

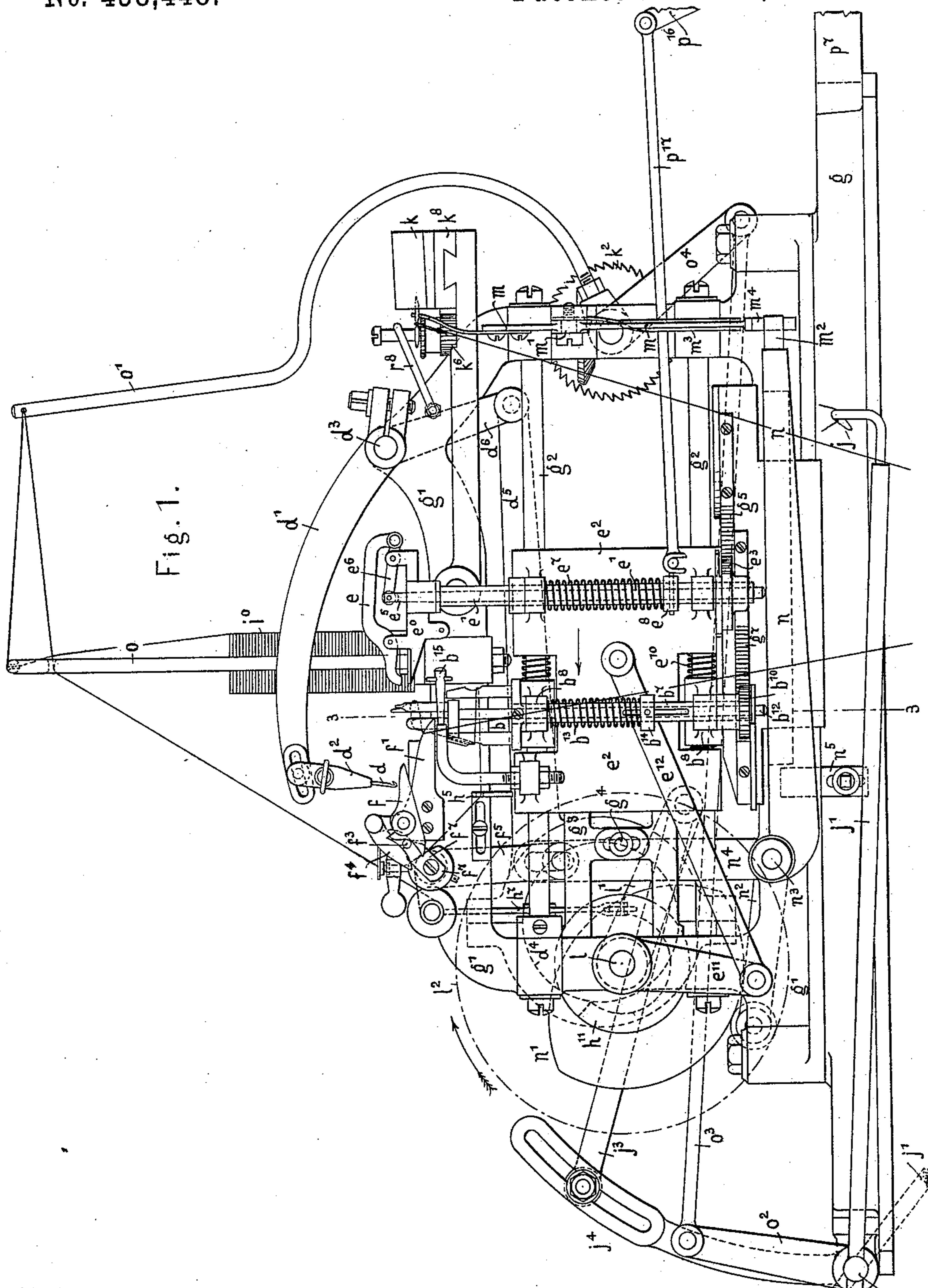
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9 Sheets—Sheet 1.

A. SAURER & V. KOBLER.

MACHINE FOR THREADING NEEDLES OF EMBROIDERING MACHINES.
No. 438,448.

Patented Oct. 14, 1890.



Witnesses:

Goellad
A. H. Shipley

Inventors

Adolph Saurer
Victor Kobler
by Marshall & Sons

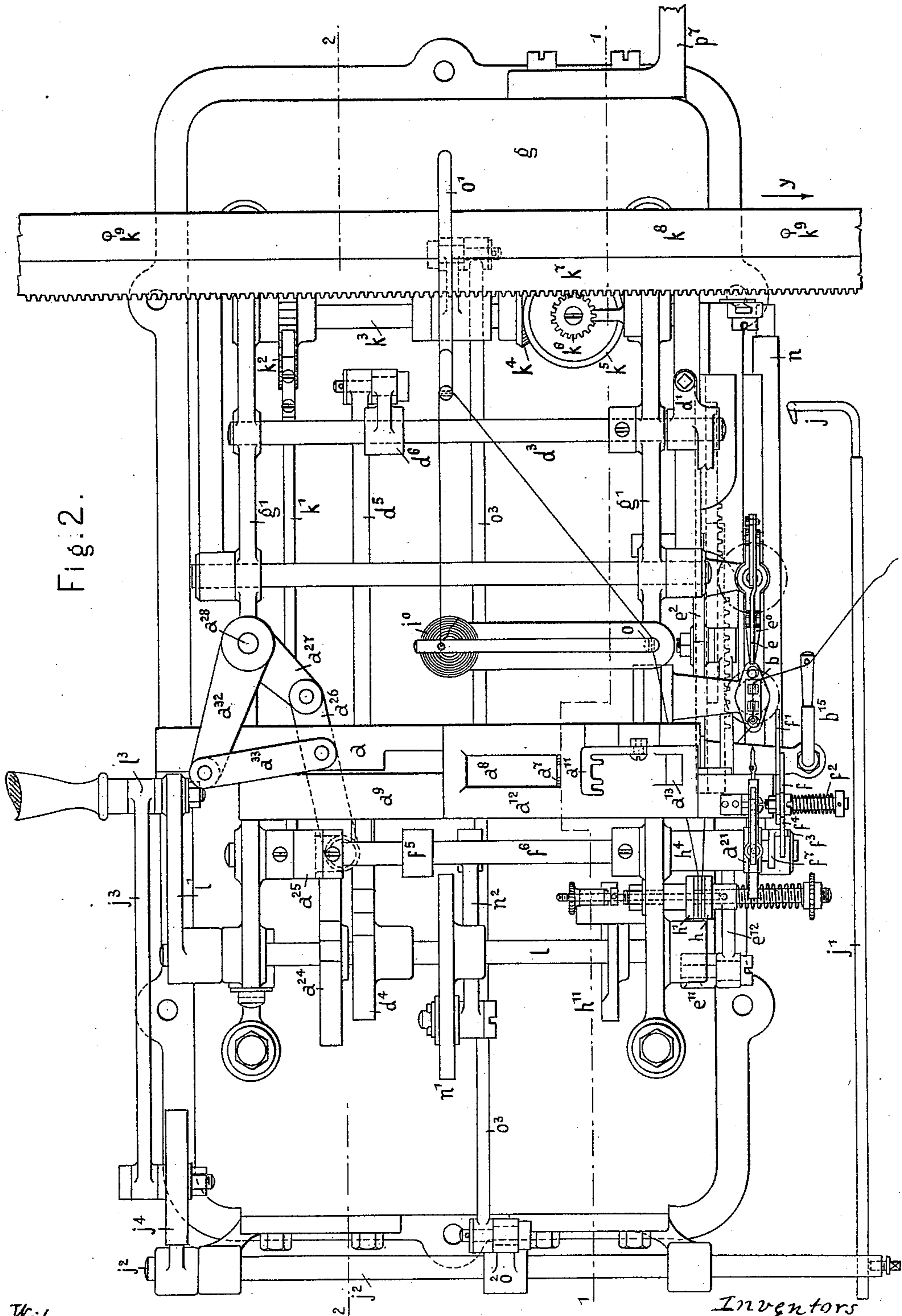
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A. SAURER & V. KOBLER.

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Patented Oct. 14, 1890.



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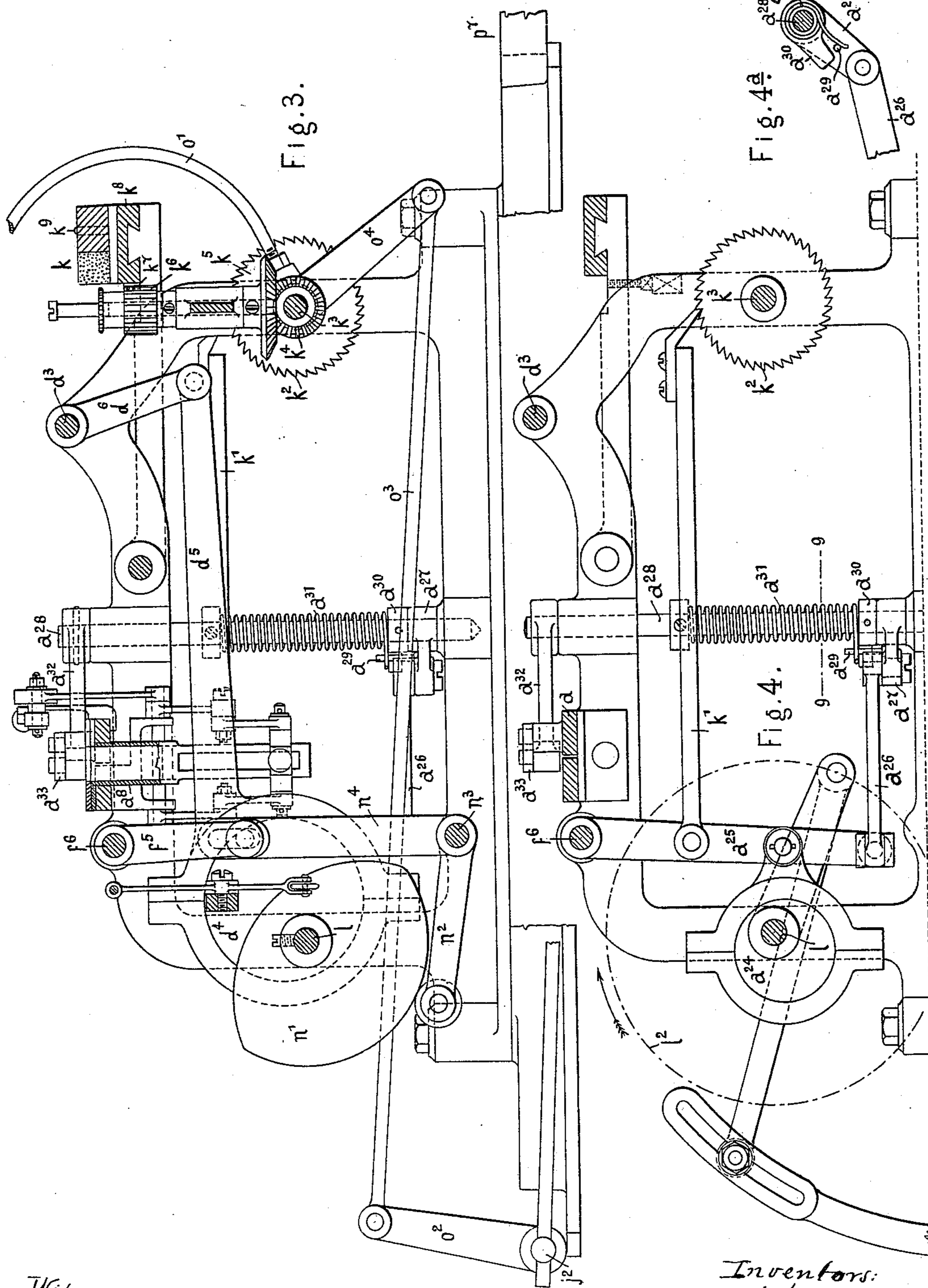
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Patented Oct. 14, 1890.



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(No Model.)

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Fig. 5.

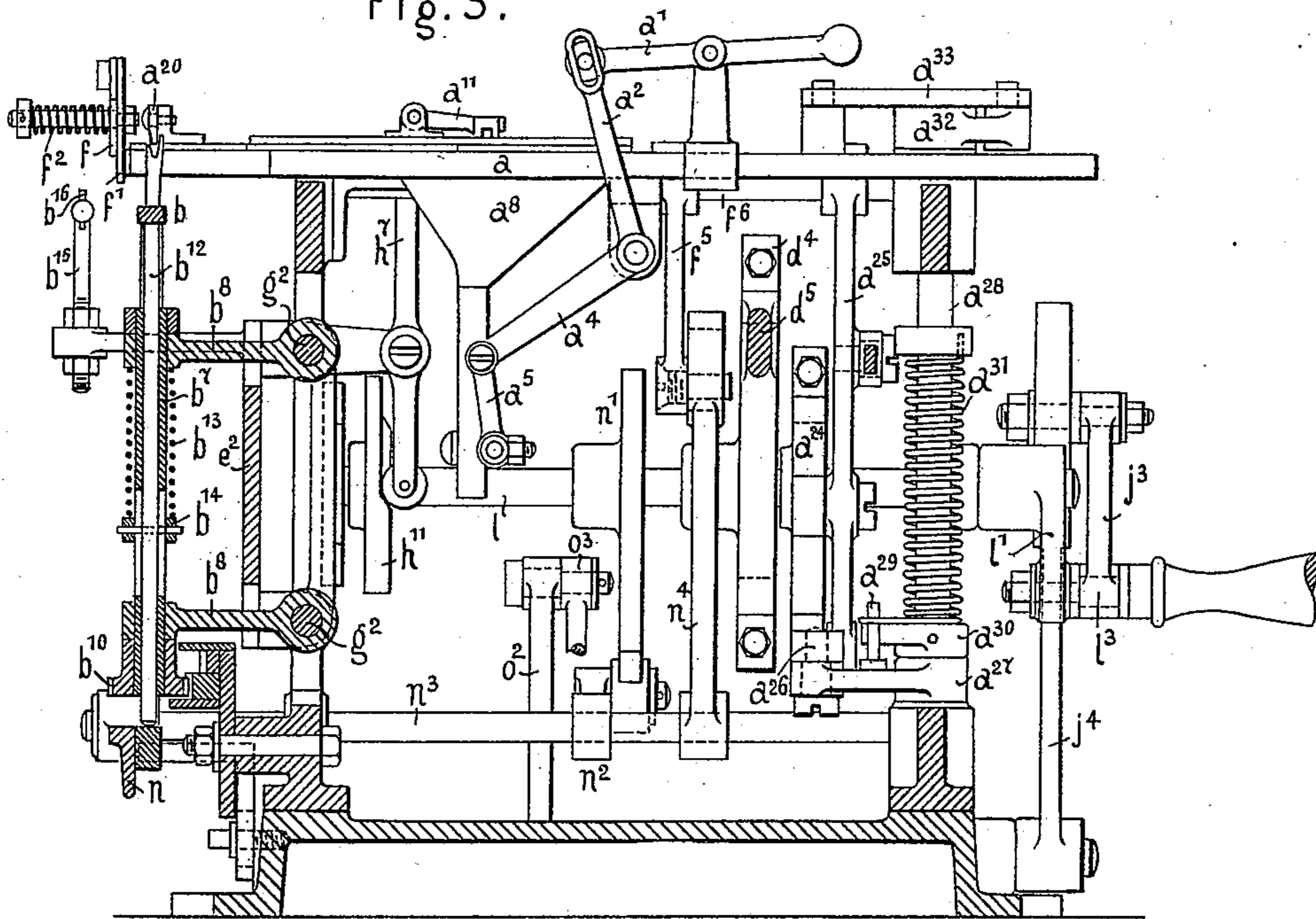
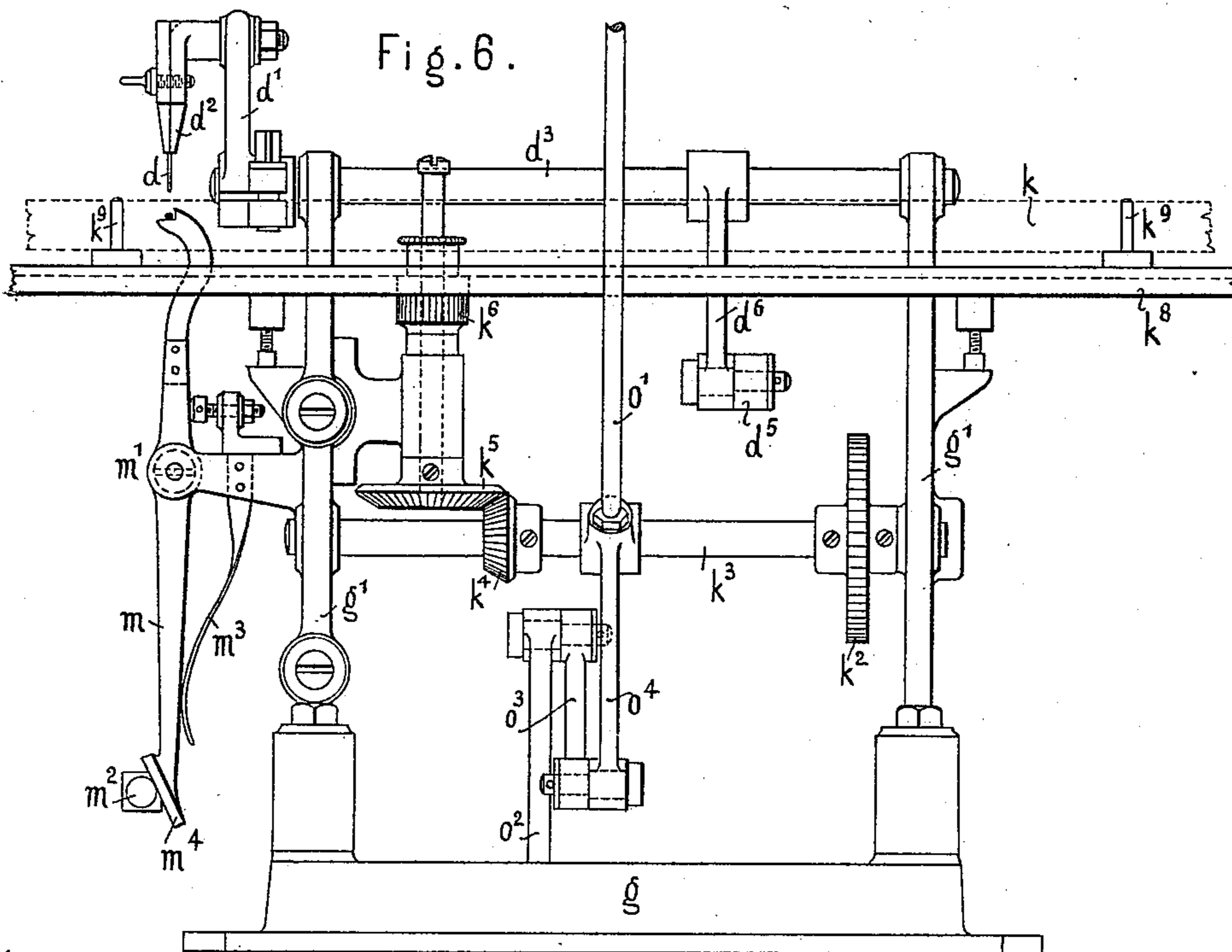


Fig. 6.



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(No Model.)

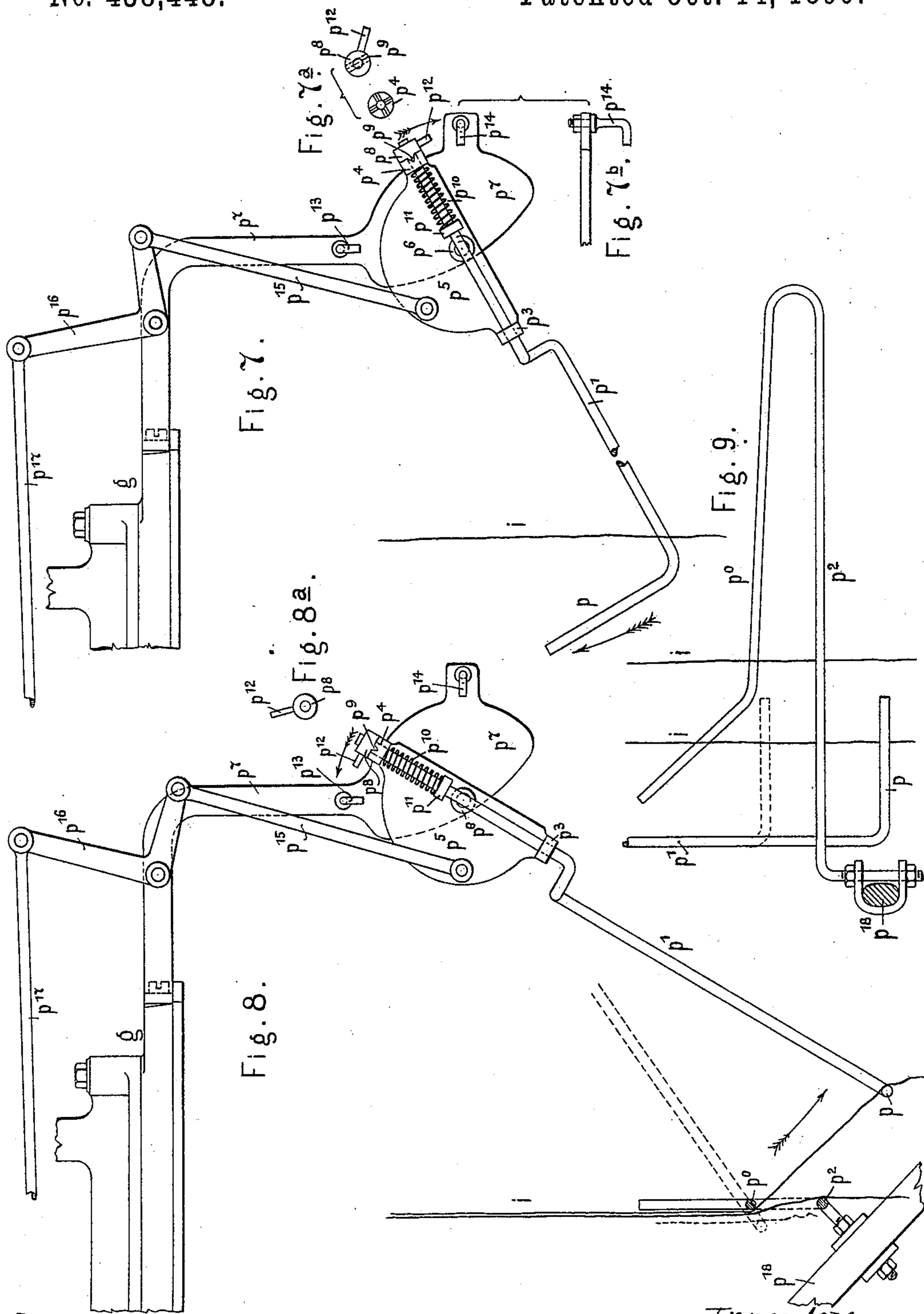
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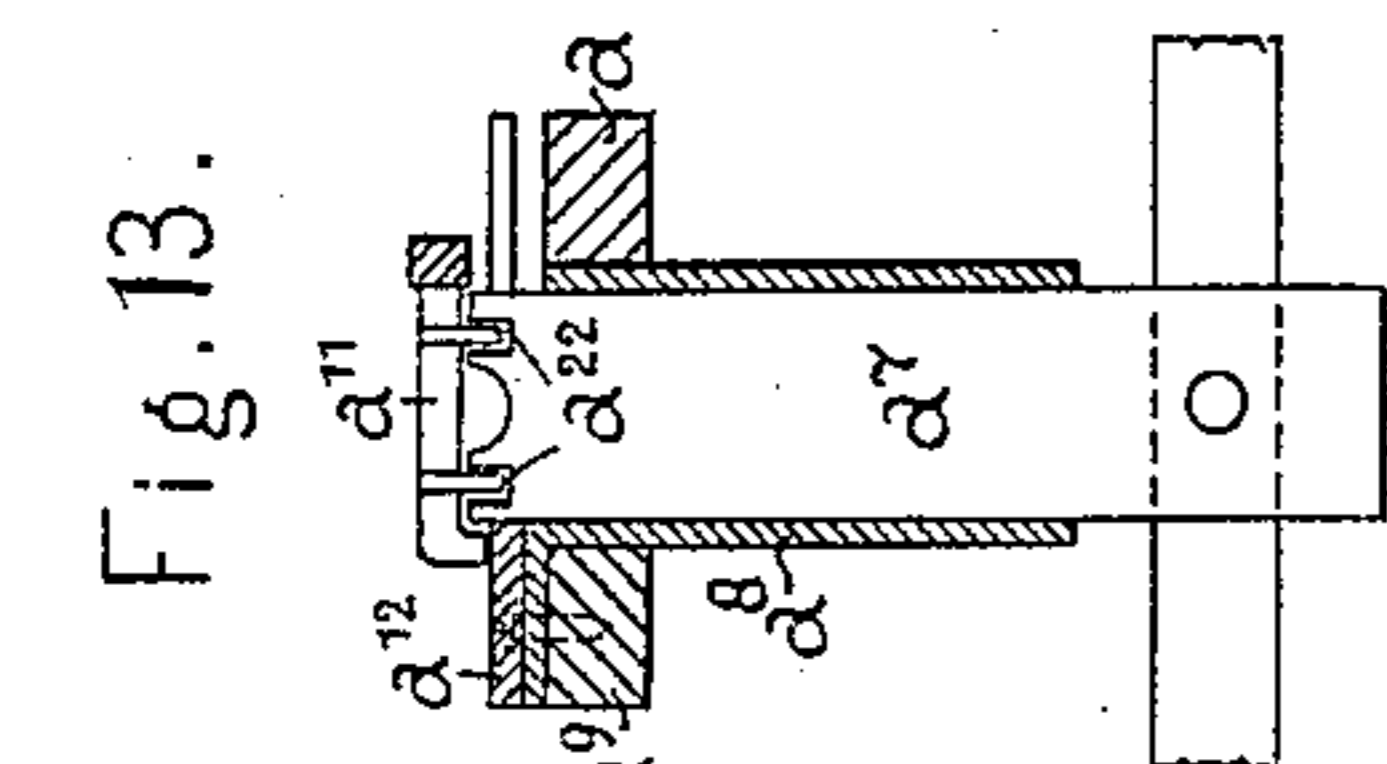
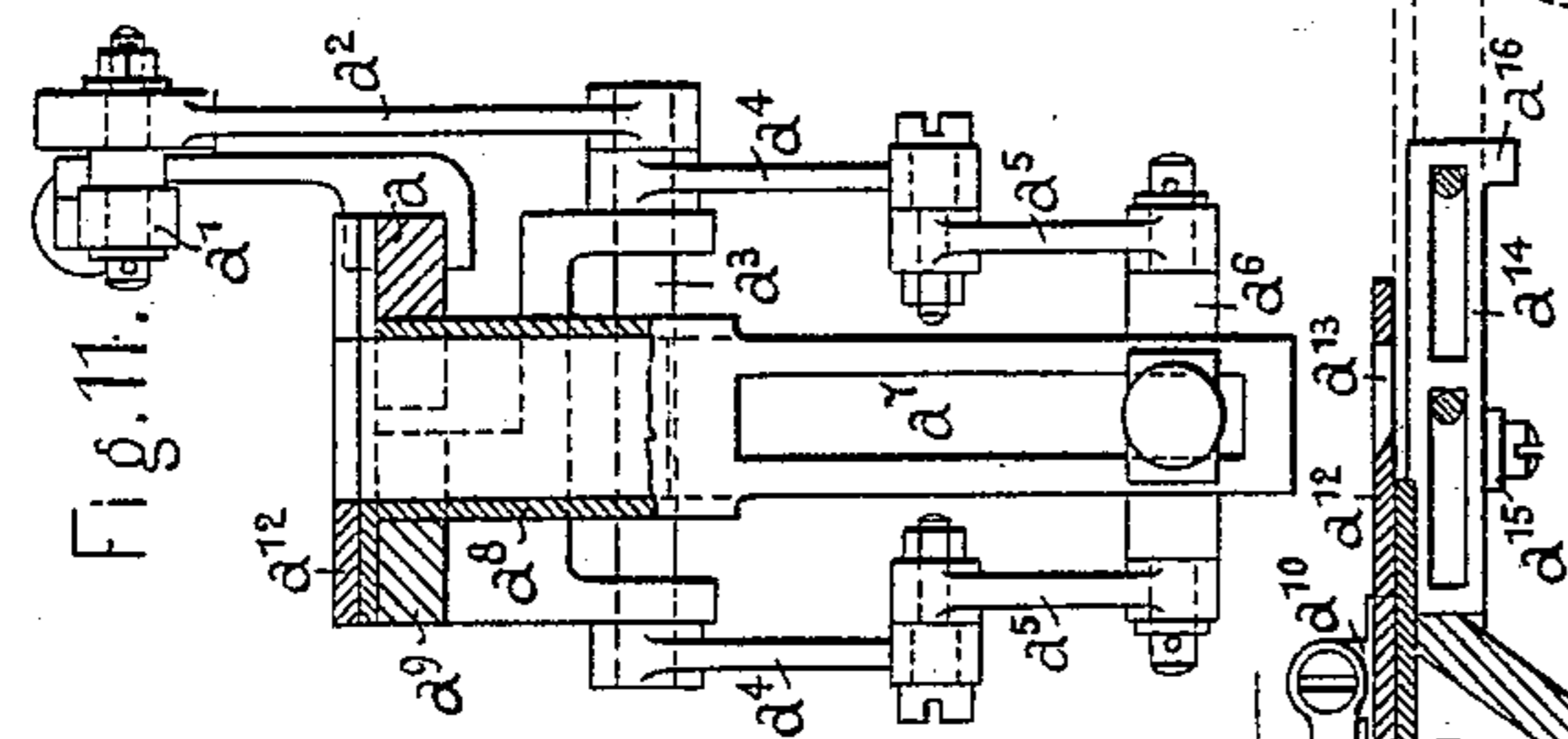
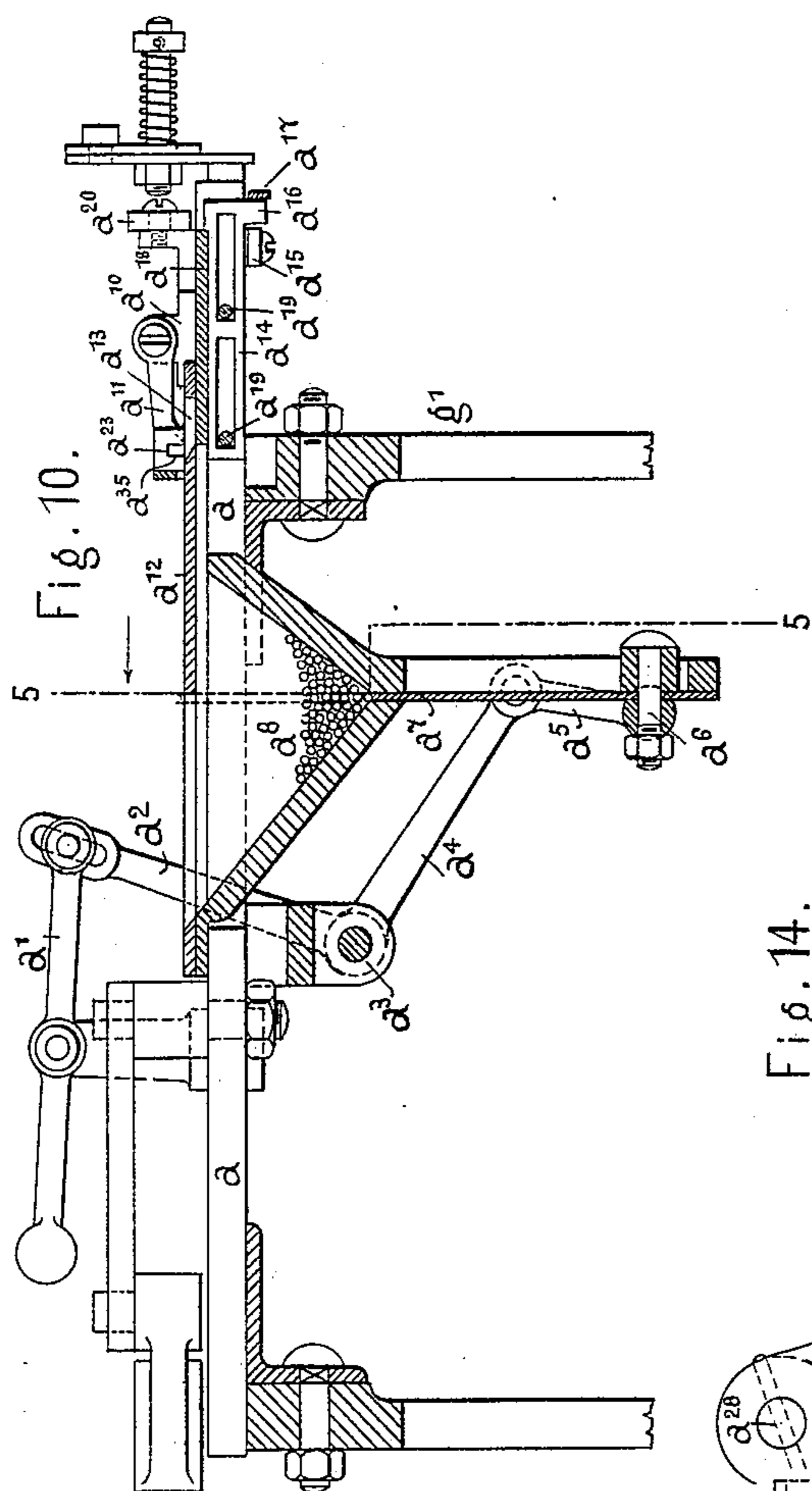
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No. 438,448.

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Witnesses
Edw. H. Shipley

Fig. 14.

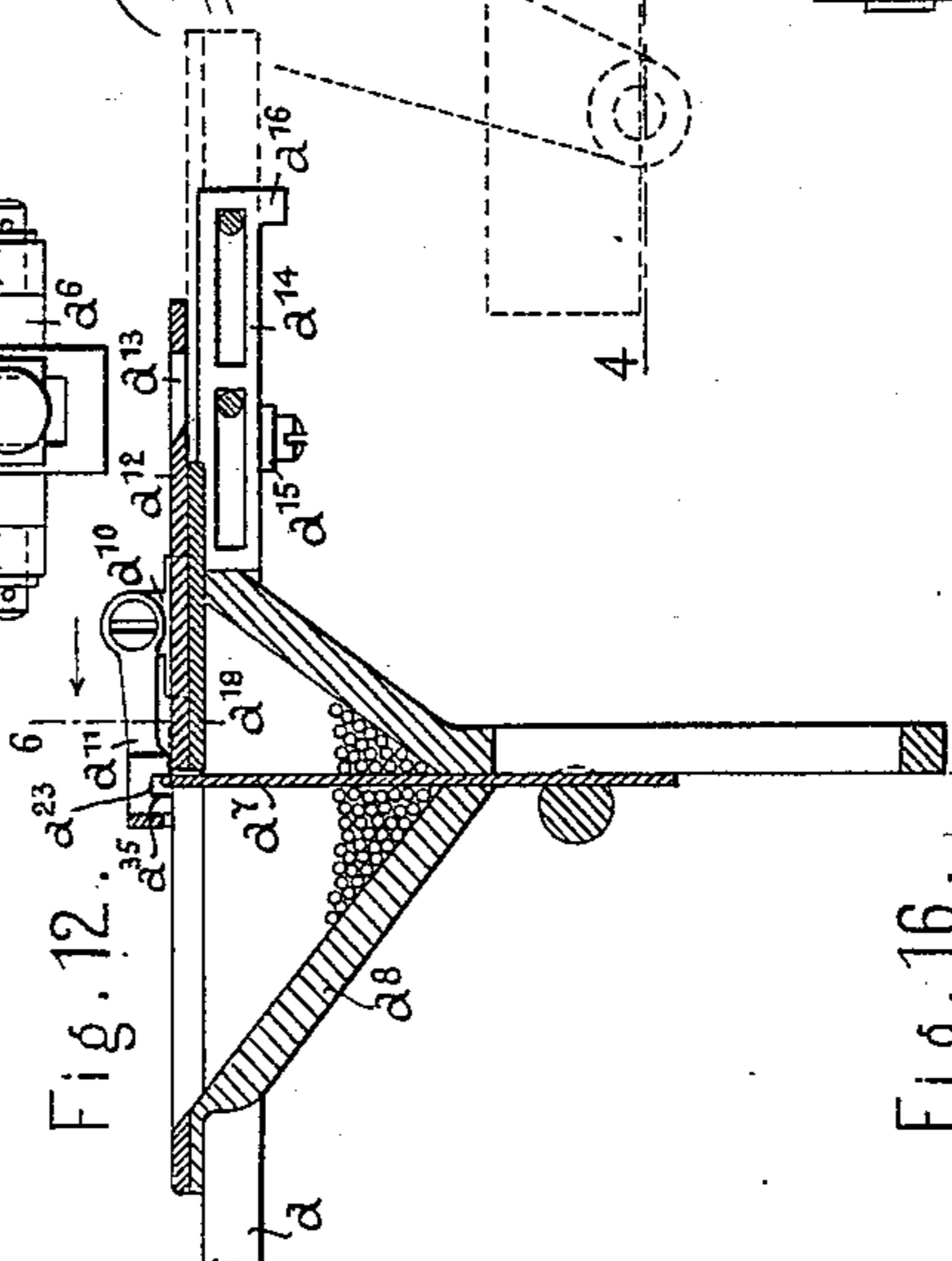
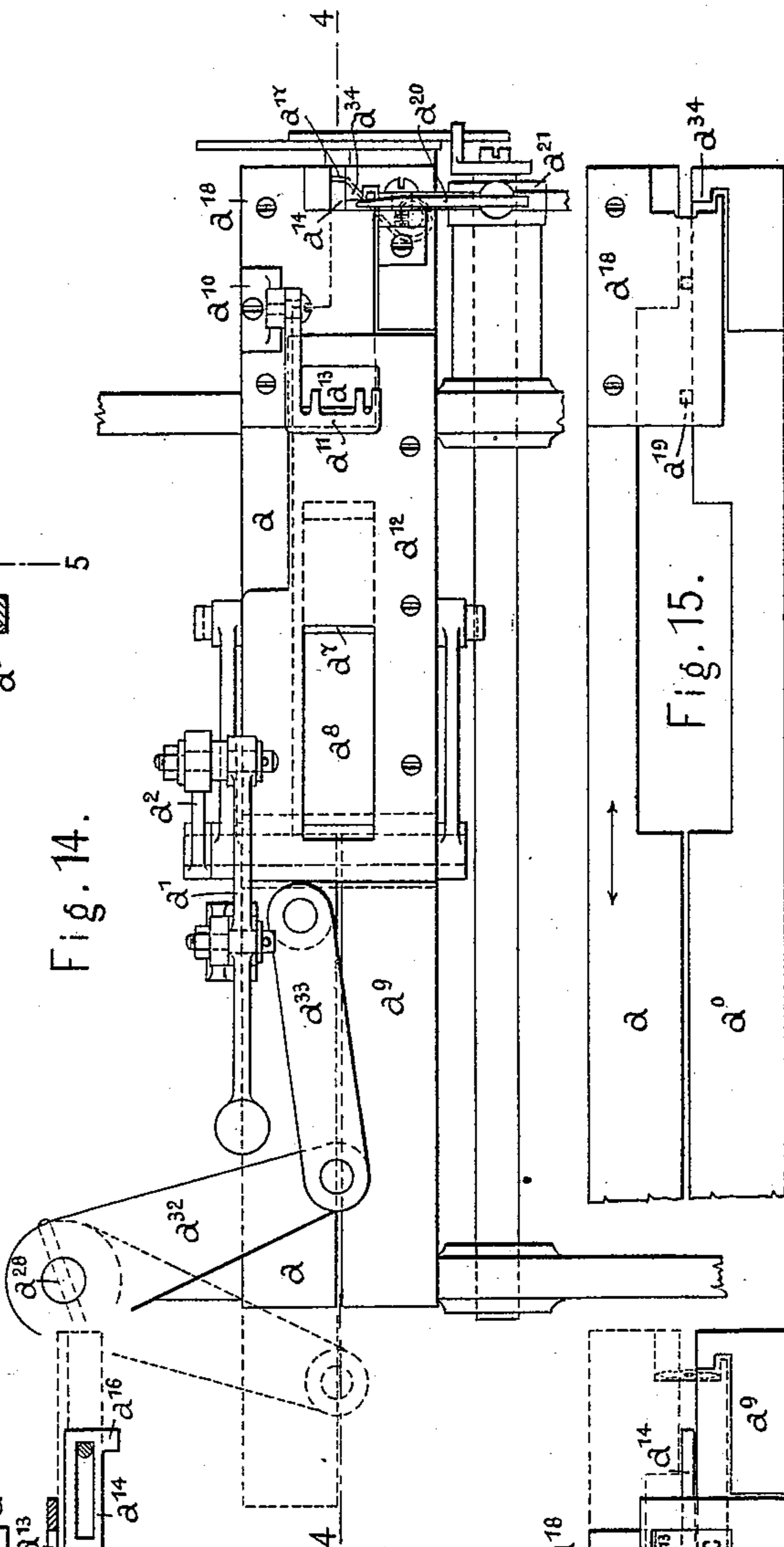
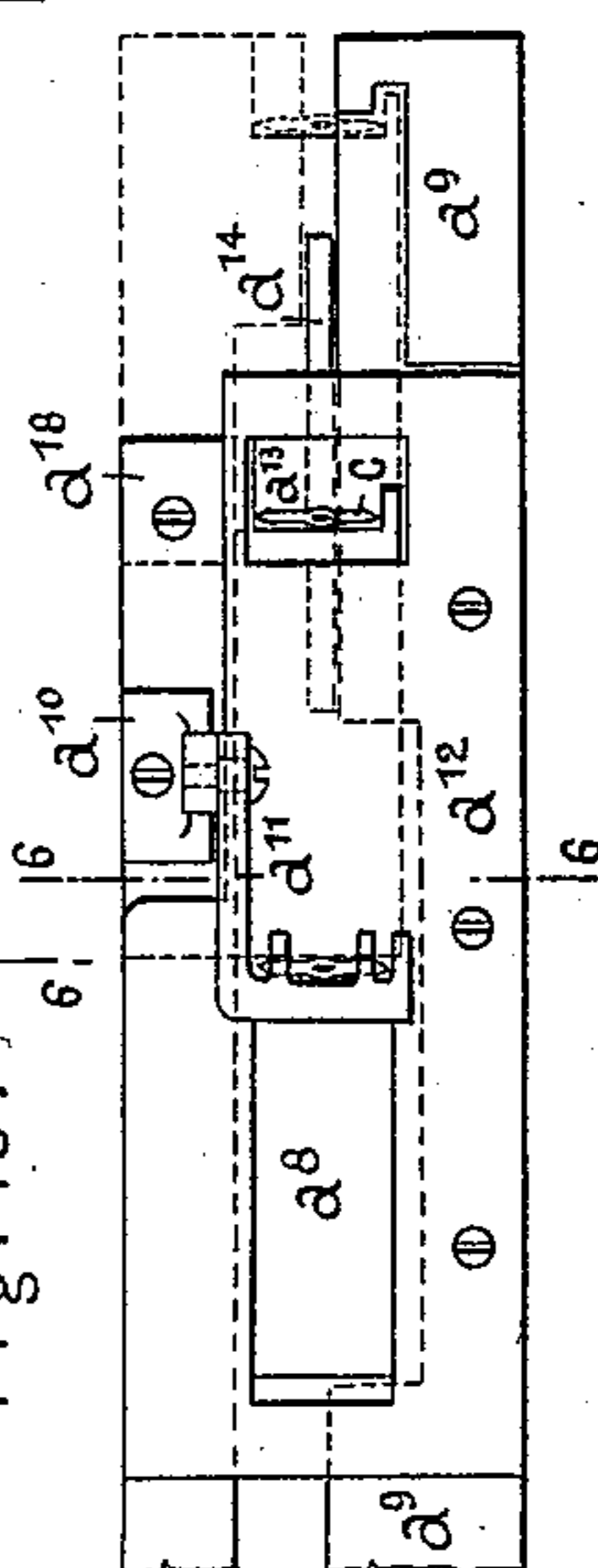


Fig. 16.



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(No Model.)

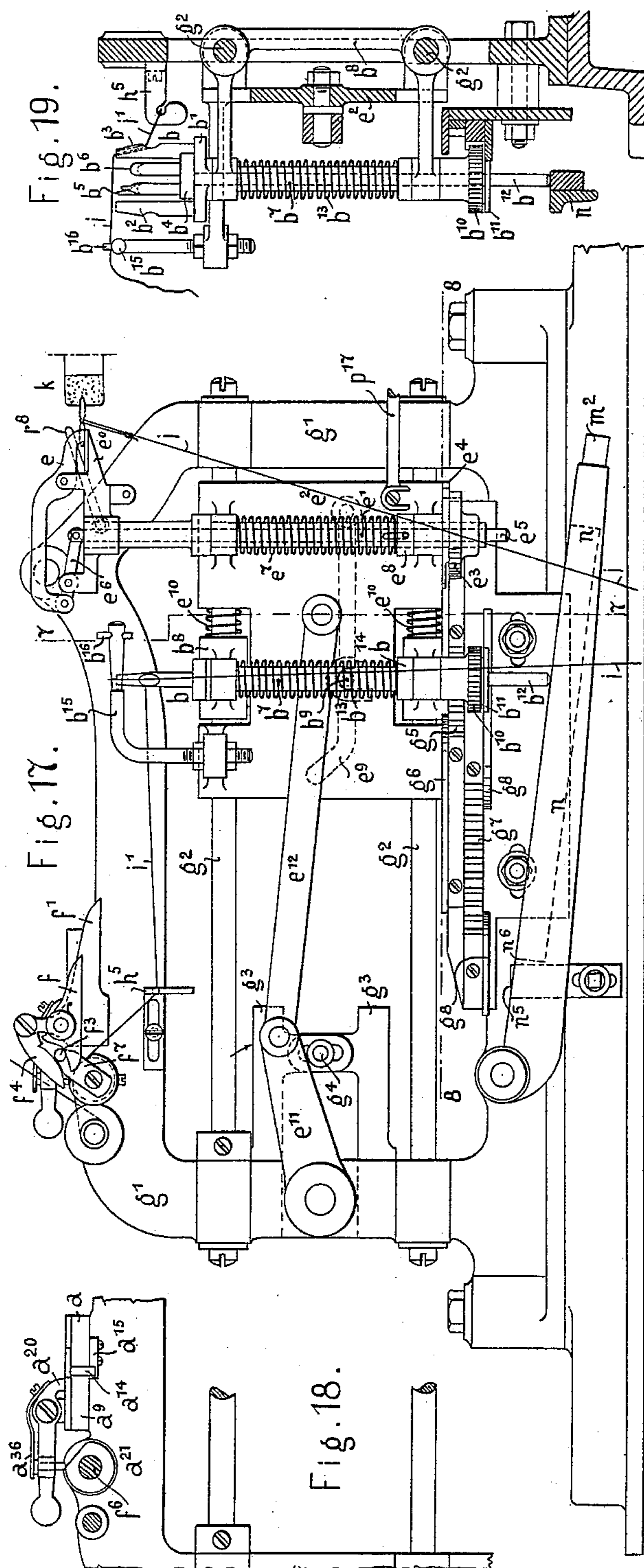
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A. SAURER & V. KOBLER.

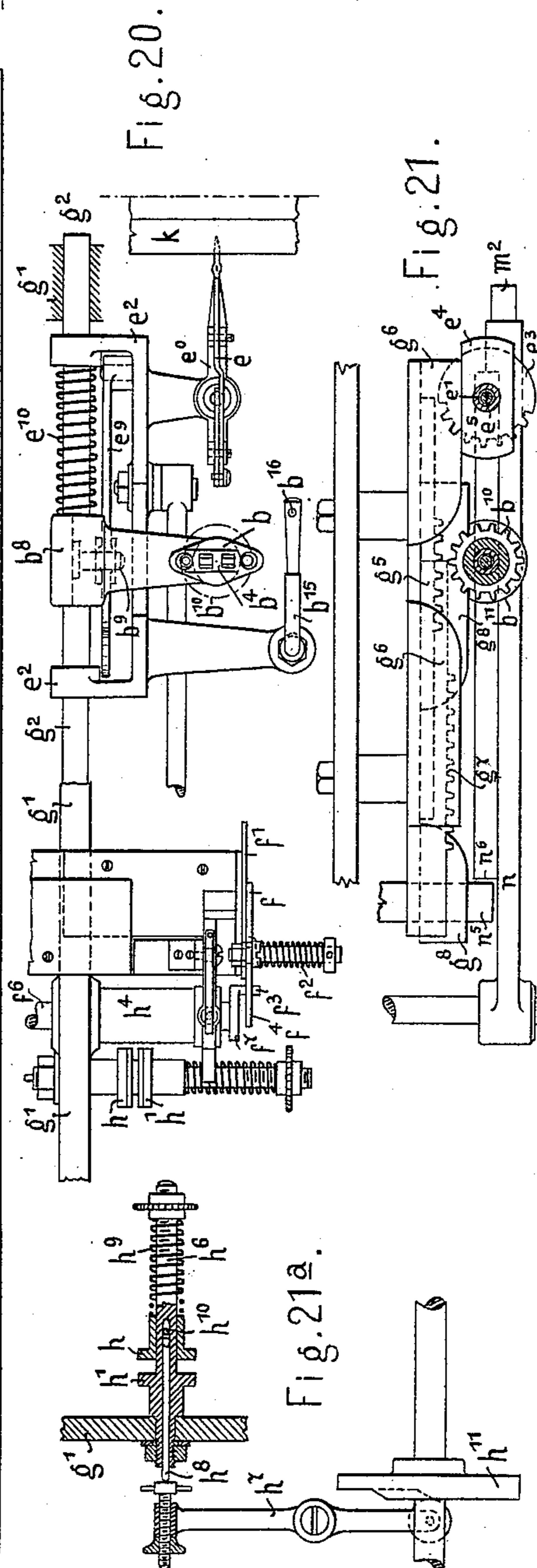
MACHINE FOR THREADING NEEDLES OF EMBROIDERING MACHINES.

No. 438,448.

Patented Oct. 14, 1890.



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9 Sheets—Sheet 8.

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Fig. 23.

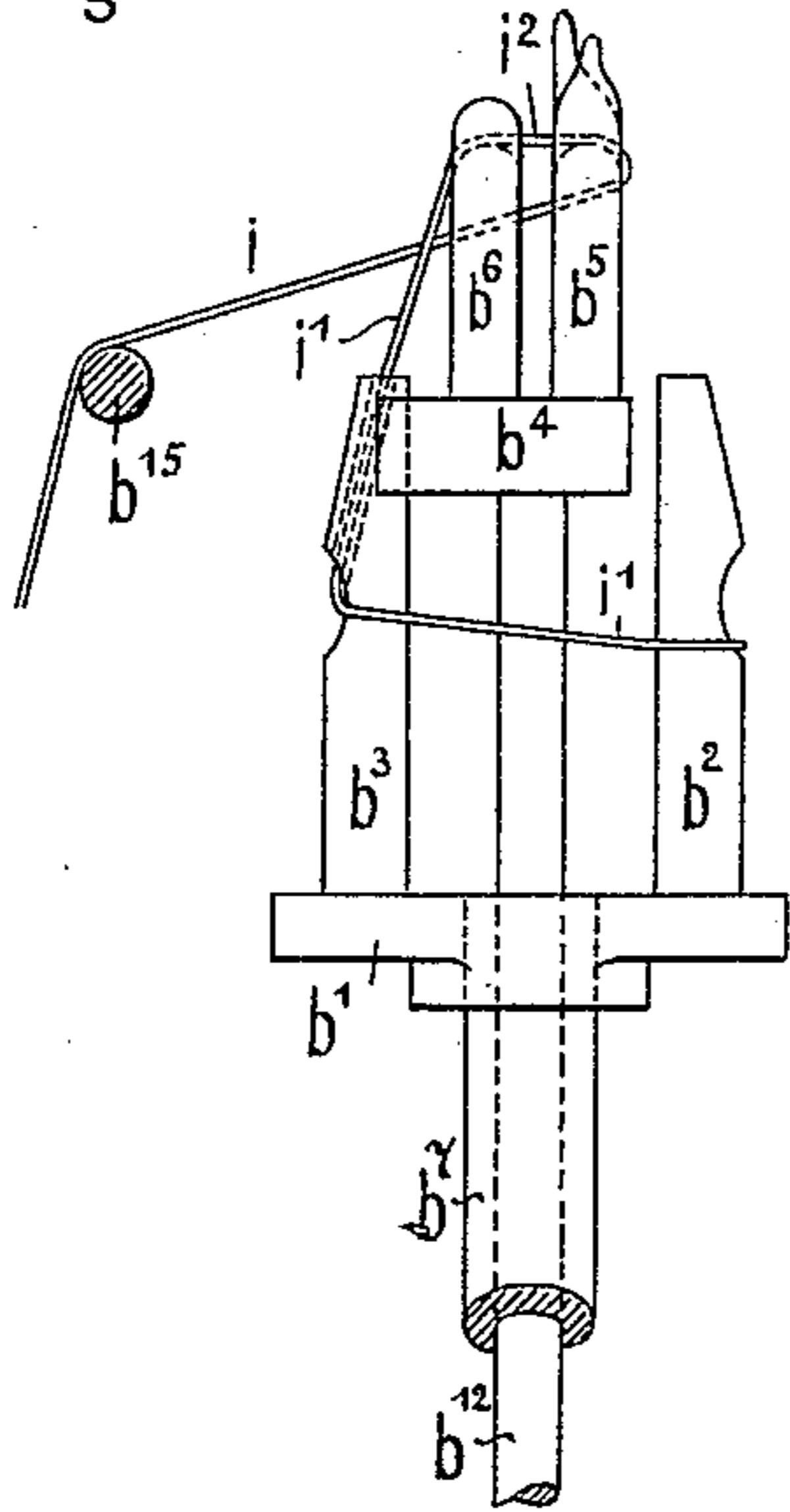


Fig. 22.

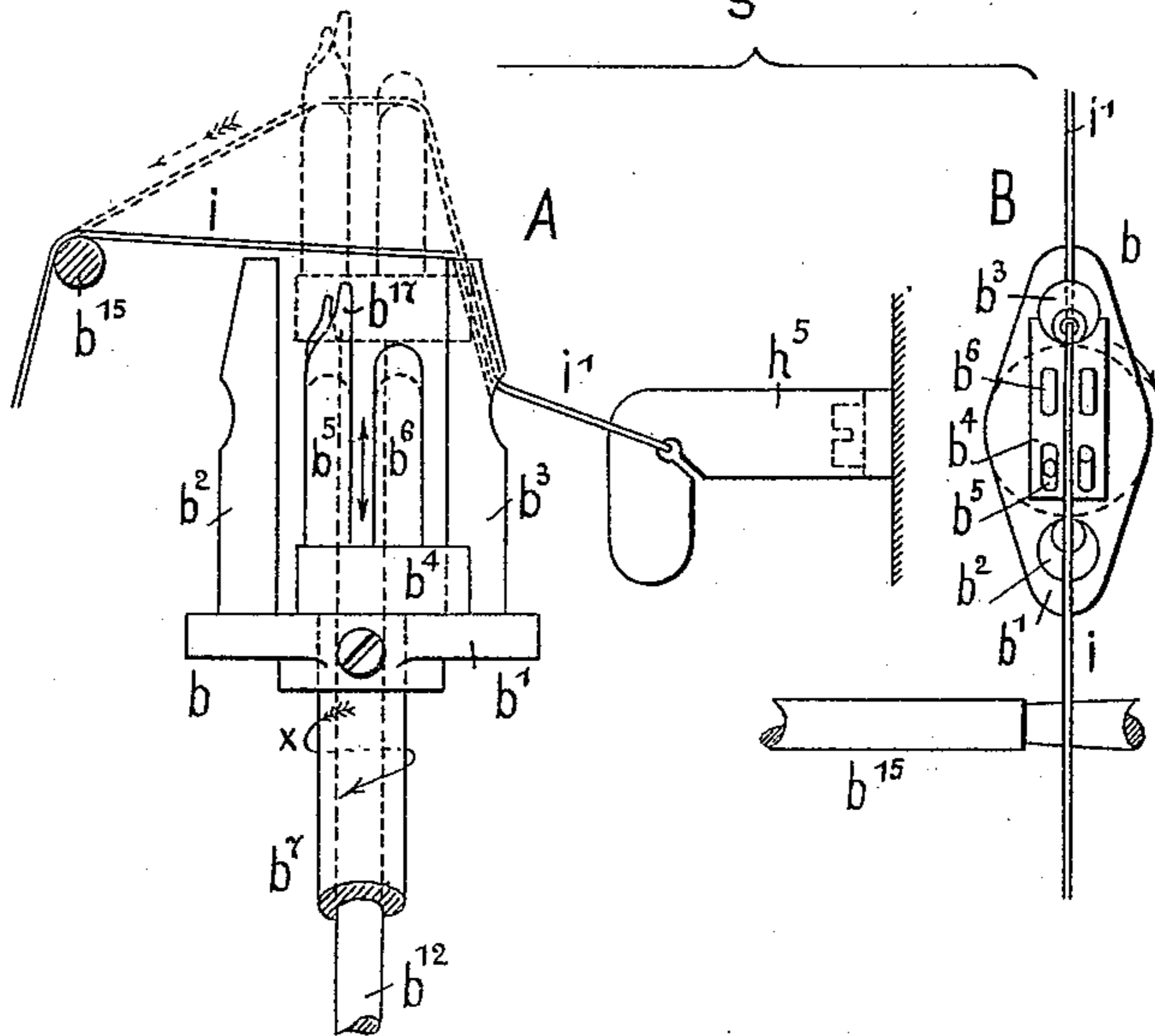


Fig. 25.

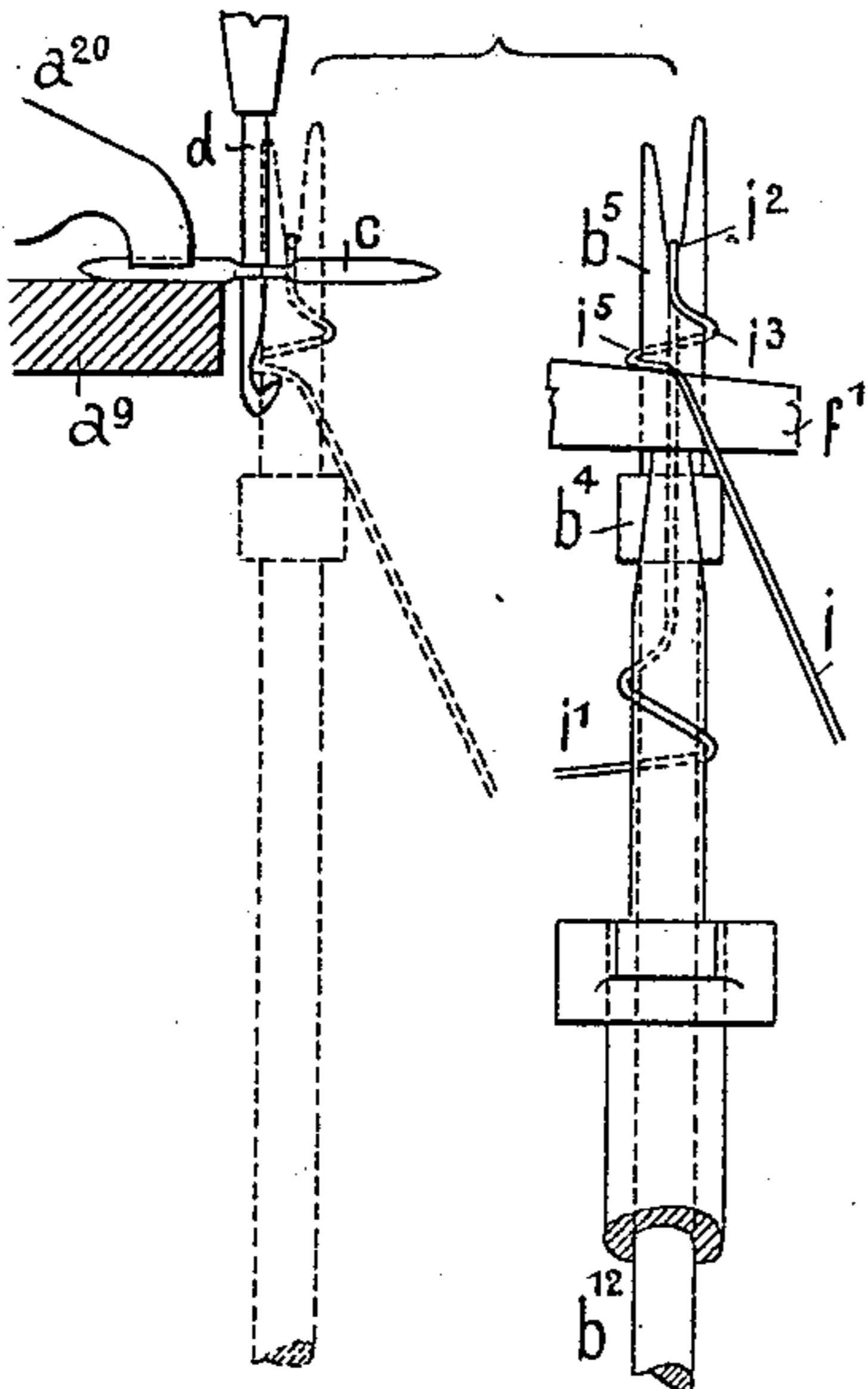
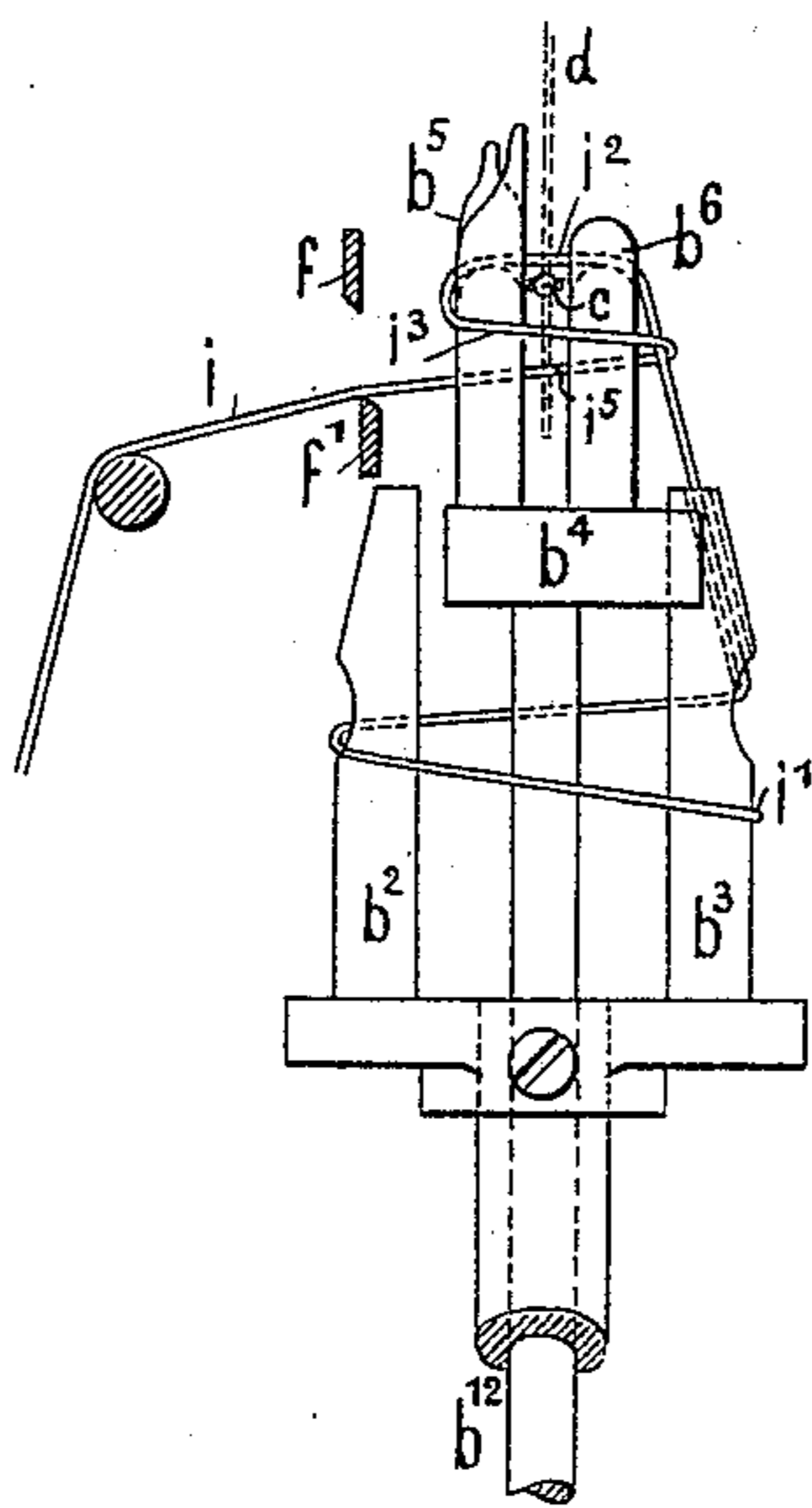


Fig. 24.



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(No Model.)

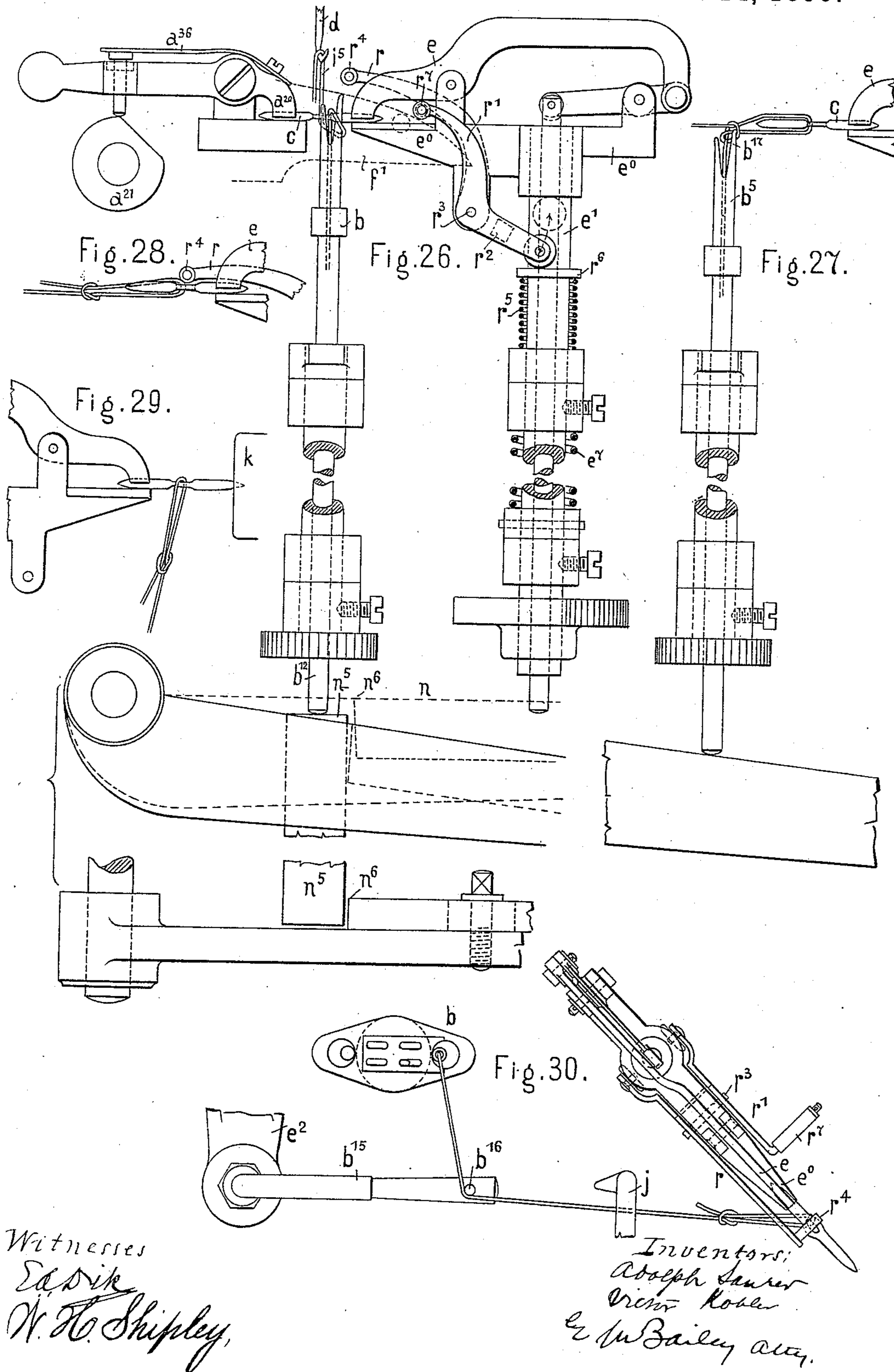
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No. 438,448.

Patented Oct. 14, 1890.



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UNITED STATES PATENT OFFICE.

ADOLPH SAURER AND VICTOR KOBLER, OF ARBON, SWITZERLAND, ASSIGN-
ORS TO F. SAURER & SÖHNE, OF SAME PLACE.

MACHINE FOR THREADING NEEDLES OF EMBROIDERING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 438,448, dated October 14, 1890.

Application filed July 22, 1890. Serial No. 359,491. (No model.) Patented in Switzerland May 27, 1889, No. 1,056; in Germany June 22, 1889, No. 51,024; in France June 26, 1889, No. 199,207; in Belgium July 1, 1889, No. 86,816; in Italy July 8, 1889, L. 495, and in Austria-Hungary February 24, 1890, No. 28,834 and No. 5,698.

To all whom it may concern:

Be it known that we, ADOLPH SAURER and VICTOR KOBLER, both citizens of Switzerland, residing at Arbon, Switzerland, have invented
5 new and useful Improvements in Machines for Threading Needles of Embroidering-Machines, (for which we have obtained Letters Patent in Germany, dated June 22, 1889, No. 51,024; in France, dated June 26, 1889, No. 199,207; in Belgium, dated July 1, 1889, No. 86,816; in Italy, dated July 8, 1889, No. 495, Vol. L; in Austria-Hungary, dated February 24, 1890, No. 28,834 and No. 5,698, and in Switzerland, dated May 27, 1889, No. 1,056,) whereof
15 the following is a specification.

In embroidering-machines working with a plurality of double-pointed needles and with threads knotted to the latter the operation of inserting the threads into the needles and
20 knotting them requires much labor and time if carried out by hand, while the machines heretofore designed for performing this operation mechanically are in various respects deficient.

25 The object of our invention is to provide an improved machine whereby the threading of the needles and the knotting of the threads are accomplished in a perfect manner and entirely automatically, so that the machine may
30 be driven by any motive power.

The main operations which the machine performs are as follows: First, picking out a needle from a pile and putting it into the jaws of a gripper in a determinate horizontal
35 position, in which its eye is vertical; second, slinging the thread around an instrument to be termed the "coiler," passing a hook downward through the eye of the needle, moving the coiler forward so that the windings of the
40 thread pass upon the needle and that one winding bears against the shank of the hook, partly withdrawing the coiler from the windings of the thread, retracting the hook with the said one winding engaged thereby and
45 cutting off one part of the thread, grasping the needle by means of another gripper, while the first gripper releases it, drawing the needle through the coiler, pulling the knot tight thereby, and causing the thread to be com-

pletely released by the coiler; third, carry- 50
ing the needle by means of the second gripper toward a cushion, sticking it into the same, and drawing out the thread to the required length; fourth, after this thread has been cut
55 off during the threading of the following needle, and the cut-off end has dropped down, catching the thread and hanging it over a bar in order to prevent its becoming entangled.

In the annexed drawings is represented a machine carried out according to our inven- 60
tion.

Figure 1 is a front elevation thereof, with exception of the mechanism shown by Figs. 7 to 9, which is broken away. Fig. 2 is a plan
65 corresponding to Fig. 1. Figs. 3 and 4 are longitudinal sections on the respective lines 1 1 and 2 2, Fig. 2. Fig. 4^a is a sectional plan on line 9 9, Fig. 4. Fig. 5 is a transverse section on line 3 3, Fig. 1, looking to the left. Fig. 6 is an end view taken from the right- 70
hand side of the machine. Figs. 7 and 8 are two views showing different positions of the mechanism omitted in Fig. 1. Figs. 7^a and 8^a are end views. Fig. 7^b is a top view, and Fig. 9 a side view, of parts belonging thereto. Fig. 75
10 is a section on line 4 4, Fig. 14, of the mechanism serving to pick out a needle from a pile of needles and to put the same into the jaws of a gripper. Fig. 11 is a section there-
80 of on line 5 5, looking to the left relatively to Fig. 10. Fig. 12 is a portion of Fig. 10, representing the movable parts in a different position. Fig. 13 is a section on line 6 6, Figs. 12 and 16, looking to the left. Fig. 14 is a plan
85 corresponding to Fig. 10. Fig. 15 shows in detail certain parts comprised in Fig. 14. Fig. 16 is a plan to Fig. 12. Fig. 17 is a front elevation of the mechanism comprising the coiler and parts in immediate co-operation
90 therewith, the coiler being near the end of its course to the right. Fig. 18 shows some parts being rearward of the shears represented in Fig. 17. Fig. 19 is a section on line 7 7, Fig. 17; Fig. 20, a plan to Fig. 17, and Fig. 21 a
95 horizontal section on line 8 8 of the same figure. Fig. 21^a is a sectional elevation of the thread-clamp and its operating mechanism. Figs. 22 to 29 are views of the coiler and the

gripper $e e^0$ drawn to an enlarged scale and serving to illustrate the operation of these parts, as will be fully set forth hereinafter. Fig. 30 shows the coiler, the gripper, and other parts in plan in the position in which the thread is engaged by the hook, serving to draw the same out. In Figs. 26 and 30 is also represented an auxiliary mechanism not shown in the other figures.

First operation—This operation is carried out by the instrumentalities represented in detail by Figs. 10 to 16 and 18. The said instrumentalities consist in a hopper a^8 , having a width slightly greater than the length of the needles, a flat vertical slide a^7 , passing from below through a slit at the bottom of the hopper and having at the top a groove adapted to hold a single needle, a needle-propeller a^{11} , having the form of a claw, pivoted to a lug a^{10} on the longitudinally-reciprocating horizontal bar a , and sliding with its free end on a plate a^{12} , fixed to the stationary bar a^9 , a plate a^{18} , integral with the bar a and sliding between the plate a^{12} and the fixed bar a^9 , which carries the whole mechanism, an auxiliary slide a^{14} , placed between the bars a and a^9 (see also Fig. 18) and guided by means of studs a^{19} , projecting from the bar a^9 while it is moved one way by a tappet a^{15} , fixed to the bar a and acting against the heel a^{16} , and the other way by a spring a^{17} , and finally a gripper formed by the upper surface of the bar a^9 and a jaw a^{20} , Figs. 14 and 18, pivoted to a lug on the said bar and operated by a cam-disk a^{21} . The aforesaid vertical slide a^7 is put in motion by the reciprocating bar a through the medium of the rod a' , pivoted to an arm of the said bar, the lever-arm a^2 and the two arms a^4 , all secured to the axle a^3 , the links a^5 , and the cross-head a^6 , to which the slide a^7 is fixed. The slide has at the top two notches a^{22} , registering with ribs formed on the needle-propeller a^{11} , the said ribs having the notches a^{23} by the edge a^{35} , whereof the needle is engaged and pushed forward. When the bar a is drawn backward or to the left relatively to Fig. 10, the slide a^7 rises, and in passing through the pile of needles previously arranged by hand in parallel position within the hopper a^8 it engages one of the needles in its groove. At the same time the needle-propeller a^{11} moves to the left, and when its notches a^{23} are above the slide a^7 (see Fig. 12) the latter, finishing its upward stroke, puts the needle which it carries in engagement with the notches of the propeller. The bar a thereupon moving to the right causes the propeller a^{11} to pull the needle transversely away from the slide a^7 and upon the plate a^{12} , and to convey the same along the latter until it drops into the hole a^{13} cut into the plate a^{12} , but which is at the time closed from below by the sliding plate a^{18} , so that the needle now rests on this plate, and remains so until the bar a and the plate a^{18} complete their second stroke to the left. The needle then drops over the edge of the plate a^{18} on the bars a and a^9 , the top surfaces

whereof are level with each other. Besides, at this moment, the needle c , whose perforated middle portion is thinner and wider than the round end portions, is caused to place itself so that the said middle portion lies flat and that its eye is vertical. (See Fig. 16.) This is brought about by means of the auxiliary slide a^{14} , which projects above the surfaces of the bars a and a^9 by an amount equal to the difference in thickness between the round and the flat portions of the needle on one side thereof. If the needle should drop with its middle portion otherwise than in flat position on the slide a^{14} , it will immediately on touching the latter turn over into the position required. The sliding plate a^{18} , now moving to the right again, pushes with its front edge the needle forward under the jaw a^{20} , which is at the time raised through the overbalancing weight of the rear arm of the same, the said arm having been released by the cam-disk a^{21} . The latter then closes the gripper, while the bar a and the slide a^{14} recede and leave the needle projecting from the gripper with one end. (See Fig. 25.) In order to insure a proper clutching of the needle, the jaw a^{20} and the counter-part constituted by the bar a^9 are provided with notches, while the arm of the jaw a^{20} is fixed a spring through which the cam-disk a^{21} acts on the arm.

Second operation.—The instrumentalities employed for this operation, which goes on simultaneously with the preceding one, are shown in Figs. 1, 2, 5, 6, 17, 19, 20, 21, and 22^{AB} to 30. They consist, first, in the coiler b , (see especially Figs. 19, 22^A, and 22^B), having an alternating rotary and a reciprocating horizontal motion with intervening pauses, and composed of the part b' , with the horns $b^2 b^3$, and the part b^4 , with the horns $b^5 b^6$, the said part b^4 passing, with its stem b^{12} , through the tubular spindle b^7 of the part b' , and being movable therein vertically. The second instrument is the hook d , Figs. 1, 6, 25, and 26, moving in an arc of a circle up and down and arranged to pass through the eye of the needle c when the latter is held by the gripper-jaw a^{20} . The third instrument is the gripper $e e^0$, Figs. 1, 17, 20, and 26, to which an alternating rotary and a reciprocating horizontal motion are imparted in similar manner as to the coiler, and the fourth instrument is the shears $f f'$, Figs. 1, 2, 5, 17, and 20.

The gripper $e e^0$, composed of the jaw e^0 , with hollow spindle e' , and the jaw e , is mounted with said spindle in bearings on the carrier e^2 , the said carrier having on the rear side lugs, with which it slides on the bars g^2 , fixed in the frame g' . At its bottom end the spindle e' has a pinion e^3 , Figs. 1, 17, and 21, capable of gearing with the rack g^5 , secured to the frame. In consequence, if the pinion is in gear with the rack and the carrier e^2 is moved one way or the other, the pinion rolling on the rack will cause the gripper to rotate. The rack and the pinion have, however, only so many teeth as are required

to impart to the said pinion and to the gripper e e^0 half a revolution, and further rotation in either direction is prevented by means of the plate e^4 , having the form shown by Fig. 21, and which, whenever the half-revolution of the pinion is completed, bears with either of its straight edges against one of the fixed guiding-edges g^6 , so that when subsequent to the said half-revolution of the gripper the carrier e^2 is shifted further the gripper will be moved onward by the carrier without rotating. The upper jaw e of the gripper is opened by means of a rod e^5 , passing through the hollow spindle e' , and by the lever e^6 , while it is closed by the spring e^7 , acting on the rod through a collar e^8 , fixed to the same by a pin passing through slits in the spindle e' . The means for pushing the rod e^5 upward consist in the lever n .

The coiler b , Figs. 1, 17, 19, and 20, turns with its hollow spindle b^7 in bearings, forming part of another carrier b^8 , sliding alike to the carrier e^2 on the bars g^2 . The carrier b^8 is, during the greater part of its course, in connection with the carrier e^2 by means of a latch e^9 , Figs. 17 and 20, pivoted to the rear side of the said carrier e^2 and engaging with a pin b^9 on the carrier b^8 , so that the latter is then moved positively by the carrier e^2 . Toward the end of their course to the left the carriers b^8 and e^2 are, however, disconnected from each other by the latch e^9 , sliding with an inclined edge upon a fixed stud g^4 , and being thus lifted out of engagement with the pin b^9 . Subsequent to this disconnection the carrier b^8 is still pushed forward a short distance by the carrier e^2 through the medium of the springs e^{10} , interposed between the said carriers, and this motion of the carrier b^8 continues until it strikes against the stop g^3 . The carrier e^2 and the gripper e e^0 then move onward (to the left) independently of the coiler, the springs e^{10} being compressed. The rotation of the coiler is produced and controlled in like manner as that of the gripper—that is to say, by means of the pinion b^{10} , fixed to the spindle b^7 , the rack g^7 , the plate b^{11} , Figs. 17 and 21, and the guiding-edges g^8 —the only difference in the arrangement consisting in this, that while the gripper turns half a revolution the coiler, whose pinion b^{10} has teeth on its whole periphery, makes a full revolution; but it also moves at each end of its course a certain distance without rotating. The vertical motion of the coiler part b^4 , the stem b^{12} whereof passes through the hollow spindle b^7 , is obtained by the aforesaid lever n , acting from below on the said stem in co-operation with a small stationary shelf n^5 and by the spring b^{13} , pressing on the collar b^{14} , which is fixed to the stem b^{12} by a pin passing through slits in the spindle b^7 . The horn b^3 of the coiler (see Figs. 22 to 24) has a perforation serving to guide the thread while the horns b^5 and b^6 are slitted at the top or bifurcated. Moreover, it is to be noticed that the two branches of the horn b^5 , produced by the said

slit, have a particular form, as shown by the figures. In front of the coiler there is a thread-guiding bar b^{15} , fixed to the carrier e^2 and provided with an upright shoulder or stud b^{16} . The hook d is secured to an adjustable arm d^2 of the lever d' , fixed to the shaft d^3 .

The shears f f' are composed of the oscillating blade f and the fixed blade f' , which is longer than the former. The blade f is impelled downward, for cutting the thread, by a torsional spring f^2 , while its upward motion is produced by a tappet f^3 , acting on the tail of the blade and projecting from an arm f^7 , fixed to the end of the oscillating shaft f^6 . After the blade has been raised by the tappet f^3 , it is maintained in this position by the pawl f^4 , engaging in a notch of the blade until the tappet f^3 on moving upward strikes against the pawl and causes it to release the blade, which thereupon with a rapid motion severs the thread previously brought between the blades. The thread taken from a bobbin i^0 , Figs. 1 and 2, passes in succession through a hole in the arm of the standard o , a hole in the oscillating arm o' , another hole in the standard o between the fixed disk h' and the movable disk h of a thread clamp, over the end h^4 of shaft h^6 , which is covered with cloth, and through the eye of the guide h^5 to the perforation of the horn b^3 .

Supposing now the coiler to be in the position shown by Figs. 17, 19, 20, 22^A, (full lines,) and 22^B, the end i of the thread projecting from the perforation of the horn b^3 is laid by hand over the bar b^{15} , so as to be in register with the slits of the horns b^5 and b^6 . The thread part i' is at this period held by the thread-clamp h h' , which is closed. If the machine is then put in motion, the lever n , oscillating upward, causes the coiler part b^4 to rise, (see dotted position in Fig. 22^A,) so that the thread part i becomes engaged in the said slits. Immediately after this the carrier e^2 begins to move to the left, together with the carrier b^8 and the coiler b , and the latter is caused to rotate in the direction of arrow x , Fig. 22^A, as soon as its pinion b^{10} , Figs. 17 and 21, comes into engagement with the rack g^7 . After having made half a revolution, the coiler has wound the two thread parts i and i' about its horns, as shown by Fig. 23, and when the revolution is completed, as in Figs. 24 and 25, (full lines,) the uppermost thread part i^2 will be above and the part i^3 below the projected axis of the needle c , held by the gripper-jaw a^{20} , while the part i^5 is somewhat higher than the bend of the hook d , the said hook having, during the forward motion of the coiler, descended and passed through the eye of the needle, as shown by Fig. 25. The connection between the carriers e^2 and b^8 , established by the latch e^9 , Figs. 17 and 20, as hereinbefore described, is now broken by the latch sliding with its inclined edge upon the pin g^4 , the carrier b^8 being thereafter pushed forward by the carrier e^2 through the springs e^{10} until it is arrested by

the stop g^3 . The coiler, which, during this last part of the motion of the carrier b^8 , had been prevented from rotating by the means set forth in the foregoing, is then in the position shown by dotted lines in Fig. 25, the horns $b^5 b^6$, with the thread parts $i i^2 i^3$, having passed on the projecting end of the needle c and the thread-part i^5 being pressed against the shank of the hook d . As soon, however, as the coiler comes into this position the stem b^{12} of the coiler part b^4 , until then supported by and sliding on the lever n , (see Fig. 26,) slips past an offset n^6 , formed on the latter, and drops on the shelf n^5 , arranged opposite to the said offset and somewhat below the level at which the upper or guiding surface of the lever n is at the time. The horns $b^5 b^6$ of the coiler are thereby partly withdrawn from the thread coiled about them. Simultaneously the hook d rises, engages with the thread part i^5 , and commences to draw it through the eye of the needle, and the shear-blade f , released by the pawl f^4 , Figs. 1 and 17, is thrown down by the spring f^2 , Figs. 2, 5, and 20, so that the thread part i , which had previously slipped on the shear-blade f , is severed from the part i^5 , the latter being thereupon drawn completely through the needle-eye, as shown by Fig. 26. While these operations are going on the gripper $e e^0$, moving with the carrier e^2 , is caused to make half a revolution by the engagement of its pinion e^3 with the rack g^5 , so that it is then in the position shown by Fig. 1. Moreover, its jaw e is opened through an upward motion of the lever n , and after the carriers e^2 and b^8 have become disconnected, as described, the carrier e^2 , continuing to move while compressing the springs e^{10} , advances the gripper toward the coiler and consequently toward the needle. When the gripper has arrived at the end of its course, (see Fig. 26,) its jaws e closes on the needle by the lever n descending and allowing the spring e^7 to act, and the gripper-jaw a^{20} , released by the cam-disk a^{21} , opens. at the same time the thread-clamp opens to release the thread. The carrier e^2 and the gripper $e e^0$ thereupon recede and the latter draws the needle with it, whereby the loop i^4 is produced, as shown by Fig. 27, the requisite resistance for closing the loop being presented by the friction of the thread on the cloth covering of the shaft part h^4 . Besides, this the loop i^4 is at first retained by the branch b^{17} of the horn b^5 , in order to cause the knot to be formed at a determinate and uniform distance from the needle. When the knot is about to be drawn tight, the carrier e^2 re-engages, by means of the latch e^9 , with the carrier b^8 , so that the latter and the coiler then partake again of the motion of the former. Simultaneously the lever n has descended far enough as to be, with its aforesaid offset n^6 , below the level of the shelf n^5 , (see dotted position of lever n in Fig. 26,) the coiler part b^4 in consequence dropping another step as soon as its

stem b^{12} slips from the shelf back upon the lever. By this second dropping and the further descent of the said coiler part, caused by the lever n , (see Fig. 27,) the branch b^{17} of the horn b^5 is finally withdrawn from the knot, which is thereupon completed by the pull of the needle, as shown by Fig. 28.

Third operation.—This operation is carried out by the gripper $e e^0$ and the hook j , fixed to the arm j' of an oscillating shaft j^2 in co-action with the needle-cushion k and the needle-supporting lever k' . (In Fig. 1 the arm j' is shown in a position higher than that which it should have relatively to the other working parts; but its true position is indicated by the broken lines j^5 . The needle-cushion is omitted in Fig. 1.) After the knot has been finished the gripper $e e^0$, continuing to move to the right, rotates about its spindle e' from the position indicated by Fig. 28 to that shown in Figs. 17, 20, and 29, and carries the needle in a cycloidal line toward the cushion k , the thread i meanwhile becoming engaged by the stud b^{16} on bar b^{15} , as shown by Fig. 30. Previously the arm o' had, by an oscillation to the right, drawn thread from the bobbin and the hook j had ascended to above the level of the needle, and when during the cycloidal motion of the needle, the thread part being between it and the stud b^{16} has been brought into the path of the hook j , (see Fig. 30,) the latter descends, engages with the said thread part and draws it down, the arm o' now delivering thread by its motion to the left, and the thread-clamp $h h'$ being open. After having completed its semi-rotation, the gripper $e e^0$ moves farther to the right in the direction of the needle, pushes the needle into the cushion k , (see Fig. 29,) and thereupon opens and recedes, leaving the needle behind in the cushion. In order that thereafter the hook j , continuing to draw out thread, may not pull the needle out of the cushion, a lever m , Figs. 1 and 6, has been provided for, which slips with its upper end surface under the projecting part of the needle and supports it. The said lever is pivoted at m' to the frame of the machine and is actuated to engage with the needle by a finger m^2 at the end of the lever n , operating against an inclined surface m^4 at the lower end of the lever m , whereas upon the lever n descending the lever m is withdrawn from under the needle and returned to its position of rest by a spring m^3 . The cushion k then moves forward lengthwise—i. e., transversely to the machine—a short distance, so as to allow the following needle to be stuck in by the side of the first one. When the gripper $e e^0$ and the coiler b are at the end of their course to the right, the thread i , drawn down by the hook j , is in the position shown by Fig. 17—that is to say, its upper left-hand end, passing over the bar b^{15} , is in register with the slits of the horns $b^5 b^6$ of the coiler, the same as shown in Fig. 22^B. This end will therefore be en-

gaged by the said horns as soon as the lever n ascends to raise the coiler part b^4 , and another threading operation will be commenced.

Fourth operation.—About at the time the hook j begins to rise from its lowest position the following needle is threaded, and the thread, drawn out as described, is cut off, its free end then dropping down so that the thread hangs by the side of the machine. In order that this thread may not become entangled with the hook j during its following stroke or with other parts of the machine, the thread is engaged by a finger p , Figs. 7, 8, and 9, constituted by an angular bend of the oscillating arm p' , and it is hung by the same over a bar p^2 , projecting from the stand of the table on which the machine is mounted. (Of this stand only a portion p^{18} of one of the diagonals is shown in Figs. 8 and 9.) The said arm p' is placed in bearings $p^3 p^4$, formed on a plate p^5 , which is pivoted at p^6 to a bracket p^7 , depending from the bed-plate g . The arm p' has two collars p^8 and p^{11} , and between the latter and the bearing p^4 is interposed a spring p^{10} , which presses the arm, with the collar p^8 , against the bearing. Moreover, the collar p^8 is provided with an angular rib p^9 and the bearing p^4 with two grooves for the latter to engage in, the said grooves being so arranged that, according as the rib is thrown into engagement with the one or the other by the spring p^{10} , the finger p will either be parallel to the axis of the pivot p^6 or vertical thereto. Moreover, the collar p^8 is furnished with a stud p^{12} and the bracket p^7 with two stops p^{13} and p^{14} , having such position that when the plate p^5 and the arm p' swing about the pivot p^6 the stud p^{12} will strike alternately against either of them and cause the arm p' to turn in its bearings $p^3 p^4$. The plate p^5 is connected by the rod p^{15} , the elbow-lever p^{16} , and the rod p^{17} (see also Fig. 1) to the carrier e^2 , so that each reciprocating motion of the latter produces an oscillation of the plate p^5 and of the arm p' . When under these conditions the arm p' swings upward, its finger p , being in the plane of motion of the arm, as shown by Fig. 7, will pass behind the thread i . Upon the stud p^{12} striking against the stop p^{14} the rib p^9 will be pushed out of engagement with one groove of the bearing p^4 , and after the arm has been turned by a right angle it will be thrown into engagement with the other groove, so that the rib then keeps the finger p parallel to the pivot p^6 or vertical to the plane of motion of arm p' . When thereupon the arm p' swings downward, (see Fig. 8,) the finger p catches the thread, draws its end through the space between the bars $p^2 p^0$, and leaves it hanging over the bar p^2 , where it is out of the way of the hook j . At the end of the downward oscillation of arm p' the stud p^{12} strikes against the stop p^{13} and returns the finger p to its first-described position.

Auxiliary operation.—As it sometimes occurs that, with the threading and knotting

mechanism constructed as described, the hook j on descending causes the knot to be drawn tight upon the needle, the gripper $e e^0$ may be provided with a device whereby the thread is prevented from slipping in the eye of the needle while the gripper recedes and conveys the needle toward the cushion. This device consists in the two elbow-levers $r r'$, Figs. 26 and 30, fixed together by a cross-piece r^2 and pivoted to the gripper-jaw e^0 at r^3 . The upper arm of the lever r has a finger r^4 , adapted to press on the eye of the needle when being held by the gripper e , while the lower arms of both levers, provided with rollers, are acted upon by a spring r^5 through the medium of the washer r^6 , the spring and the washer being placed on the spindle e' . The upper arm of the lever r' has a finger r^7 , extending outward and arranged to co-operate with the inclined upper edge of the shear-blade f' , and with an inclined bar r^8 , Figs. 1 and 17, fixed to the frame g' near the cushion k . When the finger r^7 is free from the blade f' and from the bar r^8 and the gripper e has clutched a needle, (see Fig. 28,) the spring r^5 , pushing the lower arms of the levers $r r'$ upward, causes the finger r^4 to be pressed down on the eye of the needle, and thus to prevent the thread passing through the eye from slipping therein. Preferably the finger r^4 is covered with a soft material, such as a thread wound about the same. When the gripper arrives at the end of its course to the left, the finger r^7 , passing upward on an extension of the lower shear-blade f' , whose upper edge is made inclined, causes the finger r^4 to be raised, so as to prevent it from striking against the point of the needle, as represented by Fig. 26. In similar manner the finger r^4 is raised through the medium of the bar r^8 when the gripper $e e^0$ arrives at the right-hand end of its course.

After having thus described the instrumentalities, together with the mechanisms in immediate connection therewith and the operations which they perform, I shall now proceed to set forth the mechanisms by which the said parts are actuated.

The machine is driven by means of the shaft l , which is rotated by a crank l' or a pulley, the latter being indicated in Figs. 1 and 4 by a dotted circle l^2 . The said shaft carries two eccentrics $a^{24} d^4$, provided with straps, two cam-disks $n' h^{11}$, and a crank e^{11} . The strap of the eccentric a^{24} is connected to a lever a^{25} , swinging loosely on the shaft f^6 , the said lever being in turn connected by the rod a^{26} to the lever-arm a^{27} , loose on the vertical shaft a^{28} . From the arm a^{27} motion is imparted to the shaft a^{28} in one direction by means of a stud a^{29} , (see especially Figs. 4^a and 5,) acting against an arm a^{30} , fixed to the said shaft, and in the other direction through the medium of a spring a^{31} , coiled about the shaft and fixed thereto at the top, while at the bottom it bears with its horizontally-extended end against the stud a^{29} . The shaft

a^{28} is connected at the top to the reciprocating bar a by the arm a^{32} and the rod a^{33} . The motion imparted to the shaft through the medium of the spring is made use of for pushing forward the bar a , which is thereby rendered capable of gently pressing, at the end of its stroke, the needle against a stop a^{34} , Figs. 14 and 15, and of thus adjusting it and keeping it a short time in the proper position for being clamped by the gripper-jaw a^{20} . The rotation of the shaft produced by the action of the stud a^{29} on the arm a^{30} serves to bring about the backward motion of the bar a . To the lever a^{25} is, moreover, connected the rod k' , forming a pawl, which engages with the teeth of the ratchet-wheel k^2 , fixed on the shaft k^3 . This shaft carries, in addition, a bevel-pinion k^4 , gearing with the bevel-wheel k^5 , on the spindle whereof, which is vertical, is placed a spur-pinion k^6 , gearing with the rack k^7 on the sliding bar k^8 , that carries the needle-cushion k . The said cushion is thus moved forward in the direction of arrow y , Fig. 2, at every rotation of the shaft l , for the purpose set forth in the foregoing. In order to allow the cushion k to be exchanged when it is stuck full of needles, the same is placed on pins k^9 projecting from the bar k^8 . Besides this, the portion of the spindle carrying the pinion k^6 is made square and of such length as to allow the pinion to be raised out of gear with the rack k^7 when the bar k^8 is to be slid back, in view of its being supplied with another cushion. The strap of the eccentric d^4 is connected by the rod d^5 to an arm d^6 of the shaft d^3 , to which is fastened the arm d' , carrying the hook d . The arm d' is clamped to the shaft d^3 by means of a split boss and a pressing-screw for facilitating the adjustment of the hook d relatively to the needle-eye. The cam-disk n' acts on an arm n^2 of the shaft n^3 , carrying at its outer end the arm n , which operates on the stem b^{12} of the coiler part b^4 and on the rod e^5 of the gripper $e e^o$, the said arm n^2 being kept in contact with the cam-disk n' by the overbalancing weight of the arm n . Moreover, there is fixed to the shaft n^3 the upright arm n^4 , whose upper end engages by means of a slot with a pin on the arm f^5 , secured to the shaft f^6 , so that every oscillation of the shaft n^3 brings about a contrarily-directed oscillation of the shaft f^6 . To the end of this shaft is adjustably attached the arm f^7 , having the tappet f^3 , that actuates the shear-blade f , while behind the said arm f^7 is fixed on the shaft f^6 the cam-disk a^{21} , actuating the gripper-jaw a^{20} . The cam-disk h^{11} , having a cam-surface on its rear face, acts with this surface on a lever h^7 , (see especially Fig. 21^a), which in turn operates on a pin h^8 , passing lengthwise into the arm h^6 , that carries the stationary disk h' and the movable disk h of the thread-clamp, the said pin h^8 acting on a pin h^{10} , passing transversely through the boss of the disk h and through slits in the arm h^6 , so that when the cam-surface of the disk h^{11} takes effect on the lever h^7

the thread-clamp is opened, whereas when the lever is not acted upon the spring h^9 closes the clamp. The crank e^{11} , mounted on the forward end of the shaft l , imparts motion to the carrier e^2 through the medium of the connecting-rod e^{12} . From the shaft l is finally derived the oscillating motion of the shaft j^2 , carrying the arm j' with the hook j , the connection between the said shafts being produced by the rod j^3 , paired on one hand with the crank-pin l^3 and on the other hand with the pin of the arm j^4 , keyed to the shaft j^2 . By means of the arm o^2 and the connecting-rod o^3 motion is transmitted from the shaft j^2 to the tail o^4 of the arm o' , operating to draw off thread from the bobbin, and which swings loosely on the shaft k^3 .

We claim as our invention—

1. The combination of the hopper a^8 , adapted to contain a plurality of needles, the vertically-reciprocating slide a^7 , passing through the said hopper and having at the top a groove adapted to receive a needle, the stationary bar a^9 , with plate a^{12} , the horizontal reciprocating bar a , plate a^{18} , fixed to the bar a and sliding between the bar a^9 and the plate a^{12} , and the needle-propeller a^{11} , connected to the bar a and having edges a^{35} , whereby it engages with the needle raised by the slide a^7 , substantially as described.

2. The combination of the hopper a^8 , adapted to contain a plurality of needles, the vertically-reciprocating slide a^7 , passing through the hopper and having at the top a groove, the stationary bar a^9 , with plate a^{12} , the horizontal reciprocating bar a , plate a^{18} , fixed to bar a and sliding between bar a^9 and plate a^{12} , the needle-propeller a^{11} , connected to the bar a and having the edges a^{35} , the auxiliary slide a^{14} , placed between the bars a and a^9 and projecting therefrom at the top, and having the heel a^{16} , a tappet a^{15} , fixed to the bar a , and spring a^{17} , the parts a^{15} and a^{17} acting from opposite sides on the heel a^{16} , substantially as described.

3. The combination of the stationary bar a^9 , the plate a^{12} , fixed thereto, the reciprocating bar a , the plate a^{18} , fixed to the latter, a needle-propeller having the propelling-edges a^{35} , and connected to the bar a , the gripper-jaw a^{20} , pivoted to the bar a^9 , and the cam-disk a^{21} , operating the said gripper, substantially as specified.

4. The combination of the reciprocating carrier b^8 , having bearings formed thereon, the coiler b , composed of the parts $b' b^4$, the part b' having the horn b^2 , perforated horn b^3 , and hollow spindle b^7 , mounted in the bearings on the carrier b^8 , while the part b^4 has the bifurcated horns $b^5 b^6$ and the stem b^{12} , passing through and movable lengthwise in the spindle b^7 , means for rotating the coiler and for moving the stem b^{12} up and down, the gripper formed by the jaw a^{20} and the bar a^9 , and adapted to hold a needle in the path of the coiler, the reciprocating hook d , arranged to pass through the eye of the needle, the grip-

per $e e^0$, and means for opening and closing the two grippers, so that the gripper-jaw a^{20} releases the needle when the gripper $e e^0$ clutches it, and means for moving the gripper $e e^0$ lengthwise to the needle, the fixed shear-blade f' , the oscillating shear-blade f , and mechanism for operating the latter, substantially as specified.

5. The combination of the reciprocating carrier b^8 , having bearings formed thereon, the coiler part b' , having the spindle b^7 mounted in the said bearings, the pinion b^{10} and plate b^{11} , both fixed on the spindle b^7 , the stationary rack g^7 , with which the pinion is capable of gearing, and guiding-edges g^8 , with which the plate b^{11} co-operates, substantially as described.

6. The combination of the reciprocating carrier e^2 , having bearings formed thereon, the gripper composed of the jaws e and e^0 , the jaw e^0 , having the hollow spindle e' mounted in the said bearings, while the jaw is pivoted to the jaw e^0 , the pinion e^3 and the plate e^4 , both fixed on the spindle e' , the stationary rack g^5 , with which the pinion e^3 is capable of gearing, guiding-edges g^6 , with which the plate b^{11} co-operates, the rod e^5 , passing through the spindle e' , means of connection between the rod e^5 and the gripper-jaw e , whereby the gripper is opened when the rod is raised, mechanism whereby the rod e^5 is caused to rise and descend, and needle-cushion k , placed in the path of the gripper, substantially as described.

7. The combination of the reciprocating carriers b^8 and e^2 , both having bearings formed thereon, the coiler b , mounted in the bearings on the carrier b^8 , the gripper $e e^0$, mounted in the bearings on the carrier e^2 and adapted to hold a needle, means for imparting rotative motion to the coiler and the gripper, the thread-guiding bar b^{15} , fixed to one of the said carriers, the oscillating arm j' , having the

hook j arranged to engage with the thread extending from the needle over the bar b^{15} to the coiler when during the operation of the gripper the said thread has been brought into the path of the hook j , substantially as specified.

8. The combination of the bobbin i^0 , containing a supply of thread, the standard o , and the oscillating arm o' , both having holes for the thread to pass through, the thread-clamp composed of the fixed disk h' and the movable disk h , the coiler b , the gripper $e e^0$, reciprocating carriers having bearings in which the coiler and the gripper are mounted, the thread-guiding bar b^{15} , fixed to one of the said carriers, the oscillating arm j' , having the hook j , and mechanisms whereby the arms o' and j' are oscillated, the movable disk h is shifted toward or away from the disk h' , the said carriers are moved, and the gripper rotated, substantially as described.

9. The combination of the bracket p^7 , the plate p^5 , pivoted thereto and having the bearings $p^3 p^4$, the arm p' , journaled in said bearings and having the finger p and stud p^{12} , stops p^{13} and p^{14} on the bracket p^7 , arranged in the path of the stud p^{12} and engaging and disengaging device whereby when the arm p' is rotated by its stud p^{12} striking against one of the stops $p^{13} p^{14}$ the said arm is maintained in the position produced by such rotation, means for oscillating the disk p^5 , and bar p^2 , arranged outside of the path of the finger p , substantially as specified.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

ADOLPH SAURER.
VICTOR KOBLER.

Witnesses:

PAUL TREHUNSPER,
JAMES F. CULIER.