No. 803,805.

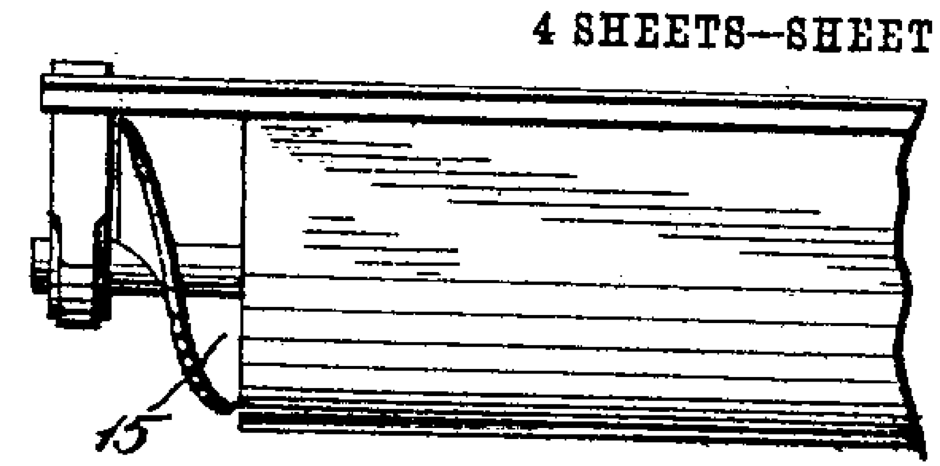
PATENTED NOV. 7, 1905.

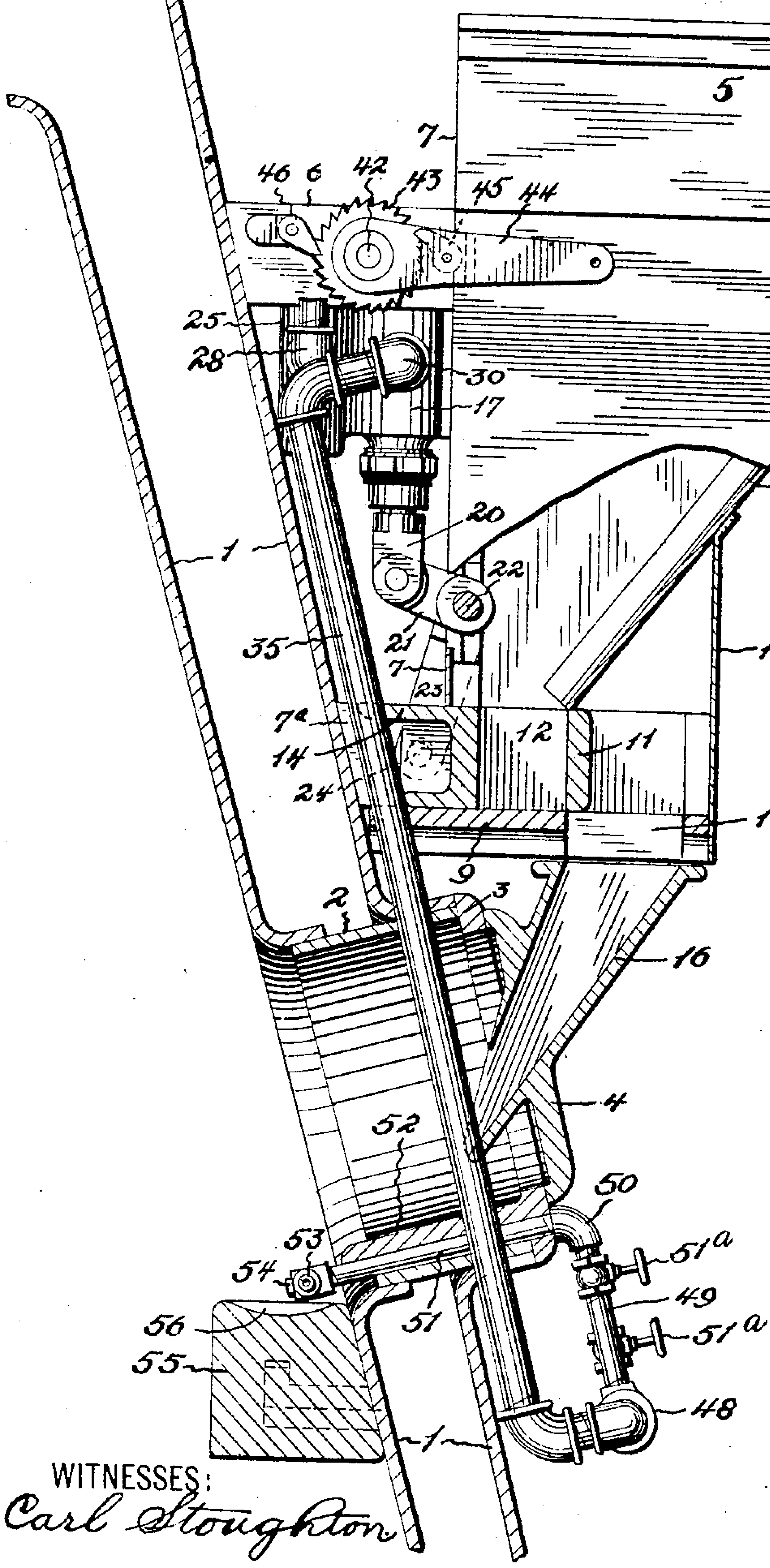
M. B. BREWSTER.

MECHANICAL STOKER.

APPLICATION FILED FEB. 20, 1905.

4 SHEETS—SHEET 1.





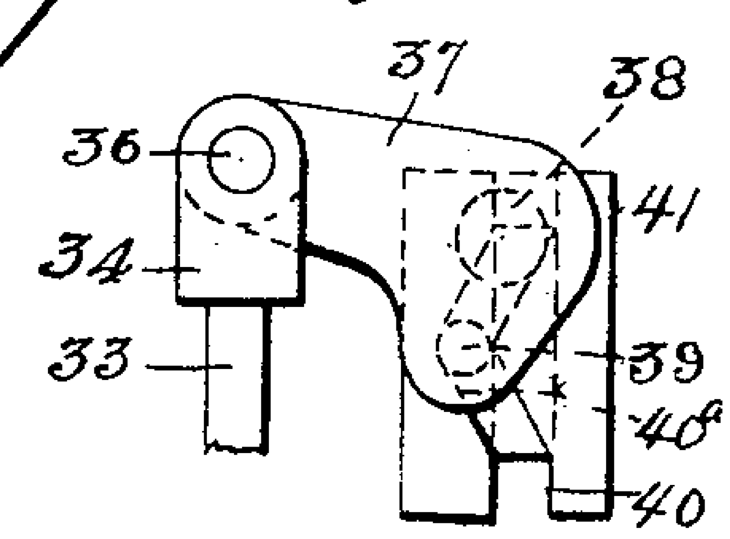


Fig. 11.

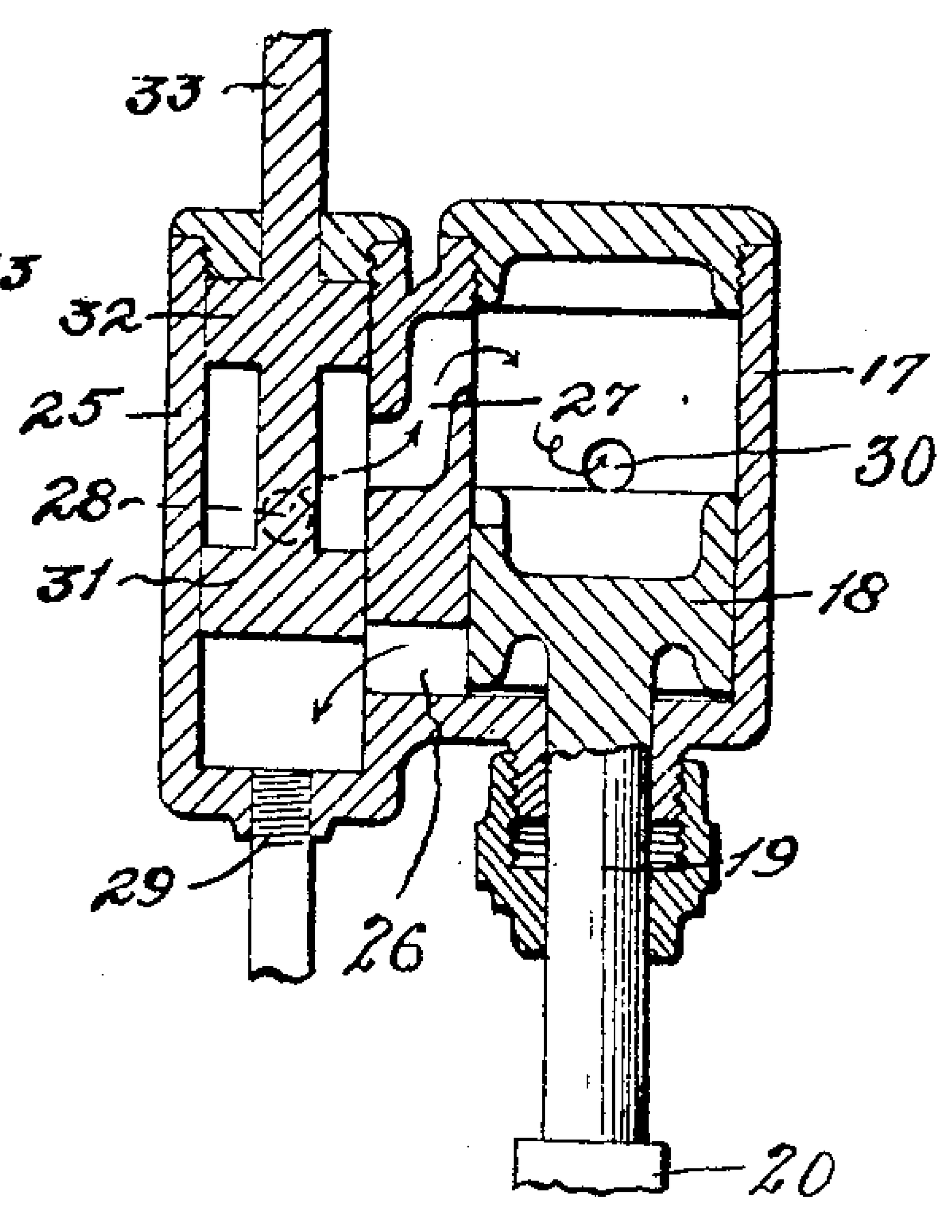


Fig. 10.

Fig. 1.

WITNESSES:

Carl Stoughton

M. V. Bochley

INVENTOR

Morris B. Brewster

BY

Shepherd & Parker

ATTORNEYS

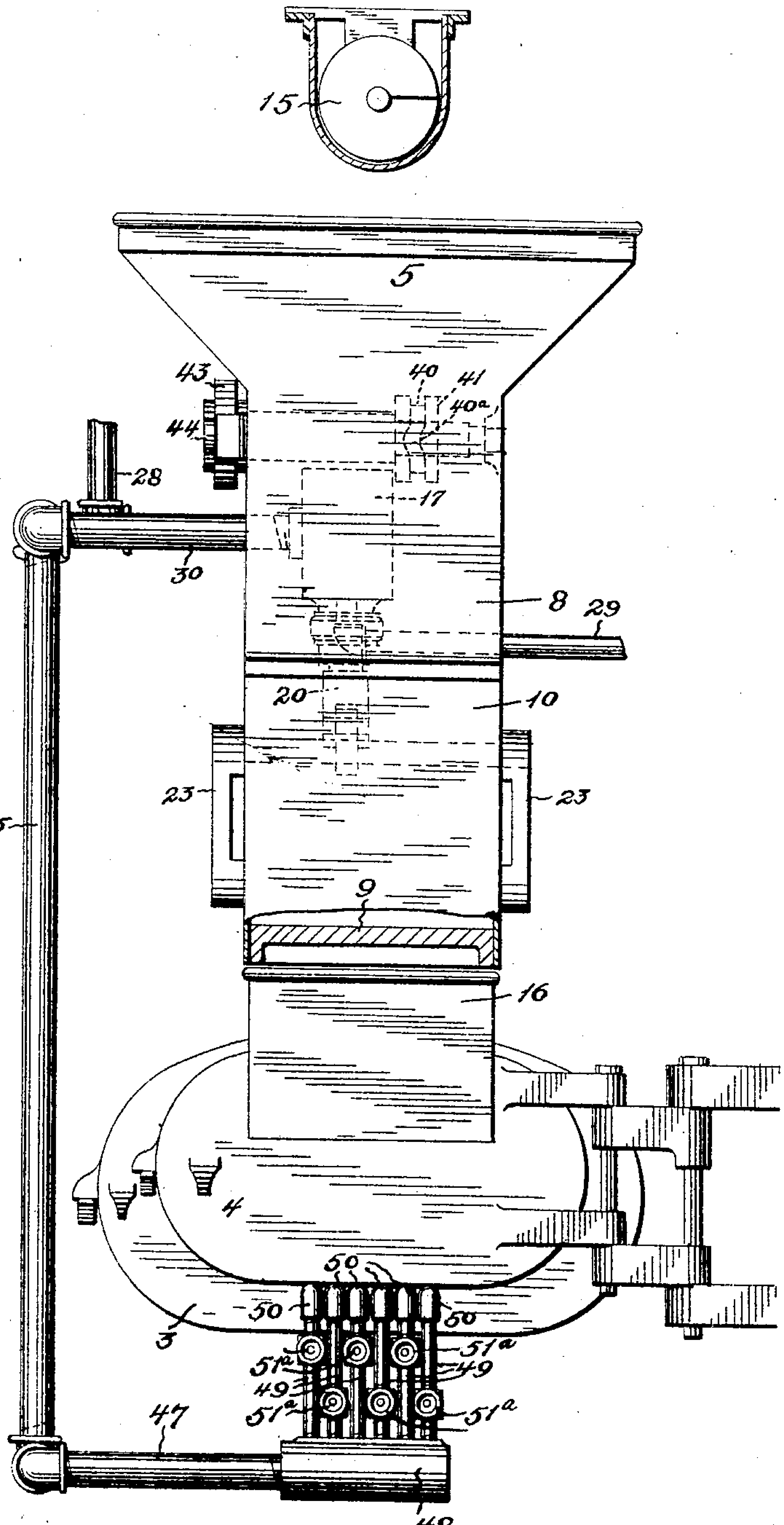
No. 803,805. PATENTED NOV. 7, 1905.

M. B. BREWSTER.

MECHANICAL STOKER.

APPLICATION FILED FEB. 20, 1905.

4 SHEETS—SHEET 2.



WITNESSES:

Carl Stoughton

M. W. Eahly

Fig. 2.

INVENTOR

Morris B. Brewster.

BY

Shepherd & Parker

ATTORNEYS

No. 803,805. PATENTED NOV. 7, 1905.

M. B. BREWSTER.

MECHANICAL STOKER.

APPLICATION FILED FEB. 20, 1905.

4 SHEETS—SHEET 3.

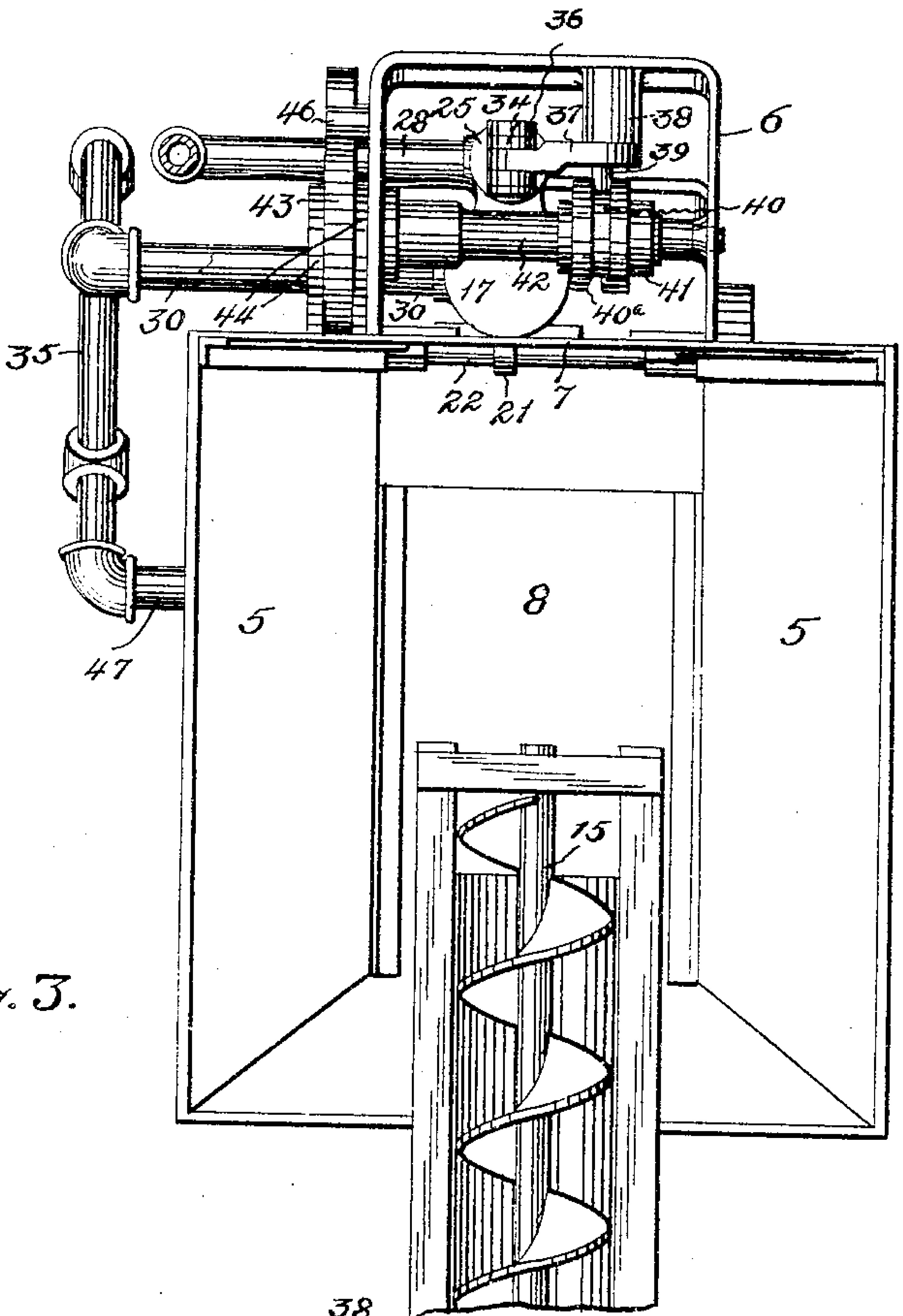


Fig. 3.

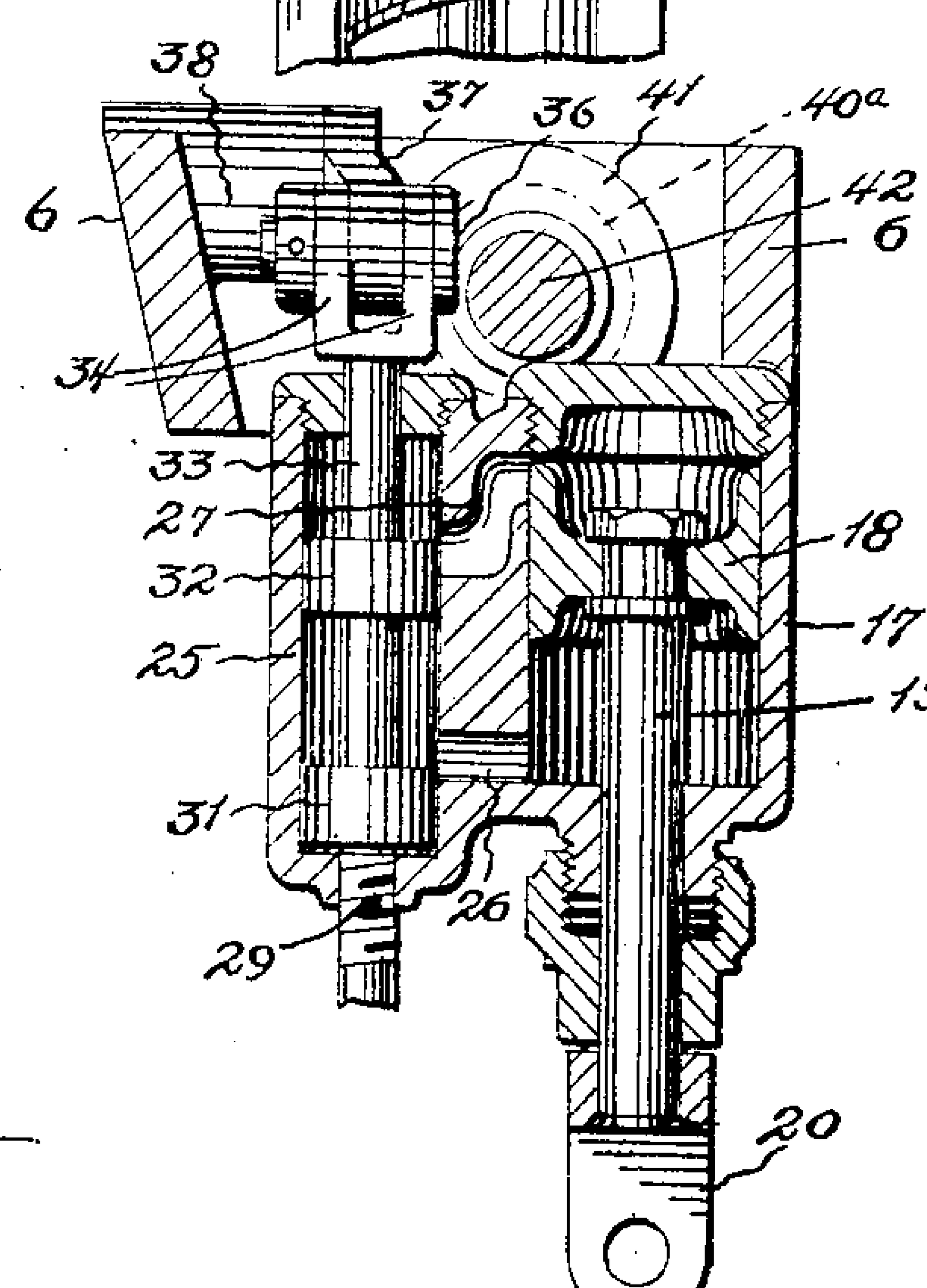


Fig. 4.

WITNESSES:

Carl Stoughton

W. V. B. Schley

INVENTOR

Morris B. Brewster

BY

Shepherd & Parker

ATTORNEYS

No. 803,805. PATENTED NOV. 7, 1905.

M. B. BREWSTER.

MECHANICAL STOKER.

APPLICATION FILED FEB. 20, 1905.

4 SHEETS—SHEET 4.

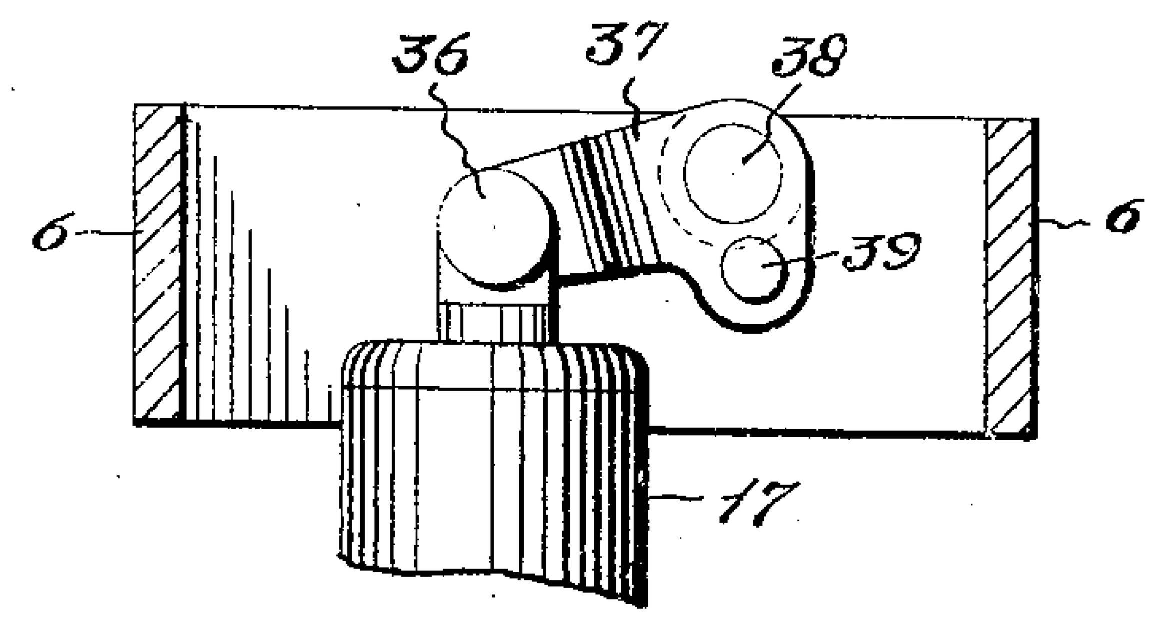


Fig. 5.

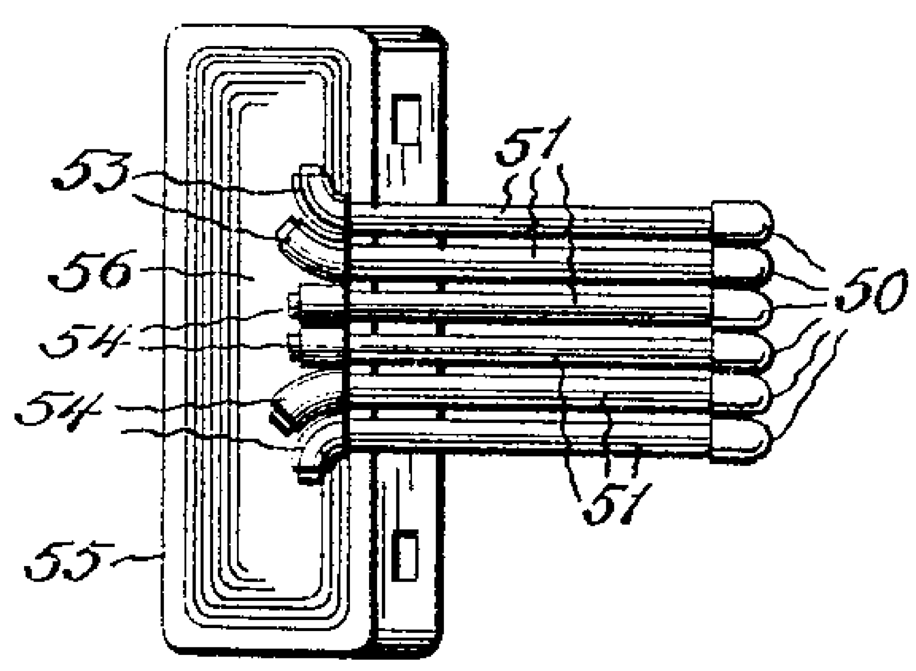


Fig. 6.

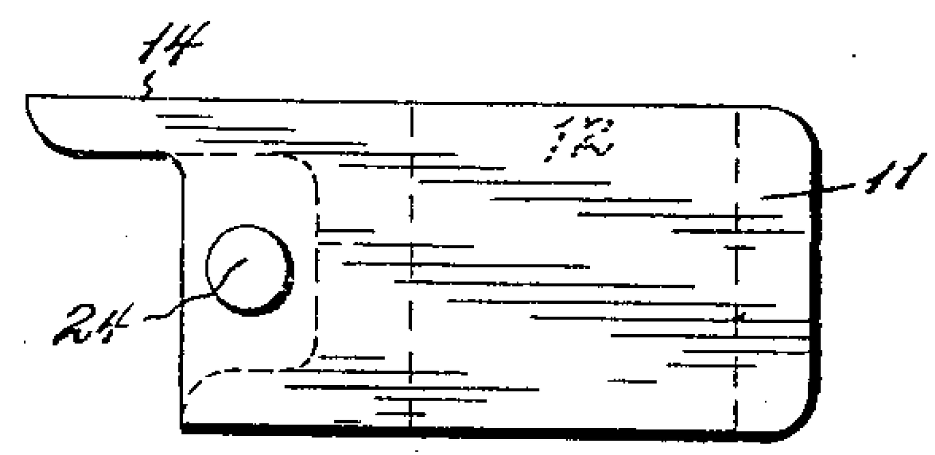


Fig. 7.

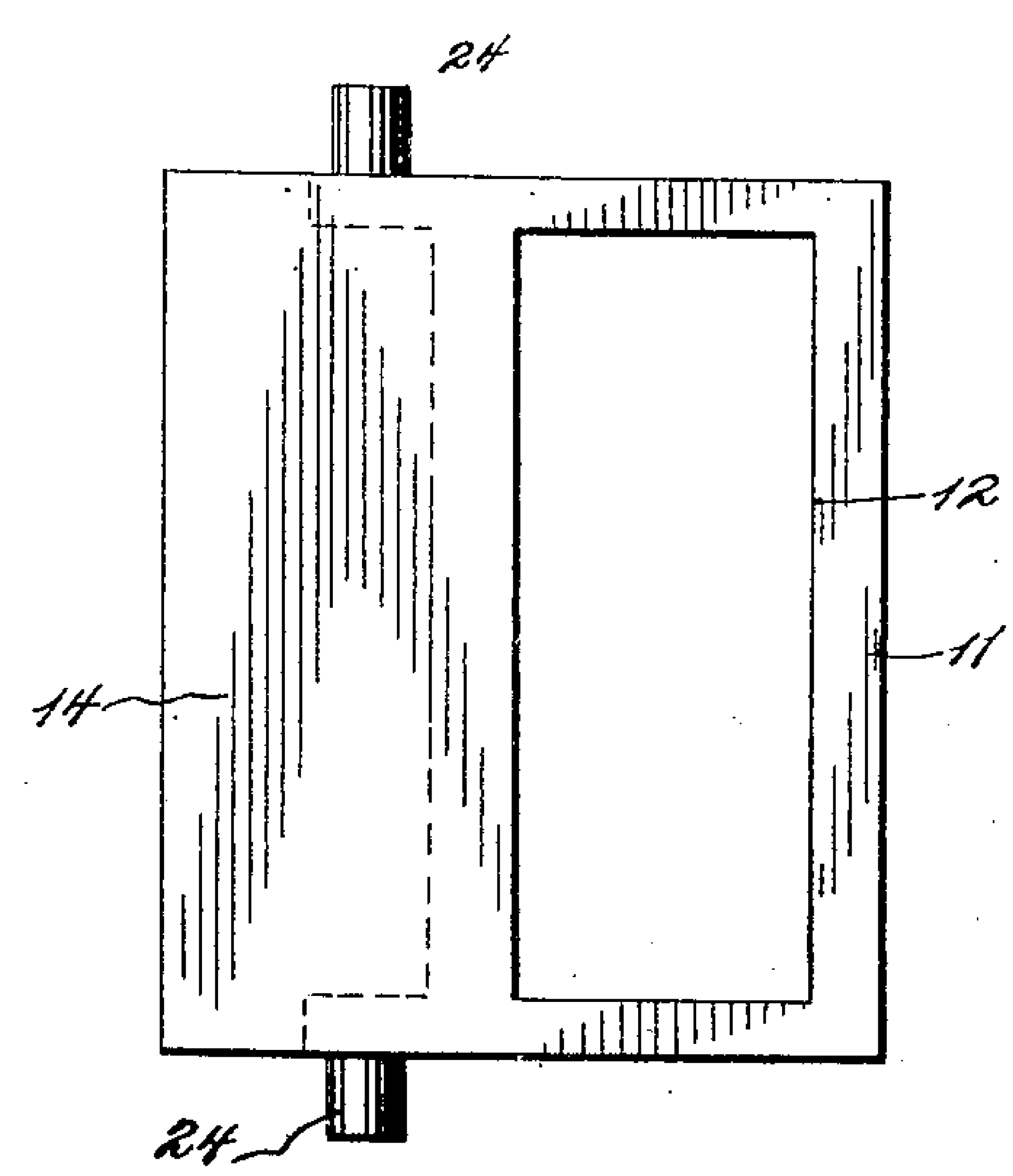


Fig. 8.

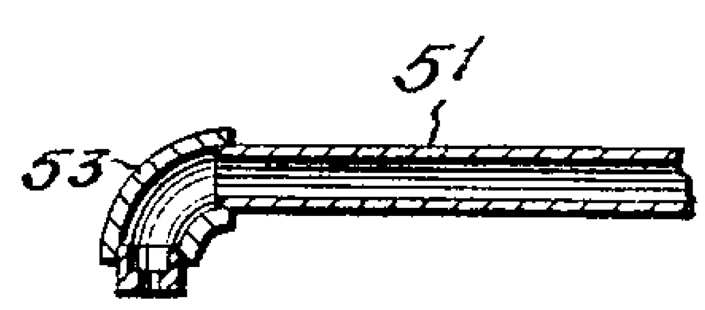


Fig. 9.

WITNESSES:

Carl Stoughton

M. B. Schley

INVENTOR

Morris B. Brewster.

BY Shepherd & Parker

ATTORNEYS

UNITED STATES PATENT OFFICE.

MORRIS B. BREWSTER, OF COLUMBUS, OHIO.

MECHANICAL STOKER.

No. 803,805. Specification of Letters Patent. Patented Nov. 7, 1905.

Application filed February 20, 1905. Serial No. 246,380.

To all whom it may concern:

Be it known that I, MORRIS B. BREWSTER, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Mechanical Stokers, of which the following is a specification.

My invention relates to a new and useful improvement in mechanical stokers.

The object of the invention is to provide an improved stoker employing means for intermittently delivering fuel to the furnace and to regulate the delivery of the fuel.

Another feature resides in means for spreading or distributing fuel evenly or unevenly, as may be desired, in the fire-box, said means being capable of variation at the will of the operator.

Finally, the object of the invention is to provide a device of the character described that will be strong, durable, and efficient, comparatively simple in its construction, and one in which the several parts will not be liable to get out of working order.

With the above and other objects in view the invention consists of the novel details of construction and operation, a preferable embodiment of which is described in the specification and illustrated in the accompanying drawings, wherein—

Figure 1 is a partial vertical sectional view of the front end of a furnace, showing my improved mechanical stoker arranged thereon, partly in side elevation and partly in vertical section. Fig. 2 is a front elevation of the stoker and its component parts, a portion being broken away to show a transverse vertical section of the bridge-plate, the ram-operating means and its controlling means being shown in dotted lines. Fig. 3 is a plan view of the stoker. Fig. 4 is a vertical sectional view of the steam-cylinder and its valve, illustrating a part of the valve-actuating mechanism in elevation, the supporting-frame and cam-shaft being shown in section. Fig. 5 is an elevation of the upper part of the steam-cylinder and the piston bell-crank, showing the supporting-frame in section. Fig. 6 is a plan view of the distributing-table and the jet-cluster. Fig. 7 is a side elevation of the ram. Fig. 8 is a plan view of the same. Fig. 9 is a longitudinal horizontal sectional view of one of the curved jets and its tube. Fig. 10 is a vertical sectional view of the steam-cylinder and its valve, illustrating the parts in position to deliver the fluid to the jet-cluster. Fig. 11 is a side elevation of valve-operating cam and bell-crank, showing the position they occupy when the valve is at the upper end of its stroke, as illustrated in Fig. 10.

In the drawings the numeral 1 designates the double-walled end of a furnace, which is generally arranged on an incline, as shown in Fig. 1. The furnace is provided with the usual fuel-opening, in which is arranged the lining 2 and which is closed at its outer end by double fire-doors 3 and 4, constructed and mounted in the usual way, so as to swing outward in a horizontal plane. Arranged above the fire-doors is a fuel hopper or compartment 5, supported from the wall 1 by a U-shaped frame 6 near its upper end and a bracket 7^a at its lower end. The hopper 5 is arranged with a vertical rear wall 7 and a downwardly-inclined front wall 8, which walls 7 and 8 terminate some distance above the bottom of the hopper or compartment, which is formed by the bridge-plate 9, extending some distance to the front and rear of the bottom end of the hopper. A jacket 10 extends from the forward end of the bridge-plate 9 upwardly, so as to inclose the lower portion of the hopper and keep out the cold air. Mounted to slide upon the bridge-plate 9 is a ram 11, which fills the space between the lower ends of the walls 7 and 8 and the said bridge-plate. The ram 11 is provided near its forward end with a rectangular opening 12, which normally stands under the lower open end of the hopper 5 between the plates 7 and 8, so that the fuel from the hopper will fall by gravity into the opening 12 and fill the same. The bridge-plate 9, lying beneath the opening 12, forms a bottom and retains the fuel in the opening of the ram. The bridge-plate 9 is formed with an opening 13 at its forward end and so disposed that upon moving the ram 11 forward the opening 12 will stand over the opening 13 and the fuel contained in said opening 12 will pass downward through the opening 13. The ram 11 is provided with a shelf 14, which extends rearwardly from the opening 12, so that when the ram is moved forward the shelf will shear across the lower ends of the plates 7 and 8 and close the lower end of the hopper while the charge of fuel delivered into the opening 12 is being emptied through the opening 13. Supported from and preferably formed integral with the small or outer fire-door 4 is an upwardly-flaring chute 16, having its upper end registering with the opening 13 and having its lower or converging end terminating within the furnace, so as to deliver the fuel which passes through the opening 13 within the lining 2, from which point it is passed to the fire-box. The chute 16 being supported by the door 4 will be swung outward therewith when the same is opened, thus moving the chute out of the way, as the same would act as an obstruction when it was desired to gain access to the interior of the furnace.

It is apparent that some means for delivering fuel to the compartment or hopper 5 must be provided, and in the drawings I have shown arranged centrally over the forward part of the said hopper the end of a conveyer 15, which will mechanically deposit fuel in the hopper. When my stoker is employed in connection with the furnace of a locomotive, for which it is more especially designed, it is essential that the fuel be delivered overhead to the hopper, and in this connection I employ a specially-arranged conveyer and elevator, which, however, form the subject-matter of a separate application bearing an even date herewith and will therefore not be described in detail in the present application.

For the purpose of operating the ram 11 and other purposes which will be hereinafter described I support upon the rear vertical wall 7 of the hopper 5 and to the rear of the said hopper a cylinder 17, arranged below the U-shaped frame 6. Within the cylinder is disposed a piston 18, from which projects downwardly a piston-rod 19, rigidly supporting upon its lower end a yoke 20, between the ends of which is pivotally supported a lever 21. The lever 21 projects through the vertical wall 7 and is keyed upon a transverse shaft 22, mounted within the hopper and adjacent the said vertical wall. The shaft 22 projects through and beyond the sides of the hopper and has keyed on its outer ends downwardly-extending arms 23, which pivotally engage with trunnions 24, projecting from each side of the ram 11. When the piston 18 is at the end of its upper stroke, and thus the yoke 20 at the end of its upward movement, as shown in Fig. 4, the lever 21 is moved upward and the arms 23 swung rearward, the ram 11 moves rearward or to its normal position, and the opening 12 is brought under the open end of the hopper or compartment, so as to be filled with fuel, as clearly illustrated in Fig. 1. Pressure being brought to bear upon the upper side of the piston 18, the latter is forced downward, carrying the yoke 20 also downward. As the yoke 20 moves downward it swings the lever 21 downward, which rocks the shaft 22 and causes the arms 23 to be swung forward, which in turn through their engagement with the trunnions 24 slide the ram forward, causing the table 14 to shear across the lower end of the hopper and support the fuel, while the opening 12 is brought over the opening 13 to allow the fuel contained therein to pass through the opening 13 into the chute 16 and from there to the fire-box. Pressure being now delivered to the under side of the piston 18, the same will be moved upward to the position shown in Fig. 4, causing the various parts to be moved back to their original and normal positions, as shown in Fig. 1.

For controlling the movement of the piston 18 I support from the cylinder, in the rear thereof, a piston-valve casing 25, which communicates with the cylinder 17 at its lower end by a straight port 26 and at its upper end by a curved port 27. A steam-supply pipe 28 enters the casing 25 about midway its height and at one side, as shown in Figs. 1 and 3. An exhaust-pipe 29 leads from the bottom of the casing 25, while an exhaust-pipe 30 for conveying exhaust and live steam leads from the side of the cylinder 17, about midway its height. Within the casing 25 I arrange a double piston-valve comprising the heads 31 and 32, connected by the valve-rod 33, which projects through the upper end of the casing 25 and terminates in an upwardly-extending yoke 34. The heads 31 and 32 are so disposed on the rod 33 that when the piston-valve is in its lowermost position, as shown in Fig. 4, the lower head 31 rests in the extreme lower end of the casing, while the upper head 32 stands opposite the curved port 27. From this it will be apparent that steam entering through the inlet-pipe 28 will be confined between the heads 31 and 32 and pass through the lower port 26 into the cylinder 17 and under the piston 18. When the piston-valve is raised, the lower head 31 is caused to stand in front of and close the lower port 26, while the upper head passes the port 27 and stands above the same, as clearly shown in Fig. 10, in which position the steam entering by the inlet 28 passes between the heads and through the port 27 into the cylinder 17 and bearing on the upper side of the piston 18 forces the same downward. It is apparent from this that whenever the piston-valve is moved a stroke will be imparted to the piston. As hereinbefore described, when the piston 18 is at the end of its upper stroke, as shown in Fig. 4, the ram will be in its normal or loading position and the piston-valve in its lowermost position. The piston-valve upon being slowly moved upward is brought into the position shown in Fig. 10, and as the upper head 32 passes the port 27 steam is admitted through the said port to the upper side of the piston 18 and the latter forced downward, the steam beneath the piston 18 passing out through the opening 26 to the exhaust 29 in the bottom of the valve-casing, as shown in the said Fig. 10. The forcing downward of the piston 18 causes the ram to be moved forward to its discharge position to allow the coal to pass through the opening 13. As the piston moves downward the exhaust 30 is gradually opened, thus allowing live and exhaust steam under pressure to pass out and into the vertical and downwardly-extending by-pipe 35 for the purpose hereinafter described.

From the foregoing it will be readily seen that the movement of the ram and the piston 18 is entirely controlled by the double piston-valve, and thus the frequency with which the ram is moved back and forth will depend entirely upon the speed of movement of the piston-valve. For operating the piston-valve I pivotally secure between the ends of the yoke 34, by means of a pin 36, the long arm of a bell-crank lever 37. The bell-crank 37 is pivotally supported upon a fixed stud 38, projecting inwardly from the rear portion of the supporting-frame 6. The bell-crank 37 has projecting inwardly from its short arm a pin 39, which projects into the groove 40 of a cam 41, keyed upon a transverse shaft 42, journaled in the frame 6, as shown in Fig. 3. The shaft 42 projects beyond the frame 6 at one side and has rigidly mounted thereon a ratchet-wheel 43, adapted to turn with the shaft and to impart motion thereto. Referring again to the cam 41, the groove 40 is provided with an offset 42^a, as best shown in dotted lines in Fig. 2. It is apparent that owing to the fact that the groove 40 extends around the cam 41 at right angles to the shaft 42 except at 40^a, which shaft is placed parallel with the plane of the bell-crank 37 and with the pin 39, projecting into the groove 40, the bell-crank will not be moved except when the pin encounters the offset 40^a. From this it will be seen that the cam 41 will revolve substantially three-quarters of a revolution without affecting the bell-crank. When the pin 39 encounters the offset 40^a, it is carried to the left with reference to Figs. 2, 3, and 11, thus swinging the bell-crank to the left and through its pivotal connection raising the valve-rod 33 upward, and when the said pin reaches the deepest portion of the offset, as indicated in Fig. 11, the piston-valve will be raised to the highest point of its upward stroke and steam admitted to the upper side of the piston 18. The continued movement of the cam 40 causes the pin to ride out of the offset 40^a, thus swinging the bell-crank 37 back to the right and lowering the piston-valve until it reaches the end of its lowermost movement, when the pin 39 will again travel in the groove 40. In accordance with the above it is obvious that as the pin 39 first enters the offset 40^a the piston-valve and the piston 18 are in the positions shown in Fig. 4, and thus the ram 11 in its normal or loading position, as shown in Fig. 1, and as the pin 39 passes along the offset the double piston-valve is raised, the piston 18 forced downward, and the ram moved forward to discharge its contents. Then as the pin passes out of the deepest portion of the offset the piston-valve is again lowered and the piston-head raised, thereby returning the ram to its normal position to be again filled. By so proportioning the movement of the parts the ram is given the time required by the cam 41 to revolve three-quarters of a revolution, in which to fill or load, and during the remaining quarter of the revolution of the cam the ram is moved forward, discharged, and returned to its normal or filling position. The rapidity with which the shaft 42 and the cam 41 are revolved govern the frequency with which the ram is moved back and forth, and thus the feeding of the fuel to the furnace may be regulated. By changing the shape of the offset 40^a the movement of the ram may be varied. Motion may be imparted to the ratchet-wheel 43 to revolve the shaft 42 by various means; but I prefer to loosely support upon the outer end of the shaft 42 adjacent the ratchet-wheel 43 a lever 44, connected at its outer end to a suitable motor or other operating means (not shown) and carrying upon its inner side an actuating-pawl 45, adapted to engage the teeth of the ratchet-wheel and turn the same rearwardly when the lever is moved upward. In the rear of the ratchet-wheel I pivotally mount upon the outer side of the frame 6 an ordinary retaining-pawl 46, which engages with the ratchet-wheel 43 to prevent the same from turning backward when the lever 44 is moved downward and the pawl 45 slipped over the teeth of the said wheel. The movement of the lever 44 and the rapidity with which it is moved will control the speed at which the shaft 42 is revolved, and thus the stoker may be regulated from this point.

The by-pipe 35, hereinbefore referred to as leading from the exhaust 30, extends downwardly some distance below the fire-doors, at which point it is suitably connected to a horizontal branch pipe 47, terminating in a cylindrical manifold 48, which is arranged centrally under the fire-doors. A number of short pipes 49 extend upwardly from the manifold 48 to elbows 50. A globe-valve 51^a is arranged in each of the pipes 49, so that the passage of the fluid or steam from the manifold 48 may be regulated. The vertical pipes 49 are of such length as to cause the elbows 50 to stand immediately beneath the small fire-door 4, while tubes 51, projecting through the fire-door 3, are engaged with the elbows 50. The tubes 51 extend along the lining 2 and are incased in a suitable protecting-covering 52, such as fire-clay or the like. The tubes 51 project into the fire-box beyond the lining 2 and carry on their inner ends jets 53 and 54, arranged in a cluster, as shown in Fig. 6. Immediately beneath the jets and the inner ends of the tubes 51 is supported a distributing-table 55, composed of fire-clay and suitably fastened to the inner side of the double wall 1. The distributing-table 55 is preferably substantially rectangular in shape, as shown in Fig. 6, and has formed in its upper surface the dished or concaved portion 56, over which dished portion the jets project. The jets 53 are curved, so as to direct the steam or fluid conveyed to them through the tubes 51 toward the ends of the dished portion 56, while the jets 54 are straight and are designed to direct the steam or fluid upon the central part of the dished portion 56. The function of the jets is to distribute the coal, which, being delivered into the lining from the chute 16, falls onto the table 55 and into its dished portion 56. The jets being disposed as described will direct the steam or fluid upon the coal, so as to blow it off the table into the fire-box, and in this way evenly or unevenly spread the coal, as may be desired, it being understood that by manipulating the globe-valves 51^a the force of the fluid or steam ejected from any one of the jets may be regulated, and in this manner the spreading of the fuel may be varied at will. It is to be observed that by means of the jets 53 and 54 the fuel may be distributed to any or all points of the fire-box and especially into the corners thereof. It is often the case that the fire burns better in one part of the fire-box than in another, thus requiring more fuel at that point. Operators of mechanical stokers have heretofore experienced no little difficulty in unevenly distributing the fuel, which must be done when the above-mentioned peculiarity is encountered. By means of my jet-cluster and the globe-valves 51^a the force of the fluid ejected from the jets may be so finely regulated or adjusted that the desired amount of coal may be placed at any point within the fire-box and the fuel distributed in such a manner as to keep the fire-bed at all times incandescent.

It will be observed that it will not be necessary or desirable to have the steam or fluid continuously ejected from the jets and that the pressure will only be desired when the ram 11 is moved forward, so as to cause its opening 12 to stand over the opening 13 and deposit its charge of coal into the chute 16, from which point the coal passes down onto the table 55. When the coal has been blown off the table, it is desirable to cut off the spray of steam or fluid from the jets. By referring to Fig. 10 it will be apparent that the exhaust 30 is open to the by-pipe 35 only when the piston 18 is at the lower end of its downstroke, in which position the ram is discharging its charge, and it is also apparent from the foregoing description that the exhaust 30 is open only during a fraction of the revolution of the cam 41 or at the time the pin 39 is passing in and out of the deepest portion of the offset 40^a. (See Fig. 11.) Therefore it will be apparent that during the greater portion of the revolution of the cam 41 the opening 12 of the ram 11 is allowed to fill or load, and the fluid or steam is cut off from the exhaust 30 and the by-pipe 35, and therefore from the jet-cluster; but upon the raising of the double piston-valve and the steam entering through the inlet 28, passing through the port 27 to the upper side of the piston 18, the latter is moved downward, throwing the ram 11 forward to discharge its load and allowing the steam or fluid under pressure to exhaust or pass out through the exhaust 30 into the pipe 35 to the manifold 48, from which it will be distributed by means of the vertical pipes 49 and tubes 51 to the jets. Discharged from the jets the fluid or steam will spread or distribute the fuel delivered on the table 55 through the chute 16, and the fluid will continue to spray from the jets until the double piston-valve is forced downward and the piston 18 raised and the ram returned to its normal position.

In view of the fact that the coal piles down upon the table, by changing the position or inclination of the jets the scattering or spreading of the coal may be varied.

I do not wish to limit myself to the exact details of construction and operation herein described, as I may make various changes in the same wholly within the scope of the claims without departing from the spirit of the invention.

Having now fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a mechanical stoker, a combustion-chamber, fuel-receiving means located within said chamber, and means for distributing fuel from said receiving means, said distributing means being located within the combustion-chamber and adapted to throw fuel to all parts of the fuel-bed of the said chamber.

2. In a mechanical stoker, a combustion-chamber, fuel-receiving means located within the said chamber, means for distributing fuel from the said receiving means, said distributing means being located within the combustion-chamber and adapted to throw fuel to all parts of the fuel-bed of said chamber and means for regulating the distribution of fuel to any part of the said fuel-bed.

3. In a mechanical stoker, a combustion-chamber, fuel-receiving means located within the said chamber and a cluster of differently-directed fluid-pressure jets located within the combustion-chamber and adapted to throw fuel to all parts of the fuel-bed of the said chamber.

4. In a mechanical stoker, a combustion-chamber, a fuel-receiving table located within the said chamber, means for conveying fuel to the said table and fluid-pressure means located within the combustion-chamber and adapted to throw fuel to all parts of the fuel-bed of the said chamber.

5. In a mechanical stoker, a combustion-chamber, fuel-receiving means located within the said chamber, means for feeding fuel to the said fuel-receiving means and fluid-pres-

sure means located within the combustion-chamber and adapted to throw fuel to all parts of the fuel-bed of the said chamber, the said fluid-pressure means being controlled by the operation of the said feeding means.

6. In a mechanical stoker, a combustion-chamber, fluid-pressure means for distributing fuel therein, means for delivering fuel to said fuel-distributing means, means for controlling the delivery of fuel to the fuel-distributing means, and fluid-pressure means for operating said controlling means, adapted to supply fluid to the fluid-pressure-distributing means.

7. In a mechanical stoker, a combustion-chamber, fuel-receiving means, fluid-pressure means for distributing fuel from said receiving means, means for feeding fuel to said fuel-receiving means, and fluid-operated means for operating the said feeding means, said fluid-operated means being adapted to supply fluid intermittently to the fluid-pressure fuel-distributing means.

8. In a mechanical stoker, the combination with a furnace, of a fuel-containing compartment, a fuel-distributing device, a ram for delivering fuel from the compartment to the distributing device, and a fluid-operated device connected with the ram for operating the same and adapted to supply fluid to the distributing device at intervals.

9. In a mechanical stoker, the combination with a furnace, of a fuel-containing compartment, a fuel-distributing device, a ram for delivering fuel from the compartment to the distributing device, a fluid-operated device connected to the ram for operating the same and adapted to supply fluid to the distributing device at intervals, and means for controlling the operation of the said fluid-operated device.

10. In a mechanical stoker, the combination with a furnace, of a fuel-containing compartment, a fuel-distributing device, means for feeding fuel from the compartment to the distributing device, a fluid-operated device connected to the feeding means for operating the same and adapted to supply fluid to the distributing device at intervals, and means for controlling the supply of fluid to the said last-named device.

11. In a mechanical stoker, the combination with a furnace, of a fuel-containing compartment, a fuel-distributing device, means for conveying fuel from the compartment to the distributing device, and a fluid-operated device connected with the fuel-conveying means for operating the same and adapted to supply fluid to the distributing device at intervals.

12. In a mechanical stoker, the combination with a furnace, of a fuel-containing compartment, a fuel-distributing device, means for conveying fuel from the compartment to the distributing device, a fluid-operated device connected with the fuel-conveying means for operating the same and adapted to supply fluid to the distributing device at intervals, and means for controlling the operation of the said fluid-operated device.

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

MORRIS B. BREWSTER.

Witnesses:

A. L. PHELPS,

M. B. SCHLEY.