates disposed laterally thereof to receive fuel, said stoker comprising a magazine having a throat at its receiving end, a hopper from which fuel descends into the throat a rocking conveyer disposed at the front end of the throat and having an approximately radial fuel forcing shoulder movable through an angle intersected by a vertical line from fuel receiving position in line with the front wall of the throat to a position wholly under the hopper to cut off the descent of fuel therefrom, a flat plate forming behind the conveyer the bottom of the throat, a second conveyer arranged wholly behind the rear edge of the said plate and having a fuel forcing shoulder movable from fuel-receiving position below the plate to a position above the same for forcing rearwardly the fuel received from the throat, a mechanism for simultaneously moving one conveyer to fuel-receiving position while the other is moving on its feeding stroke, and an uptake in the magazine behind the conveyer, the axis of the second conveyer being disposed below and approximately vertically in line with the front lower edge of the uptake.

6. An automatic stoker comprising a magazine having spaced walls, uptakes extending between the walls and spaced longitudinally in the magazine, rocking conveyers movable between the uptakes and each conveyer having a sector-shaped portion arranged with its curved surface in proximity to the rear surface of the preceding uptake and also having a hub provided with an arcuate face in close proximity to the front lower edge of the succeeding uptake, and means for operating alternate conveyers on their feeding strokes while the remaining conveyers move on their fuel-receiving strokes.

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

WALTER F. SMITH.

Witnesses:

DWIGHT M. LUDINGTON,
LITTLETON M. STURGIS.