G. E. STEVENS.

STOKER.

APPLICATION FILED APR. 29, 1914.

1,167,028.

Patented Jan. 4, 1916.

2 SHEETS—SHEET 1.

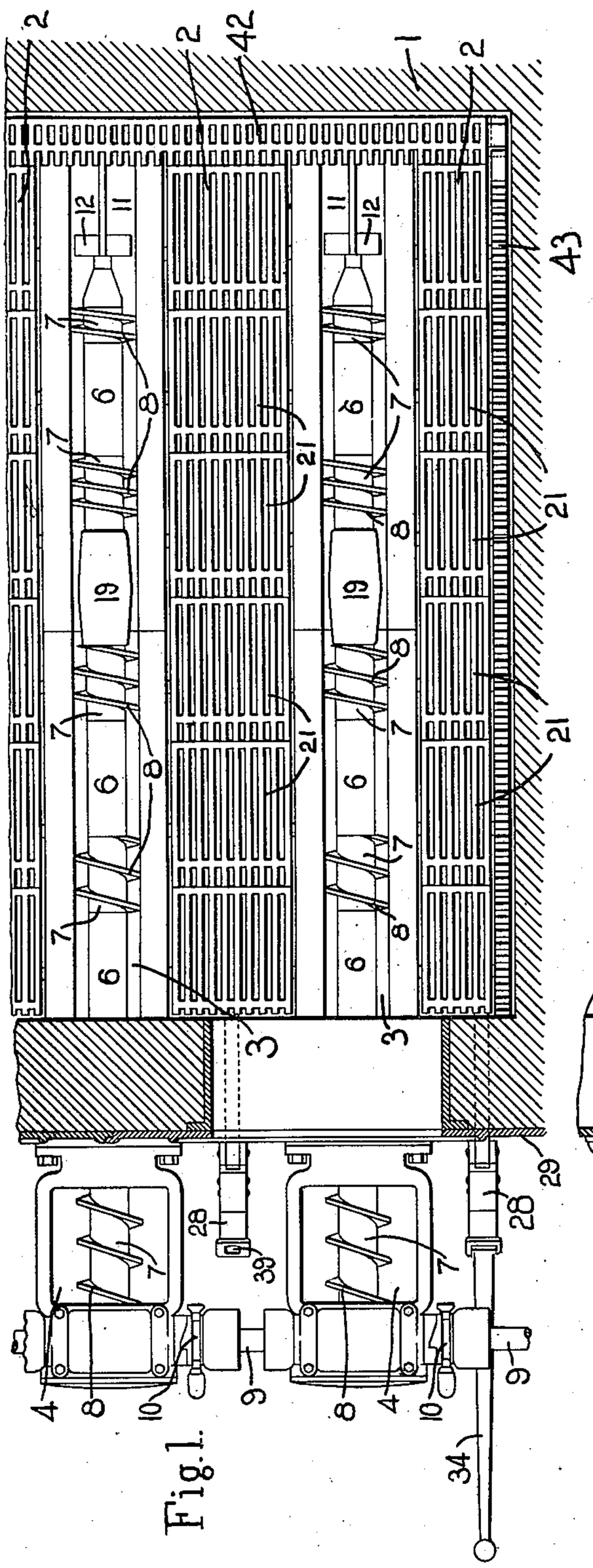

Fig. 1.

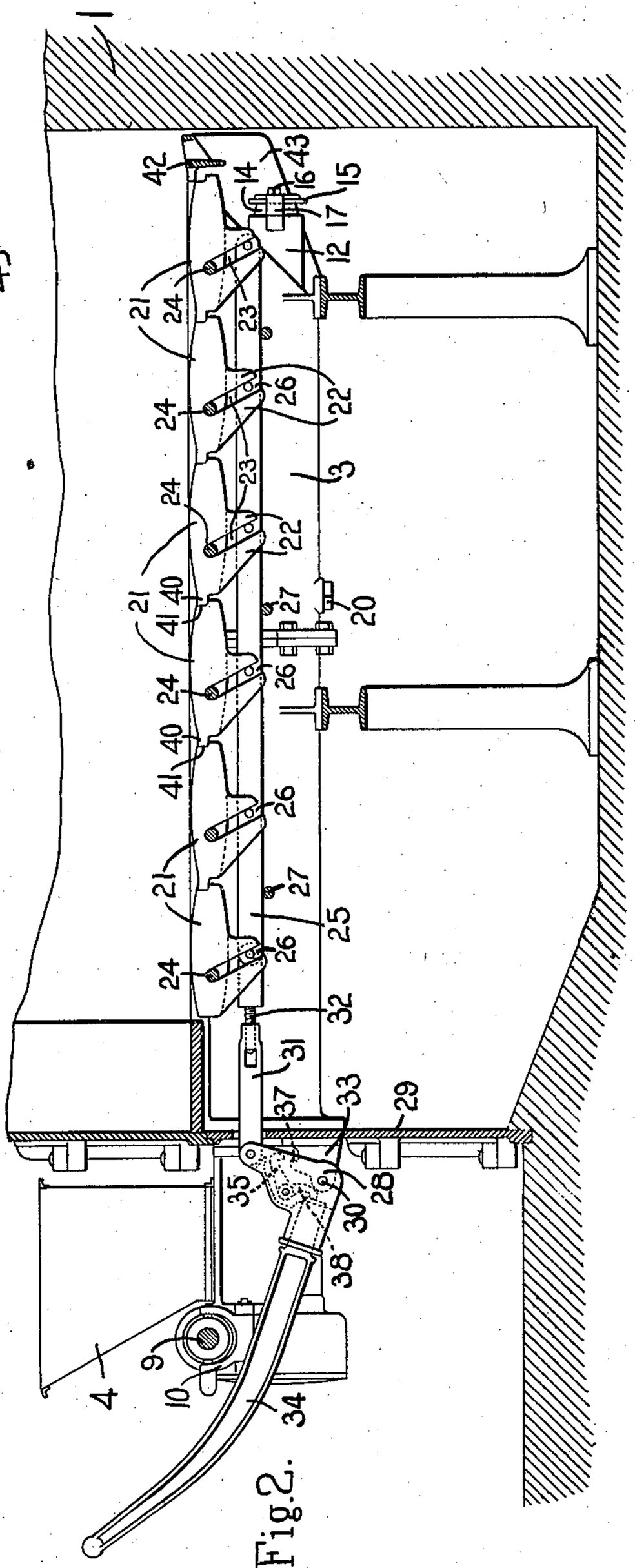

Fig. 2.

Witnesses.

J. Morrill Fuller,

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Att'y's

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2 SHEETS—SHEET 2.

Fig.3.

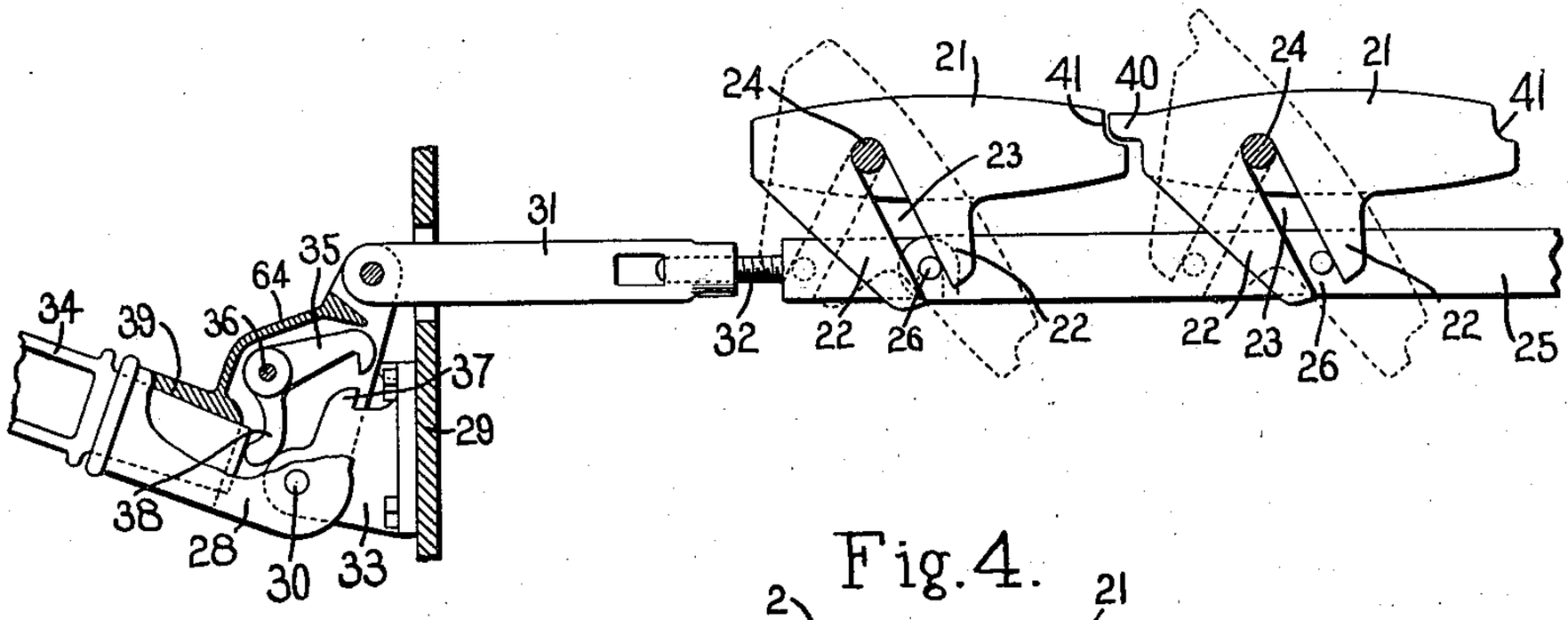


Fig.4.

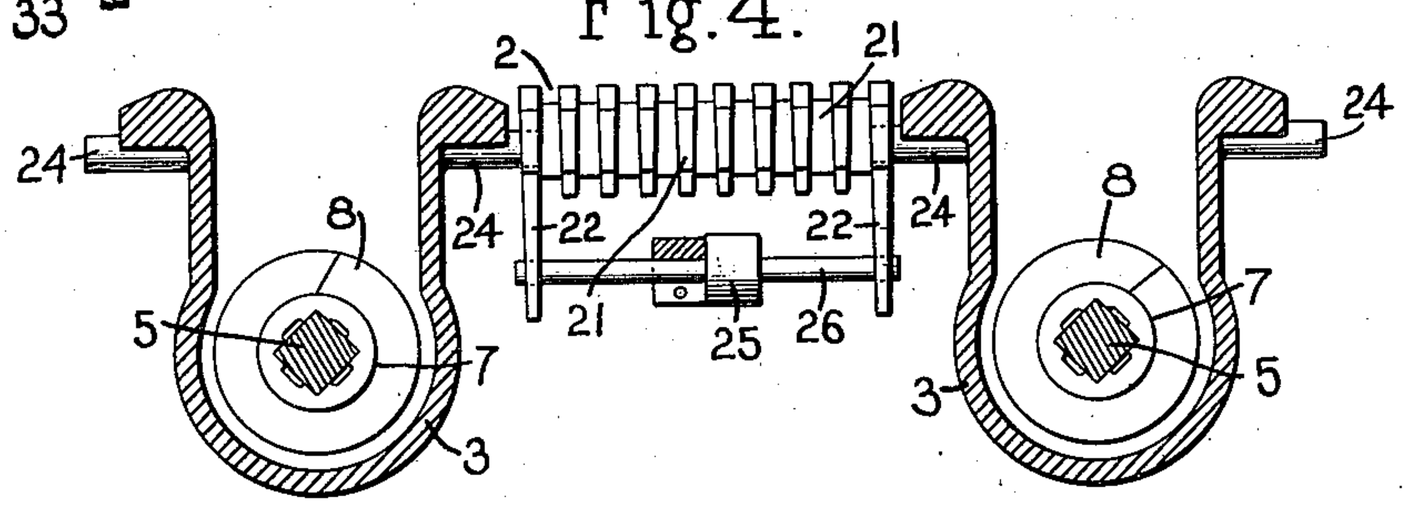


Fig.5.

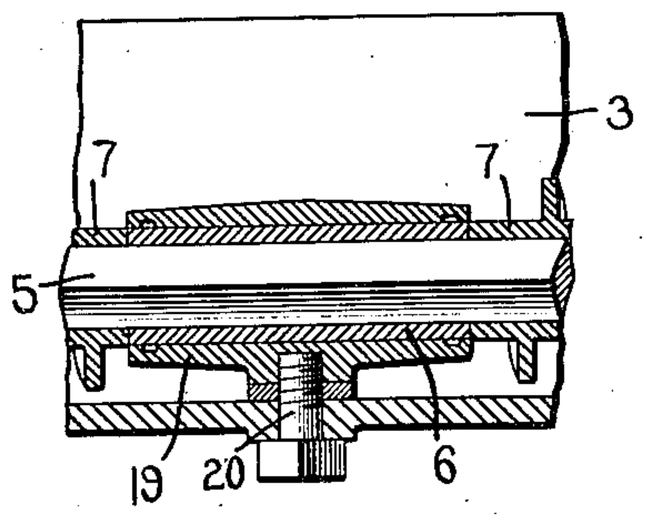


Fig.6.

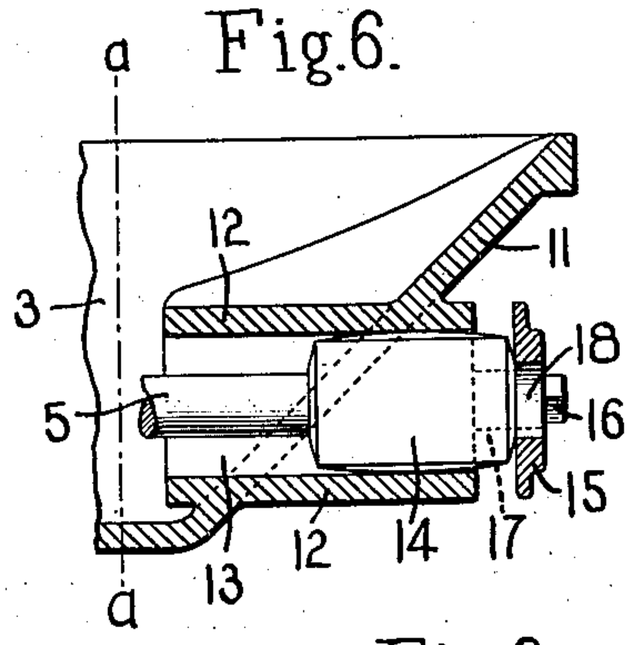


Fig.7.

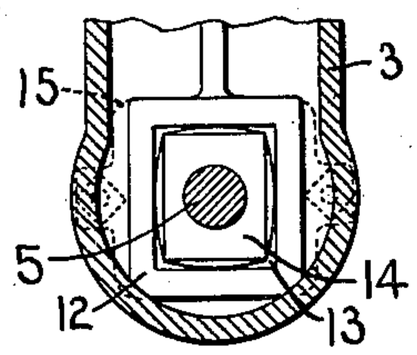


Fig.8.

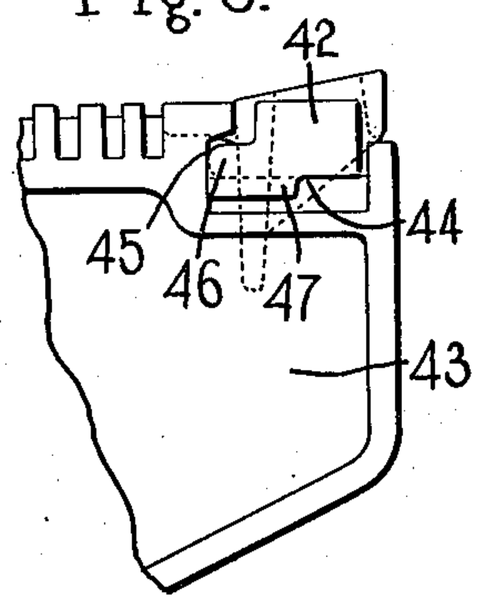
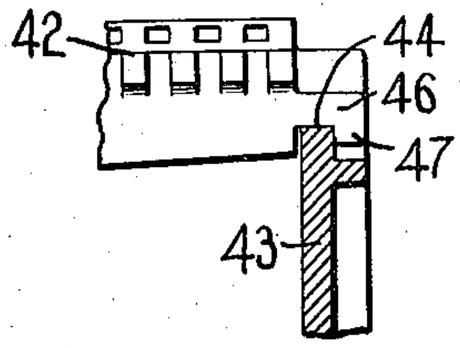


Fig.9.



Witnesses.

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UNITED STATES PATENT OFFICE.

GEORGE E. STEVENS, OF EVERETT, MASSACHUSETTS, ASSIGNOR TO CLARENCE E. ALDERMAN, TRUSTEE, OF NEWTON, MASSACHUSETTS.

STOKER.

1,167,028. Specification of Letters Patent. Patented Jan. 4, 1916.

Application filed April 29, 1914. Serial No. 835,331.

To all whom it may concern:

Be it known that I, GEORGE E. STEVENS, a citizen of the United States, residing at Everett, county of Middlesex, State of Massachusetts, have invented an Improvement in Stokers, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to stokers of the underfeed type and has for an object to provide a novel stoker constructed so that the different parts thereof can be readily assembled and when assembled the parts which are most liable to deterioration are readily accessible so that they can be easily removed and replaced by new parts as occasion arises; and which is so constructed that it can be readily installed in any boiler setting, thus providing a construction wherein an ordinary grate structure can be replaced with my underfeed stoker without changing or altering in any way the boiler setting.

Further objects of the invention are to provide a novel construction of feed screw for feeding the coal to the grates by which the coal will be evenly distributed over the grates and to provide a grate structure which will permit the grate elements to be readily removed or replaced as occasion requires, and otherwise to improve stokers, all as will be more fully hereinafter described and then pointed out in the appended claims.

In order to give a proper understanding of the invention, a selected embodiment thereof is illustrated in the drawings which will now be described.

Figure 1 is a horizontal section through a boiler setting showing in plan the grate and stoker mechanism; Fig. 2 is a vertical longitudinal section through the grate shown in Fig. 1; Fig. 3 is a detail fragmentary view of one end of one of the grate areas showing the means for shaking and dumping the grate; Fig. 4 is an enlarged transverse section through one of the grate sections and the adjacent troughs; Fig. 5 is a longitudinal section through the center bearing for the feed shaft; Fig. 6 is a sectional view showing the rear bearing; Fig. 7 is a section on the line *a*—*a*, Fig. 6; Figs. 8 and 9 are detail views showing the manner of supporting the rear grate.

Underfeed stokers of the type to which this invention belongs comprise a plurality of separated grate areas with fuel-delivering troughs between said areas, in which troughs feed screws operate for feeding coal from hoppers exterior to the furnace along the troughs and delivering the coal from the troughs onto the adjacent grate areas.

In the illustrated embodiment of the invention the boiler setting is shown at 1 and the grate areas are shown at 2, and the troughs which are situated between the grate areas are shown generally at 3. Each trough has situated within it a feed screw by which the coal is moved longitudinally thereof and delivered to the grate areas, the coal being fed to said troughs from hoppers 4 which are situated exterior to the boiler setting, it being understood that the troughs 3 extend through the front of the boiler beneath the hoppers.

In the operation of an underfeed stoker it is essential that the coal should be delivered to the grate areas in such a manner as to be spread evenly over the areas without piling up at either end thereof. In order to provide a feed screw which will thus operate to deliver the coal evenly to the grate areas, a feed screw is provided which has alternate bladed and plain sections, the bladed sections having blades of a progressively-decreasing pitch from the front to the rear of the grate. With this construction the coal will be fed rapidly from the hopper through the trough to the front of the grate, and the rate of feed will be gradually diminished as the coal moves toward the rear of the furnace, so that the coal will be evenly distributed over the entire extent of the grate areas.

In the preferred embodiment of the invention the screw comprises a shaft non-circular in cross-section extending longitudinally of each trough, and alternate plain and bladed sections mounted on the shaft. The non-circular shaft is shown at 5, and this extends longitudinally of the trough. The plain and bladed sections are shown at 6 and 7, respectively, each section being in the form of a sleeve slipped onto the shaft and provided with a non-circular opening which fits the shaft. Five bladed sections are herein shown on each shaft, the first bladed section extending through the bottom of the

hopper and up to the front end of the grate and the other bladed sections being within the troughs adjacent the grate areas. Each bladed section is provided with a spiral blade 8 and in the embodiment herein illustrated the pitch of the blades 8 varies from one end of the trough to the other although this is not essential. The pitch of the blade at the entering end of the trough is greatest and that at the rear end of the trough is least. The shafts 5 may be rotated by any suitable mechanism herein shown as a transverse driving shaft 9 which is provided with suitable clutch mechanism 10 by which each of the shafts 5 may be driven separately.

It will be noted that the first plain section 6 is located at the front end of the grate area, and during the operation of the device the coal will be fed longitudinally of the troughs until the first plain section 6 is reached when part of the coal will be forced up onto the adjacent grate areas, while the rest of the coal will be taken by the first bladed section 7 and advanced farther along the trough to the next plain section at which some of the coal will be thrown up onto the grate areas, and so on, the amount of coal which is fed forward by each bladed section being less than that fed by the preceding bladed section because of the progressively-decreasing pitch of the various bladed sections.

Each shaft 5 is supported at its rear end in a bearing which is so constructed as to facilitate the removal of the shaft from the bearing or the replacing of the shaft therein. The rear bearing is perhaps best seen in Fig. 6, from which it will be seen that the rear wall 11 of each trough 3 is provided with flanges 12 that surround an elongated opening 13 in which the bearing is received. The end of the shaft 5 is circular in cross section and fits into a bearing block 14 that loosely fits the aperture 13, the latter being non-circular in cross-section. The block 14 will preferably have more or less rounding sides so as to allow it to have a certain amount of play in the opening 13, but because of its non-circular shape it is prevented from rotating, and it forms a bearing for the rear end of the shaft 5. The rounded sides of the bearing block 14 give a certain amount of flexibility to the rear bearing this preventing any binding of the parts even if the shaft 5 becomes bent or sprung. This bearing block 14 is retained in place by a retaining member 15 herein shown as a plate that is secured to the rear wall of the trough by means of bolts 16, said plate having spacing lugs 17 extending therefrom which engage the end of the flange 12 and hold the plate separated slightly from the flange and also being provided with a central opening 18 in line with the shaft 5. This retaining plate 15 prevents the bearing 14 from being crowded out through the rear end of the opening 13, and the spacing lugs 17 hold said plate spaced from the rear wall so as to allow any coal which may get lodged in the opening 13, to readily work its way out through the rear end thereof. One advantage of this construction of bearing is that the shaft 5 can be readily removed even though said shaft becomes ground into the bearing block 14, for if this condition does arise then the block 14 will be drawn forwardly out of the aperture 13, as the shaft is removed.

It is also desirable to support each shaft 5 intermediate of its ends and the present invention provides means for doing this without introducing any material obstruction to the movement of the coal along the trough. This end is herein accomplished by the center bearing shown best in Fig. 5 which comprises a center bearing member 19 in which one of the plain sleeve sections 6 is journaled, said bearing being rigidly secured to the bottom of the trough by means of a screw or bolt 20. This center bearing 19 is spaced from the sides of the trough and is only connected therewith at the bottom, and thus affords no appreciable obstruction to the free movement of the coal along the trough.

The grate areas 2 are made up of separate grate sections which are constructed so that each can be readily removed or replaced in position without disturbing the others, and which are also so constructed that the grate may be readily dumped without breaking down the bed of coke which is formed on the top of the burning body of coal. The various grate sections are shown at 21 and each is formed with connected grate bars which provide between them suitable air spaces. In order to make these grate sections readily removable independently from each other, I propose to form each grate section at each side thereof with two arms 22 spaced from each other by the slot 23, and to provide the troughs 3 with trunnions 24 which enter the slots and about which the grate sections can rock. The grate is shaken by rocking the sections on their trunnions 24 and this is accomplished by a shaking bar 25 extending longitudinally of the grate and provided with pins or arms 26 that are received in the lower ends of the slots 23 between the arms 22, so that reciprocating movement of the bar 25 will rock the grates into the dotted line position Fig. 3. This bar is shown as supported on cross pieces 27 extending between the troughs. It will be seen that with this construction each grate section can be readily removed by simply lifting it off from its trunnion 24, and a new grate section can be as readily placed in position,

and these operations can be performed without disturbing any of the other grate sections.

The bar 25 is given its reciprocating movement from a rocker member 28 that is herein shown as pivoted at 30 to a bracket 33 secured to the furnace front 29. This rocker member is adjustably connected to the bar 25 through a link 31, said link being herein shown as having screw-threaded engagement with a connector 32 which hooks over the end arm 26 of the bar 25. The rocker member 28 is oscillated by means of a handle 34 which is detachably secured to said rocker member and can be removed when not in use. The rocker 28 is shown as closed at its upper side as at 64 but it is open at its lower side so that it will not become clogged with coal or dirt.

A suitable lock is provided for locking the rocker member from movement, which lock is normally operative, but is automatically disengaged or rendered inoperative when the handle 34 is connected to the rocker member. This lock is best shown in Fig. 3 and comprises a latch 35 pivoted to the rocker member at 36 and adapted normally to engage a hook 37 formed on the bracket 33. The latch is provided with a toe portion 38 which is engaged by the end of the handle 34 when the latter is inserted into the socket 39 of the rocker. When the handle is removed the latch 35 drops by gravity into locking engagement with the hook 37 and thus locks the bar 25 from movement. The insertion of the handle 34 into the socket 39, however, automatically disengages the latch, as shown in Fig. 3, thus allowing the bar 25 to be moved freely.

Fine soft coal is generally used in underfeed stokers of this type, and in order to avoid the presence of any spaces between the meeting ends of the individual grate sections 21 of sufficient size to allow the coal to sift through such spaces thereby becoming wasted, I propose to make each grate section with fingers which overlie the next adjacent grate section and thus close up the gap between the sections. These fingers are shown at 40 and they stand in line with the longitudinal ribs of the grate sections. Each grate section is also provided at its front end with a recess 41 to receive the fingers of the next adjacent grate, and when the grates are in normal position, therefore, the overlapping portions 40 and 41 close up the space between the grates so as to prevent the waste of coal at this point. The construction of these fingers 40 is such that the grate when in operative position has the appearance shown in Fig. 1.

At the rear end of the troughs is a transversely-extending grate section 42. This is sustained at its ends upon side rails 43 extending at each side of the fire box, and the construction is such that the rear grate section 42 can be readily removed by simply rocking it forwardly, but when it is in place it is held in proper position. The two side bars 43 are each formed with a seat portion 44 on which the ends of the rear grate section 42 rest. This seat portion is formed with the undercut portion 45 and the rear grate section 42 is formed at each end with a nose 46 to enter said undercut portion. Each grate section is also shown as having a depending lip 47 which overhangs the seat 44, as shown in Fig. 9, and locks the two parts from relative movement laterally of the fire box. The rear grate section can be removed by simply tipping it up at the back end so as to withdraw the nose 46 from the undercut portion 45.

From the above it will be seen that I have simplified the structure of underfeed stokers and have provided a device which can be readily assembled and set up in any boiler setting and in which the different parts can be readily removed independently if occasion arises.

While I have described in great particularity one embodiment of my invention I do not wish to be limited to the constructional features shown.

I claim:

1. In a stoker, the combination with separated grate areas, of coal-delivery troughs between said areas, a non-circular shaft extending longitudinally of each trough, a plurality of sleeves removably mounted thereon, each provided with a screw blade, and plain spacing members on said shaft interposed between said sleeves, the blades of said sleeves having a progressively-decreasing pitch from one end to the other of the shaft.

2. In a stoker, the combination with separated grate areas, of coal-delivery troughs between said areas, a shaft extending longitudinally of each trough, a plurality of sleeves on each shaft spaced from each other and provided with screw blades and removably mounted on the shaft, plain spacing members on said shafts interposed between said sleeves, and a center bearing for each shaft secured to the bottom of the trough and free and spaced therefrom at the sides whereby it forms no obstruction to the passage of the coal, said center bearing forming a plain spacing member.

3. In a stoker, the combination with separated grate areas, of troughs between said areas, each having a non-circular opening in its rear end, a screw feed shaft in each trough, and a rear bearing for each shaft loosely fitting the non-circular opening in the trough.

4. In a stoker, the combination with separated grate areas, of troughs between said areas, each having a non-circular opening in its rear end, a screw feed shaft in each

trough, a rear bearing for each shaft loosely fitting the non-circular opening in the trough, and a retaining plate secured to the rear end of the trough but spaced therefrom and preventing the bearing block from rearward movement.

5. In a grate structure, the combination with separated grate areas, of troughs between said areas, feed screws in said troughs for feeding coal to the grate areas, side members at each side of the grate structure, and a rear grate extending from one side member to the other, each side member having a seat and an undercut portion, and the rear grate resting on said seat and having a nose to enter the undercut portion.

6. In a stoker, the combination with separated grate areas, of coal delivery troughs between said areas, a non-circular shaft extending longitudinally of each trough, a plurality of sleeves removably mounted thereon, each provided with a screw blade, and plain spacing members on said shaft interposed between said sleeves, the blades of said sleeves having a progressively-decreasing pitch from one end to the other of the shaft, and a center bearing for each shaft secured to the bottom of the trough and free and spaced therefrom at the sides whereby it forms no obstruction to the passage of the coal, said bearing forming a plain spacing member.

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

GEORGE E. STEVENS.

Witnesses:
FRANK C. SMITH,
CLARENCE E. ALDERMAN.