

(No Model.)

15 Sheets—Sheet 1.

S. E. PETTEE.
PAPER BAG MACHINE.

No. 542,447.

Patented July 9, 1895.

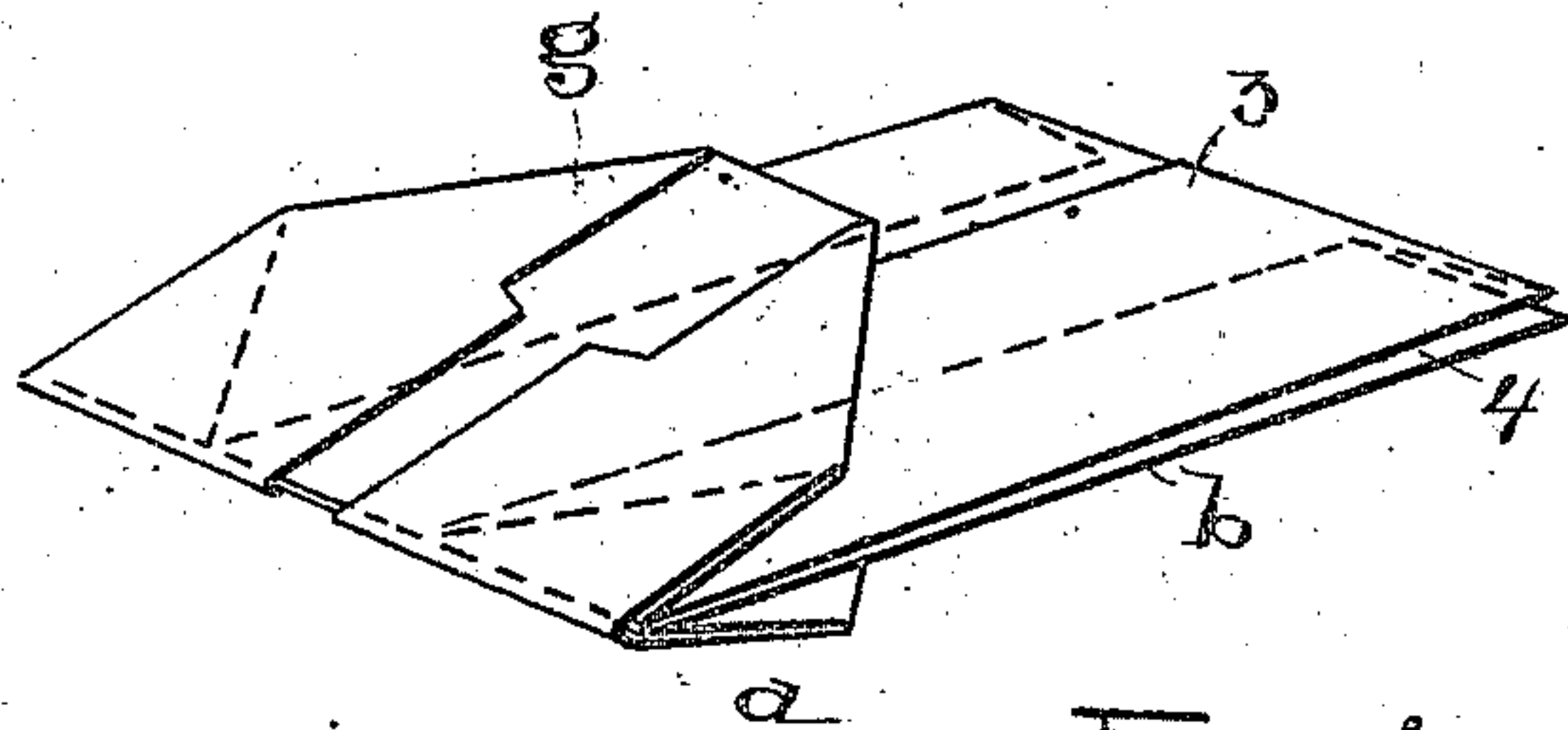
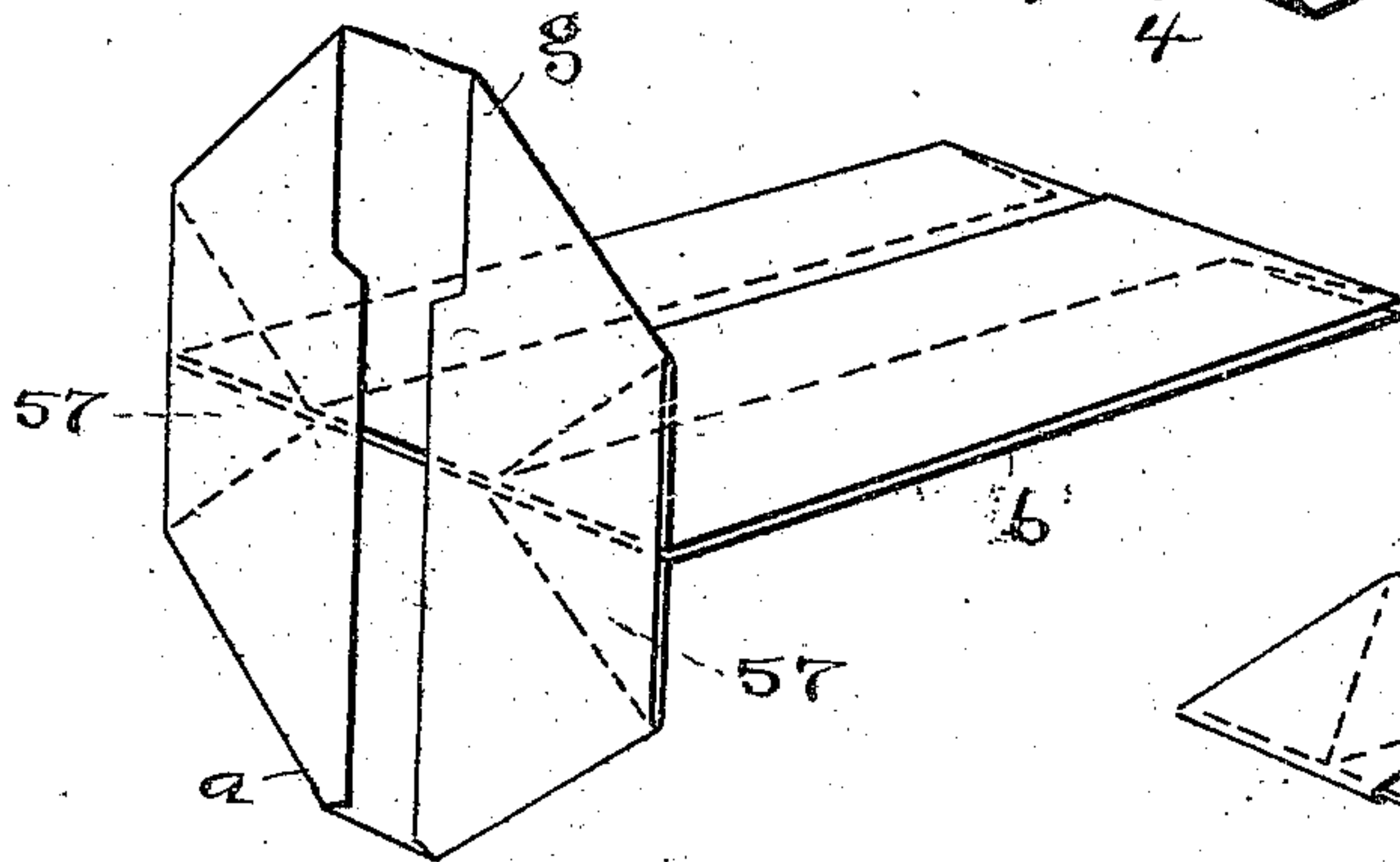
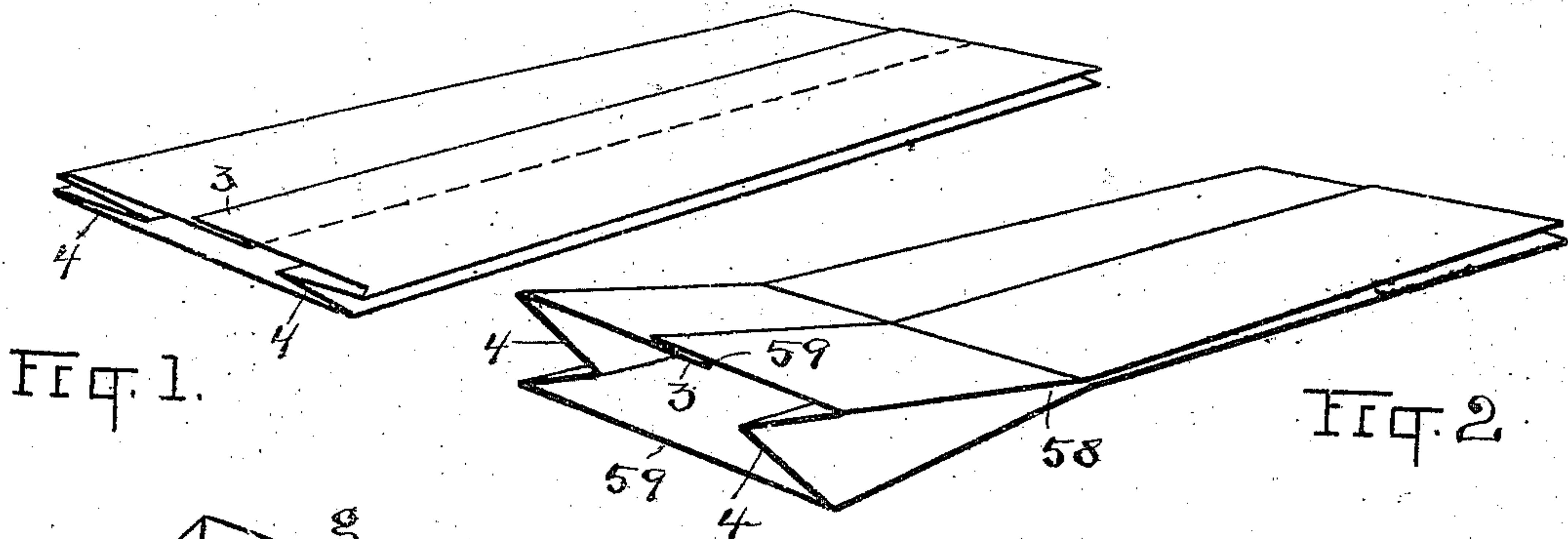


Fig. 3.

Fig. 4.

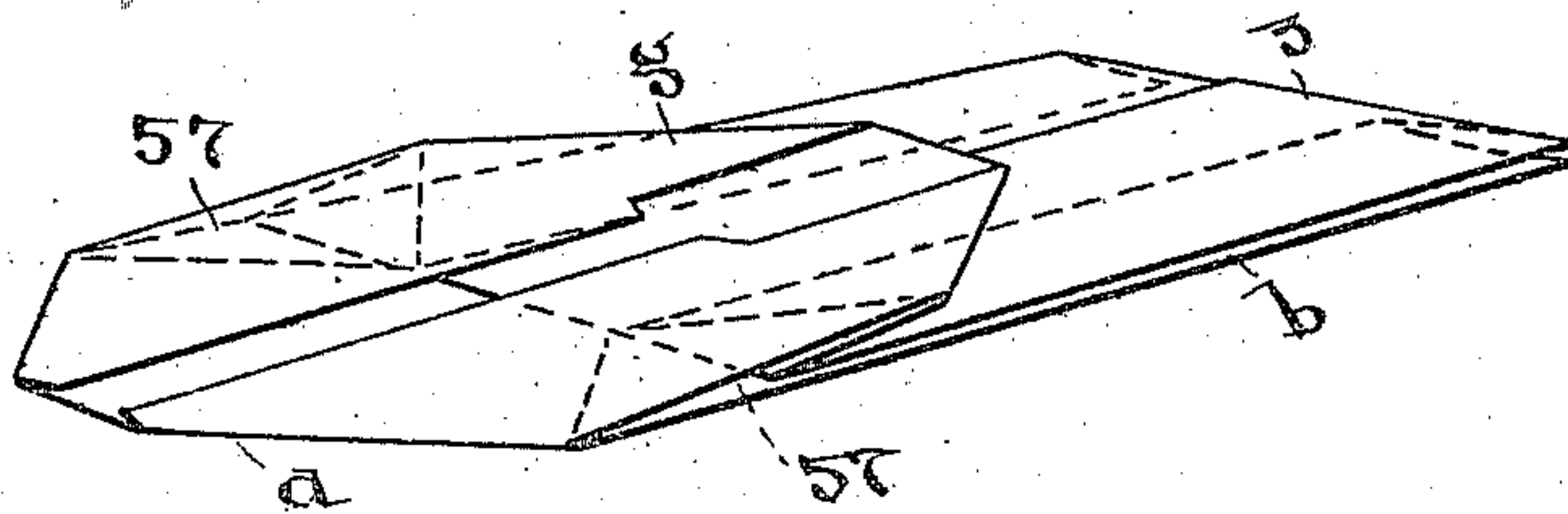
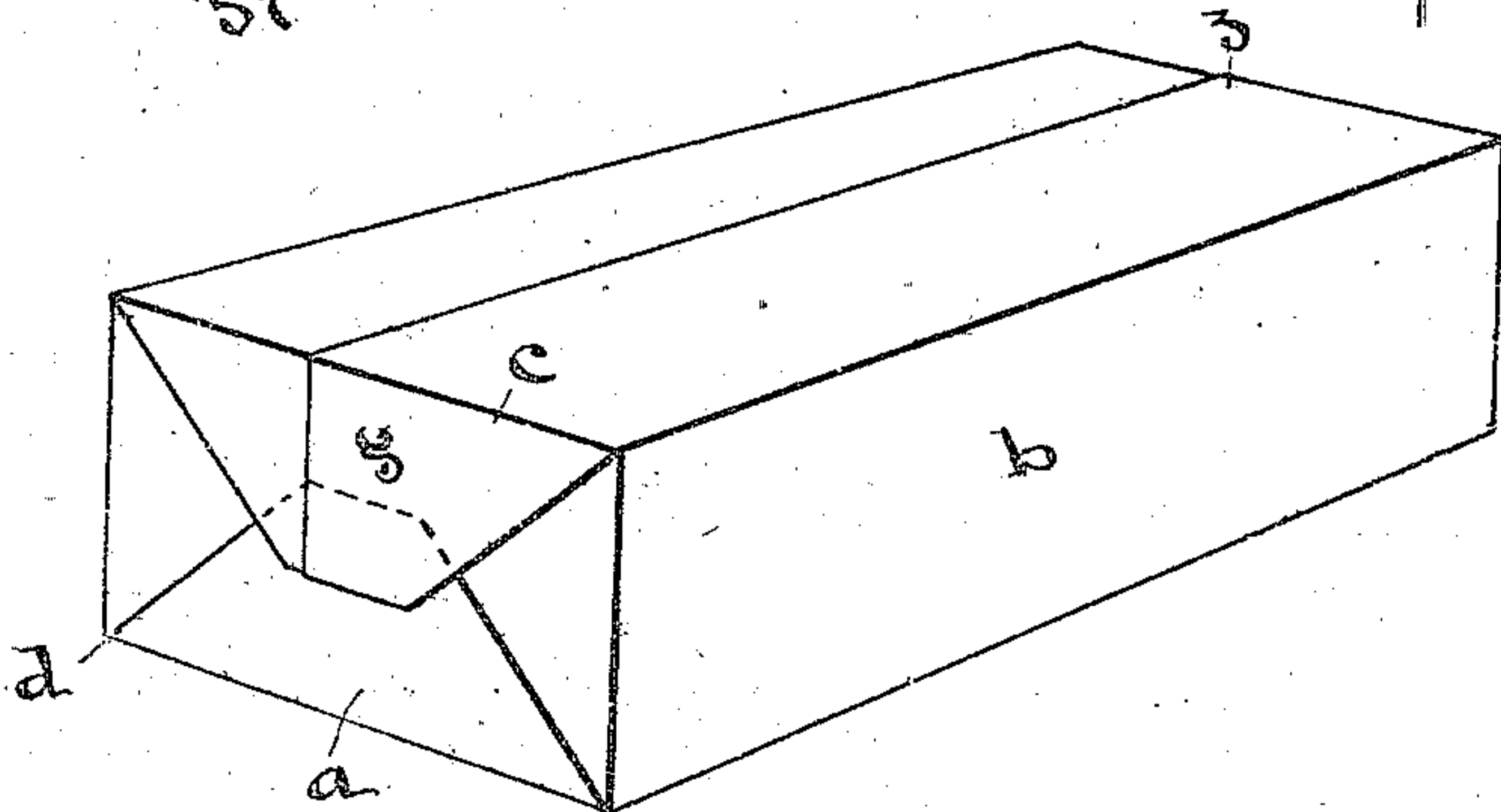


Fig. 5.

Fig. 6.



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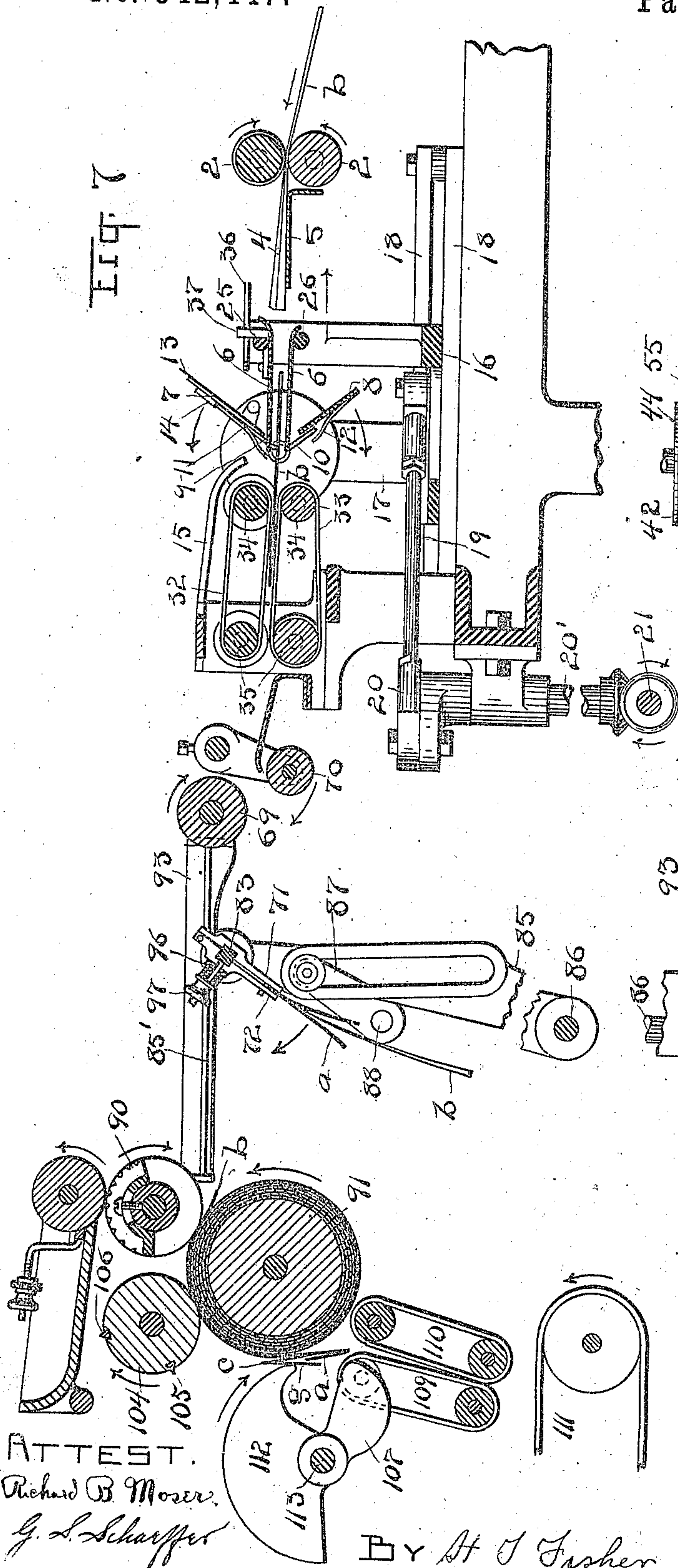
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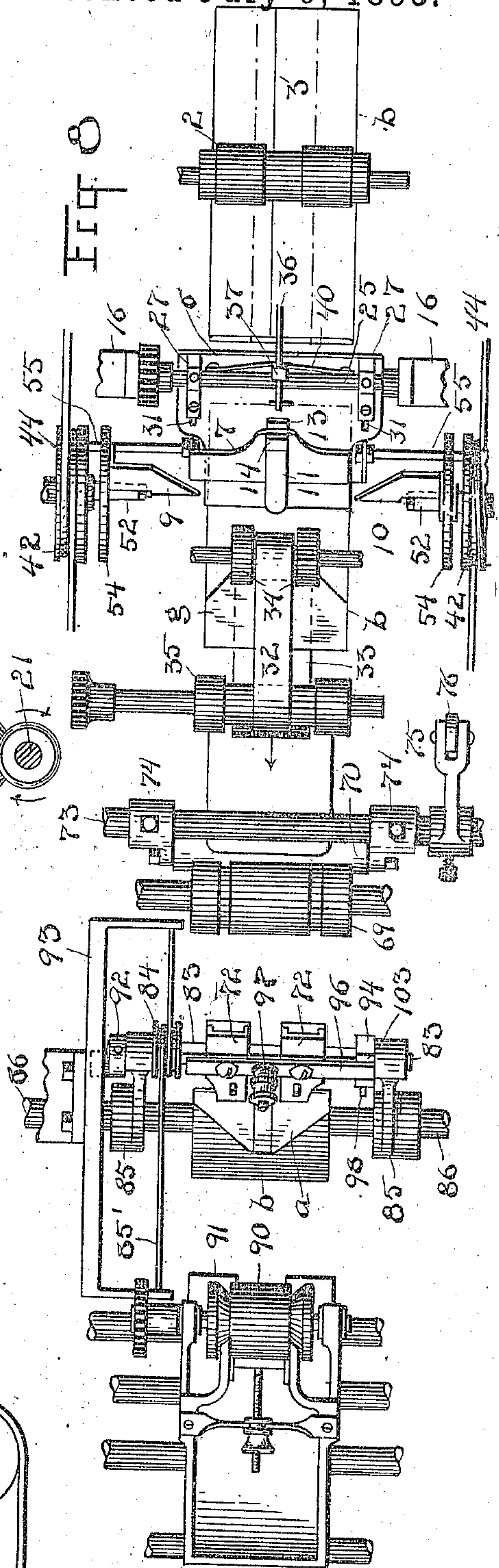
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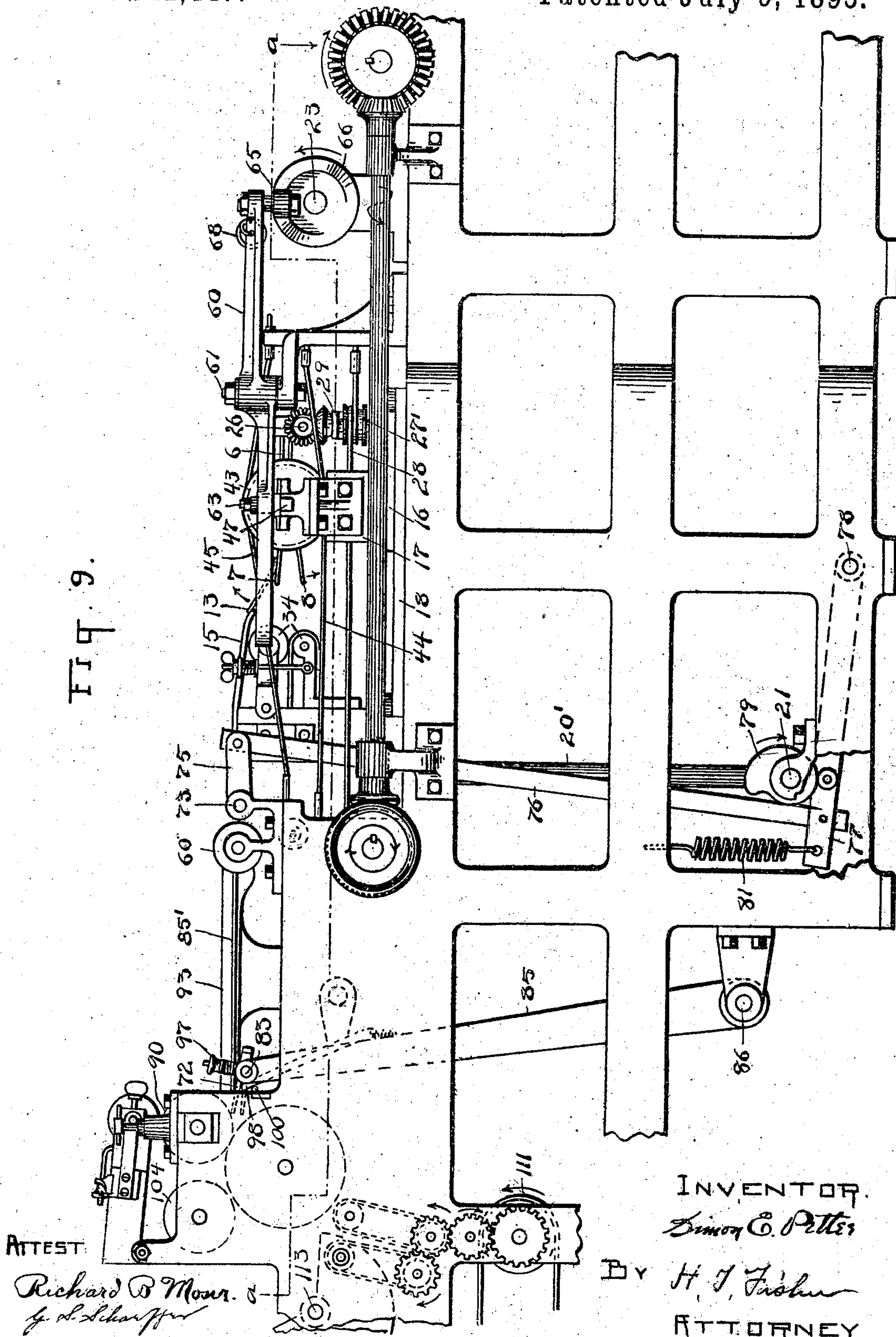
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Fig. 9.



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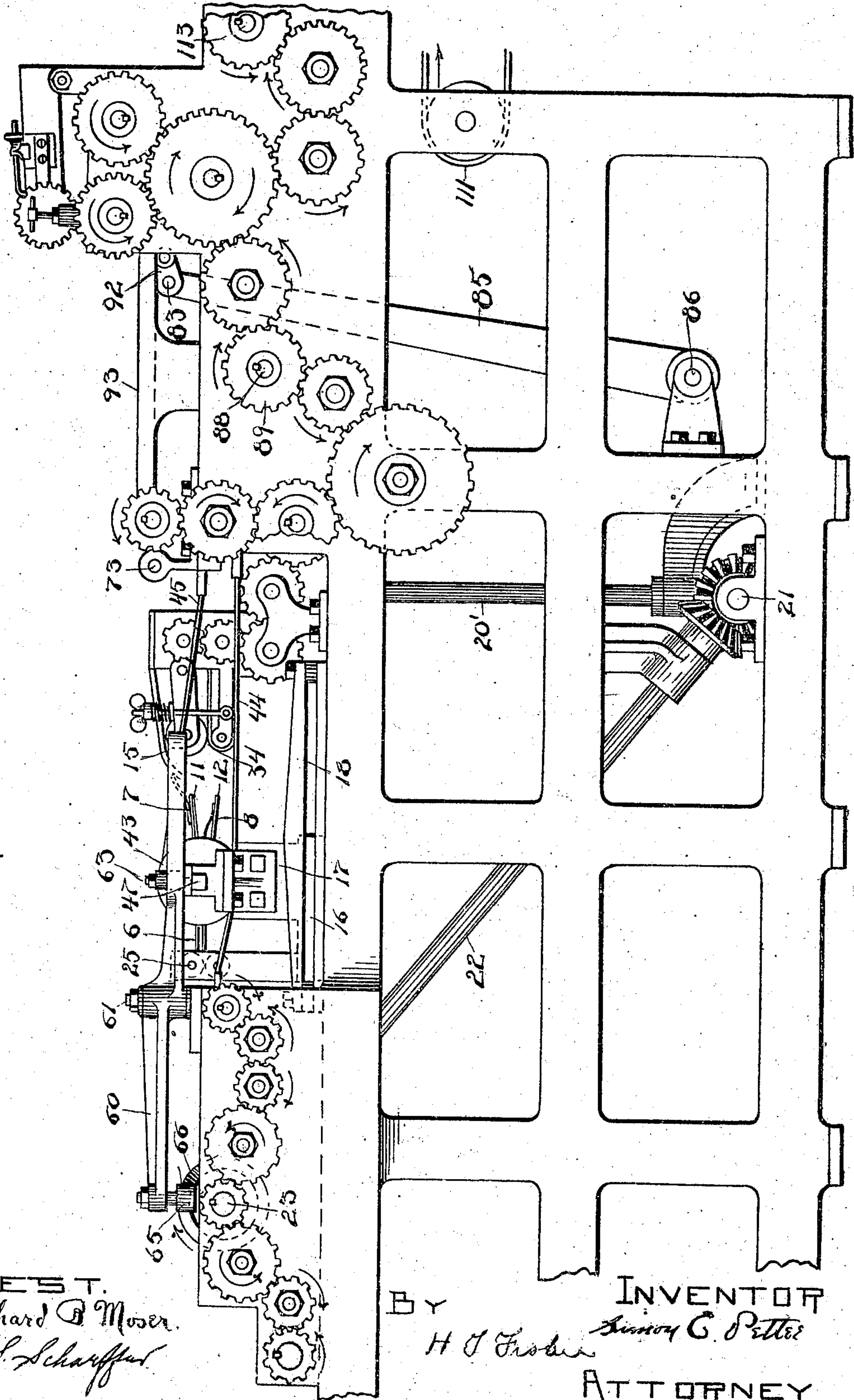
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Fig. 10.



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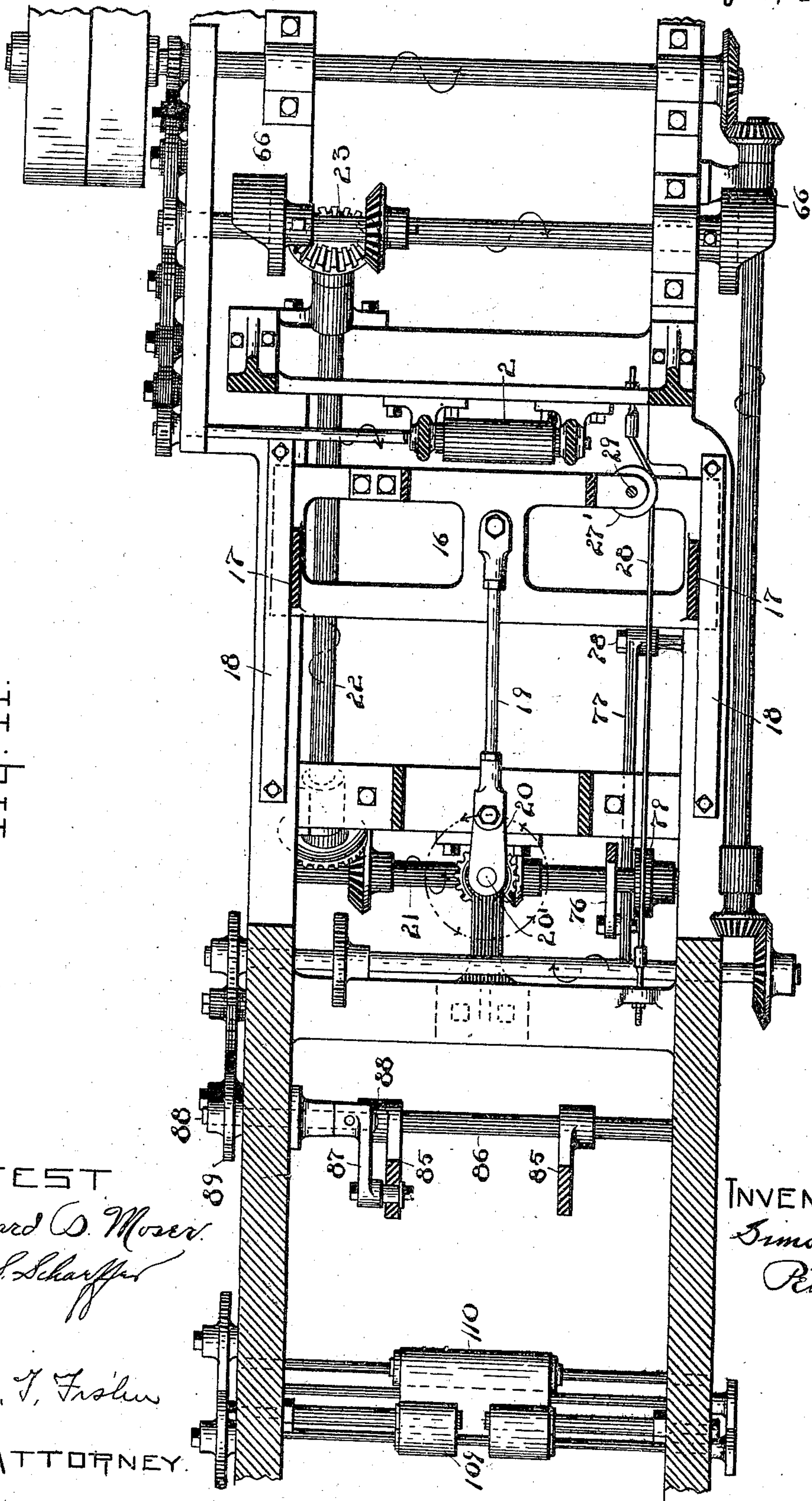
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Fig. 11.



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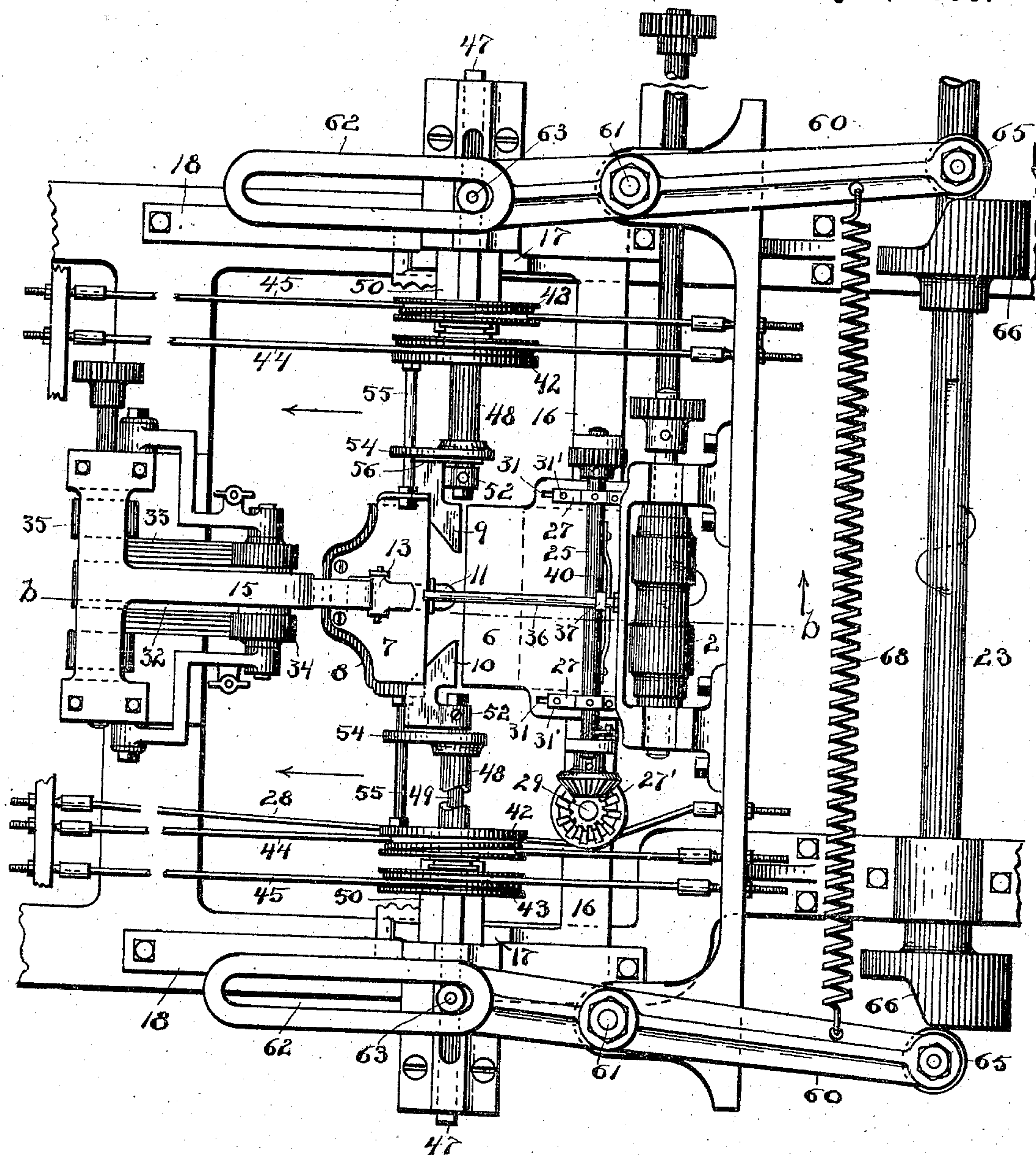


FIG. 12.

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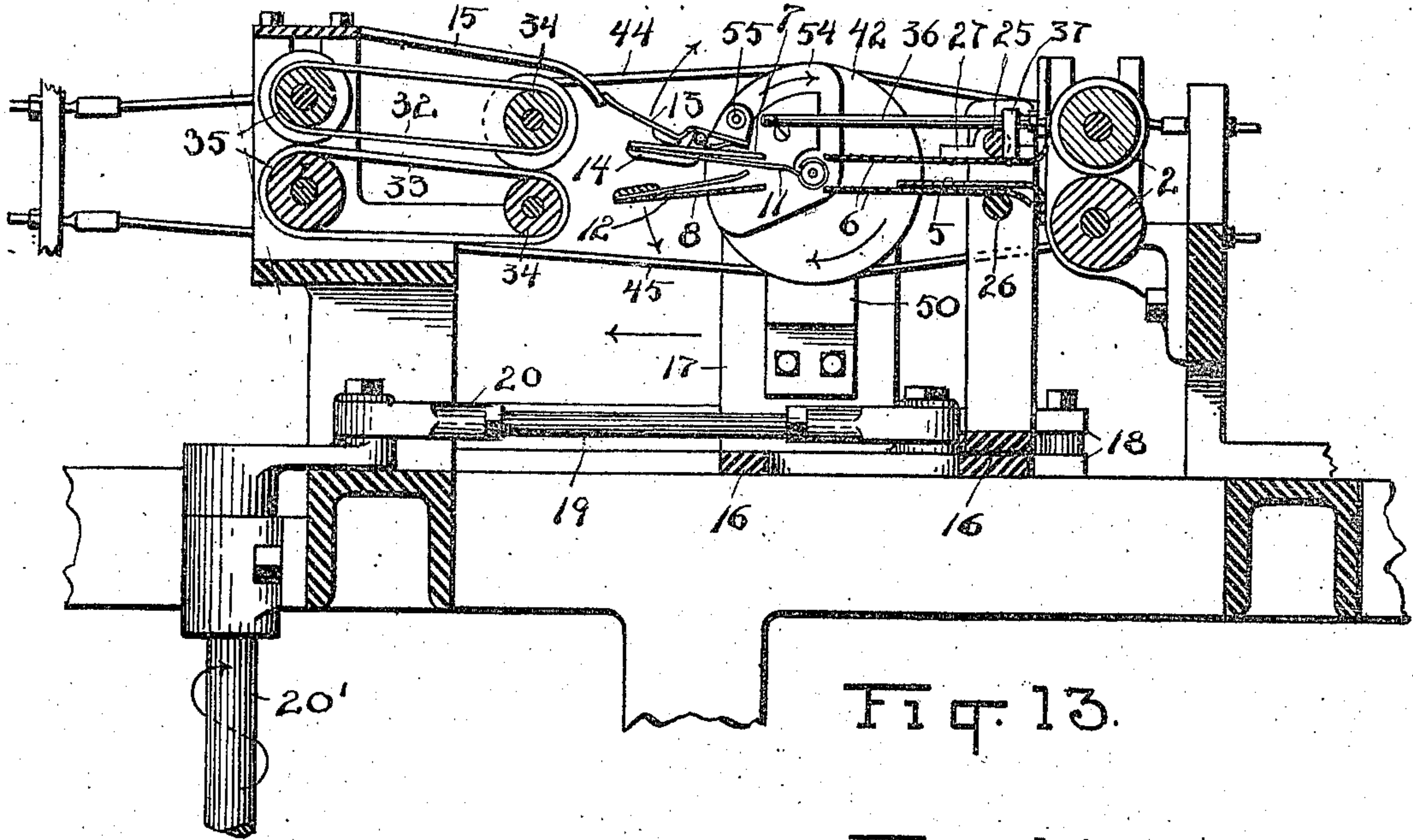
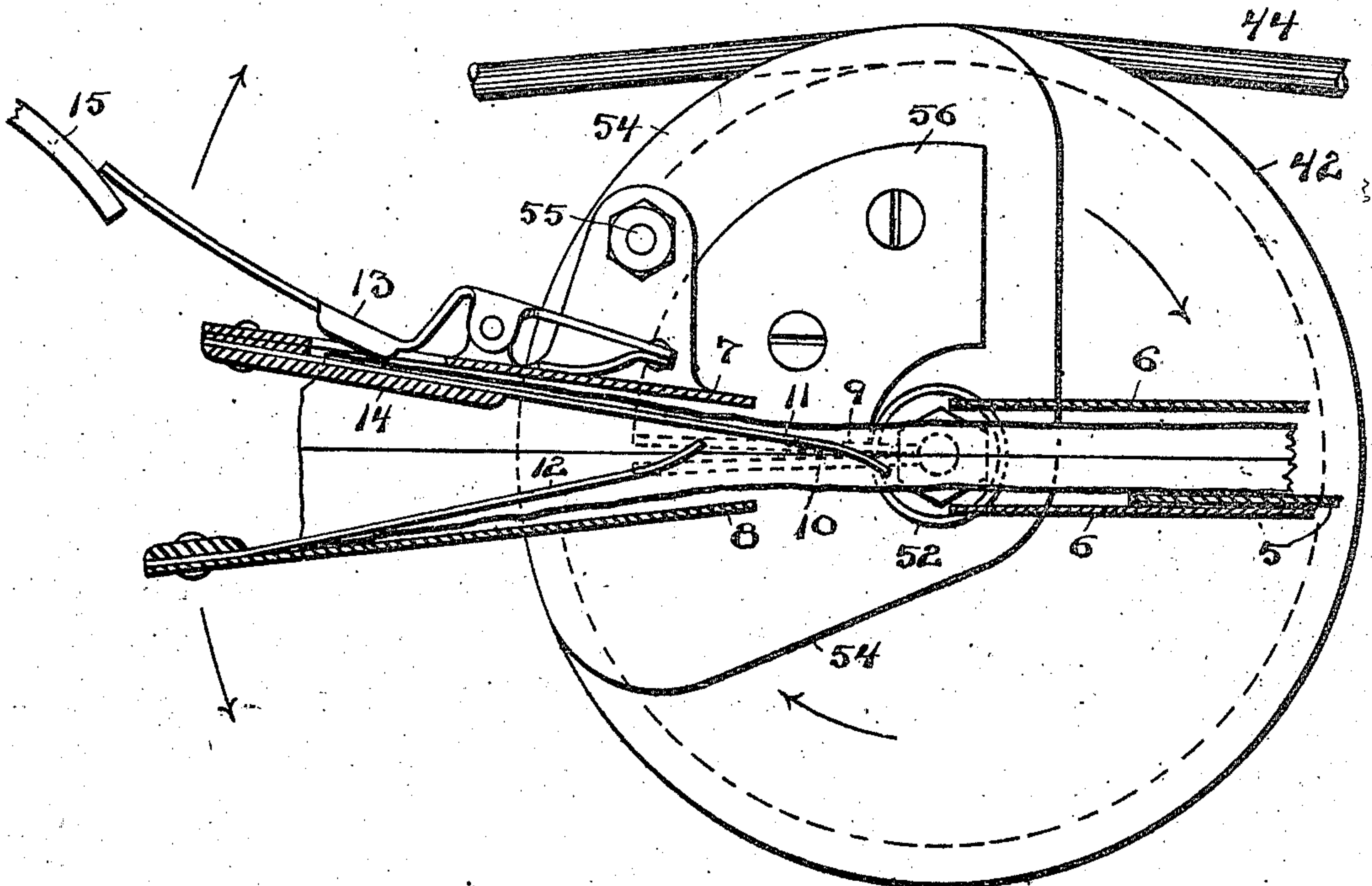


FIG. 13.

FIG. 14.



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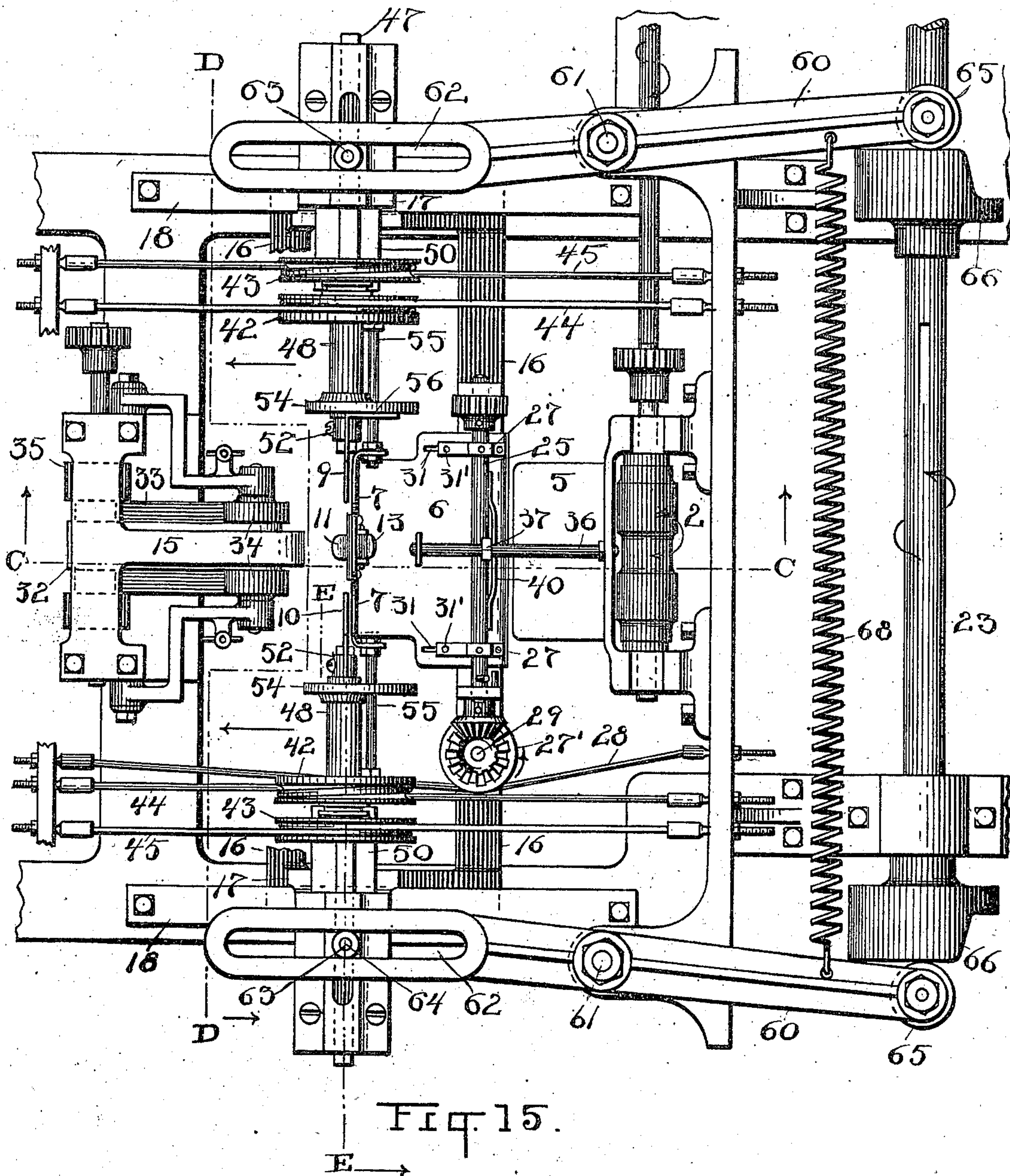
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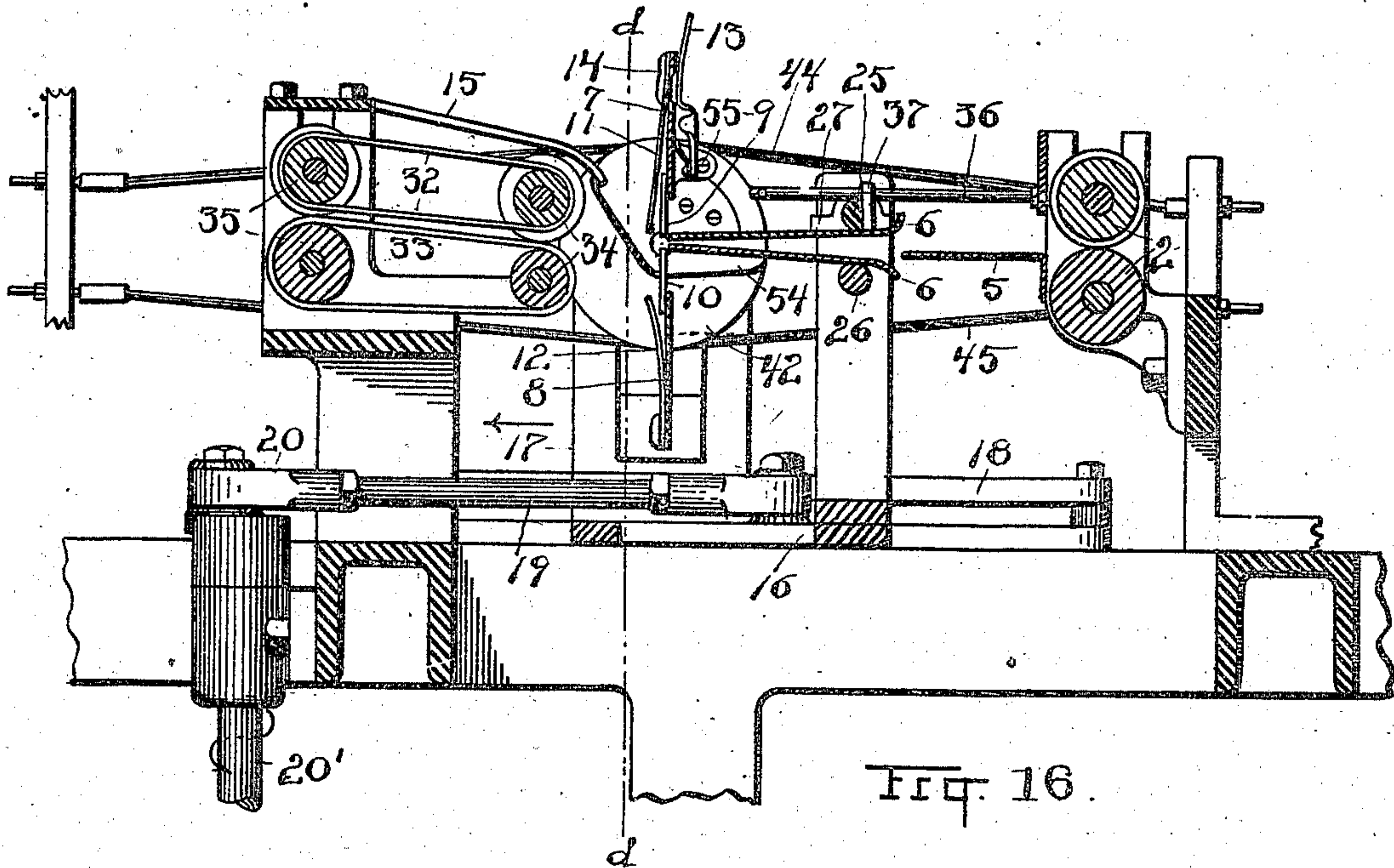


FIG. 16.

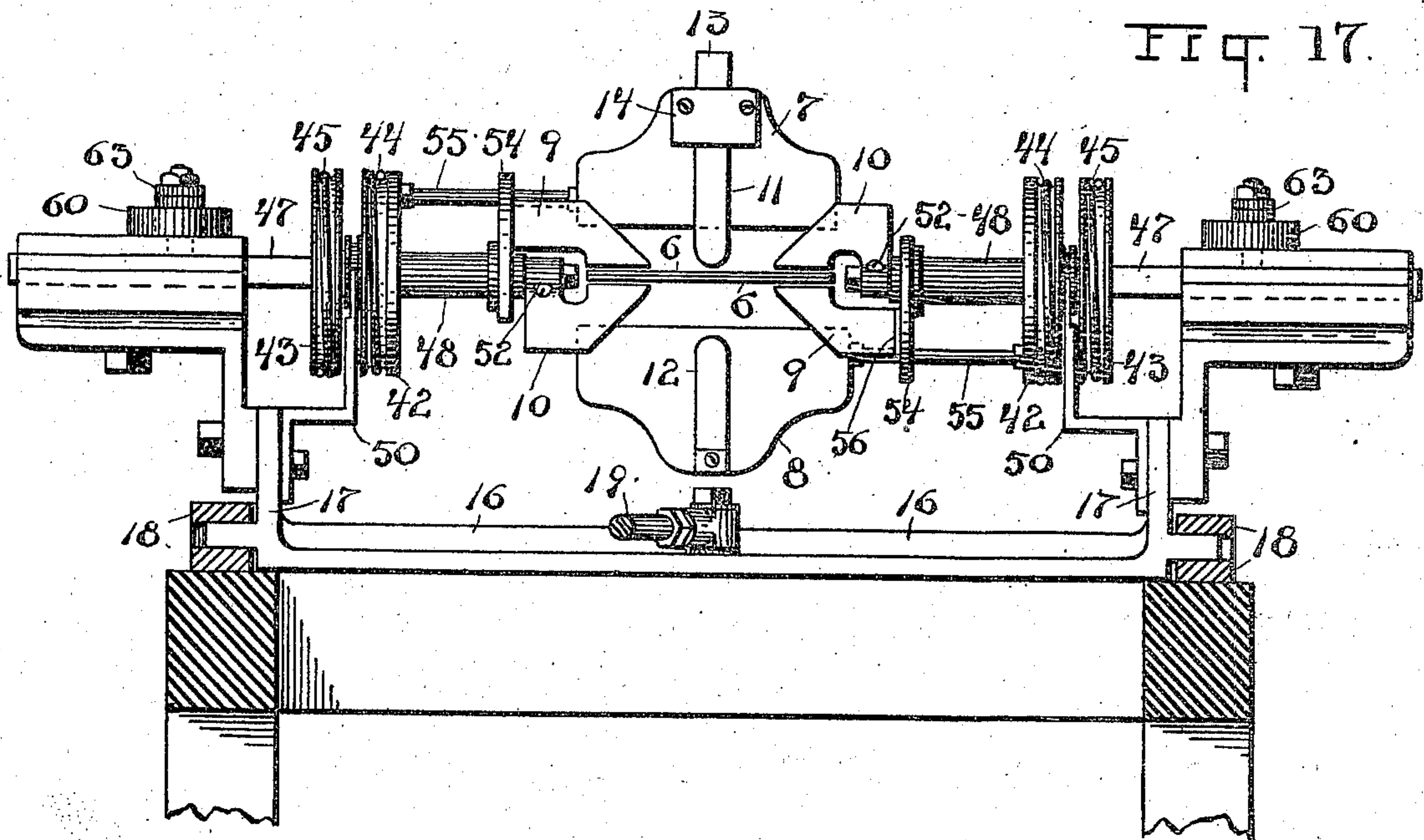


FIG. 17.

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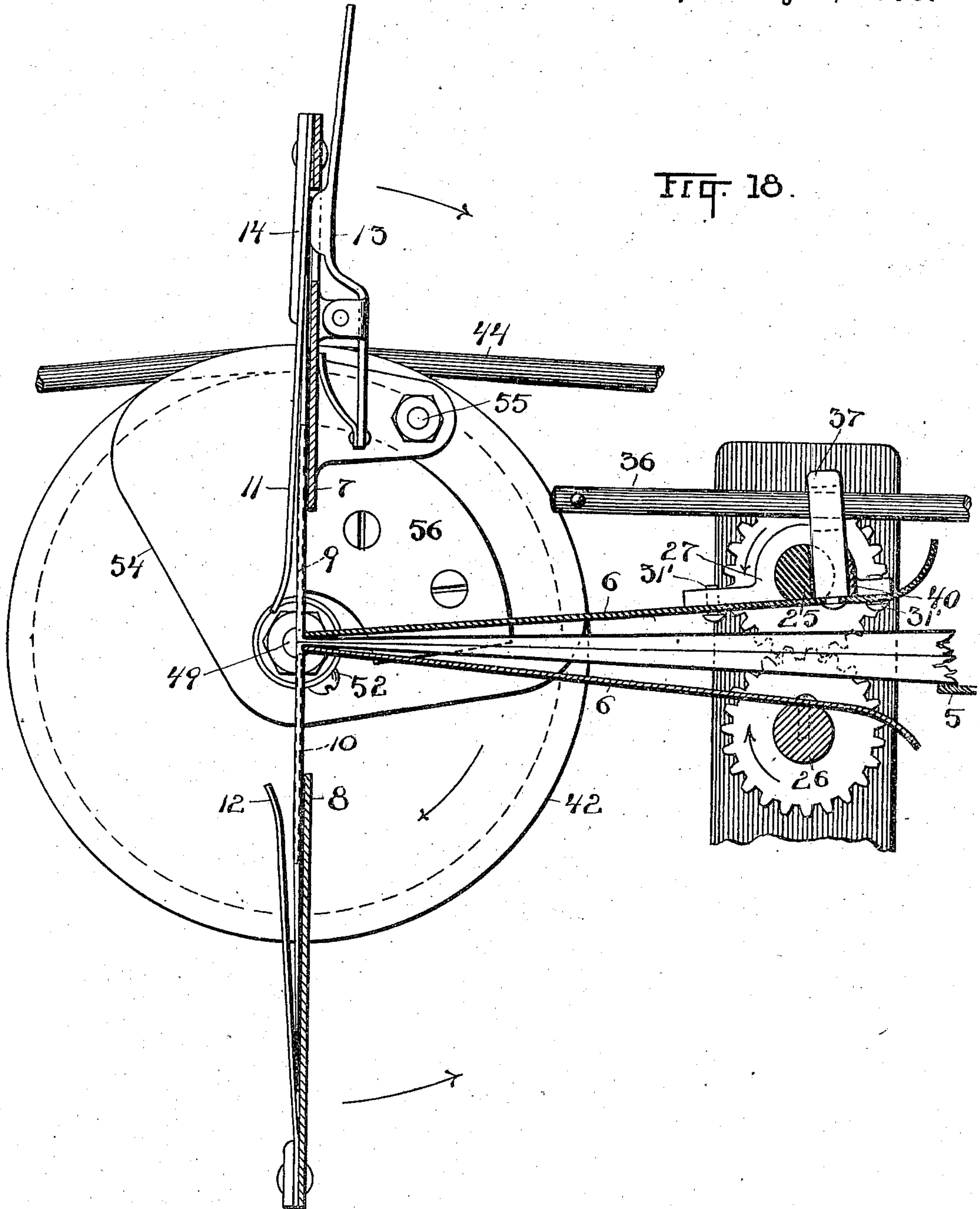
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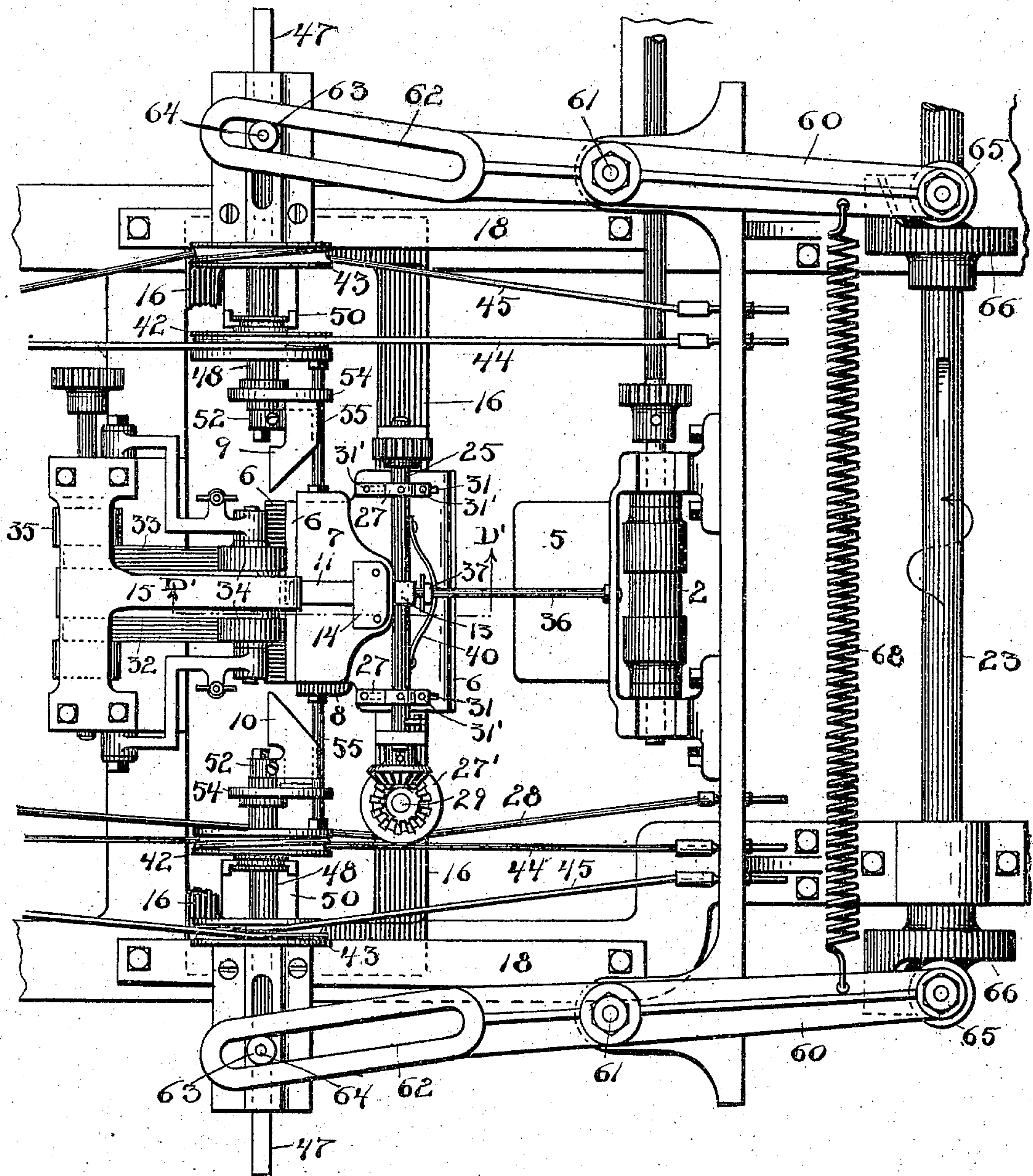


FIG. 19.

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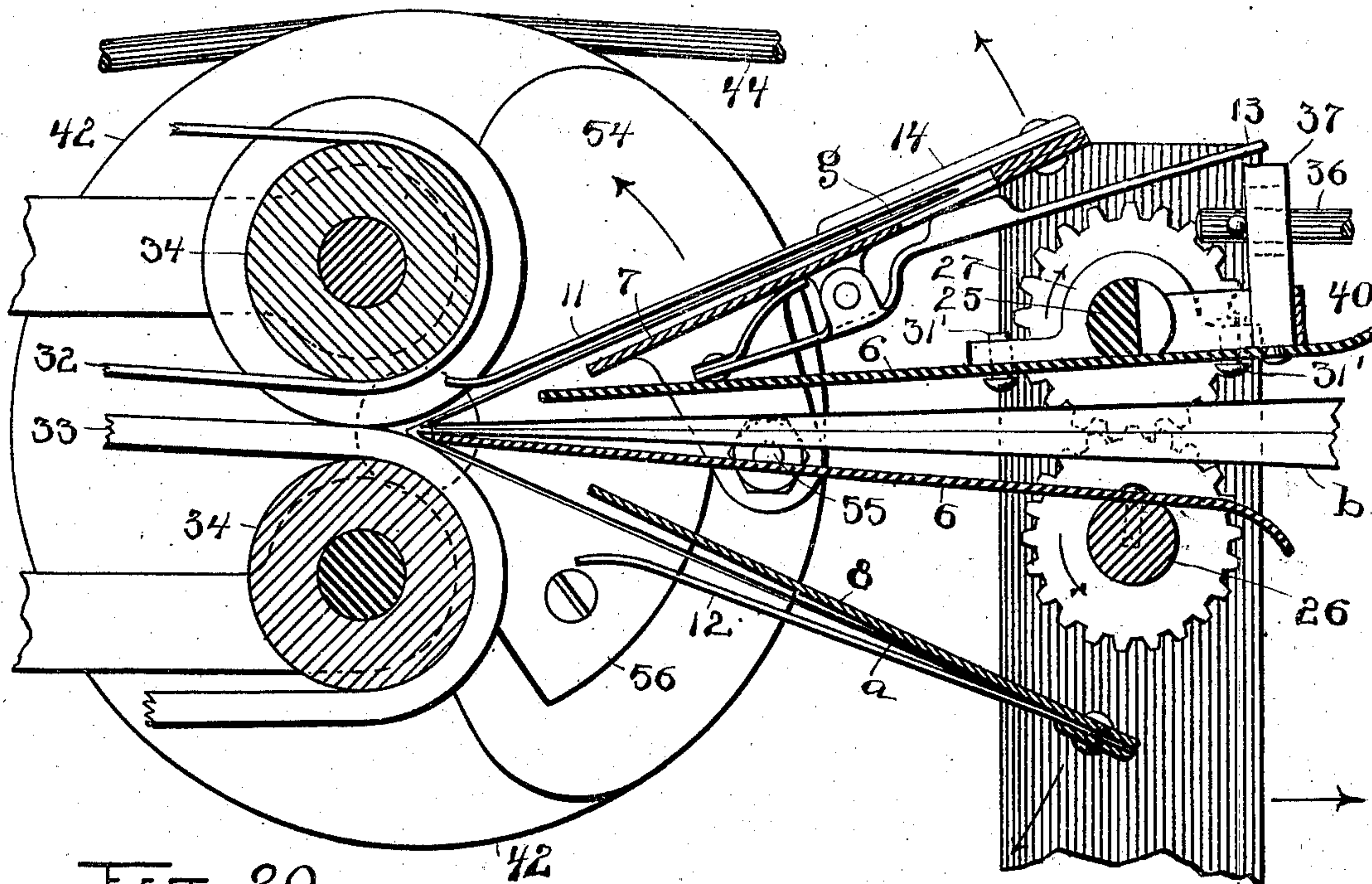


FIG. 20.

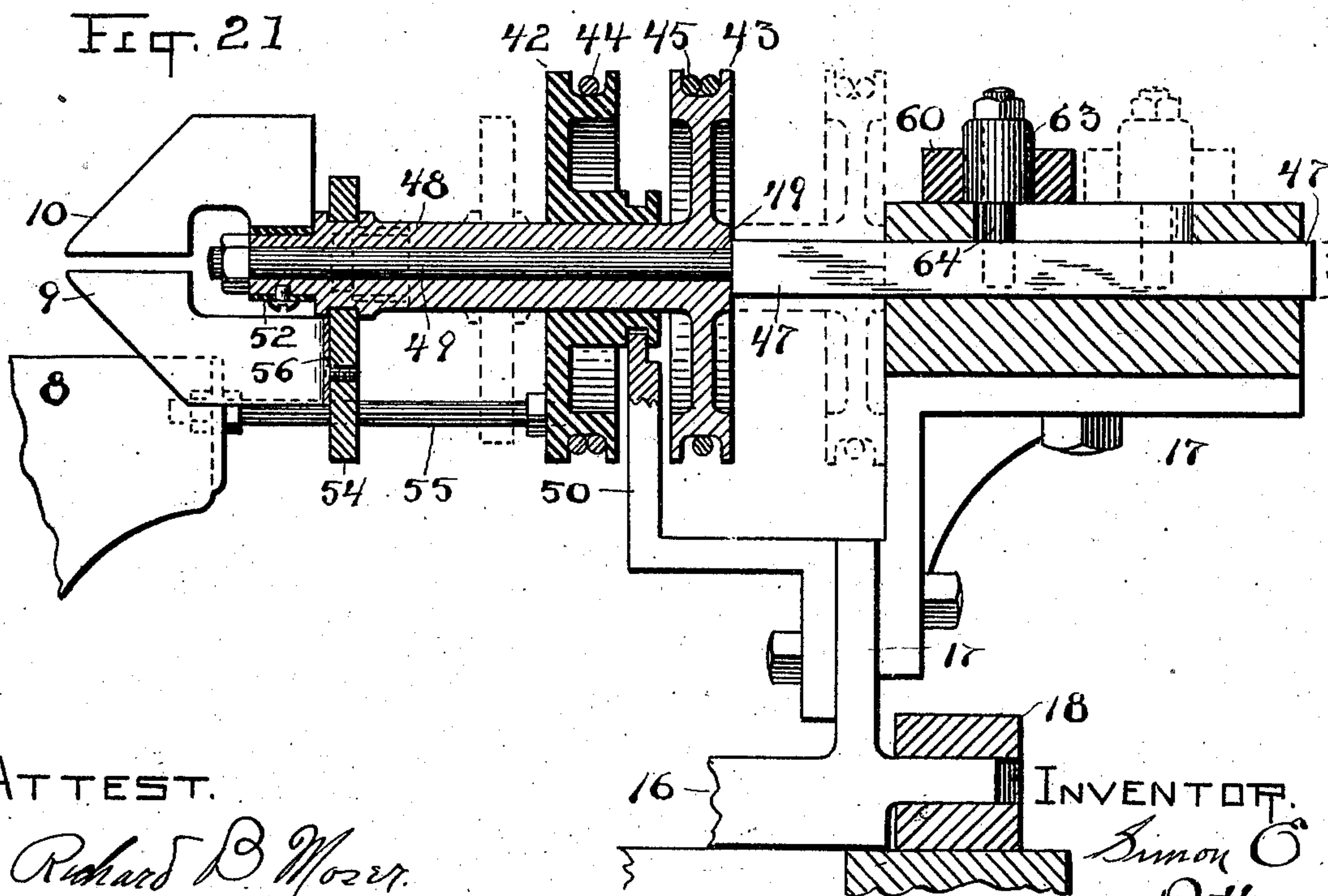


FIG. 21

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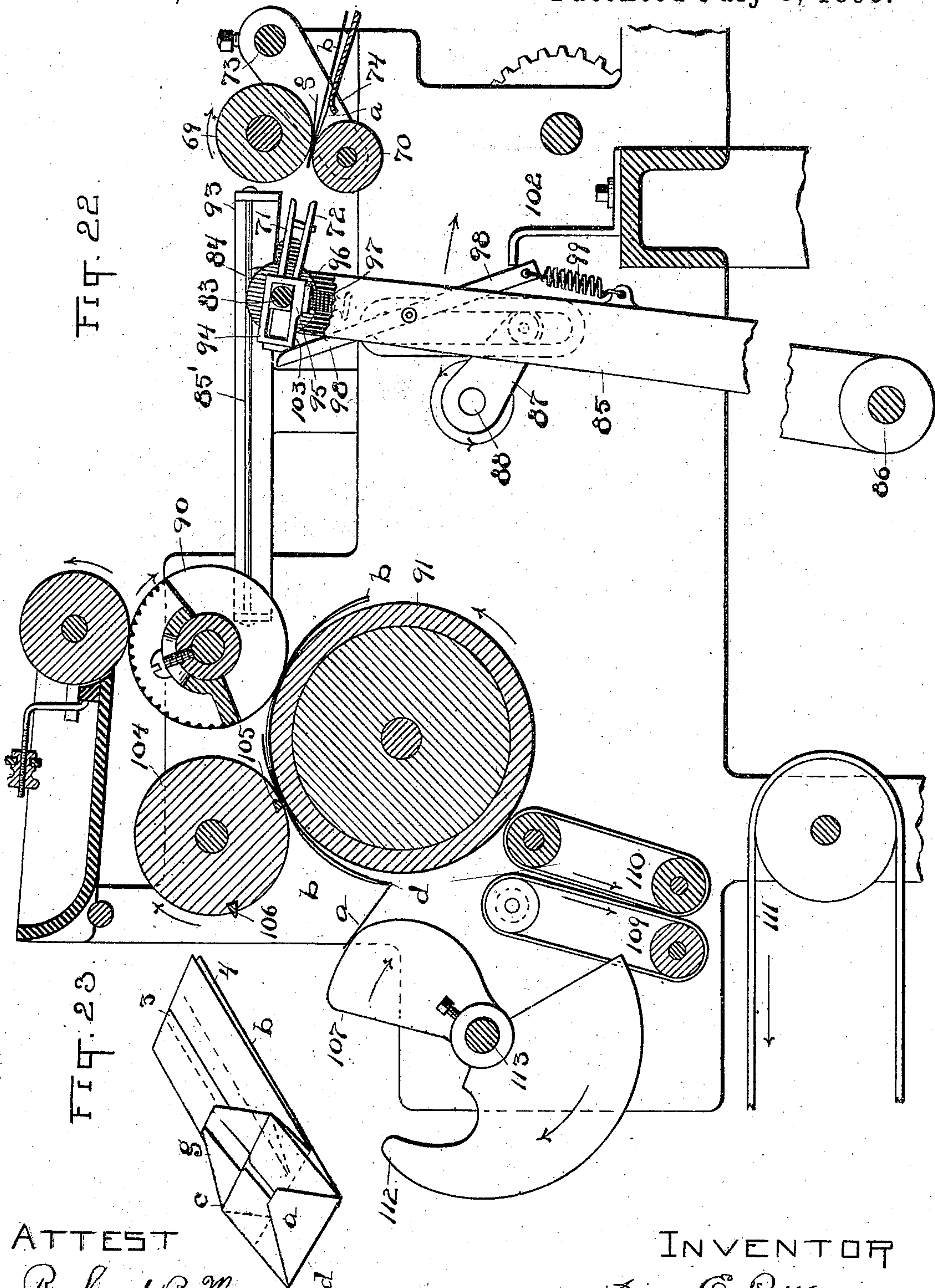
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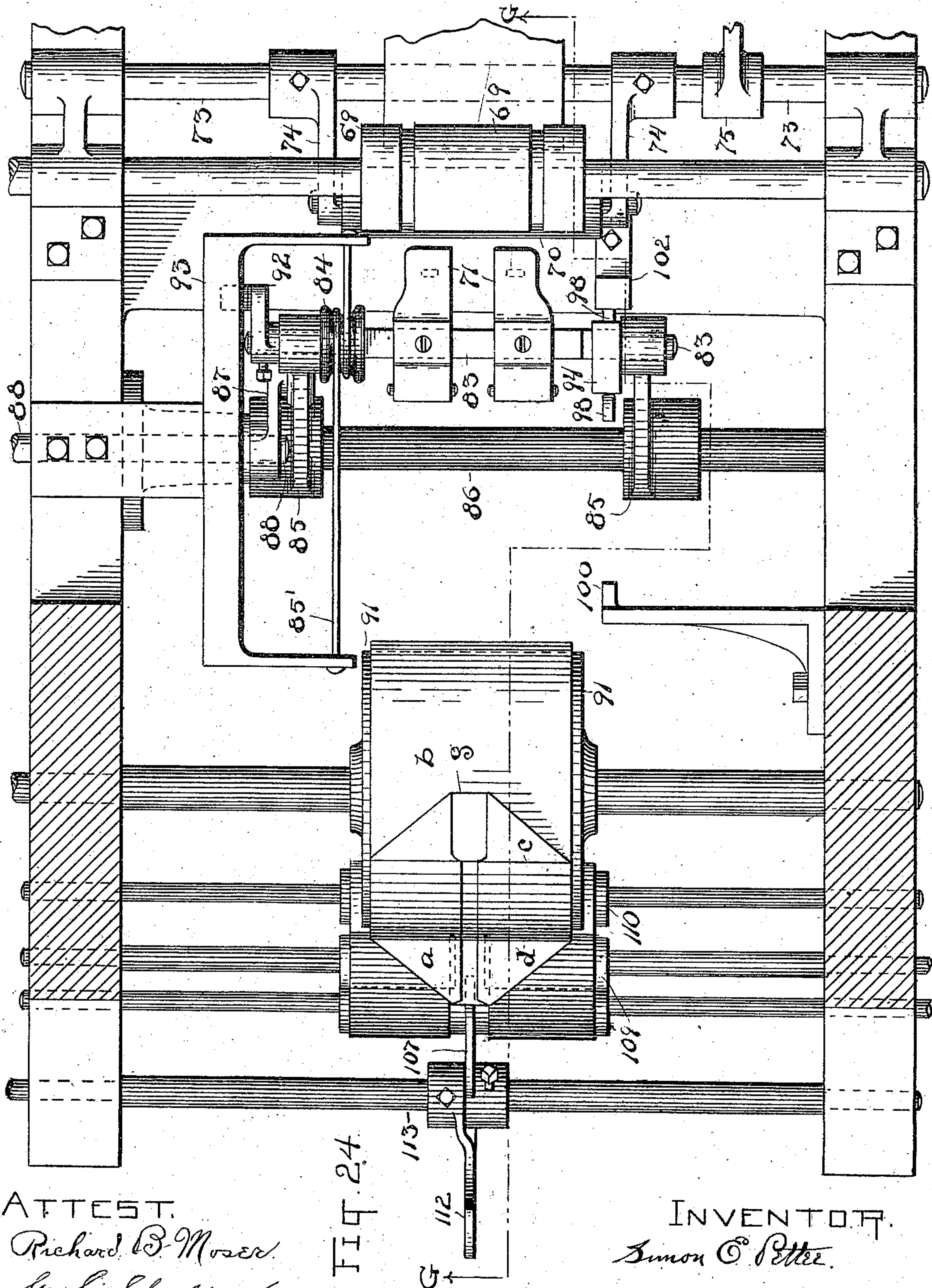
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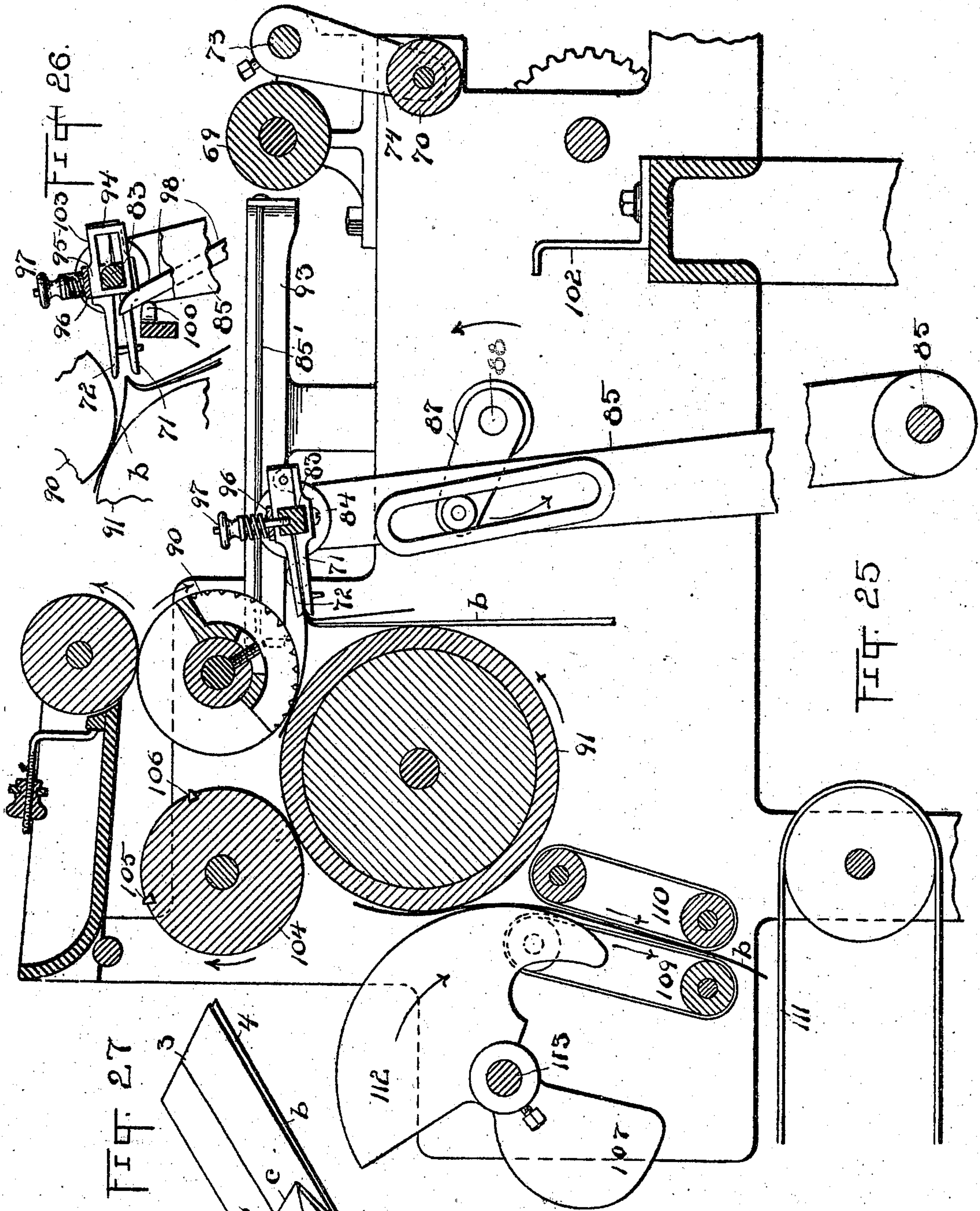
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UNITED STATES PATENT OFFICE.

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AND NORTON T. HERR, TRUSTEES.

PAPER-BAG MACHINE.

SPECIFICATION forming part of Letters Patent No. 542,447, dated July 9, 1895.

Application filed June 21, 1894. Serial No. 515,245. (No model.)

To all whom it may concern:

Be it known that I, SIMON E. PETTEE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Paper-Bag Machines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to paper-bag machines; and the object of the invention is to provide a machine which is adapted to produce square-bottom paper bags, all substantially as shown and described, and particularly pointed out in the claims.

In the accompanying drawings, Figures 1 to 6, inclusive, show a paper bag as it appears in the different stages or steps of its manufacture in and by my machine. Thus in Fig. 1 we have the bag-blank cut to the required length and folded and pasted along its overlapping edges, as is usual and well known in this line of manufacture, the sides of the blank being also tucked in along their center. Fig. 2 represents the blank when it is passed through the set of rolls immediately in front of the bottom-forming mechanism, with the parts about as they appear in Figs. 13 and 14. Fig. 3 shows the bag-blank after the first steps in folding the bottom have been completed, and the parts directly participating in this work are in the position shown in Figs. 16, 17, and 18 when the result is accomplished. This is what I call the "diamond fold." Fig. 4 shows the bag-blank with the bottom flaps bent back across its center toward its sides, so as to bring the bag to position to feed through the next succeeding rolls to complete the work of pasting and folding the bottom, the mechanism when this occurs being in the relation substantially as seen in Figs. 19 and 20. Fig. 5 shows the blank as it appears after it is taken from the rolls by the fingers shown in Fig. 22 and thrown across into the opposite position to pass through the pasting and finishing rolls, in which the free flap of the blank is engaged, as shown in Fig. 25. Fig. 6 shows a complete and open bag as it appears for use. Fig. 7 is a longitudinal central sectional

elevation of the machine on a line corresponding to a central line through Fig. 8 and showing more particularly the mechanism which has to do directly with handling the paper bag and little else, the said view being in this sense fragmentary and mechanically incomplete. At the extreme right the paper for the bag is shown as it enters the first set of feed-rolls, side folds or plaits being already made therein, as seen in Fig. 1. Fig. 8 is a plan view of the mechanism shown in Fig. 7 and some additional and associated parts. These two figures represent the mechanism in which practically all the work of the machine is done, and they are divested of the operating mechanism as much as possible, so as to simplify the views and to more clearly develop the parts which have to do especially with the formation of the bag. Fig. 9 is a side elevation of the machine, the extreme front of the machine where the original fold and central pasting of the paper occurs being omitted, because it is not deemed a part of the present invention. This view corresponds in other respects to the mechanism shown in Figs. 7 and 8, but with all the details supplied. Fig. 10 is an elevation of the machine from the opposite side to Fig. 9 and representing substantially the same part of the machine as in Fig. 9; but the rear of the machine is at the right in Fig. 10, while the rear is at the left in Fig. 9. It will be observed that the power-transmitting gears are mostly upon this side of the machine, and hence the need of this view. Fig. 11 is a horizontal sectional view on a line corresponding to *a a*, Fig. 9, looking down, and revealing especially the mechanism for actuating the sliding table or frame which carries the folding mechanism for producing the diamond fold, as revealed in Figs. 3 and 17. Fig. 12 is a plan view, enlarged, of the central part of the machine, having the diamond-folding mechanism and corresponding to the central part of Fig. 11, the horizontal side arms and cams for actuating the side folders being clearly disclosed in this figure. Fig. 13 is a longitudinal vertical central sectional elevation on line *b b*, Fig. 12, with the parts in the same relation to one another as in said figure. Fig. 14 is an enlarged sectional elevation of a detail of the mechanism

shown as in Fig. 13 and disclosing the central folders in the relation shown in Fig. 13 and a bag-blank in position therein as it appears when the spreading of the bottom to the diamond fold has just begun. Fig. 15 is a plan view of the mechanism disclosed in Fig. 12, but with the folding mechanism in the half-way position and the bag held therein in the form as it appears in Fig. 3. Fig. 16 is a vertical central sectional elevation of the parts of the folding mechanism shown in Fig. 15 and showing the central folders in the same place as in Fig. 15. Fig. 17 is a cross-section of Fig. 16 on line *d d* in front of the "diamond folders," but showing the full mechanism across the machine. Fig. 18 is an enlarged vertical central sectional elevation of the central folders and of certain associated parts on a line corresponding to C C, Fig. 15, the folders here being in the same position as in said figure. Fig. 19 is a plan view of the parts shown in Fig. 15, but with the table carrying the folding mechanism at the extremity of its rearward movement. When the position is reached the bag is held with its folds back as in Fig. 4, and the side folders are withdrawn and the bag is ready to be delivered to the next series of rolls. Fig. 20 is an enlarged view of the central folders and associated mechanism on line D' D', Fig. 19, and showing the bag-blank and the parts carrying the same in the position they occupy in Fig. 19 and ready to deliver the bag to the succeeding rods or carrier which deliver this blank to the transferring device. Fig. 21 is an enlarged partly-sectional elevation on line E E, Fig. 15, and designed to illustrate the construction and connections of the side folders which enter the plaits of the blank, strip and produce the side folds of the bottom, as hereinafter fully described, their position in the blank when they are spread corresponding to the central folders, as clearly shown in the elevation, Fig. 17, the central folders there having the position shown in Fig. 16 above. Fig. 22 is an enlarged elevation of the mechanism shown on line G G, Sheet 14, and is intended more especially to disclose the means for transferring the blank from the rolls shown at the left in Fig. 20 and at the right in this figure to the pasting and creasing rolls at the left of this figure. Fig. 23 is a view of the bag as it comes through the pasting and creasing rolls in Fig. 22, the corresponding blank being shown as passing through said rolls and getting the last transverse crease. Fig. 24 is a plan view of the mechanism shown in Fig. 22 with the pasting and creasing rolls removed and showing the bag in the same position as in said figure and just at the point of making the first back double fold after pasting, as seen at the left in Fig. 22. Fig. 25 is a central sectional elevation of the mechanism as shown in Fig. 22, but with the transferring device in the reverse position from Fig. 22 and showing it as feeding a bag into the pasting-rolls, one flap of

the bottom of the bag having been thrown up into said rolls. Fig. 26 is a detail of the gripping and transferring mechanism shown in Fig. 25, but open, as it appears when the bag is released and carried on through the succeeding rolls. Fig. 27 shows the bag with its bottom completely folded and as it is delivered to the endless aprons at the end of the machine and is carried off to the drier.

The essential elements of this invention are centered, first, and most particularly, in the mechanism which produces the substantially diamond fold shown in Fig. 3, and then as a proper supplement in the mechanism which completes the fold. Leading up to this invention and necessary as a preliminary step, but not novel nor shown here, is mechanism for producing the plaited folds or plaits seen in Fig. 1. Having the paper thus folded, it passes thence to the first feed-rolls 2, Figs. 7 and 8, the paper having been first cut to the desired length for blanks farther back in the machine, but not now nor necessarily shown here. The blank as it passes through these feed-rolls has already been pasted along its overlapping middle edges 3, Fig. 1, and has been tucked or plaited in at the sides, so as to make the side folds 4 the full length of the blank. This pasting, folding, and tucking usually occurs before the bag has been cut to length, and hence before the blank appears at the rolls 2. The said rolls therefore receive and convey the blank forward over the table 5 and into the channel formed between the two top and bottom pinching-plates 6, which are close together, so as to form a comparatively narrow channel and keep the folds of the blank intact and at times to grip the same, as hereinafter more fully described. These plates thus arranged serve as feed and holding plates for the folding-wings 7 and 8 at the middle or center of the machine and the side folders 9 and 10 at each side.

For convenience and simplicity in description the side wings and their operating mechanism at one side alone will be specifically described, because these parts are the same on both sides, and if the construction of one set of wings be understood both will be understood. Like parts upon the opposite sides also bear like designations.

The middle and larger wings 7 and 8 perform the larger part of the work in making the diamond fold; and in order that their construction and operation may be understood attention is first called to Fig. 14, where the said wings are in position to receive the bag-blank. It will be noticed that in this position they are nearly horizontal and very near to each other. It will also be noticed that they have upon their inside thin but fairly firm tongues 11 and 12, respectively, made of strips of suitable sheet or other light metal, the tongue 11 extending inward some distance beyond the wings 7 and 8 and to about the mouth of the channel between the two pinching and feeding plates 6 and 6.

These tongues may be, say, an inch or more in width, and the tongue 11 first enters the blank centrally, so as to separate its upper and lower folds, and the tongue 12 lies under the cover of the tongue 11 and takes the lower fold, and the two tongues together guide the blank into the relation and position shown in Fig. 14 and serve at last, by reason of their position and arrangement, not only as initial separating-fingers for the sides of the bag or blank, but as the blank slides up to the pinching-point, as in Fig. 14, to hold the sides at their centers against or with the wings 7 and 8, very much as they would be held between the thumb and forefinger of the hand, and their action is precisely the same as the action of the human fingers would be in the same place to hold the sides of the bag and help to spread them.

Over the upper wing 7 is a spring-pressed arm 13, which has a bearing through an opening in the wing 7 upon the top side of the bag and presses it against or upon the inner plate 14. To raise this spring-pressed arm when the parts are in the position shown in Fig. 14, so that the bag may move up into the wings into proper position to be held and folded, a bar 15, or its equivalent, is employed, which lifts the said arm momentarily as the bag slips under. Then as the wings begin to spread or open, the arm 13 at once bears down upon the bag, and it is held and the bottom folding occurs in the manner described. Now the further movement of these wings is toward the position shown in Fig. 18, where they stand in vertical and parallel planes. To reach this position, I employ a horizontally-sliding frame extending across the machine and having a base 16, with uprights 17 at its end, and sliding between two upper and lower guide-pieces 18 on the main frame of the machine, as seen in Figs. 7 and 17 and other views. This guide frame or table carries the folding-wings which make the diamond fold, and their opening and closing is related to the forward and backward movements of this frame, as hereinafter further described. Thus when the said frame is in the first or starting position it appears as shown in Figs. 11 and 12, plan view, and in Fig. 13, side view. In Fig. 11 there is shown a connecting-rod 19, pivotally united with the center of frame 16 at one end and at the other end with the horizontally-rotating arm 20. The arm 20 is on an upright shaft and is actuated by suitable gear on the shafts 20', 21, 22, and 23, and connecting thence with the power. When said crank-arm 20 is turned at right angles to the position shown in Fig. 11, the central folding-wings 7 and 8 are in the parallel vertical position shown in Figs. 15 and 16, and when the said arm has taken position at the opposite or other extremity of its throw the frame 16 is carried to the third position and the folding-wings 7 and 8 and the connecting mechanism are in the position shown in Figs. 19 and 20.

I have referred to the guide-plates 6 ar-

anged immediately before the folding-wings 7 and 8 and as providing a channel or passage-way for the paper to said wings. To do their work effectively and to perform their full function these plates should have a momentary pinching effect at their free ends at certain stages of the folding and the upper one of said plates should have a backward sliding movement in respect to the other, as will now appear. Thus, referring to Fig. 18, we see said plates 6 and 6 supported, respectively, on the shafts 25 and 26, the lower plate being rigid with shaft 26 and the upper plate fixed to yoke 27. Hence when the shafts are rotated toward one other the free end of lower plate 6 will be raised and the extremities of the plates be brought together to pinch and hold the blank, as in Fig. 18. Rotation of these shafts is effected through a sheave 27', Fig. 11, working on a stretched cable or cord 28. This sheave is supported in a vertical shaft 29, Fig. 9, and has gear meshing with another gear on the shaft 26. Shaft 26 has gears meshing with gears on the shaft 25, so that when the frame 16 moves from its starting or first position rearward the said shafts 25 and 26 are rotated toward each other.

The pinching of the blank is necessary in order that the folding may be perfectly accomplished, and the instant that the said plates 6 come together they can of course move no farther, and then as the frame 16, carrying sheave 27', moves forward to the second and third positions the sheave necessarily must slide on the cable 28. This operation not only continues through the operation of folding the bottom by means of the wings hereinbefore described, but until the parts assume substantially the position seen in Fig. 20. In this figure it will be observed that the blank is being delivered to the endless carriers 32 and 33 running over suitable rolls 34 and 35, and the lower plate 6 extends directly into the space between said rolls and carriers, while the upper plate is drawn back in respect to the lower one a sufficient distance to make room for the blank to be grasped between the said rolls. In Figs. 16 and 20 it will also be noticed that there is a fixed rod 36 centrally over plate 6, which has a stop-pin through its end, and the upper plate 6 has a stud or post 37, having said rod sliding through it. As the parts are carried forward by the sliding frame 16 toward the position shown in Fig. 20 the said stud comes in contact with said pin, and then as said frame slides farther along the said upper plate is detained, and the said plate has just enough sliding movement in its slots 31, Fig. 12, to allow this to be done. The said slots slide on the screws 31' at the sides of said top plate 6, and which holds it on brackets 27 at its sides. In this way the top plate 6 is temporarily carried back, as in Fig. 20.

Referring to the mechanism for taking the blank from the wings at Fig. 20, it will be seen that the upper rolls 34 and 35 are re-

duced at their center, while the lower rolls 34 and 35 are of the same cross-section throughout, and the upper belt 32 is only about half the width of the lower belt 33. However, any construction that will serve to promptly take the blank from the plates 6 and carry it forward for further treatment will serve the purpose of this part of the invention.

When the sliding carriage or frame 16 is returned to its starting position the plates 6 are again open, and remain that way until the carriage returns. The back-and-forth movements of the carriage necessarily are rapid, and the actions of the machine involved in the immediately foregoing description are in a sense momentary and can scarcely be observed with the eye because they are so speedy in operation. A leaf-spring 40, Fig. 8, bearing against the post 37, serves by its own action to carry the top plate 6 forward again, so as to bring its extremity again into proper engaging relation with the lower plate 6, this occurring when the said parts are moving back toward first position.

The folding-wings, central and side, supported by the carriage 16, are turned primarily by sheaves 42 and 43, which have wound about them the stretched cords or cables 44 and 45, Fig. 12. When the carriage 16 travels in either direction the said folding-wings are turned in one direction or the other, according to the direction of such travel, and connecting and actuating mechanism is provided for each of said sheaves, as shall now appear.

Referring to Fig. 21, it will be seen that upon the carriage 16 there is a bracket or end support 17, as hereinbefore described, and that in this arm or support is a shaft 47, which has a square or equivalently-formed body (seen also in Fig. 9) and is adapted to slide inward and outward within limitations, as the operations of the mechanism require. Upon this shaft is supported the pulley or sheave 43, having a long inwardly-extending sleeve 48, which goes to the inner extremity of the said shaft 47 and is held thereon by a nut to prevent its coming off. The shaft 47 has a splined portion 49, upon which the sheave 43 and its sleeve 48 are adapted to rotate, and they are caused to rotate by the cable or cord 45 about said sheave, as before described. At the side of the sheave 43 and on its sleeve is the sheave 42, which has a hub that turns freely upon the sleeve 48, and the said sheave 42 is prevented from sliding either to the right or to the left and is kept in its place to rotate therein by an elbow-arm 50, Fig. 21, rigid with bracket 17 and engaging a groove in the hub of the sheave 42. This sheave likewise is adapted to turn when the carriage 16 and the sleeve 48 upon which it rotates are moved back and forth. It will be observed, however, that the said sheaves 42 and 43 are oppositely wound by their cables, so that they will turn in opposite directions whichever way the carriage moves. Now, it will be further

seen that the wing 10 has a sleeve 52, held by a set-screw on the reduced extremity of the sleeve 48, so that it will turn therewith. By the side of this sleeve 52 is a segment 54, held within flanges or their equivalents on the sleeve 48 and adapted to turn thereon, and this segment is made rigid with the sheave 42 by means of a rod 55 fixed in said sheave and passing through said segment. The wing 9, Figs. 17 and 21, has a right-angled flange 56, through which it is firmly fixed to the segment 54, and each of the middle folding-wings 7 and 8 has a right-angled flange, through which it is rigidly secured to the initial extremity of the said rods 55.

Now, observing further the construction disclosed in Fig. 21, it will be seen that both the side folders 9 and 10 are supported on the sleeve 48, but that the wing 10 is rigid therewith and the wing 9 is free to rotate in respect thereto by reason of its control through sheave 42, rod 55 fixed therein, and segment 54. Hence any sliding of wheel 43 back and forth in respect to wheel 42—as, for example, from the wheel in full lines to the wheel in dotted lines—will carry both wings back with it. In like manner the movement of the said sheave 43 from the dotted position to the full position will carry the said wings 9 and 10 forward, as in Fig. 21. It will further be observed that, since wing 9 is rigid with segment 54 and middle wing 8 is rigid with the end of rod 55, which passes through said segment and is free to slide therein, the wings 8 and 9 will at all times sustain the same relation to each other in respect to their plane or face, so that if the wing 8 be in one or another of its positions in the three movements hereinbefore described the wing 9 will be in the same relative plane or position whether it be withdrawn from the bag or participating in the folding operation. It also is clear that since the sheaves 42 and 43, which control wings 9 and 10, are arranged to rotate in opposite directions they will also turn these wings in respect to each other according to the direction of their rotation. It therefore follows that when the wings 7 and 8 are in a vertical plane, Figs. 16 and 17, the wings 9 and 10 will be so far rotated as to stand in precisely the same plane therewith and they will occupy the position shown in Figs. 16, 17, and 18, where they overlap the corners of the middle wings and produce the half-diamond-shaped tuck of the paper indicated by 57 in dotted lines, Figs. 3 and 5.

It should be understood that when all the wings are at the initial position to begin the folding of the bottom of the bag the middle wings engage the edges across the bottom end, as seen in Fig. 14, and then the said wings 9 and 10 are brought practically together side by side and enter near the plaits or folds of the bag at about the point marked 58, Fig. 2. The two middle wings at the same time engage the edges marked 59 in said figure. Now, as the wings 7 and 8 spread toward and

take the half-way position, Figs. 16 and 18, the side wings are caused to open in like manner and degree and are brought to stand at the half-way place in the same plane with the middle wings, as shown in Figs. 16 and 17. Again, it may be said that when the parts reach this position the diamond fold shown in Fig. 3 is made, and it then only becomes necessary to throw the flaps or sides of the bottom, which now stand in vertical position, back into the position shown in Fig. 4, so as to get the bag into a position to carry it forward through the machine and do the further folding required. Hence as the carriage 16 and its associated mechanism move forward to the third position and the middle folders are thrown back, as shown in Fig. 20, the side wings 9 and 10 have done their work and are withdrawn and the top and bottom plates 6 release the bag and the bag becomes free to be fed into the rolls, as seen in Fig. 20. To effect this inward and outward movement of the side wings at the time and in the manner required to co-operate with the middle wings and the other parts of the machine, I employ two horizontal levers 60. (Shown in Figs. 12, 15, and 19.) These levers are pivoted at 61 and are provided with longitudinal slots 62, in which operate rollers 63, Fig. 21, on the stud 64 fixed upon the shaft 47. The bearing for this shaft, which is angular at this part, like shaft 47, is provided with a slot, in which the stud 64 is adapted to move back and forth, and at the other end of the lever 60, Fig. 12, there is another roller 65, which works upon the cam 66 fixed upon the cross-shaft 23, which is driven by gear and power connections at the other end, not necessary to particularly describe. This shaft 23 is so geared as to bring the cam 66 into action at the right times.

Now, following Figs. 12, 15, and 19 in succession, we find the shaft 47 moved inward and the wings 9 and 10 of consequence inward also to enter into the side folds or plaits of the bag for the purpose of turning the same in the fold, as hereinbefore described. This occurs before the frame 16 carrying the wings has begun to make its movement from first to second position. The said cam 66 holds the lever 60 with its slot 62 parallel to the sides of the machine, so that when the parts come to the middle position, as seen in Fig. 15, the said slots are still in parallel position and the wings are still projected inward and not withdrawn from the bag. All the wings are now in vertical position and the diamond fold is made. Now, since the side wings are no longer required and have done their work by tucking the stock in upon the sides, as indicated by 57, Figs. 3 and 5, they should be withdrawn, and they are withdrawn shortly after the carriage and its wings pass the center point in the slot 62, and then the side wings are withdrawn and all the parts take the position seen in Fig. 19. When this occurs the spring 68, which connects the inner ends of the levers 60, draws said levers to-

gether, throws the slots at the ends thereof at an inclination to the axis of the machine, and the side wings are drawn back, as shown in Fig. 19. They remain in this position until the parts are carried back to starting position and it becomes necessary that they be again thrust forward to engage the folds of the next blank and go through the same operation as before, and thus the action of these parts is repeated over and over as bag after bag is folded and passed through the machine.

It will, of course, be seen and understood that while the side wings upon the opposite sides of the machine are operated in exactly the same manner by similar mechanism, they move in reverse directions to each other by reason of being upon opposite sides of the machine. Furthermore, all the parts of the mechanism participating in the foregoing operations are arranged and connected to co-operate and to do their work automatically.

When the blank has been folded, as seen in Figs. 4 and 20, it is delivered through the carrying-rolls 34 and 35 and the endless carriers 32 and 33 over the same to the rolls 69 and 70, Fig. 22, and thence to the transferring device, having fingers 71 and 72, which takes the bag from said rolls. In order that the movement of the bag may be free and unobstructed as it enters the space between the rollers 69 and 70 I have deemed it best to make the roller 70 movable in respect to the roller 69, more or less. In this instance the roller 70 is shown as being swung with the shaft 73, Figs. 22, 24, and 25, on hangers 74, and the said shaft rotated by mechanism shown in Fig. 9. Thus there is fixed upon said shaft 73 an arm 75, and connected with this arm is the rod 76, which extends down to a cam-lever 77 (shown in dotted lines at the bottom of Fig. 9) pivoted at 78. The rod or bar 76 is pivotally secured to the free end of this lever, and a cam 79 on a rotating shaft 21 serves to depress the said lever at the proper times, and thus by drawing the bar 76 down rotate the shaft 73 sufficiently to carry the roller 70 up into position, as seen in full lines, Fig. 22. When the cam 79 has passed into the position shown in Fig. 9 the spring 81 restores the roller 70 to the position seen in Fig. 25 and in dotted lines, Fig. 9. The movement of this roller to and from position to engage the bag of course is rapid, and engagement is always effected at the right time and after the blank has passed into the position substantially as shown in Fig. 22. The blank is then fed forward to be gripped by the gripping-fingers 71 and 72. There are two sets of these fingers in pairs, as seen in Fig. 24, and they are supported on a shaft 83, which has a sheave 84 operated through the stretched cord or cable 85. The said shaft and its fingers are adapted to both rotate and to be swung together back and forth from gripping to releasing position. To this end the shaft is supported upon the posts or uprights 85, Fig. 22, pivoted at their lower ends upon the shaft 86,

In order that the said transferring device may be operated as and for the purpose specified, I employ a crank-arm 87, Fig. 11, which is secured to the short shaft 88 and has gearing 89 in the chain or power gear and so arranged and constructed as to do this work at the proper time. This crank-arm 87 is fixed upon shaft 88 and operates in a slot in one of the arms 85. As this crank revolves it carries the frame, consisting of the standards 85 and the cross shaft or bar 83, from the position shown in Fig. 22, which is its receiving or gripping position, to the position shown in Fig. 25, which is its releasing position. As this occurs the said shaft 83 is rotated in the arms or standards 85 by and through the sheave 84 and the cable 85' around the same. In this action the fingers rotate around beneath the said shaft, and the action is such as to throw the wing α of the bag-bottom into the space between the pasting-roller 90 and the large roller 91 beneath, Fig. 25. Now, in order that the fingers 71 and 72 shall be in position and relation to both grip and release the blank it is necessary that they should close and open for that purpose. To this end I have provided the mechanism shown in Figs. 22, 24, 25, and 26. As already indicated, the standards 85 and shaft 83 at their top swing back and forth together from the rolls 69 and 70, where the gripping-fingers receive the blank, to the position substantially as shown in Fig. 25, where they release the blank to the rolls 90 and 91. In this operation the shaft 83 makes a half-way rotation within fixed limits, front and rear, by a crank-arm 92, Fig. 24, fast on its farther extremity and adapted to engage under the frame 93 and limit the rotation of the shaft, so that the gripping-fingers shall be in the right position, first, to receive the blank, and, secondly, to discharge it. This crank is held by a set-screw and is adjustable rotarily to fix the location of the gripping-fingers.

An additional and important element in connection with this transferring mechanism is the box 94 on the shaft 83 near the opposite end from the crank 93, and shown in elevation in Figs. 22 and 26. This box is adapted to slide lengthwise of itself upon the shaft 83, which is rectangular in cross-section at the box and is enlarged or deepened upon one side about half its length, as shown at 95, and a flat strip 96 lies longitudinally upon the shaft 83, as seen in end view in Fig. 22 and in plan in Fig. 8, across the fingers 72.

It will be noticed that the gripping-fingers 71 and 72 are hinged together at their connected ends and that the fingers 71 are rigidly fixed to the shaft 83 by screws, while the fingers 72 are adapted to open and have no connection with the shaft 83, except an indirect one. However, the flat strip or piece 96 lies across the finger 72 in line with the shaft 83, and thumb-screws and springs 97 pass through the said strip and through the fingers 72 into the shaft 83, and the springs tend normally to keep the fingers closed.

Referring now to Fig. 22, it will further be seen that a lever 98 is pivoted at about its middle on the inside of the near arm 85, and near the top of said arm, and is provided with a spring 99 on its lower end to keep it normally in a certain position. This lever is beneath the box 94 on shaft 83 and has its upper end projecting high enough to engage said box at certain times and for certain purposes, as will now be indicated. Thus suppose that the transferrer be in the position substantially as shown in Fig. 25. When this occurs, the lever 98 will bear against the extremity 100 of the bracket. (Shown centrally in Figs. 24 and 26.) Then as the crank 87, Fig. 25, makes a further rotation and carries the transferring device slightly farther backward the box 94 on shaft 83 will contact with the lever 98 and the flat cross-strip 96 will be forced to ride up on the enlargement 95 and thus open the fingers 72. Now, of course, the blank or bag is released and it passes through the rolls 90 and 91, in which flap α has been previously engaged. The gripping-fingers will remain in this open position as they are reversed to the gripping position, Fig. 22, and in coming back to this position they are inverted, as compared with Fig. 26; but in all other respects their relation and connection remains unchanged. When they come to this latter position, Fig. 22, and the bag-blank enters between them, it is desirable that the fingers should be closed immediately upon the blank, and this is accomplished by forcing the box 94 forward through the operations of the lever 98, bearing, in this instance, against the post or arm 102 at its bottom and carrying the flat strip 96 to the reduced surface 103 of the said box and thereby permitting fingers 72 to close under the pressure of the spring mechanism 97 bearing thereon. Then, having gripped the bag, the standards and their parts are carried back again by crank 87 to the discharge position in Fig. 25 and the action before described is repeated. After the bag has been received between the rolls 90 and 91 and the necessary paste is applied by the roll 91 from above the blank or bag b passes on through the creasing-roll 104, having two creasers 105 and 106. These crease the bottom across lines c and d at the point where the extremities of the diamond fold are folded back upon the bottom and pasted down, thereby making the bottom perfectly square, as clearly seen in Figs. 23 and 27. After passing through between the creasing-roll and the bottom roll 91 the blank is ready for the finishing work and naturally drops down behind the roll 91. As this occurs the flap α is engaged by the curved arm 107 and pressed against the said roll, so as to take the fold seen in Fig. 23. After the blank has passed sufficiently far to allow the second crease c to come behind the roll 91 the hook-shaped arm 112 on the shaft 113, and closely following after arm 107, comes in position to strike the blank above and behind the crease and causes

the upper flap *g* of the bag-bottom to be folded, as seen in Fig. 27. This completes the folding, and the bag then passes on between the endless carriers 109 and 110 and thence off to the drier on the endless apron 111, Fig. 25. The entire work from first to last is mechanical and automatic, and all the parts work in perfect harmony and successively as they are required.

10 Having thus described my invention, what I claim is—

1. The machine described, having a pair of central folding wings constructed to grip the edges of the bottom of the bag transversely, side folding wings to enter the side plaits of the blank, and mechanism to turn said central and side wings together into parallel planes, substantially as set forth.

2. The construction described, comprising 20 a pair of plates arranged to grip the bag blank across the center of the diamond fold, at its back, a pair of central folding wings, constructed to grip the edge of the blank and opposite pairs of side folding wings to 25 fold the side edges of the blank, substantially as set forth.

3. The folding mechanism described, consisting of a pair of opposite pinching plates arranged to momentarily grip the blank while the bottom thereof is being folded, the central folding wings constructed to grip the edge of the blank, and the side folding wings, and mechanism connected with said wings to turn them together from the initial position 30 to a parallel vertical plane, and thereby produce the "diamond fold" of the blank, substantially as set forth.

4. The folding mechanism consisting of the central folding wings, folding wings at each 40 side of the central wings arranged to enter the sides of the blank and to turn and spread the same, a pair of pinching guide plates for the blank adapted to be moved in respect to each other and to the central wings and a 45 sliding frame carrying said central and side wings, substantially as set forth.

5. In a paper bag machine, a pair of pinching guide plates before the folding wings and separate shafts supporting said plates and 50 one of said plates constructed and arranged to move longitudinally in respect to the other, and the central and side folding wings substantially as set forth.

6. The pinching guide plates and separate 55 shafts on which said plates are supported, mechanism to rotate said shafts, and mechanism to slide one of said plates back and forth in respect to the other, substantially as set forth.

60 7. The mechanism described, consisting of a sliding carrier frame, a pair of central folding wings and a pair of side folding wings on each side of the central wings supported upon said frame, and mechanism upon said 65 frame to rotate said wings and fold the end of the bag blank, substantially as set forth.

8. The machine having a horizontally slid-

ing carrier frame, central and side folding wings supported on said frame, and mechanism connecting each of said side wings and 70 one of the central wings rigidly together for rotation one with the other and sliding shafts supporting said mechanism, substantially as set forth.

9. In a paper-bag folding machine, a sliding 75 carrier frame, central and side folding wings supported upon said frame, a horizontal arm upon each side of said frame pivoted on the main frame and slotted at its end, and mechanism engaged in said slot to carry the side 80 folding wings inward and outward in respect to the central wings, substantially as set forth.

10. The sliding carrier frame, the central and side wings supported thereon, separate shafts upon opposite sides of said frame extending toward each other, side folders supported upon the ends of said shafts, and a 85 horizontal lever on each side of the machine having a slot in its end engaging a projection on the corresponding shaft, substantially as 90 set forth.

11. The side wings and the central wings for folding the bottom of the bag, the sliding carrier frame supporting said wings, a longitudinally sliding shaft on each side of said 95 frame and carrying the said wings, a horizontally pivoted lever on each side of the machine in one end of which one of said sliding shafts engages, and mechanism at the opposite end of said lever to move the same at intervals, 100 whereby as said levers are moved the shafts carrying the folding wings are moved, substantially as set forth.

12. The main frame, the sliding carrier frame thereon, and the central and side fold- 105 ing wings upon said carrier frame, in combination with horizontally arranged arms upon the sides of the machine constructed to connect with and operate the said folding wings, and mechanism to move said sliding carriage 110 back and forth, substantially as set forth.

13. The main frame, the movable carriage thereon, and the folding wings carried by said carriage, said folding wings having connected therewith sliding shafts on each side of the 115 machine, horizontally arranged arms to actuate said shafts, mechanism to operate said arms, and mechanism to move said carriage back and forth, substantially as set forth.

14. The main frame and the movable car- 120 rier frame, a pair of shafts extending each transversely of the machine and having folding wings operated from their inner ends, in combination with said wings and with horizontally arranged actuating levers having 125 slots at their ends through which said shafts are engaged, substantially as set forth.

15. The mechanism herein described for operating the middle and side folding wings consisting of a sliding frame, a pair of shafts 130 supported upon said frame transversely thereto, the folding wings and mechanism supporting said wings upon said shafts, pulleys on said shafts and cables to turn the same, and

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a horizontally arranged lever upon each side of the machine and having a slot at one end through which the shaft upon that side of the machine is engaged, whereby the said shafts
5 are rotated and moved inward and outward at the same time, substantially as set forth.

16. The mechanism described, consisting of a shaft, gripping fingers supported upon said shaft, and a pulley and cord for rotating
10 said shaft, pivoted supports carrying said shaft, and a crank to actuate said supports and carry them back and forth, whereby the bag blank is received by the gripping fingers at one extremity of its throw, and is
15 delivered to the carrying rolls at the other extremity of its throw, substantially as set forth.

17. In a machine as described, the shaft carrying the gripping fingers, and gripping fingers upon said shaft constructed to open and
20 close, and mechanism connected with said shaft and said fingers comprising a sliding box supported on said shaft and means to bear against said box, substantially as set forth.

25 18. The machine having a transferring device, consisting of a series of fingers, hinged together and a shaft supporting said fingers having one of each set fixed rigidly thereto and a pivoted frame carrying said shafts, and

mechanism to open and close said fingers at
the extremities of the throw of the said device to one position and the other, in combination with a rotating shaft having a crank working in said pivoted frame, whereby said frame is moved back and forth, substantially
35 as set forth.

19. The mechanism described, consisting of the carrying roll, the pasting roll and the creasing roll above said carrying roll and bearing thereon, and a device constructed to fold
40 the blank and bear it against the carrying roll, said device constructed to engage the opposite flaps of the blank successively, substantially as set forth.

20. The mechanism described for completing
45 ing the folding of the blank, the creasing roll and the carrying roll, and rotating members constructed to fold the flaps of the blank successively and to bear the said flaps against the said carrying roll and complete the bag,
50 substantially as set forth.

Witness my hand to the foregoing specification this 18th day of May, 1894.

SIMON E. PETTEE.

Witnesses:

H. T. FISHER,
GEORGIA SCHAEFFER.