No. 879,682. PATENTED FEB. 18, 1908.

A. R. SELDEN.

MECHANICAL STOKER.

APPLICATION FILED OCT. 2, 1905.

5 SHEETS—SHEET 1.

FIG. 1.

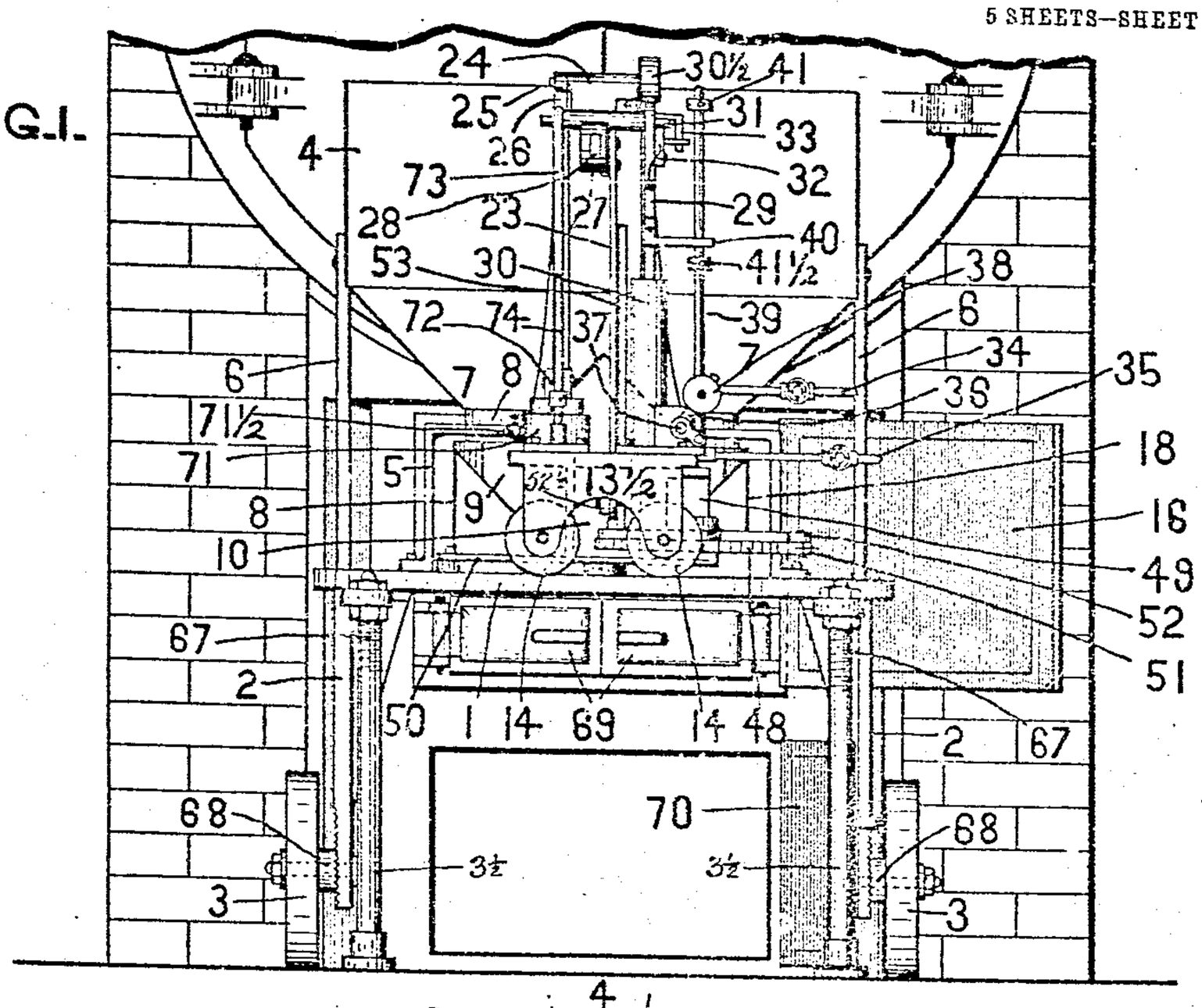

FIG. 2.

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5 SHEETS—SHEET 2.

FIG. 3.

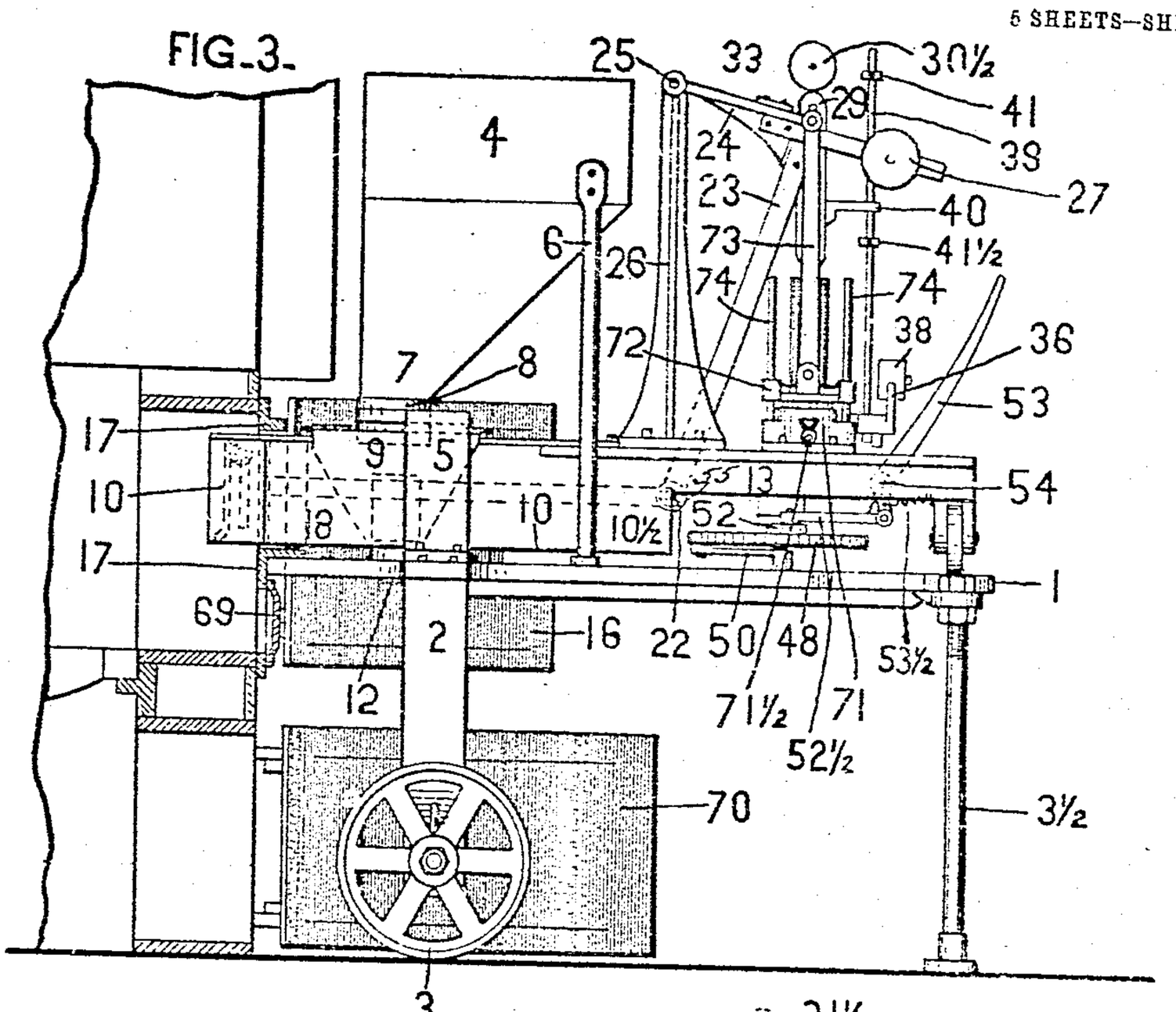
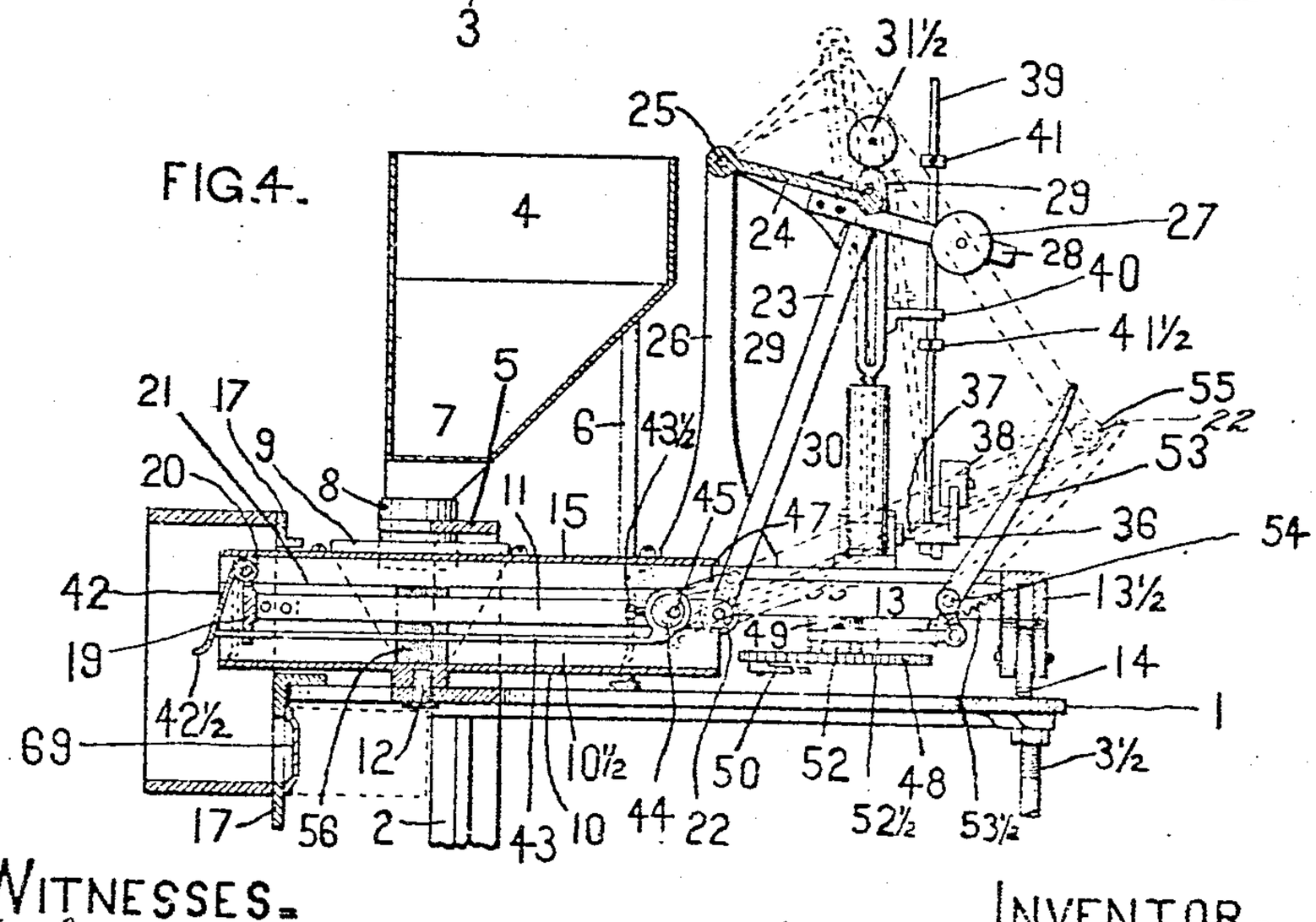


FIG. 4.



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5 SHEETS—SHEET 3.

FIG. 5.

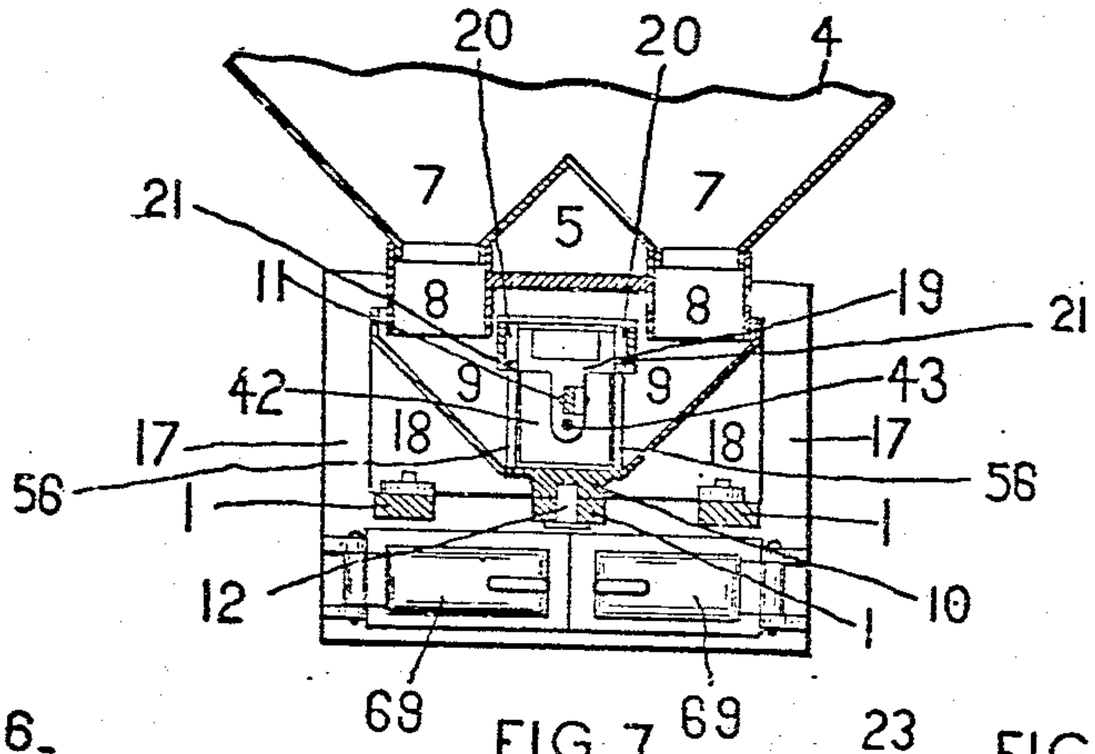


FIG. 6.

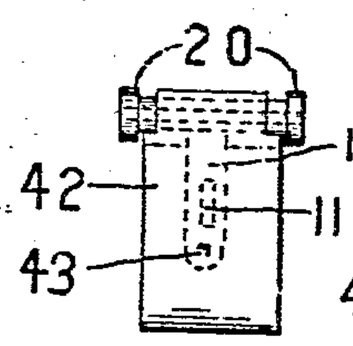


FIG. 7.

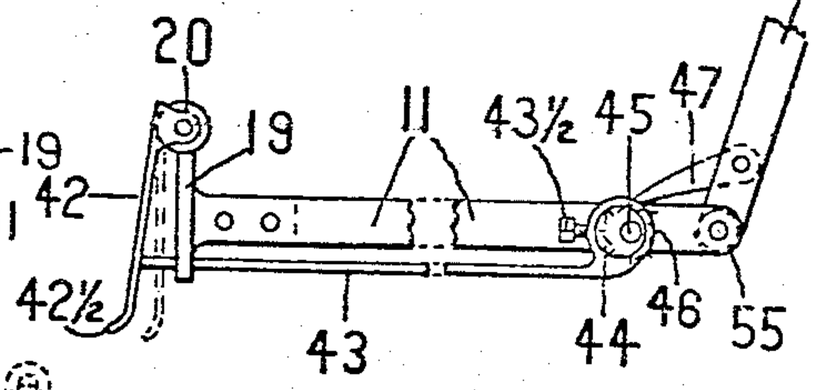


FIG. 8.

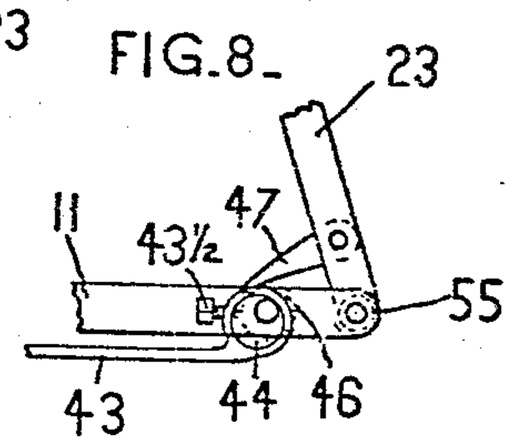


FIG. 9.

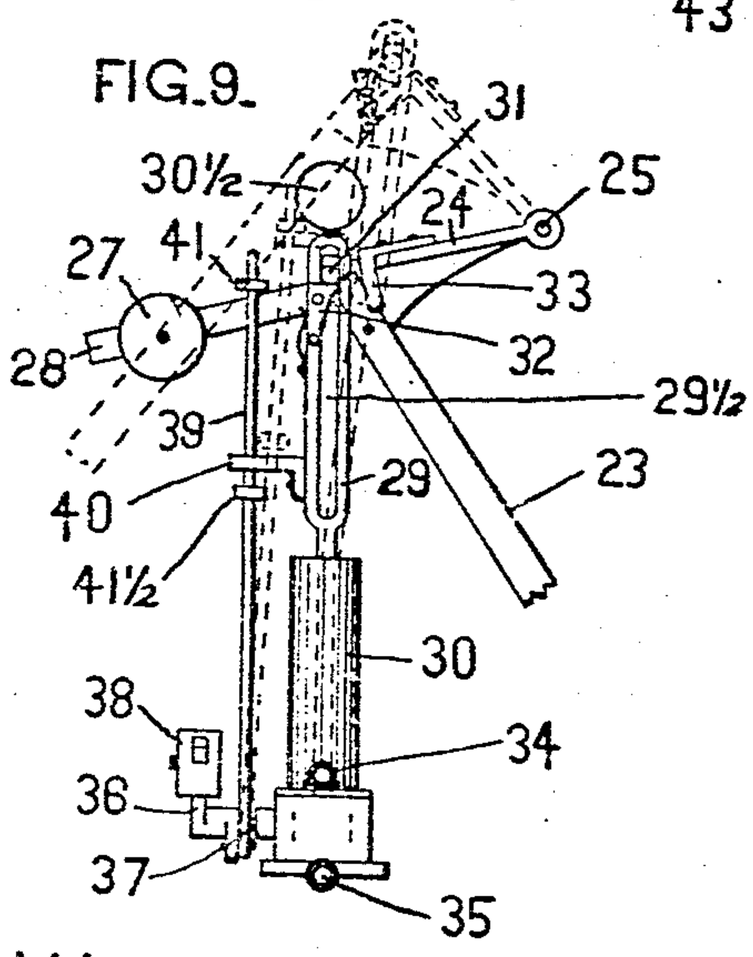
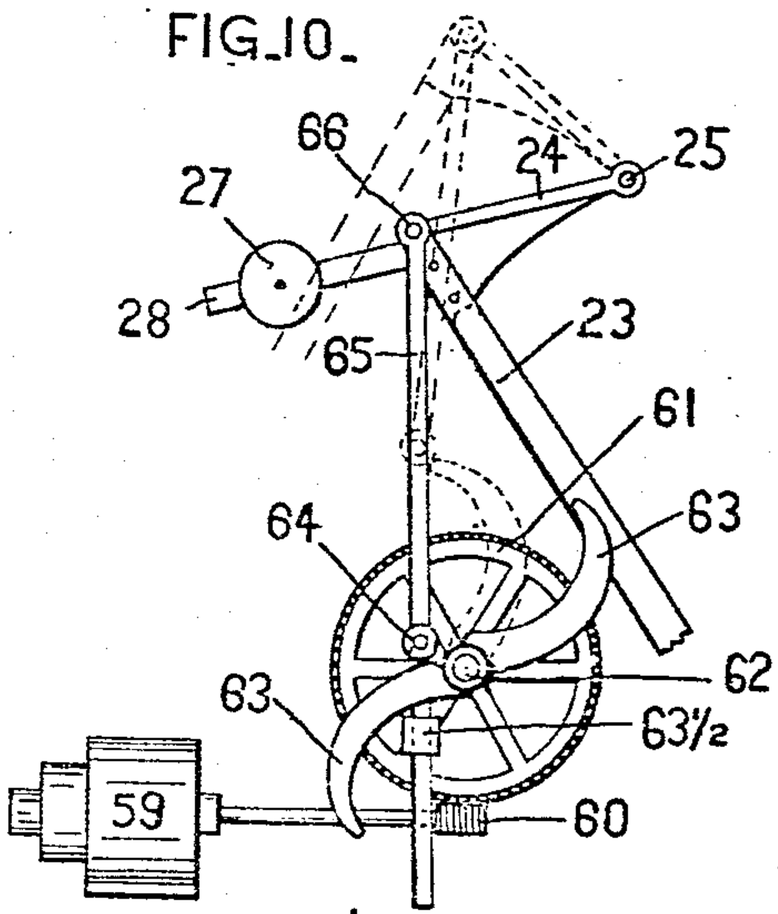


FIG. 10.



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MECHANICAL STOKER.

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5 SHEETS—SHEET 4.

FIG. 11.

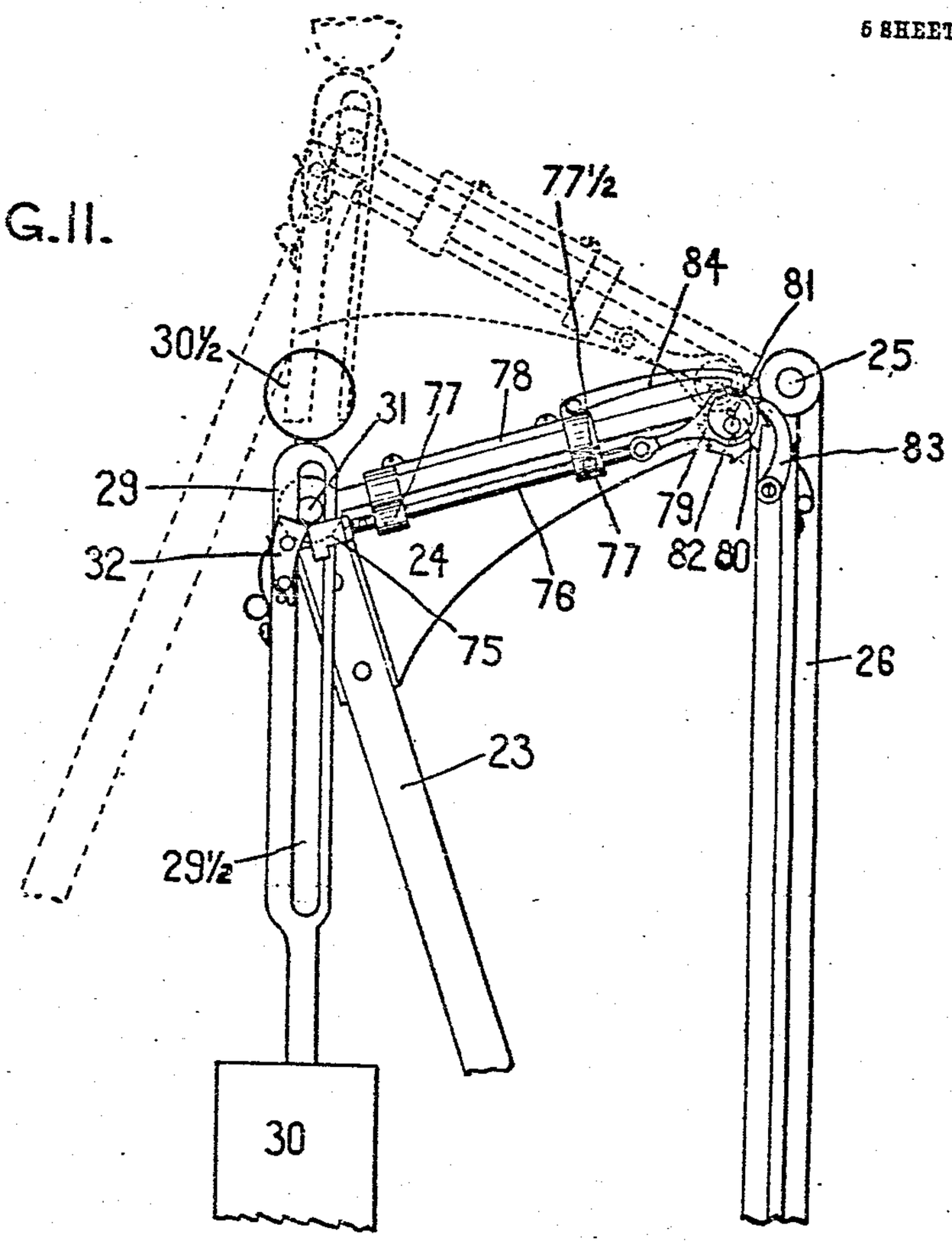
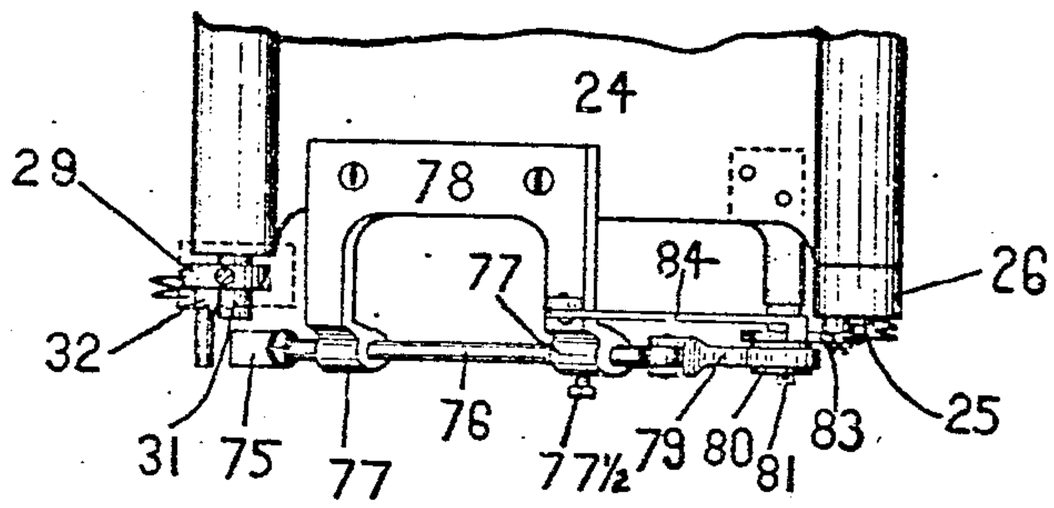


FIG. 12.



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APPLICATION FILED OCT. 2, 1905.

5 SHEETS—SHEET 5.

FIG. 13.

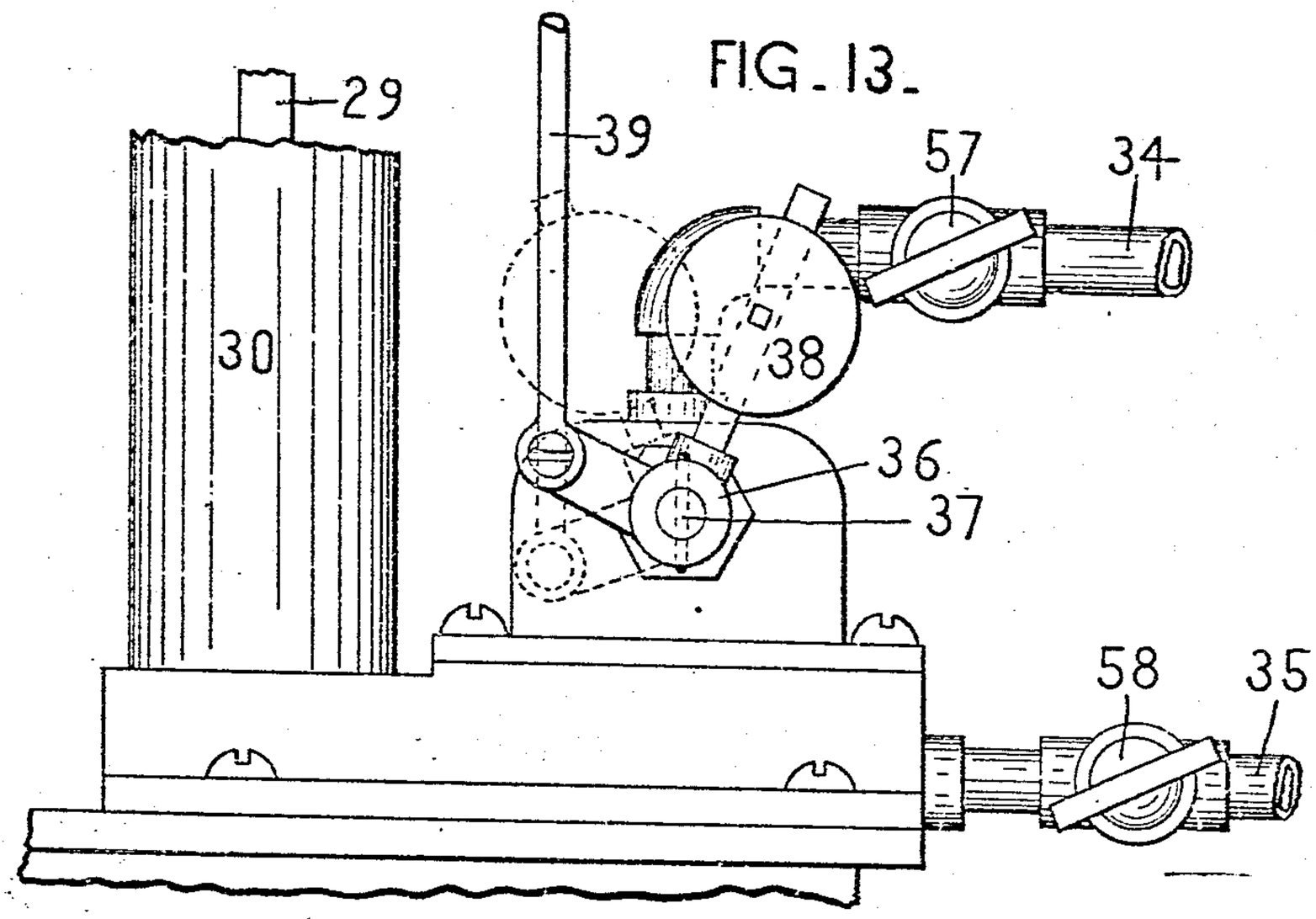
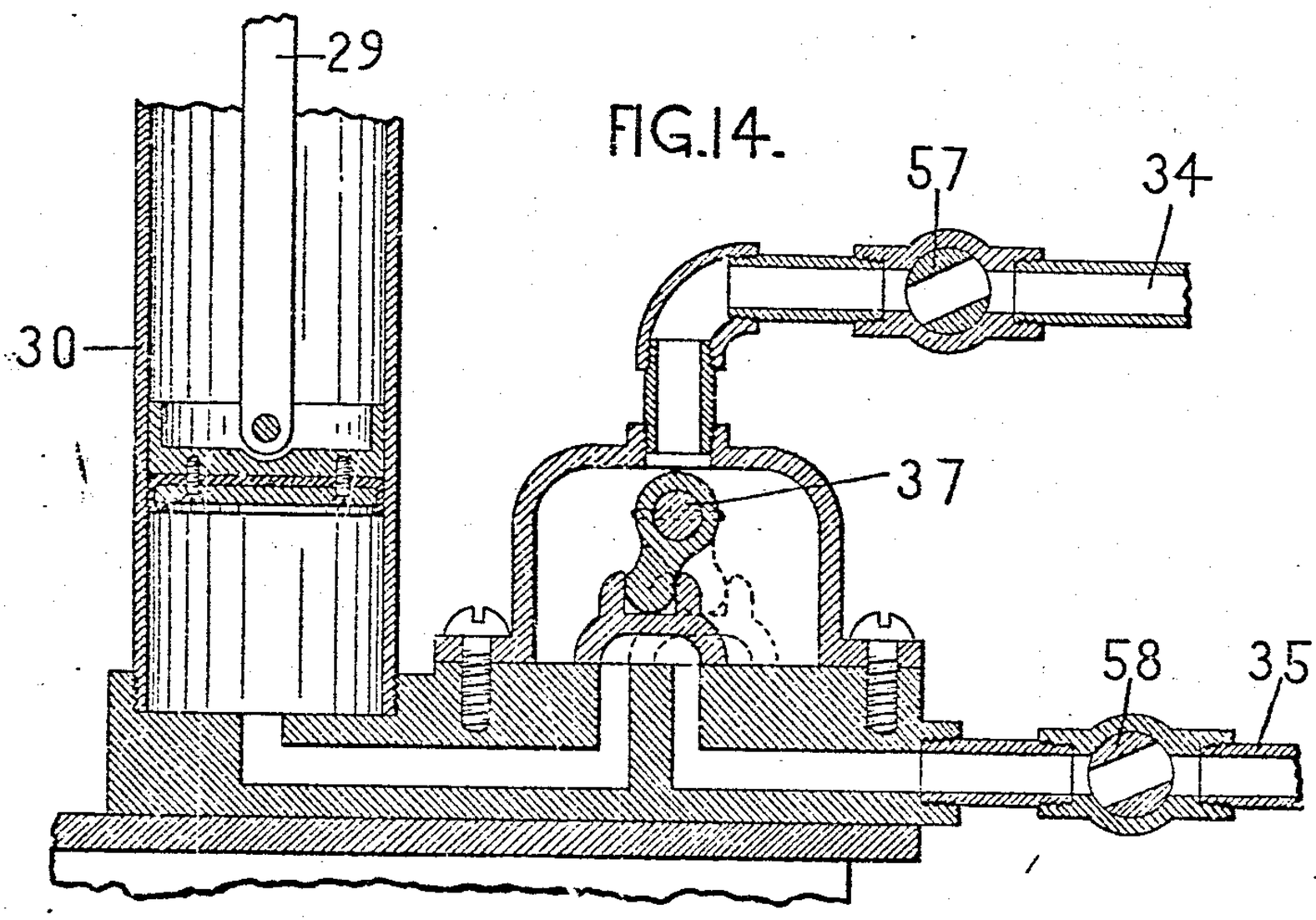


FIG. 14.



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UNITED STATES PATENT OFFICE.

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MECHANICAL STOKER.

No. 879,682. Specification of Letters Patent. Patented Feb. 18, 1908.

Application filed October 2, 1905. Serial No. 280,885.

To all whom it may concern:

Be it known that I, ARTHUR R. SELDEN, a citizen of the United States, and resident of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Mechanical Stokers, of which the following is a specification.

This invention relates to mechanical stokers, and has for its object to provide a machine that is complete in itself so that it is not necessary to change or adapt furnaces to it.

Other objects of the invention are to avoid waste of fuel in the form of smoke by feeding the fuel in small quantities, and scattering it evenly over the grates in thin layers, in the manner in which it would be laid on the grates by the hand of a skilful stoker, and to make it possible to use with good results fine coal of a cheap grade that cannot be used under ordinary conditions.

Still other advantages will be pointed out in the course of the specification.

In the drawings:—Figure 1 shows an end view of the stoker in position before a boiler; Fig. 2 is a top view of the same showing the hopper in dotted lines; Fig. 3 is a side view of the same; Fig. 4 is a vertical section on the line 4—4 of Fig. 2; Fig. 5 is a section on the line 5—5 of Fig. 2; Fig. 6 is a front view of the parts that throw the fuel into the furnace; Fig. 7 is a side view of the same parts; Fig. 8 shows in another position some of the parts shown in Fig. 7; Fig. 9 shows the means for operating and controlling the said projector; Fig. 10 shows another device for operating the said projector; Fig. 11 shows in elevation the means for operating said projector, with means for automatically changing the stroke; Fig. 12 is a top view of the parts shown in Fig. 11; Fig. 13 shows another view of part of the means for operating the projector shown in Fig. 9; and Fig. 14 shows the same in section.

The operating parts of the stoker are secured upon the platform 1 of a truck 2, whose forward end is placed upon wheels 3, 3, and its rear end supported by standards $3\frac{1}{2}$, $3\frac{1}{2}$, so that it can be moved readily into position before the furnace (see Fig. 3).

4 is a hopper which is supported at its forward end above the truck by the bracket 5, and, at its rear end, by posts 6, 6, one on each side.

The hopper is arched at its center so that it forms two separate chutes 7, 7. These chutes lie, respectively, within spouts 8, 8 (see Fig. 5) upon the bracket 5, the upper edges of the spouts supporting the forward end of the hopper.

The fuel is discharged from the spouts 8, 8 into a lower chute 9 (see Fig. 5), and the latter is attached to a trough 10 through which the plunger, or projector, 11 reciprocates to convey fuel to the grates. The forward end of the trough 10 is pivotally supported upon the truck at 12 to swing horizontally, and at its rear end is extended back in the form of a frame 13 that is supported upon a carriage $13\frac{1}{2}$, the wheels 14, 14 of the latter being adapted to roll upon the table 1, as the trough 10 is swung from side to side in the manner to be described.

The trough 10 is provided with a removable lid 15 above the projector 11, whereby access is had to the parts contained within it.

When the machine is in position before a furnace, as shown in the drawings, the door 16 that opens into the fire box is thrown open and back against the furnace wall, and the end of the trough is inserted into the doorway. In order to close the doorway around the trough, plates 17, 17 (see Fig. 2) are fastened upon the platform 1. These overlap the frame of the door and extend inwardly toward the trough 10, meeting, respectively, shields 18, 18 that are attached to and extend out from the trough 10. The shields 18, 18 are represented as bent into the arc of a circle that will cause them to lie close to the plates 17, 17, respectively, while the trough 10 is turned upon its pivot 12. The head 19 of the projector 11 carries the rollers 20, 20 by which it is supported upon horizontal guides 21, 21 that lie beneath the cover 15.

The outer end of the projector 11 is pivotally attached at 22 to one end of a lever 23. A bracket 24 is rigidly secured to the other end of this lever 23, and that is pivoted by the rod 25 between posts 26, 26 that stand upon the trough 10.

The lever 23 and bracket 24, falling by gravity, force by their weight the projector 11 inwardly to make its forward stroke, after the projector 11 and lever 23 have been drawn back into, and released from, the positions in which they are shown, respectively, in dotted lines in Fig. 4. The force

of the stroke may be increased by an adjustable weight 27 upon a projecting rod 28 that extends back from the bracket 24.

The lever 23 is raised so as to draw back the projector for its forward stroke by a pitman 29 attached to the plunger of a water cylinder 30. The pitman 29 is slotted at 29½ to receive a pin 31 on the lever 23 (see Fig. 9). A spring-controlled dog 32 on the side of the pitman engages the end of the pin, thereby causing the lever to be elevated by the pitman, and a detent 33 on the bracket 24 trips the dog so as to release the pin 31 and allow the lever to drop, when it has reached the proper height.

The water pressure of a city water supply main may be utilized to raise the pitman 29, the water being admitted to the cylinder 30 through the pipe 34 and discharged through the pipe 35. A suitable valve (not shown) such, for example, as an ordinary D valve, controls the admission and explusion of water from the cylinder, and this is governed by a part connected with the pitman 29. Such a governor is shown in the bell crank lever 36 which is attached to the valve stem 37, and has at one end a weight 38, and at the other end a rod 39. A bracket 40 on the pitman 29 engages a stop 41 on the rod 39 and raises the lever 36 till the weight 38 passes the central vertical plane, when it will fall and complete the stroke of the valve, shutting off the water from the inlet and opening the exhaust. When the piston 29 descends the bracket 40 engages another stop 41½, forcing down the rod 39, throwing back the lever 36 and opening the valve to the water pressure. A weight 30½ on the piston causes it to descend rapidly and force the water out of the cylinder 30. It is obvious that, if desired, steam instead of water may be admitted into the cylinder 30 to operate the pitman 29.

The projector 11 is impelled forward with sufficient force to throw the fuel into the furnace and scatter it over the grate; but in order to project the fuel farther, and to distribute it more finely and uniformly over the grates, an outwardly swinging plate 42 is pivotally attached to the head 19 of the projector, so that it is free to swing outwardly therefrom (see Figs. 6 and 7). When the projector 11 has reached the end of its forward stroke and is brought to a stop, the lower end of the plate 42 continues to swing outward and upward by its acquired momentum, and the curved lower edge 42½ scoops up the fuel and carries it upward to some extent, thus throwing it farther into the furnace than it would be thrown if the end of the projector 11 was solid and always in a vertical position.

For the purpose of automatically varying the distance that the fuel is projected into the furnace, a rod 43 is carried through and out beyond the head 19 of the projector 11, as shown in dotted lines in Fig. 6, which engages the rear face of the swinging-plate 42, as shown in Fig. 7. The other end of the rod is attached to an eccentric 44 which in turn is attached to one end of a shaft 45 that carries on its other end a ratchet 46 shown in dotted lines in Figs. 7 and 8. The ratchet 46 is operated by the pawl 47 on the lever 23 to thrust the rod 43 gradually out against the back of the swinging-plate 42, further and further, and then to withdraw it in the same way.

Distribution of the fuel over the grates is also enhanced by consecutively and gradually facing the projector in different directions as it operates. Thus the trough in which the projector 11 reciprocates may be swung gradually from side to side as it delivers the fuel. For this purpose a ratchet wheel 48 is pivoted to the under side of the swinging trough 10 upon a post 49, and a rod 50 is attached at its one end to the rim of said ratchet wheel, and at the other end to the stationary plate 1. A pawl 51, carried on one end of a lever 52, engages the teeth of the ratchet wheel 48. The lever 52 extends across said ratchet wheel, and is free to turn upon the pivot 49. The end of said lever 52 opposite the pawl 51 is connected by a link 52½ to the lower end of a lever 53, which is pivoted to the frame 13 at 54. A roller 55 on the end of the projector 11 engages the lever 53 each time said projector is drawn backward, and therefore at each stroke, the lever 53 is swung on its pivot 54, and the link 52½ is reciprocated. The motion of the latter actuates the lever 52 and the pawl 51, thus slowly turning the ratchet wheel 48 around. The rod 50, being held stationary at one end, forces the said ratchet wheel, and the frame 13 to which it is pivoted, toward one side; then as the said rod passes the "dead center," the frame 13 will begin to move the other way, and the total distance which it swings will be just equal to the diameter of the circle described by the end of the rod 50 which is pivoted to the ratchet wheel 48. A spring 53½ tends to return the lever 53 to its initial position.

The operation of the machine is as follows: The hopper 4 is filled with a supply of fuel, some of which passes down into the chute 9 and thence through openings 56, 56, one on each side of the trough 10, onto the bottom plate of the latter directly in the path of the plate 42. The cocks 57 and 58 (see Fig. 2) in the water supply and exhaust pipes, respectively, are next opened. Assuming that the parts of the machine are in the positions in which they are represented in the drawings in full lines, the valve in the cylinder 30 is open to the admission of water under pressure from the main 34, the pitman 29 raises the lever 23, and, in so doing, draws

back the projector 11. The pivoted plate 42 as it comes in contact on the back stroke with the pile of fuel that lies in its path upon the bottom of the trough 10, swings outwardly so that it is drawn over said fuel, but leveling it off as it passes, and in so doing drawing down more from the chute onto the bottom of the trough 10, for the fuel is discharged from the hopper by gravity. When the projector has been drawn back into the position shown in dotted lines in Fig. 4, and the lever 23 and bracket 24 gain the positions shown in dotted lines in said figure, the lever is released from the plunger 29 by the catch 33, and said lever and bracket, falling by gravity, drive forward the projector 11. On the forward stroke of the projector 11 the swinging plate 42 gathers up the fuel that lies in its path on the floor of the trough 10 and carries it along between the sides $10\frac{1}{2}$, $10\frac{1}{2}$, of the trough 10 to the furnace. When the projector reaches the limit of the forward stroke the fuel is projected into the furnace and spread over the grates.

Each time that the projector is withdrawn in preparation for the forward stroke the rod 43 is moved a space forward or back, as the case may be, in its adjustment with reference to the swinging plate 42, so that the throw of the projector is constantly and uniformly changed. Furthermore, each time that the projector is withdrawn, its position in the horizontal plane is changed, so that the direction in which the fuel is discharged by the swinging plate 42 is constantly changed by small degrees. Thus by these constant changes an even distribution of the fuel in thin layers is assured.

This machine is an efficient smoke consumer, as the term is used. Complete combustion is in the main dependent upon the manner and quantity in which fuel is supplied to the grates, that is to say, upon the stoking. Efficient stoking can be done by hand, because the fuel can be fed in small quantities at a time in that way, and distributed evenly over the grates in thin layers. This machine accomplishes what is done by hand stoking and with greater precision.

It is obvious that the machine may be modified in many respects and still be within the scope of the invention, and it is also apparent that it may be adapted readily to different conditions. Thus where neither water nor steam pressure is available, or desirable, as the operating power, a motor 59 may be employed to drive a worm 60 that turns a worm wheel 61, which, in turn, rotates a shaft 62, and a double cam 63 (see Fig. 10). One branch of the cam 63 engages a roller 64 on the rod 65. This rod is pivoted at its upper end at 66 to the bracket 24, and slides through a guide $63\frac{1}{2}$ at its lower end. When the lever 23 and the bracket 24 are elevated by the cam 63 into the positions in which they are shown in dotted lines in Fig. 10, the roller 64 escapes from said cam 63, and the lever 23 and bracket 24 fall by gravity as already described, driving the projector 11 through its forward stroke. The other branch of the cam 63 is now in position to engage the roller 64 and in its turn begins to raise the parts into position for the next forward stroke.

The foregoing description has made it clear that this stoker can be used with any style of furnace or boiler, and that no alterations or additions are necessary to adapt the furnace to it. The door opening into the fire box is opened and the stoker is pushed up to it. That is all there is to be done. If the relative heights of the doorway and projector are not right, the height of the projector can be adjusted to the doorway at its rear end by the screw connections 67, 67 between the standards $3\frac{1}{2}$, $3\frac{1}{2}$ and the table 1, and at its forward end by the toothed collars 68, 68, which engage and lock the legs 2, 2 of the truck to the wheels 3, 3. Another great advantage afforded by this machine is that while it is in place before the furnace, the fire box is accessible with a poker. Thus Fig. 1 shows the doors 69, 69 that give the poker access to the fire box to even up and rake down the fuel over the grates, to be free and exposed. The door 70 into the ash pit can also be opened and closed without disturbing the position of the machine, for it is adapted to swing between the wheels 3, 3 of the truck.

No automatic feed is required to carry the fuel from the hopper into the path of the projector, for the coal is agitated sufficiently in the lower chute 9 by the rotation of this chute with respect to the stationary spouts 8, 8 to prevent any clogging, and furthermore is stirred by the jarring produced by the shock of the projector in operation to cause the coal to fall by gravity in the path of the plunger when, and in such quantities as it is required.

In order to stop the projector at the completion of its stroke without unduly jarring the machine, a dash pot 71 may be employed, whose plunger 72 is connected with the bracket 24 by the connecting rod 73. Guides 74, 74 control the vertical movement of the plunger 72, (see Fig. 3).

The impetus with which the fuel is thrown into the furnace may be regulated by manipulating the valve $71\frac{1}{2}$ in the dash pot.

The force with which the fuel is discharged by the projector into the furnace may also be made to change automatically in order to promote its distribution. Means for accomplishing this is shown in Figs. 11 and 12 in connection with the pitman 29, lever 23 and bracket 24 already described. Here the spring-controlled latch 32 is forced back out of the path of the pin 31 by the block 75 carried by the rod 76. The rod 76 is slidably mounted in arms 77, 77 from the plate 78

that is attached to the bracket 24, and at its inner end is pivoted to the eccentric strap 79 upon the eccentric 80. The eccentric 80 revolves on the pin 81 fast to a stud on the bracket 24 and carries the ratchet 82. A spring-controlled pawl 83, pivoted upon the standard 26, gradually advances and then withdraws the block 75 by rotating the eccentric, the latch 84 retaining the ratchet against backward rotation.

The farther out the block 75 projects the sooner in the backward stroke of the projector will the lever 23 be released from the pitman 29, and consequently the shorter and lighter will be the stroke of the projector.

The machine may be equipped with any one or all of these automatic devices for enhancing the distribution of the fuel, viz: automatic means for gradually and constantly varying the inclination of the swinging plate 42 on the end of the projector, automatic means for constantly changing the direction of the discharge from the projector, and automatic means for constantly changing the impetus of the projector, and consequently the force with which the fuel is discharged into the furnace, and by varying the sizes of the ratchet wheels and eccentrics of these automatic features, the machine can be adapted readily to all conditions of fuel and furnace construction that are apt to be encountered. But if the machine is equipped with all of these automatic devices, it is not necessary to use them all at the same time, for instead of constantly changing automatically the inclination of the swinging plate 42 on the end of the projector, it can, if desired, be set at any angle and there locked in place permanently. This is done in the construction shown and described by first rotating the eccentric 44 till said plate 42 is tilted into the right position, and then removing or fastening back, the pawl 47, and locking the rod 43 against movement in either direction by the bolt 43½ (see Fig. 7). So too the position of the block 75 (see Fig. 11) may be adjusted with reference to the latch 32 by rotating the eccentric 80 till the block is adapted to spring the latch and free the lever 23 from the pitman 29 at the desired height, and then removing or fastening back the pawl 83 and locking the rod 76 in place by means of the bolt 77½.

The trough may also be kept in one position by detaching the spring 53½, in which case the lever 53 that rotates the trough, lies back beyond the reach of the projector.

Finally, the intervals between the strokes the projector may be regulated and controlled by means of the cocks 57 and 58 in the pipes that, respectively, carry the water or steam supply to the cylinder 30, and the exhaust away from it. By closing the exhaust pipe part way, by means of the cock 58, the water is made to pass slowly out from the cylinder 30 under the pressure exerted by the weighted pitman 29, after the latter has been released from the lever 23, and, since the water will not be admitted into the cylinder 30 from the supply pipe until the cylinder has first been exhausted, the backward stroke of the projector will be delayed. So too, by regulating the flow of water into the cylinder 30 from the supply, by means of the cock 57, the cylinder may be made to fill slowly, thus further prolonging the intervals between strokes.

What I claim is:—

1. In a mechanical stoker the combination with a fuel supply of a longitudinally reciprocating projector, adapted to discharge fuel into the furnace; means for delivering fuel from said supply to said projector; means for gradually oscillating the delivery end of the projector from side to side by intermittent movements in each direction between the strokes of the projector; and means for actuating the projector.

2. In a mechanical stoker, the combination with a fuel supply, of a reciprocating projector adapted to discharge fuel into a furnace, and having a movable part that is adapted to engage the fuel; means for delivering fuel from said supply to said projector; means for changing between strokes of the projector the inclination of that part of it which engages the fuel: and means for actuating the projector.

3. In a mechanical stoker, the combination with a fuel supply, of a reciprocating projector adapted to discharge fuel into a furnace; means for delivering fuel from said supply to said projector; means for changing the inclination of that part of it which carries the fuel to the furnace; means for changing the length of the stroke of the projector; and means for actuating said projector.

4. In a mechanical stoker, the combination with a fuel supply, of a reciprocating projector adapted to discharge fuel into a furnace and having a movable part that is adapted to engage the fuel; means for delivering fuel from said supply to said projector; means for gradually oscillating the projector; automatic means for gradually changing the inclination of that part of the projector which engages the fuel; means for changing the length of the stroke of the projector; and means for actuating said projector.

5. In a mechanical stoker, the combination with a fuel supply, of a reciprocating plunger adapted to discharge fuel into a furnace, and having a movable part that is adapted to engage the fuel; means for delivering fuel from said supply to said projector; means for changing the inclination of that part of it which carries the fuel to the furnace; means for gradually oscillating the projector; and means for actuating said projector.

6. In a mechanical stoker, the combination with a fuel supply, of a trough adapted to enter an opening into a furnace; a projector adapted to reciprocate therein and to discharge fuel into the furnace; means for delivering fuel from said supply into said trough in position to be acted upon by said projector; means for gradually oscillating the delivery end of said trough, by intermittent movements in each direction; and means for actuating said projector.

7. In a mechanical stoker, the combination with a fuel supply, of a trough adapted to enter an opening into a furnace; a projector adapted to reciprocate therein and to discharge fuel into the furnace; means for delivering fuel from said supply into said trough in position to be acted upon by said projector; and means actuated by the movement of said projector for oscillating said trough.

8. In a mechanical stoker, the combination with a fuel supply, of a projector having a pivotally supported part that is adapted to engage the fuel and to swing upwardly and outwardly towards the furnace as the fuel is discharged therefrom; means for delivering fuel from said supply to said swinging part of said projector; means for actuating said projector; and adjustable means for setting the inclination of the swinging part of the projector at different angles.

9. In a mechanical stoker, the combination with a fuel supply, of a projector having a pivotally supported part that is adapted to engage the fuel and to swing upwardly and outwardly towards the furnace as the fuel is discharged therefrom; means for delivering fuel from said supply to said swinging part of said projector; means for actuating said projector; and means for gradually changing the inclination of the swinging part of the projector.

10. In a mechanical stoker, the combination with a fuel supply, of a projector adapted to discharge fuel into a furnace; means for delivering fuel to said projector; means for driving said projector through its forward stroke by the impulse of a body falling under gravity; means for releasing such body to fall by gravity; means for elevating it to its initial position, and at the same time drawing back the projector for its forward stroke; and adjustable means for determining the height from which such body falls.

11. In a mechanical stoker, the combination with a fuel supply, of a projector impelled by its fall under gravity to discharge fuel into a furnace; means for delivering fuel to said projector; means for elevating the projector for its forward stroke; and means operated by the stroke of the projector for changing the height to which the projector is raised.

12. In a mechanical stoker, the combination with a fuel supply, of a reciprocating projector impelled through its forward stroke by its fall under gravity; means for delivering fuel to said projector; a motor for retracting said projector; a detachable connection between said projector and said motor; means for releasing said projector from said motor when withdrawn for its forward stroke; and means for adjusting the center of gravity of said projector to regulate the force of its forward impulse.

13. In a mechanical stoker, the combination with a fuel supply, of a trough pivotally supported upon a suitable support so as to swing horizontally, and adapted to conduct fuel to a furnace; a projector adapted to reciprocate therein and to discharge fuel into the furnace; means for delivering fuel from said supply into said trough in position to be acted upon by said projector; and means actuated by the projector, while making its stroke, for oscillating said trough.

14. In a mechanical stoker, the combination with a fuel supply, of a trough pivotally supported upon a suitable support so as to swing horizontally, and adapted to conduct fuel to a furnace; a projector adapted to reciprocate therein and to discharge fuel into the furnace; means for delivering fuel from said supply into said trough in position to be acted upon by said projector; a ratchet wheel centrally pivoted to the trough; a lever pivoted at one end to the ratchet off its center and at its other end to a fixed support; and a second lever carrying a pawl for said ratchet, carried by the trough and adapted to be engaged by the projector on its backward stroke, whereby the trough is oscillated.

15. In a mechanical stoker, the combination with a fuel supply, of a reciprocating projector impelled through its forward stroke by its fall under gravity, and having a pivotally supported part that is adapted to engage the fuel and to swing upwardly and outwardly towards the furnace as the fuel is discharged therefrom; means for delivering fuel from said supply to said swinging part of the projector; means for retracting said projector for its forward stroke; and means actuated by the projector while making its stroke, for gradually changing the inclination of said swinging part of said projector.

16. In a mechanical stoker, the combination with a fuel supply, of a reciprocating projector impelled through its forward stroke by its fall under gravity, and having a pivotally supported part that is adapted to engage the fuel and to swing upwardly and outwardly towards the furnace as the fuel is discharged therefrom; means for delivering fuel from said supply to said swinging part of the projector; a lever for retracting said projector for its forward stroke, pivotally connected to said projector and to a suitable support; a detachable connection between

said lever and a motor, whereby the projector is drawn back; an eccentric and ratchet carried by said projector, and rotative together; a pawl carried by said lever, whereby said ratchet is gradually rotated during the stroke of the projector; and a connection between the free end of the pivoted part of the projector and the eccentric whereby the former is gradually tilted.

17. In a mechanical stoker, the combination with a fuel supply, of a reciprocating projector impelled through its forward stroke by its fall under gravity; means for delivering fuel to said projector; a motor for retracting said projector for its forward stroke; a lever for drawing back said projector for its forward stroke, pivotally attached at one end to said projector and at its other end to a suitable support; a latch carried by the motor and adapted to engage said lever to retract the projector; and a block upon said lever adapted to engage said latch to release said lever from the motor, when the projector has been withdrawn for its forward stroke.

18. In a mechanical stoker, the combination with a fuel supply, of a reciprocating projector impelled through its forward stroke by its fall under gravity; means for delivering fuel to said projector; a motor for retracting said projector; a lever for drawing back said projector for its forward stroke, pivotally attached at one end to said projector and at its other end to a suitable support; a latch carried by the motor and adapted to engage said lever to withdraw the projector; a block upon said lever adapted to engage said latch to release said lever from the motor when the projector has been withdrawn for its forward stroke; and means controlled by the movement of said lever for gradually advancing said block.

19. In a mechanical stoker, the combination with a fuel feeder for a furnace, of a chute for delivering fuel to said feeder, adapted to oscillate horizontally; the stationary hopper for a fuel supply supported above said chute, adapted to enter said chute and to agitate the fuel therein as the chute is oscillated; and means for oscillating said chute.

20. In a mechanical stoker, the combination with an oscillating feeding device, adapted to enter the door of the fire box of a furnace; of a platform adapted to support said feeder in position before the furnace; and a shield for closing the doorway around the feeding device, comprising vertical plates that are attached to the platform one on either side of said doorway, that meet, respectively, curved vertical plates attached to the feeding device one on either side of it, substantially as shown and described.

21. In a mechanical stoker, the combination with a carriage, of a truck adapted to roll thereon; a trough pivoted on the truck at its forward end, and adapted to enter the door to the fire box of a furnace, and supported at its rear end by said truck; means for delivering fuel to said trough and for discharging it therefrom into the furnace; and means for oscillating said trough upon said carriage.

22. In a mechanical stoker, the combination with a fuel supply, of a reciprocating projector adapted to discharge fuel into a furnace, impelled through its forward stroke by its fall under gravity; means for delivering fuel to said projector; means for elevating the projector for its forward stroke; and adjustable means for regulating the height to which the projector is elevated.

23. In a mechanical stoker, the combination with a fuel supply, of a reciprocating projector adapted to discharge fuel into a furnace, impelled through its forward stroke by its fall under gravity; means for delivering fuel to said projector; a reciprocating piston for elevating the projector for its forward stroke; and a detachable connection between said projector and said piston, adapted to release said projector at its retracted position to make its forward stroke under the impulse of gravity.

24. In a mechanical stoker, the combination with a fuel supply, of a reciprocating projector adapted to discharge fuel into a furnace, impelled through its forward stroke by its fall under gravity; means for delivering fuel to said projector; a reciprocating piston for elevating the projector for its forward stroke; a detachable connection betwen said projector and said piston, adapted to release said projector at its retracted position to make its forward stroke under the impulse of gravity; and adjustable means for determining the intervals between the operating strokes of the piston.

25. In a mechanical stoker, the combination with a fuel supply, of a reciprocating projector impelled through its forward stroke by its fall under gravity; means for delivering fuel to said projector; a cylinder having a piston that is adapted to be moved in one direction by fluid pressure; a detachable connection between said projector and the piston of said cylinder adapted to release said projector at its retracted position for its forward stroke under the impulse of gravity; a connection between said cylinder and a fluid pressure supply; and means for controlling the admission and discharge of fluid from said cylinder.

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Witnesses:
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L. THON.