

No. 659,950.

Patented Oct. 16, 1900.

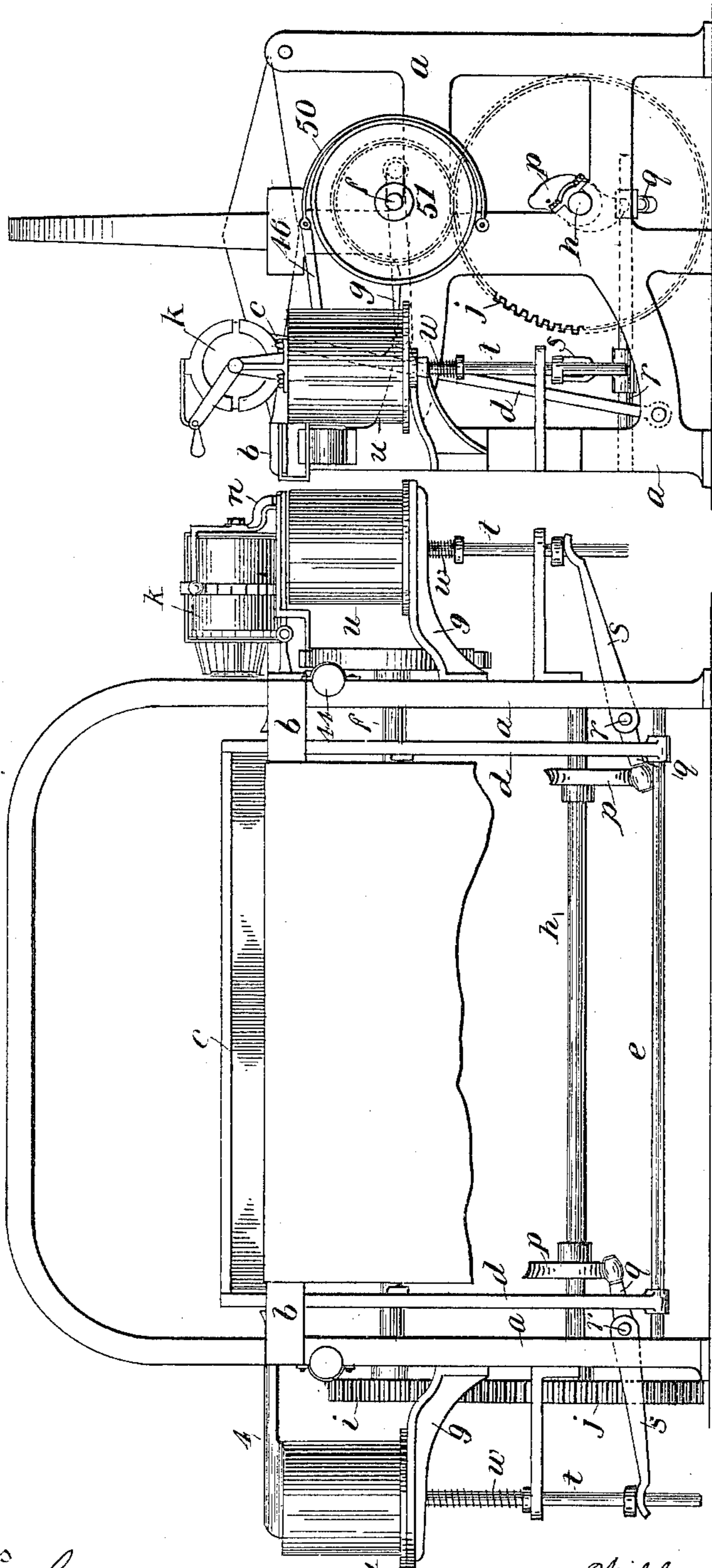
W. H. BAKER & F. E. KIP.

LOOM.

(Application filed Nov. 3, 1899.)

No Model.)

8 Sheets—Sheet 1.



Witnesses  
Geo. B. Rowley.  
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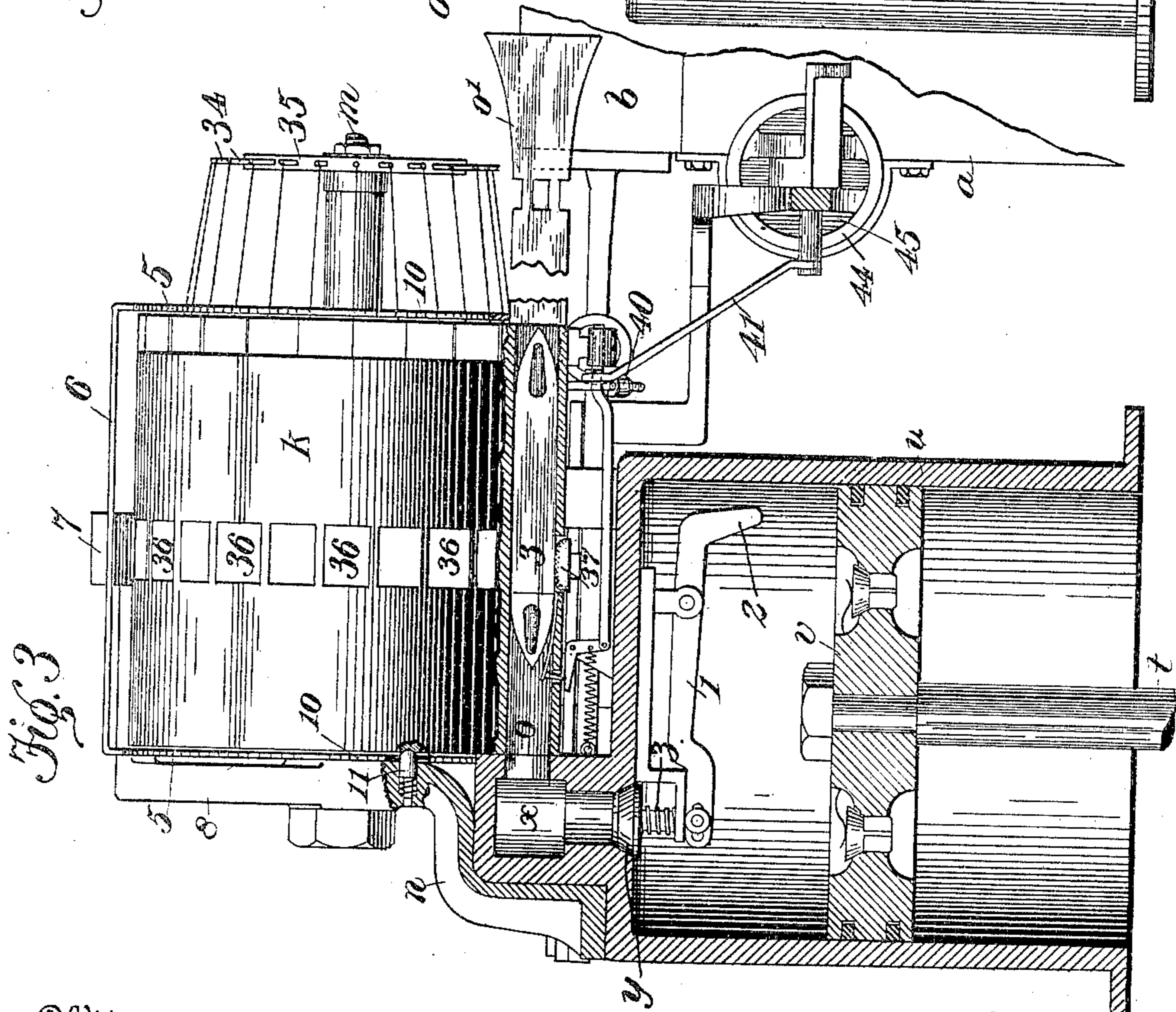
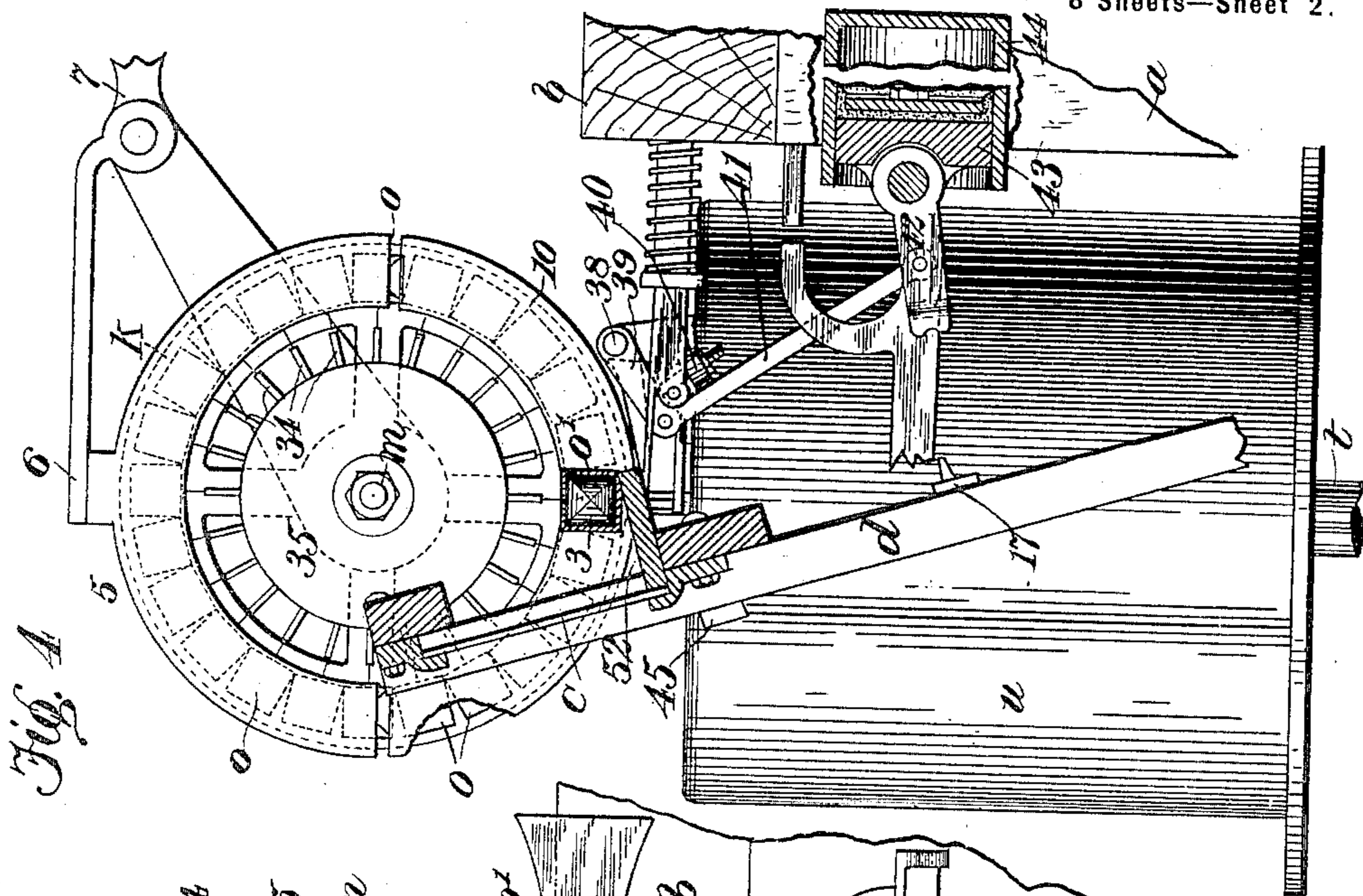
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8 Sheets—Sheet 2.



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8 Sheets—Sheet 3.

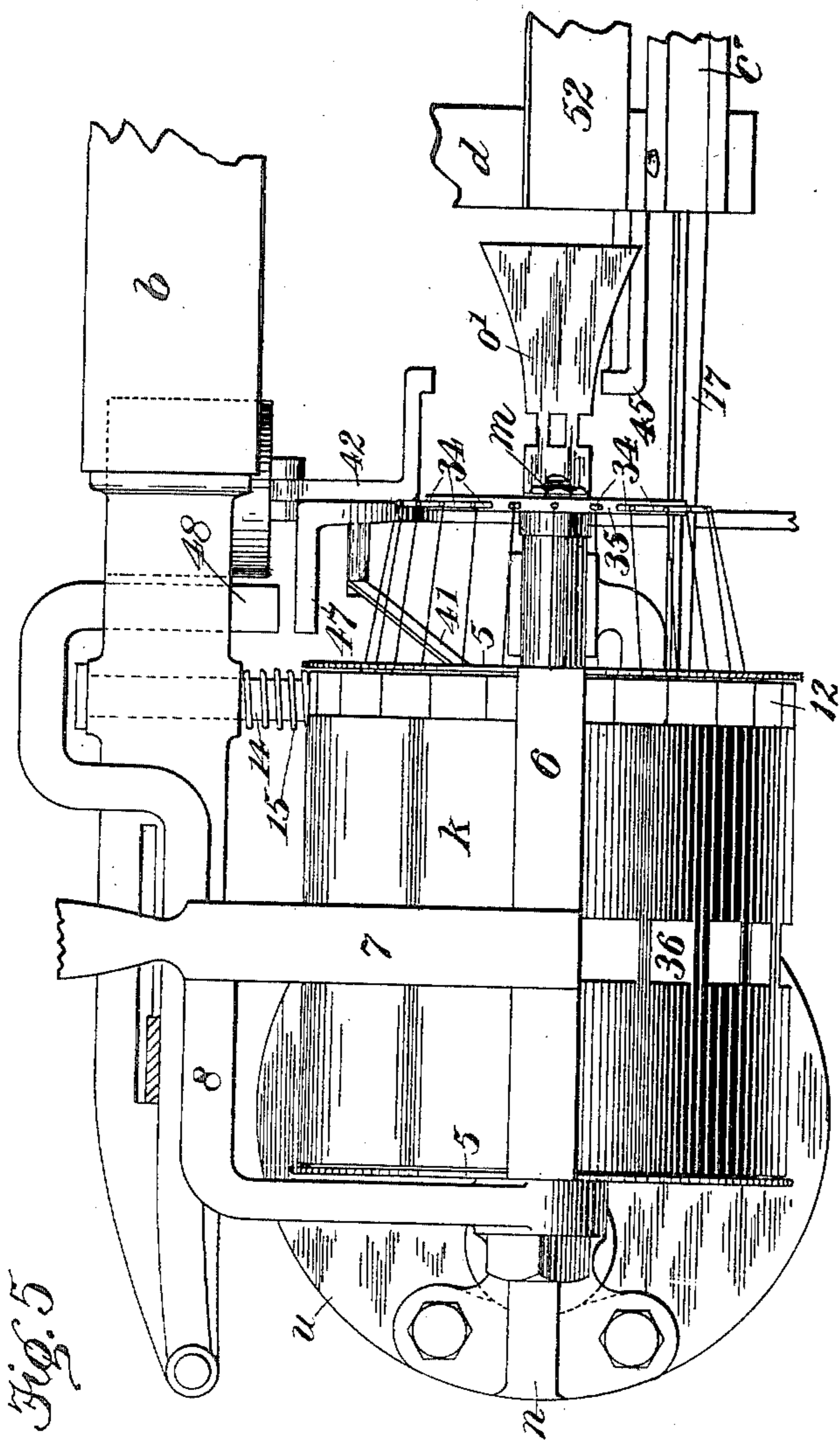


Fig. 5

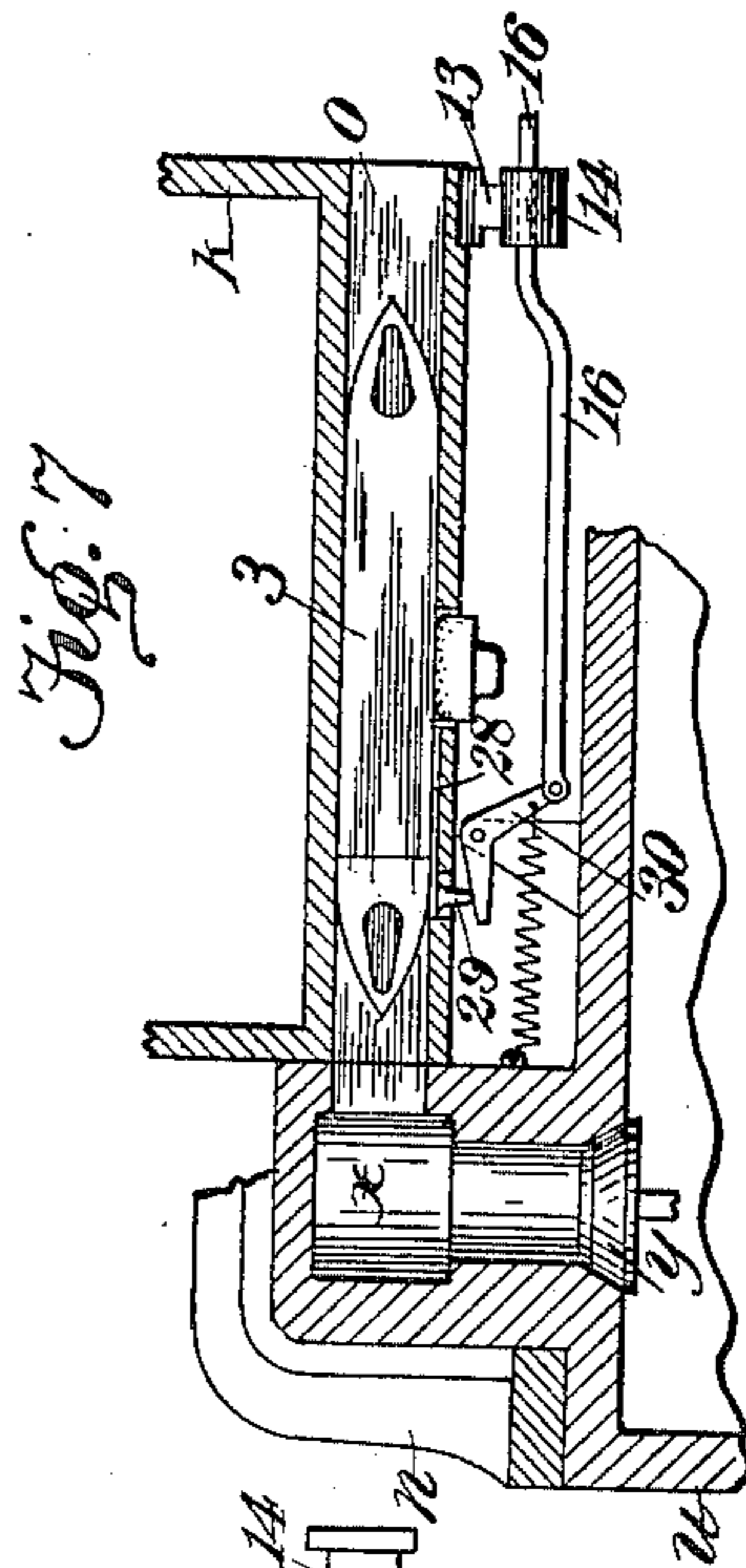


Fig. 7

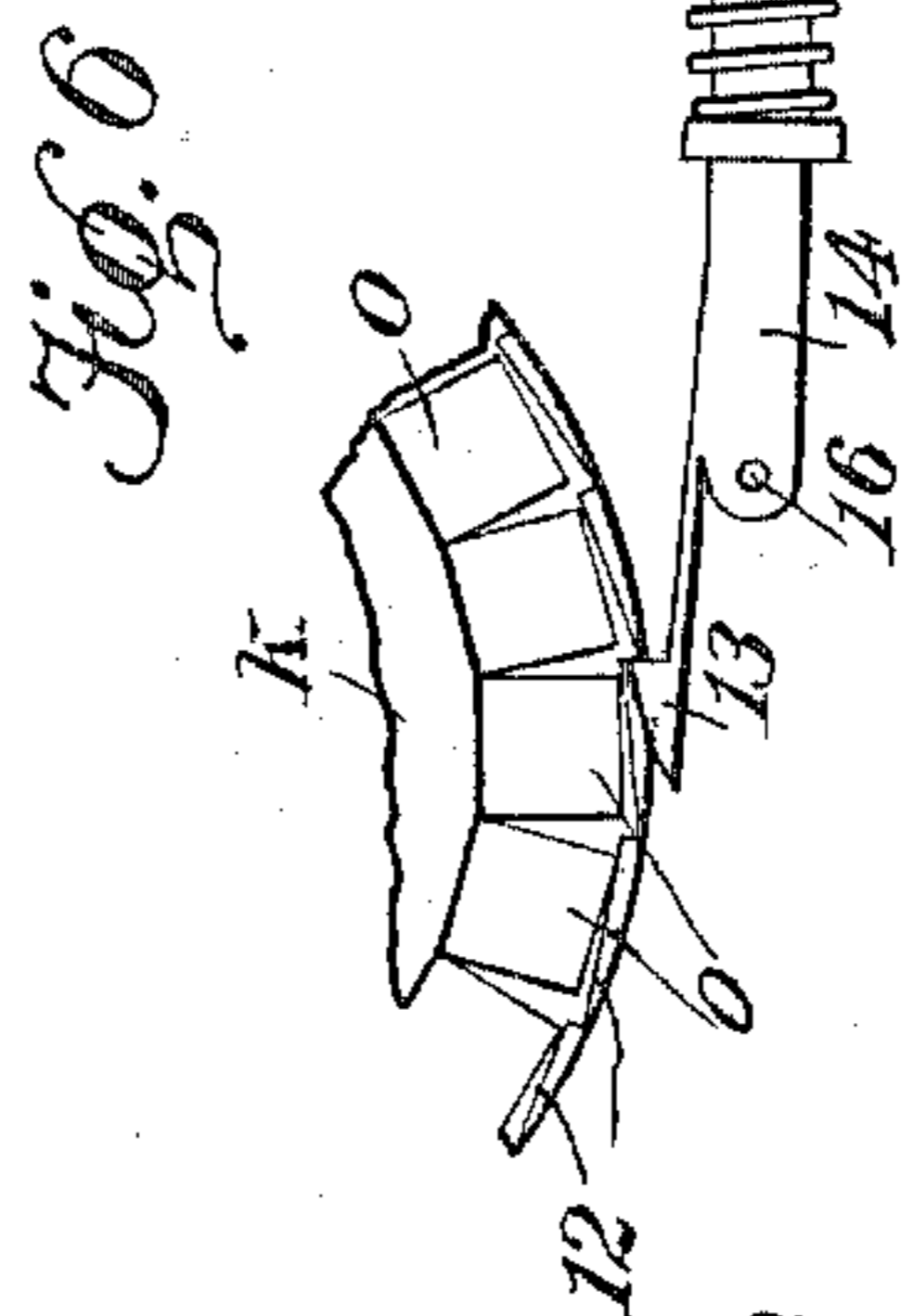


Fig. 6

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8 Sheets—Sheet 4.

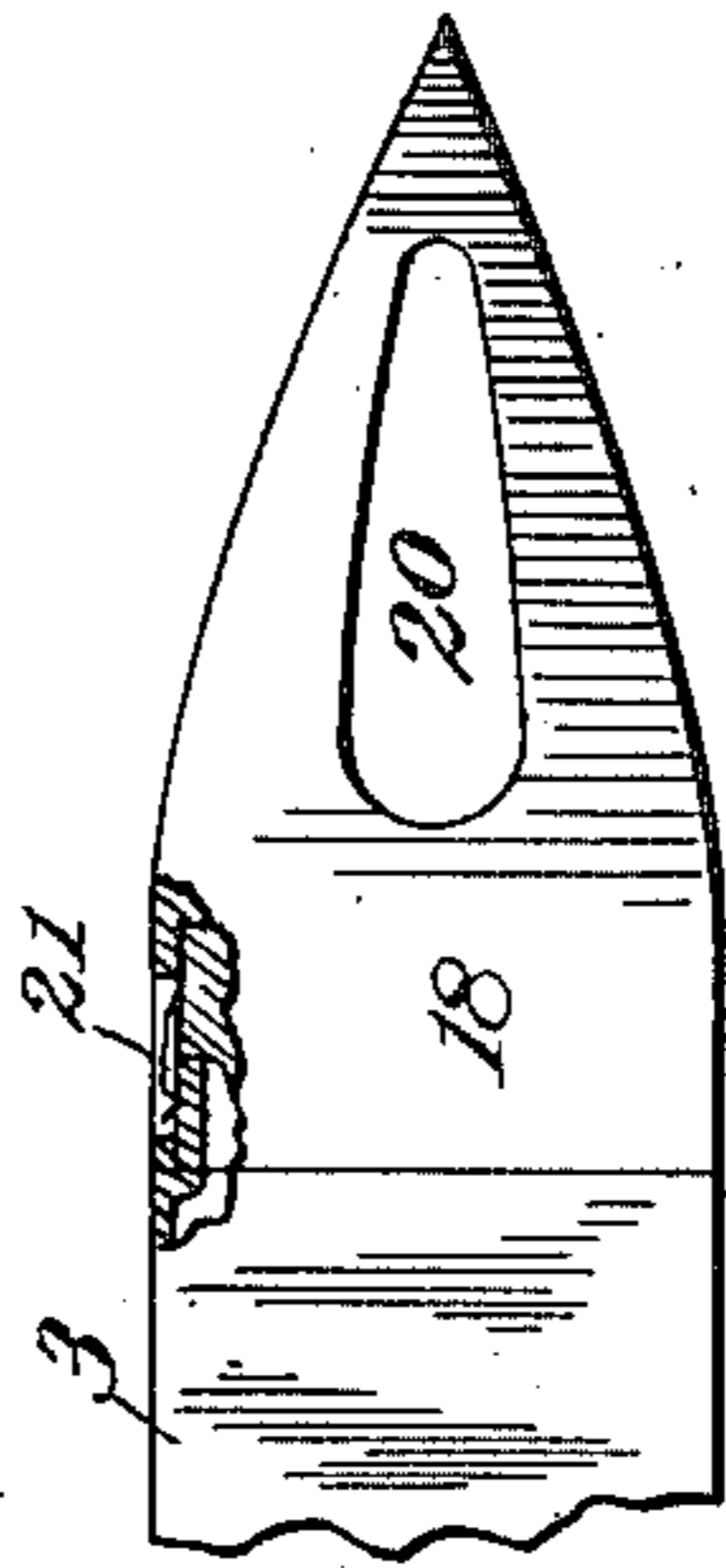
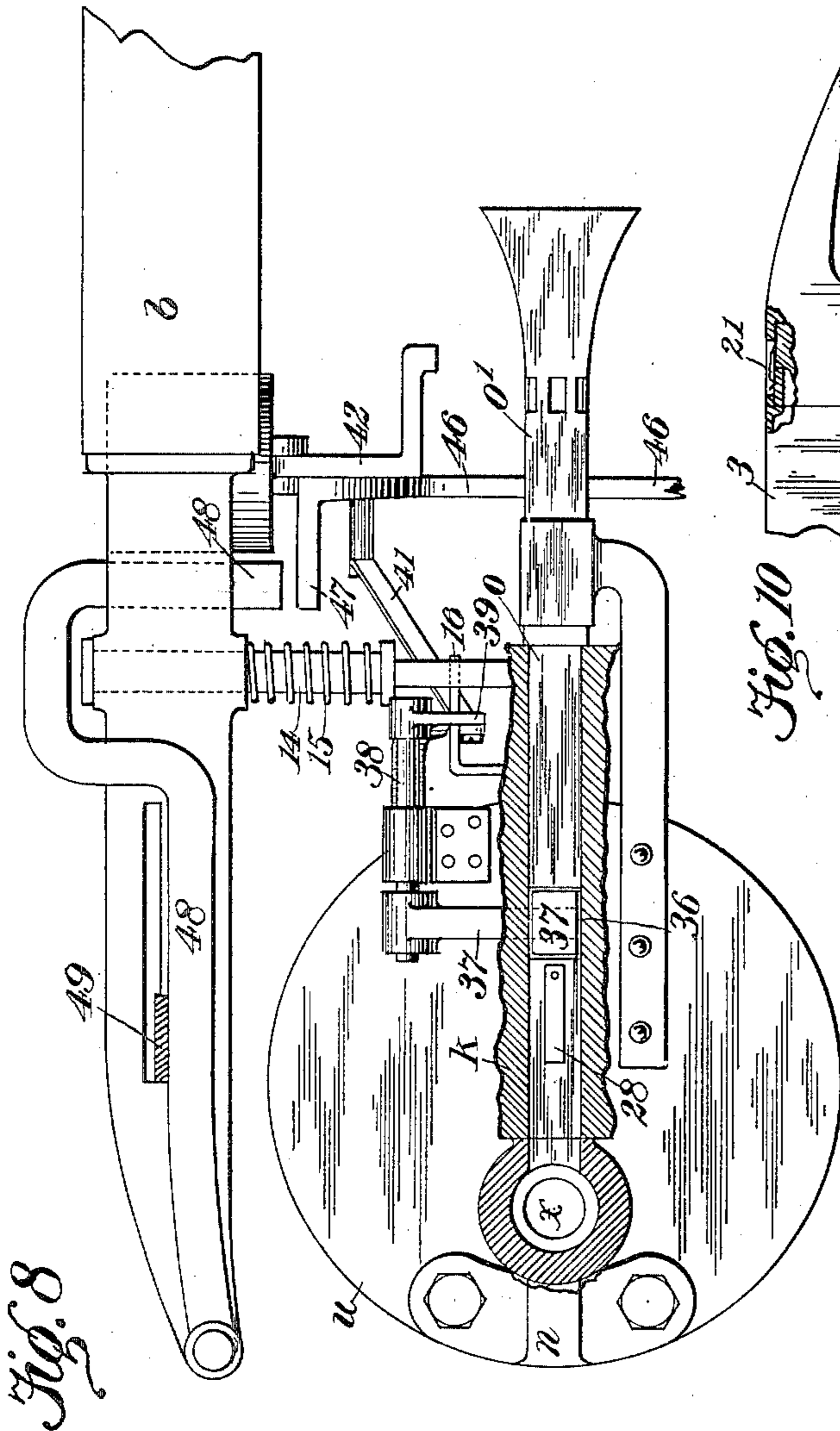


Fig. 9

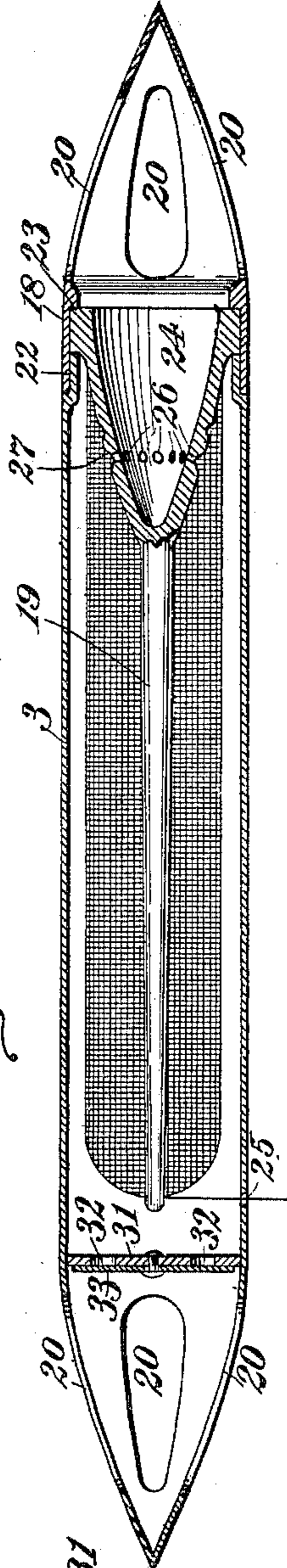


Fig. 11

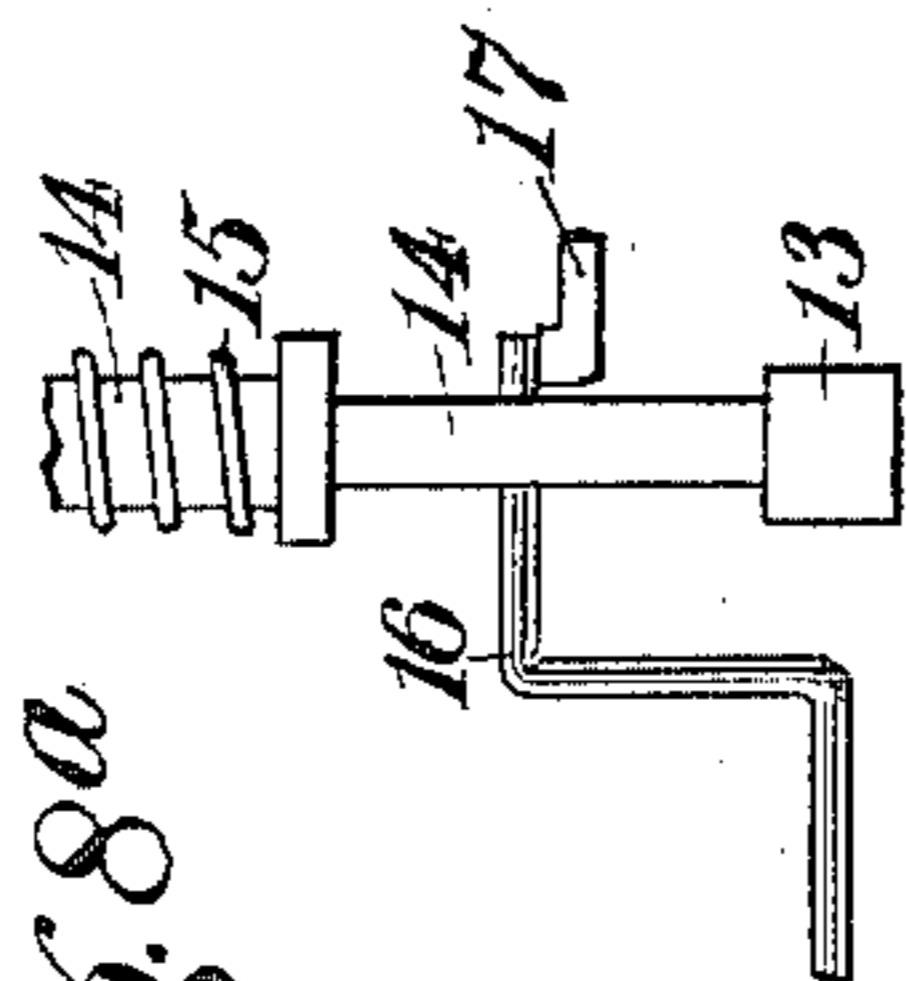
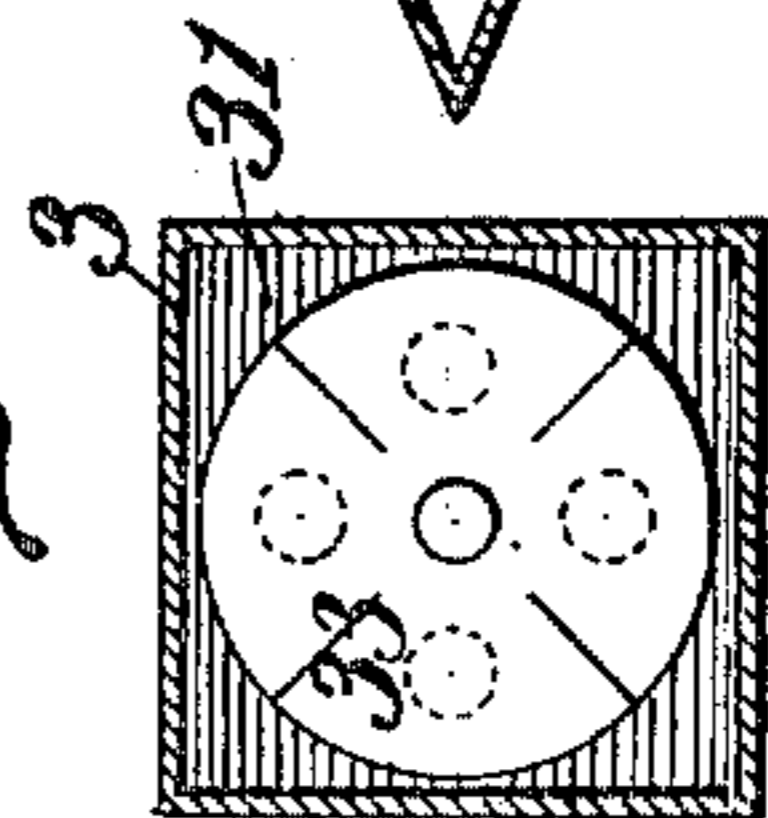


Fig. 8a

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Fig. 12

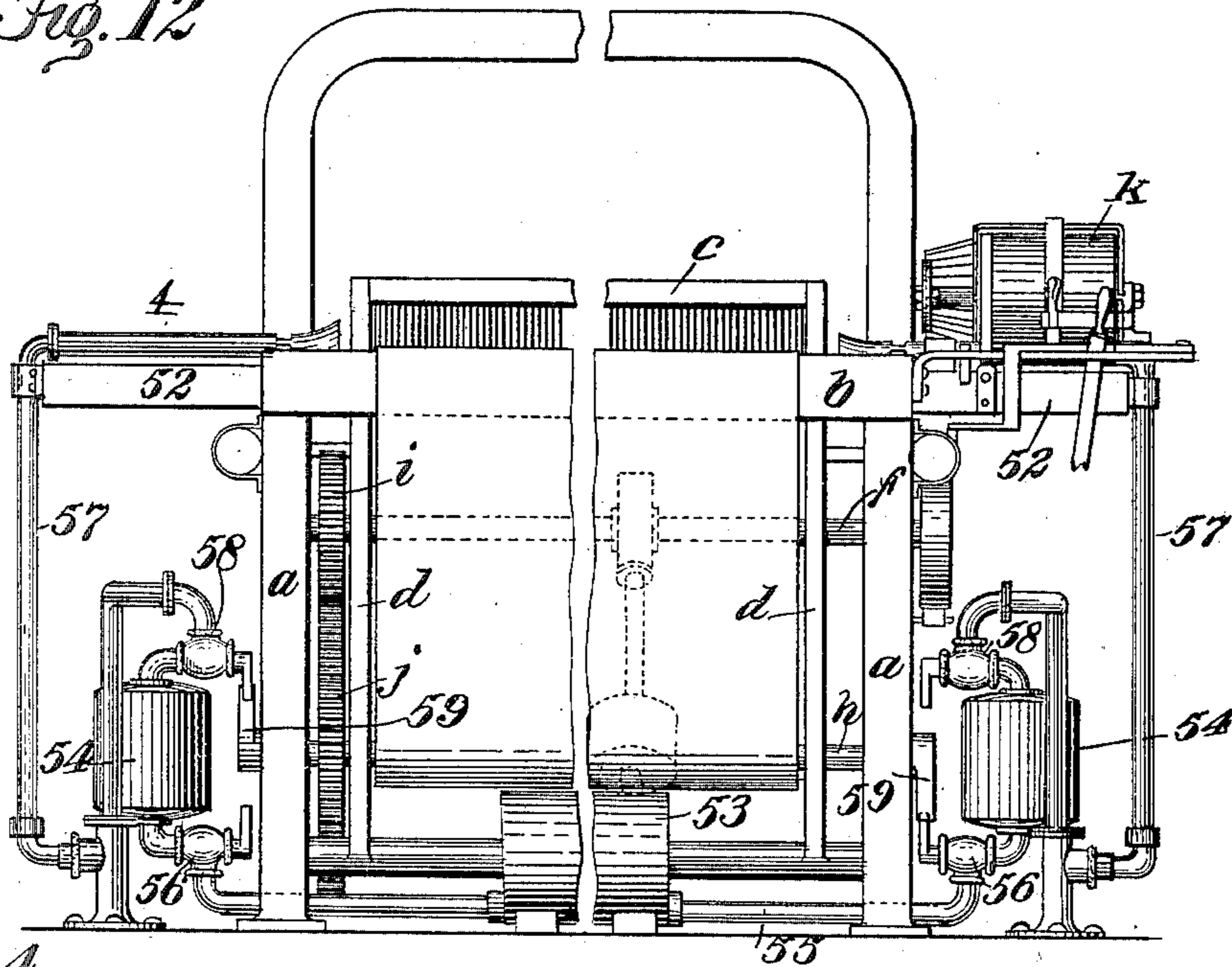


Fig. 14

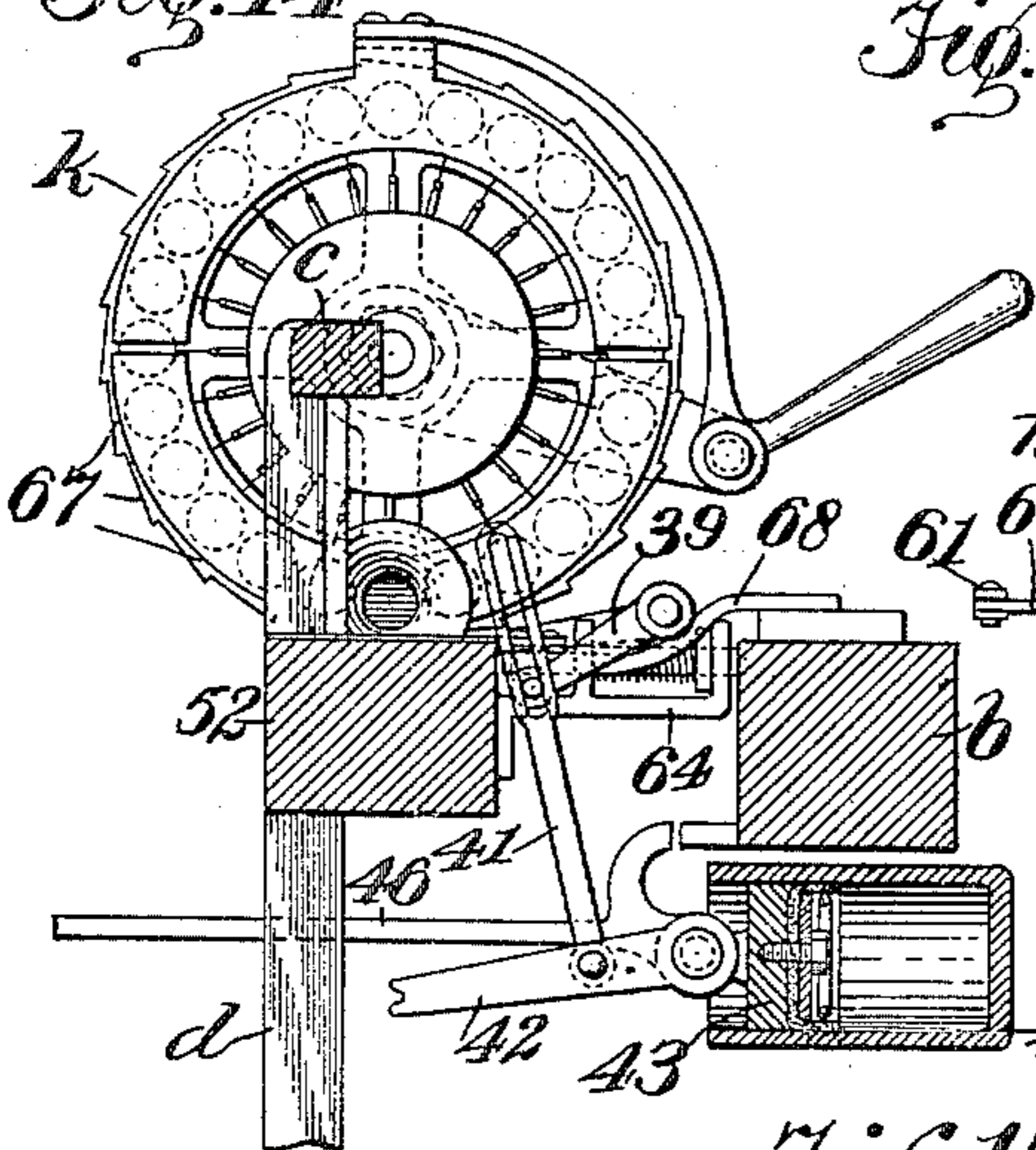


Fig. 15

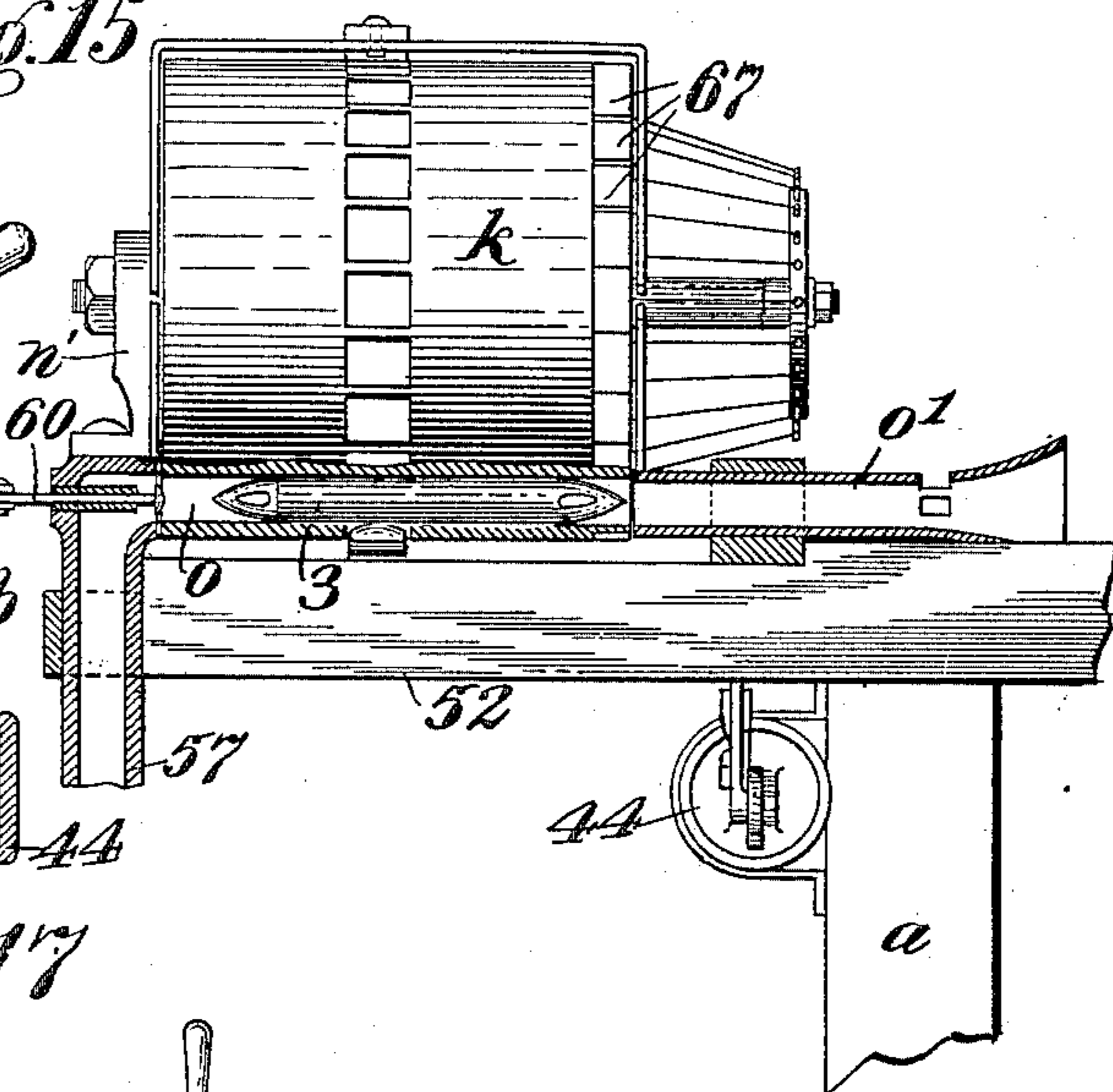
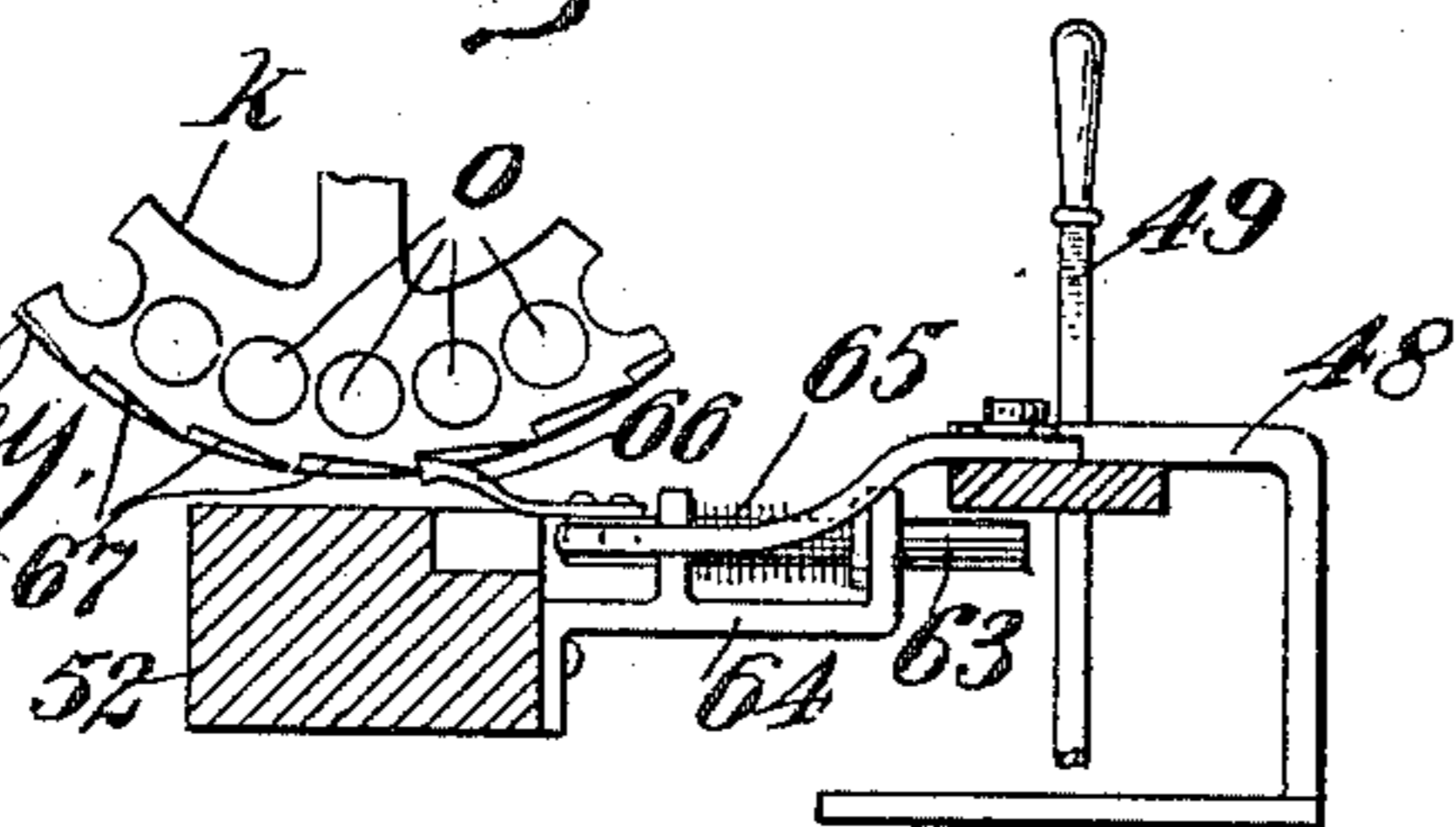


Fig. 17



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Fig. 13

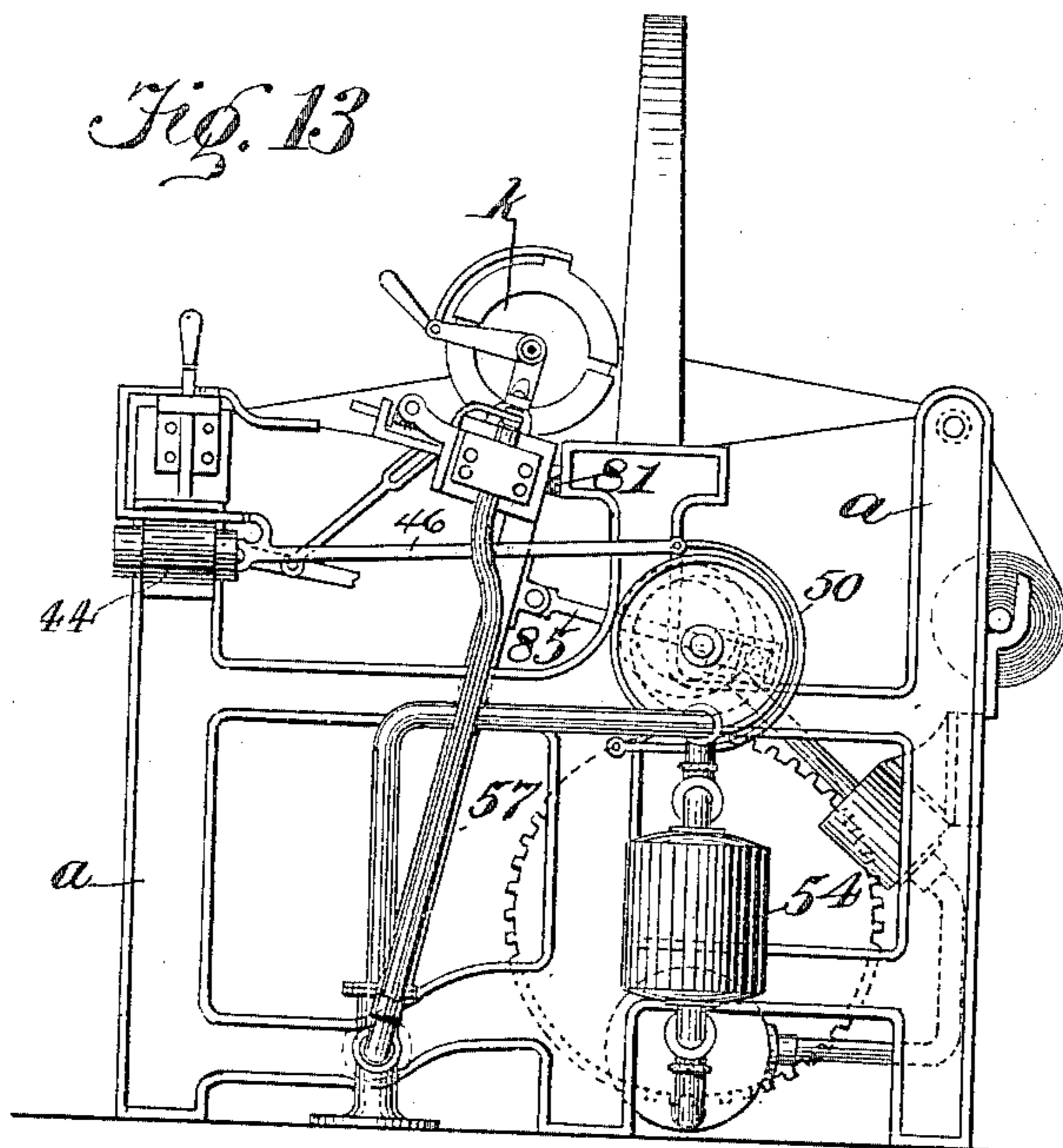


Fig. 13<sup>a</sup>

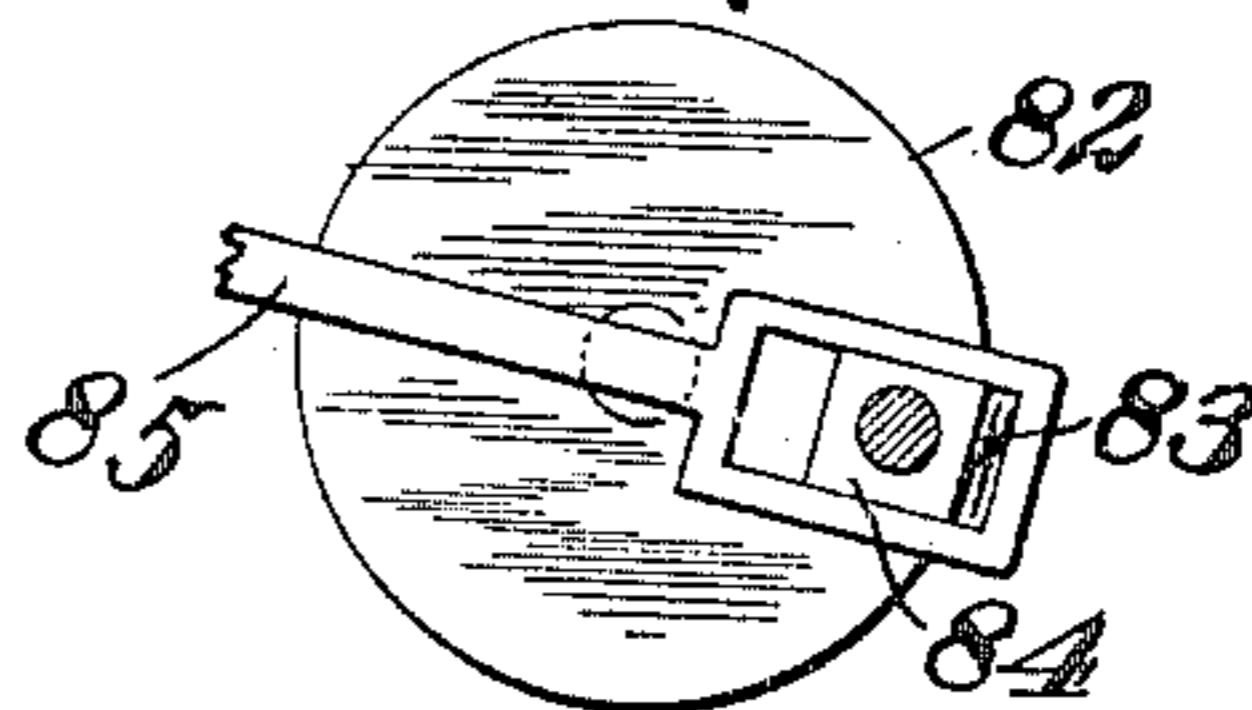
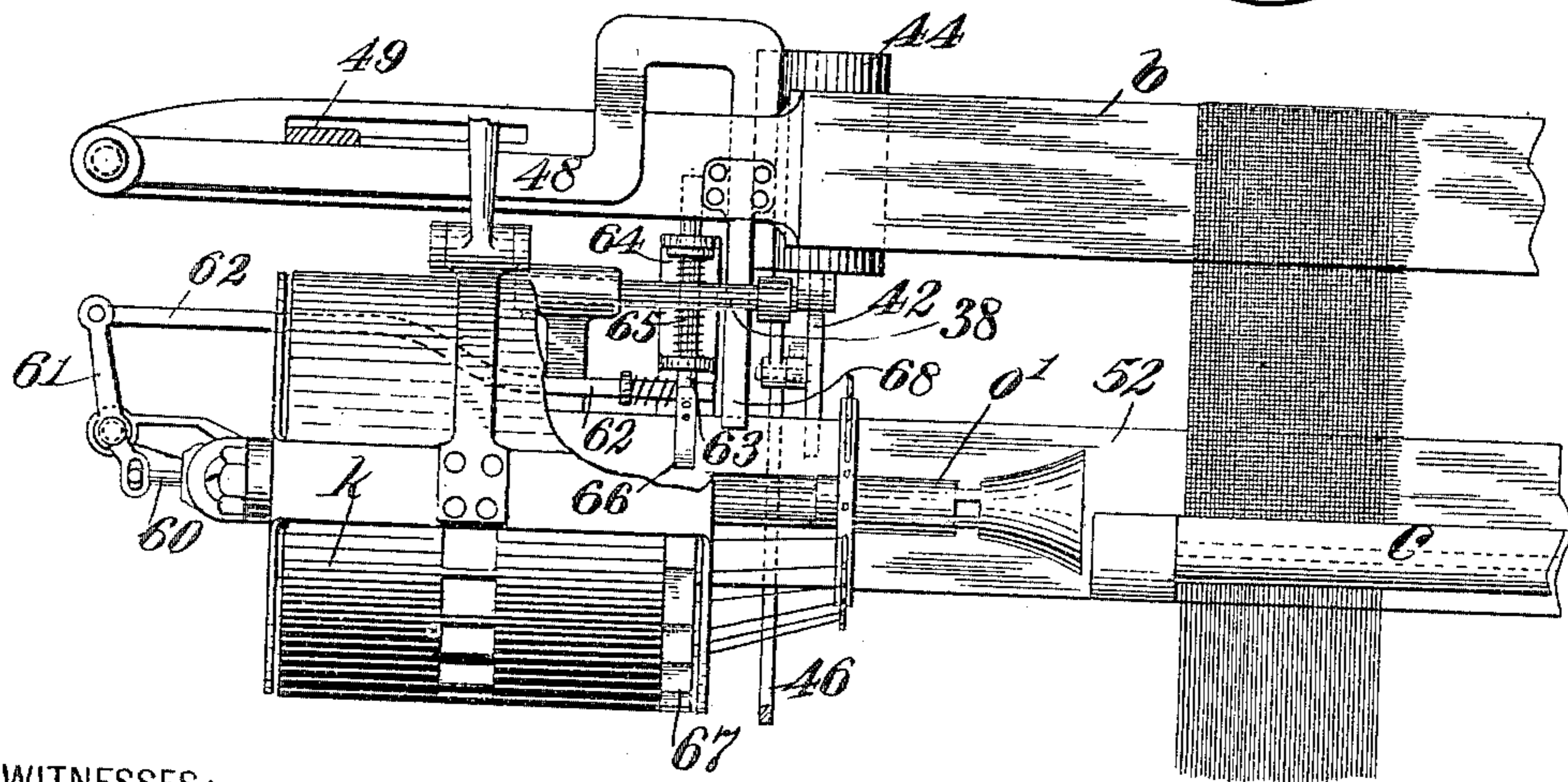


Fig. 16



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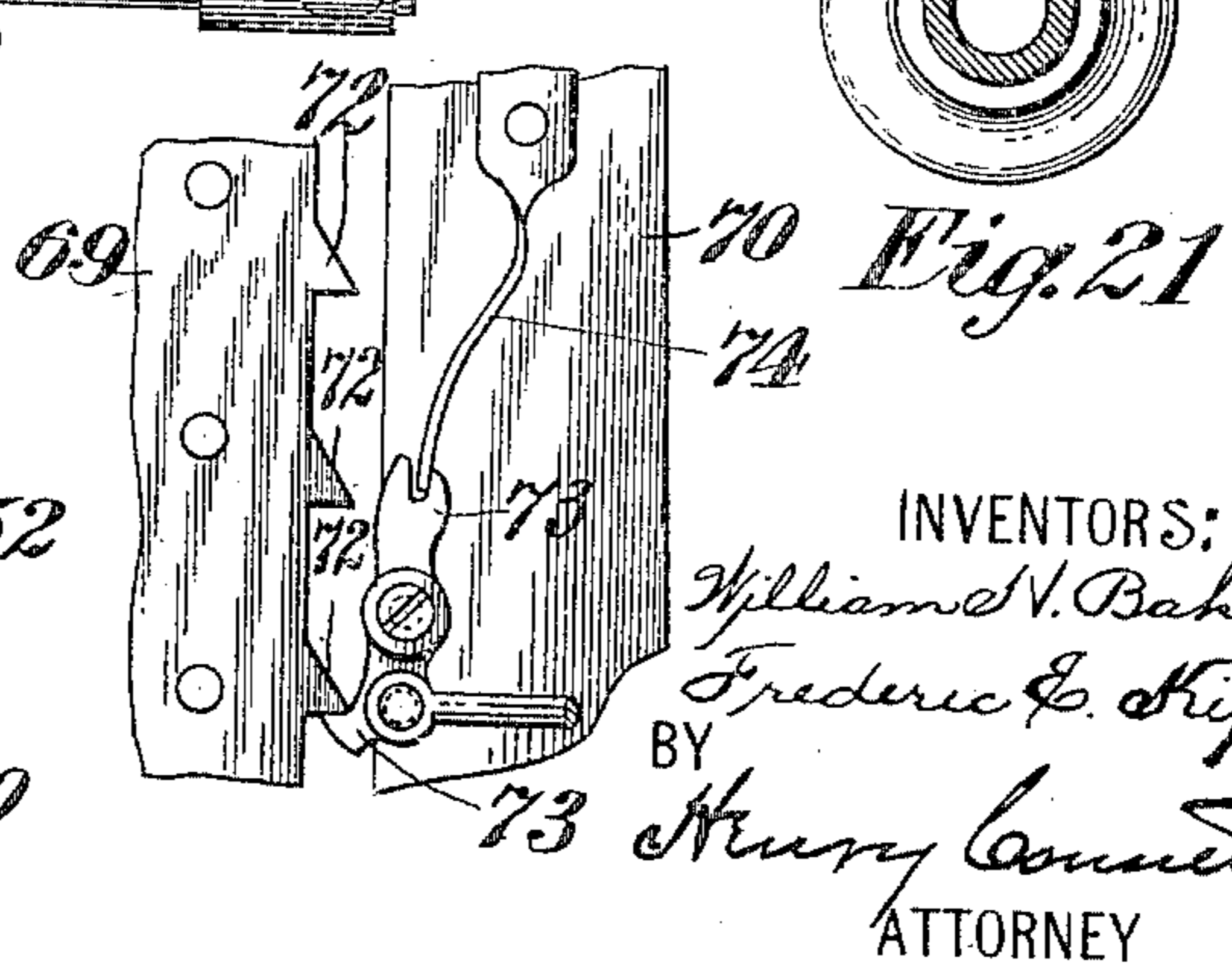
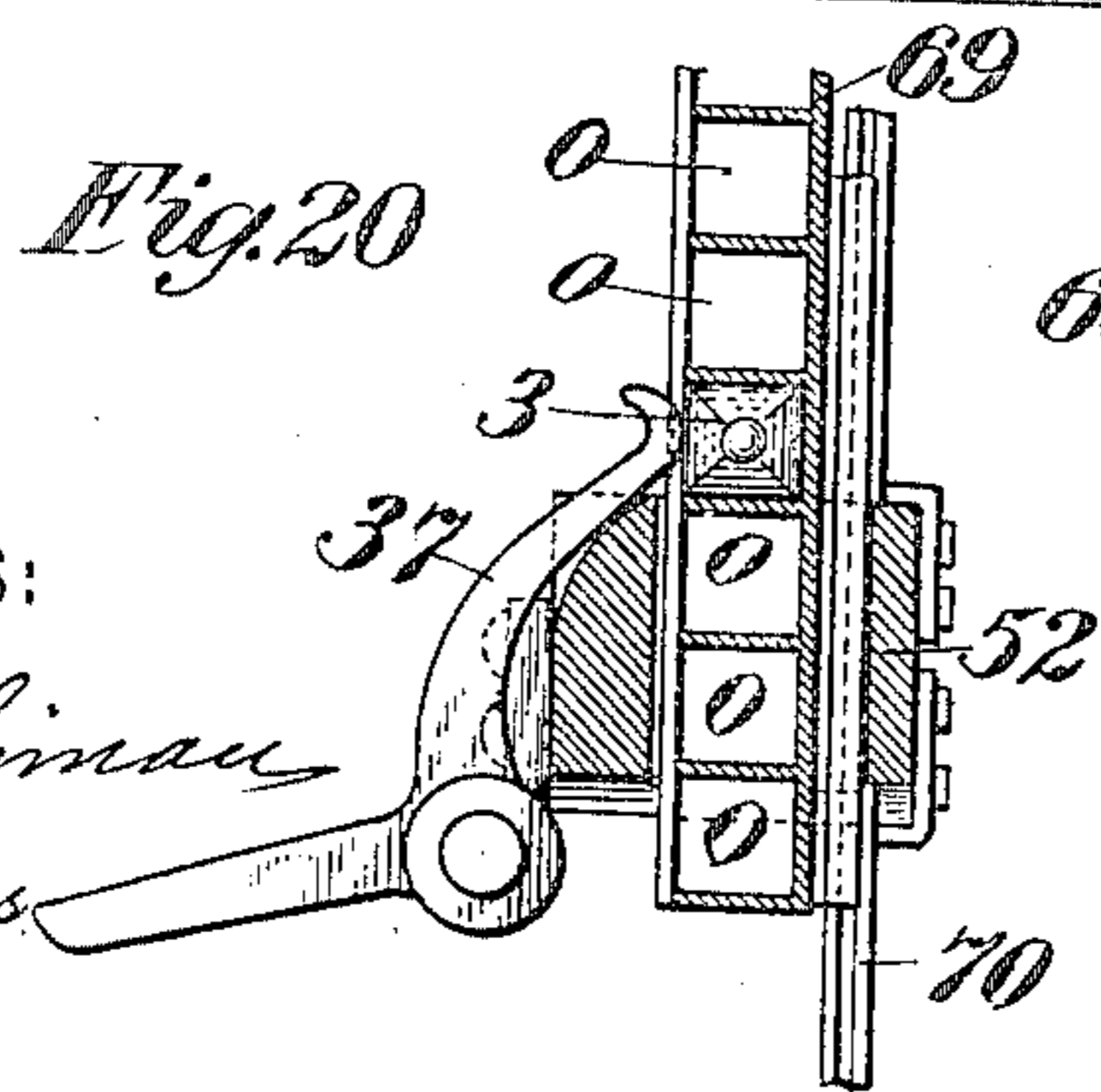
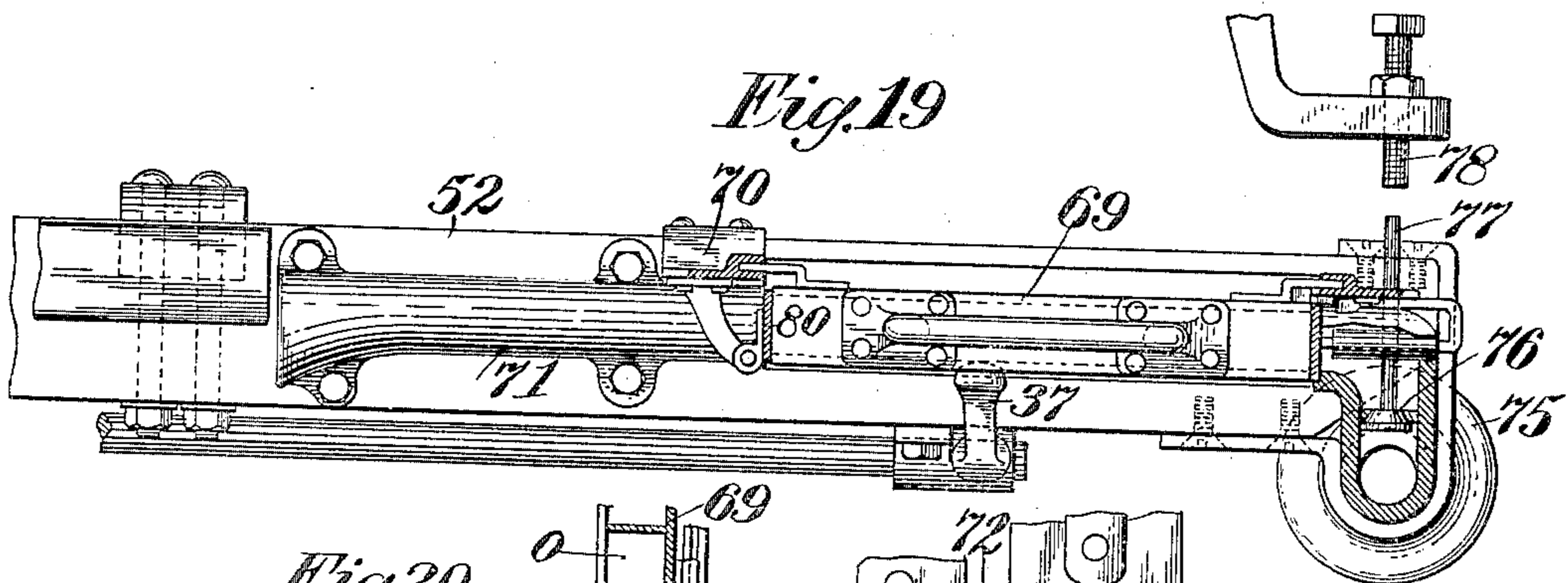
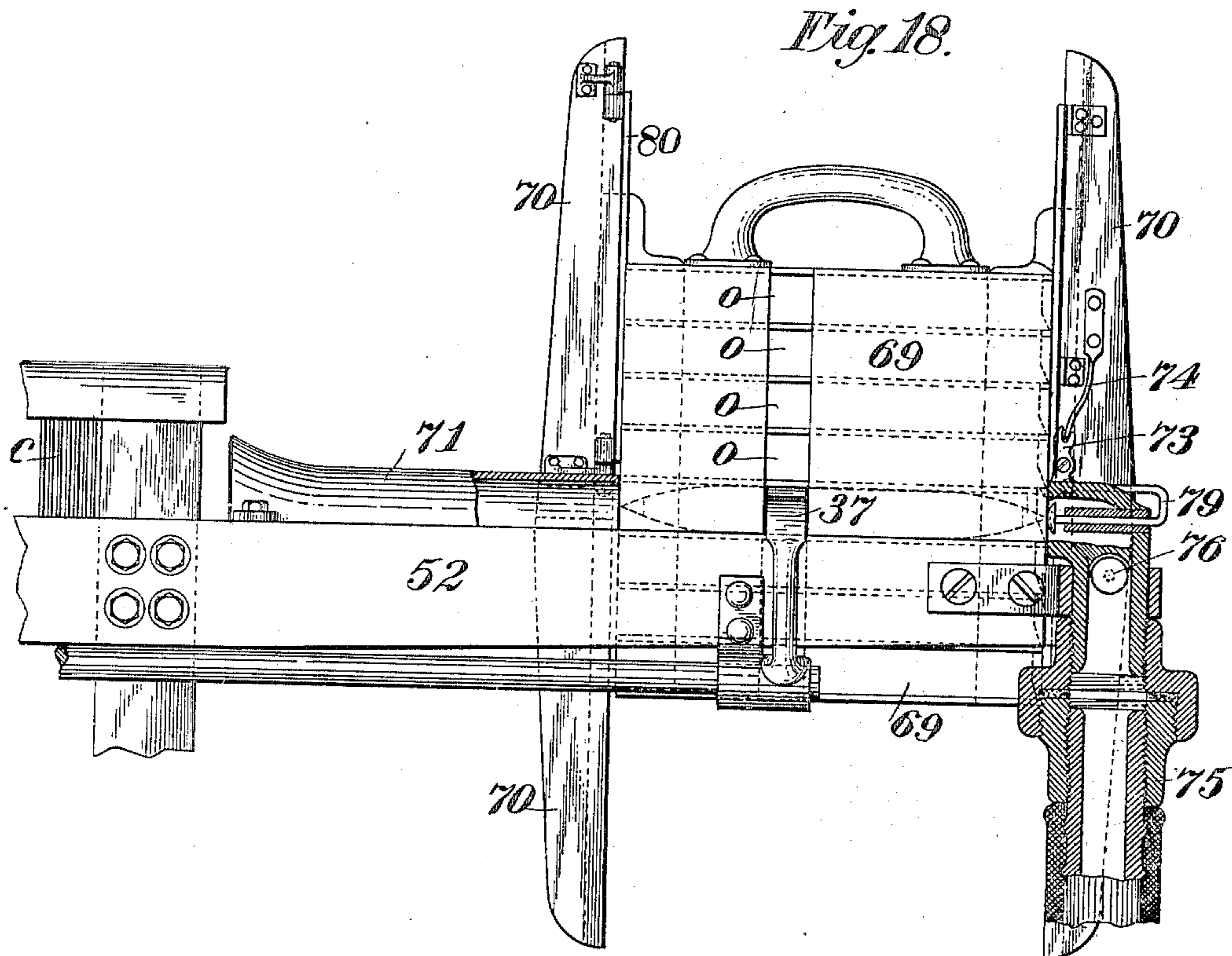
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Patented Oct. 16, 1900.

(Application filed Nov. 3, 1899.)

(No Model.)

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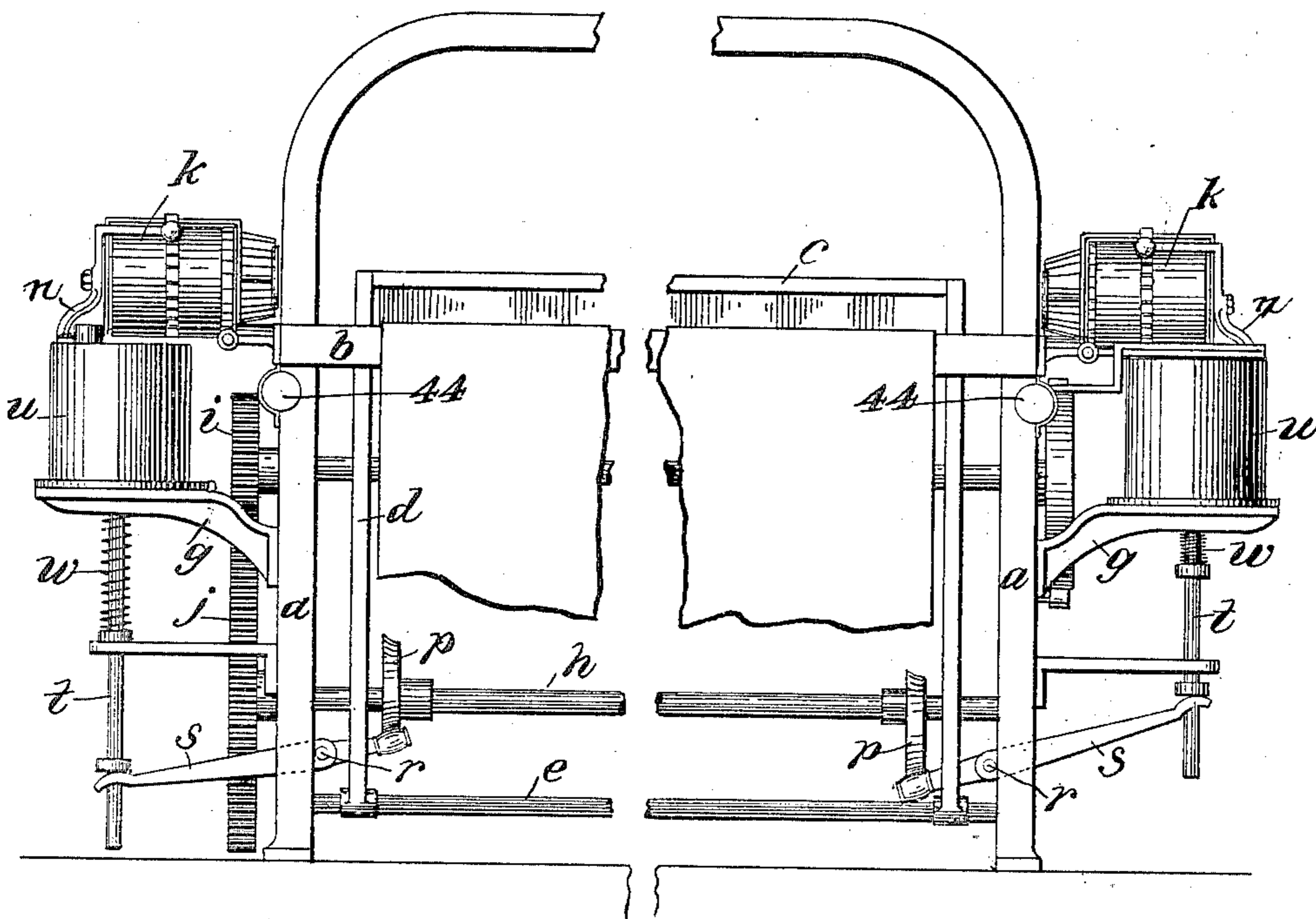
Patented Oct. 16, 1900.

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8 Sheets—Sheet 8.

Fig. 22



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# UNITED STATES PATENT OFFICE.

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E. KIP, OF MONTCLAIR, NEW JERSEY.

## LOOM.

SPECIFICATION forming part of Letters Patent No. 659,950, dated October 16, 1900.

Application filed November 3, 1899. Serial No. 735,647. (No model.)

*To all whom it may concern:*

Be it known that we, WILLIAM H. BAKER, residing at Central Falls, Providence county, Rhode Island, and FREDERIC E. KIP, residing at Montclair, Essex county, New Jersey, citizens of the United States, have invented certain new and useful Improvements in Looms, of which the following is a specification.

This invention relates to looms having means for automatically supplying weft or filling as needed to replace that exhausted, and particularly to the class of looms wherein a compressed aeriform fluid is employed for picking or driving the shuttle through the warp-shed.

The object of the present invention is to provide a means whereby when the weft or filling in the shuttle shall be nearly or quite exhausted a supply of weft or filling shall be furnished to replace that exhausted. Means are also provided whereby if the shuttle in play does not get home in its box or cell from some accident the loom will be stopped.

In a general way the principal feature of the invention consists in a rotatively-mounted magazine shuttle-box which will be filled, normally, with shuttles full of weft. One of the cells of this magazine will be at the picking or driving point or alined with the race-way, if there be one, and when the shuttle in play shall be exhausted of weft, or nearly so, and it enters this working cell it will set in action mechanism to shift said shuttle-box, so as to bring the next succeeding cell containing a fresh shuttle to the driving or picking point. The magazine shuttle-box may of course be rotated by any going part of the loom; but it is convenient to operate it by the reed or by the lay or batten, if there be one.

In the accompanying drawings, which illustrate an embodiment of the invention, Figure 1 is a front view of the loom, and Fig. 2 is a side view of the right-hand side thereof. These views are on a small scale and show only so much of a loom as is required to illustrate the invention. Fig. 3 is an enlarged side elevation of the magazine shuttle-box, partly in section at its lower part, the air-compressing devices being also in section. Fig. 4 is a view of the same parts seen from

the right in Fig. 3. In this view the flared receiver and director of the shuttle is broken away and the cylinder of the protector is in axial section. Fig. 5 is a plan of the parts seen in Fig. 3. Fig. 6 is a detail view of the ratchet mechanism for rotating the magazine. Fig. 7 is a sectional view of the working cell of the magazine, showing the exhausted shuttle in action. Fig. 8 is a plan view similar to Fig. 5, but with the magazine omitted, so as to better show the parts below it. Fig. 9 is a longitudinal section of the shuttle; Fig. 10, a side elevation of one end thereof. Fig. 11 is a cross-section thereof, showing the valved diaphragm or partition 31. Figs. 12, 13, 13<sup>a</sup>, 14, 15, 16, and 17 are views illustrating a modification wherein the rotary magazine shuttle-box is carried by the lay, and Figs. 18, 19, 20, and 21 are views illustrating a modification wherein is employed a gravity-magazine on the lay. Fig. 22 shows a construction wherein the loom has a magazine at each side thereof. Fig. 8<sup>a</sup> is an illustrative view of the means for rotating the magazine.

In the principal views, Figs. 1 and 2, *a* is the loom-frame. *b* is the breast-beam forming a part thereof. *c* is the reed carried by lay-swords *d*. *e* is the rock-shaft or swing-rail. *f* is the crank-shaft, which imparts a to-and-fro motion to the reed through the medium of connecting-rods *g*. All of these parts are or may be similar to those in the known forms of looms. In the construction shown in the principal views the shuttle-boxes are stationary at the picking-point or non-vibrating. A cam-shaft *h* below the crank-shaft *f* is driven from the latter through the medium of gear-wheels *i* and *j* on the respective shafts. The wheel *i*, as here shown, is one-half the diameter of the wheel *j*, and consequently the shaft *h* rotates at one-half the speed of the shaft *f*.

It may be stated here briefly that the loom as shown has, Fig. 1, a rotative magazine shuttle-box *k* at one side and like means otherwise than this at both sides of the loom for picking or driving the shuttle. For simplicity of description the mechanism at the side of the loom where the magazine shuttle-

box is situated will be described, premising that the mechanism at the opposite side, except as will be pointed out, is the same and is designated by the same reference characters.

The magazine shuttle-box *k* is rotatively mounted on a horizontal spindle *m*, fixed in a bracket *n*. It has a drum-like form and is provided with a plurality of concentrically-arranged shuttle-cells *o* parallel with its axis of rotation. The arrangement shown is such that the lower cell *o*, called the "working cell," is at the picking-point and will be alined with the raceway, if one be used, when the shuttle is picked or driven. Alined with the inner end of the working cell is a fixed shuttle receiver and director *o'*, which will be by preference flared at its receiving end.

The shuttle is adapted to be driven or picked by compressed air, and the means herein shown for compressing a charge of air and applying it for picking the shuttle will now be described. On the cam-shaft *h* is a cam *p*, which acts on an arm *q* on a rock-shaft *r*, and on this shaft is another arm *s*, which is forked and takes under a collar on an upright piston-rod *t*, which extends upward into the cylinder *u* of an air-compressor.

Figs. 1 and 2 show the features above described; but the enlarged view, Fig. 3, shows the interior construction of the compressor. The rod *t* is fixed to a piston *v*, which is driven upward by the cam *p* to compress the air and is retracted by a spring *w*. (Seen in Fig. 1.) In the piston are suitable valves, which allow the air to pass above the piston when it descends. A passage *x* connects the outer end of the working cell *o* with the upper part of the compressing-cylinder, and this passage is controlled by a valve *y*, which opens inwardly and is held up to its seat by a suitable spring *z*. The valve *y* is coupled to the longer arm of a lever *l* in the upper part of the compressor-cylinder, and the shorter arm of said lever has a depending nose 2, which when the piston nears the end of its upstroke is impinged upon by the latter in a manner to rock said lever and suddenly throw open the valve *y*, thus admitting the compressed air to the rear end of the working cell *o* to drive the shuttle 3 therein through the warp-shed to the opposite side of the loom.

So far as above described the operation is the same at the opposite side of the loom, (at the left in Fig. 1.) The cam *p* at that side, however, is set oppositely on the shaft *h* to the cam *p*, which is at the side where the magazine shuttle-box *k* is situated, so that the picking operations may alternate, as will be understood by those skilled in the art. The shuttle-box 4 at this side, (the left in Fig. 1,) which corresponds to the working cell of the magazine *k*, will be fixed and may be integral with the part called the "shuttle receiver and director."

The means whereby the exhaustion of the weft in the shuttle in play controls the supply of a fresh shuttle and the operating mechanism controlled will now be described with especial reference to Figs. 3, 4, and 5.

As before stated, there is a series of concentrically and longitudinally arranged cells *o* in the magazine and shuttle-box *k*, and these cells will be primarily filled with full shuttles. These latter may be inserted at one end of the drum of the magazine, and to facilitate this two semicircular end plates 5 5 are provided, which close over the respective ends of the cells in the upper half of the magazine. The plates do not or need not touch the ends of the magazine, and they are connected by a strip 6 with a suitable lifting handle or lever 7, fulcrumed on an arm 8 of the bracket *n*, which supports the magazine. This latter bracket is herein shown as fixed to or integral with the air-compressor cylinder, and the latter is represented as supported on a bracket 9 on the loom-frame.

By means of the handle 7 the end plates 5 may be lifted out of the way and the shuttles inserted in the cells of the magazine *k*, the latter being rotated to afford access to the lower cells thereof. These lower cells may be closed at their ends by suitable fixed plates 10, one of which may be secured to the director *o'*, and these two parts be secured to a bracket on the cylinder of the air-compressor or to any non-moving part.

To steady the rotating magazine *k* with its lower cell *o* alined with the passage *x* at its outer end and with the flared director at its inner end, the device seen in Fig. 3 may be employed. This device comprises a spring pin or latch 11, with a rounded end, which engages one of a concentric series of recesses in the end of the magazine *k*. This pin fixes the alinement and steadies the magazine; but it does not prevent the latter from being rotated when a little force is applied. On the drum-like magazine are formed a series of ratchet-teeth 12, (see Figs. 4 and 5,) one for each cell *o*, and with these teeth engages a spring-pawl 13 on a slidable pawl-bar 14, which has a retracting-spring 15. A slide-rod 16 plays at its free end through an aperture in the bar 14, and when protruded the end of this rod 16 finds itself in the path of a tappet 17, carried by a vibrating or going part of the loom, as the reed *c*, the raceway, or the lay-sword. When the reed beats up, the tappet 17 encounters the protruding end of the rod 16 and through it drives back the bar 14, thus causing the pawl 13 to impart a rotary impulse to the magazine *k*, bringing the next succeeding cell *o* into operative alinement with the raceway. When the tappet 17 recedes, the pawl is retracted, its spring allowing it to yield and pass over the ratchet-tooth on the magazine.

To understand how the exhaustion of the weft in the shuttle acts to control the protru-

sion of the rod 16, it will be best to first describe the shuttle and bobbin, which are best illustrated in Figs. 9 to 11.

The shuttle 3 is of an inclosed or tubular form, though not necessarily cylindrical. As herein shown, it is rectangular with conical ends, one end piece 18 being removable, so as to permit of the introduction of the bobbin or weft-holder 19. At its end it has apertures 20 to admit air, a fastening 21 to secure the end piece 18, internal shoulders, as 22 and 23, to clamp on the head 24 of the bobbin and hold the latter firmly in place, and an aperture, as 25, in the shuttle-wall for the weft-thread to pass through. In the present construction the bobbin is hollow at its butt or head and has one or more apertures 26 in its wall, which open into a circumferential exterior groove 27, Fig. 9, so that when the weft or filling is wound on the bobbin this groove is filled with a mass of weft which pays off in weaving just before the bobbin is exhausted, thus uncovering the apertures 26 at one pick, so as to open a passage for air through the shuttle from the apertures 20 at one end to the like apertures at the other end. Normally when the shuttle enters the working cell *o* of the magazine shuttle-box *k* it encounters a cushion of air therein, which cannot pass back about its body, and this cushion of air so resists the entry of the shuttle as to stop it short at, say, the point indicated in full lines in Fig. 3; but if the weft be nearly exhausted the apertures 26 will be open, so that air may pass entirely through the shuttle. Consequently when the shuttle next enters the working cell *o* the air of the cushion will pass back through the shuttle in a measure, thus removing or much reducing the resistance to the entry of the shuttle, and the latter under momentum will enter farther into the cell, as indicated in the detail view, Fig. 7. When this occurs, the shuttle-body wipes over a side spring 28 in the cell *o*, which has a beak 29, that passes out through an aperture in the cell-wall and is adapted when the cell *o* is the working cell to impinge upon the horizontal arm of an elbow-lever 30, the pendant arm of which is coupled or jointed to the slide-rod 16. Thus when the weft uncovers the apertures 26 in the bobbin the shuttle will enter the working cell *o* far enough (see Fig. 7) to press down the side spring 28 and through it drive out the slide-rod 16 into the path of the tappet 17.

As we are the first, as far as we are aware, in this field of invention, we claim this invention in its broadest sense, and we do not limit ourselves to any specific device for accomplishing the results. We would consider our invention practiced in a loom having a weft or filling changing or supplying mechanism wherein the shuttle or weft carrier is picked or driven through the shed by the agency of an aeriform fluid.

We do not confine ourselves to any particular form of shuttle or weft-carrier or any par-

ticular form of shuttle-box, shuttle-tube, or ejector-tube. By the word "tubular" we do not mean to imply that the box is cylindrical. It may have any convenient form in cross-section, as rectangular, circular, elliptical, polygonal, or irregular. It will be understood that the form of the shuttle or weft-carrier used will conform to that of the interior of the shuttle-box. If the latter be cylindrical, the shuttle or weft-carrier will be of cylindrical form also; but if the box be square, polygonal, or elliptical in cross-section the cross-section of the shuttle will conform thereto.

The shuttle-box may of course be constructed in any convenient way, out of any suitable material, and the lining therein may be omitted if the shuttle is made to fit closely enough to prevent too much leakage of air around it. There will be or may be a little leakage in order to avoid the formation of too strong a cushion of air in front of the incoming shuttle.

We may explain here that the shuttle 3 has in it a partition 31, in which is an aperture or apertures 32, controlled by valves 33, which may be of leather. The purpose of this device is to permit the air of the cushion in cell *o* to pass through the shuttle in one direction only when the apertures 26 in the bobbin are opened. The reason for this is that the shuttle is designed to be so placed that it will enter the working cell *o* always with the end having the cap 18 foremost, and the air of the cushion may then pass back through the shuttle; but if the apertures 26 should, as they may, first become uncovered by the weft while the shuttle is in the box 4 at the opposite side of the loom the charge of air for driving the shuttle cannot pass through the latter by reason of the valves 33 and partition 31. Of course the shuttle might be reversed, in which case the valves 33 would be placed on the opposite side or face of the partition. In any case these valves operate as check-valves. The cells *o* will of course all be provided with side springs 28, and they will be or may be lined with chamois, velvet, or other soft packing material, as described in our pending application, Serial No. 735,648, filed November 3, 1899. The weft-threads from the several shuttles in the magazine-cells will be led out and attached to a weft-end holder, comprising, as herein shown, pins 34, in a disk or ring 35, carried with the drum of the magazine *k*. At any time when the loom is at rest the weaver may place filled shuttles in any of the upper cells, removing at the same time the empty shuttles therefrom.

Should a shuttle from any cause not get home in the cell or box when it is picked, a protecting device is provided to stop the loom at the next beat-up of the reed. This device will now be described with especial reference to Figs. 3, 4, 5, and 8.

In the side walls of the several cells *o* of

the magazine *k* are apertures 36, (seen in Fig. 3,) and a convex-faced protecting-finger 37, in the nature of a swell, is so situated as to occupy the aperture 36 of the lower working cell *o*. In the specific construction herein shown the finger 37 is fixed to a rock-shaft 38, having bearings in a fixed bracket, and to this shaft is fixed an arm 39. This arm is backed by an adjustable spring device 40, which tends to press the finger 37 inward and into the path of the shuttle entering the working cell *o*. The arm 39 is coupled by a link 41 to an arm 42, hinged or pivotally attached to a piston 43 in a cylinder 44, fixed on the loom-frame. When there is no shuttle in the working cell *o*, the spring device 40 will press the finger 37 inward, thus serving to raise the arm 42 until it is alined in the path of a tappet or "dagger" 45, carried by a lay-sword *d* or other vibrating part of the loom; but when the shuttle enters the working cell the finger 37 is pressed outward and the arm 42 so depressed therethrough as to be below the path of the tappet 45. As seen in the plan, Fig. 8, the piston 43 carries a brake-rod 46, to which is fixed a tappet or dagger 47, which when the piston is driven back into the cylinder strikes a knock-off lever 48, which sets free a shipper-lever 49 and stops the loom. The knock-off and shipper-lever and the mechanism whereby the shipper-lever stops the loom are very common and well known and will require no further description. Our invention resides mainly in the air-cushion device, comprising the cylinder 44, closed at its outer or rear end, and the piston 43 therein. In the ordinary devices employed for this purpose a metal spring is used; but the impact thereon is so great in a rapid-running loom that a metal spring will not answer promptly and is often broken by the blow. The air-cushion serves to overcome this objection and responds quickly and without injury even in looms where the lay or going part moves with great rapidity. Fig. 2 shows a strap-brake 50 on a pulley 51 on the shaft *f*. The brake-rod 46 is coupled to this strap 50, so that the brake is set simultaneously with the shifting of the shipper-lever. This braking device is not in itself new.

As has been said, the shuttle need not be cylindrical; but when it has this form it should be ballasted, so as to prevent it from turning axially in its passage through the warp-shed. This is shown and claimed in our pending application, Serial No. 735,648, filed November 3, 1899. Fig. 8<sup>a</sup> shows the tappet 17 in operation on the rod 16, and Figs. 4 and 5 show a raceway or batten 52 moving with the reed. This raceway or batten may be employed or not, as desired. Our present invention is not restricted to its use.

In the construction described we have shown a non-vibrating shuttle-magazine or one not carried by or moving with the lay or reed; but our invention is capable of embodi-

ment as well in a construction where the magazine moves to and fro with the reed or with the parts forming the raceway, if there be such parts.

In Figs. 12 to 17, inclusive, a construction is shown wherein the rotary magazine shuttle-box is carried on and vibrates with the lay or batten 52, which is extended to receive it. Fig. 12 is a front view, and Fig. 13 a side view, on a small scale, illustrating this form of the invention. Fig. 14 is an end view of the magazine and adjacent parts. Fig. 15 is a side view, partly in section, of the same parts. Fig. 16 is a plan and Fig. 17 a detail view. These are drawn to a larger scale than Figs. 12 and 13. In these views we have embodied in the modified construction several features which differ from those in the principal views. For example, the shuttles and shuttle-cells in the magazine are represented as cylindrical, as shown and described in our pending application, Serial No. 735,648. The devices for supplying compressed air to pick or drive the shuttle are also substantially the same as those shown in our said pending application. The pneumatic mechanical controlling devices at the magazine shuttle-box are also similar to those in our said pending application, except that they are adapted to rotate the magazine instead of to stop the loom. In this construction, Figs. 13 to 17, the bracket *n*, which supports the magazine, is mounted on the lay 52, which is extended in a manner similar to that in ordinary looms for receiving the ordinary shuttle-box, and said magazine is or may be constructed precisely as shown in the principal views. By way of variation, however, the cells *o* are represented as of cylindrical form, and the shuttles 3 will be of course of the same form. The air used to pick the shuttle is contained in a reservoir or holder 53, from which it flows to a vessel 54 by a pipe 55, controlled by a self-closing cock or valve 56, and it flows to the shuttle box or cell by way of a rocking pipe 57, controlled by a cock 58. The cocks are opened alternately by a cam 59 on the cam-shaft *h*, driven from the shaft *f* by gear-wheels *i* and *j*. This construction is the same in substance as that illustrated in our said pending application. When an exhausted shuttle enters the working cell *o* of the magazine shuttle-box, it enters far enough to strike and press outward a push-rod 60, Figs. 15 and 16, and this rod is coupled to one arm of a lever 61, fulcrumed on the lay. To the other arm of this lever is coupled a rod 62, which has a bearing in a pawl-slide 63, mounted in a bracket 64 on the lay and provided with a retracting-spring 65. The slide 63 carries a spring-pawl 66, which engages teeth 67 on the magazine *k*. When the rod 62 is protruded thus by the shuttle through the pawl-slide and the lay beats up, the protruding extremity of rod 62 encounters a fixed tappet 68 on the loom-frame and the pawl 66 (which is here shown as a push-pawl) acts to rotate the magazine *k* to

the desired extent. The protection-finger 37 and its mechanism operate the same as in the construction of the principal views, except that in this modified form the finger 37 and shaft 38 move to and fro with the lay and the arm 39 has a slotted connection with the link 41, so that the proper play of the parts is permitted. This is seen in Fig. 14. The reed and other vibratory parts of the loom may be arrested at the picking-point and allowed to dwell momentarily as the shuttle or weft-carrier is traversing the warp-shed, as explained in our before-mentioned pending application; but in Fig. 13<sup>a</sup> we show a somewhat different means for effecting this dwell. Said means comprises a cushion or buffer 81 on the loom-frame, Fig. 13, which arrests the lay or reed at the picking-point before the crank 82, Fig. 13<sup>a</sup>, has reached the outer limit of its throw, the remainder of the movement of the crank being permitted by a strong spring 83, behind a block 84 on the crank-pin in the yoke of the connecting-rod 85. This construction allows the lay or reed to dwell while the shuttle is traversing the warp. There is or may be two rods 85 and cranks 82 to operate the lay.

The magazine shuttle-box need not necessarily be rotative nor need it be moved or shifted by a going part of the loom in order to bring a fresh shuttle into play. In Figs. 18 to 21, inclusive, a construction is illustrated wherein the magazine-box, containing a plurality of cells superposed in position, is mounted in guides on the lay and adapted to shift by gravity as permitted. Fig. 18 is a front view, Fig. 19 a sectional plan, Fig. 20 a fragmentary vertical section, and Fig. 21 an enlarged detail view, of the detent device. In this construction the magazine 69 is mounted to play vertically in guides 70 on the lay 52, the cells *o* therein being superposed or arranged one above another. The flared guide 71 is fixed on the lay, and the magazine is allowed to descend step by step to bring the several cells into alinement with said guide and with the raceway. A spring detent device for supporting the magazine (seen best in Figs. 18 and 21) comprises a series of teeth or shoulders 72 on the magazine—one for each cell—a detent 73 on the guide 70, and a spring 74 to hold said detent in proper engagement. The compressed air or aeriform fluid for picking or driving the shuttle comes to the lay by way of a flexible or rocking pipe, tube, or hose 75, and a valve 76 controls its admission to the outer end of the working cell *o*. This valve is held to its seat by the compressed air, and it has a stem 77, which extends out at the back in position to impinge upon a suitable tappet 78 on the loom-frame when the lay recedes to the picking-point. The stem of the valve then encounters the tappet and opens the valve, thus admitting air to the cell. When a shuttle 3 enters the working cell under ordinary conditions, it will occupy the position seen

in dotted lines in Fig. 18; but if the weft or filling therein be nearly or quite exhausted and the passage or vent therethrough opened, 70 as before explained, by such exhaustion the shuttle will enter farther into the cell and its end will strike and drive back a slide-rod 79. This rod has a U shape, and its other branch is coupled to the detent 73, so that 75 the blow of the shuttle will momentarily drive back said detent and allow the magazine to drop; but the detent-spring will move the detent forward again in time for it to catch under the next shoulder 72 above. A 80 protection-finger 37, similar to that before described, may be employed with this form of magazine. In order to facilitate the insertion of shuttles or weft-carriers into the magazine 69, a hinged door or flap 80 is 85 mounted on one of the upright guides 70. The other ends of the magazine-cells may be closed by a plate on the other guide 70.

It will be noted that we have shown a form of the invention where the magazine shuttle-box is stationary or non-vibrating and also forms where the same part vibrates with the lay or going part of the loom. We do not wish to give undue prominence to either construction. In looms for weaving certain fabrics it may be desirable to use one form, and in those for weaving other kinds of fabrics the other form may be preferred. We have also shown means for picking or driving the shuttle or weft-holder by a compressed aeriform fluid in lieu of a picker and picker-stick; but it will be obvious that the pneumatic controlling devices whereby the substantial exhaustion of the weft or filling in the weft-carrier acts to set in motion the weft or filling changing or supplying mechanism is really independent in its operation of the particular means employed for driving the shuttle or weft-carrier through the shed.

It will be apparent that by placing a magazine shuttle-box *k* and all the mechanism for controlling and operating it at both sides of the loom the store of weft may be doubled, and this construction may be employed if desired. In Fig. 22 we have shown a construction of this character where a weft or filling changing or supplying mechanism is situated at both sides of the loom. This view in other respects is the same as Fig. 1. When two magazine shuttle-boxes are employed, 120 the valves 33 in the shuttle may be dispensed with.

Our pneumatic device for controlling the times of operation of the weft or filling changing or supplying mechanism—that is to say, 125 the vent or passage for air in the weft-carrier or shuttle, which is opened by the exhaustion or substantial exhaustion of the weft or filling therein—requires a special form of shuttle box or cell, and this form of box or cell is 130 also adapted for use where compressed air is employed for picking the shuttle, and hence we have shown in the drawings these two features combined; but the pneumatic con-

trolling device is adapted for operation in any loom having a suitable shuttle box or cell wherein the air will be incarcerated by the entry of the shuttle therein. In order  
5 that the pneumatic control shall be effective, the shuttle must enter the box somewhat in the manner of a piston in a cylinder.

Where an aeriform fluid under tension is employed to pick or drive the shuttle, the  
10 charge of fluid will be to some extent deflected laterally through apertures in the walls of the shuttle-director near its receiving end, so that the entire force of the expansion of the charge shall not be expended in the direction  
15 in which the shuttle travels; but we do not limit ourselves to this particular deflecting means. In our pending application, Serial No. 9,842, filed March 23, 1900, another means for deflecting the fluid is illustrated.

20 We have shown and described in this application pneumatic control; but we do not limit ourselves in this respect. Other controlling means are known and may be employed. Also other means for rotating the  
25 magazine or shuttle-feeder than that shown are known, and we do not limit ourselves in this respect. For example, another device for this purpose is illustrated in our application, Serial No. 6,143, filed February 23, 1900.

30 Being the first, as we believe, in this field of invention, we claim, broadly, and would consider as coming within the scope of our invention a mechanism for supplying weft or filling to a loom combined with pneumatic  
35 means controlling the times of operation of said mechanism and also such a supplying mechanism combined with means for applying an aeriform fluid to pick or drive the shuttle and pneumatic means at the shuttle-  
40 box for controlling the times of operation of said mechanism.

By exhaustion or substantial exhaustion and presence or absence or substantial absence of the weft or filling in the weft-carrier  
45 in play we mean either the entire denudation of the weft-holder or such degree of denudation thereof as will allow the shuttle or weft-carrier to perform its functions as described. By a "shuttle" or "weft-carrier" we  
50 mean that instrument which carries the weft or filling or yarn through the warp-shed in the process of weaving, and by "bobbin" or "weft-holder" we mean that device in the shuttle on which is wound the weft or filling.  
55 This device or part is variously called a "bobbin," a "spindle," a "cop," &c. Where there is a spindle, the cop or "all cop" will usually be slipped thereon.

We have shown herein means for picking  
60 or driving the shuttle with compressed air; but some of the features of the invention are applicable as well to other means for picking the shuttle—as, for example, with a picker-stick and picker, as shown in our pending  
65 application, Serial No. 6,143, filed February 23, 1900.

In our pending application, Serial No.

739,874, filed December 11, 1899, which relates to double-shuttle looms, we have shown and claimed some features of construction which  
70 are shown and described herein. These features we do not of course make claim to in this application.

Having thus described our invention, we claim—

1. In a loom, the combination with means  
75 for automatically supplying weft or filling to the loom as required, and means for picking or driving the shuttle, of the said shuttle, means controlled by the weft or filling there-  
80 in for determining the extent to which the shuttle shall enter its box, and means adapted to be actuated by the shuttle when it enters its box to the maximum extent for setting in  
85 motion said supplying mechanism.

2. In a loom, the combination with means  
90 for automatically supplying weft or filling to the loom as required, and means for picking or driving the shuttle, of the said shuttle, means controlled by the weft or filling there-  
95 in for determining the extent to which the shuttle shall enter its box, and means extending into the shuttle-box and so situated as to be actuated by the shuttle when it enters its box to the maximum extent for setting in  
100 motion said supplying mechanism.

3. In a loom, the combination with an automatic weft or filling changing or supplying  
105 mechanism, an intermediate mechanism between said supplying mechanism and the shuttle-box of the loom, of a shuttle or weft-carrier, and means within the latter, controlled by the weft or filling therein, which governs the extent to which the shuttle shall  
110 enter the box, said means permitting the shuttle, when the weft therein is substantially exhausted, to enter the box to an extent greater  
115 than the normal and to actuate said intermediate mechanism.

4. A loom having an automatic weft or filling changing or supplying mechanism, a shuttle-  
120 box, an intermediate mechanism between the shuttle-box and said supplying mechanism, a shuttle, and means for bringing said shuttle to rest in its box at one point normally, or when the weft therein is not exhausted, and for bringing same to rest at another point in the box when the weft therein  
125 is substantially exhausted, whereby said shuttle may be made to actuate said intermediate mechanism.

5. A loom having an automatic weft or filling changing or supplying mechanism, a shuttle-  
130 box, an intermediate mechanism between the shuttle-box and said supplying mechanism, a shuttle, means for picking or driving said shuttle, and means for bringing said shuttle to rest in its box at one point normally, or when the weft therein is not exhausted, and for bringing same to rest at another point in  
135 the box when the weft therein is substantially exhausted, whereby said shuttle may be made to actuate said intermediate mechanism.

6. In a loom, the combination with a weft-

supplying mechanism, a going or vibrating part of the loom, and an intermediate mechanism between the supplying mechanism and said going part, of a shuttle-box, a shuttle 5 having an air-passage through it which is normally closed by the weft, means for applying to said shuttle an aeriform fluid for picking or driving it, and means extending into the shuttle-box and connected with said intermediate mechanism, whereby when the exhaustion of the weft opens said passage through the shuttle the latter is permitted to actuate the said intermediate mechanism to supply weft or filling to the loom.

7. In a loom, the combination with a weft or filling supplying mechanism, a going or vibrating part of the loom, and an intermediate mechanism between the supplying mechanism and said going part, of a shuttle-box, a shuttle having an air-passage through it which is normally closed by the weft, and a valve which permits the air to flow in one direction only through said passage, means for applying to said shuttle an aeriform fluid for picking or driving it, and means extending into the shuttle-box and connected with said intermediate mechanism, whereby when the exhaustion of the weft opens said passage through the shuttle the latter is permitted to actuate the said intermediate mechanism to supply weft to the loom.

8. In a loom, the combination with a vibrating or going part, a weft or filling supplying mechanism, and an intermediate mechanism between said supplying mechanism and going part and adapted for operatively connecting the same at proper times, of a shuttle-box, means for admitting thereto an aeriform fluid for picking or driving the shuttle, the said shuttle, having a passage through it for air, a bobbin or weft-holder having in it an aperture normally closed by the weft thereon, and means extending into the path of the shuttle in the shuttle-box and connecting with the said intermediate mechanism, whereby the shuttle is adapted to operate the latter when the weft is nearly exhausted.

9. In a loom, the combination with a shuttle-box adapted for incarcerating air, of a shuttle or weft-carrier having an air-passage through it which is normally closed by the weft or filling in said weft-carrier.

10. In a loom, the combination with a shuttle-box adapted for incarcerating air, of a shuttle or weft-carrier having through it a passage for air, and a bobbin in and closing the air-passage through said shuttle, said bobbin having through it an air-passage which is normally closed by the weft thereon.

11. A shuttle or weft-carrier for a loom having an air-passage through it which is adapted to be closed by the weft or filling within the said carrier and to be opened by the substantial exhaustion of said weft or filling.

12. The combination with a hollow shuttle or weft-carrier, having apertures near its respective ends for the entry and escape of air,

of a bobbin or holder for the weft in the carrier, said bobbin having an aperture or apertures in it which are closed by the weft wound thereon.

13. A bobbin 19, having an aperture or apertures 26, and an exterior, annular, circumferential recess 27, into which said aperture or apertures open, the weft being adapted to fill said recess.

14. In a loom, the combination with a weft-carrier to traverse the warp-shed, means for applying to said weft-carrier an aeriform fluid for picking or driving it, a shuttle-box, and a weft-supplying mechanism, of means extending from said box and adapted when actuated by the incoming shuttle to operate to supply weft or filling to the loom, and means within the shuttle and controlled by the presence or absence of weft thereon, which governs the extent to which the shuttle shall enter the shuttle-box.

15. A loom having the following instrumentalities, namely: a weft or filling changing or supplying mechanism, a shuttle or weft-carrier, means for picking the same, a shuttle-box, and intermediate mechanism between the supplying mechanism and the shuttle-box and extending into the path of the body of the incoming, substantially-exhausted shuttle, for setting in operation the supplying mechanism through the direct impact of the shuttle-body thereon.

16. A loom having the following instrumentalities, namely: a weft or filling changing or supplying mechanism, a shuttle or weft-carrier, means for picking the same, a shuttle-box, means for arresting the movements of the reciprocating part or parts of the loom used for beating up the filling, while the shuttle is traversing the shed, and intermediate mechanism between the supplying mechanism and the shuttle-box and extending into the path of the body of the incoming, substantially-exhausted shuttle, for setting in operation the supplying mechanism through the direct impact of the shuttle-body thereon.

17. In a loom, the combination with a weft-supplying mechanism, of means for controlling the times of operation of said supplying mechanism, said means comprising a weft-carrier having an air passage or vent, which passage is normally closed by the weft or filling in said carrier and opened by the substantial exhaustion of said weft or filling.

18. In a loom, the combination with a weft-supplying mechanism, of means for controlling the times of operation of said supplying mechanism, said means comprising a weft-carrier having a bobbin or weft-holder within it, the weft or filling on said bobbin normally closing a vent or passage within the weft-carrier, which passage is opened by the substantial exhaustion of the weft or filling on said holder.

19. In a loom, the combination with a weft-supplying mechanism, of means for controlling the times of operation of said supplying

mechanism, said means comprising a weft-carrier having an air passage or vent, which passage is normally closed by the weft or filling in said carrier and opened by the substantial exhaustion of said weft or filling, and means for arresting the movement of the beating-up portion of the loom at about the time the weft-carrier is traversing the warp-shed.

20. In a loom, the combination with a weft-supplying mechanism, of means for controlling the times of operation of said supplying mechanism, said means comprising a weft-carrier having a bobbin or weft-holder within it, the weft or filling on said bobbin normally closing a vent or passage within the weft-carrier, which passage is opened by the substantial exhaustion of the weft or filling on said holder, and means for arresting the movement of the reed of the loom at about the time the weft-carrier is traversing the warp-shed.

21. In a loom, the combination with a weft-supplying mechanism, a shuttle-box, and co-operating connecting mechanism between said box and the mechanism for supplying weft to the loom, of means for controlling the times of operation of said supplying mechanism, said means comprising a weft-carrier having an air passage or vent, which passage is normally closed by the weft or filling in said carrier and opened by the substantial exhaustion of said weft or filling.

22. In a loom, the combination with a weft-supplying mechanism, a shuttle-box, and means extending therefrom to coöperate and connect with the mechanism for supplying weft to the loom, of means for controlling the times of operation of said supply mechanism, said means comprising a weft-carrier having an air passage or vent, which passage is normally closed by the weft or filling in said carrier and opened by the substantial exhaustion of said weft or filling.

23. In a loom, the combination with a weft-supplying mechanism, a shuttle-box, and means extending into the latter for coöperation with the said weft-supplying mechanism, of a shuttle or weft-carrier adapted to impinge upon said means within the box for supplying the loom when the weft or filling in the shuttle is nearly or quite exhausted, said shuttle having within it an air passage or vent which is normally closed by the weft or filling therein, and which is opened by the substantial exhaustion of said weft or filling.

24. In a loom, the combination with a weft-supplying mechanism, a shuttle-box, and means extending into the latter for coöperation with the said weft-supplying mechanism, of a shuttle or weft-carrier adapted to impinge upon said means within the box for supplying the loom when the weft or filling in the shuttle is nearly or quite exhausted, said shuttle having within it a bobbin carrying weft or filling which latter normally closes an air-passage through the shuttle, said pas-

sage being opened by the substantial exhaustion of the said weft or filling.

25. In a loom, the combination with a weft-supplying mechanism, of a tubular, laterally-closed shuttle-box adapted for incarcerating air, mechanism extending into said box and adapted to coöperate with the weft-supplying mechanism when impinged upon by the entering weft-carrier, and a piston-like weft-carrier having extending through it an air-passage which is normally closed by the weft or filling in the carrier and opened by the partial exhaustion of said weft or filling so that the tension of the air-cushion in the box is relieved.

26. In a loom, the combination with a weft-supplying mechanism, a going or vibrating part of the loom, and an intermediate mechanism between the said supplying mechanism and said going part, of a shuttle-box, a shuttle having an air-passage through it which is normally closed by the weft, and means extending into the shuttle-box and connected with said intermediate mechanism, whereby when the exhaustion of the weft opens said passage through the shuttle the latter is permitted to actuate the said intermediate mechanism to supply weft or filling to the loom.

27. In a loom, the combination with a weft-supplying mechanism, a going or vibrating part of the loom, and an intermediate mechanism between said supplying mechanism and said going part, of a shuttle-box, a shuttle having an air-passage through it which is normally closed by the weft, and a valve which permits the air to flow in one direction only through said passage, and means extending into the shuttle-box and connected with said intermediate mechanism, whereby when the exhaustion of the weft opens said passage through the shuttle the latter is permitted to actuate the said intermediate mechanism to supply weft or filling to the loom.

28. In a loom, the combination with a vibrating or going part, a weft-supplying mechanism, and an intermediate mechanism between said supplying mechanism and going part and adapted for operatively connecting the same at proper times, of a shuttle-box adapted to incarcerate air for a cushion, a bobbin or weft-holder having in it an aperture normally closed by the weft thereon, and means extending into the path of the shuttle in the shuttle-box and connecting with the said intermediate mechanism, whereby the shuttle is adapted to operate the latter by impact when the weft is nearly exhausted.

29. In a loom, the combination with a weft or filling supplying mechanism, a vibratively-mounted reed, a shuttle box or cell, means for imparting movement to said reed, and means for arresting the movement of the reed while the shuttle is traversing the warp-shed, of means for controlling the times of operation of said supplying mechanism, said means comprising a weft-carrier or shuttle having

in it a vent or air-passage which is normally closed by the weft or filling in said carrier and opened by the substantial exhaustion of said weft or filling.

5 30. In a loom, the combination with a weft or filling supplying mechanism, a vibratively-mounted reed, a shuttle box or cell, and means for imparting movement to said reed, of means for controlling the times of operation of said  
10 supplying mechanism, said means comprising a weft-carrier or shuttle having in it a vent or air-passage which is normally closed by the weft or filling in said carrier and opened by the substantial exhaustion of said weft or filling.

15 31. In a loom, the combination with a weft or filling supplying mechanism, a vibratively-mounted reed, a shuttle box or cell capable of incarcerating air, means for imparting movement to said reed, and means for arrest-  
20 ing the movement of the reed while the shuttle is traversing the warp-shed, of means for controlling the times of operation of said supplying mechanism, said means comprising a weft-carrier having a bobbin or weft-holder  
25 within it, the weft or filling on said bobbin normally closing a vent or passage within the weft-carrier, which passage is opened by the substantial exhaustion of the weft and inter-  
30 mediate mechanism actuated by the impact of the exhausted weft-carrier for setting said supplying mechanism in operation.

32. In a loom, the combination with a weft or filling supplying mechanism, a going or vi-  
35 brating part of the loom, and an intermediate mechanism between the supplying mechanism and said going part, of a shuttle-box, a shuttle having an air-passage through it which is normally closed by the weft, and a valve which permits the air to flow in one direction only  
40 through said passage, pneumatic means for picking or driving it, and means extending into the shuttle-box and connected with said intermediate mechanism, whereby when the exhaustion of the weft opens said passage  
45 through the shuttle the latter is permitted to actuate the said intermediate mechanism to supply weft to the loom.

33. In a loom, the combination with a rota-  
50 tably-mounted magazine having in it a plurality of shuttle-cells, of means for imparting rotary impulses to said magazine, and pneumatic mechanical means controlled by the weft or filling in the weft-carrier in play, for setting in motion said rotating means.

55 34. In a loom, the combination with a rota- tively-mounted magazine having in it cells to receive weft-carriers, and mechanism for im-  
60 parting rotative impulses to said magazine, of pneumatic mechanical means controlled by the weft or filling in the weft-carrier in play for setting in operation said magazine-rotat- ing mechanism, and said weft-carriers, adapt-  
ed to fit snugly into the said cells.

35. In a loom, the combination with a rota-  
65 tively-mounted magazine having in it cells of rectangular cross-section to receive weft-car- riers, and mechanism for imparting rotative

impulses to said magazine, of pneumatic me-  
chanical means controlled by the weft or fill-  
ing in the weft-carrier in play for setting in  
operation said magazine-rotating mechanism,  
and said weft-carriers, adapted to fit snugly  
into the said cells. 70

36. In a loom, the combination with a rota-  
tively-mounted magazine having in it cells to  
receive weft-carriers, and mechanism for im-  
parting rotative impulses to said magazine,  
of pneumatic mechanical means controlled by  
the weft or filling in the weft-carrier in play  
for setting in operation said magazine-rotat-  
ing mechanism, said weft-carriers, and pro-  
tecting means, substantially as described, to  
stop the loom in case the weft-carrier does  
not properly enter its cell. 75

37. In a loom, the combination with a rota-  
tably-mounted magazine having a plurality  
of concentrically-arranged shuttle-cells and  
a weft-end holder which rotates with it, of  
means for imparting rotary impulses to said  
magazine, and pneumatic mechanical means  
controlled by the weft or filling in the weft-  
carrier in play, for setting in motion said ro-  
tating means. 80

38. In a loom, the combination with the vi-  
brating reed, and a non-vibrating, rotatively-  
mounted magazine having a plurality of cells  
to contain weft-carriers, of means for impart-  
ing intermittent rotative impulses to said  
magazine, and pneumatic mechanical means  
controlled by the weft or filling on the weft-  
carrier in play for setting in motion at proper  
times said magazine-rotating mechanism. 85

39. The combination with the rotary, mul-  
tiple-celled magazine having a director *o'*, of  
movable means, substantially as described,  
for closing the ends of the upper cells thereof. 90

40. The combination with a rotary, multi-  
ple-celled magazine having a shuttle-director,  
of the connected, movable end plates 5, and  
the lever for operating same. 95

41. The combination with the rotary, mul-  
tiple-celled magazine, of the shuttle-director,  
situated in alinement with the working cell  
of the magazine. 100

42. The combination with the non-vibrat-  
ing, rotary, multiple-celled magazine, of the  
shuttle-director, situated in alinement with  
the working cell of the magazine. 105

43. The combination with the magazine,  
having in it a plurality of cells for the weft-  
carriers, of the side springs 28, mounted in  
the respective cells and projecting through  
the walls of same, the lever 30, having its arm  
in operative position with respect to said side  
spring, the slide-rod 16, projecting through  
the pawl-bar 14, the said bar and its spring,  
the pawl thereon, engaging teeth on the ro-  
tatable magazine, the vibrating part of the  
loom, and a tappet thereon adapted to im-  
pinge upon the rod 16 when the latter is pro-  
truded, substantially as set forth. 110

44. In a protection device for stopping a  
loom when the shuttle or weft-carrier in play  
fails to enter the shuttle-box, properly, the

combination with a protecting-finger 37, which enters the shuttle-box at its side, its spring, the cylinder 44, the piston fitting therein, the movable arm 42, coupled to said piston, and means coupling the protecting-finger with the arm 42, whereby the former operates the latter, of the vibrating or going part of the loom, and the dagger or tappet carried thereby and adapted to impinge upon the arm 42 and move the piston when the shuttle fails to enter the shuttle-box properly.

45. In a loom, the combination with a rotatively-mounted magazine shuttle-box, of means for supplying thereto compressed air for picking or driving the shuttle, said means comprising a cylinder *u*, having a passage *x* leading to the shuttle-box, a piston *v* in said cylinder, mechanism for imparting reciprocatory movements to said piston, a valve *y* controlling the passage leading to the shuttle-box from the cylinder, the spring behind said valve, and the lever which operates said valve, said lever being adapted to be operated by the piston on its compressing stroke, substantially as set forth.

46. In a loom, the combination with a rotatively-mounted magazine shuttle-box, and pneumatic mechanical means for controlling its rotation when the weft or filling in the weft-carrier is nearly or quite exhausted, of means for supplying thereto compressed air for picking or driving the shuttle, said means comprising a cylinder *u*, having a passage *x* leading to the shuttle-box, a piston *v* in said cylinder, mechanism for imparting reciprocatory movements to said piston, a valve *y* controlling the passage leading to the shuttle-box from the cylinder, the spring behind said valve, and the lever which operates said valve, said lever being adapted to be operated by the piston on its compressing stroke, substantially as set forth.

47. In a loom having a shuttle-box, the combination with a weft or filling supplying mechanism, and an intermediate mechanism between the supplying mechanism and said shuttle-box, of a shuttle having a passage through it for air which is normally closed by the weft or filling, means for applying to said shuttle an aeriform fluid for picking or driving it, and means connected with said intermediate mechanism whereby when the substantial exhaustion of the weft opens said passage through the shuttle the latter is permitted to actuate said intermediate mechanism to supply weft or filling to the loom.

48. In a loom having a shuttle-box, the combination with a weft or filling supplying mechanism, and an intermediate mechanism between the supplying mechanism and said shuttle-box, of a shuttle having a passage through it for air which is normally closed by the weft or filling, and a valve which permits the air to flow in one direction only through said passage, means for applying to said shuttle an aeriform fluid for picking or driving it, and means connected with said intermediate

mechanism whereby when the substantial exhaustion of the weft opens said passage through the shuttle the latter is permitted to actuate said intermediate mechanism to supply weft or filling to the loom.

49. In a loom having a shuttle-box, the combination with a weft or filling supplying mechanism, and an intermediate mechanism between the supplying mechanism and said shuttle-box, of a shuttle having a passage through it for air which is normally closed by the weft or filling, and a valve which permits the air to flow in one direction only through said passage, and means connected with said intermediate mechanism whereby when the substantial exhaustion of the weft opens said passage through the shuttle the latter is permitted to actuate said intermediate mechanism to supply weft or filling to the loom.

50. In a loom having a shuttle-box, the combination with a weft or filling supplying mechanism, and an intermediate mechanism between the supplying mechanism and said shuttle-box, of a shuttle having a passage through it, a bobbin or weft-holder having in it an aperture for air which is normally closed by the weft or filling, means for applying to said shuttle an aeriform fluid for picking or driving it, and means connected with said intermediate mechanism whereby when the substantial exhaustion of the weft opens said passage through the shuttle the latter is permitted to actuate said intermediate mechanism to supply weft or filling to the loom.

51. In a loom having a shuttle-box, the combination with a weft or filling supplying mechanism, and an intermediate mechanism between the supplying mechanism and said shuttle-box, of a shuttle having a passage through it, a bobbin or weft-holder having in it an aperture for air which is normally closed by the weft or filling, and means connected with said intermediate mechanism whereby when the substantial exhaustion of the weft opens said passage through the shuttle the latter is permitted to actuate said intermediate mechanism to supply weft or filling to the loom.

52. In a loom having a shuttle-box, the combination with a weft or filling supplying mechanism, and an intermediate mechanism between the supplying mechanism and said shuttle-box, of a shuttle having a passage through it, a bobbin or weft-holder having in it an aperture for air which is normally closed by the weft or filling, and a valve which permits the air to flow in one direction only through said passage, means for applying to said shuttle an aeriform fluid for picking or driving it, and means connected with said intermediate mechanism whereby when the substantial exhaustion of the weft opens said passage through the shuttle the latter is permitted to actuate said intermediate mechanism to supply weft or filling to the loom.

53. In a loom having a shuttle-box, the combination with a weft or filling supplying mechanism

anism, and an intermediate mechanism between the supplying mechanism and said shuttle-box, of a shuttle having a passage through it, a bobbin or weft-holder having in it an aperture for air which is normally closed by the weft or filling, and means connected with said intermediate mechanism whereby when the substantial exhaustion of the weft opens said passage through the shuttle the latter is permitted to actuate said intermediate mechanism to supply weft or filling to the loom.

54. A shuttle or weft-carrier for a loom having an air-passage through it which is adapted to be closed by the weft or filling within the said carrier and to be opened by the substantial exhaustion of said weft or filling, and having also a valve for allowing the air to flow through same in one direction.

55. The combination with a hollow shuttle or weft-carrier, having apertures near its respective ends for the entry and escape of air, of a bobbin or holder for the weft in the carrier, said bobbin having an aperture or apertures in it which are closed by the weft wound thereon, and a valve for permitting the flow of air through same in one direction only.

56. As a new article of manufacture, a hollow bobbin or weft-holder having a flared or laterally-enlarged butt and a lateral aperture or apertures in said enlarged butt for the escape of air.

57. The combination with a shuttle or weft-carrier, of a bobbin or weft-holder adapted to go into said shuttle and having a laterally-enlarged end or butt which closes the passage for air through the shuttle, said bobbin having in its enlarged butt a laterally-disposed air-aperture opening to its interior and normally closed by the weft or filling on the holder.

58. In a loom, the combination with a rotatively-mounted magazine having in it cells to receive weft-carriers, and a weft-end holder, which rotates therewith, and mechanism for imparting rotative impulses to said magazine, of pneumatic mechanical means controlled by the weft or filling in the weft-carrier in play for setting in operation said magazine-rotating mechanism, and said weft-carriers, adapted to fit snugly into the said cells.

59. In a loom, the combination with a rotatively-mounted magazine having in it concentrically-arranged, cellular shuttle-boxes, each provided with an aperture in its side for the entry of a protection finger or device, and the said device adapted to enter the cell when the latter is in position to receive the shuttle in play, of mechanism for imparting rotative impulses to said magazine, a weft-carrier or shuttle adapted to fit snugly into the said boxes, and pneumatic mechanical means controlled by the weft or filling in said shuttle for setting in operation said magazine-rotating mechanism.

60. In a loom, the combination with a rotatably-mounted magazine having in it a plurality of shuttle-cells, each provided with an aperture in its side adapted to receive a protection device, and said protection device, adapted to enter said aperture when the cell is in position to receive the shuttle in play, of means for imparting rotary impulses to said magazine, and pneumatic mechanical means controlled by the weft or filling in the weft-carrier in play, for setting in motion said rotating means.

61. In a loom, the combination with a rotatably-mounted magazine having a weft-end holder and in it a plurality of shuttle-cells, each provided with an aperture in its side adapted to receive a protection device, and said protection device, adapted to enter said aperture when the cell is in position to receive the shuttle in play, of means for imparting rotary impulses to said magazine, and pneumatic mechanical means controlled by the weft or filling in the weft-carrier in play, for setting in motion said rotating means.

62. A tubular shuttle, comprising a body of thin material, one of the conical ends of which is removable and has an internal shoulder, and the flange in the open end of the body.

63. The combination of the tubular shuttle, having a removable end piece and shoulders to embrace the head of the bobbin, and the said bobbin, substantially as set forth.

64. A loom having an automatically-operating weft or filling changing or supplying mechanism, the operation of which is controlled by pneumatic mechanical means and made inoperative and operative, respectively, by the presence or absence of weft or filling in the shuttle or weft-carrier.

65. A loom having automatically-operating means for furnishing a fresh supply of weft or filling in place of that substantially exhausted, said means comprising a rotary magazine and pneumatic mechanical controlling means, made inoperative and operative, respectively, by the presence or absence of weft or filling in the shuttle in play, for operating said magazine.

66. A loom having automatically-operating means for furnishing a fresh supply of weft or filling in place of that substantially exhausted, said means comprising a rotary, non-vibrating magazine and pneumatic mechanical controlling means, made inoperative and operative, respectively, by the presence or absence of weft or filling in the shuttle in play, for operating said magazine.

In witness whereof we have hereunto signed our names, this 25th day of August, 1899, in the presence of two subscribing witnesses.

WILLIAM H. BAKER.  
FREDERIC E. KIP.

Witnesses:

CLAUDE J. FARNSWORTH,  
PETER A. ROSS.