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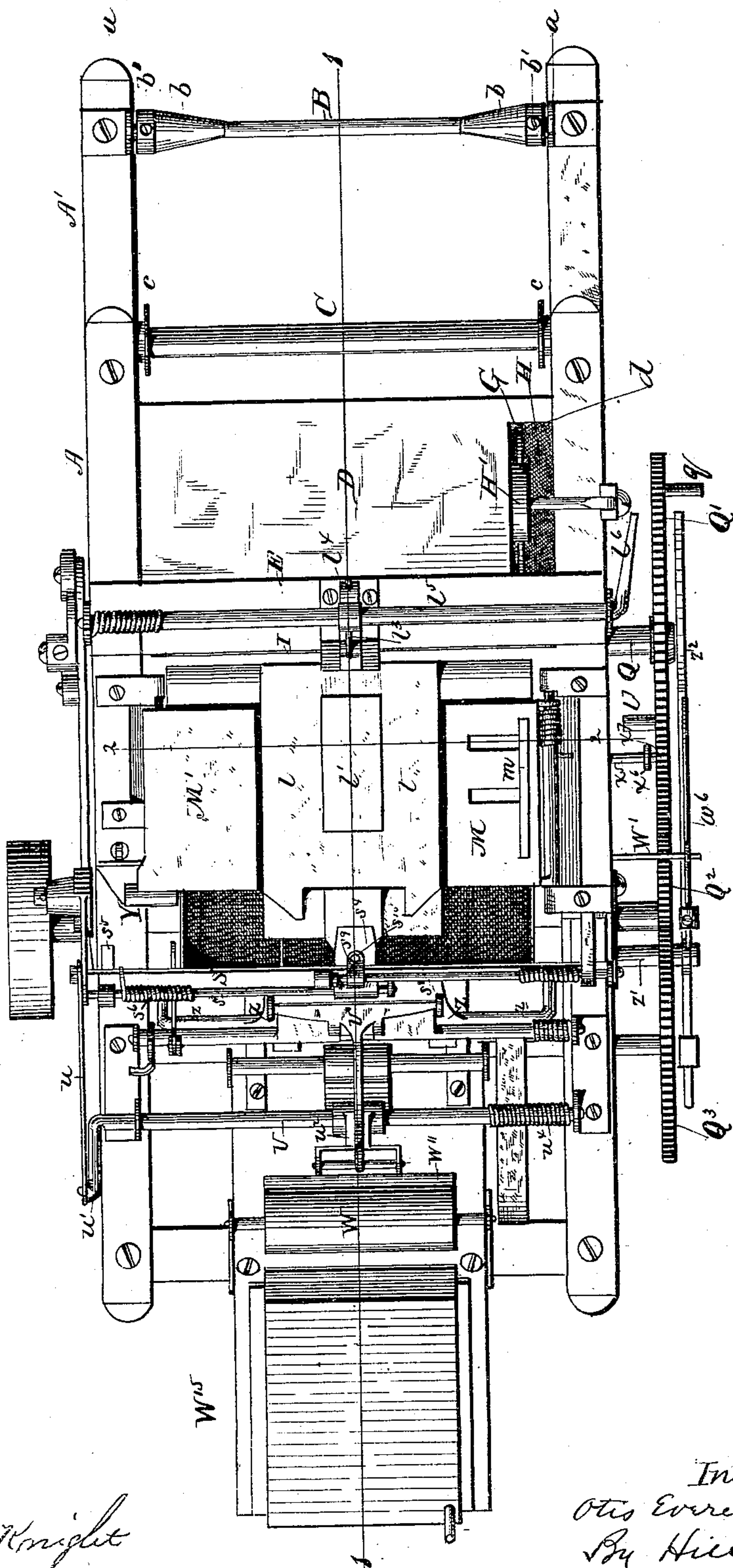
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O. E. DAVIDSON.  
Paper Bag Machine.

No. 234,544.

Patented Nov. 16, 1880.

Fig. 1.



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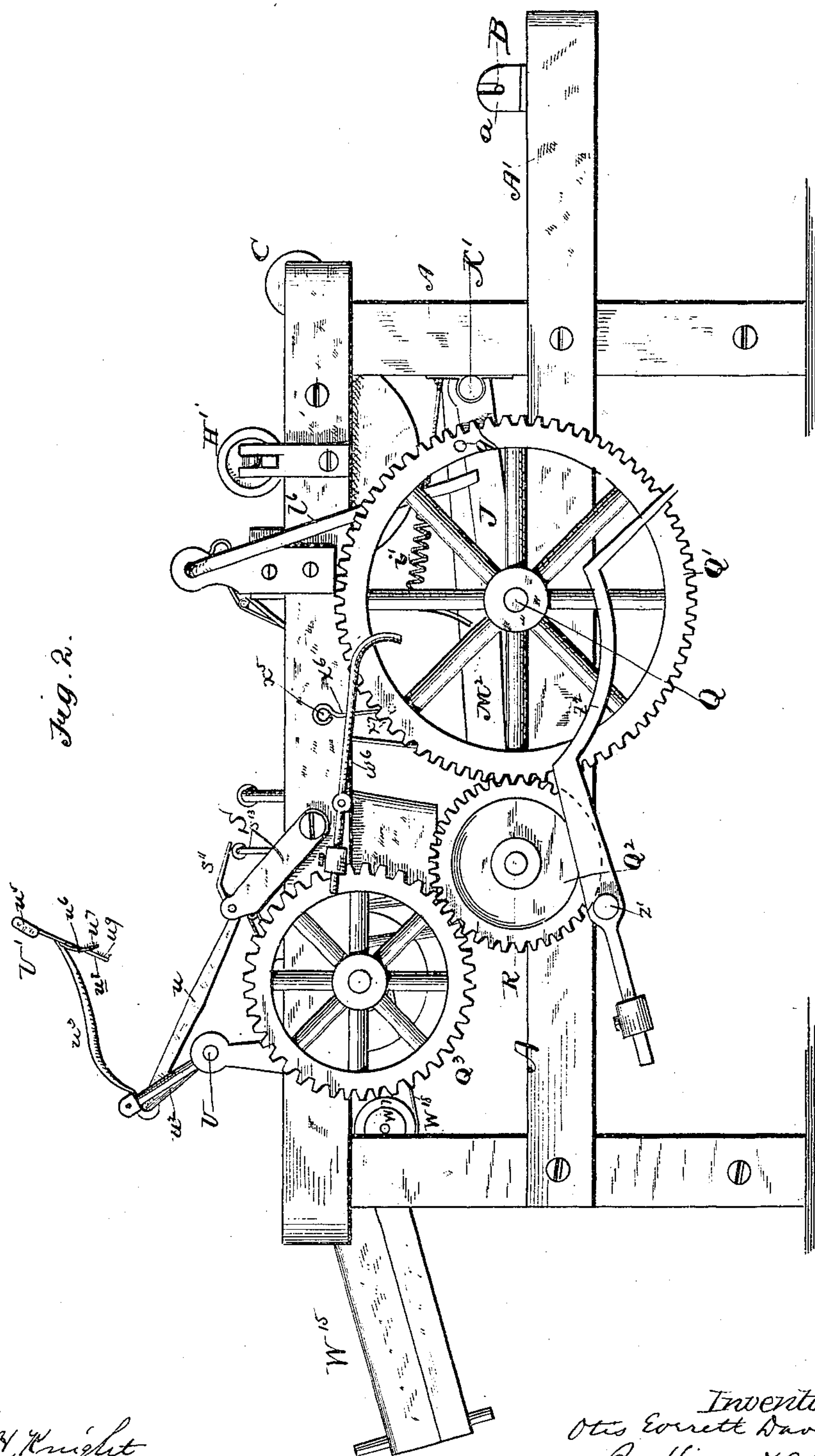
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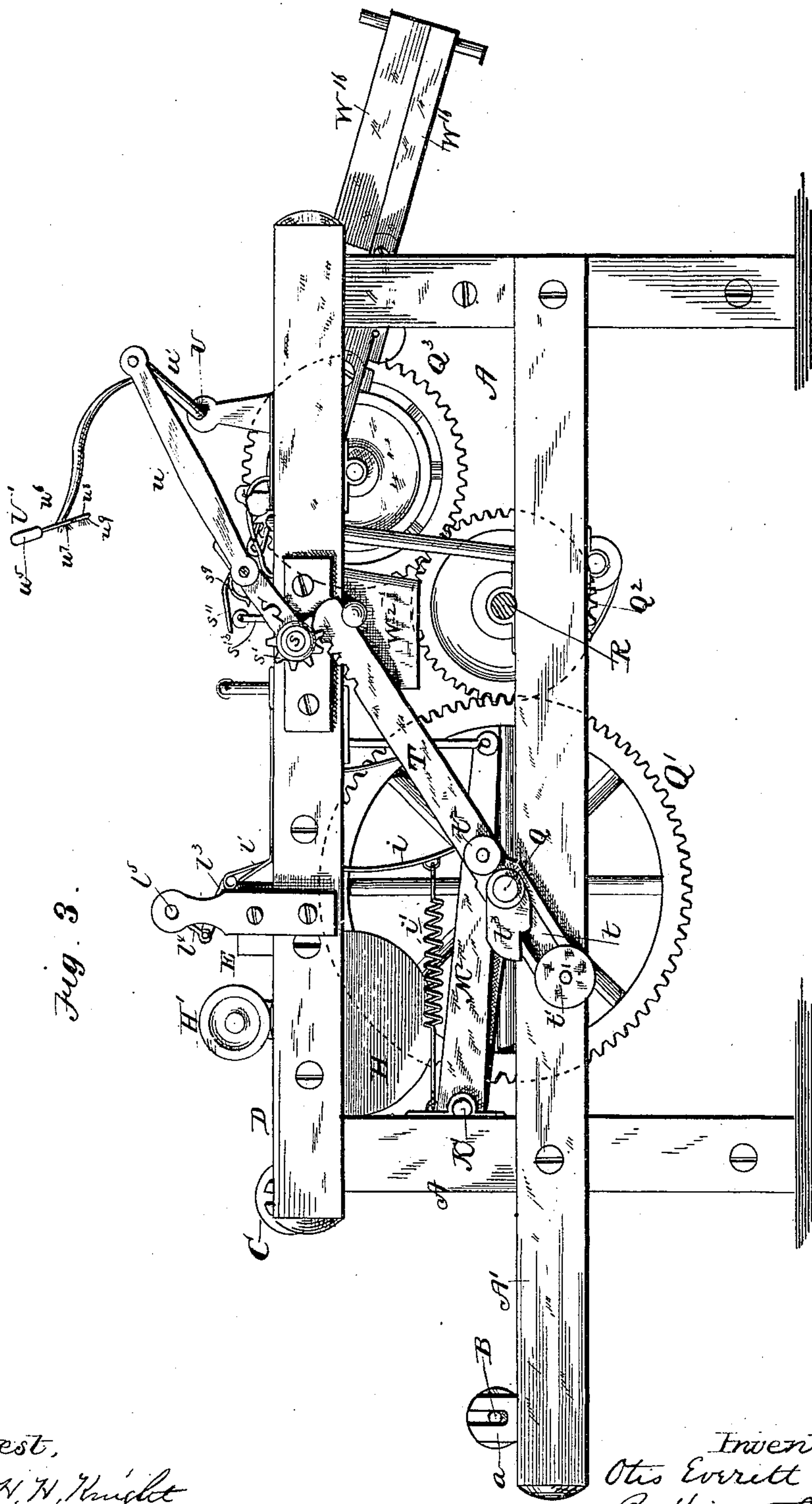
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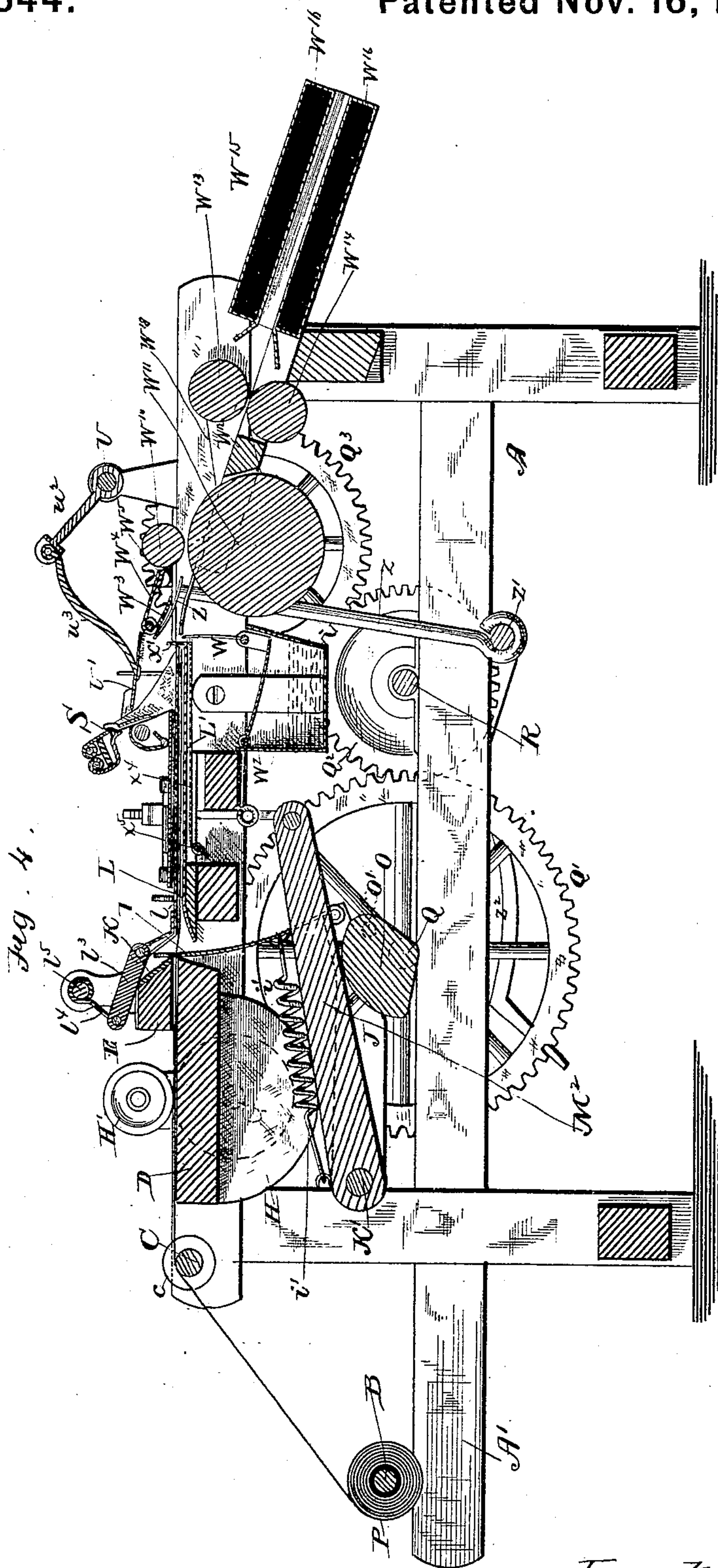
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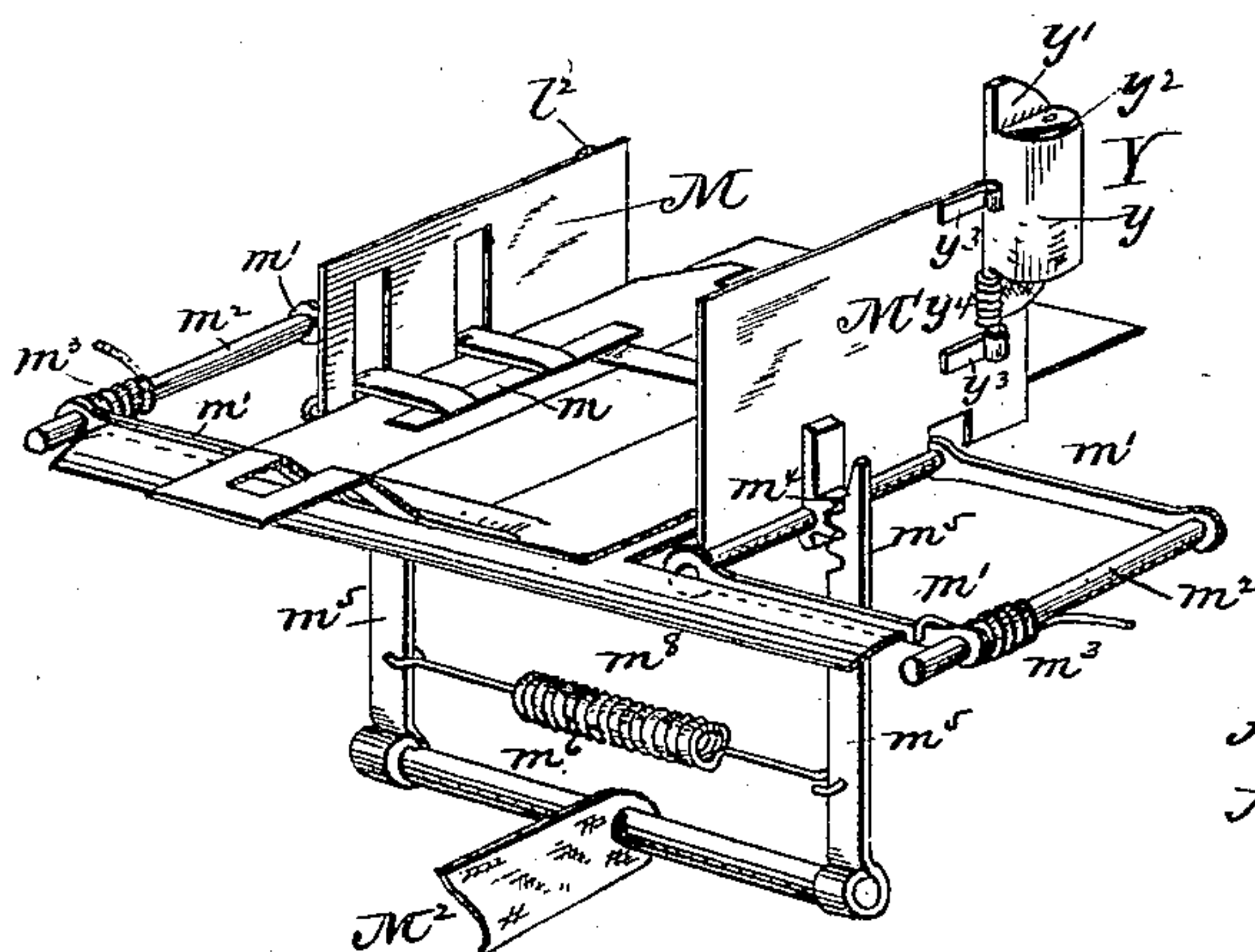
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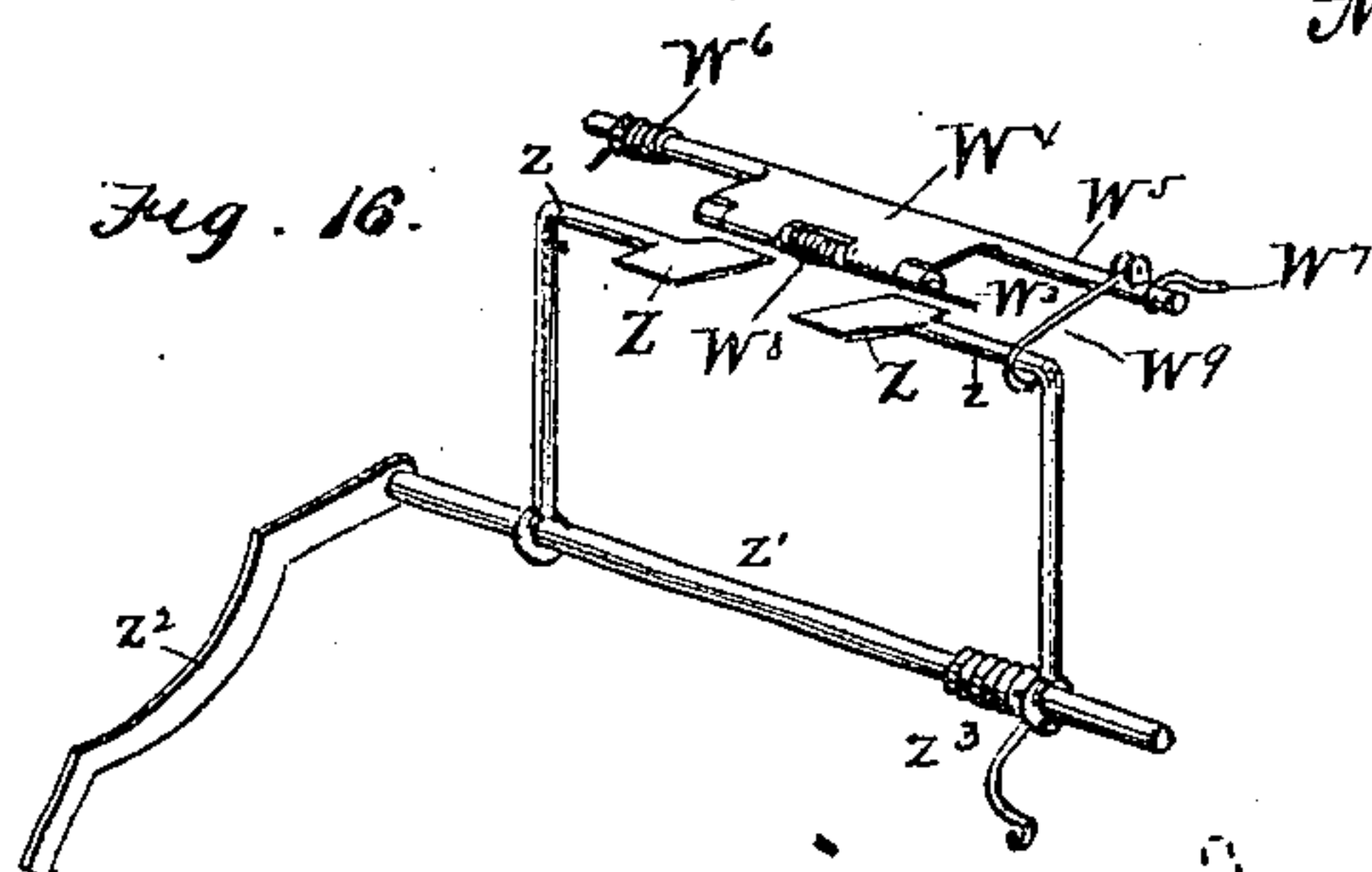
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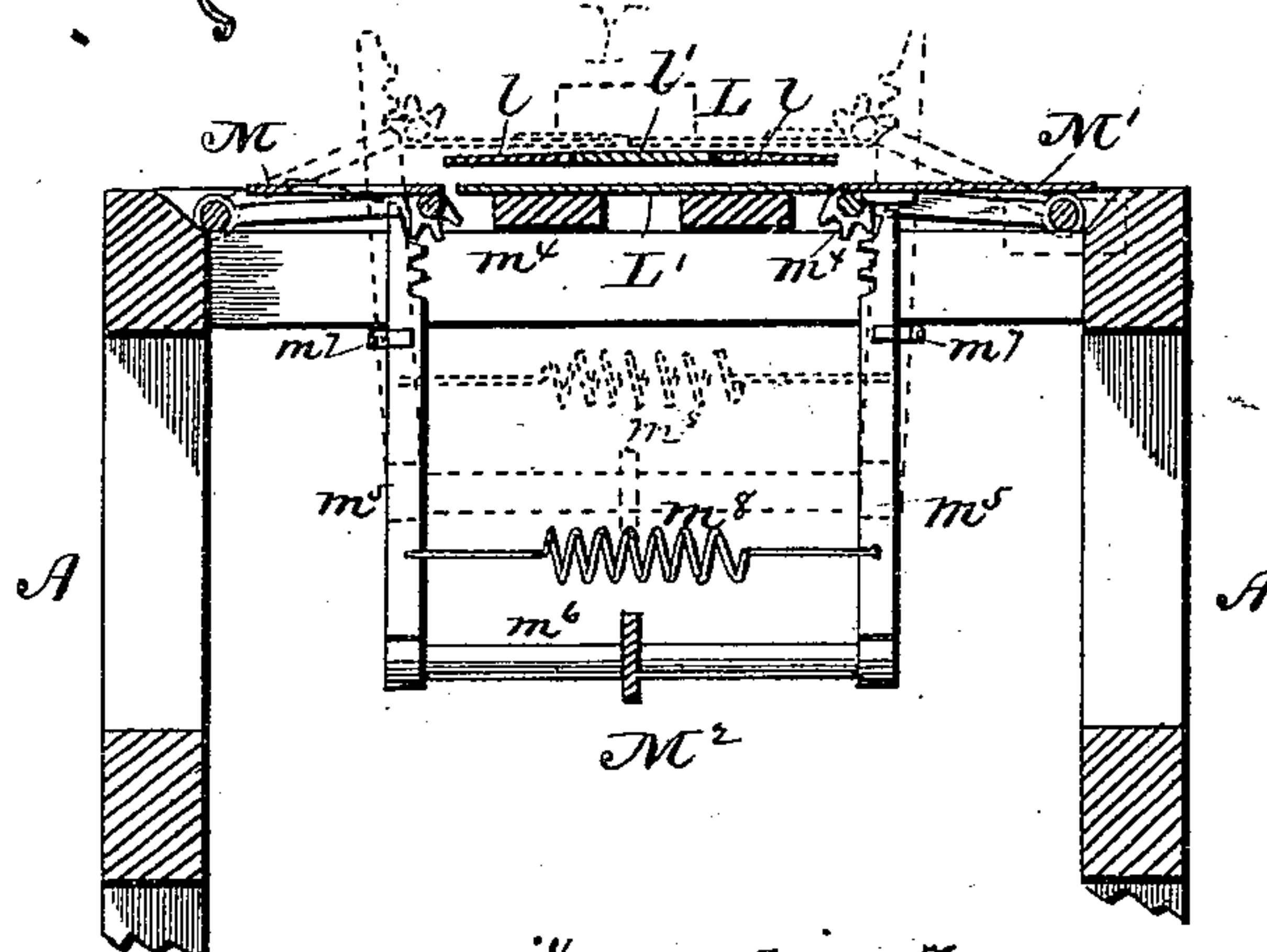
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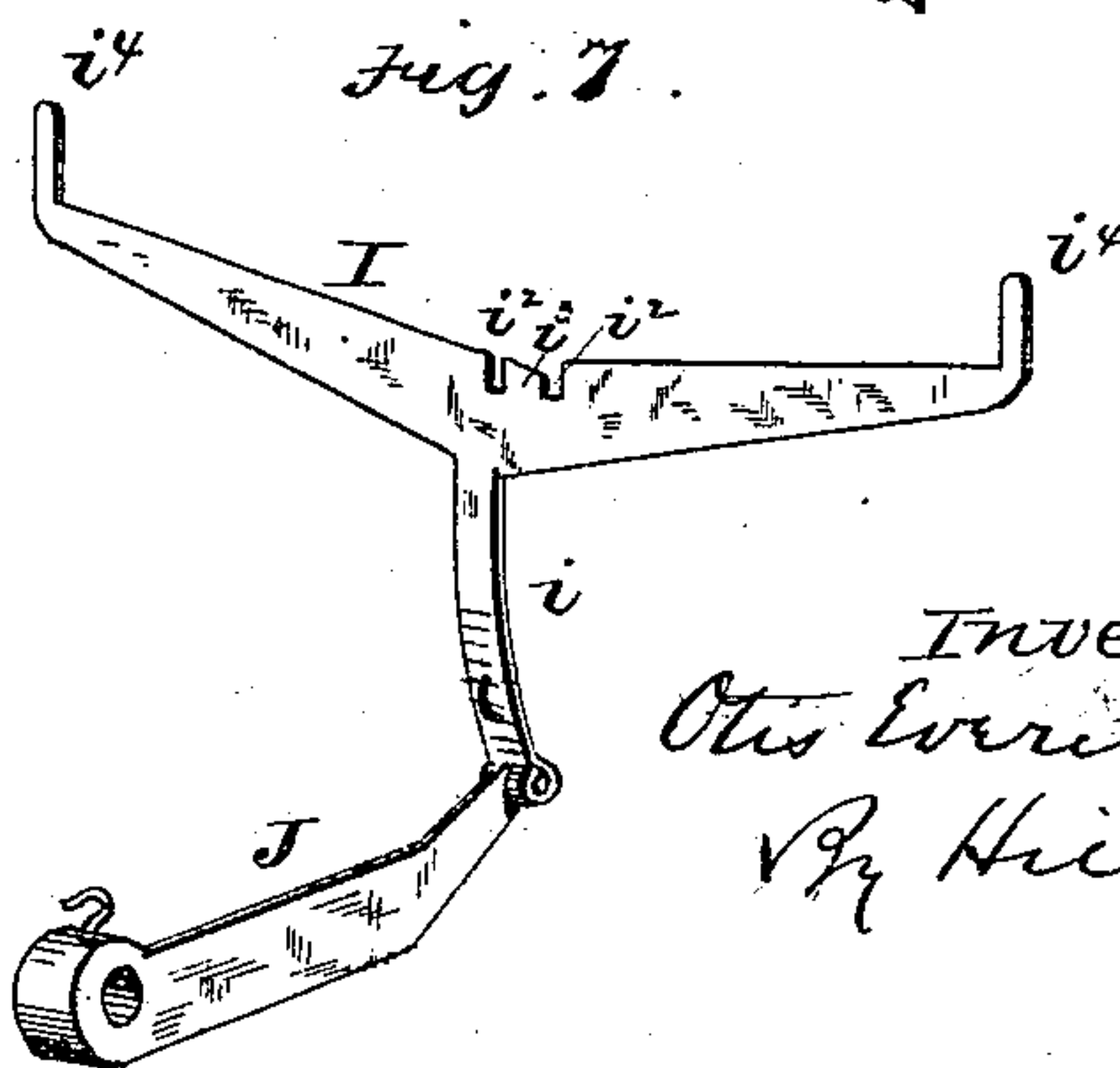
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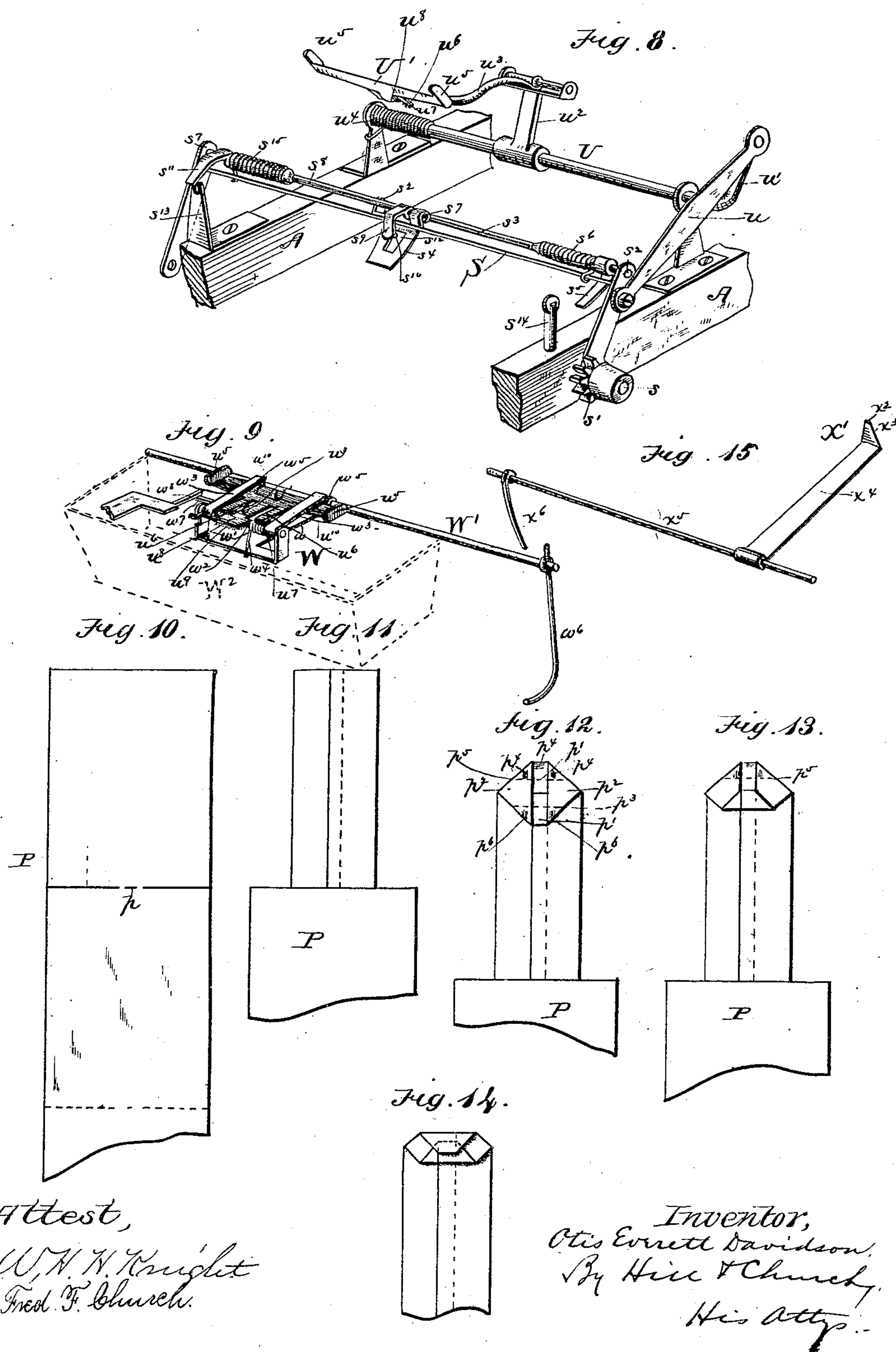
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# UNITED STATES PATENT OFFICE.

OTIS E. DAVIDSON, OF NASHVILLE, TENNESSEE.

## PAPER-BAG MACHINE.

SPECIFICATION forming part of Letters Patent No. 234,544, dated November 16, 1880.

Application filed July 8, 1880. (Model.)

*To all whom it may concern:*

Be it known that I, OTIS EVERETT DAVIDSON, of Nashville, in the county of Davidson and State of Tennessee, have invented certain new and useful Improvements in Paper-Bag Machines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a top-plan view; Figs. 2 and 3, elevations from opposite sides; Fig. 4, a longitudinal vertical section taken on the line 1 1, Fig. 1; Fig. 5, a perspective view of the mechanism for forming the longitudinal seam of the bag; Fig. 6, a sectional view of the same, taken on the line 2 2, Fig. 1; Fig. 7, a perspective view of the cutting-knife and its connections; Fig. 8, a perspective view of a part of the mechanism which forms the bottom of the bag; Fig. 9, a perspective view of the paste-applying devices. Figs. 10, 11, 12, 13, and 14 represent the bag at various stages of its development; Fig. 15, a perspective view of the knife which operates to sever the completed bag from the strip of paper; Fig. 16, a perspective view of the carrying-plates and final-fold mechanism; and Fig. 17, a sectional view, showing the grooved rib on the folding-wings and the creasing and smoothing blade which co-operates with it.

Similar letters of reference in the several figures denote the same parts.

This invention has for its object to improve the construction and operation of that class of paper-bag machines which are adapted to form a bag with a single lengthwise lap or seam and a satchel-bottom, in respect, first, to the means for applying the paste to the strip for the longitudinal lap or seam; secondly, to the mechanism for partly severing the blank from the strip of paper; thirdly, to the means for operating the folding-wings which form the longitudinal lap or seam; fourthly, to the means for opening the bottom of the blank, folding the same, and applying the paste thereto; fifthly, to the final-fold mechanism; sixthly, to the devices for finally severing the completed bag, and, lastly, in the construction and combination of the various parts of the mechanism, all as I will now proceed to describe.

In the drawings, A represents the main frame of the machine, constructed of wood or metal, or both, and of the general form shown. 55

On an extension, A', of the frame is mounted a spindle, B, containing the roll of continuous paper, P, from which the bag-blanks are cut. The spindle is provided with adjustable sleeves or heads *b*, having conical inner faces and set-screws *b'*, by which to securely hold them to the spindle. When the roll of paper is slipped onto the spindle the heads are adjusted so that their conical portions enter the ends of the roll, and the screws are then tightened. By this means the roll of paper is held securely between the heads, and any longitudinal movement of the roll is prevented. The ends or journals of the spindle have their bearings in slotted lugs *a*, secured to the extension A' of the frame, and are adapted to turn freely therein. 60 65 70

The strip or web of paper passes from the roll P up over a guide-roll, C, and thence across a table, D, under a cross-bar, E, to the mechanism by which the blank is formed and folded, as will be presently explained. Circular flanges *c c* are provided at the ends of the roll C, for the purpose of guiding the strip of paper properly as it passes into the machine. 75 80

A slot, *d*, is made in the table D, near one of its side edges, and through this slot projects a paste-wheel, G, having its bearings in a paste-box, H, arranged below the table, as shown. The wheel G is adapted to rotate within the paste-box and dip into the paste therein, and its periphery projects slightly above the surface of the table D, and applies a line of paste along one edge of the paper as it passes over it. To insure the application of the paste a bearing-roll, H', mounted on a short hinged shaft, is employed. This bearing-roll, when the machine is in operation, rests upon the paper and presses the latter lightly against the paste-wheel; but when the paper is not running into the machine the bearing-roll is swung back out of the way, so as not to come in contact with the paste-roll. The strip of paper passing in under the cross-bar E is next subjected to the action of a cutting-knife, I. This knife is of angular form, as shown in Fig. 7, and cuts against the edge of an inclined metal plate, K, secured to the cross-bar. The 85 90 95 100



shank  $i$  of the knife extends down and is articulated to the outer end of an arm or lever, J, pivoted to a cross-shaft, K', and a spiral spring,  $i'$ , connected at opposite ends to the shank and the rear portion of the lever J, operates to hold the blade of the knife close against the edge of the plate K and insure a proper cutting action. A vertical reciprocating movement is imparted to the knife at regular intervals by means of a lateral pin, O', projecting from a cam, O, on a shaft, Q, striking against the under side of the arm J. The cutting-edge of the knife is slotted or broken away at  $i^2 i^2$ , so as to leave a projection or point,  $i^3$ , between the slots, and said point or projection is beveled off or sharpened, as shown. It results from this construction that when the knife ascends it co-operates with the metal plate K to sever a blank from the body of the strip of paper, except at the points opposite the slots  $i^2 i^2$ , where the paper remains unsevered, and forms a connecting-piece between the blank and the paper strip. The slit or opening  $p$ , made by the point  $i^3$ , remains open, and serves as a guide for the insertion of the knife-blade, which finally severs the connecting-piece, as will be hereinafter explained. A vertical arm or projection,  $i^4$ , is provided at each end of the cutting-blade I, for the purpose of affording a bearing against the edge of the table D when the cutting-blade is at its lowest position. Passing by the cutting-blade, the strip of paper enters between what I term the "upper" and "lower" plates, L and L', of the former, and over the folding plates or wings M M'. Simultaneously with the operation of the knife I the folding-wings are swung inward, carrying with them the sides of the blank.

The wing M is made slightly narrower than the wing M', so as to expose the edge of the side of the blank which it folds down, (and which edge, it will be remembered, is the one to which the paste-wheel has applied the paste,) and enable the wing M' to close the edge of the other side down upon said first-mentioned edge and cause the edges to unite and form the longitudinal seam or lap of the bag.

As it is essential that the side of the blank operated upon by the wing M should be brought down first, in order that the other side of the blank may be closed down upon it to paste the parts properly together, I provide the wing M with a pivoted gravitating leaf,  $m$ , which, when the wings are turned inward, drops in advance of them, and carries with it the pasted side of the blank, down upon the upper former-plate, L, before the wing M can bring down the other side of the blank, as will be readily understood.

Each of the wings M M' is hinged at its inner edge to a pair of arms,  $m' m'$ , secured to a short shaft,  $m^2$ , and a spiral spring,  $m^3$ , operates to keep the wing normally pressed down flush with the top surface of the under former-plate, as shown. Each wing is also provided near its inner edge with a cogged segment,  $m^4$ ,

with which a vertical rack-bar,  $m^5$ , is adapted to engage. The rack-bars are mounted on the ends of a cross-bar,  $m^6$ , on an arm or lever, M<sup>2</sup>, and slide in guides  $m^7 m^7$ , and they are kept in engagement with the cogged segment by a spiral spring,  $m^8$ , as shown. The arm or lever M<sup>2</sup> is secured to the rock-shaft K', and an intermittent motion is imparted to it by the cam O on shaft Q. The latter shaft is geared by wheels Q' Q<sup>2</sup> to the main driving-shaft R.

The lifting of the arm or lever M<sup>2</sup> by the cam O causes the vertical rack-bars to operate on the cogged segments and close down the wings M M'. When cam O raises the lever M<sup>2</sup> it also, by means of a pin, L, lifts the arm J and causes the knife I to ascend and nearly sever the blank, as before explained. It will thus be seen that the operation of the knife and the closing down of the wings to form the lengthwise seam or lap of the bag are performed concurrently.

The next operation is to so manipulate the bottom end of the paper tube, formed in the manner above described, as to form a satchel-bottom to the ultimate bag. This is accomplished by the following mechanism: S is an oscillating bar or frame extending transversely over the main frame of the machine and pivoted at the sides thereof at  $s s$ . A cogged segment,  $s'$ , is formed upon, or otherwise secured to, the bearing portion on one side of the frame S, and with said segment engages a rack-bar, T, having a slot,  $t$ , at its lower end, for the accommodation of the shaft Q, and having friction-rollers  $t' t^2$  at the extremities of said slot, against which a cam,  $t^3$ , on the end of shaft Q, is adapted to alternately strike when said shaft is rotated.

Mounted upon the top of the frame S, in bearings  $s^2 s^2$ , is a metal rod,  $s^3$ , to the inner end of which is secured a metal tongue or blade,  $s^4$ , and to the outer end a curved operating-arm,  $s^5$ . A spring,  $s^6$ , coiled about the rod, operates to keep the metal tongue depressed, as shown in Fig. 8. Also, mounted upon the top of the frame S, in bearings  $s^7 s^7$ , is a second rod,  $s^8$ , to the inner end of which is secured a gripping-arm,  $s^9$ , having a point,  $s^{10}$ , and to the outer end an operating-arm,  $s^{11}$ . A spring,  $s^{15}$ , coiled about the rod  $s^8$ , operates to project the point  $s^{10}$  of the gripping-arm into an opening or slot,  $s^{12}$ , in the metal tongue or blade  $s^4$ , when the frame S is oscillated forward. Connected to one of the side arms of the frame S is one end of a pitman,  $u$ , its other end being connected to a crank,  $u'$ , on the end of a cross-shaft, U. A bracket,  $u^2$ , is secured to the middle of this cross-shaft, and to said bracket is pivoted the shank  $u^3$  of a smoothing and creasing blade, U'. A spring,  $u^4$ , coiled about the shaft U, exerts its tension to rotate the shaft backward.

When the frame S is in its normal position the operating-arm  $s^{11}$  of the rod  $s^8$  is held elevated by a fixed stop,  $s^{13}$ , secured to the top of the main frame, and the gripping-arm  $s^9$  is



also kept raised while the tongue  $s^4$  bears upon the end of the stationary part  $l'$  of the upper former-plate, L, within the bottom end of the paper tube. Immediately after the side seam or lap of the tube is completed, and while the folding-wings are still down upon the body of the tube, the cam  $t^3$  on shaft Q, striking against the friction-roller  $t^2$  on the bar T, causes the frame S to be oscillated forward. During such forward movement the arm  $s^{11}$  on rod  $s^8$  is disengaged from the stop  $s^{13}$ , thus permitting the spring  $s^{15}$  to force the point of the gripping-arm  $s^9$  through the lapped portion of the paper tube and into the opening  $s^{12}$  in the metal tongue, and secure a firm hold on the paper. The opposite side of the end of the paper tube being held by the stationary part  $l'$  of the upper former-plate, L, it follows that as the gripping-arm and tongue continue to advance the sides  $p'p'$  of the tube will be opened out and the ends  $p^2p^2$  will be folded in, as shown in Fig. 12. Just before the gripping-arm and tongue reach the limit of their forward movement the smoothing and creasing blade  $U'$  drops down upon the portion  $p^2$  of the folded end of the tube, which lies upon the end of the upper former-plate, and, advancing, smooths or irons out such portion. When the smoothing-blade reaches the limit of its forward movement its edge presses the paper tightly against a grooved rib,  $l^2$ , on the wings  $MM'$ , (shown in Fig. 17,) and forms the crease  $p^3$ , as shown in Fig. 12. Lugs or flanges  $w^5w^5$  are formed on the ends of the blade  $U'$ , for the purpose of preventing the edge of the blade from catching under the edges of the folding-wings  $M M'$  as the blade moves forward.

The blade  $U'$  has two small rearwardly-projecting spring-arms,  $w^6w^6$ , which are provided on their under sides, at the ends, with paste-brushes  $w^7w^7$ , and it also has a third spring-arm,  $w^8$ , which carries another brush,  $w^9$ , that is at right angles to the brushes  $w^7w^7$ .

W is a paste-applying device, consisting of an arm,  $w$ , secured to a rod or shaft,  $W'$ , and having a cross-bar,  $w'$ , which is bent up at its ends to form bearings for a small shaft,  $w^2$ . This small shaft is preferably covered with felt or other material that will hold paste, and to it are secured two thin spring-arms,  $w^3w^3$ , and a coiled spring,  $w^4$ , to throw said arms backward. The arms  $w^3w^3$  are provided with brushes  $w^5$  on the under sides of their outer ends. The arm  $w$  is adapted to work in and out of a paste-box,  $W^2$ , filled with paste, and receives its motion from a pin,  $q$ , on the side of a wheel,  $Q'$ , which strikes a crank-arm,  $w^6$ , secured to the end of the shaft  $W'$ .

As the smoothing and creasing blade  $U'$  drops down and starts to move forward, the pin  $q$  strikes the crank-arm  $w^6$ , and causes the arm  $w$  and its attachments to be raised out of the paste-box and lifted till the felt-covered shaft  $w^2$  comes in contact with the brushes  $w^7w^7$  of the blade  $U'$  and transfers paste thereto.

One of the spring-arms,  $w^3$ , has a laterally-

projecting spur,  $w^7$ , which, as the arm rises, strikes a fixed projection,  $w^8$ , and vibrates the arms downward, so as to bring the brushes  $w^5$  on their ends in contact with the back of the blade  $U'$  at the points  $w^{10}w^{10}$ . As the blade  $U'$  moves forward over the surface of the paper its brushes  $w^7w^7w^9$  apply paste to the paper at places marked  $p^4$ , Fig. 12.

On the back of the wing  $M'$  a folder, Y, is arranged. This folder has a rounded or curved back,  $y$ , a face-plate,  $y'$ , and a friction-roller,  $y^2$ , and is secured at its inner edge to a pivot which has its bearings in lugs  $y^3y^3$  on the wing  $M'$ . A spring,  $y^4$ , coiled about the pivot and bearing upon the back of the face-plate  $y'$ , operates to hold the roller and face-plate of the folder down against the wing.

In the forward movement of the tongue and gripping-arm to open the side portions of the end of the tube, as aforesaid, the tongue strikes the folder Y and swings it backward on its pivot; but when the tongue reaches the extreme limit of its movement the operating-arm  $s^5$  on the outer end of its shaft strikes a stop,  $s^{14}$ , which separates the tongue from the gripping-arm, releases the portion of the tube previously held by said parts, and permits the folder Y to spring forward and fold down the side flap,  $p'$ , on the line  $p^5$ , Fig. 12, and over the blade  $U'$ , which latter at this movement is stationary and forms a guide for said folding.

As the flap comes down it licks the paste from the back of the blade  $U'$  and transfers it to the places marked  $p^6$ , Fig. 12, and thereupon the frame S and its attachments are vibrated back by the operation of the devices before described, thus carrying the blade  $U'$ , the tongue, and the gripping-arm to their first positions, but leaving the folder Y clamped down.

Z Z are two carrying-plates mounted on bent arms  $z z$ , that are rigidly secured to an oscillating cross-shaft,  $z'$ . The shaft  $z'$  has a cam-arm,  $z^2$ , secured to its outer end, and with said arm the pin  $q$  on the outer side of the wheel  $Q'$  is adapted to engage.

The upper former-plate, L, consists of a stationary part,  $l'$ , and a movable part,  $l$ . The movable part is connected by a pitman,  $l^3$ , to a crank,  $l^4$ , on a cross-shaft,  $l^5$ , and an arm,  $l^6$ , is secured to the end of shaft  $l^5$ , and with said arm a pin,  $l^7$ , on the inside of wheel  $Q'$  is adapted at certain times to engage. After the blade  $U'$  has been raised and the tongue and griper moved back out of the way, and while the folder Y is still down upon the side lap,  $p'$ , the pin  $l^7$  strikes the cam-arm  $z^2$  and throws the carrying-plates Z Z forward into the position shown in Fig. 4. While this is being done, or immediately after its accomplishment, the pin  $l^7$  on the inside of wheel  $Q'$  strikes the arm  $l^6$  and causes the movable part of the upper former-plate to move forward and carry the end of the tube farther under the carrying-plates. The carrying-plates remain stationary while the folding-wings M



M' are being opened by the operation of the mechanism before described to release the body of the bag-tube.

In front of the carrying-plates the mechanism for making the final fold is arranged. Such mechanism consists of a flap, W<sup>3</sup>, hinged to a plate, W<sup>4</sup>, secured to a shaft, W<sup>5</sup>, extending across the machine. The plate W<sup>4</sup> is held in an elevated position by a spring, W<sup>6</sup>, applied to the shaft W<sup>5</sup> and assisted by a stop-arm, W<sup>7</sup>.

When the carrying-plates are in their normal position they are retracted under the plate W<sup>4</sup> and hold the flap swung up against said plate; but when they are moved outward and backward, as before described, the flap is forced down by a spring, W<sup>8</sup>, into a vertical position, and the arm of one of the carrying-plates, coming in contact with a hook, W<sup>9</sup>, attached to the shaft W<sup>5</sup>, causes the shaft to be rotated and the plate W<sup>4</sup> to be depressed and held in that position till the carrying-plates again move forward and inward. Supposing, now, that all but the final fold has been made, and that the carrying-plates are holding the bag, at the instant the cam-arm z<sup>2</sup> is released from the pin on the outer side of the wheel Q' a spring, z<sup>3</sup>, throws the carrying-plates quickly forward under the plate W<sup>4</sup>, the edges of the carrying-plates forming the crease, and the flap W<sup>3</sup> operating to lay down the last fold and cause the paste previously applied at p<sup>4</sup> to hold it down. The bag then enters between the two metal feed-rolls W<sup>10</sup> W<sup>11</sup> preparatory to leaving the machine.

It will be remembered that the blank is not completely severed by the operation of the cutting-knife I, but that a narrow connection still remains between the blank and the paper strip. During the carrying forward of the blank, first by the sliding portion of the upper former-plate, next by the carrying-plates, and, finally, by the feed-rolls just alluded to, this connection between the blank and the paper strip remains unbroken, and material for a new blank is gradually drawn into the machine from the roll P. To provide for the final severance of the connection, however, a diamond-shaped knife, X', with blunt point X<sup>2</sup> and sharp edges X<sup>3</sup>, is mounted on the end of a long elastic spring, X<sup>4</sup>, secured to a cross-rod, X<sup>5</sup>. The rod X<sup>5</sup> has at one end an arm, X<sup>6</sup>, which is adapted at intervals to engage with a pin, X<sup>7</sup>, on the wheel Q'. After the bag with completed bottom has entered between the feed-rollers and passed half-way through, or thereabout, the pin X<sup>7</sup> in the wheel Q' strikes the arm X<sup>6</sup> and causes the knife to be raised, so that its blunt point will bear with a yielding pressure against the under side of the paper passing over it. The point of the knife lies in the path of the slit or opening p in the connection between the bag and the blank, and when said opening reaches it it is pressed by the spring up through the same, and the sharp inclined edges X<sup>3</sup> operate to sever the connection, and

thus release the bag completely. The knife then drops below again, as before. The operation of the machine is so timed that as the bag is severed from the paper strip the large cutting-blade I operates and partially severs the strip for the succeeding blank. The strip being fed in by drawing it, instead of pushing it, as is customary, it is kept smooth and even, and the blank is cut and presented to the folding devices every time with accuracy.

The feed-rolls W<sup>10</sup> W<sup>11</sup> are preferably of metal, and the upper one is idle, while the under one is driven by a gear, Q<sup>3</sup>, on its shaft meshing with the wheel Q<sup>2</sup>.

Passing from between the feed-rollers, the completed bag is carried down an incline, W<sup>12</sup>, and between two other rolls, W<sup>13</sup> W<sup>14</sup>, and finally through a heater or drier, W<sup>15</sup>, and out of the machine.

The heater or drier is for the purpose of drying the pasted portions of the bag and preventing their adhering to one another. It may consist of two steam-heated boxes, W<sup>16</sup> W<sup>16</sup>, with a space between them for the passage of the bags, or of steam-heated rolls, or may be of other construction, as preferred.

The roll W<sup>14</sup> is driven by a pulley, W<sup>17</sup>, on its shaft, a belt, W<sup>18</sup>, and pulley W<sup>19</sup> on the shaft of the roll W<sup>11</sup>, while the roll W<sup>13</sup> is driven by friction from the roll W<sup>14</sup>.

I claim as my invention—

1. In a paper-bag machine, the combination, with the paste-wheel, of the co-operating bearing-roll, mounted upon a pivoted shaft and adapted to be thrown back out of the way, when desired, so as not to bear upon the paste-wheel, substantially as described, for the purpose specified.

2. In a paper-bag machine, the angular cutting-knife, having the slots at or near its middle and the perforating-projection between the slots, substantially as described, for the purpose specified.

3. In a paper-bag machine, the combination of means for partially severing the strip of paper and forming a slit or perforation in the connecting portion, mechanism for folding and pasting the sides and bottom of the bag, mechanism for feeding the bag and bag-strip forward, and a knife or cutter for entering the aforesaid slit or perforation in the connecting portion and effecting the complete severance of the bag, substantially as described.

4. In a paper-bag machine, the folding-wings hinged at their inner edges to pivoted arms, to which downwardly-acting springs are applied, and having cogged segments also at their said edges, in combination with the vertical rack-bars, their connecting-spring, and the means for operating them, substantially as described.

5. In a paper-bag machine, the combination, with the folding-wings, of the gravitating leaf in one of the wings, for carrying down in advance the flap of the blank to which the paste is applied, substantially as described, for the purpose specified.



6. In a paper-bag machine, the combination, with the former and the folding-wings, of a griper, one or more of whose jaws strike through the overlapped portions of the tube and hold such overlapped portions positively from displacement while the end of the tube is being opened and folded, substantially as described.

7. In a paper-bag machine, the combination of the vibrating frame, carrying the opening-tongue and the gripping-arm and their respective shafts, springs, and operating-levers, with the stops on the frame for controlling the movements of said gripping-arm and opening-tongue and the mechanism for imparting motion to said vibratory frame, substantially as described.

8. In a paper-bag machine, the opening-tongue, provided with a slot or opening for the reception of a pin or projection on the gripping-arm, substantially as described.

9. In a paper-bag machine, the combination, with the vibrating frame, which carries the gripping-arm and its connections, of a stop on the main frame for holding the gripping-arm elevated while the blank is being formed into a tube, substantially as described.

10. In a paper-bag machine, the final-fold mechanism, consisting of the vibratory carrying-plates  $Z\ Z$ , the plate  $W^4$ , spring-flap  $W^3$ , shaft  $W^5$ , with its spring and stop, and the hook  $W^9$ , for connecting the shaft  $W^5$  to the arm of one of the carrying-plates, substantially as described.

11. In a paper-bag machine, the combination of the former, the folding-wings, and the smoothing and creasing blade, which smooths down the first side flap of the bottom and creases it by pressing it against the grooved rib  $l^2$  on the folding-wings, substantially as described.

12. In a paper-bag machine, the smoothing and creasing blade, provided with lugs at its ends, which permit it to ride past the edges of the wings without engaging therewith, substantially as described.

13. In a paper-bag machine, the smoothing and creasing blade, provided with the spring-arms  $u^6\ u^6\ u^8$ , carrying the brushes  $u^7\ u^7$  and  $u^9$ , in combination with a device for applying paste to said brushes, substantially as described.

14. In a paper-bag machine, the smoothing and creasing blade and its brushes, and mechanism for imparting to them a forward movement when down, whereby the one side flap of the bottom of the bag is smoothed and creased while paste is being applied to the other side flap, substantially as described.

15. In a paper-bag machine, the combination, with the smoothing and creasing blade and its paste-brushes, of the felt-covered shaft  $w^2$ , of the intermittently-operating paste-applying device  $W$ , for transferring paste to the said brushes, substantially as described.

16. In a paper-bag machine, the combination of the smoothing and creasing blade and the spring brush-arms  $w^3\ w^3$  of the paste-applying device, operated as described, for transferring paste to the back of said smoothing and creasing blade, substantially as described, for the purpose specified.

17. In a paper-bag machine, the knife for entirely severing the completed bag from the paper strip, having a blunt point and sharp inclined cutting-edges, and adapted to cooperate with the slit or puncture in the paper, substantially as described.

18. In a paper-bag machine, the knife-bar for entirely severing the completed bag, mounted upon a spring which holds its blunt point with slight pressure against the under side of the paper until the slit in the paper is reached, and then projects the knife up through said slit and severs the bag from the strip, substantially as described.

OTIS EVERETT DAVIDSON.

Witnesses:

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WM. A. BLACKSTOCK.