P. L. CROWE & A. FRANKENHEIM.

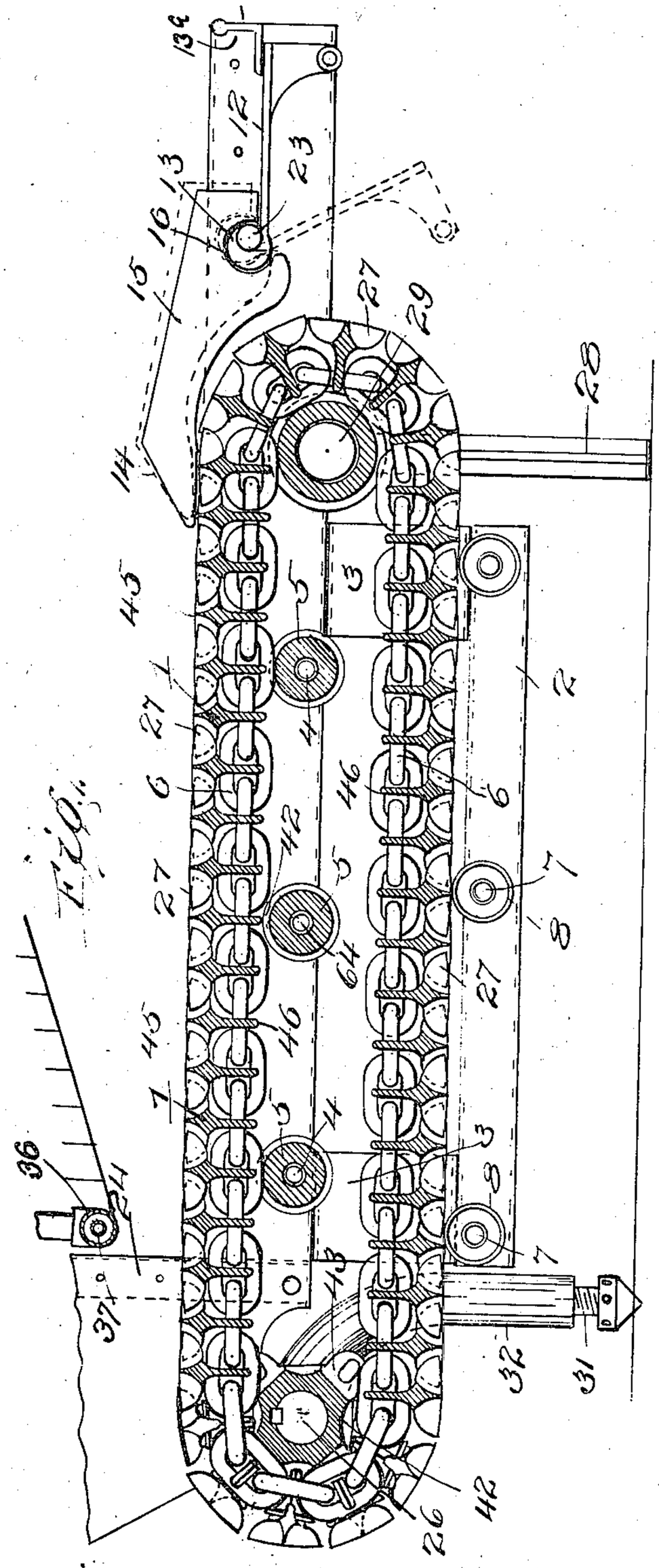
STOKING MECHANISM.

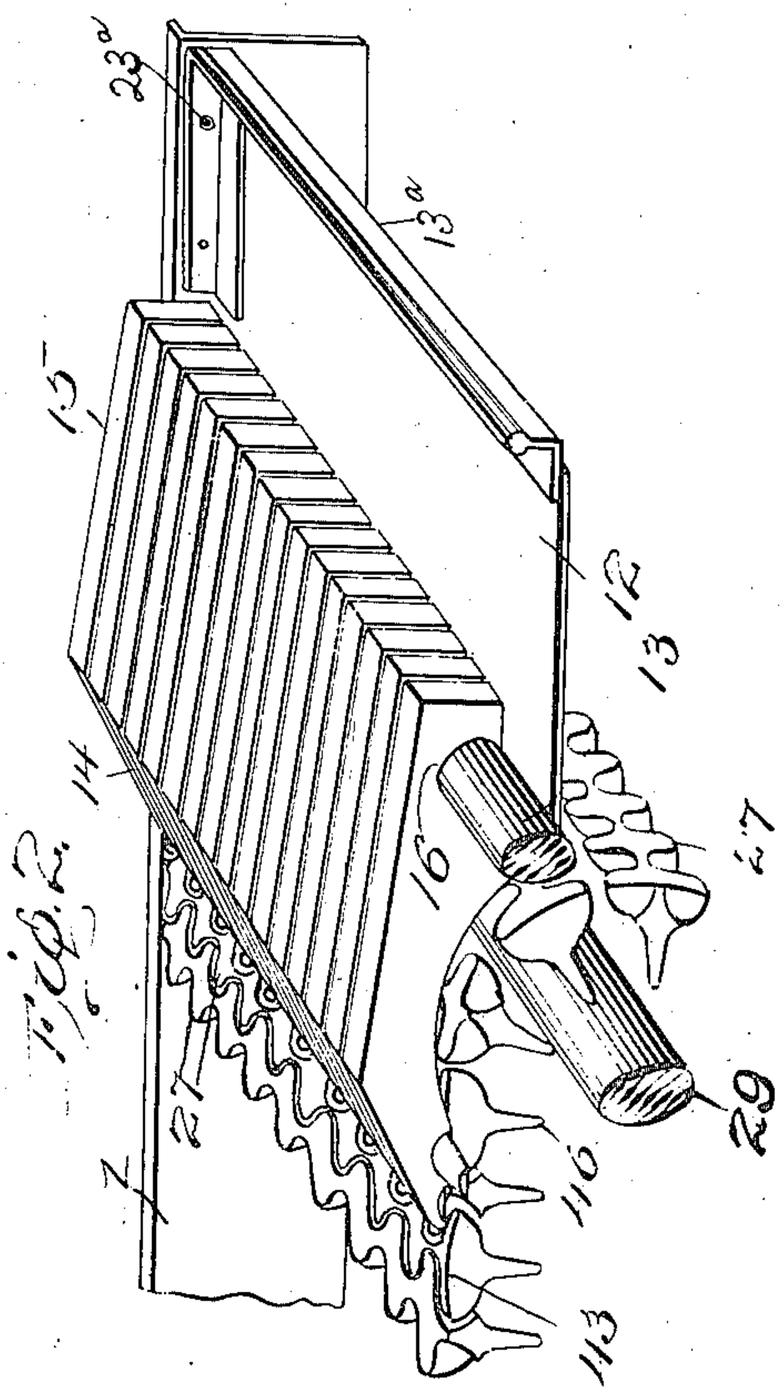
APPLICATION FILED APR. 14, 1906.

964,399.

Patented July 12, 1910.

4 SHEETS—SHEET 1.





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4 SHEETS—SHEET 2.

Fig. 3.

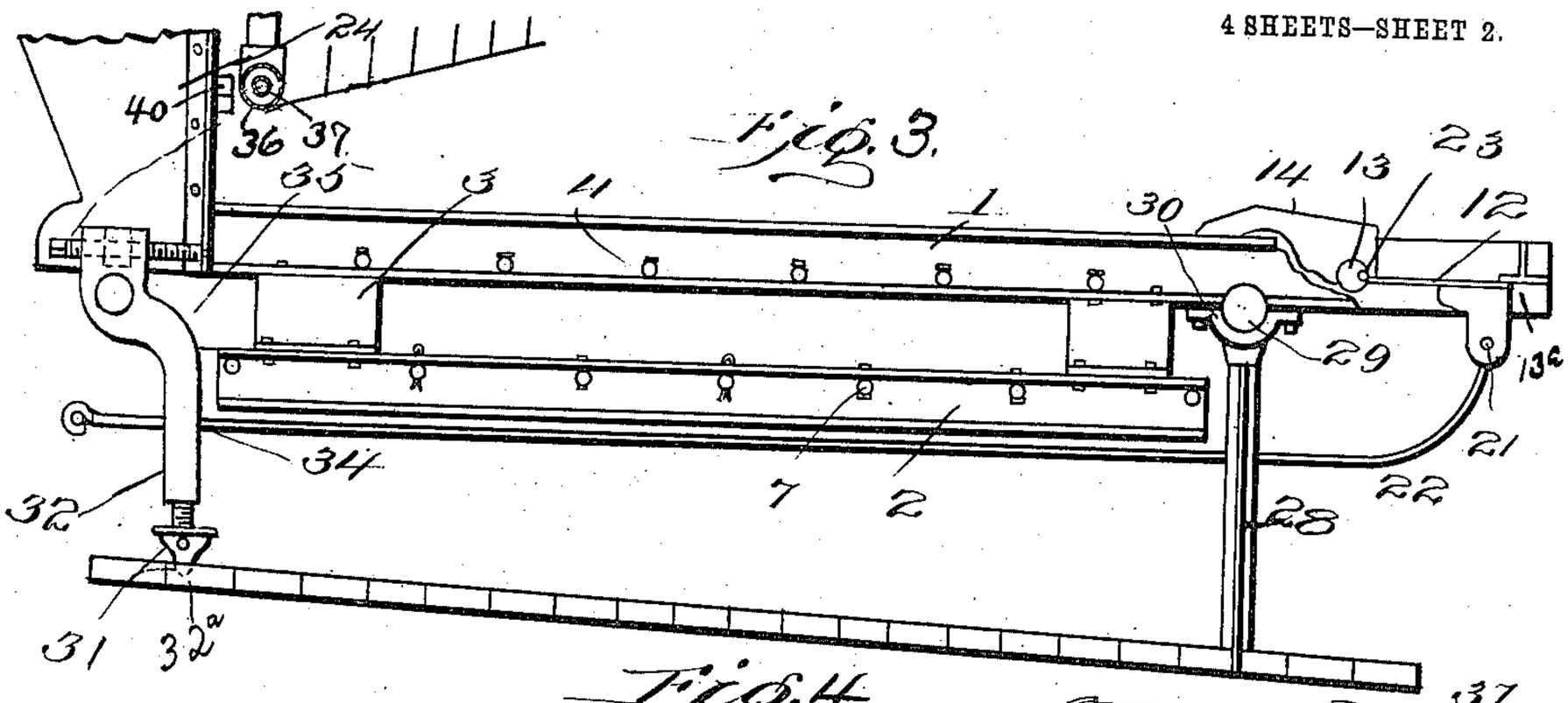

Fig. 4.

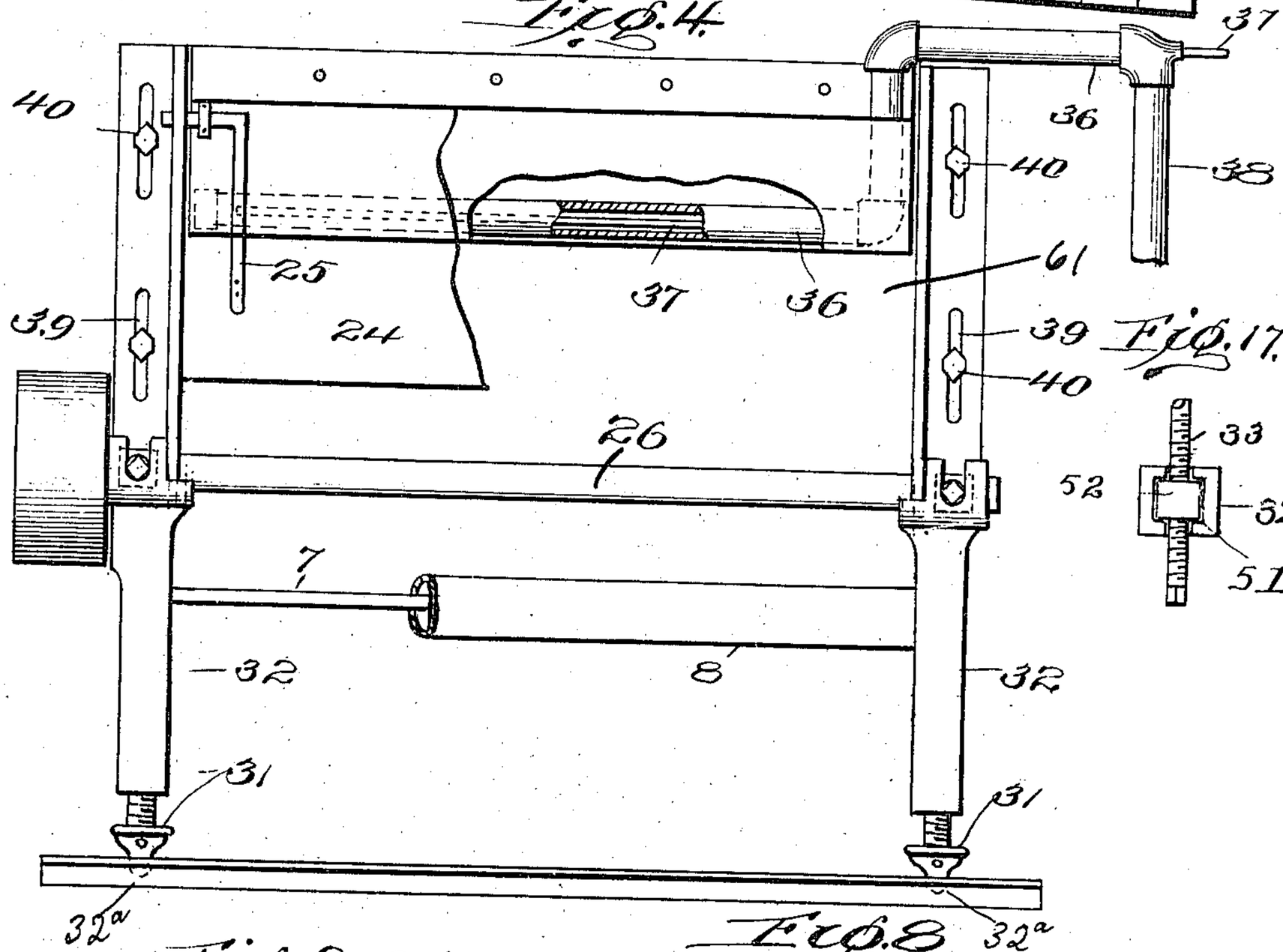

Fig. 17.

Fig. 9.

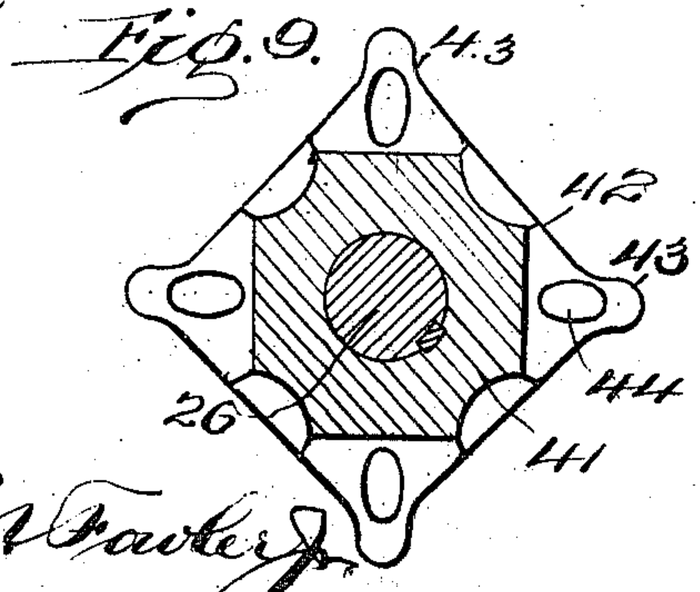

Fig. 8

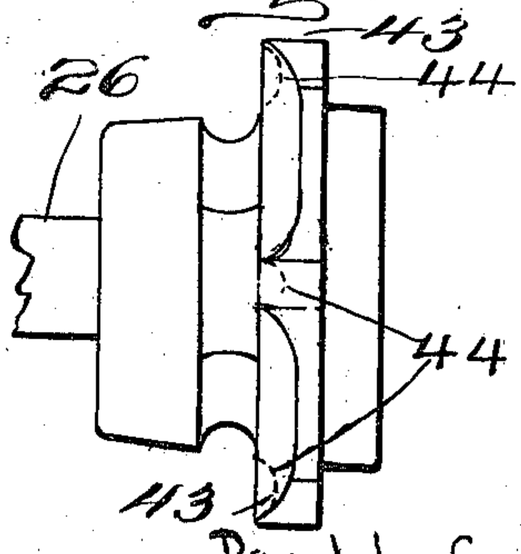

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Fig. 5.

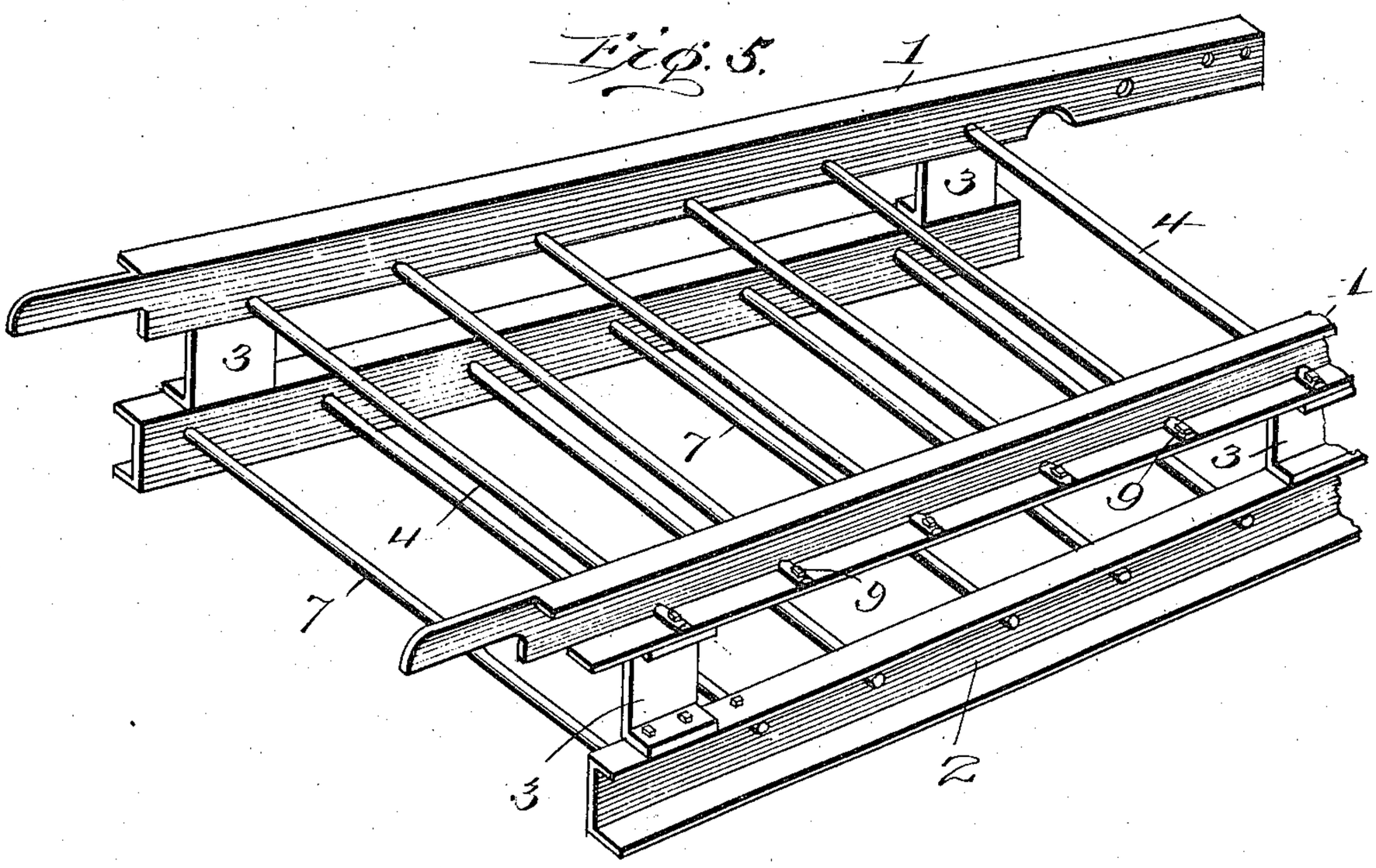


Fig. 15

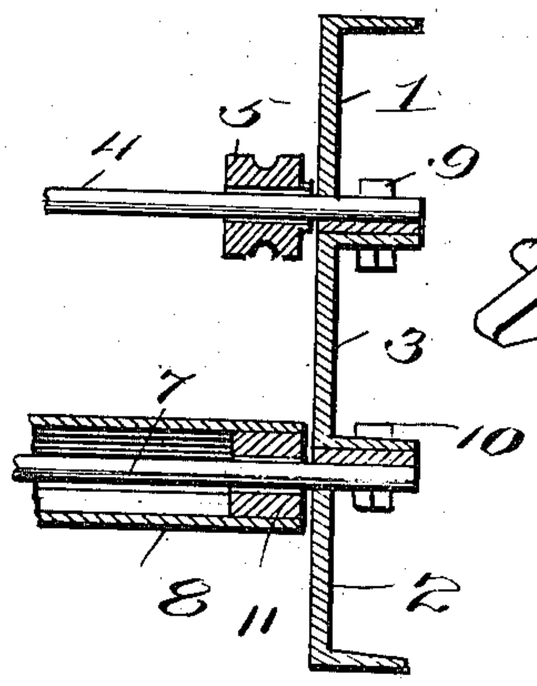


Fig. 16.

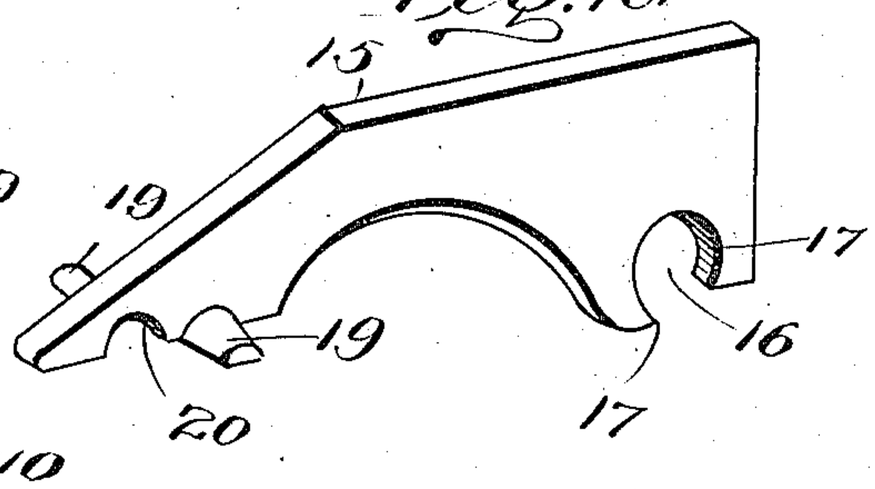
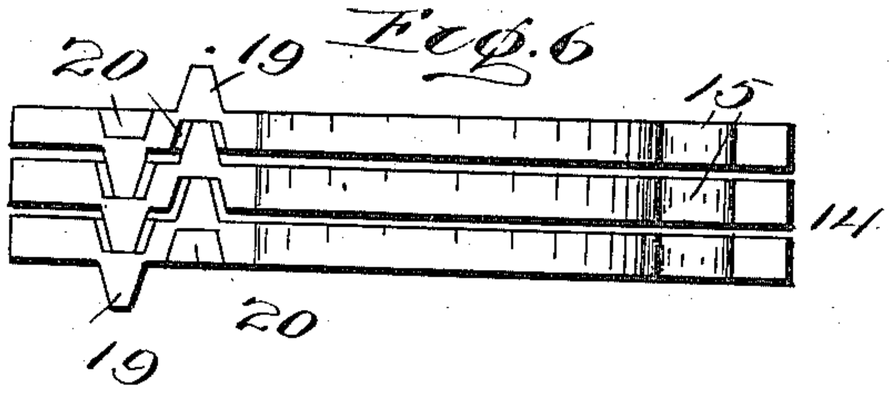


Fig. 6



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4 SHEETS—SHEET 4.

Fig. 7.

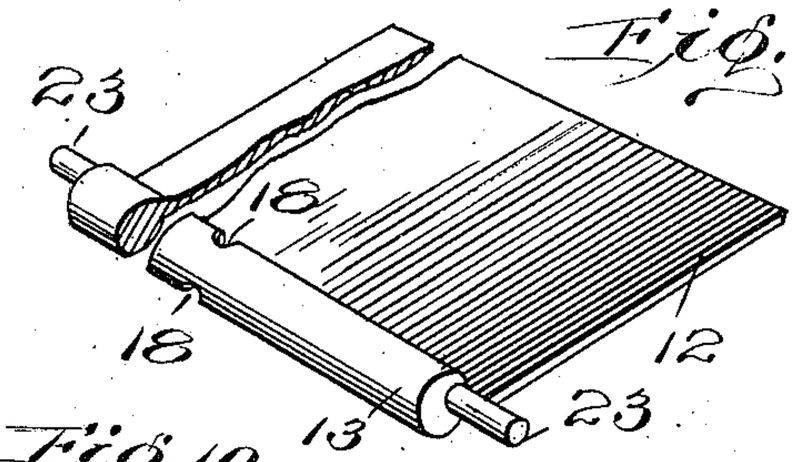


Fig. 10.

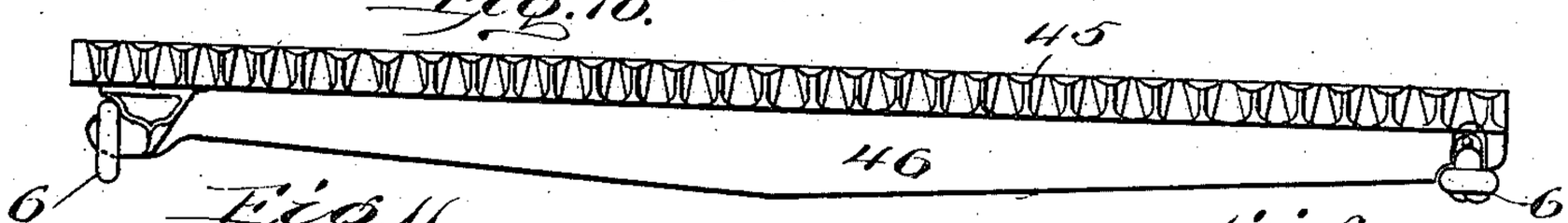


Fig. 11.

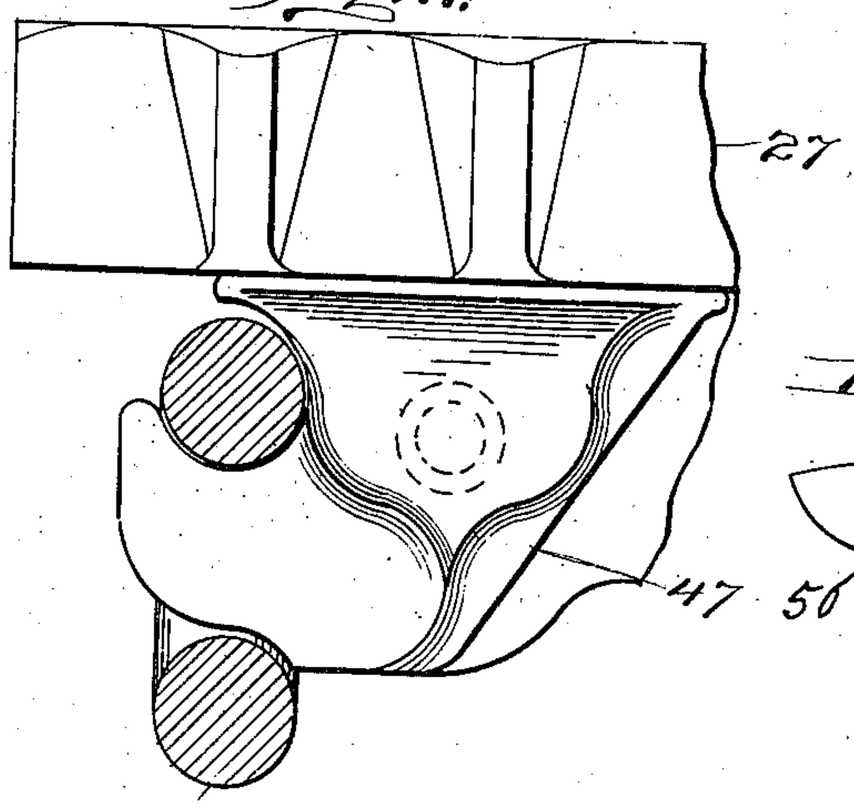


Fig. 12.

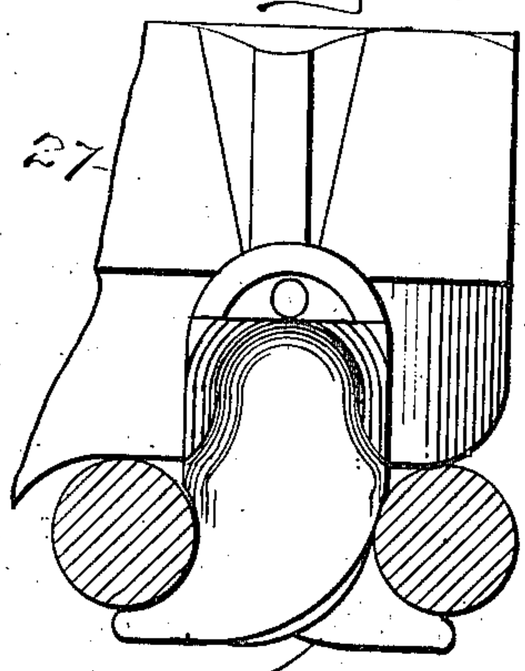


Fig. 13.

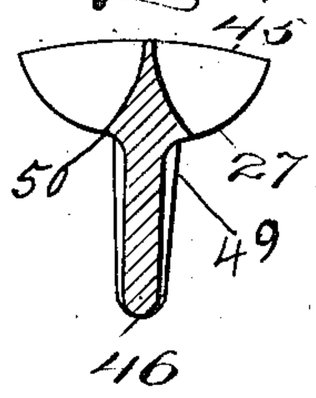
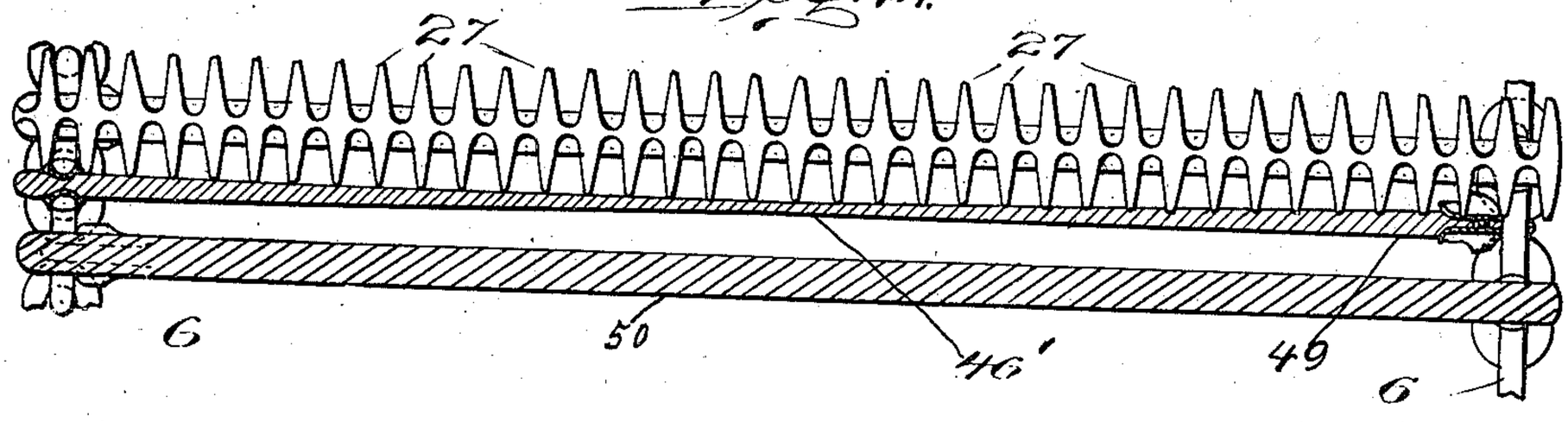


Fig. 14.



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UNITED STATES PATENT OFFICE.

PAUL L. CROWE, OF JERSEY CITY, NEW JERSEY, AND AARON FRANKENHEIM, OF NEW YORK, N. Y.; SAID FRANKENHEIM ASSIGNOR TO SAID CROWE.

STOKING MECHANISM.

964,399. Specification of Letters Patent. Patented July 12, 1910.

Application filed April 14, 1906. Serial No. 311,699.

To all whom it may concern:

Be it known that we, PAUL L. CROWE, a citizen of the United States, residing at Jersey City, in the county of Hudson and State of New Jersey, and AARON FRANKENHEIM, a citizen of the United States, and resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Stoking Mechanisms; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in stoking mechanism, and has for its object the provision of means for facilitating combustion in a furnace, as well as minimizing the cost of construction.

With this and other objects in view, the invention consists of certain novel constructions, combinations and arrangements of parts, as will be hereinafter fully described and claimed.

In the drawings:—Figure 1 is a longitudinal, vertical, sectional view of the improved stoking mechanism. Fig. 2 is a perspective view of the movable bridge and adjacent portions of the conveyer. Fig. 3 is a view in side elevation of the mechanism constructed in accordance with the present invention, with the chain grate omitted. Fig. 4 is a front view, in elevation, with parts broken away to show the internal construction. Fig. 5 is a perspective view of the frame of the stoking mechanism. Fig. 6 is an inverted plan view of a plurality of the lapping bars in engagement. Fig. 7 is a perspective view of the dumping plate. Fig. 8 is a view in side elevation of one of the sprocket wheels. Fig. 9 is an end view of a sprocket wheel. Fig. 10 is a view, in side elevation, of one of the grate bars. Fig. 11 is a fragmentary view, in side elevation, of one end of the grate bar, showing the means for fastening the bar to a vertical link. Fig. 12 is a similar view of a grate bar, showing the means of fastening the opposite end to a horizontal link. Fig. 13 is a transverse, sectional view of a grate bar constructed in accordance with the present invention. Fig. 14 is a fragmentary, top plan view of a traveling grate portion, showing three of the grate bars in horizontal section, one bar through the lower strengthening web, the third bar through the side strengthening web at the root of the surface web. Fig. 15 is a fragmentary, sectional view of the mechanism showing the rollers adapted to support the endless traveling grate portion. Fig. 16 is a perspective view of one of the lapping bars. Fig. 17 is a detail top plan view of the conveyer adjusting means.

Referring to the drawings by numerals, 1 designates the upper, and 2 the lower channel beams of the frame of the stoking mechanism. While, of course, this frame may be made of any structural material, we preferably use channel beams. The upper and lower beams 1 and 2 are spaced apart by channel pieces or struts 3 and rigidly held with respect to each other, both longitudinally and vertically. The channel struts have their flanges bolted to the adjacent flanges of the channel beams 1 and 2 upon each side of the traveling grate. The apertures into which the transverse shafts are inserted are preferably located above the lower flange of the channel beam for the purpose of obtaining the flexibility from the wrought material of which the channels are composed and of the web of the beam up to its upper surface.

On the interior of the frame of the grate structure are transverse shafts 4, which are provided with wheels 5, Fig. 1, so formed upon their periphery as to receive the horizontal and vertical links of the chains 6, Fig. 14. When the vertical links of said chains pass over said wheels 5, the grate surface will rise at that point, and when the horizontal links pass over said wheels, the grate surface will correspondingly drop. The passing of the links of the chains 6 over the wheels 5 causes an uneven movement of the grate surface, resulting in keeping the fuel in a loose condition, permitting the passage of air through the fuel with the least resistance. The lower, transverse rods 7 are fixed to the channel beams 2, the said rods carrying tubular members of drum 8, (Fig. 15), over which the grate surface returns. These tubes have collars inserted in their ends forming bearings. The rods 4 rest upon the upper surface of the lower flanges of the channel beam 1, and by perforating the ends of said rods and flanges of

the channel beams, securing bolts 9 may be passed through the rods and flanges for securely holding the said rods in position and also spacing the channel beams of the opposite sides of the grate frame with respect to each other. The rear end of each of the upper channel beams 1 is preferably extended beyond the lower channel beams 2 a sufficient distance to properly support the dumping plate 12, Figs. 1, 3 and 7.

The dumping plate 12 is formed with a blank portion extending from the supporting, enlarged portion 13, which enlarged portion 13 supports a bridge 14, consisting of lapping bars 15, Figs. 1, 2, 3 and 7, 16. The dumping plate is further provided with a stationary frame 13ª serving as the edge of the ash tray, the bottom of which consists of the dumping plate 12. Each lap bar 15 is provided with an engaging recess 16, preferably circular shape and adapted to be adjusted to the enlarged portion 13 of the dumping plate 12. The recess 16 of each of the lapping bars 15 has converging extremities 17 sufficiently contracted to allow the bar to be positioned longitudinally upon the enlarged portion 13 of the dumping plate by means of notches 18, Fig. 7. Each lapping bar 15 is thus pivotally mounted upon the enlarged portion 13 of the dumping plate and the forward, free end of the bar constitutes the bridge 14, which bridge loosely rests upon the upper surface of the grate.

Referring particularly to Figs. 6 and 16 oppositely extending lugs 19 are formed upon each lap bar preferably near the front end thereof. Upon each bar in directly opposite portions to the lug of the adjacent bar, are lug-receiving notches 20, Fig. 6. When the bars 15 are in their assembled positions, Fig. 6, each lug 19 is normally seated in a notch, 20. Upon vertically moving one of said bars, the adjoining or contiguous bars will be also slightly raised by means of which any small clinker, which may adhere to the grate, may pass underneath said bridge 14 without interfering with the operation of the mechanism, the elasticity of the bridge 14 being such that the lap bars will drop in their positions automatically of their own weight and by the weight of the contiguous lap bars. It will, therefore, be obvious that our improved bridge 14 constitutes a flexible structure.

The dumping plate 12 is operated by a rod 22 which rod may be pivotally connected, as at 21 with the under surface of said dumping plate 12 said rod extending forwardly to the front of the furnace, Fig. 3. By moving the rod 22 forwardly, the dumping plate 12 may be swung downwardly, as it is hinged upon trunnions 23, which trunnions are placed eccentrically with respect to the enlarged portion 13. Any accumulation of ashes or clinkers resting upon said plate will be deposited in the ash-pit below the grate structure, when desired. It is to be noted that the positioning of the trunnions 23 upon the enlarged portion 13 constitutes an eccentric. The eccentric movement of the enlarged portion 13 of the dumping plate occasioned by the operation of the rod 22 will be communicated to the lapping bars 14, giving slight vertical or horizontal movement, but since the said lap bridge rests loosely upon the grate surface, the movement thereof will not affect the operation of the stoker parts in any way, but tend to keep the lap bars free from each other. The lap bars are placed on the dumping plate frame for simplification and particularly for moving the lap bars every time the dumping plate is operated to dump the ashes, thus preventing them from being burned together, which occurs gradually when the lap bars remain without motion for a definite period. Of course, the inward thrust of the rod 22 operates to restore the dumping plate 12 to its normal position for collecting ashes at the rear end of the grate, preventing the inflow of air. The grate hereinafter described, will be permitted to pass under the bridge 14 in a comparatively clean condition, as ashes and clinkers will be passed upon the bridge and subsequently deposited upon the dumping plate 12. The bars of the bridge being slightly separated allow a limited quantity of air to pass through, sufficient to consume any possibly unconsumed fuel that may pass over them thereby thoroughly consuming the same, before reaching the dump plate 12. The front wall of the stoker is protected by the front plate 61 forming the rear wall of the hopper.

Referring to Figs. 3 and 4, a hopper 24 is closed by a removable plate, which plate is held in position by springs 25, arranged at each end of the hopper near the upper edge thereof. These springs 25 engage apertures formed in the end walls of the hopper 24. The upper ends of the springs are bent to form catches arranged to spring into the apertures in the end wall of the hopper 24 automatically and may be retracted and the plate lifted out of position, when it is desired to remove the same, the lower end of springs being rigidly attached to said plate. Any desired mechanism may be employed for operating the shaft 26 carrying the endless chains 6 to which are secured the grate bars 27, Fig. 14. The grate is, of course, moved comparatively slowly, the fuel being received from the hopper 24 and as it passes rearwardly into the combustion chamber of the furnace, it becomes gradually coked and ignited. By the time the material upon the traveling grate surface reaches bridge 14, it will usually be reduced to ashes and clinkers and will be forced from

said grate over the bridge and deposited on the dumping plate 12, as heretofore stated. The flanges of each of the channel beams 1 terminate short of the front end for securing the hopper 24 to the frame, see Fig. 1. The rear end of the frame of the mechanism may be supported in any suitable manner, but in the present embodiment it is preferable to pivotally support the rear end of said frame, permitting the raising and lowering of the front end of the stoker. This pivotal movement is permitted upon the standards 28 by means of the shaft 29 being supported upon brackets or bearings 30 carried by standards 28, the channel beams resting upon shaft 29. This construction permits the regulation of the grate by screw 31. The forward end of the channel irons rest upon the shaft 26 supported by standards 32, said shaft also carrying sprocket wheels 42 upon which the endless chain 6 is supported. The traveling grate bars 27 are carried by the chain. The screws 31 are threaded into standards 32. The ends of the standards are positioned within notches or recesses 32a. By rotating the screws 33, the standards 32 may be moved outwardly for tightening the endless traveling grate surface composed of the endless chain 6 and the grate bars 27. If the standards 32 are permitted to swing outwardly, the endless traveling grate will be stretched or tightened principally by the weight of the front of the stoker, while, if said standards 32 are moved inwardly the endless traveling portion will be slackened.

Cooling means for the front portion of the stoker is depicted in Fig. 4, which means comprises an outer pipe 36 and an inner pipe 37. The outer pipe 36 is positioned between the front arch and the front wall of the stoker constituting the rear wall of the hopper 24. The auxiliary or smaller pipe 37 extends substantially the entire length of the horizontal portion of pipe 36, excepting at the extreme end where circulation is permitted from one pipe to the other, which is positioned contiguous to said front wall, said auxiliary pipe 37 being open at its extremity, so that the cooling agent may pass through said pipe for causing the circulation of the cooling agent. The heated liquid is discharged from pipe 36 through a downwardly extending portion 38, or vice versa.

Referring to Fig. 4, it is to be noted that the frame pieces of the hopper 24 are provided with elongated apertures 39, within which bolts 40 are positioned securing the hopper to the front wall. It will be observed that the hopper can be adjusted vertically in view of the sliding connection with plate 61. The sides of the hopper rest at their lower edges on shaft 26. The adjustment of screw 31 therefore effects the adjustment of the grate and of the hopper resting on shaft 26.

The sprocket wheels 42 upon which the endless chains 6 are supported, are provided with straight portions between sprockets 43 and each sprocket 43 is provided with a socket or hollow portion 44 formed upon its inner surface. Each bar 27 is provided with a transversely curved, upper surface 45 and with a depending web 46. The web 46 materially increases the durability of the grate bar. The grate bar is provided with the ordinary fingers or teeth upon each side. Each bar is secured to the links of the chain 6 by means of horizontal and vertical shoes 47 and 48, respectively. The horizontal shoe 47 of each bar is first placed on the web of the bar and then hooked into a vertical link of one of the chains and subsequently the opposite end of the bar is positioned between the sections of the vertical shoe 48 and then fixedly secured thereto by a spring cotter or other securing means. The depending web is tapered in width from the ends of the bar toward the central portion which is deeper and thinner as indicated at 46', whereby the heavier or stronger portion of the bar is at the ends thereof shown at 49 close to the chain shoes enabling the bars to withstand all torsional strains occasioned by performing their functions in the operation of the stoker. The web 50 takes up the side strains in thus performing said work.

The upper extremity of the standard 32 is provided with a recess or aperture 51 proportioned to receive a nut 52 and provided upon opposite sides with recesses 53 positioned and proportioned to receive and accommodate the screw 33, whereby the nut 52 is maintained against rotary displacement and the screw 33 is positioned for engagement with the frame of the hopper, as hereinbefore described.

From the above description, it will be evident that our stoker mechanism is admirably adapted for accomplishing the objects set forth at the beginning of the specification and in a manner well suited for handling fuel in furnaces.

What we claim is:—

1. In a stoking mechanism of the character described, a traveling grate, a bridge resting at one end on the traveling grate, a dumping plate arranged in a horizontal plane when closed and located adjacent to and extending beyond the other end of said bridge, means connecting said bridge and dumping plate for moving the former as the dumping plate is lowered and raised, and a dumping plate frame positioned above the dumping plate.

2. In a stoking mechanism of the character described, a traveling grate, a bridge resting at one end on the traveling grate, a dumping plate arranged in a horizontal plane when closed and adjacent to and extending beyond said bridge, said plate be-

ing provided with means for raising one edge of the bridge and moving the bridge longitudinally when the dumping plate is lowered.

3. In a stoking mechanism of the character described, a traveling grate, a dumping plate located adjacent to one end of said traveling grate and arranged in a horizontal plane when closed, and provided with an eccentric hinge, and a bridge located between said plate and traveling grate and having one end resting on said traveling grate and its other end connected to the eccentric hinge.

4. In a stoking mechanism of the character described, an endless traveling grate, a dumping plate arranged in a horizontal plane when closed located adjacent to one end of said traveling grate and provided with an eccentric hinged portion, channel side plates formed with outwardly turned flanges supporting said dumping plate, said dumping plate having its support in the web of said channel plates intermediate the flanges, a bridge located between said dumping plate and the end of the traveling grate and having one end resting loosely upon the traveling grate and its other end pivotally engaging said eccentric hinged portion of the dumping plate whereby one edge of the bridge is raised and lowered by the movement of the dumping plate.

5. In a stoking mechanism of the character described, an endless traveling grate, a dumping plate arranged in a horizontal plane when closed located and hinged adjacent to one end of said traveling grate and having an enlarged eccentric portion, a bridge located between said dumping plate and endless grate and having one end loosely resting on said traveling grate and its other end hinged to said enlarged eccentric portion, said bridge being composed of separately detachable bars provided with oppositely projecting side portions for connecting them together at their ends adjacent to the traveling grate.

6. In a stoking mechanism of the character described, an endless traveling grate, a dumping plate arranged in a horizontal plane when closed located and hinged adjacent to one end of said traveling grate and having its pivotal portion provided with an enlarged portion eccentric thereto, a bridge located between said dumping plate and the end of said traveling grate and resting at one end upon the traveling grate and hinged at its other end to said enlarged eccentric portion of the dumping plate, said bridge being composed of spaced bars, each of said bars being independently detachable and having a recess at one end engaging said enlarged eccentric portion of the dumping plate and provided at its opposite end with a partly oval recess, and lugs extending laterally from each side of said bar adjacent to said recess, said lugs of each bar extending into the recesses of the adjacent bars.

7. In a stoking mechanism of the character described, supporting channel bars having their flanges outwardly turned, a traveling grate, a hopper located at one end of said traveling grate for feeding fuel thereto, one side of the hopper constituting the front plate of the furnace and the opposite side being detachable, and spring connections secured to said detachable plate for holding the latter plate in position.

8. In a stoking mechanism of the character described, a traveling grate, a hopper located at one end of said traveling grate and including a plate arranged adjacent to the wall of the arch of the furnace, and a second plate pivotally secured in position opposite the first plate, a spring connecting the second plate with the end plate for holding the latter in position, and cooling means located back of the plate first mentioned adjacent to the arch of the furnace and positioned between the front plate of the hopper and the fire box.

9. In a mechanism of the class described, in combination, a frame comprising upper and lower yieldable side supporting channel plates having outwardly directed flanges and struts connecting said upper and lower channels and extending longitudinally with respect thereto, the said struts serving to brace said channel plates against longitudinal torsional strain and serving also to space the said channel plates.

10. In a mechanism of the class described, the combination with a frame, an endless traveling grate carried by said frame, a dumping plate positioned contiguous to said endless traveling grate, said plate comprising a flat portion and an integral enlarged portion, trunnions secured eccentrically to the ends of said enlarged portions, a stationary frame above one edge of the dumping plate, a bridge pivotally secured on the enlarged portion of said dumping plate and spanning the space between said traveling grate and said plate, said bridge resting at one end loosely upon the traveling grate, and said bridge consisting of lap bars, each bar comprising a body provided with a recess at one end conforming to the enlarged portion of the dumping plate, and at its opposite end with partly oval recesses on one side, and laterally partly oval lugs on the opposite side, the said lugs of each bar extending into the recesses of the adjacent bars when said lap bars are in juxtaposition.

11. In a mechanism of the class described, the combination with a frame, of a traveling grate mounted on said frame, a hopper for feeding fuel to the surface of said grate, a detachable plate forming one wall of the hopper, spring-bolts arranged to secure said

plate in position, said spring bolts forming catches arranged to engage portions of the hopper structure for securing said front plate in position.

12. In a mechanism of the class described, a frame with outwardly turned flanges, rods arranged in the frame and extending transversely thereof, pedlar wheels journaled on said rods, chains passing over said wheels comprising alternate vertical and horizontal links, grate bars with webs thinner horizontally and deeper vertically in their central portions than at each end having their opposite ends secured to said chains, said grate bars being undulated by said alternate passing of the vertical and horizontal links over said pedlar wheels, and shoes for said bars for engaging said chains.

13. In a mechanism of the class described, the combination with a frame having a web and an endless grate carried by said frame, of a dumping plate carried by said frame and pivoted in the web thereof, said dumping plate being provided with an enlarged portion formed upon one edge, said enlarged portion provided with notches, lap bars each provided with a circular recess, the lower portion of said recess being cut away sufficiently to pass through the notches of said enlarged portion of said dumping plate and permitting the upper portion of said recess to be positioned thereon for loosely securing said bars upon said enlarged portion of said dumping plate and positioning them contiguously to span the distance between said dumping plate and said endless grate.

14. In a mechanism of the character described, the combination with a grate frame, a grate carried by said frame, and a dumping plate arranged in a horizontal plane when closed, of a bridge spanning the space between said dumping plate and said grate, said bridge comprising lapping bars each bar provided with oppositely extending projections and with recesses contiguous to said projections, the oppositely extending projections upon each bar engaging the recesses of the adjoining bars, the dumping plate being provided with means whereby said bridge will be moved when said dumping plate is lowered.

15. In a mechanism of the class described, the combination with supports, of rods carried by said supports, sprocket wheels carried by one of said rods, chains positioned upon said sprocket wheels, a grate bar secured to said chains, each sprocket wheel being provided with a recessed portion in the inner face thereof, fastening means fixedly securing said grate bars to said chains, said fastening means being adapted to engage the recessed portions of the sprocket wheels.

16. In a stoking mechanism, the combination of a traveling conveyer, of a frame for supporting such conveyer, a standard arranged to adjust one end of the frame vertically, and provided with an aperture in its upper extremity, a nut disposed within said aperture and a screw extending through said nut and aperture and engaging the frame, and arranged to move the upper extremity of the standard angularly.

17. In a mechanism of the class described, the combination of a frame comprising yielding channel side supports, each support comprising a web, and flanges on the web, rods extending through the webs of the channels and secured to the flanges, and a fuel supporting traveling grate supported by the rods.

18. In a mechanism of the class described, a frame of yielding channel irons, each comprising flanges and a web, said flanges being outwardly turned and said web being formed with apertures extending therethrough, rods provided with apertures at their ends passing through the apertures in said web, and fastening means connecting the rods with each flange of the channel irons.

19. In a mechanism of the class described, a yielding channel iron frame, chains mounted to move around said frame and comprising alternate vertical and horizontal links, the vertical links of the chain on one side of the grate being opposite the horizontal links of the chain on the other side of the grate, grate bars extending between the sides of said frame, each bar being connected at one end to a horizontal link and at the other end to a vertical link, and supporting rollers for the chains said vertical and horizontal links in combination with said rollers comprising means for producing an undulatory movement of the grate bars.

20. In a stoking mechanism of the character described, supporting channel irons having their flanges flaring outwardly, a traveling grate, a bridge located at one end of said traveling grate and having one end mounted over said traveling grate, a hinged dumping plate arranged in a horizontal plane when closed, co-acting with said bridge, and extending beyond the same, having a hinged connection with said bridge by means of which one edge of the bridge is raised and lowered as the dumping plate is lowered and raised, and a dumping plate frame secured stationary between said channel irons and arranged to form an air-tight joint with said dumping plate when closed.

21. In a stoking mechanism of the class described, a traveling grate, a grate frame formed of channeled side plates, with flanges extending outwardly, a dumping plate located in the rear of said grate, comprising a flat portion and a circular enlarged portion along one edge, said enlarged portion being pivotally supported in the web of the channeled side plates above the

lower flanges and at the rear end of said side plates, a dumping plate frame connected at each end to the web of said channeled side plate, and above the dumping plate a bridge comprising independent sections, one end of each section resting on the rear of the traveling grate, the dumping plate being arranged to swing adjacent to and in a normal operative position in dumping in the opposite direction to the traveling grate and to swing to a horizontal closed position against the under side of the dumping plate frame.

22. In a mechanism of the class described, the combination of a grate frame, a traveling grate mounted in said frame a vertically adjustable fuel hopper and a detachable closure plate therefor, spring bolts arranged to secure said plate in position, such bolts forming handles for such closure plate, cooling means positioned back of the front plate contiguous to the arch walls and extending parallel with said hopper, said cooling means permitting the free vertical adjustment of the traveling grate to the front plate, the cooling means so arranged as shown, for the protection of the said front plate from the furnace heat and the free expansion of said cooling means.

23. In a mechanism of the class described, a traveling grate frame formed of channel plates with flanges extending outward from the grate surface, rods extending between said frames and fixed between the flanges of the channel plates, collars mounted rotatably upon the rods and cylindrical rollers mounted pivotally on the rollers and rotating therewith in combination with a traveling grate surface, a dumping plate, a lap bar bridge formed in sections and mounted pivotally on the dumping plate co-acting with said grate surface, and having interlocking devices for receiving the ashes from the traveling grate.

24. In a mechanism of the class described, a yieldable frame for a traveling grate comprising side supporting channel plates having outwardly directed flanges and struts of like material connecting the upper and lower channels and extending longitudinally therewith, the said struts serving to brace said channel plates against the longitudinal torsional strains, in combination with a pivotal support at the rear end of said frame, and means for adjusting the front of the frame.

25. In a mechanism of the class described, a frame, chains mounted to move around the said frame upon rollers and comprising alternate vertical and horizontal links and grate bars extending between the frame and alternately connected with horizontal and vertical links and means adapted to produce in combination with vertical and horizontal links an undulatory movement of the grate bars.

In testimony whereof we affix our signatures.

PAUL L. CROWE.
AARON FRANKENHEIM.

In the presence of—
ALBERT FAHNER,
HERMAN L. SCHMEDES.