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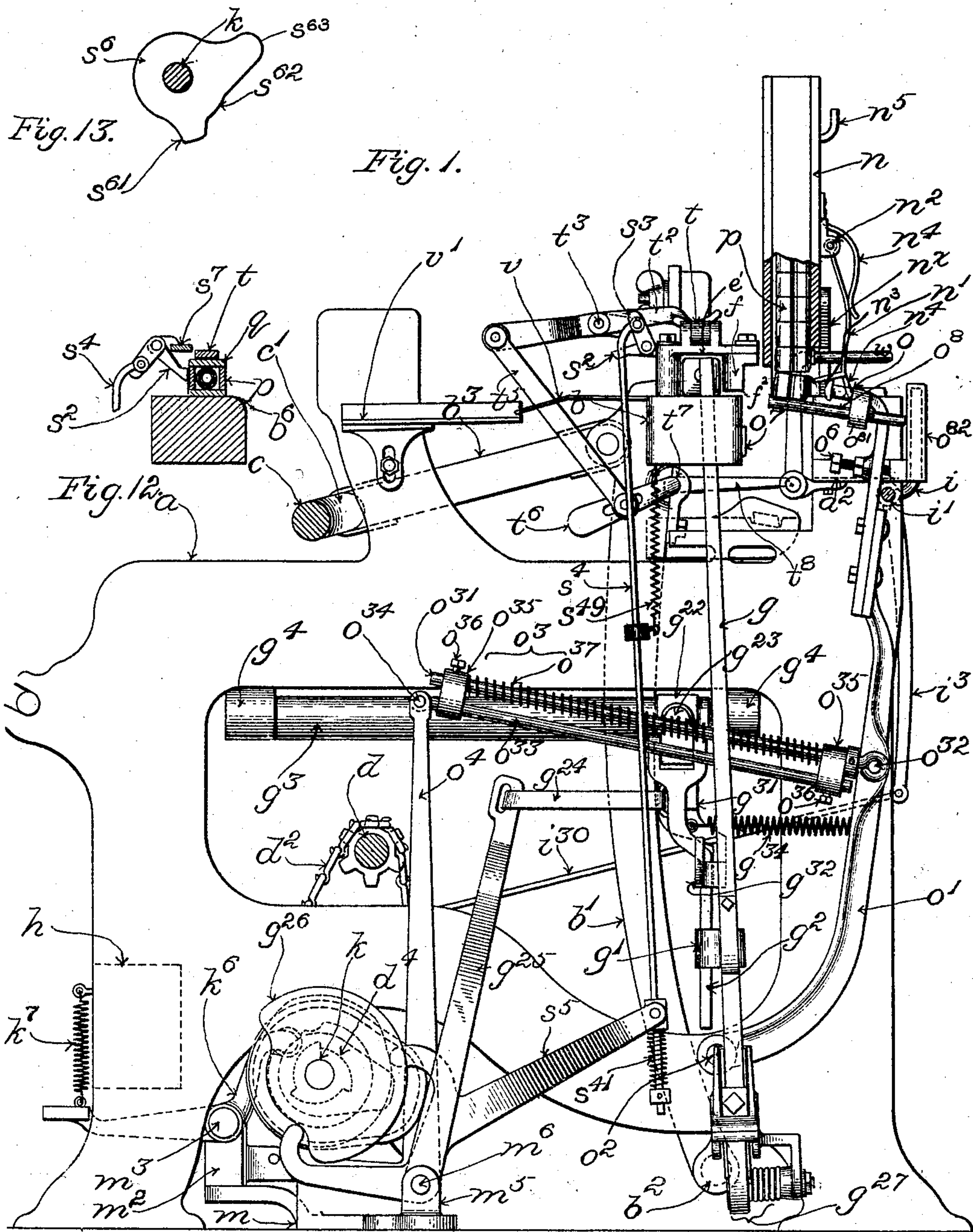
PATENTED APR. 25, 1905.

H. I. HARRIMAN.

# WEFT REPLENISHING MECHANISM FOR LOOMS.

APPLICATION FILED MAR. 24, 1902.

9 SHEETS—SHEET 1.



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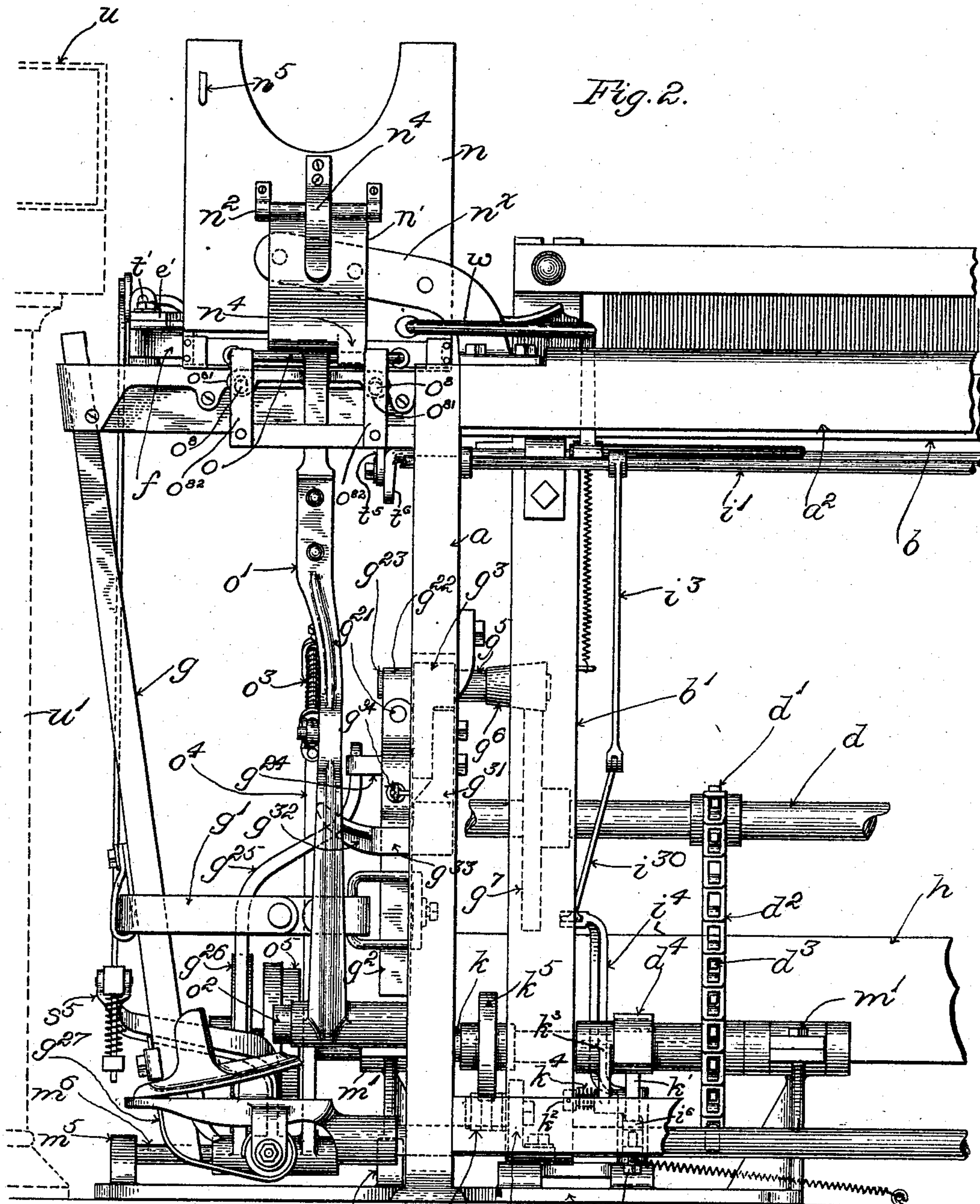
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9 SHEETS—SHEET 2.



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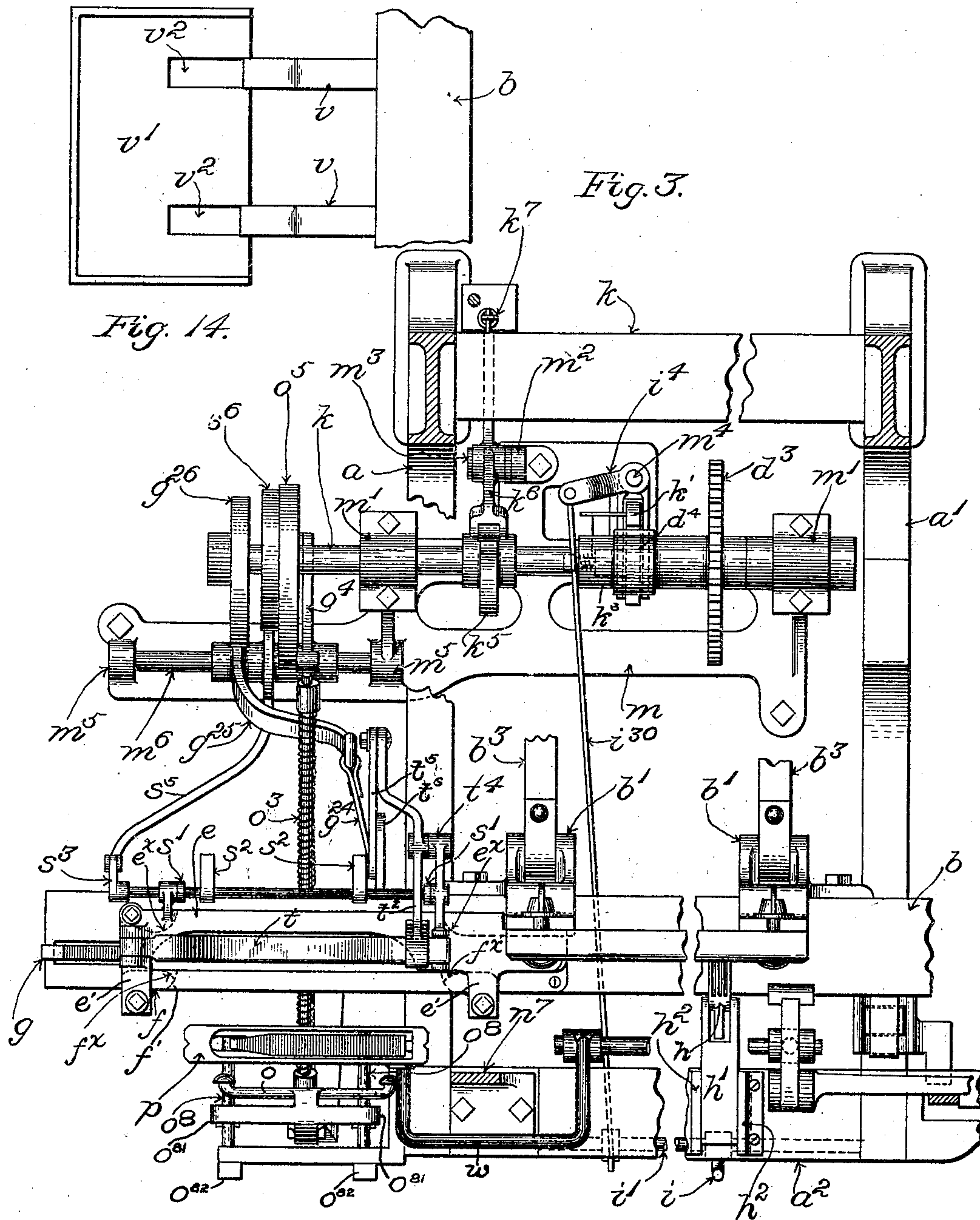
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9 SHEETS—SHEET 3.



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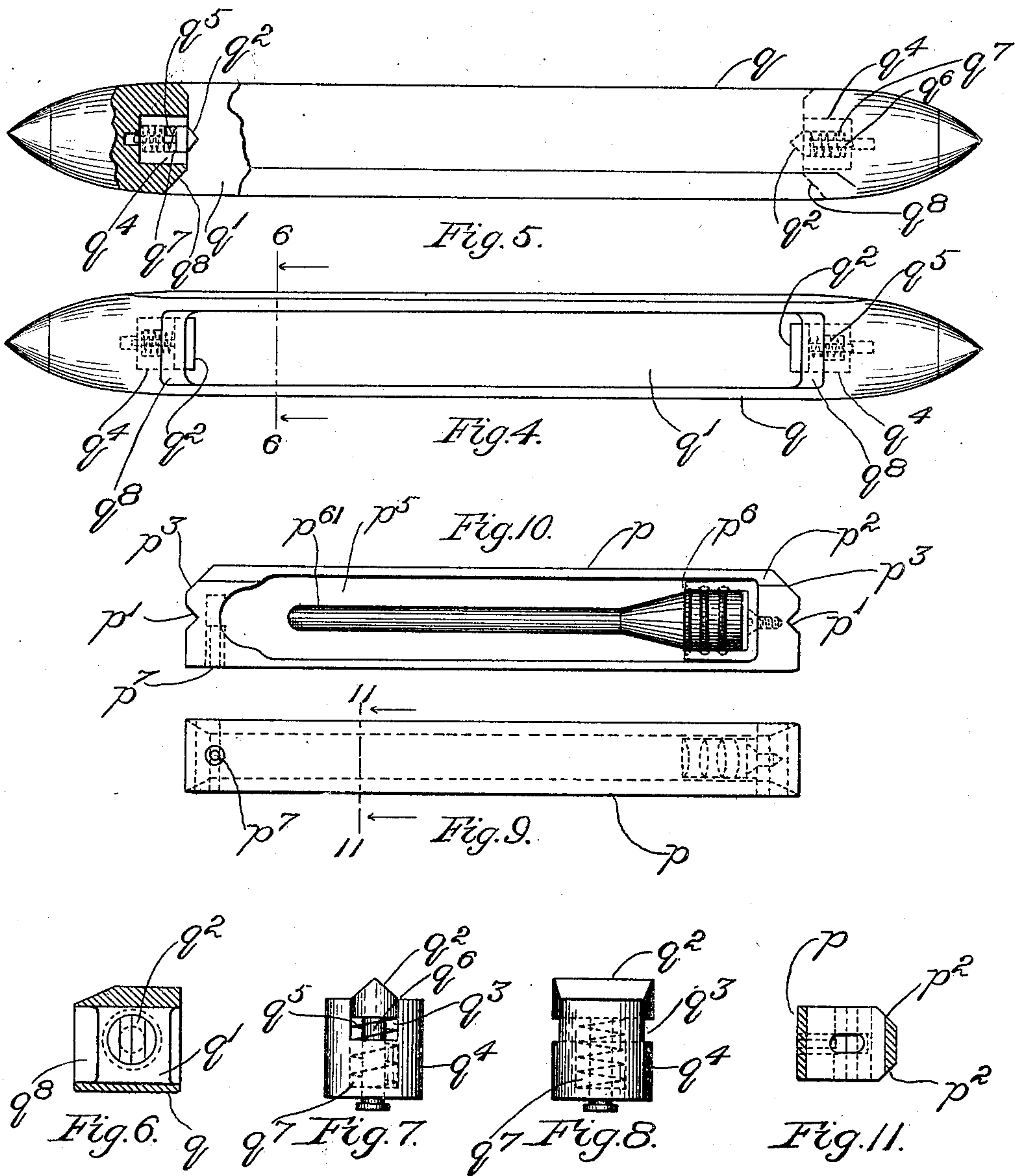
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9 SHEETS—SHEET 4.



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9 SHEETS—SHEET 5.

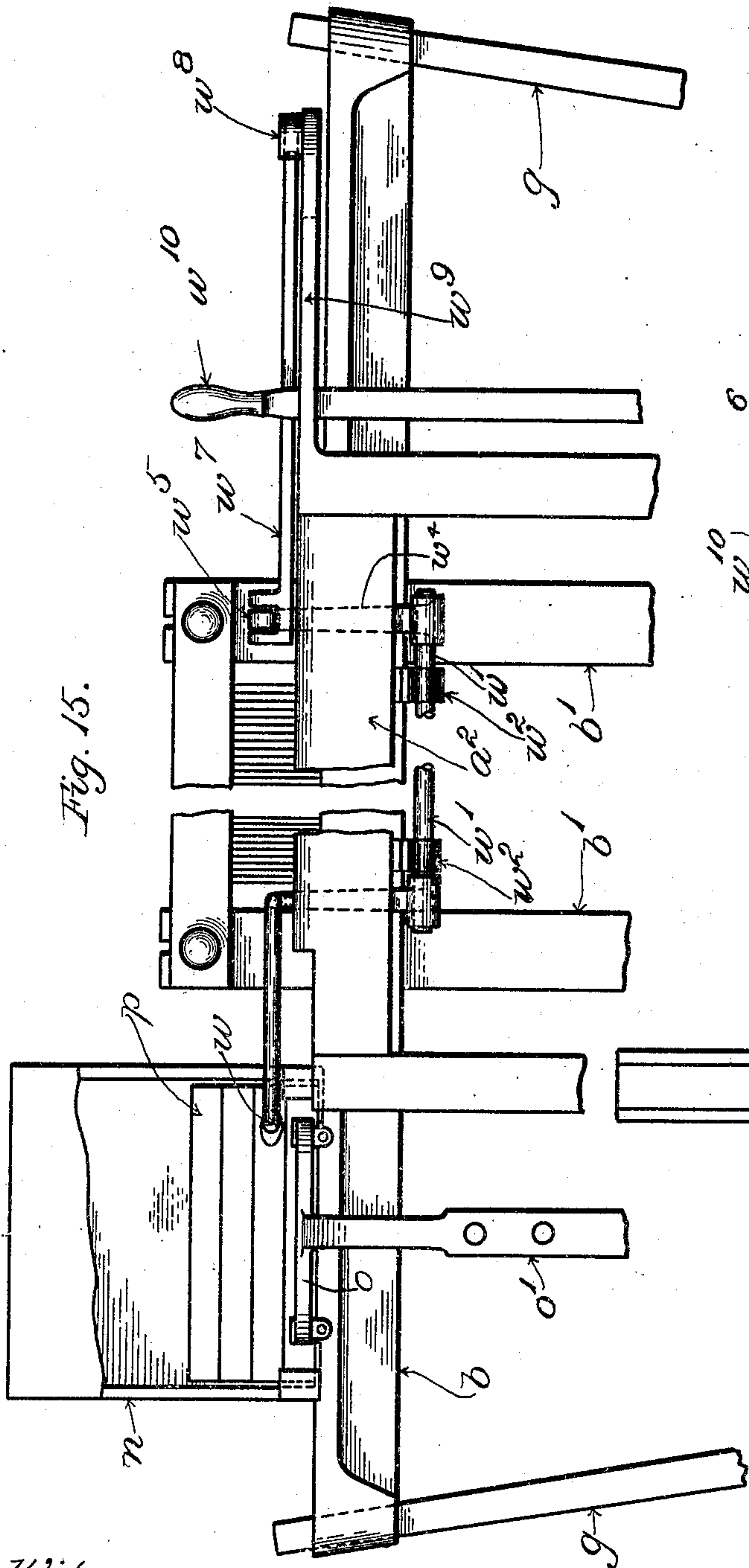


Fig. 15.

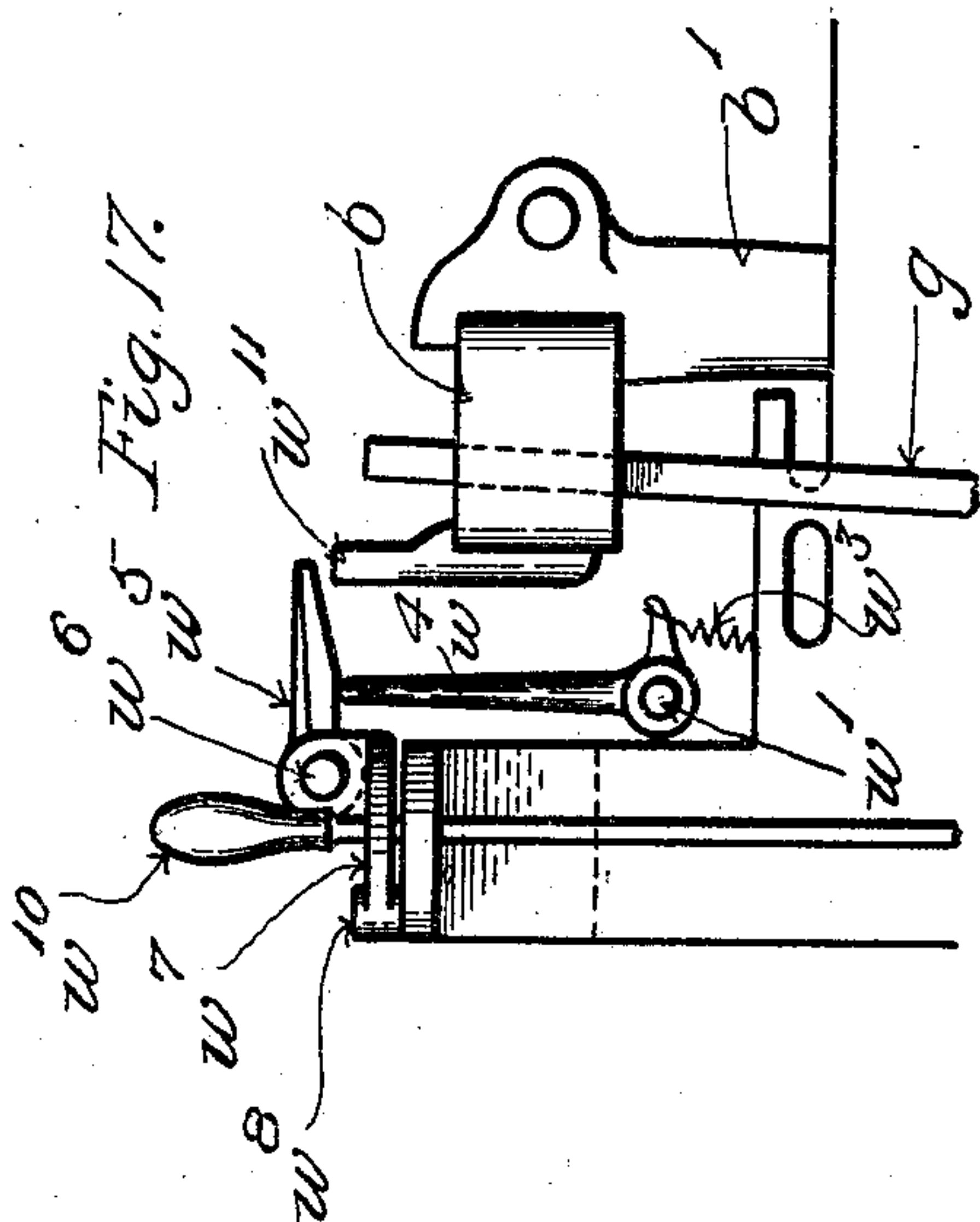


Fig. 17.

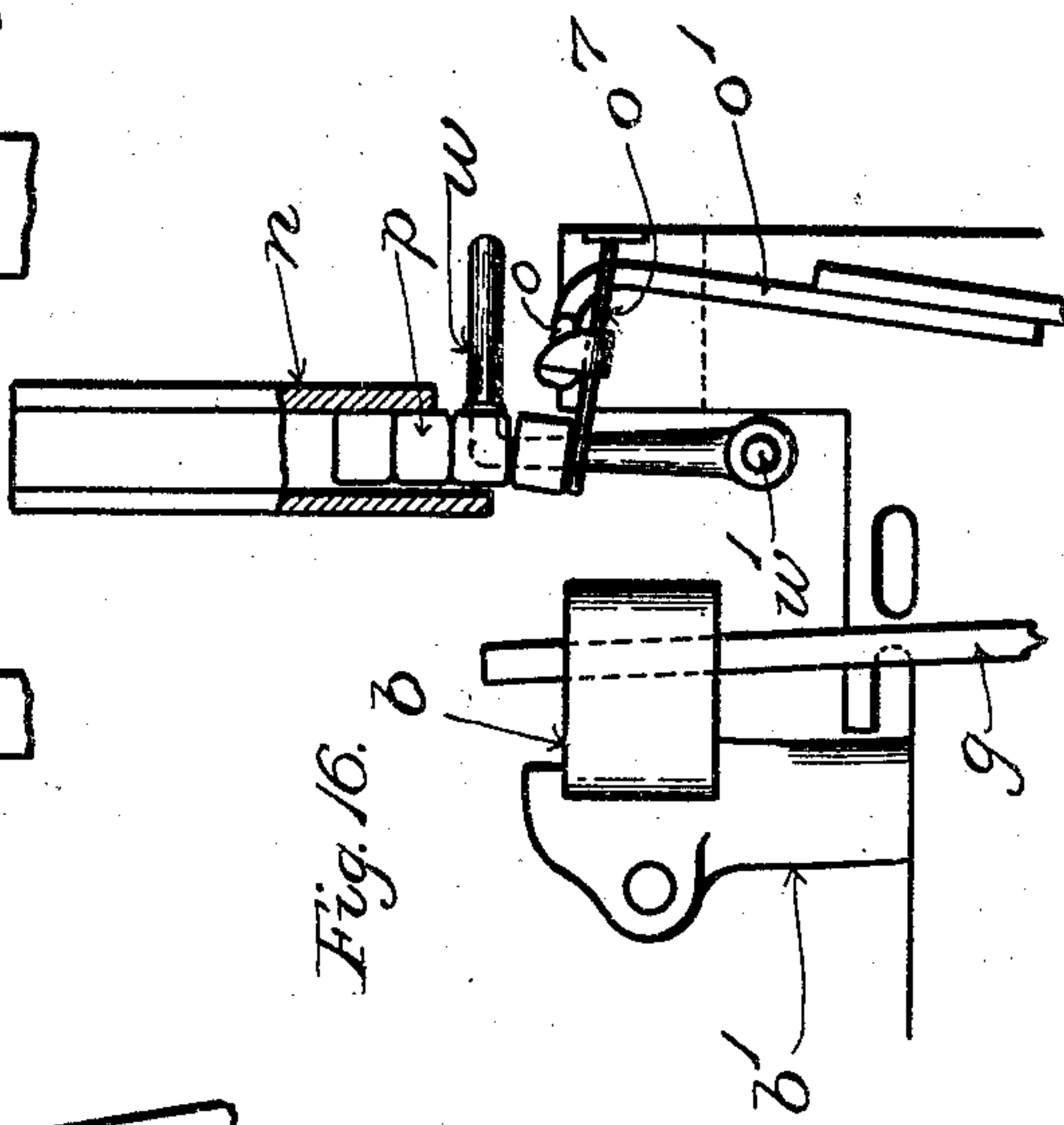


Fig. 16.

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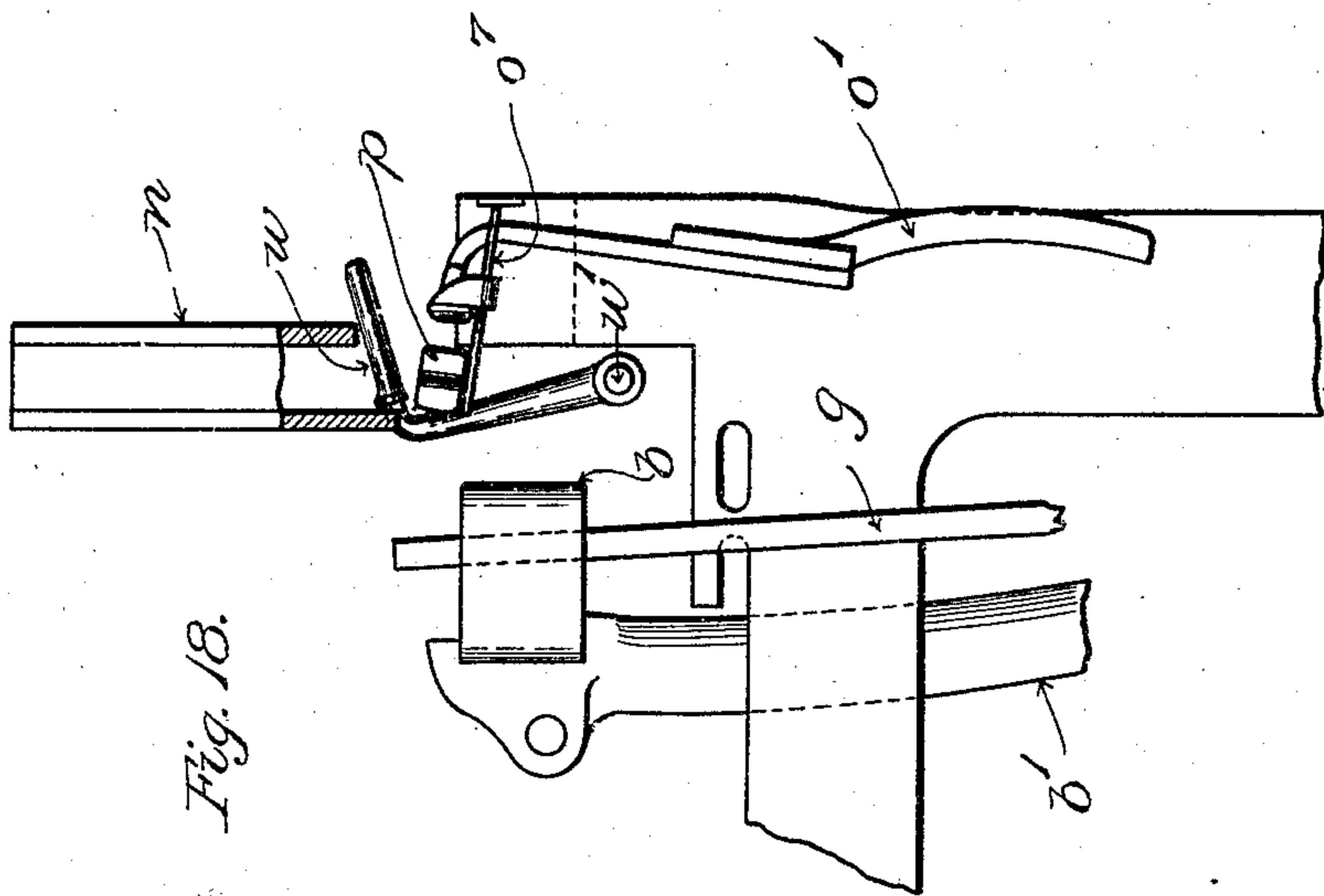
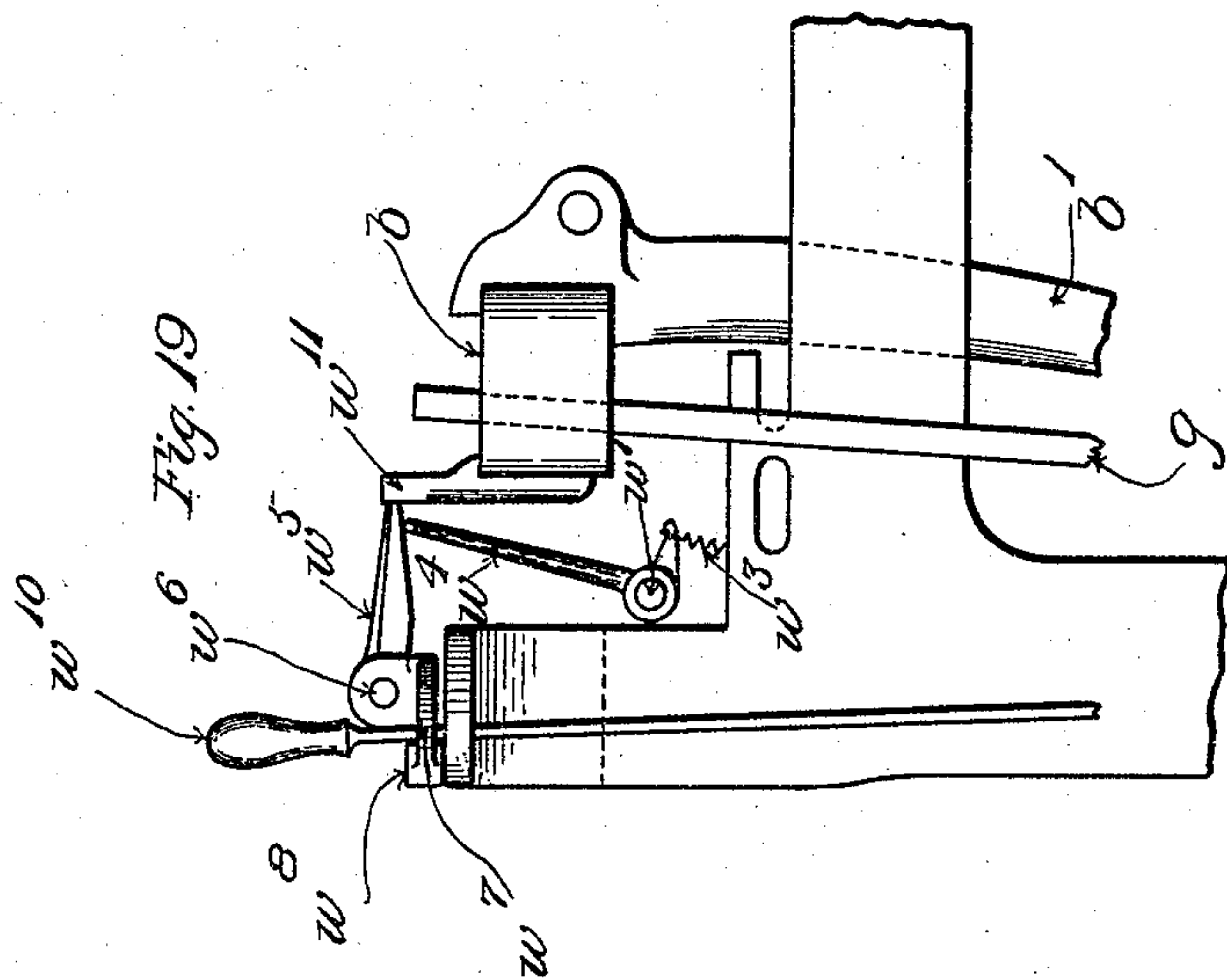
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9 SHEETS—SHEET 6.



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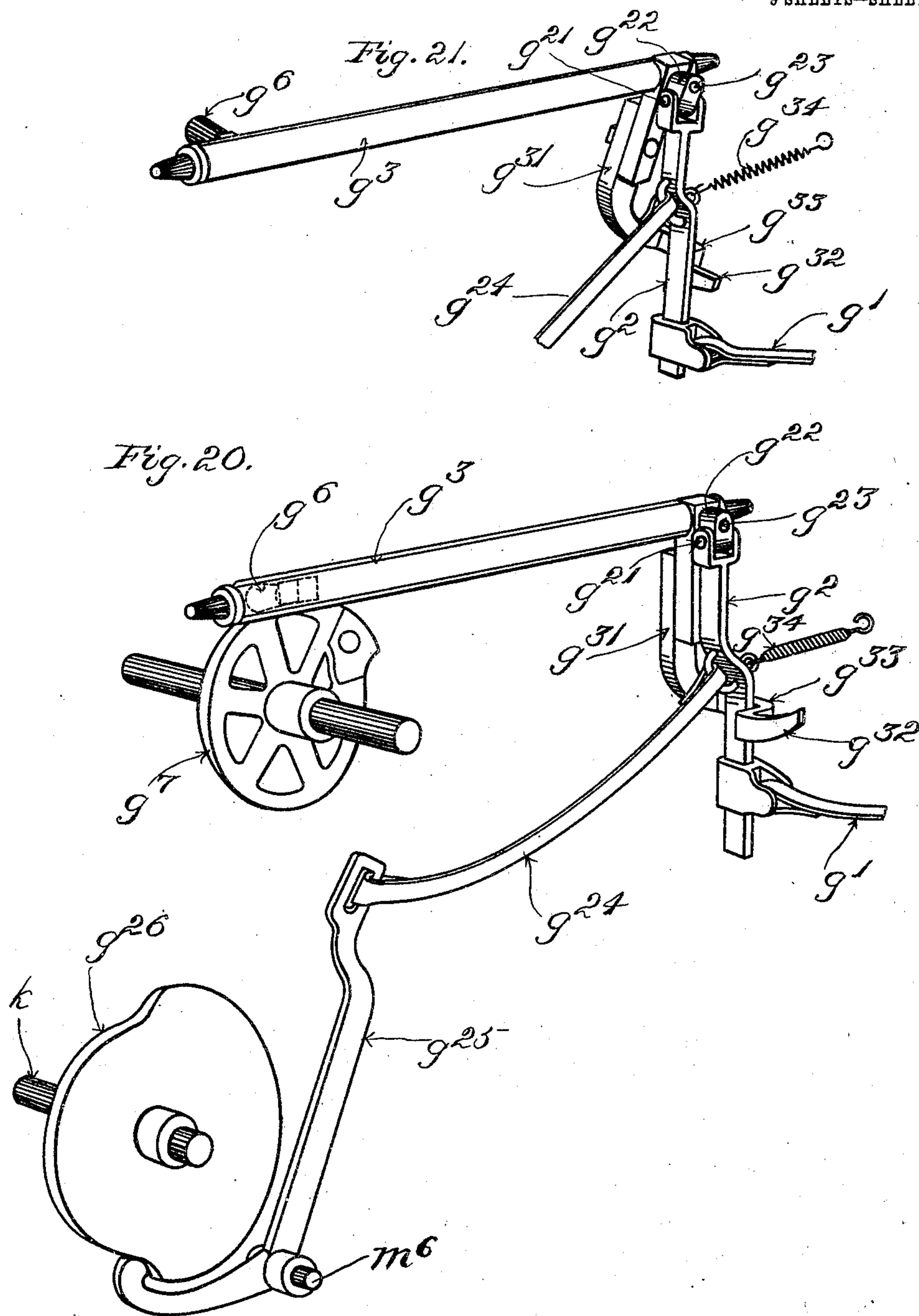
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9 SHEETS—SHEET 7.



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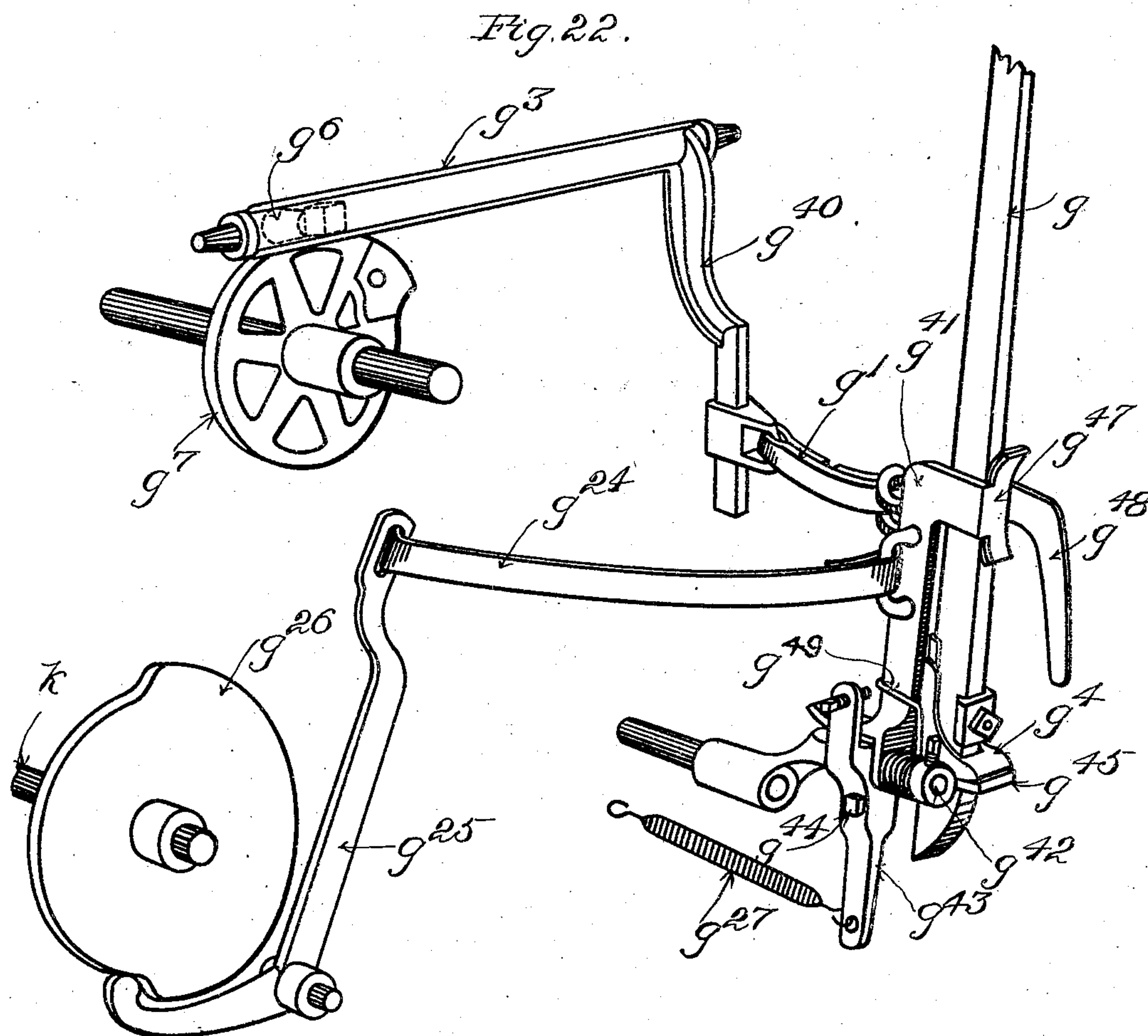
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9 SHEETS—SHEET 8.



Witnesses:

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9 SHEETS—SHEET 9.

Fig. 23.

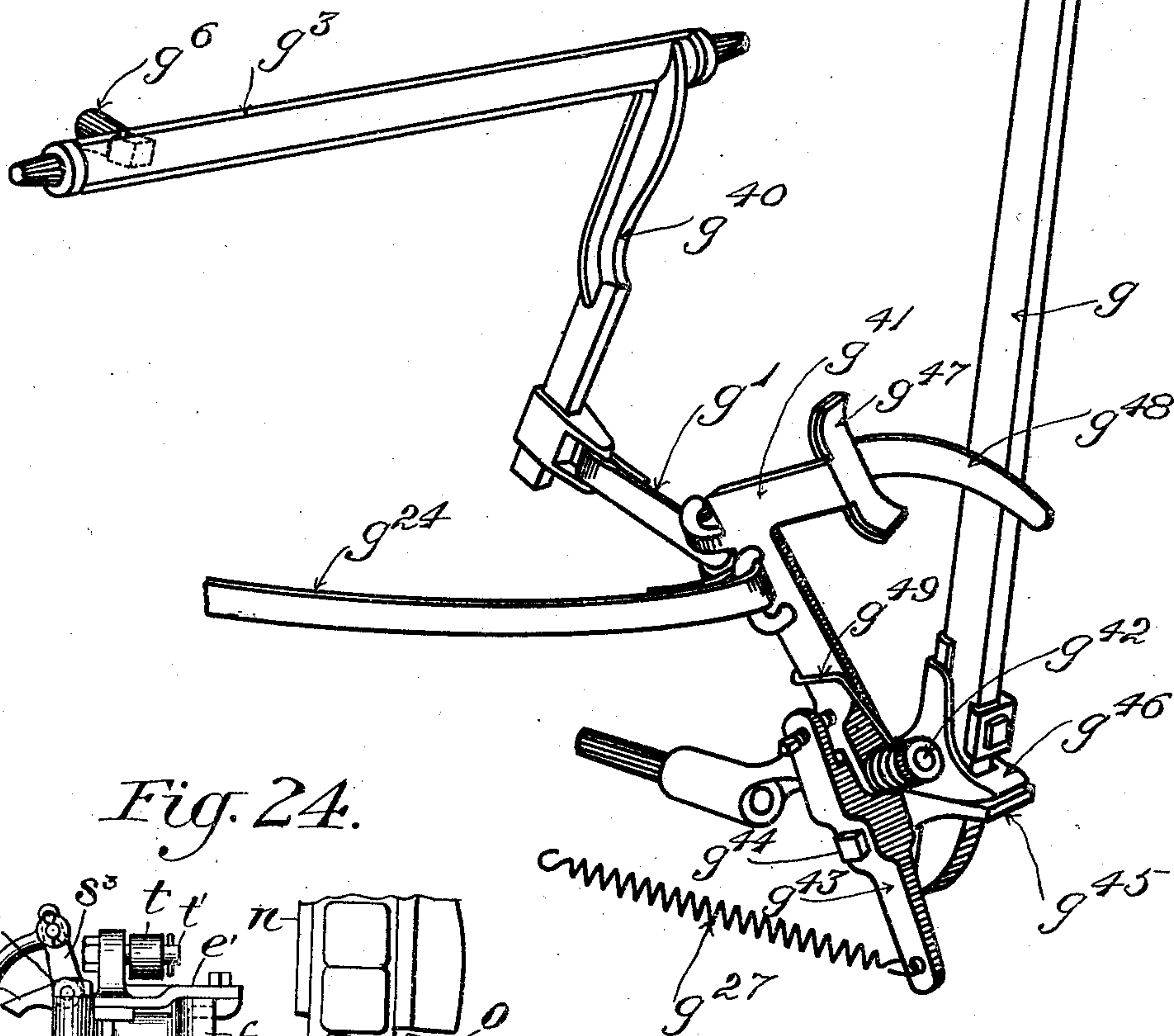
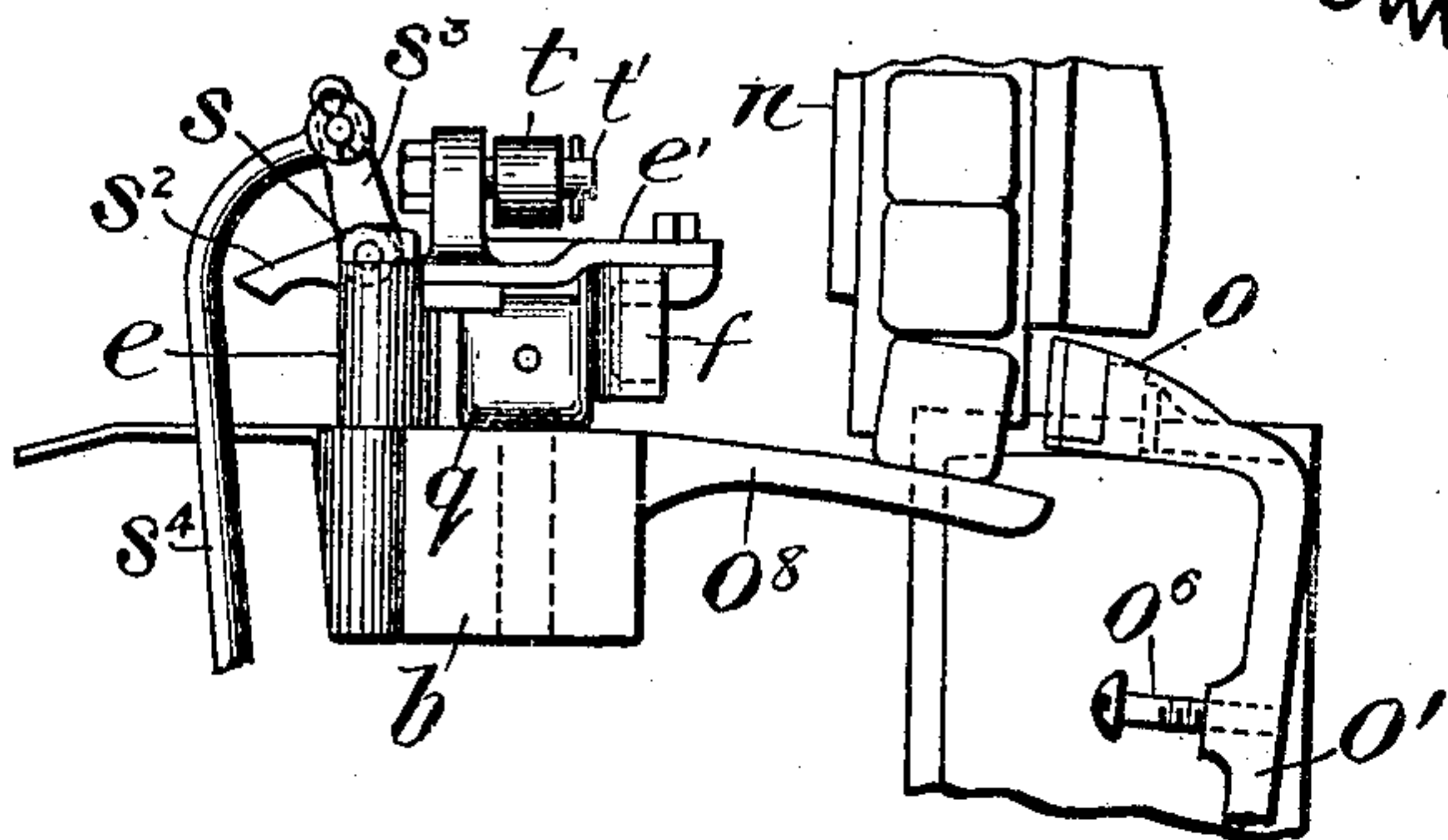


Fig. 24.



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# UNITED STATES PATENT OFFICE.

HENRY I. HARRIMAN, OF NEW YORK, N. Y., ASSIGNOR TO THE AMERICAN LOOM COMPANY, OF READVILLE, MASSACHUSETTS, A CORPORATION OF NEW JERSEY.

## WEFT-REPLENISHING MECHANISM FOR LOOMS.

SPECIFICATION forming part of Letters Patent No. 788,356, dated April 25, 1905.

Application filed March 24, 1902. Serial No. 99,578.

*To all whom it may concern:*

Be it known that I, HENRY I. HARRIMAN, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new and useful Improvement in Weft-Replenishing Mechanism for Looms, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention has relation to the class of mechanisms which have been devised for the purpose of effecting automatically replenishment of the working weft-supply of looms when necessity arises therefor—as, for example, on exhaustion of the supply of weft or filling that is carried by the working shuttle on the lay of a loom, or on exhaustion thereof to a predetermined extent, or on loss of continuity of such weft or filling—the action of the replenishing instrumentalities being brought about or instituted through the agency of suitable forms of weft-indicator mechanism. In some types of mechanisms of the said class the replenishment is effected by discharging or removing the spent or failed working shuttle from the lay and bringing a fresh or reserve shuttle into action in lieu thereof. In others it is effected by employing filling-cases adapted for removable application to the body of a loom-shuttle, each filling-case carrying a load of weft or filling, and by ejecting the spent or failed filling-case from the working shuttle on the lay and introducing in its place a reserve filling-case loaded with weft or filling. In others still it is effected by replacing automatically the bobbin which is contained within the working shuttle on the lay by a reserve bobbin loaded with weft or filling.

My present improvements are in part applicable to mechanisms in general of the automatic weft-replenishing class and in part are more especially applicable to mechanisms of the types in which weft replenishment is effected by automatically replacing the filling-case or bobbin in the working shuttle on the lay by a reserve filling case or bobbin.

For convenience I have in the accompany-

ing drawings illustrated my present improvements embodied in mechanism constructed and operating to effect replenishment by making change of filling-cases, and I will thus describe the same.

In the drawings, Figure 1, Sheet 1, shows, mainly in side elevation, but partly in vertical section, a portion of a loom having the said embodiment of my improvements applied thereto. Fig. 2, Sheet 2, shows in front elevation a portion of the said loom and also represents in dotted lines a portion of a filling-case receiver located adjacent the loom. Fig. 3, Sheet 3, shows, mainly in plan, a portion of the said loom, the magazine for filling-cases and part of the loom-frame being removed. Fig. 4, Sheet 4, shows in side elevation, and Fig. 5, same sheet, shows in plan, with part thereof broken away, a shuttle such as is employed in the loom of Figs. 1, 2, and 3. Fig. 6, Sheet 4, is a view in vertical section on the plane indicated by the dotted line 6 6 in Fig. 4. Figs. 7 and 8, Sheet 4, are views of one of the arrangements which are applied to the shuttle-body for the purpose of holding the filling-case in place within the chamber or cavity thereof. Fig. 9, Sheet 4, shows in front elevation, and Fig. 10, same sheet, shows in plan, one of the filling-cases which are employed in connection with the shuttle of Figs. 4 and 5. Fig. 11, Sheet 4, shows the said filling-case in vertical section on the plane indicated by the dotted line 11 11 in Fig. 9. Fig. 12, Sheet 1, is a sectional detail showing partly the positioner and its operation. Fig. 13, Sheet 1, shows the cam for operating the filling-case positioner. Fig. 14, Sheet 3, is a plan of certain details, showing partly the shuttle-box at the change end of the loom, the guides over which the expelled filling-case passes from the shuttle-box, and the shelf at which the said expelled filling-case is received. Fig. 15, Sheet 5, is a detail view in elevation, showing chiefly the detector device which is employed in connection with the magazine for ascertaining when a deficiency in the reserve supply of filling in the magazine occurs and the knocking-off arrangements with which the said detector



is combined. Fig. 16, Sheet 5, is a partly-sectional view of the same looking at the change end of the loom. Fig. 17, Sheet 5, is an end elevation showing chiefly the knocking-off arrangements. Figs. 18 and 19, Sheet 6, are views corresponding, respectively, with Figs. 16 and 17, respectively, but showing the parts in the positions which they assume when there is an absence of reserve filling at the detector. Fig. 20, Sheet 7, is a perspective of the details of the picking arrangement. Fig. 21, Sheet 7, is a perspective of some of the parts which are shown in Fig. 20, but representing them as disengaged in order to effectuate the suspension of the picking. Fig. 22, Sheet 8, is a perspective of a slightly-modified picking arrangement. Fig. 23, Sheet 9, shows the same disengaged to occasion the suspension of the picking. Fig. 24, Sheet 9, is a detail view showing a modification in which the filling-case-supporting guides are attached to the front of the lay-beam.

Having reference to the drawings,  $a$   $a'$  designate the opposite end frames of a loom, and  $a^2$  the breast-beam thereof.

$b$  is the lay-beam, and  $b' b'$  are the lay-swords, the latter being pivoted at  $b^2$  and the lay being operatively connected with the crank-shaft  $c$  by lay-pitmen  $b^3 b^3$ , extending from the lay-swords  $b' b'$  to the cranks  $c' c'$  of the crank-shaft  $c$ , as usual.

$d$  is the cam-shaft of the loom.

The shuttle-box back at the change end of the lay-beam is designated  $e$ , the shuttle-box front being designated  $f$ , and  $g$  is the corresponding picker-stick,  $g'$  being the lug-strap through which motion is transmitted to the said picker-stick from the arm  $g^2$  of the adjacent picking rock-shaft  $g^3$ , the latter being journaled, as usual, in bearings at  $g^4 g^4$ , which are applied to the corresponding end frame  $a$  of the loom, and, as shown in Fig. 2, being furnished with an inwardly-extending arm  $g^5$ , provided with a cone-shaped bowl  $g^6$ , that is acted upon by a picking-tappet  $g^7$  on the cam-shaft  $d$ .

$h$  is the rear cross-girth.

It is not material to the invention which form or arrangement of weft-indicator devices or mechanism is employed in connection with the present improvements. Various forms and arrangements of such devices or mechanism are known, some thereof being operative to ascertain breakage or exhaustion of the weft-supply in process of being woven in and others thereof being operative when the weft-supply within the working shuttle on the lay becomes reduced in quantity to the predetermined minimum prior to complete exhaustion thereof. For convenience of illustration I have represented in the drawings (see more especially Fig. 3) an ordinary weft-fork  $h$ , which, as usual, is pivotally mounted upon a weft-fork slide  $h'$ , fitted between guides at  $h^2 h^2$  upon the breast-beam. The weft-fork

slide  $h'$  is arranged, as in similar constructions, to press forward the adjacent arm  $i$  when said slide is slid forward across the breast-beam  $g^2$  in consequence of the engagement of the gooseneck (not shown) with the tail of the weft-work  $h$ , as in case of absence of the weft or filling from in front of the tines of the weft-fork when the lay beats up. The arm  $i$  is mounted upon the usual rod  $i'$ , the said rod extending across the loom just below the breast-beam and being journaled in the opposite end frames  $a a'$ . The rod  $i'$  controls the starting of the weft-replenishing instrumentalities, and, as presently will be made to appear in the further description of the illustrated embodiment of the invention, when the said rod  $i'$  is rocked, as in consequence of an advance of the weft-fork slide  $h'$ , the said instrumentalities are brought into action and caused to effectuate the desired weft replenishment.

I have represented the parts which are more immediately concerned in the performance of the weft-replenishing operations as actuated by cams upon a change-shaft  $k$ , the said change-shaft being operatively combined with one of the rotating shafts of the loom (herein the cam-shaft  $d$ ) through motion-transmitting connections including a clutch. The clutch is under the operative control of the rod  $i'$ , and when the said rod is rocked in the manner which has already been explained the clutch is caused to serve in the transmission of driving power to the change-shaft, whereby the latter is rotated. The character, arrangement, &c., of the motion-transmitting connections and clutch may vary in practice as preferred or found necessary. In the present case, reference being had to Figs. 1, 2, and 3, the driving arrangements comprise a sprocket-wheel  $d'$ , fast on the cam-shaft  $d$ , a sprocket-chain  $d^2$ , passing around the said sprocket-wheel  $d'$  and also around a large sprocket-wheel  $d^3$ , which is mounted loosely upon the change-shaft  $k$ , and the clutch aforesaid, the latter serving to couple the said sprocket-wheel  $d^3$  to the change-shaft when required. The clutch proper is in the present instance similar to that of United States Letters Patent No. 652,105, granted to me June 19, 1900. It comprises, essentially, a toothed wheel  $d^4$ , fast with the hub or sleeve of the sprocket-wheel  $d^3$ , a dog  $k'$ , pivoted at  $k^2$  upon an arm  $k^3$  of change-shaft  $k$ , and a spring  $k^4$ , Fig. 2, acting upon said dog with a tendency to move the latter so as to carry its hooked or toothed end into position to become engaged by one of the teeth of the wheel  $d^4$ . The clutch-controlling means is similar in the main to that of the said Letters Patent No. 652,105 and comprises the rod  $i'$  aforesaid, an arm  $i^3$ , a rod  $i^{30}$ , joined to the said arm, and a clutch disengager or controller  $i^4$ , to which said rod is joined also, the said clutch disengager or controller being mounted to swing upon a vertical pivot  $m^4$  and



having an acting portion  $z^6$ , which last is vertically adjustable by means of a set-screw  $z^7$ . Normally the clutch disengager or controller occupies a position in which its said acting portion extends within the path described by the tail of dog  $k'$  during the rotation of the change-shaft, it acting against the said tail to hold the dog  $k'$  out of engagement with toothed wheel  $d^4$ . While it thus acts the change-shaft  $k$  stands at rest, it being held from accidental shift by means of the detent-lever  $k^6$ , Figs. 1 and 3, the latter having connected therewith the spring  $k^7$ , the said spring acting to hold the roll that is carried by the working end of the detent-lever pressed into an indentation which is formed in the periphery of the detent-disk  $k^5$ , fast on the change-shaft. When rod  $z'$  is rocked—as, for instance, under the control of the weft-indicator devices—motion is transmitted to the clutch disengager or controller, so as to move the acting portion  $z^6$  thereof away from the tail of dog  $k'$ , thereby enabling the spring  $k^4$  to throw the dog into engagement with the rotating clutch-wheel  $d^4$ , whereby the change-shaft is set in rotation and the replenishment of the working weft-supply is effectuated through the operation of the instrumentalities which are provided for the purpose.

In order to facilitate the application of automatic weft-replenishing instrumentalities to looms which have already been built and to enable such application to be effected with a minimum of altering and fitting, I have provided a mounting for the above-described change-shaft and its immediate appurtenances, said mounting being in the form of a separate stand or stands constructed to support the change-shaft and the movable parts or levers appurtenant thereto and adapted to be secured to the floor immediately beneath or adjacent a loom. In Figs. 1, 2, and 3 of the drawings,  $m$  is a floor-stand which is constructed and adapted as has just been stated. The said floor-stand is provided at  $m'$   $m'$  with bearings for the change-shaft  $k$  and has attached thereto a bracket  $m^2$ , Figs. 1 and 2, provided with a pin or pivot  $m^3$ , upon which the detent-lever  $k^6$  is mounted. The floor-stand also has attached thereto a vertical pin or pivot  $m^4$ , Fig. 3, to which the clutch disengager or controller  $z^5$  is applied, as shown best in Fig. 3. At  $m^5$   $m^5$  are upwardly-extending lugs upon the floor-stand  $m$ , to which lugs is applied the fulcrum or supporting rod  $m^6$  of the levers, hereinafter referred to, which are operated by the cams on the change-shaft for the purpose of effecting a weft replenishment. The use of the floor-stand  $m$  renders it unnecessary to attach bearings, brackets, and the like to the loom-frame for the support of the change-shaft and its more immediate appurtenances and enables said parts to be conveniently applied to looms which have already been built without interference with the usual

parts of such looms as such usual parts are at present constructed and arranged.

For the purpose of affording time for permitting the weft-replenishing to be effected without undue precipitateness and violence I preferably, although not necessarily in all embodiments of the invention, provide means for suspending the picking for a predetermined number of movements of the lay. The suspension of the picking may be brought about in various ways under the control of the change-shaft. As a portion of the invention in its more complete form I have devised the mode of enabling the picking to be suspended, which I will now describe. Having reference to Figs. 1, 2, 20, and 21 in the construction which is represented in such figures, the arm  $g^2$ , with which the lug-strap  $g'$  is connected, is not rigid with the picking rock-shaft  $g^3$ , as customary, but is pivotally connected at  $g^{21}$  to a block  $g^{22}$ , which block in turn is mounted upon a pin or pivot  $g^{23}$ , projecting outwardly from the picking rock-shaft. The block  $g^{22}$  is capable of turning or swinging around the pin or pivot  $g^{23}$  in unison with the arm  $g^2$  in a direction from front to rear of the loom, while the arm  $g^2$  is capable of swinging in a direction transversely of the loom upon the pivots  $g^{21}$ , which connect the same with the block  $g^{22}$ . An arm  $g^{31}$ , bolted to the picking rock-shaft  $g^3$ , is formed with an extension  $g^{32}$  projecting outwardly from the loom end frame  $a$ , the said extension having a recess at  $g^{33}$ , which is adapted to receive the arm  $g^2$ , the said arm being caused to occupy the said recess normally by means of a tension-spring  $g^{34}$ , which is connected with the arm  $g^2$  and also with a fixed portion of the loom-frame. During the regular working of the loom the arms  $g^{31}$  and  $g^2$  move in unison, and thereby the picking is effected. When it is desired to suspend the picking at the change end of the loom, the arm  $g^2$  is carried rearwardly out of the recess  $g^{33}$  of the lateral extension  $g^{32}$  of the arm  $g^{31}$  of the picking rock-shaft  $g^3$ . Thereby the arm  $g^2$  is uncoupled from the actuating-arm  $g^{31}$  and is not compelled to participate in the movements of the latter. For the purpose of drawing the arm  $g^2$  rearwardly automatically the said arm is joined by a strap or other connection  $g^{24}$  to a lever  $g^{25}$ , which lever is fulcrumed on the rod  $m^6$  and actuated by means of a cam  $g^{26}$  on the change-shaft  $k$ . When the said cam acts to move the lever  $g^{25}$ , the arm  $g^2$  and block  $g^{22}$  are swung rearwardly around the pivot or supporting pin  $g^{23}$ , with which the picking rock-shaft  $g^3$  is provided. When the cam  $g^{26}$  permits the spring  $g^{34}$  to swing the arm  $g^2$  forwardly again, it reenters the recess  $g^{33}$  in the lateral extension  $g^{32}$  of the fixed arm  $g^{31}$  on the picking rock-shaft  $g^3$ . The picker-stick-retracting device at  $g^{27}$ , Figs. 1 and 2, acts with a tendency to hold the picker-stick  $g$  in its outer position, as shown in Fig. 2.



In order to permit the picker-stick to remain in this position while the arms  $g^2$  and  $g^{31}$  are uncoupled from each other, the arm  $g^2$  is pivoted, as at  $g^{21}$ , to the block  $g^{22}$ , thereby enabling the arm  $g^2$  and block  $g^{22}$  to swivel relatively to each other, (the arm  $g^2$  standing at rest,) while the block  $g^{22}$  participates in the rocking movement of the picking rock-shaft  $g^3$ , that is occasioned by the action of the picking-tappet  $g^7$ .

In the present case the reserve supply of weft or filling is contained in a hopper or magazine at  $n$ , mounted upon the breast-beam, a supporting-bracket being shown at  $n^x$  attached to the breast-beam  $a^2$  and carrying the magazine  $n$ .

For the purpose of making the transfer of the reserve weft or filling from the magazine  $n$  to the lay an injector or pusher  $o$  is provided, it being mounted upon an arm  $o'$ , which is pivoted to the loom-frame at  $o^2$ . The said arm  $o'$  is joined by a connection  $o^3$  with a lever  $o^4$ , the said lever being pivoted on the fulcrum-rod  $m^6$  and actuated by means of a cam  $o^5$  on the change-shaft  $k$ . When the cam  $o^5$  acts to move the lever  $o^4$  for the purpose of carrying weft or filling to the lay, it draws the arm  $o'$  and injector  $o$  rearwardly to meet the lay. The arm and injector gravitate forwardly to their normal position again when permitted so to do by the action of the said cam. The arm  $o'$  is provided with an adjustable contact-piece  $o^6$  to strike against a stop, as at  $o^7$ , on the lay when the arm  $o'$  and injector or pusher are moved rearwardly. For the purpose of enabling the arm  $o'$  and injector or pusher to be moved rearwardly under the action of the cam  $o^5$  until the contact-piece  $o^6$  encounters the stop  $o^7$  and of thereafter holding the said contact-piece pressed against the said stop while the arm and injector or pusher participate in the movement of the lay the connection  $o^3$  is made yielding and elastic. Thus in the present case the said connection  $o^3$  comprises a rod  $o^{31}$ , which is pivoted to the arm  $o'$  at  $o^{32}$ , a similar rod  $o^{33}$ , which is pivoted to the lever  $o^4$  at  $o^{34}$  opposite blocks  $o^{35} o^{35}$ , having holes therethrough through which the pair of rods  $o^{31}$  and  $o^{33}$  is passed, the said blocks having clamping-screws  $o^{36} o^{36}$ , by means of which one of the same is made fast to the rod  $o^{31}$ , while the other is made fast to the rod  $o^{33}$ , and a compression-spring  $o^{37}$ , surrounding the rod  $o^{31}$  between the opposite blocks  $o^{35} o^{35}$ .

I have shown the magazine  $n$  filled or charged with filling-cases  $p$ . Suitable means is provided for regulating the feed of the filling-cases to the injector or pusher  $o$ . Various contrivances may be employed for the purpose. I have herein represented a plate  $n'$ , which is hung pivotally at  $n^2$  to the front of the magazine  $n$  and provided with a rearwardly-projecting lip  $n^3$ , Fig. 1. A spring, as  $n^4$ , acts upon the plate  $n'$  and tends to hold

the same pressed rearwardly into a position in which its lip  $n^3$  extends beneath the bottom filling-case in the magazine  $n$  and supports the same, together with the other filling-cases, on top thereof. For the purpose of moving the plate  $n'$  so as to withdraw the lip  $n^3$  and permit of the descent of the filling-cases which are held back thereby the plate  $n'$  is furnished with a projection  $n^4$ , extending into the path of movement of the injector or pusher  $o$ . As the injector or pusher moves forward into its position of rest it encounters the projection  $n^4$  and presses the plate  $n'$  forward, thus withdrawing the lip  $n^3$ , so as to permit the filling-cases to descend within the magazine  $n$  until the bottom one comes to rest upon filling-case supports, as  $o^8 o^8$ . The said filling-case supports  $o^8 o^8$  preferably are arranged to move in unison with the said injector or pusher and extend rearwardly thereof, as in Figs. 1, 2, and 3, or may be attached to the lay and extend forwardly therefrom, as in Fig. 24, Sheet 9. When, now, the injector or pusher is moved rearwardly for the purpose of transferring the bottom filling-case from the filling-case supports  $o^8 o^8$  to the lay, the plate  $n'$  is released to the action of its spring  $n^4$ , and the lip  $n^3$  thereof is thereby caused to pass beneath the next filling-case and support the same above the top of the injector or pusher  $o$  while the latter is in its rearward position.

When the filling-case supports  $o^8 o^8$  are arranged to move in unison with the injector or pusher, the retraction of the injector or pusher forwardly into its normal or inoperative position after having been moved rearwardly to carry a filling-case toward the lay also carries the filling-case supports forwardly out of immediate proximity to the lay-beam. Should the said filling-case have failed for any reason to enter the shuttle in the shuttle-box, this retraction of the filling-case supports  $o^8 o^8$  will permit the same to drop from the lay-beam. Thereby is obviated possible injury, such as might be occasioned in the advance of the lay by collision of said filling-case against the next reserve filling-case or other objects in the loom or from said next reserve filling-case being carried rearwardly by a succeeding movement of the injector or pusher against a filling-case lying at the front of the shuttle-box. In Figs. 1, 2, and 3 the filling-case supports  $o^8 o^8$  are constituted by short rods fitted to bearings, as  $o^{81} o^{81}$ , carried by the injector or pusher  $o$ , and are capable of endwise movement through said bearings being kept from endwise movement by their frictional contact within the bearings. When the injector or pusher is moved rearwardly, the filling-case supports move in unison therewith until the rear ends of the said filling-case supports make contact with the lay-beam, after which the injector or pusher moves relatively to the said supports. In the return of the injector



or pusher to its forward position the filling-case supports move forward therewith until their forward ends encounter a fixed stop or stops, as at  $o^{82}$ , which arrests them in proper position beneath the magazine  $n$ ; but the injector or pusher continues until it reaches its completely retracted position.

One of the filling-cases  $p$  is shown in detail in Figs. 9, 10, and 11, Sheet 4, and the form of shuttle which is employed in connection with filling-cases like that which is represented in the said figures is shown in detail in Figs. 4 to 8, inclusive, same sheet. The body of the shuttle  $q$ , Figs. 4 and 5, is formed with an opening  $q'$  of a size to contain a filling-case  $p$ , Figs. 9 and 10, the said opening extending entirely through the shuttle-body, as indicated in Figs. 4, 5, and 6, so as to enable a filling-case to be introduced at one side of the shuttle into the chamber which is constituted by such opening and subsequently to be expelled at the opposite side. When in position within the opening or chamber  $q'$ , the filling-case  $p$  is retained in place therein by detents, which in the present instance are constituted by V-shaped blocks  $q^2 q^2$ , Figs. 4 to 8, that enter correspondingly-shaped notches  $p' p'$ , Fig. 10, in the ends of the filling-case  $p$ . The said blocks are fitted within the vertical slots  $q^3 q^3$  of plugs  $q^4 q^4$ , (see more especially Figs. 7 and 8,) which are inserted into the shuttle-body at the opposite ends of the opening or chamber  $q'$ . The blocks are held projected normally into position to engage with the ends of the filling-case by means of spiral springs  $q^5 q^5$ . The said springs surround the stems  $q^6 q^6$  of the blocks  $q^2 q^2$  and are confined within the longitudinal chambers  $q^7 q^7$  of the said plugs between the blocks and the inner ends of the chambers. When a filling-case is first pressed into the opening or chamber  $q'$  of the shuttle, the blocks  $q^2 q^2$  yield to the pressure of the end portions of the filling-case against their oblique faces, so as to permit the said filling-case to be forced into position within the opening or chamber  $q'$ ; but when said blocks have been caused by the springs  $q^5 q^5$  to enter the notches  $p' p'$  of the ends of the filling-case they serve to hold the filling-case in place during the movements of the shuttle. They yield and recede also to allow the spent or failed filling-case to be expelled from said chamber in advance of the reserve filling-case which is being substituted therefor when the latter is pressed laterally against the former by the injector or pusher  $o$  as the said injector or pusher is carried rearward in the loom by the action of cam  $o^5$  when the change-shaft is being rotated. In order to facilitate the entrance of a filling-case into the opening or chamber  $q'$  of the shuttle, the upper and lower edges of the side of said filling-case which first enters are beveled off longitudinally, as at  $p^2 p^2$ , Figs. 10 and 11, and the ends of said ends are also beveled off, as at

$p^3 p^3$ , Fig. 10. In addition the shuttle-body is beveled off at  $q^8 q^8$ , Figs. 4, 5, and 6, at the opposite ends of the opening or chamber  $q'$  on the side of the shuttle at which the filling-case enters. The various beveled surfaces of the filling-case and the shuttle tend to deflect the entering filling-case into the opening or chamber  $q'$  in case the filling-case and the entrance to the chamber of the shuttle should not register properly with each other. In particular the bevels  $p^3 p^3$  at opposite ends of the filling-case and the beveled shoulders  $q^8 q^8$  of the shuttle-body at opposite ends of the chamber  $q'$  are important, inasmuch as they enable a filling-case to enter the chamber  $q'$  readily notwithstanding considerable misplacement of the shuttle longitudinally relative to the entering filling-case. This misplacement is due to the fact that the shuttle will not always stop at the same point in the length of a shuttle-box at the ends of its successive flights across the loom. At different times it will vary more or less in the position in which it comes to rest within the shuttle-box. The beveled surfaces  $p^3 p^3$  and  $q^8 q^8$  acting with one another will cause the entering filling-case to adjust itself automatically and to properly find the entrance to the chamber  $q'$ , even though the shuttle may be misplaced considerably from its proper position—that is to say, the filling-case resting on the filling-case supports  $o^8 o^8$  and pressed rearwardly by the injector or pusher  $o$  is free to shift endwise relative to the injector or pusher as the inclined surfaces  $p^3 p^3$  and  $q^8 q^8$  act against one another.

The weft or filling in wound form, which is carried by the filling-case, is contained within the chamber or cavity  $p^5$  of the filling-case. The manner of applying the said weft or filling to the filling-case and retaining it in place therein is not material to the invention. In the present instance the filling-case is adapted to receive weft or filling wound upon bobbins, a bobbin  $p^{61}$  being shown in position in the filling-case in Fig. 10, and for the purpose of holding the bobbin in place within the chamber  $p^5$  the filling-case  $p$  is provided with a U-shaped clasp  $p^6$  to receive and engage with the head of the bobbin. The means of holding the bobbin in place within the filling-case is not material to the invention. At  $p^7$ , Figs. 9 and 10, is shown the yarn-delivery eye or educt of the filling-case.

The position of a reserve filling-case as it rests upon the filling-case supports  $o^8 o^8$  preparatory to being pushed into place in the working shuttle when the latter occupies the shuttle-box at the change end of the loom is represented in Fig. 3. For the purpose of permitting the passage of the said filling-case into the shuttle the shuttle-box front  $f$  is formed with an opening  $f'$  of a length sufficient to permit of free movement of the filling-case therethrough. (See dotted lines, Fig. 3.)



The ends of the yarns leading from the yarn-delivery eyes  $p'$  of the respective filling-cases within the magazine  $n$  are in practice attached to a suitable holder, which may be constituted by a pin, as  $n^5$ , Figs. 1 and 2, upon any suitable part in connection with the loom, the said pin being shown herein upon the magazine  $n$ . In order that after a filling-case has been transferred from the magazine  $n$  to the shuttle on the lay the portion of weft which extends from the filling-case just introduced into the shuttle to the holder  $n^5$  may escape from the shuttle-box as the shuttle is picked, the front  $f$  of the shuttle-box is so contrived and mounted as to leave a passage  $f^2$ , Fig. 1, between its lower edge and the upper surface of the lay-beam  $a^2$ . Through this passage the said portion of weft finds its way when the shuttle is picked toward the other side of the loom. This passage  $f^2$  need be provided only at the inner end of the shuttle-box front—that is to say, at the end thereof next adjacent the warp—although in the drawings I have shown such a passage at the outer end of the shuttle-box also. The said shuttle-box front is attached to arms  $e' e'$ , extending forwardly from the shuttle-box back  $e$ . The shuttle-box back  $e$  has an opening there-through, the curved ends of which are indicated in dotted lines at  $e^x e^x$ , Fig. 3, to permit of the passage of the spent or failed filling-case as the latter is forced out of the shuttle by the fresh filling-case in process of being introduced into the shuttle by the injector or pusher  $o$ .

A filling-case in being introduced into the shuttle by the action of the replenishing instrumentalities may in some manner be improperly positioned in the shuttle, so that it projects more or less at the rear side of the latter. For the purpose of insuring that the filling-case shall not thus project when the shuttle is picked and of properly positioning a filling-case which has been improperly positioned in being introduced by the action of the injector or pusher I provide a filling-case-positioning device, which herein is constituted by a rocker, the said rocker being journaled in bearings at  $s'$  at the rear of the shuttle-box and having a wing or wings  $s^2 s^2$  adapted to make contact with the rear side of a filling-case occupying the chamber  $q'$  of the shuttle in the said shuttle-box. The filling-case-positioning device is placed under the operative control of the change-shaft through connections, which in the present instance comprise an arm  $s^3$  on the said rocker, a rod  $s^4$ , joined to the said arm  $s^3$ , and a lever  $s^5$ , to which the said rod  $s$  is also joined, the said lever being mounted upon the supporting-rod  $m^6$  and engaging with the cam  $s^6$  on the change-shaft. The said cam is shown separately in Fig. 13, Sheet 1. Under the control of the portion  $s^{63}$  of the said cam the rocker moves so as to press its wing or wings  $s^2$  forwardly against the rear side of the filling-

case, which has just been introduced into the shuttle in the shuttle-box. Normally the rocker occupies a position in which its wing or wings  $s^2$  are retracted, so as not to obstruct the rearward movement of the spent or failed filling-case after being ejected from the shuttle. The rocker is moved into this position by means of a tension-spring  $s^{49}$ , connected with the rod  $s^4$  and with the lay-beam, respectively.

In order to avoid injury in case the movement of the positioning device is obstructed, a yielding member, as  $s^{41}$ , is introduced into the train of operative connections. This yielding member, herein constituted by a compression-spring, yields to the continued movement of lever  $s^5$ , when the positioning device is prevented from completing its forward movement, and thereby obviates straining or breaking of the parts. The use of this yielding member also renders unnecessary delicate adjustment of the parts in order to secure accurate working of the positioner. The extreme forward position of the positioner is determined by means of a stop  $s^7$ , Fig. 12, against which one or both of the wings  $s^2$  makes contact. After such contact occurs in the forward movement of the said wings the spring at  $s^{41}$  yields to any remaining portion of the continued movement of the lever  $s^5$ . The cam  $s^6$ , by means of which the positioner is operated, is formed with a portion, as  $s^{61}$ , by means of which the positioner is caused to assume at the time of the expulsion of a filling-case from the shuttle in the shuttle-box at the change end of the lay an intermediate position in the path of the said filling-case. Thereby the said filling-case is arrested as soon as it has cleared the shuttle. By this means not only is the expelled filling-case prevented from being driven too violently away from the shuttle, but the said filling-case is arrested in a position to cause it to serve as a stop by means of which the entering filling-case is prevented from being driven too far through the shuttle-body at either or both ends of the filling-case by the action of the injector. I thereby provide against either lateral misplacement of the filling-case in its entirety within the chamber or cavity of the shuttle-body or the projection of either of the ends of the filling-case at the rear side of the shuttle-body. The portion  $s^{62}$  of the cam  $s^6$  permits the positioner to assume its entirely-retracted position, in which latter the wing or wings  $s^2$  are withdrawn from the path of the expelled filling-case. The latter rests upon the supporting-guides  $v$ , Figs. 1 and 14, projecting from the lay at the rear of the shuttle-box, and after the withdrawal of the wing or wings  $s^2$  the said filling-case is caused by the movement of the lay to pass rearward along the said supporting-guides and from the same onto the shelf  $v'$ , which is suitably attached to



the loom-frame. The rear ends of the supporting-guides  $v$  work in slots  $v^2$   $v^2$  in said shelf, as shown best in Fig. 14.

At the front of the shuttle-box at the change end of the loom the edge of the lay-beam is rounded off, as at  $b^6$ , Fig. 12, Sheet 1, in order to facilitate the transfer of a filling of a filling-case from the magazine  $n$  to the shuttle-box and prevent the lower portion of the filling-case from catching against the edge of the lay-beam. The rounding off at this place also facilitates the dropping of a filling-case which has been transferred to the lay but for any reason has been prevented from entering the chamber or cavity of the shuttle on the lay.

It may sometimes happen that a filling-case after being introduced into the chamber or cavity of the shuttle in the shuttle-box at the change end of the loom may project more or less at either the front or the back of the shuttle at one end of the filling-case. For the purpose of insuring that a filling-case which thus projects shall be restored into proper working position in the shuttle I bevel the shuttle-box front and shuttle-box back at the ends of the openings therethrough, as at  $f^x$   $f^x$   $e^x$   $e^x$ , Fig. 3, so as to form inclined surfaces which by their action against projecting portions of the filling-case will operate to force the filling-case in, so that its sides shall lie flush with the sides of the shuttle-body.

I mount the swell or binder  $t$  above the top of the shuttle-box on a horizontal pivot  $t^1$ , Figs. 1 and 24, so that it swings in a vertical plane and bears against the upper side of the shuttle. A protector-lever  $t^2$  is pivoted at  $t^3$  upon a bracket  $t^4$ , projecting rearwardly from the lay. The forwardly-extending arm of the protector-lever rests upon the top of the swell or binder  $t$ , and the rear arm thereof is connected, by means of a rod  $t^5$ , with the rearwardly-extending arm  $t^6$  of the protector-shaft  $t^7$ , the latter being provided with the usual dagger  $t^8$ , Fig. 2.

For the convenience of the weaver a container or receptacle, as  $u$ , Fig. 1, may be located adjacent the loom to hold a quantity of filled filling-cases and from which the magazine  $n$  may be charged by the weaver when necessary, or the said container or receptacle may hold wound filling in readiness to be introduced by the weaver into empty filling-cases. Such container or receptacle is shown mounted upon a standard  $u'$ ; but some other convenient support therefor may be provided.

For the purpose of bringing about the arrest of the working of the loom whenever there is a deficiency in the supply of reserve filling I provide a detector  $w$ , Figs. 1, 2, 3, and Figs. 15 and 16, Sheet 5, which acts in connection with the contents of the magazine, and with the said detector I operatively combine knocking-off devices and other coacting parts by means of which the driving power of the loom is unshipped when the detector indicates de-

ficiency of reserve filling in the magazine. Preferably I arrange so that the devices just referred to shall act to stop the loom before the last charge of reserve filling has been transferred to the lay, and to this end I arrange the detector so that it shall be controlled by the reserve charge of filling next succeeding the one which is in readiness to be fed to the lay by the injector. Reference will now be had more particularly to Figs. 15 to 19, Sheets 5 and 6. In these figures the detector  $w$  is shown in the shape of an arm mounted upon a rock-shaft  $w'$ , supported in bearings  $w^2$   $w^2$  from the breast-beam  $a^2$ . The said arm is shaped so as to extend upwardly from the rock-shaft  $w'$ , then forwardly over the breast-beam, then outwardly toward the end of the breast-beam, and then rearwardly, so as to enter an opening at the front of the magazine  $n$ , the end of the said detector being adapted to take bearing against the filling-case which is next above the filling-case resting on the supports  $o^8$  of the injector  $o'$ . (See Figs. 15 and 16.) The rock-shaft  $w'$  is acted upon by a light spring  $w^3$ , Fig. 17, tending to move the detector  $w$  rearwardly. Thereby the detector is pressed against the filling-case that is in line with its end, as in Fig. 16, and when there is no filling-case in line with the said end, which will occur when the last filling-case in the magazine has descended onto the supports  $o^7$ ,  $o^7$ , the spring causes the detector to move rearwardly into the position which it occupies in Fig. 18.

For the purpose of bringing about the unshipping of the driving power an arm  $w^4$ , Figs. 15, 17, and 19, is attached to the rock-shaft  $w'$  at the driving end of the loom. This arm extends upwardly beneath a bunter  $w^5$ , which is pivoted at  $w^6$  to the inner end of the knocking-off lever  $w^7$ , the latter being pivoted at  $w^8$  at the outer end of the usual bracket  $w^9$  for the shipper-handle  $w^{10}$ . Normally—that is to say, when the feeler  $w$  is held forward by a filling-case in line with its end, as in Fig. 16—the arm  $w^4$  takes a position in which it sustains the bunter  $w^5$  above the path of motion of a suitable going part. In the present case the lay-beam  $b$  carries a striker  $w^{11}$ , Figs. 17 and 19, that is adapted to cooperate with the said bunter  $w^5$ . When by the absence of a filling-case  $p$  from in line with the end of the detector  $w$  the said detector is permitted to move rearwardly into the position which it occupies in Fig. 18, the arm  $w^4$  also moves rearwardly, (see Fig. 19,) lowering the bunter  $w$  into the path of motion of the striker  $w^{11}$ . In the next succeeding advance of the lay the striker  $w^{11}$  engages with the bunter  $w^5$ , and thereby the knocking-off lever  $w^7$  is forced forward, dislodging the shipper-handle  $w^{10}$  from its holding-notch and causing the loom to be unshipped.

In the modified picking arrangement which is shown in Figs. 22 and 23, Sheets 8 and 9,



the picking rock-shaft  $g^3$  is provided with picking-arm  $g^{40}$  of usual character rigid therewith and having the inner extremity of the lug-strap  $g'$  connected thereto in usual manner. The outer extremity of the said lug-strap is connected with the arm  $g^{41}$ , the latter being pivoted at  $g^{42}$  upon a lever  $g^{43}$  with capacity to swing in a direction from front to rear in the loom. The lever  $g^{43}$  in turn is pivoted at  $g^{44}$  upon the support  $g^{45}$ , upon which the rocker  $g^{46}$  of the picker-stick  $g$  is mounted. Lever  $g^{43}$  is arranged to swing transversely of the loom upon the pivot  $g^{44}$ . Arm  $g^{41}$  is provided with a shoulder at  $g^{47}$  to take behind the outer side or edge of the picker-stick  $g$ , as shown in Fig. 22, and from an outward extension or horn  $g^{48}$ , which when the said arm  $g^{41}$  is disengaged from the picker-stick bears against the rear side of the picker-stick  $g$  and guides the arm  $g^{41}$  in its movements, so as to facilitate the subsequent reengagement of the said arm with the picker-stick. This horn  $g^{48}$  corresponds with the similar outward extension of the portion  $g^{32}$  of the arm  $g^{31}$  of the picking rock-shaft  $g^3$ , which is shown in Figs. 20 and 21. The arm  $g^{41}$  is connected by the strap  $g^{24}$  with the lever  $g^{25}$ , operated by cam  $g^{26}$  on the change-shaft  $k$ , and when by the action of the said cam the lever  $g^{25}$  is moved so as to draw the arm  $g^{41}$  rearwardly away from the picker-stick into the position in which it is shown in Fig. 23 the arm  $g^{41}$  is disconnected from the picker-stick. If now the picking rock-shaft is oscillated by the action of the picking-tappet  $g^7$ , the parts  $g^{41}$  and  $g^{43}$  will turn in unison upon the pivot at  $g^{44}$ , but without operating the picker-stick. A spring  $g^{49}$  serves to carry the arm  $g^{41}$  toward the front of the loom again when permitted so to do by the cam  $g^{26}$ , and when this spring is permitted thus to act the shoulder  $g^{47}$  passes forward outside the outer edge of the picker-stick  $g$  after the parts  $g^{41}$  and  $g^{43}$  have been swung outwardly by the action of the picker-stick-retracting spring  $g^{27}$ .

I claim as my invention—

1. In combination, the shuttle-body having the chamber to receive a filling-case, and having oblique or inclined surfaces or shoulders at opposite ends of the entrance to said chamber, the filling-case having correspondingly inclined or oblique surfaces or shoulders at opposite ends thereof, to coact with the said surfaces or shoulders of the shuttle-body in causing the filling-case to adjust itself longitudinally to the position of the shuttle, and a pusher for introducing said filling-case into said chamber constructed to permit the filling-case to shift in the direction of its length in entering said chamber.

2. In combination with the lay, an injector or pusher, the shuttle, and the filling-case, provided with means to shift the filling-case longitudinally so as to cause it to register with

the entrance to said chamber, when the shuttle is misplaced relative to the filling-case, and the shuttle-box side having an opening of greater length than that of the filling-case so as to permit the longitudinal shift of the filling-case in being brought into register with the chamber.

3. In combination with the lay, and an injector or pusher, the shuttle having the chamber to receive a filling-case, the filling-case having oblique or inclined deflecting surfaces at opposite ends thereof to contact with shoulders at the respective ends of said chamber, when the shuttle is misplaced relative to the filling-case, and cause the filling-case to adjust itself longitudinally into register with the said chamber.

4. In combination with the lay, a filling-case, and an injector or pusher, the shuttle having the chamber to receive a filling-case, and provided with oblique or inclined deflecting surfaces or shoulders at opposite ends of said chamber to shift the filling-case longitudinally into register with said chamber when the shuttle is relatively misplaced.

5. In combination, the lay, the injector or pusher, the supports moving in unison therewith and also movable relative thereto, said supports engaging with the lay as the injector or pusher advances toward the latter, and a stop to arrest the said supports in the predetermined normal position thereof independently of the injector or pusher as the injector or pusher retracts.

6. In combination, the lay, the injector or pusher, the supports frictionally mounted and moving in unison with said injector or pusher, said supports engaging with the lay as the injector or pusher advances toward the latter, and a stop to arrest the said supports in the predetermined normal position thereof as the injector or pusher retracts.

7. In combination, the lay, the shuttle, a filling-case, an injector or pusher to introduce said filling-case into the chamber of said shuttle, and a filling-case-positioning device external to the shuttle to cause the filling-case to occupy the correct position in the shuttle after being introduced by the injector or pusher.

8. In combination, the lay, the shuttle, a filling-case, an injector or pusher to introduce said filling-case into the chamber of said shuttle, and a filling-case-positioning device coacting with the filling-case in the shuttle to correct misplacement thereof.

9. In combination, the lay, the shuttle, a filling-case, an injector or pusher to introduce said filling-case into the chamber of said shuttle, a filling-case-positioning device, and means to cause said device to act against the filling-case in the shuttle and correct misplacement thereof.

10. In combination, the lay, the shuttle, a filling-case, an injector or pusher to introduce



said filling-case into the chamber of said shuttle, the filling-case-positioning rocker, and means to actuate said rocker.

11. In combination, the lay, the shuttle, a filling-case, an injector or pusher to introduce said filling-case into the chamber of said shuttle, the filling-case positioner, and the change-shaft in operative control of said injector or pusher and positioner.

12. In combination, the lay, the shuttle, a filling-case, an injector or pusher to introduce said filling-case into the chamber of said shuttle, the filling-case positioner, and operating means for said positioner containing a yielding member to obviate injury when the movement of said positioner is obstructed.

13. In a weft-replenishing loom, in combination, a reserve-filling magazine independent of the lay, an injector to transfer filling from said magazine to the lay, a detector acting in connection with the contents of said magazine, knocking-off devices, a going part, and a bunter in operative connection with said knocking-off devices and detector and automatically actuated from said detector to be moved into the path of the said going part when the detector indicates deficiency of reserve filling in the magazine.

14. In a weft-replenishing loom, in combination, a reserve-filling magazine independent of the lay, an injector to transfer filling from the magazine to the lay, the detector controlled by the reserve charge of filling next succeeding the one about to be fed by the injector, knocking-off devices, a going part, and the bunter in operative connection with said knocking-off devices and detector, and automatically actuated from said detector to cause the same to become engaged by said going part to operate the knocking-off devices when said reserve charge is lacking or absent from its place adjacent the detector.

15. In a weft-replenishing loom, in combination, a reserve-filling magazine, the injector for transferring reserve filling from said magazine to the lay, the detector controlled by the reserve charge of filling next succeeding the one about to be fed by the injector, the rock-shaft with which said feeler is connected, the knock-off lever, the bunter, the going part, and the arm on said rock-shaft controlling the engagement of said bunter with said going part.

16. In a weft-replenishing loom, in combination, the lay, means to transfer a reserve-filling carrier to the lay and cause the same to expel before it the filling-carrier previously upon the lay, a movable stop to engage the expelled filling-carrier and hold the same so as to arrest the freshly-fed filling-carrier in its proper position, and operating means for the movable stop, said operating means acting to withdraw the said stop after the aforesaid action has taken place, to permit the escape of the expelled filling-carrier.

17. In a weft-replenishing loom, in combination, the lay, means to transfer a reserve filling-case to the lay and cause the same to expel before it the filling-case previously contained in the shuttle on the lay, the rocker mounted on the lay, and operating means for said rocker whereby the same is caused to stop the latter filling-case in being expelled from the shuttle and thereby arrest the freshly-fed filling-case in proper position within the shuttle, and subsequently is withdrawn to permit the expelled filling-case to escape.

18. In a weft-replenishing loom, in combination, the lay, a support for expelled filling-cases, means to transfer a reserve filling-case to the lay and cause the same to expel before it the filling-case previously contained in the shuttle on the lay, the movable stop mounted on the lay, and operating means for said stop whereby the same is actuated to hold the latter filling-case in being expelled from the shuttle and thereby arrest the freshly-fed filling-case in proper position within the shuttle, and subsequently is withdrawn to permit the expelled filling-case to escape upon said support.

19. In a loom, in combination, picking mechanism comprising, essentially, motion-transmitting members arranged to move in unison in effecting the picking, one thereof having a shoulder which engages with another thereof to transmit movement thereto to effect the picking, and the change-shaft operatively connected with one of said members and acting to move the same transversely with relation to the coacting member to disestablish the engagement of the shoulder with the other member and thereby suspend the picking.

20. In a loom, in combination, picking mechanism comprising, essentially, motion-transmitting pivoted members mounted to swing in unison in effecting the picking, one thereof having a shoulder which engages with the other to transmit movement thereto to effect the picking, and the change-shaft operatively connected with one of said members and acting to move the same transversely with relation to the coacting member to disestablish the engagement of the shoulder with the other member and thereby suspend the picking.

21. In a loom, the swinging picking-arm, means to operate the same, the picker-stick, and the motion-transmitting connections between said picking-arm and picker-stick, the construction embracing essentially two arms, one whereof engages with the other to cause the two to swing in unison in effecting the picking, and in combination therewith means to swing one of said arms transversely with relation to the other, to disengage the arms from each other and suspend the picking.

22. In a loom, in combination, the swinging picking-arm, means to operate the same, the picker-stick, and the motion-transmitting connections between said picking-arm and picker-



stick, the construction embracing essentially two members mounted to swing in the line of the pick, one whereof engages with the other to cause the two to swing in unison in effecting the picking, and in combination therewith means to swing one of said members in a direction from front to rear in the loom to disengage it from the coacting member and thereby suspend the picking.

23. In a loom, in combination, the swinging picking-arm, means to operate the same, the picker-stick, and the motion-transmitting connections between said picking-arm and picker-stick, the construction embracing essentially two members mounted to swing in the line of

the pick, one whereof engages with the other to cause the two to swing in unison in effecting the picking, and in combination therewith the change-shaft in operative connection with one of said members and arranged to swing the same in a direction from front to rear in the loom to disengage it from the coacting member and thereby suspend the picking.

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

HENRY I. HARRIMAN.

Witnesses:

CHAS. F. RANDALL,

EDITH J. ANDERSON.