

No. 616,009.

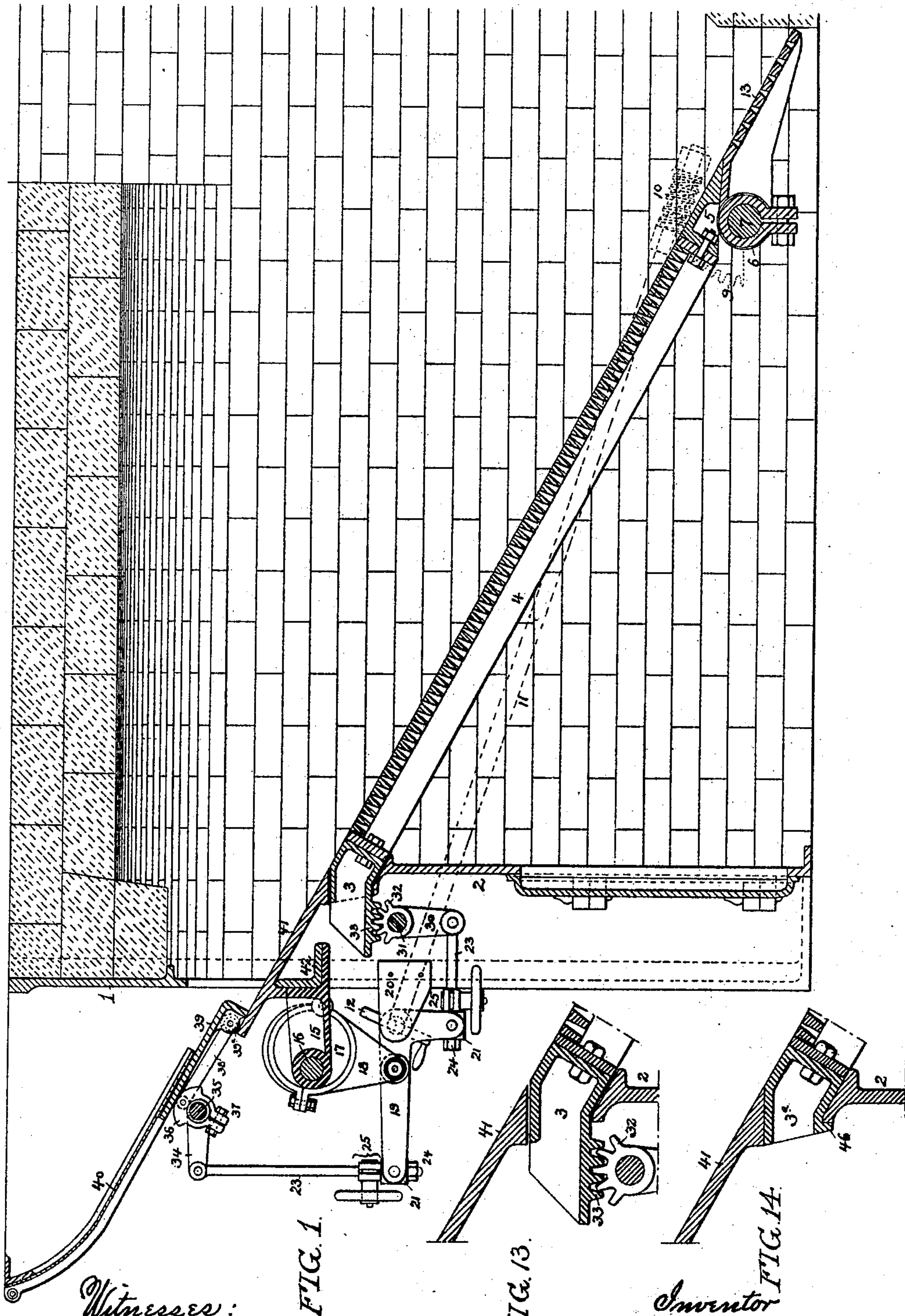
Patented Dec. 13, 1898.

J. F. POOL.
MECHANICAL STOKER.

(Application filed July 10, 1897.)

(No Model.)

4 Sheets—Sheet 1.



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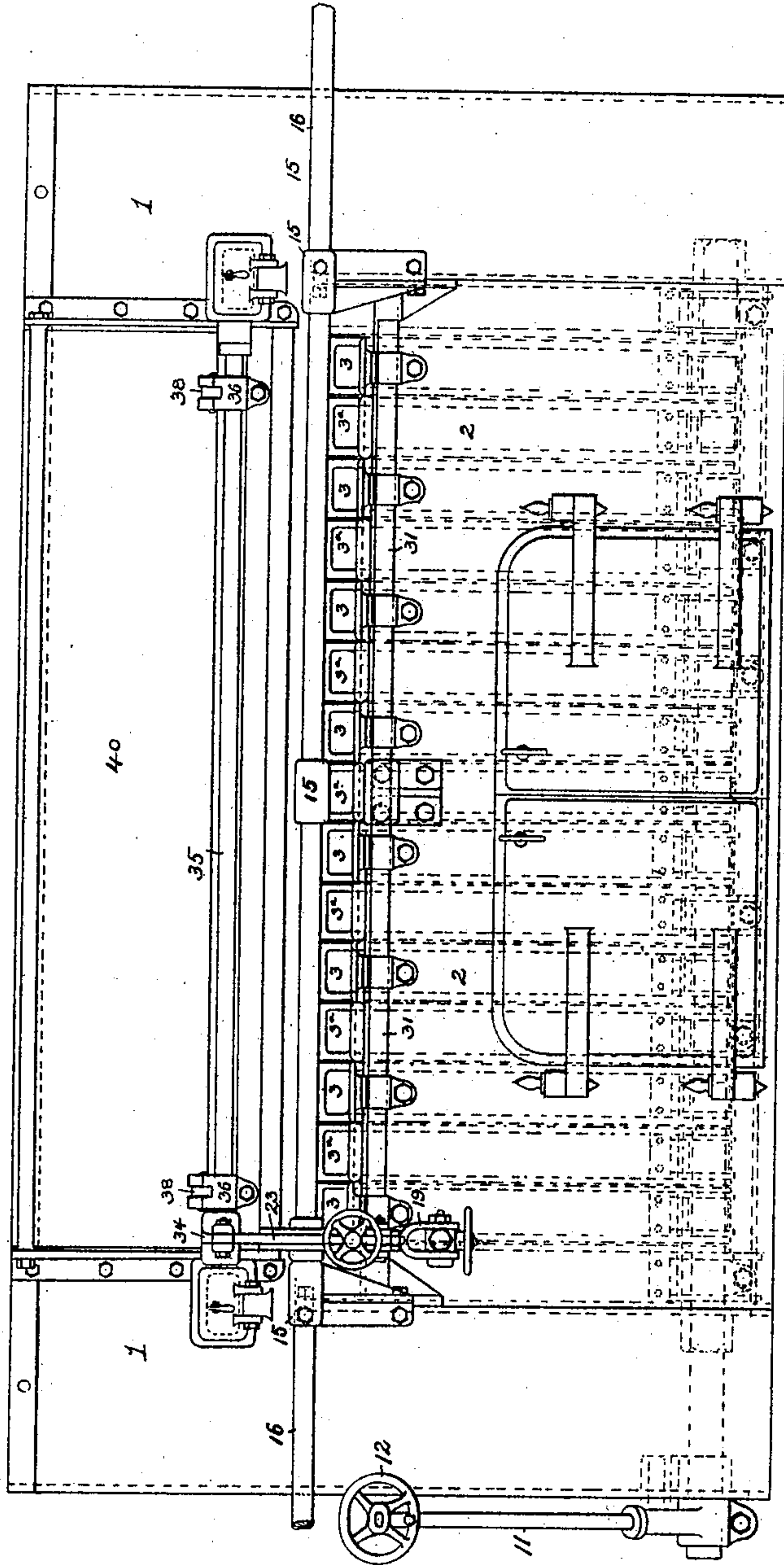
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4 Sheets—Sheet 2.

FIG. 2.



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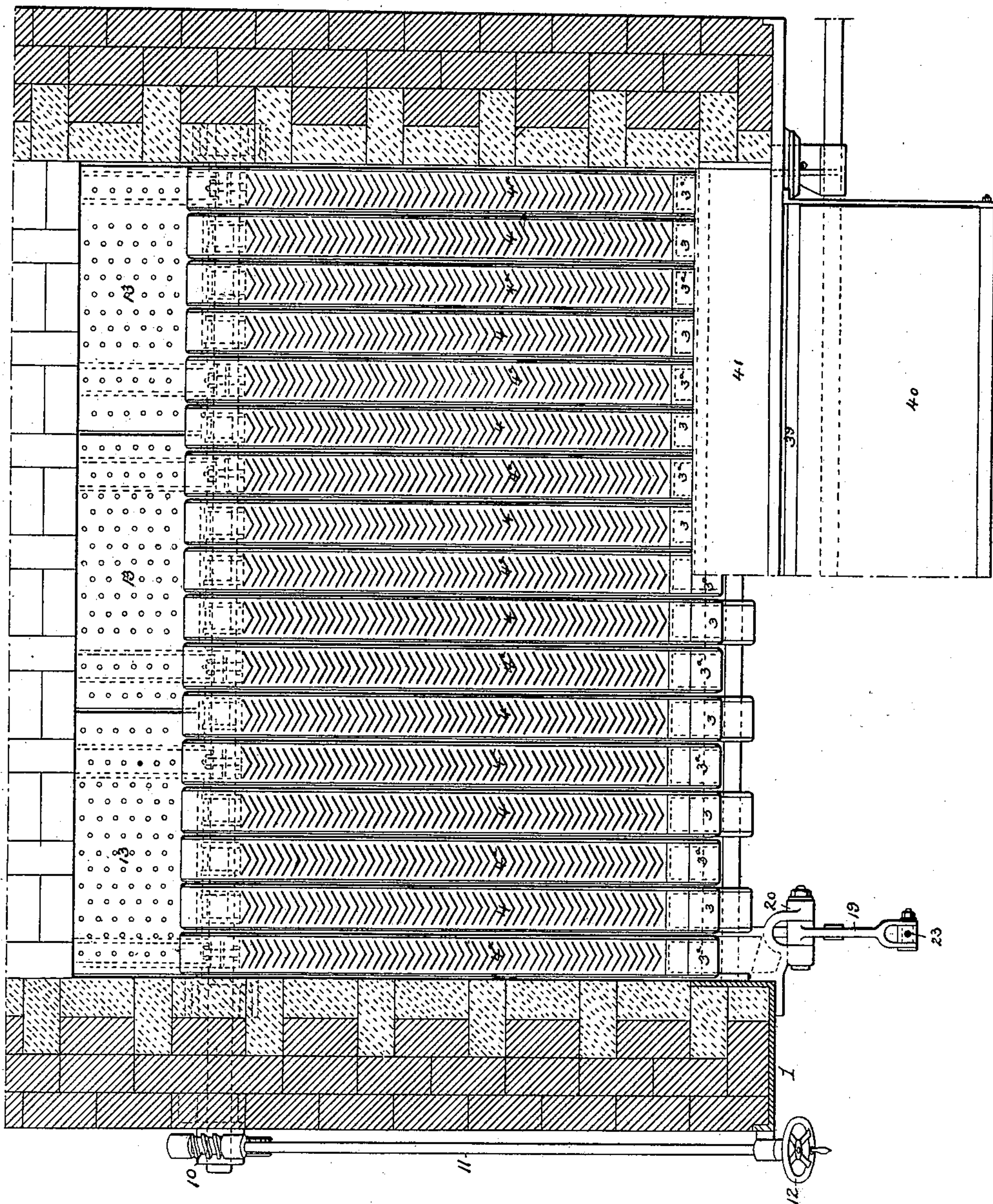


FIG. 3.

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FIG. 4.

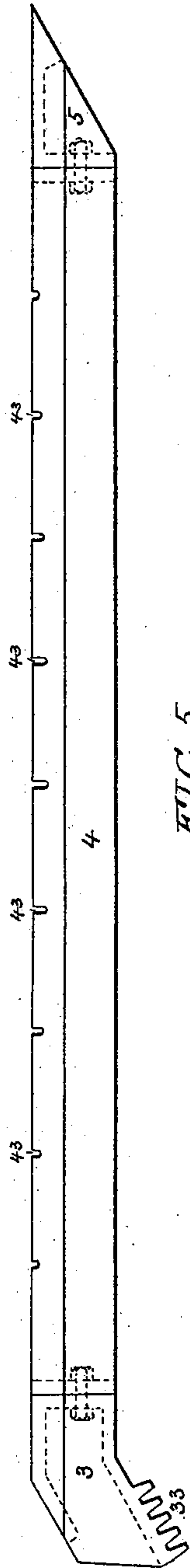


FIG. 5.

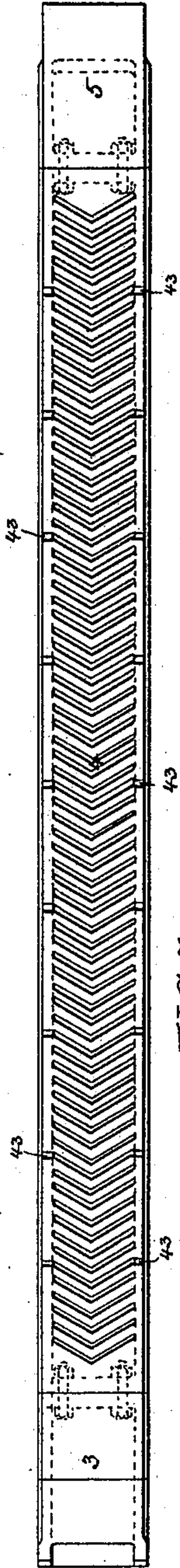


FIG. 7.

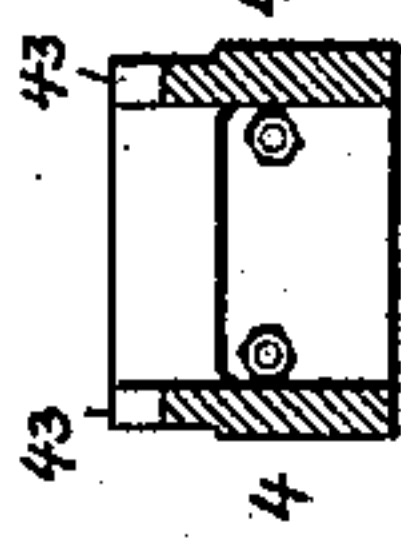


FIG. 6.

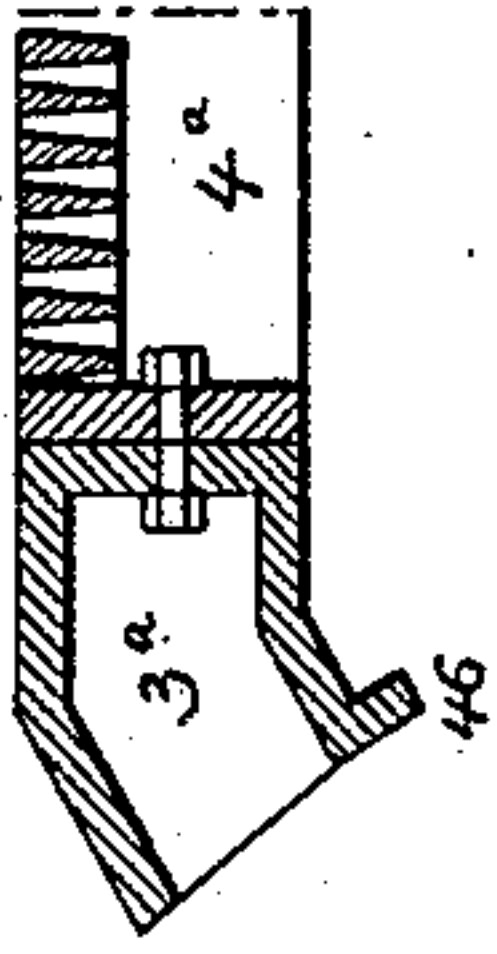


FIG. 8.

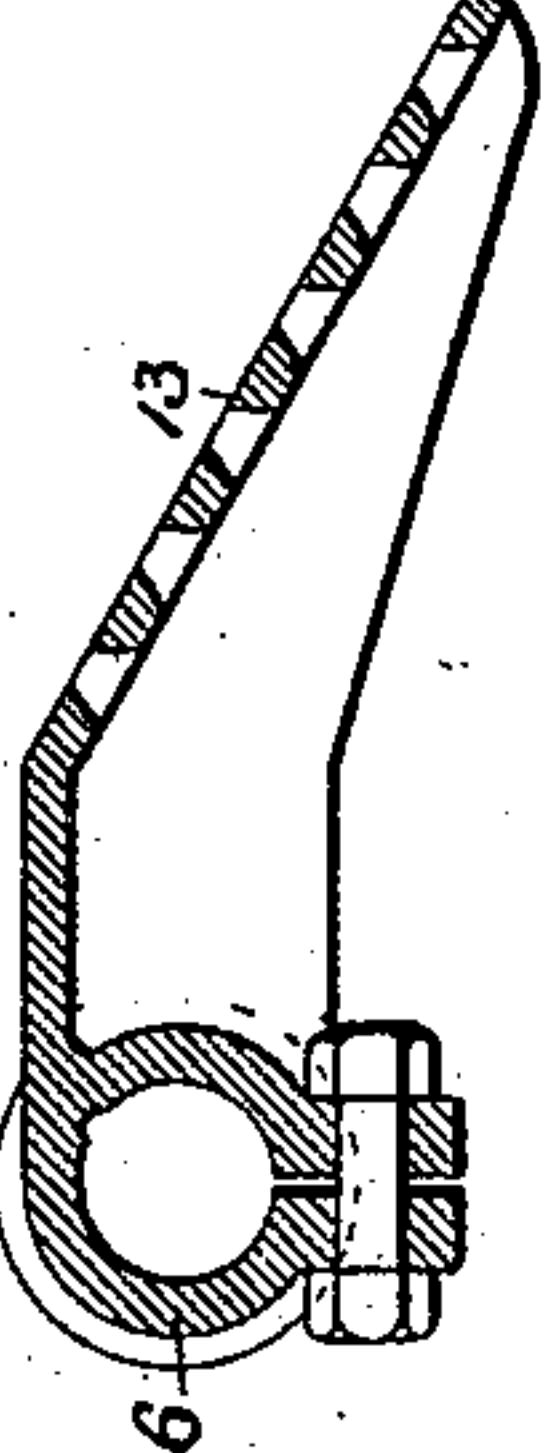


FIG. 9.

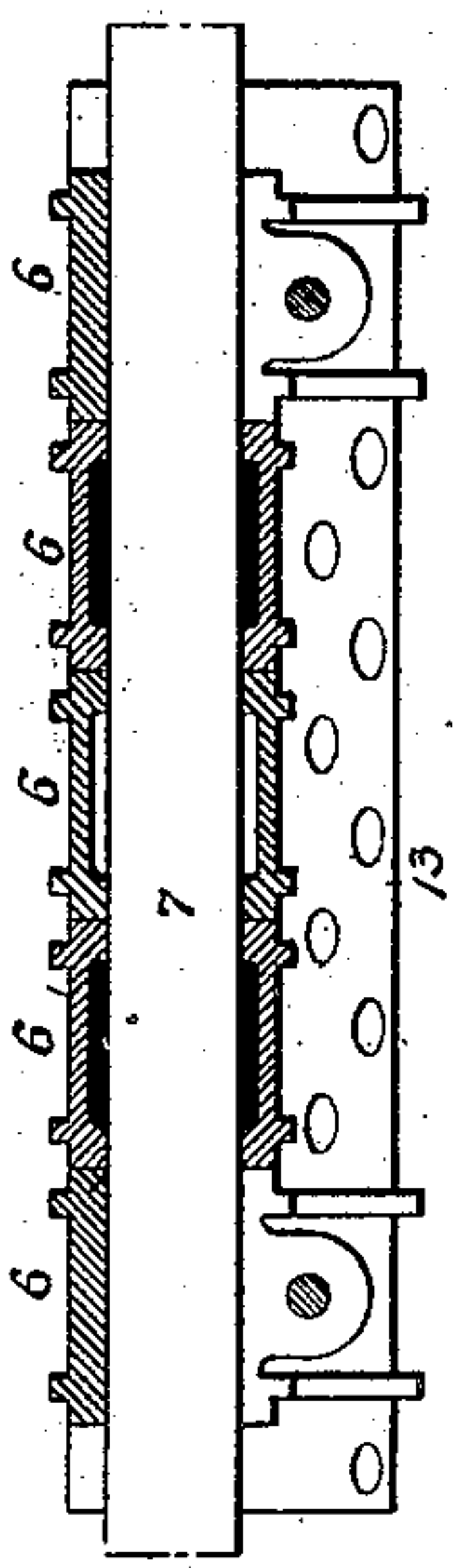


FIG. 10.

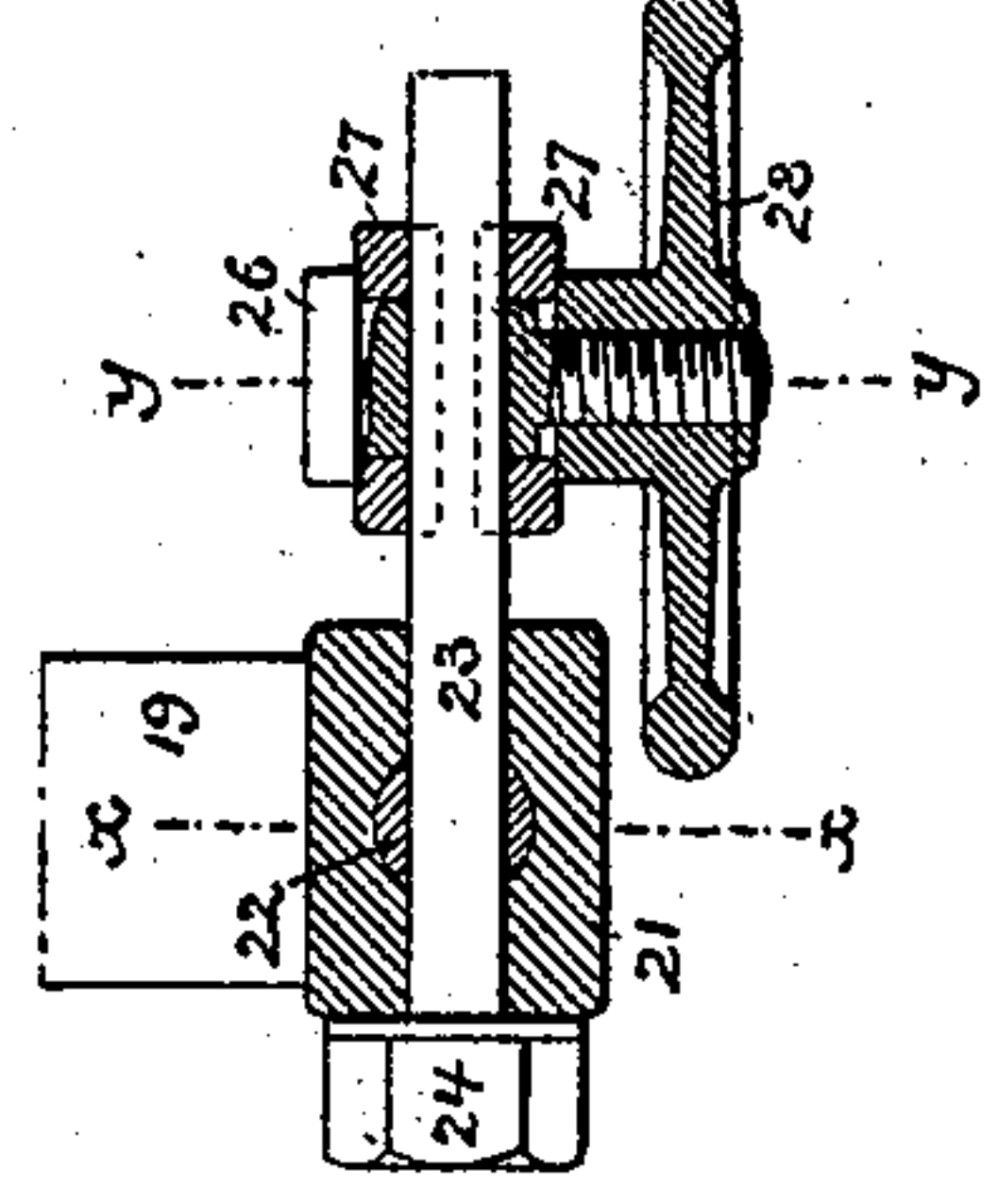


FIG. 12.

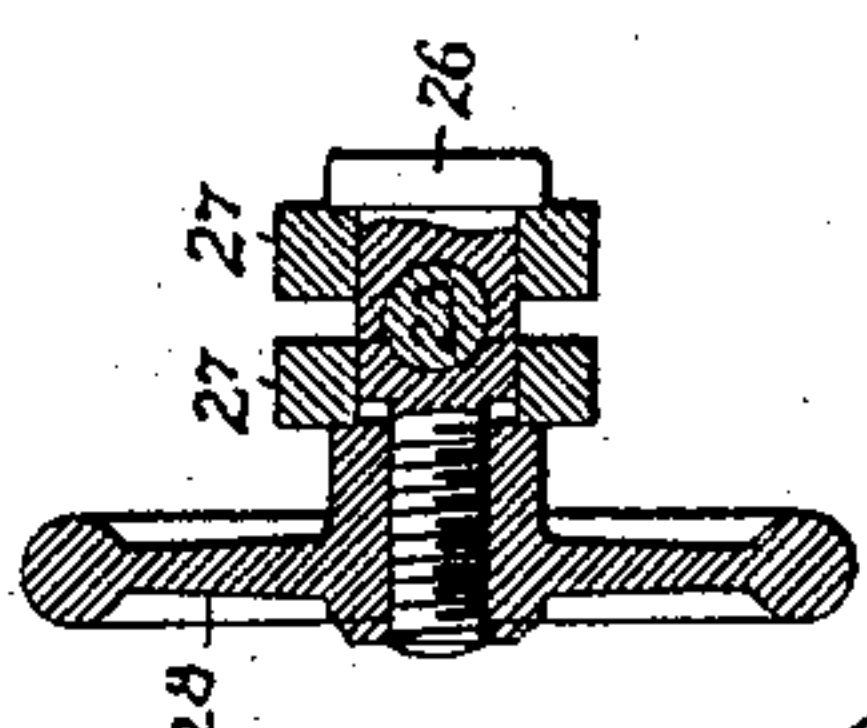
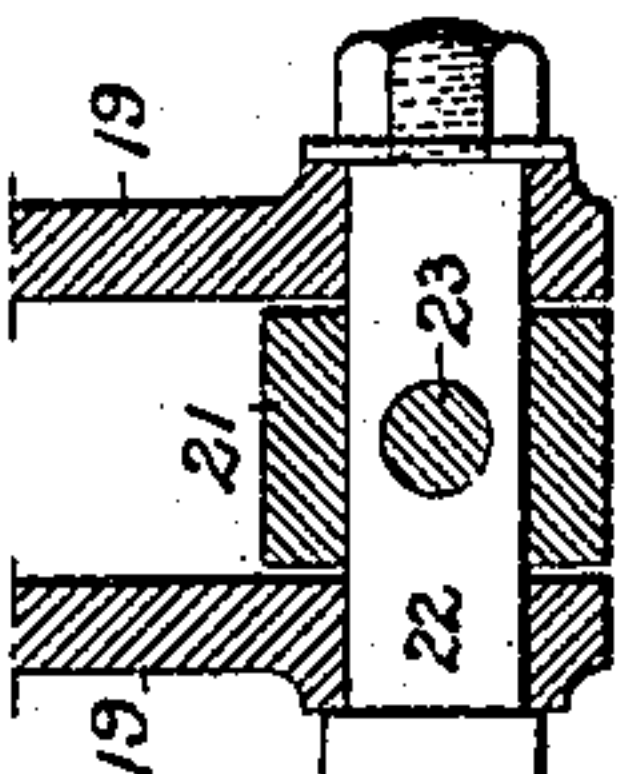


FIG. 11.



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UNITED STATES PATENT OFFICE.

JOHN F. POOL, OF PHILADELPHIA, PENNSYLVANIA.

MECHANICAL STOKER.

SPECIFICATION forming part of Letters Patent No. 616,009, dated December 13, 1898.

Application filed July 10, 1897. Serial No. 644,045. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. POOL, a subject of the Queen of Great Britain and Ireland, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Mechanical Stokers, of which the following is a specification.

The main objects of my invention are to insure regularity and uniformity of feed of the fuel to the grate-bars, to promote steady combustion, to insure the durability and efficient action of the working parts of the stoker, to provide means for readily adjusting the feed so as to adapt it to the requirements of the fuel which is being burned, and to permit of the ready renewal of the grate-bars, the general purpose of the invention being to burn with economy low-grade fuels, to avoid the formation of smoke, to automatically handle the fuel and ashes, and to use fuel that burns either from above or below.

In the accompanying drawings, Figure 1 represents a longitudinal section of a mechanical stoker constructed in accordance with my invention. Fig. 2 is a front view of the same. Fig. 3 is a view partly in plan and partly in sectional plan. Fig. 4 is a side view of one of the movable grate-bars. Fig. 5 is a plan or top view of the same. Fig. 6 is a side view of the upper end of one of the stationary grate-bars. Fig. 7 is a transverse section of one of the grate-bars. Fig. 8 is a section of one of the ash-dumping plates on a larger scale than Fig. 1. Fig. 9 is a transverse section on the line of the shaft carrying the ash-dumping plates, showing one of said dumping-plates and some of the grate-bar-supporting devices. Fig. 10 is a sectional view of the connection employed between the operating-lever and the fuel-feeding or grate-operating device, such section being on a larger scale than Fig. 1. Fig. 11 is a transverse section on the line *xx*, Fig. 10. Fig. 12 is a transverse section on the line *yy*, Fig. 10. Fig. 13 is an enlarged view of the upper end of one of the movable grate-bars, showing its relation to the furnace-front and dead-plate; and Fig. 14 is a similar view of the upper end of one of the fixed grate-bars.

1 represents the upper portion of the furnace-front, and 2 the lower portion of the same, the latter being offset inwardly in respect to the upper portion and constituting a bearing for the heads 3^a of the fixed grate-

bars 4^a, the bars 4 being the movable bars and the heads 3 of said bars being supported upon the operating devices therefor, as hereinafter set forth.

Both sets of bars have toes 5 at their lower ends, and these toes have side walls with horizontal bottoms, which rest upon flanged collars 6 and 6', mounted upon a shaft 7, which is adapted to suitable bearings in the side walls of the furnace and is capable of having motion of partial rotation imparted to it whenever such motion becomes desirable, one end of the shaft projecting beyond one of the side walls of the furnace and having secured to it a toothed segment 9, with which meshes a worm-screw 10 on an inclined shaft 11, mounted in suitable bearings at the side of the furnace and having at its upper end a hand-wheel 12, whereby it may be turned in one direction or the other, so as to cause such movement of partial rotation of the shaft 7 in either direction.

The collars 6', upon which the toes of the movable grate-bars 4 rest, are free to turn on the shaft 7 and are preferably provided with an internal mass of graphite or other heat-resisting lubricant, so that as the grate-bars are moved these supporting-collars can turn back and forth on the shaft, and thereby lessen the friction due to such movement.

The fixed grate-bars 4^a alternate with the movable grate-bars 4, and the flanged collars which support said fixed grate-bars are by preference secured to the shaft 7, some of said collars forming part of ash-dumping plates 13, suitably perforated or slotted, and when in their raised position forming a continuation of the upper surface of the grate-bars, as shown in Fig. 1. Those of the collars 6 which form part of the dumping-plates 13 are preferably split and provided with ears which can be drawn together by means of a clamp-bolt, as shown in Fig. 8, so that they may be tightened upon the shaft 7 and secured to keys let into the shaft, thus causing the ash-dumping plate to move with said shaft.

To suitable brackets 15 on the upper portion of the front plate of the furnace is adapted a shaft 16, which has an eccentric 17, with strap 18, connected to a pin on a right-angled lever 19, the latter being suitably fulcrumed in a bracket 20 on the front plate, so that as the shaft 16 is rotated a

swinging movement will be imparted to said lever.

Each of the arms of the lever 19 is forked for the reception of a block 21, which is mounted so as to be free to turn with the transverse bolt 22, which is adapted to bearings in the forked portion of the arm, both block and bolt being perforated for the passage of a rod 23, which has, outside of the block 21, a nut 24, and inside of said block an adjustable stop 25, so that by adjusting the latter to different positions on the rod 23 more or less lost motion of the block 21 between the nut 24 and the stop will be permitted, and hence the extent of movement imparted to the rod 23 by the lever 19 can be readily regulated.

Each of the stops 25 consists of a bolt 26, which has an opening for the passage of the rod, and passes through a pair of washers 27, embracing the opposite sides of said rod and acted upon by a handled nut 28, adapted to the threaded end of the bolt 26. Hence by turning said nut backward the hold of the washers 27 upon the rod 23 can be loosened and the stop 25 adjusted to any desired position on the rod to be again locked in position after adjustment by screwing up the nut 28 and tightening the washers upon the rod.

The rod 23 of one arm of the lever 19 is connected to an arm 30, depending from a rock-shaft 31, which carries the heads 3 of the movable grate-bars 4, toothed segments 32 on said shaft 31 meshing with and supporting racks 33 on the under sides of the projecting heads 3 of said movable grate-bars 4, so that the latter are constantly moved back and forth, the heads 3 being just free from contact with the upper portion of the furnace-front 2, so that there is no frictional retardation of the movement of the bars. Continual agitation of the bed of fuel lying upon the grate-bars is thus effected in order to insure the proper access of air thereto to support combustion and also to insure the feeding of the mass of fuel downward on the grate-bars and thereby make room for the fresh fuel at the upper ends of said grate-bars and deliver the ashes from their lower ends onto the plates 13, which can be swung downward at intervals so as to dump the mass of ashes into the ash-pit or can be swung partially downward, so as to withdraw their ends to a greater or less distance from the bridge-wall and thus provide for a slow but continuous discharge of ashes into the ash-pit. The other arm of the lever 19 is connected by its rod 23 to an arm 34 on a rock-shaft 35, mounted in suitable bearings in front of the upper plate of the furnace-front, said rock-shaft having near each end a segment 36, split and secured to the shaft 35 by means of a clamping-bolt 37, said segments being connected by means of rods 38 to a pusher-plate 39, which forms part of the bottom of a fuel-hopper 40, extending across the upper front plate of the furnace.

The forward end of the pusher-plate 39 car-

ries antifriction-rollers 39^a, bearing upon a dead-plate 41, which extends into the upper portion of the furnace and is in contact at its lower end with the heads 3^a of the stationary grate-bars 4^a, so that there is a constant feeding or pushing forward of the fresh fuel from the bottom of the hopper first onto the dead-plate and then onto the upper ends of the grate-bars, the fuel being maintained upon the dead-plate for a sufficient length of time to insure the comparatively slow distillation therefrom of the more volatile gases, which, passing through the highly-heated products of combustion arising from the incandescent fuel on the grate, are ignited and consumed, so as to prevent the formation of smoke.

The dead-plate 41 rests upon the heads of the stationary grate-bars 3^a, and upon an angle-bar 42, extending transversely across the front of the furnace, and said plate can when the occasion arises be readily lifted from the tops of the grate-bars, so as to permit of the withdrawal of any one of the latter when it becomes burned out or otherwise in need of repair or replacement. The inner end of the dead-plate is supported free from contact with the heads of the movable grate-bars, and hence does not retard the movement of the same.

Each of the grate-bars is of inverted-U shape with slotted top and vertical side walls, as shown in Fig. 7, and the upper portion of each of the side walls of each grate-bar is reduced in thickness at and near the top, this reduction in thickness preferably extending throughout the depth of the top member of the bar, so that while the lower portions of the side walls of adjoining bars may be in contact with each other the upper portions of said side bars are separated by a space sufficient to permit of the lateral expansion and "growth" due to the heating of this portion of the grate-bar without causing the bars to bind upon each other, and thereby interfere with the movement of the movable bars of the grate. The upper portion of each of the contracted side walls of each grate-bar is also slotted, as shown at 43, Figs. 4, 5, and 7, so as to provide for longitudinal contraction and expansion of the upper surface of the bar without causing the same to buckle or otherwise become distorted, the slots 43 gradually increasing in depth from each end of the bar toward the center of the same, as shown in Fig. 4.

The heads of the fixed bars of the grate have lugs 46, engaging with the bearing bar or portion of the furnace-front, upon which said grate-bar heads are supported.

My improved stoker can be used in connection with a furnace having either natural, induced, or forced draft, the ash-pit doors fitting snugly to the lower portion of the front plate of the furnace and the heads of the grate-bars being of box-like form and fitting snugly against each other, so that there is no undue leakage when the air is maintained under pressure in the ash-pit.

As all portions of the bed of fuel are subjected to the same degree of agitation and receive the same supply of air, it follows that the combustion is regular and uniform throughout the entire mass of fuel upon the grate, so that the maximum heating value of the fuel is obtained, and fuels of inferior quality can be successfully used, the provision of the dead-plate at the upper end of the grate-bars enabling me to partially coke or distil the volatile gases from the green fuel before the latter reaches the air-supplying portion of the grate, where active combustion begins. Hence the formation of smoke, such as is due to the rapid distillation of volatile gases from a mass of green fuel thrown upon a highly-heated body of incandescent fuel, is effectually prevented in my furnace, and the fuel, of whatever character, is burned without any production of smoke or with at least the minimum production of it.

Having thus described my invention, I wish it to be understood that the same is not limited to the exact construction illustrated, as many changes within the knowledge of those skilled in the art may be made therein without departing from the main features of my invention. For instance, the front plate may be made without the inward offset, and the grate-bars may be supported upon a special bearing extending across the furnace inside of the front plate, the rock-shaft 31 being also inside of the same, and the heads and toes of the grate-bars may be cast with said bars instead of being cast separable and bolted thereto, and the ash-dumping plate may be made without its perforations or in the form of a grate and may be carried by a shaft independent of that which supports the toes of the grate-bars, or many other immaterial variations of this character may be made within the scope of my invention.

I claim as my invention and desire to secure by Letters Patent—

1. In a mechanical stoker, the combination of the front plate of the furnace having its lower portion offset inwardly in respect to the upper portion, a transverse opening being formed between the upper and lower portions of the furnace-front, with the grate-bars supported at their upper and lower ends and capable of being withdrawn from above through said opening between the upper and lower portions of the furnace-front and a dead-plate forming an upper continuation of the grate-bars and extending across the space between the offset portions of the furnace-front, substantially as specified.

2. In a mechanical stoker, the combination of inclined grate-bars and supports therefor, with a dead-plate forming an upward continuation of the grate-bars, a furnace-front having an opening through which the grate-bars can be withdrawn, and provision for mounting the dead-plate so that it can be raised above the heads of the grate-bars in

order to permit of such withdrawal, substantially as specified.

3. In a mechanical stoker, the combination of alternating fixed and movable grate-bars, with a dead-plate forming an upward continuation of said bars, said dead-plate resting upon the heads of the fixed grate-bars, but being free from contact with the heads of the movable bars, substantially as specified.

4. In mechanism for reciprocating the grate-bar or pusher-plate of a mechanical stoker, the combination of the vibrated lever, with a power-transmitting rod having stops between which the end of the lever plays, one of said stops being adjustable on the rod and comprising a bolt perforated for the passage of the rod, washers strung on said bolt and embracing the opposite sides of the rod, and a nut adapted to the threaded portion of the rod and bearing upon one of said washers, substantially as specified.

5. A grate-bar for furnaces having an inverted-U shape in cross-section, the opposite side walls of the bar being reduced in thickness at and near the top, whereby the lower portions of the side walls of adjoining bars may be in contact without restricting the lateral expansion and growth of the upper portion of the bar, substantially as specified.

6. A grate-bar for furnaces consisting of a slotted or perforated body or central portion, and detachable head and toe portions, said entire series of grate-bars, with their head and toe portions having vertical side walls, and all of the parts of the bars having the upper portions of said side walls reduced in thickness, substantially as specified.

7. A grate-bar for furnaces having an inverted-U shape in cross-section, the upper member being slotted or perforated, with vertical side walls reduced in thickness at and near the top, and transverse slots extending through the upper portions of said side walls, substantially as specified.

8. In a mechanical stoker, the combination of the inclined grate-bars, an ash-dumping structure forming a continuation of said grate-bars, a shaft located under the lower ends of the grate-bars, and to which said ash-dumping structure is secured, and provision for moving said shaft whereby the ash-dumping structure will swing down and away from the bridge-wall, substantially as specified.

9. In a mechanical stoker, the combination of the grate-bars, ash-dumping plates having collars which serve also as supports for the lower ends of the grate-bars, and a shaft to which said collars are secured, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN F. POOL.

Witnesses:

JOS. H. KLEIN,

FRANK E. BECHTOLD.