E. S. CLARK.

MECHANICAL STOKER.

APPLICATION FILED AUG. 5, 1909.

989,895.

Patented Apr. 18, 1911.

3 SHEETS—SHEET 1.

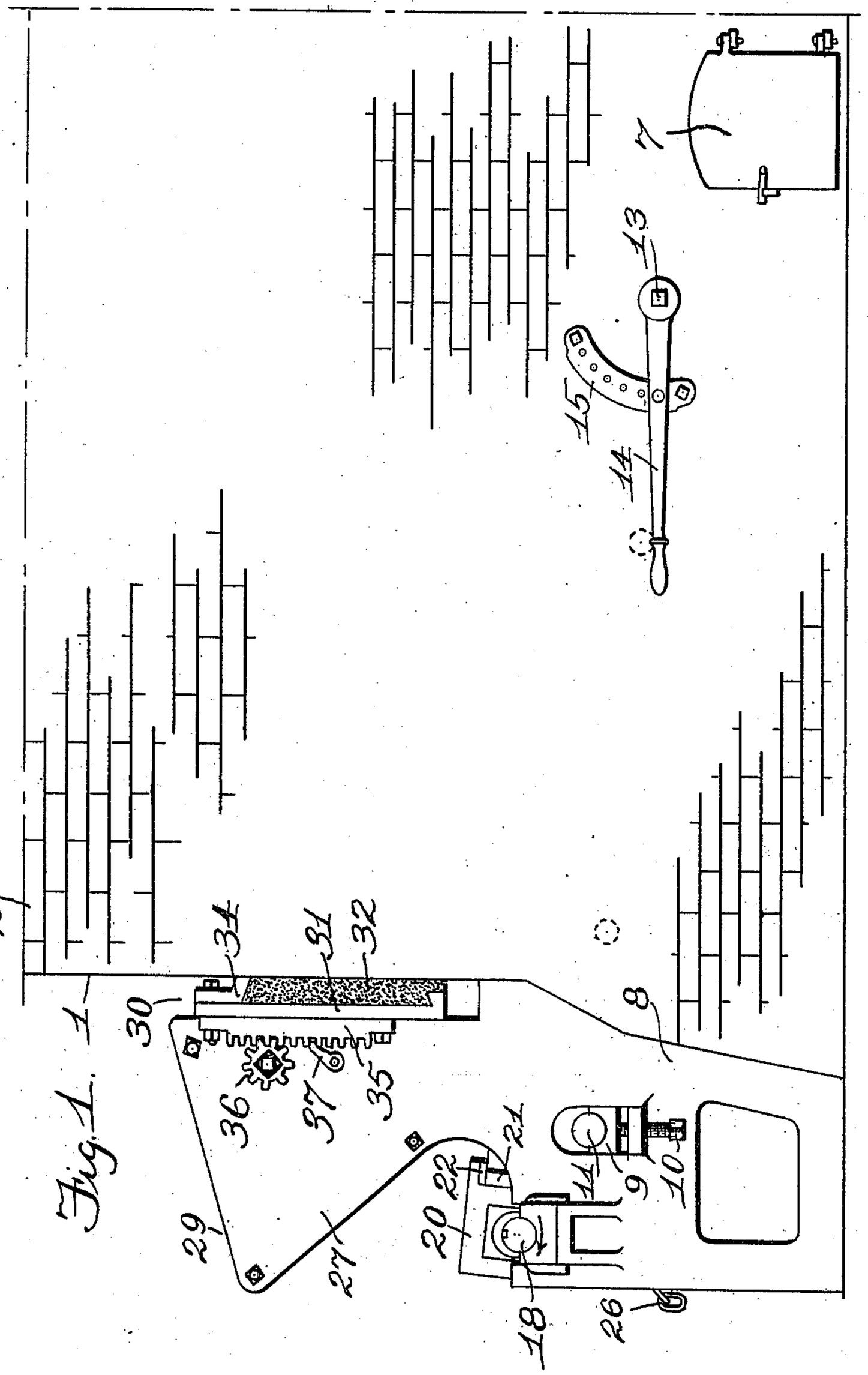

Fig. 1.

Witnesses:
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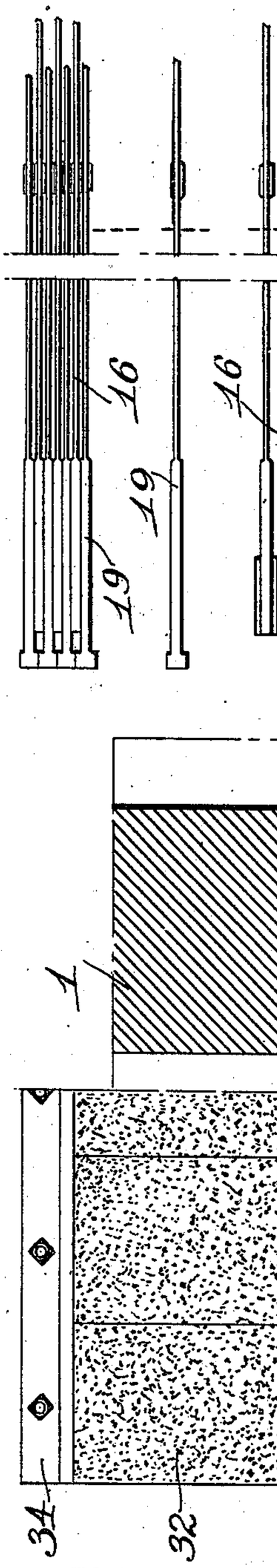

Fig. 4.

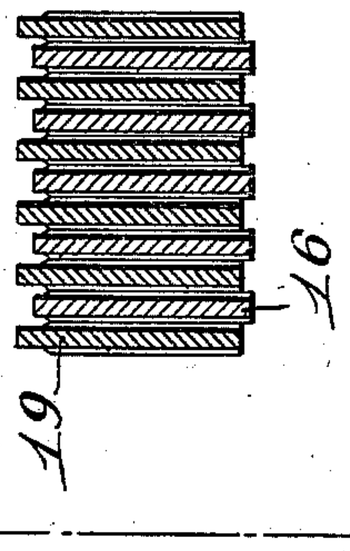

Fig. 5.

Fig. 3.

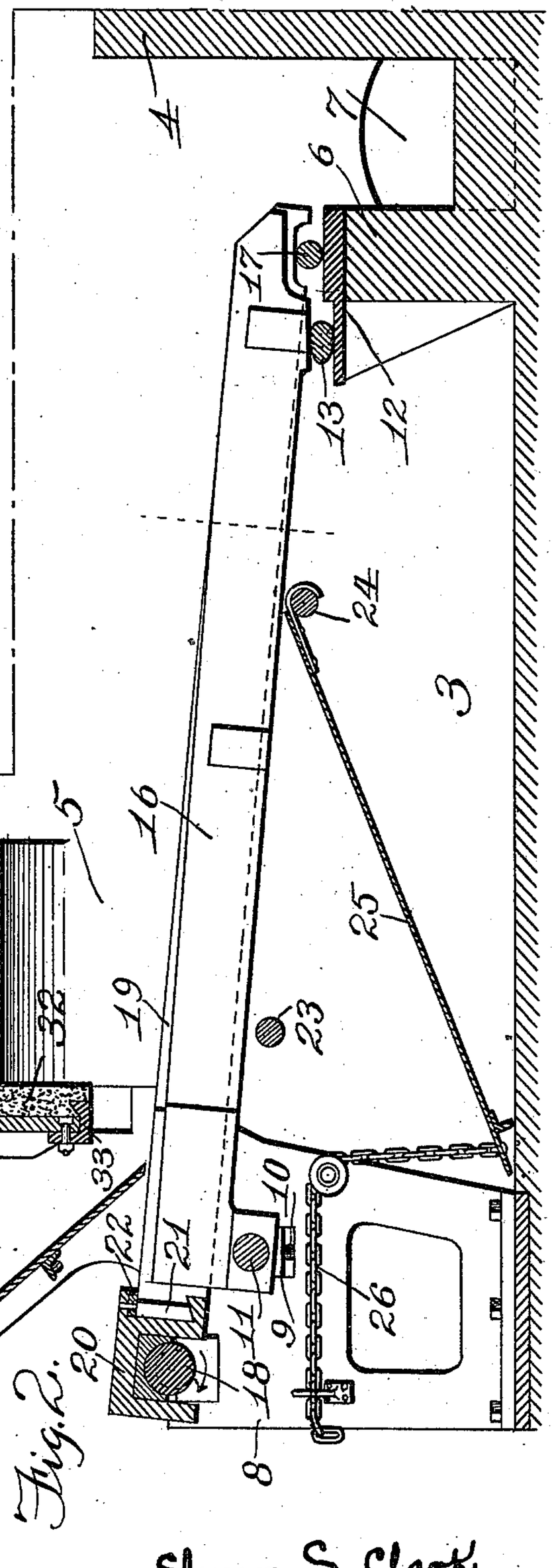

Fig. 2.

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3 SHEETS—SHEET 3.

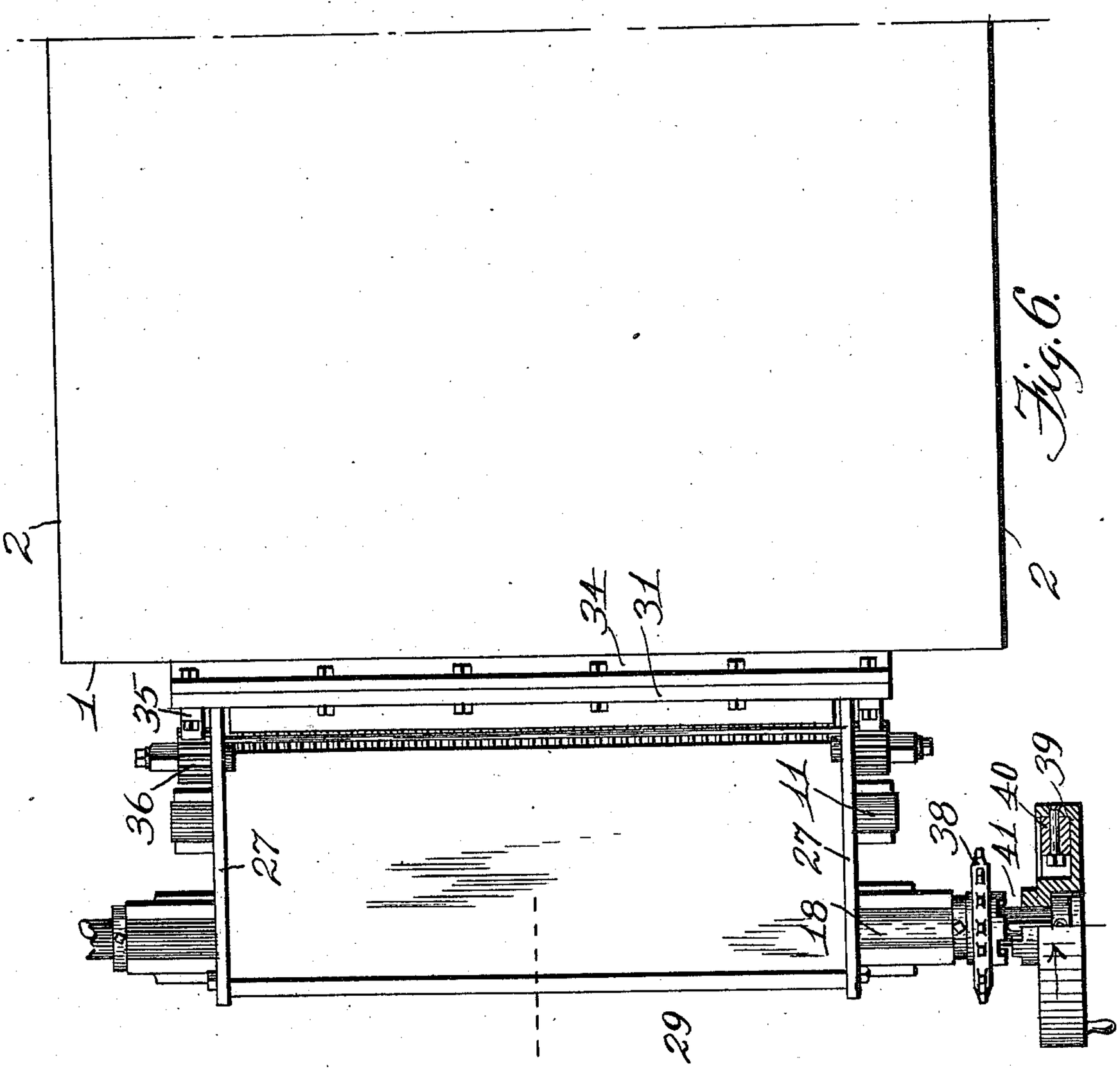

Fig. 6.

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UNITED STATES PATENT OFFICE.

ELMOR S. CLARK, OF MIDDLETOWN, OHIO.

MECHANICAL STOKER.

989,895. Specification of Letters Patent. Patented Apr. 18, 1911.

Application filed August 5, 1909. Serial No. 511,269.

To all whom it may concern:

Be it known that I, ELMOR S. CLARK, a citizen of the United States, residing at Middletown, Butler county, Ohio, have invented certain new and useful Improvements in Mechanical Stokers, of which the following is a specification.

This invention relating to improvements in mechanical stokers will be readily understood from the following description taken in connection with the accompanying drawings in which:—

Figure 1 is a side elevation of a boiler-setting fitted with a mechanical stoker exemplifying my invention. Fig. 2 a vertical longitudinal section of the same. Fig. 3 a rear elevation of a portion of the fire-door. Fig. 4 a plan of dissected portions of the grate. Fig. 5 a vertical transverse section of a portion of the grate; and Fig. 6 a plan of the general apparatus.

In the drawings:—1 indicates the front wall of the furnace: 2, the side-walls of the furnace: 3, the ash-pit: 4, the bridge-wall: 5, the fire door-way: 6, a bearer-wall forward of the bridge-wall: 7, clinker doors in the side-walls at the base of the bridge-wall and between the bridge-wall and the bearer-wall 6: 8, housings, one extending forward from the furnace at each side of the general open front thereof: 9, a block fitted to slide vertically in a slot in each of the housings: 10, set-screws for raising these blocks in the slots: 11, a bearing-bar extending across between the housings and resting on the blocks 9: 12, a bearing-plate supported by bearer-wall 6: 13, a cam-shaft extending across between the furnace walls forward of bearer-wall 6 and journaled at the sides of the furnace, this shaft preferably resting upon bearing-plate 12, the cam portion of the shaft having a length equal to the full width of the grate: 14, a lever on one of the ends of cam-shaft 13, exterior to the furnace: 15, a segmental detent secured to the side of the furnace to coöperate with lever 14 in locking the lever in selected angular position: 16, adjustable grate-bars having their forward ends provided with downwardly projecting lugs engaging the bearing-bar 11, the heels of these bars resting on cam-shaft 13: 17, a roller resting on bearing-plate 12: 18, a cam-shaft journaled in housings 8 forward of and above bearer-shaft 11, the cam on this cam-shaft being in the form of a long eccentric: 19, shaking grate-bars interposed between the stationary bars, their heels resting on roller 17 and their heads being supported by cam-shaft 18: 20, an inverted trough-shaped box forming a bearing engaging over cam-shaft 18 and having a dovetail channel extending along its rear: 21, a dovetail head formed on the forward end of each of the shaking grate-bars and adapted to fit in the dovetail channel in box 20: 22, a removable strip laid within the dovetail channel in box 20 along over the heads of the shaking grate-bars: 23, a safety-bar supported in the side-walls of the furnace and extending across under the forward portions of all of the grate-bars: 24, a similar safety-bar farther to the rear: 25, an inclined apron extending across the ash-pit and having its rear upper end journaled on safety-bar 24: 26, a chain to serve in supporting and adjusting the lower forward end of the apron: 27, the side-walls of the hopper, these side-walls being illustrated as upward prolongations of the housings 8: 28, the sloping front wall of the hopper: 29, the hopper, considered as a whole: 30, vertical slots formed at the rear of the side-walls of the hopper: 31, the fire-door, in the form of a composite slab seated in the slots 30 and adapted to slide vertically therein and close more or less of the fire-door openings: 32, refractory lining blocks forming the rear face of the fire-door, these blocks being arranged in a longitudinal series: 33, a dovetail clip bolted to the lower edge of the metallic plate portion of the fire-door and extending rearwardly through about half the thickness of the lining blocks with which it has hooking engagement: 34, a removable clip bolted to the rear surface of the upper edge of the fire-door plate and having dovetail engagement with the upper edges of the lining-blocks: 35, a rack secured to each end of the fire-door, outside the side-walls of the hopper: 36, a pinion journaled in each side-wall of the hopper and engaging a rack on the fire-door and having a square portion to permit it to be turned by means of a wrench: 37, an upwardly projecting pawl mounted on each side-wall of the hopper and engaging one of the racks: 38, a sprocket-wheel mounted loosely on one end of cam-shaft 18 and provided with a clutch hub: 39, a disk provided with a clutch-hub and mounted to slide but not to rotate on cam-shaft 18 near the sprocket-wheel: 40,

a counterbalance weight secured in disk 39 opposite the eccentric portion of cam-shaft 18: and 41, the coöperating clutch-parts on the disk and sprocket-wheel.

Power applied, in an obvious manner, to sprocket-wheel 38, turns that sprocket-wheel idly; by pushing the disk inwardly the clutch will be engaged and thereupon cam-shaft 18 will be turned by power; while the clutch is disengaged, the cam-shaft may be turned by hand, the disk being provided with a handle; the fire-door may be raised and lowered by means of the pinions so as to completely open or almost close the fire-door opening; the pinions operate independently, thus permitting one end of the fire-door to be more open than the other end; the clip and block system for the lining of the fire-door permitting of the renewal of such lining-blocks as most need it; if individual grate-bars burn and break they are caught by the safety-bars instead of falling into the ash-pit; the floor of the clinker-pit just forward of the bridge-wall slopes toward the clinker-doors, or toward the clinker-door if there is but one door; fine unburned fuel dropping through the grate before becoming coked is caught by the apron and delivered forward for re-use; the raising of the front edge of the apron adjusts the admission of air to the fuel on the rear portion of the grate. The stationary grate-bars 16 have a definite rearward declination and this declination may be altered by raising bearing-bar 11 by means of set-screws 10, or by turning cam 13. The shaking grate-bars have a motion of longitudinal reciprocation and of vertical vibration, the degree of the vertical vibration varying throughout the length of the shaking bars. At the rear ends of the shaking bars the motion is that of mere translation, while at cam-shaft 18 the motion is that of a true circle as imposed by the action of the eccentric cam. Between the rear and forward ends of the shaking bars the path of motion varies, being the straight horizontal path at the rear end, a circle at the forward end, and egg-ovals of varying proportions at intermediate points.

Coal from the hopper becomes delivered upon the head of the grate in quantities determined largely by the degree to which the fire-door is open. In Fig. 2 the shaking bars are in upper position. They advance and carry fuel with them and descend below the level of the tops of the stationary bars and then retreat leaving the fuel supported by the stationary bars. At the next impulse this fuel is carried still farther down the grate. It will of course be understood that not all of the fuel is then advanced at one impulse, but the successive impulses of the shaking grates urge forward more or less of the fuel. The speed action of the grate, taken in connection with the character and amount of fuel permitted to go to the grate from the hopper, should be such that the fuel will be carried forward only so rapidly as it can be properly coked and burned. The clinker goes over the tail of the grate and is readily removed at the clinker door or doors. The degree of movement of the shaking grate being an invariable one, the feeding effect of that movement will be dependent largely upon the vertical relationship of the tops of the stationary and shaking bars at the extremes of vertical motion of the shaking bars. By raising the front ends or heads of the stationary bars the shaking bars will descend a greater distance below the tops of the stationary bars and rise a less distance above them. At the rear portion of the grate there is but little vertical motion on the part of the shaking grates and the feeding action is slow, as it should be, and at the extreme rear of the grate the tops of all bars may be substantially even at all times, the forward feeding of the fuel at this point being due largely to the pushing action of the fuel on the more forward portions of the grate. If cam 13 be turned it will raise the tail ends of the stationary grates and develop more pronounced grooves between the shaking grates, and this will serve to resist the advance of the fuel at this point on the grate. It is thus possible, by the adjustment of the stationary grates, to regulate and vary the feeding effect of the fuel on various portions of the grate.

The front ends of the grate-bars are thickened so as to substantially eliminate any air spaces. The heads 21 on the shaking grate-bars are of such width as to make contact with each other and permit the heads of the shaking bars to straddle the stationary bars. The lugs of the stationary bars which engage bearing shaft 11 are thickened so as to make contact with each other and permit the stationary bars to straddle the shaking bars. The tail portions and intermediate portions of all the bars are provided with rub-bosses to keep the bars properly spaced.

In all grates of the general character of the one under consideration individual grate-bars are liable to injury from breakage or warpage. In the present construction the cam-box forms a header uniting the heads of all of the shaking-bars, thus practically making a unit of the shaking-bar system. By withdrawing strip 22 from the header-box, any individual one of the shaking-bars may be removed without disturbance of other parts and a new bar may be readily inserted. A keeper-pin, as illustrated, may be employed to keep the strip from becoming accidentally displaced. In case any of the bars break, they become temporarily supported by the safety bars in-

stead of being permitted to drop into the ash-pit. This provision permits the temporary continuation of the use of the grate even after one or more bars are broken.

I claim:—

1. A mechanical stoker comprising, a series of rearwardly sloping stationary grate-bars, rearwardly sloping intermediate shaking bars, dovetail heads on the front ends of the shaking bars, a box provided with a longitudinal rear recess engaging the heads of the shaking bars, a removable strip disposed in said recess over the heads of the shaking bars, and a rotary cam-shaft engaging the box, combined substantially as set forth.

2. A mechanical stoker comprising, a furnace, a bearer-wall across the rear portion thereof, housings projecting forward from the furnace, a bearing shaft extending across the front of the furnace and mounted for vertical adjustment in the housings, a series of stationary grate bars supported by said bearing-shaft and bearer-wall, a rotary cam-shaft disposed along in front of the furnace and journaled in said housings, and shaking grate-bars supported by said cam-shaft and bearer-wall and operated by the cam-shaft, combined substantially as set forth.

3. In a mechanical stoker, shaking bars having dove-tail heads provided at their forward ends, a box having a dove-tail channel in the rear thereof to receive the dove-tail heads on the grate bars, a removable strip within the dove-tail channel adapted to secure the heads of the grate bars in position therein, and a cam shaft forming a support for the box and adapted to impart an oscillatory movement thereto.

4. A mechanical stoker comprising a furnace, a bearer wall across the rear portion thereof, housings projecting forwardly from the furnace, a bearing member adjustably carried in said housings, a series of stationary grate bars supported between said bearing member and the bearer wall, a rotary cam shaft disposed along in front of the furnace and journaled in said housings, and shaking grate bars operated by said cam shaft and supported between the cam shaft and bearer wall.

5. A mechanical stoker comprising a furnace, a bearer wall across the rear portion thereof, housings projecting forwardly from the furnace, a supporting member adjustably carried in said housings, a series of stationary grate bars supported between said supporting member and the bearer wall, a rotary cam shaft disposed along in front of the furnace and journaled in said housings, shaking grate bars operated by the cam shaft and supported between said cam shaft and the bearer wall, and a hopper carried by said housings located above the grate bars.

6. In a mechanical stoker, a furnace, housings projecting forward from the furnace, a cam shaft journaled in said housings, shaking grate bars having their forward ends supported on said cam shaft and operated thereby and their inner ends supported within the furnace, and relatively stationary grate bars having their forward ends supported in said housings and their rear ends supported within the furnace.

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