

No. 777,276.

PATENTED DEC. 13, 1904.

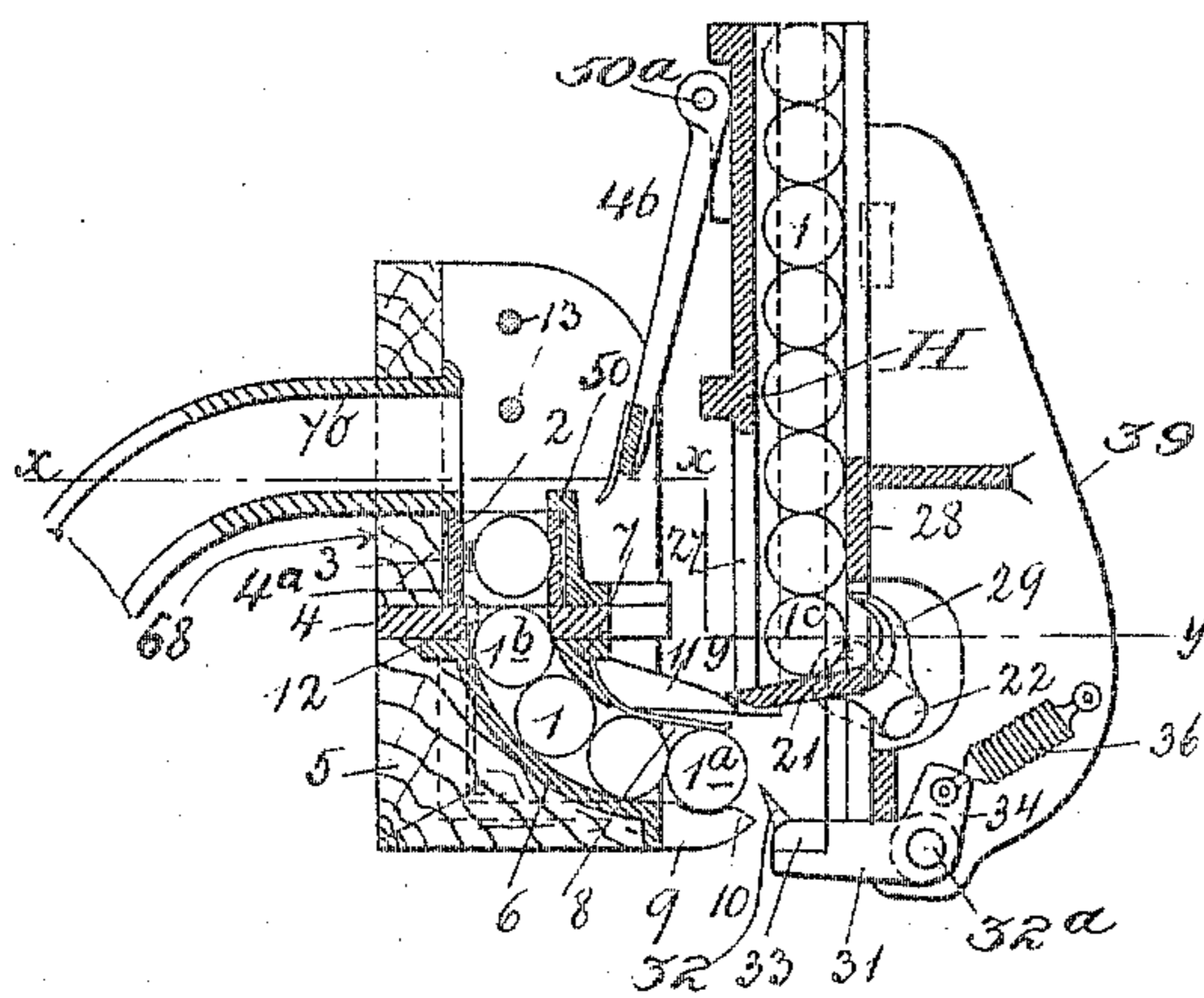
B. CROSSLEY.  
FILLING REPLENISHING LOOM.

APPLICATION FILED FEB. 17, 1903.

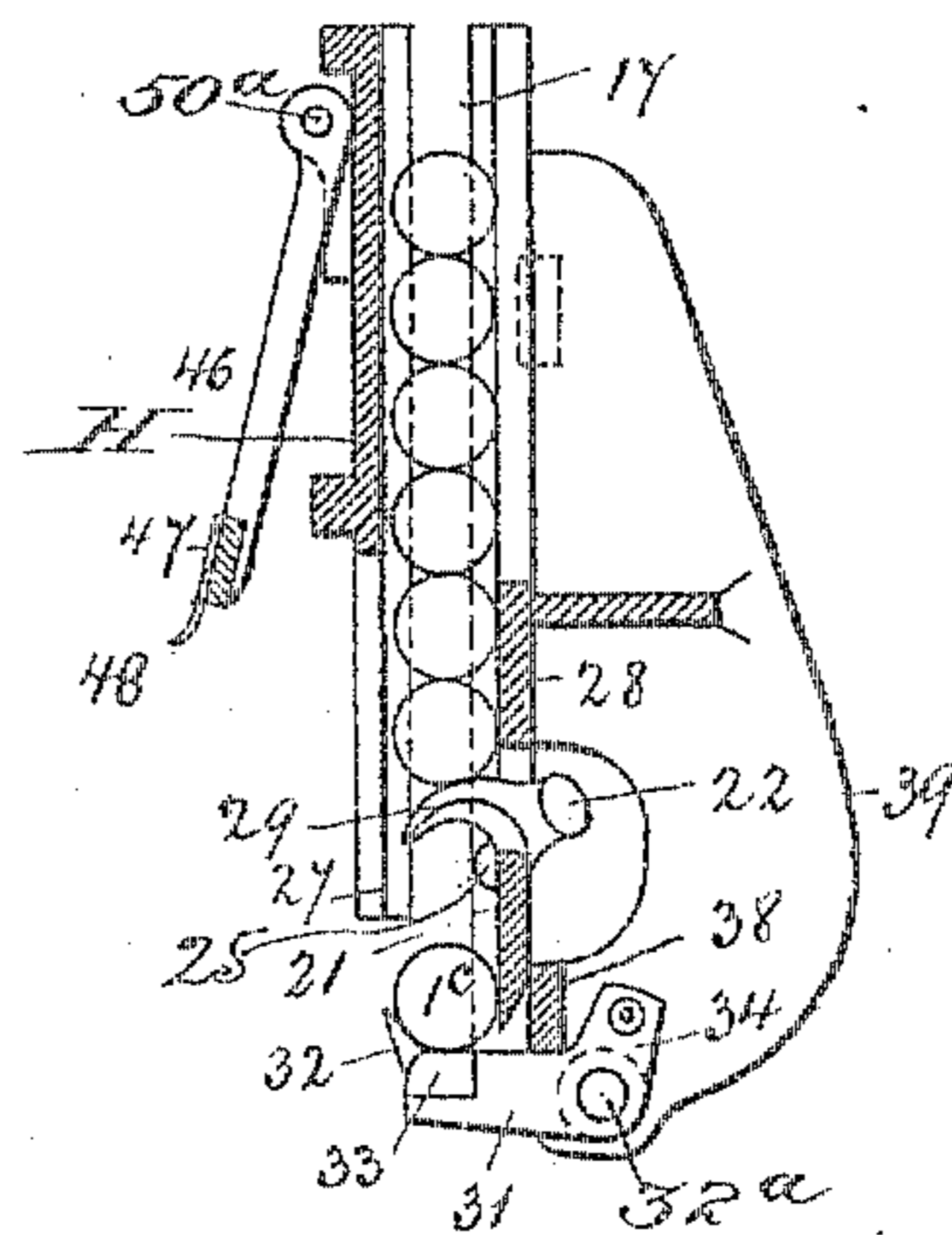
NO MODEL.

2 SHEETS—SHEET 1.

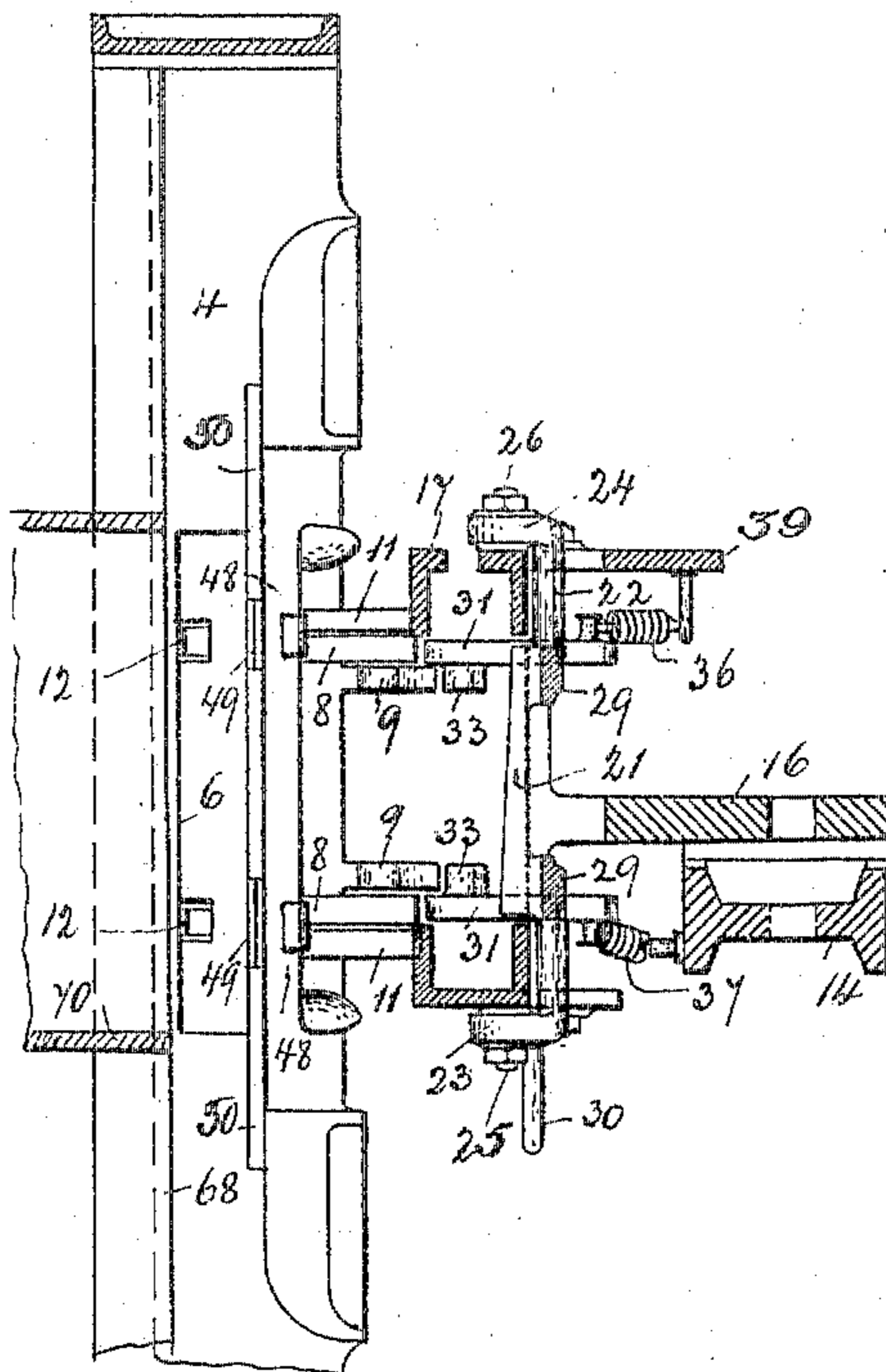
*Fig. 1.*



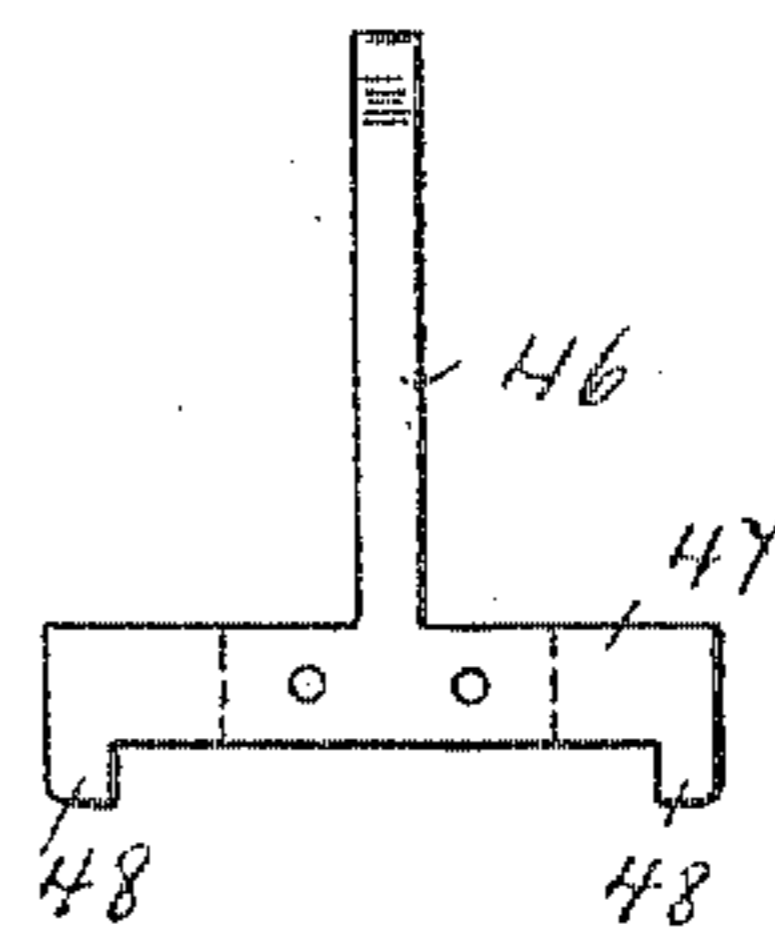
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



Witnesses

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2 SHEETS—SHEET 2.

Fig. 5.

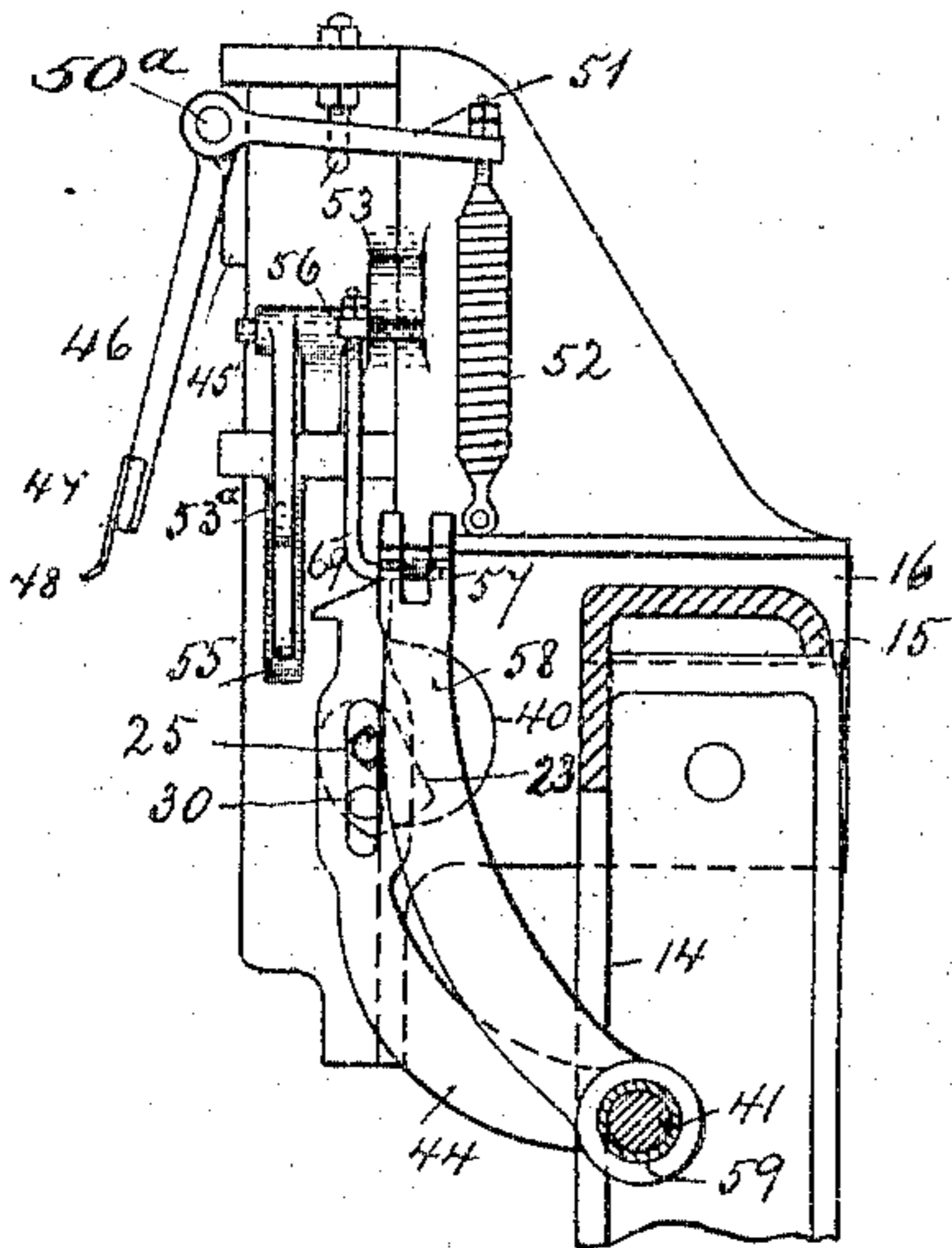


Fig. 6.

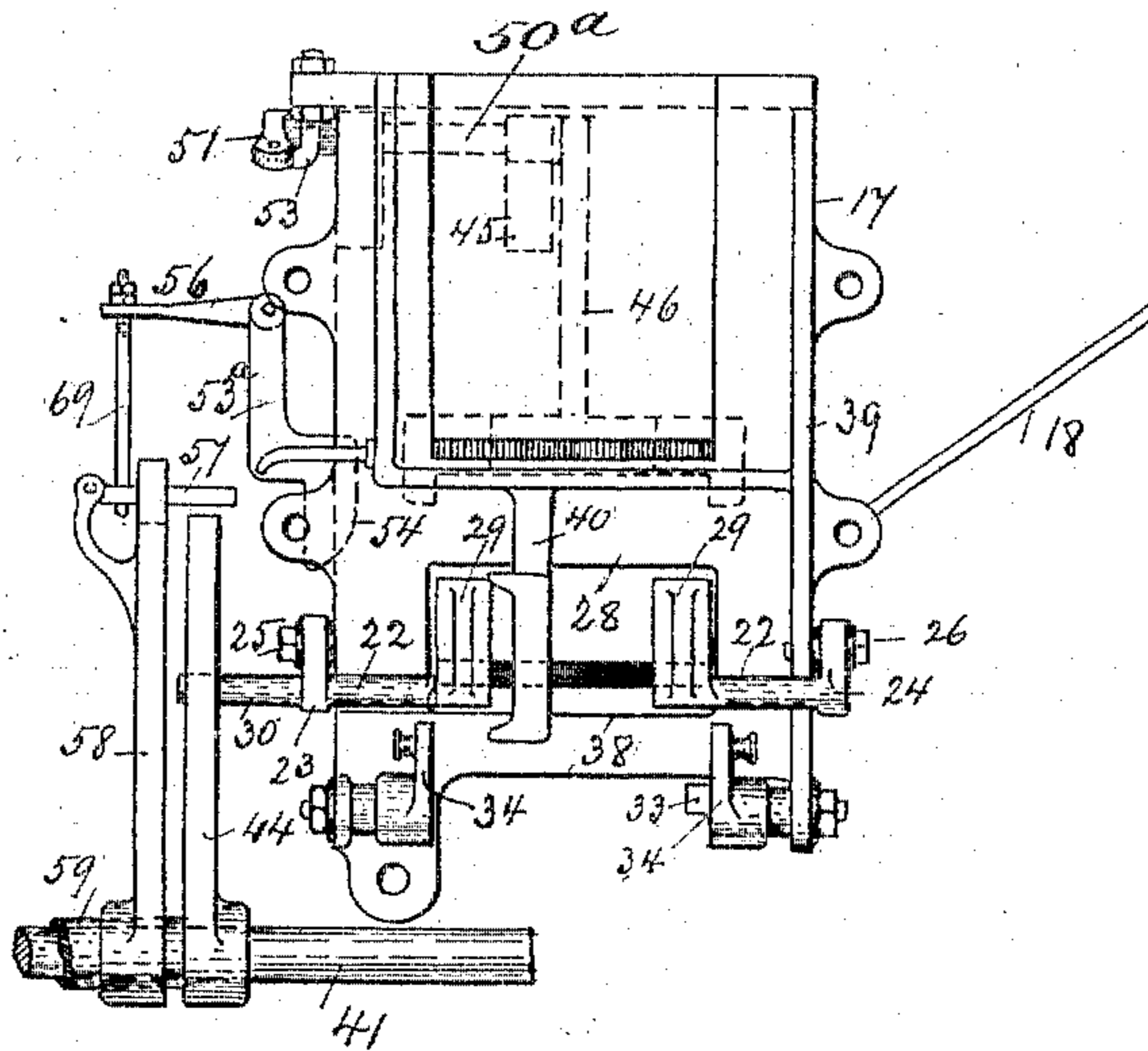


Fig. 7.

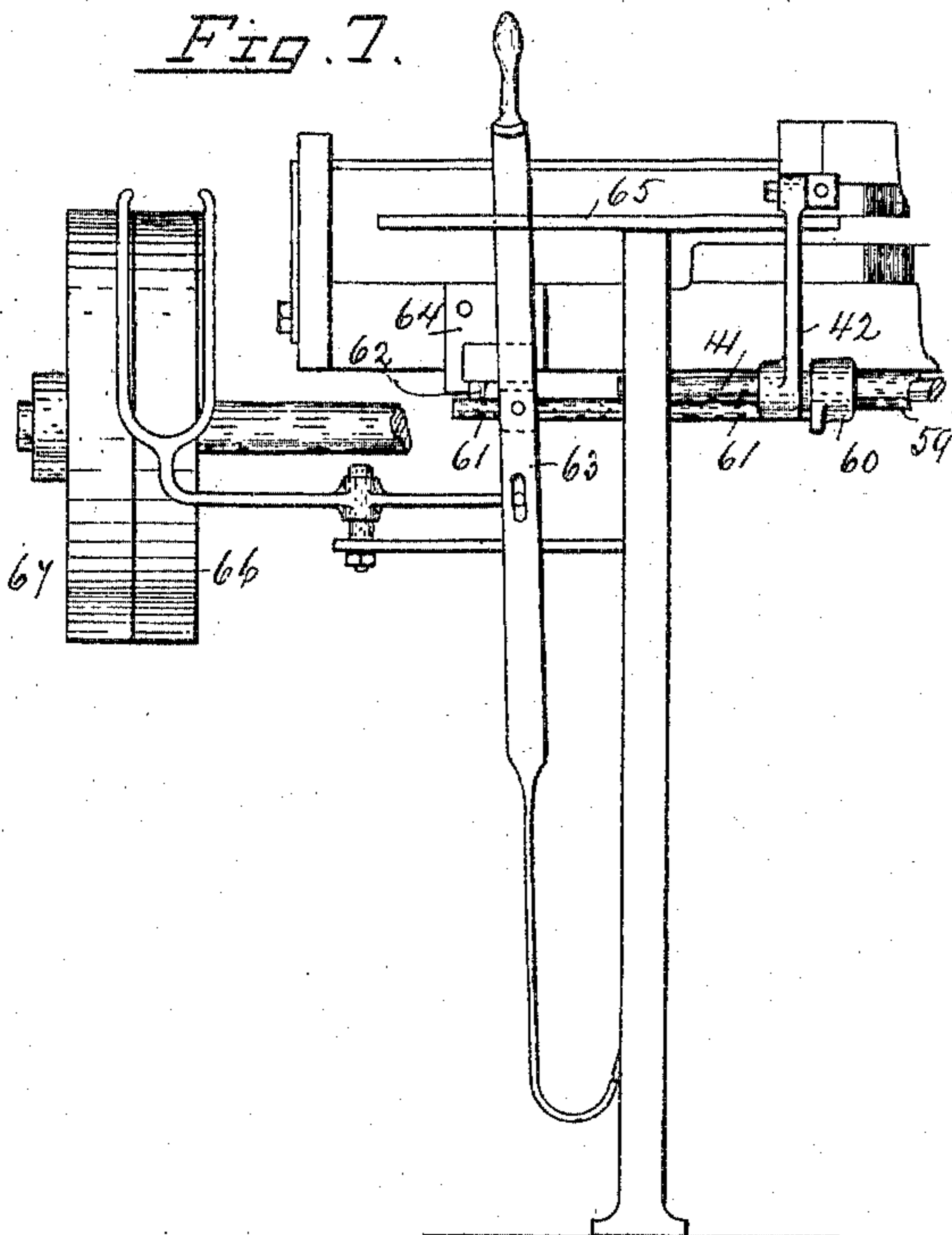
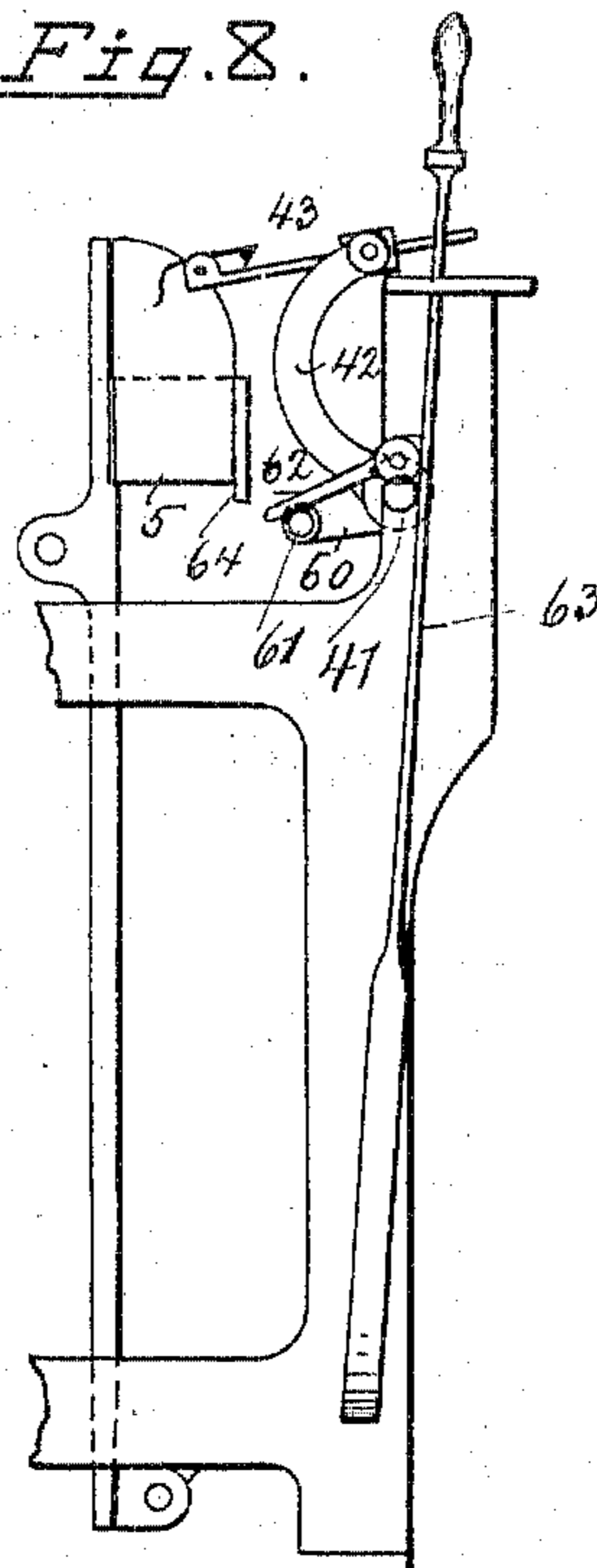


Fig. 8.



Witnesses

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# UNITED STATES PATENT OFFICE.

BERNARD CROSSLEY, OF BURNLEY, ENGLAND, ASSIGNOR TO BURNLEY AUTOMATIC LOOM, LIMITED, OF MANCHESTER, ENGLAND, A CORPORATION.

## FILLING-REPLENISHING LOOM.

SPECIFICATION forming part of Letters Patent No. 777,276, dated December 13, 1904.

Application filed February 17, 1903. Serial No. 143,752. (No model.)

*To all whom it may concern:*

Be it known that I, BERNARD CROSSLEY, a subject of the King of Great Britain, and a resident of Burnley, in the county of Lancaster, England, have invented new and useful Improvements in Filling-Replenishing Looms, of which the following is a specification.

This invention relates to filling-replenishing looms; and it consists in an improved motion or arrangement and combination of mechanism for providing the running shuttle at the proper time with a fresh supply of filling or weft, a suitable hopper containing a supply of filling cases or shells, hereinafter called "shells," which are transferred one by one to the shuttle by being inserted into the same at the bottom side thereof, the spent filling-shell being ejected thereby from the top side of the shuttle. The change is brought about by the action of the filling-fork when the filling in the shed is absent in consequence of breakage or exhaustion of the filling and by the forward movement of the slay.

On the drawings appended hereunto the improved motion or mechanism is represented, only such parts of the loom being shown as relate to the said motion.

Figure 1 shows a transverse section of the shuttle-box and of the hopper with the movable parts in the positions they normally occupy while the weaving proceeds, the slay and hopper being shown on this figure in the positions they occupy relatively to one another when the slay is approaching the end of its forward movement. Fig. 2 is a similar section of the hopper with the movable parts in the positions they occupy when the change of filling-shell is to be effected. Fig. 3 is a plan of Fig. 1 with the shuttle-box sectioned on line *xx* and of the hopper sectioned on line *yy* with the shuttle and shells removed; Fig. 4, a back view of the shell-ejector; Fig. 5, a side view of the hopper and actuating-levers as seen from the driving end of the loom, and Fig. 6 a front view of the same. Fig. 7 is a front view, and Fig. 8 a side view, of the driving end of the loom.

For the purpose of carrying out this invention the filling-cops are inclosed in cylin-

dric cases 1, Figs. 1 and 2, and the shuttle 2, Fig. 1, has a through-slot from the top to the bottom and is concave on one side of the slot and fitted with a spring 3 on the other side adapted to hold a shell in the shuttle while the weaving proceeds and allow it to be pushed in and out.

The shuttle-box bottom 4 at that side of the loom which is opposite to the driving side is formed with a slot 4<sup>a</sup> of such a size that the shells can easily pass through the same, and this slot is continued in a curved form through the slay-bottom 5 to the front thereof, the slot being formed by the lower side or cheek 6 and the upper cheek 7, the two flat springs 8, attached to it, forming a continuation of the latter. The slot is of such length that it will contain a definite number of filling-shells—say three. In front of the slay two carriers 9 are formed on the lower cheek 6, adapted to support in front of the others a fourth shell, hereinafter called "front" shell 1<sup>a</sup>, the carriers being formed concave for the shell to rest in the cavities and the springs 8 holding it in the cavities. The carriers 9 are formed with inclined ends 10 in front and curved below, as shown on the drawings. There are two guards 11 cast to the upper cheek to prevent a shell that is pushed up the inclines from rising too high. The top shell 1<sup>b</sup> in the slot next to the shuttle is prevented by two curved springs 12, fixed in recesses of the bottom cheek 6, from rising out of the slot while the slay is beating backward and forward, so that the four shells on the slay are securely held in their positions. As with this arrangement the loom-picker (not shown on the drawings) cannot have a foot, it is guided by means of two picker-spindles 13.

Opposite to the slot in the shuttle-box and slay-bottom a hopper H, adapted to contain a number of filling-shells, is arranged and fixed to the loom side 14 or the breast-beam 15. On the drawings it is shown with a foot 16 and fixed to the loom side. This hopper is open at the top and bottom and has also at the outer end 17 a narrower opening for the ends of the filling-yarn, which are threaded through one end of each filling-shell and

lapped onto a fixed wire 18 in the usual manner to pass through. The reserve shells 1 contained in the hopper are supported by a tray or tipper 21, which is cast in one with bars 22, passing round the front of the hopper and having at right angles thereto flat extensions 23 24, extending outside the front 28 of the hopper toward the back. These extensions are mounted on studs 25 26, screwed into the ends of the hopper H, so that the tray 21 can rock on these studs. The middle of the lower part of the back of the hopper is cut out for the tray; but the parts 27, left standing at the ends, are continued below the tray, as shown on Figs. 1 and 2. The upper part of the front 28 of the hopper is similarly cut out to allow the shells contained in the hopper to be seen.

Formed in one piece with the tray 21 and bars 22 are two horns 29 of curved or crescent shape, which when the tray 21 is in the position represented by Fig. 1 are in front of the row of shells, but which when the tray is turned down into the position shown by Fig. 2 are moved forward and prevent more than one shell from following the tray and hold up the remainder, as shown on Fig. 2. The extension 23 of the bars 22, supporting the tray, has a pin 30 formed or fixed on it, by means of which the tray and horns are turned when required from the position shown on Fig. 1 into that shown on Fig. 2 and back again in the manner hereinafter described.

Below the bottom of the hopper-back 27 two shell-holders 31 are arranged and are adapted to rock on studs 32<sup>a</sup>, fixed in the ends of the hopper-front. The holders 31 have levers 34 formed in one with them, which are pulled, by means of springs 36 37, attached to them and to any convenient fixed pin on the hopper or loom side, in such a direction as to hold up the holders 31 in the position shown on Figs. 1 and 2 against the bottom edge of the cross-rail 38, which is connected to the front of the hopper by the webs 39 40, these being cut out, as shown on Figs. 1, 2, and 5, to clear the bars 22. At their ends the holders 31 have rising projections 32 and at the side curved lugs 33, which lie in the path of the curved under side of the carriers 9.

On a shaft 41, extending from one loom side to the other, supported in any convenient way, a lever 42, Figs. 7 and 8, is fixed, which carries the filling-fork holder 43. Near to the hopper another lever 44 is fixed upon this shaft and formed with a slot into which the pin 30 engages. If the filling fails while the loom is working, the filling-fork holder 43 is carried forward in the usual way, thereby turning the lever 42 and shaft 41 toward the front. The lever 44 is thereby also turned toward the front and moves the pin 30 in the same direction. The bars 22, with tray 21 and horns 29, are thereby turned from the position represented by Fig. 1 into that rep-

resented by Fig. 2. The bottom shell 1<sup>c</sup>, that was resting on the tray 21, is thereby allowed to drop down upon the holders 31, being prevented from rolling off by the projections 32 and the parts 27 of the back of the hopper. In this position this shell is in the path of the front shell 1<sup>a</sup>, held by the carriers 9 on the slay as the latter beats up, the slay moving toward the hopper so far that when there is no shell dropped upon the holders 31 and the weaving proceeds the front shell 1<sup>a</sup>, held by the carriers 9, is brought near to the cross-rail 38.

As the shell 1<sup>c</sup> on the holders 31 is backed by the turned-down tray 21, which is resting against the cross-rail 38, it pushes the front shell 1<sup>a</sup>, resting on carriers 9, into the slot, while itself mounts up the inclines 10 of the carriers 9, raising the springs 8 as it does so till it gets into the cavities of the carriers and is held therein by the springs 8, thus replacing the previous front shell. The latter being pushed into the slot pushes the top shell 1<sup>b</sup> contained therein into the shuttle 2 and pushes the shell that was in the shuttle out of the same.

To the back of the hopper brackets 45 are fixed, supporting a spindle 50<sup>a</sup>, on which is fixed a pushing-lever or ejector 46, carrying at its end a broad blade 47, Fig. 4, with two projecting parts 48, which while the loom is working normally pass just over the shuttle, notches 49 being cut out of the shuttle-box front 50 to allow them to do so. The other end of the spindle 50<sup>a</sup> carries a lever 51, pulled downward by a spring 52 upon a stop-pin 53, whereby the ejector 46 is held in its position. When a shell is being pushed out of the shuttle in the manner aforesaid, the ejector encounters it as it rises and is pushed back by it, whereby the spring is extended. When the shell has risen so far out of the shuttle as to be free of the same, the spring pulls the ejector back to its original position, and the shell is thereby jerked into the mouth of a chute 70, fixed to the shuttle-box back above the shuttle, through which chute the shell is guided into a receptacle placed on the floor at the side of the loom. As the new shell has to be pushed into the center of the shuttle, the shell below it must be pushed up above the shuttle-box bottom 4, and as the shuttle has more play or clearance at the inner end of the guides arranged for it, as usual, on the front 50 and back 68 of the shuttle-box, and consequently lifts a little at that end as the new shell is pushed into it, the shell underneath it must be pushed up a little higher at the inner end of the shuttle-box than at the outer end. This is effected by making the tray 21 thicker at this end, as shown by Fig. 3, which causes the front shell to be pushed farther in and the top shell 1<sup>b</sup> farther out of the slot at the inner end than at the outer end. The shells are brought down again into the positions they must occupy while weaving by the springs

8 and 12, respectively. The lugs 33 on the holders 31 are during the forward movement of the slay encountered by the curved under sides of the carriers 9, and the holders are thereby turned downward till the projections 32 at their ends are clear of the bottom of the shell held by the carriers 9, so that they do not rub against the shell while the loom is weaving and allow the slay after the change has been made to retire and carry back with it the shell transferred from the holders 31 to the carriers 9. The shells contained in the hopper are thus transferred successively to the carriers 9, and thereby cause the respective top shell in the slot to be pushed into the shuttle and the used-up shell to be ejected.

If the loom is constructed as shown and described, it stops when the filling breaks or gives out, while there is only one shell left in the hopper at the time of breakage. The stop-motion and the filling-change motion in that case act simultaneously, as described, a fresh filling-case is pushed into the shuttle, and at the same time the loom is stopped. This is effected by the following mechanism:

At the inner end of the hopper a feeler 53<sup>a</sup> is pivoted on a bracket and has a projecting edge 54, which through a slot 55 in the hopper can enter into it. This edge rests against the end of the second filling-shell in the hopper, but can swing freely over the lowest shell resting on the tray 21. To this feeler an arm 56 is fixed, carrying a wire 69, which holds up the latch 57 as long as there are more than one shell in the hopper. The latch is hinged to one prong of the forked lever 58 and guided in a slot in the other prong. This lever is fixed upon a tube 59, carried by the shaft 41, or is mounted upon an equivalent shaft. Near to the driving side of the loom another lever, 60, Figs. 7 and 8, is fixed upon the tube, and a pin 61, fixed to the end of this lever, extends underneath a hinged finger 62, carried by the loom-starting lever or handle 63. As long as there are two shells left in the hopper the feeler and latch remain in the positions shown by Figs. 5 and 6 when a shell is ejected from and replaced by another in the shuttle as the lever 44 passes clear under the latch 57; but when only one shell is left in the hopper the feeler swings inward into the hopper and the arm 56 allows the latch 57 to drop in the slot and below the end of the lever 44, so that when this lever is turned toward the front on the next failure of the weft it carries the lever 58 with it. Thereby the tube 59 is turned and the pin 61 is raised and in its turn raises the finger 62, which is then encountered by a plate 64, fixed to the front of the slay opposite to the finger and pushed to the front, whereby the loom-handle is pushed out of the notch in the plate 65 retaining it and shifts the strap from the fast pulley 66 onto the loose pulley 67 in the usual manner and stops the loom. The weaver can then

start the loom before refilling the hopper, as a full filling-shell is in the shuttle and the parts operated by the filling-fork will have returned to their normal position on its release. This saves the time lost with other filling-replenishing looms having a stop-motion that only acts if the filling fails after the hopper has been completely emptied, as in such case no fresh filling-shell is inserted into the shuttle and one shell at least must be filled into the hopper before the loom can be restarted for the purpose of replacing the spent shell in the shuttle by a fresh one. On the other hand, this loom can be restarted at once, and if the filling should fail again while there is no shell in the hopper the stop-motion will come into action again, because the feeler 53 remains swung inward and the latch 57 dropped below the end of the lever 44, so that on the filling-fork holder and lever 44 being turned forward these parts act as described and stop the loom again. This arrangement allows this loom to be used as an ordinary loom without self-replenishing action by simply leaving the hopper empty, the loom stopping on the failure of the filling as an ordinary loom, when the weaver would have to change the shuttle, as usual, with ordinary looms. On the other hand, if the loom is used as a self-acting filling-replenishing loom the following three cases may occur on restarting it: First, the filling may break while the hopper is still empty. The stop-motion then acts and stops the loom as the feeler 53 is still swung inward. In that case one shell at least must be placed into the hopper before restarting it a second time. The change-motion will then come into action after the first two picks and the shell will be transferred from the hopper to the carrier 9, thereby ejecting the shell with broken filling and replacing it by a fresh one, and the loom will be stopped again at the same time and can be restarted at once. Secondly, the filling breaks while only one shell has been placed into the hopper, the change and stop motion then act simultaneously, as described, and the loom can be restarted at once while the hopper is being refilled. Thirdly, the filling does not break until two or more shells have been placed into the hopper. The shell-changing motion then will act normally without stopping the loom. Obviously the arrangement of hopper and tray may be varied and replaced by equivalent arrangements without departing from the nature of my invention, which consists in effecting the change of the filling on its failure in the shed by placing a filling-shell in a stationary position into the path of another shell held on carriers in front of a curved slot in the slay-bottom, so that this shell is pushed into the slot by the former as the slay beats up and by means of other shells in the slot pushes the topmost of these into the shuttle, and thereby ejects the spent filling-shell.

I claim as my invention—

1. In a loom, a slay having a curved slot extending from and through the bottom of the off-side shuttle-box to the front of the slay-bottom and adapted to hold three cylindrical filling-shells, carriers attached to the front of the slay adapted to support a fourth filling-shell in front of the others, and springs adapted to secure said shells in their positions.

2. In a loom, a slay having a curved slot extending from and through the bottom of the off-side shuttle-box to the front of the slay-bottom and adapted to hold three filling-shells, carriers attached to the front of the slay adapted to support a fourth filling-shell in front of the others, springs adapted to secure said shells in their position, and means operative upon failure of the filling in the shed and adapted to place a fifth shell into the path of the said fourth shell and hold it in this position while the slay beats up, and to push the said fourth shell into the slot and the top shell into a slotted shuttle.

3. In a loom, a slay having a curved slot extending from and through the bottom of one shuttle-box to the front of the slay and adapted to hold several filling-shells, carriers attached to the front of the slay adapted to support a shell in front of the shells in the slot, springs adapted to hold said shells in their position, means operative on the failure of the filling in the shed and adapted to place another shell into the path of the shell on the carriers and hold it in this position while the slay beats up and pushes the other shell onto the said carriers and the top shell in the slot into the loom-shuttle from below, and an ejector held in position by a spring and adapted to push the used filling-shell emerging from the top of the shuttle into a chute.

4. In a loom, a hopper adapted to contain a number of reserve filling-shells, said hopper being fixed onto the loom-frame in front of one of the shuttle-boxes and open at the top and bottom, a tray adapted to support the shells in the hopper, pivoted holders extending underneath the hopper and adapted to support a filling-shell, springs adapted to keep said holders normally in a horizontal position, means operative on the failure of the filling adapted to turn said tray into a vertical position, and horns connected to said tray adapted to pass below the second shell in the hopper when said tray is turned to vertical position.

5. In a loom, a hopper mounted on a loom-frame in front of one of the shuttle-boxes and open on top and bottom, and adapted to hold a plurality of reserve filling-shells, a pivoted tray at the bottom of said hopper adapted to support said shells, pivoted holders beneath said tray and held resiliently in a horizontal position, a rock-shaft, a lever mounted on said rock-shaft, a filling-fork carried on said lever, a second lever fixed on said rock-shaft and ad-

jacent to the hopper, a connection between said last-named lever and said tray whereby said tray is turned into a vertical position when the filling-fork is moved toward the front on the failure of the filling in the shed, and projections on said tray adapted to pass between the bottom shell in the hopper and the one next above when said tray is turned to vertical position.

6. In a loom, a slay having a curved slot extending through and from the bottom of one shuttle-box to the front of the slay-bottom and adapted to hold several filling-shells, carriers attached to the front of the slay adapted to support a shell in front of the shells in the slot, springs adapted to hold said shells in their position, a hopper mounted on the loom-frame and adapted to contain a number of reserve filling-shells, said hopper being in front of said shuttle-box and open at the top and bottom, a pivoted tray adapted to support the shells in the hopper, pivoted holders extending underneath the hopper and normally held in a horizontal position by springs and adapted to support a shell in the path of the shell on said carriers, means operative on the failure of the filling in the shed adapted to turn said tray into a vertical position, and horns attached to said tray and adapted to pass under the second shell in the hopper when the tray is turned to vertical position.

7. In a loom, the combination of a slay having a curved slot extending through and from the bottom of the shuttle-box to the front of the slay-bottom and adapted to hold a plurality of filling-shells, carriers attached to the front of the slay and adapted to support an additional shell in front of the others; springs cooperating with said carriers to hold said additional shells in position thereon, a hopper fixed to the loom-frame in front of said shuttle-box and adapted to contain reserve shells, said hopper being open at the bottom, a pivoted tray beneath the open bottom of said hopper and adapted to support the shells therein and to permit one shell at a time to pass it when oscillated, holders extending beneath said tray and resiliently supported in horizontal position and adapted to receive the bottom shell in said hopper and support the same in the path of the shell carried by said carriers, a rock-shaft, a filling-fork mounted on said rock-shaft and adapted to oscillate the same on the failure of the filling in the shed, a lever fixed on said rock-shaft adjacent to the hopper, and a connection between said lever and said tray whereby the latter is turned to vertical position on the operation of the filling-fork as above said.

8. In a filling-replenishing loom, the combination of a hopper adapted to contain a number of filling-shells, a feeler-arm pivoted at one side of the hopper and adapted to rest against a shell at or near the bottom of the hopper, a rock-shaft, a filling-fork mounted

on said rock-shaft and adapted to oscillate the same on the failure of the filling in the shed, a rock-lever mounted on said rock-shaft and oscillated by said filling-fork, a second lever 5 carrying a latch adapted to oscillate in the path of said rock-lever, a connection between said feeler-arm and said latch whereby it is held normally out of the path of said rock-lever and dropped in the path thereof when 10 there is no longer a shell in the hopper supporting said feeler-arm, a trip mounted on part of the stopping mechanism of the loom and adapted to oscillate into the path of the slay, and a connection between said trip and 15 said second lever for oscillating it into the path of the slay when said second lever is oscillated in the manner aforesaid.

9. In a loom, the combination of a slay having a curved slot extending through and from 20 the bottom of the shuttle-box to the front of the slay-bottom and adapted to hold a plurality of filling-shells, carriers attached to the front of the slay and adapted to support an additional shell in front of the others; 25 springs cooperating with said carriers to hold said additional shell in position thereon, a hopper fixed to the loom-frame in front of said shuttle-box and adapted to contain reserve shells, said hopper being open at the 30 bottom, a pivoted tray beneath the open bottom of said hopper and adapted to support the shells therein to permit one shell at a time to pass it when oscillated, holders extending beneath said tray and resiliently supported in horizontal position and adapted to 35 receive the bottom shell in said hopper and support the same in the path of the shell carried by said carriers, a rock-shaft, a filling-fork mounted on said rock-shaft and adapted 40 to oscillate the same on the failure of the filling in the shed, a lever fixed on said rock-shaft adjacent to the hopper and connected with said tray to oscillate it, a feeler fulcrumed on the side of the hopper and adapted 45 to rest against one of the shells therein and to swing inward when said shell is absent, and means actuated by the inward movement of said feeler for stopping the loom.

10. In a loom, the combination of a slay having a shuttle-box and a slot leading from said 50 shuttle-box to the exterior of said slay and adapted to receive filling-shells, said slot being opposite an opening in the shuttle whereby shells may be successively pushed into 55 said shuttle from said slot, and carriers projecting at the outer side of said slot and adapted to resiliently support a filling-shell at the opening of said slot.

11. In a loom, the combination of a slay having a shuttle-box and a slot leading from said 60 shuttle-box to the exterior of said slay and adapted to receive filling-shells, said slot being opposite the opening in the shuttle whereby said shells may be successively pushed into 65 said shuttle from said slot, carriers project-

ing at the outer side of said slot and adapted to resiliently support a filling-shell at the opening of said slot, said carriers being slightly 70 dished or concaved, and springs cooperating with said carriers to hold a filling-shell in the concavities thereof.

12. In a loom, the combination of a slay having a shuttle-box and a slot leading from said shuttle-box to the exterior of said slay and adapted to contain filling-shells, said slot being 75 opposite an opening in the shuttle whereby said shells may be successively pushed into said shuttle from said slot, mechanism fixed to the frame of the loom at the front of said slay and adapted to deliver filling-shells one 80 by one into said slot, thereby simultaneously pushing a filling-shell into the shuttle and pushing out the spent filling-shell in said shuttle.

13. In a loom, the combination of a slay having a shuttle-box and a slot leading from said shuttle-box to the exterior of said slay and adapted to receive filling-shells, said slot being 85 opposite an opening in the shuttle whereby said shells may be successively pushed into said shuttle from said slot, carriers projecting at the outer side of said slot and adapted to resiliently support a filling-shell at the 90 opening of said slot, and holders mounted on the loom-frame in front of said slay and the slot thereof and adapted to support a filling-shell and deliver it to said carriers at the forward 95 movement of said slay.

14. In a loom, the combination of a slay having a shuttle-box and a slot leading from said shuttle-box to the exterior of said slay and adapted to receive filling-shells, said slot being 100 opposite an opening in the shuttle whereby said shells may be successively pushed into said shuttle from said slot, carriers projecting at the outer side of said slot and adapted to resiliently support a filling-shell at the 105 opening of said slot, holders mounted on the loom-frame in front of said slay and the slot thereof and adapted to support a filling-shell 110 and deliver it to said carriers at the forward movement of said slay, a receptacle for reserve shells, and mechanism operated by the failure of the weft for delivering a shell from 115 said receptacle to said holders.

15. In a loom, the combination of a slay having a shuttle-box and a slot in said slay leading from said shuttle-box to the front side 120 thereof and adapted to contain filling-shells which are successively pushed into a slot in the shuttle, and means for pushing a shell into said slot on the forward motion of said slay operated by the failure of the weft.

In testimony whereof I have hereunto signed my name in the presence of two witnesses.

BERNARD CROSSLEY

Witnesses:

CARL BOLLÉ,

ROBERT A. COLLINGE.