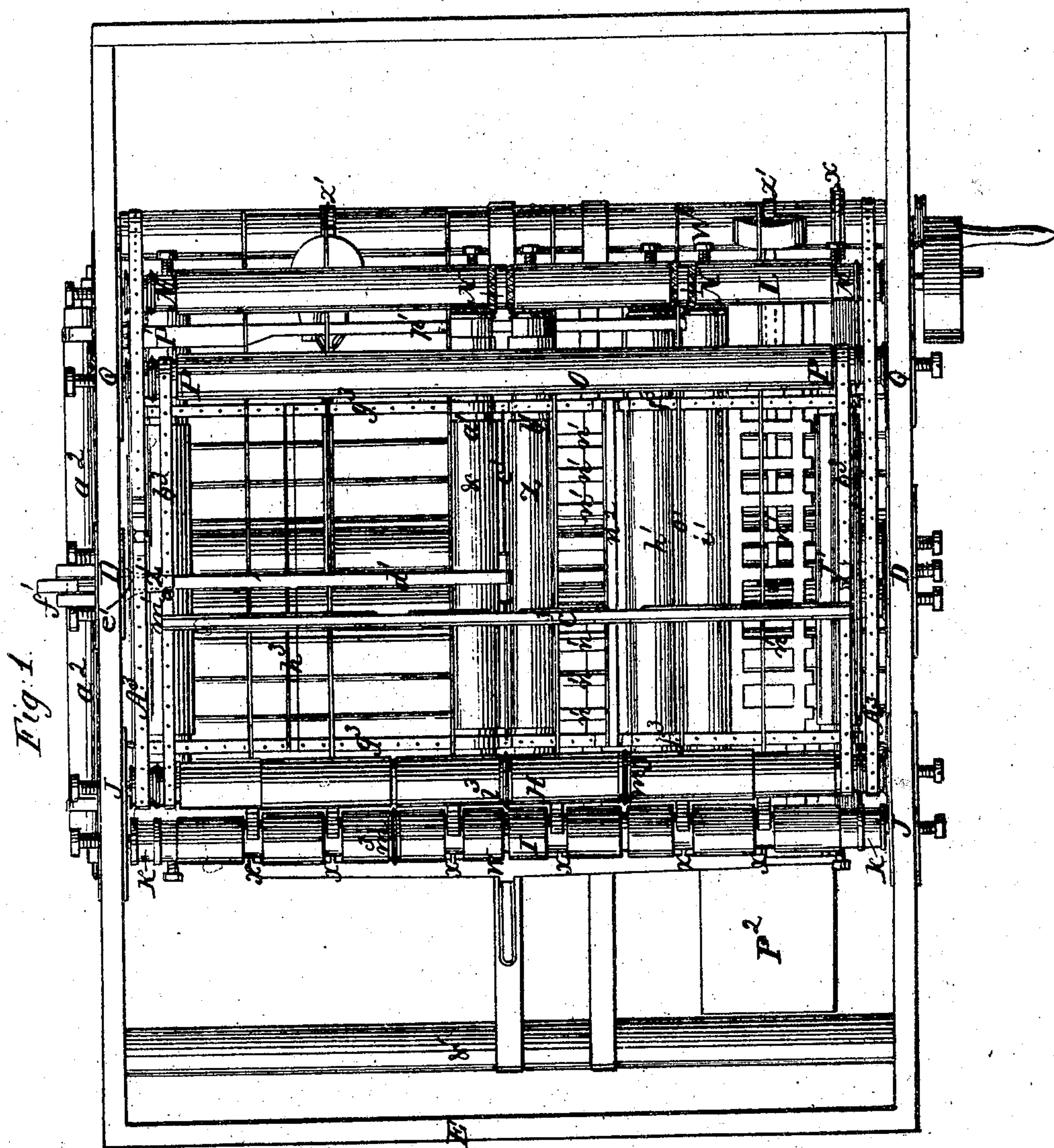


Sheet 1. 4 Sheets

J. S. Gallaher Jr.  
Paper Folding Mach.

Nº 30853.

Patented Dec. 4. 1860.



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Sheet 2 of 4 Sheets

J. S. Gallaher Jr.  
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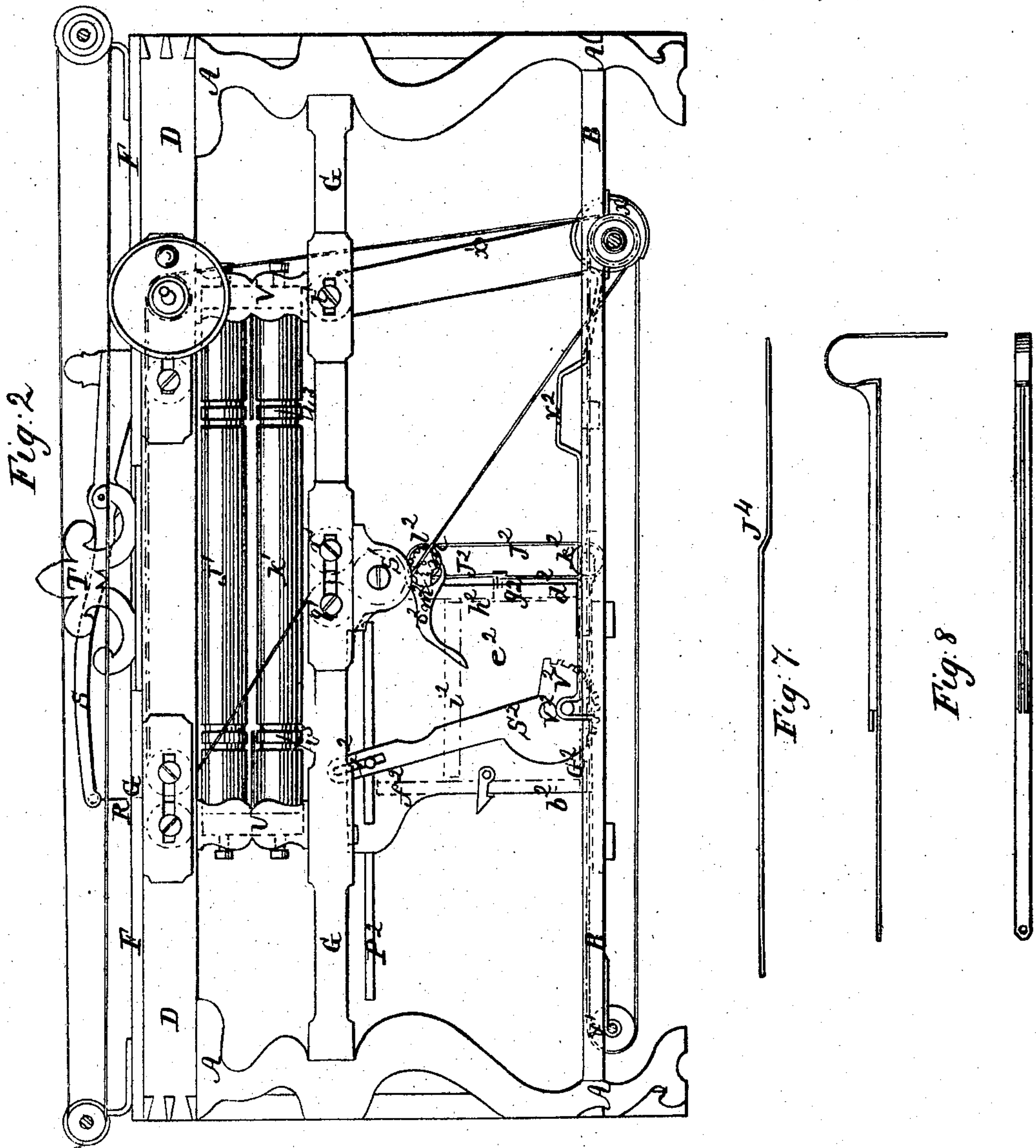


Fig. 2

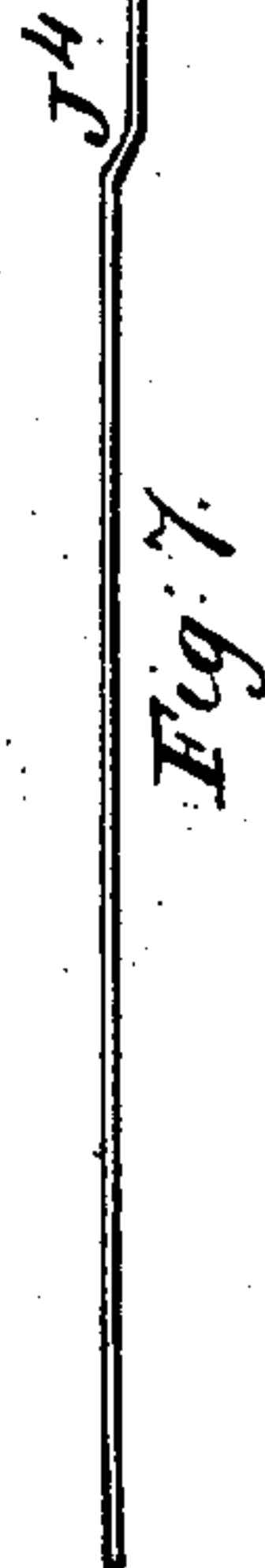


Fig. 7

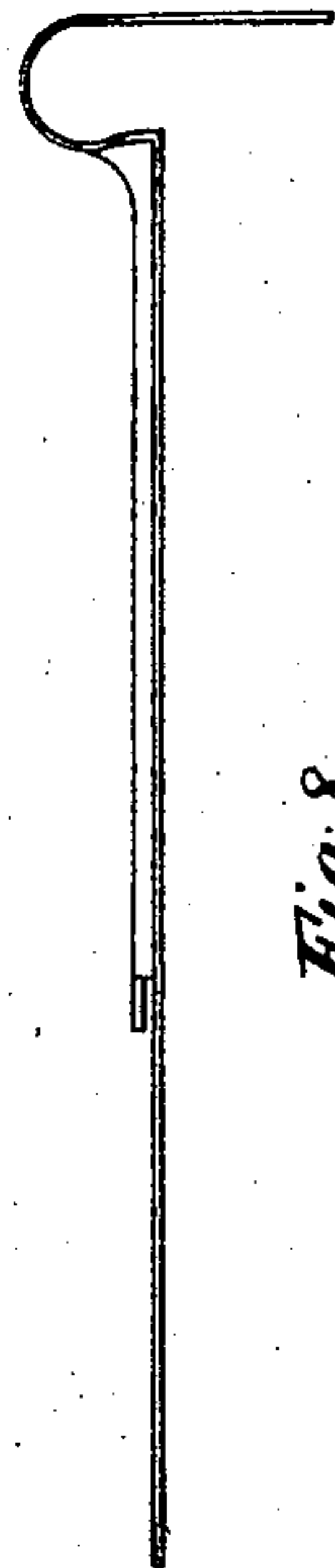


Fig. 8

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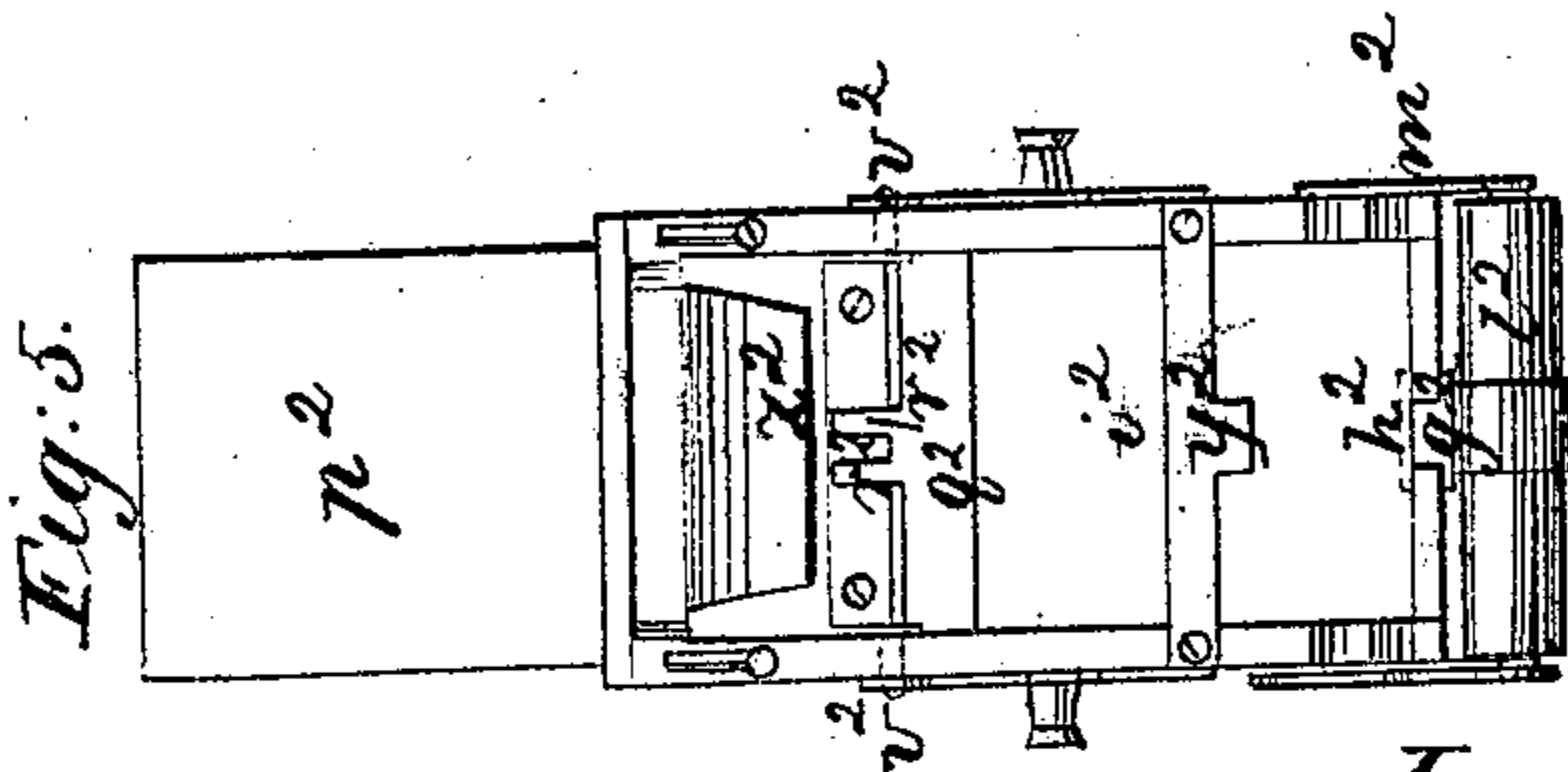
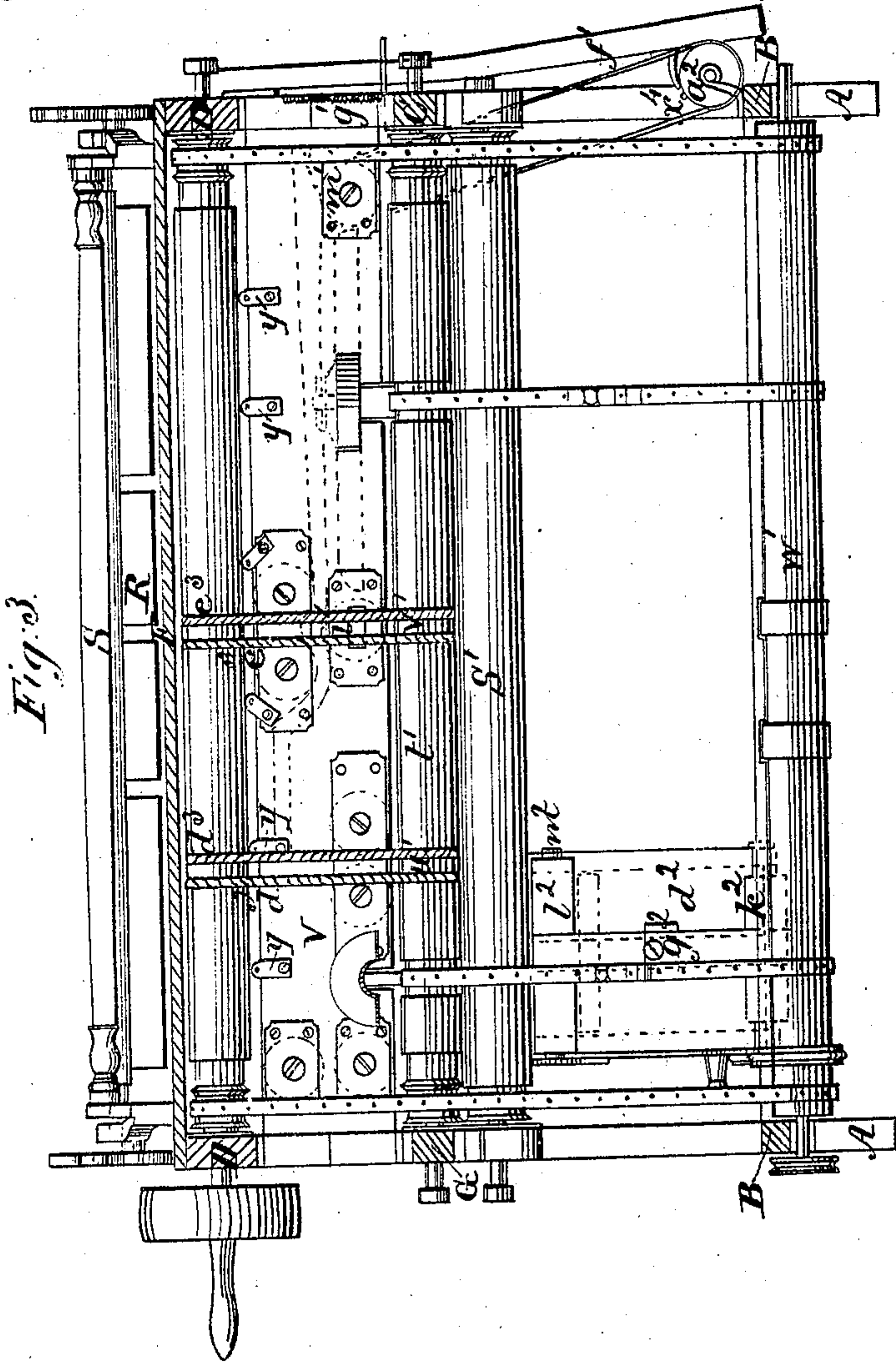
John S. Gallaher Jr.



*J. S. Gallacher Jr.*  
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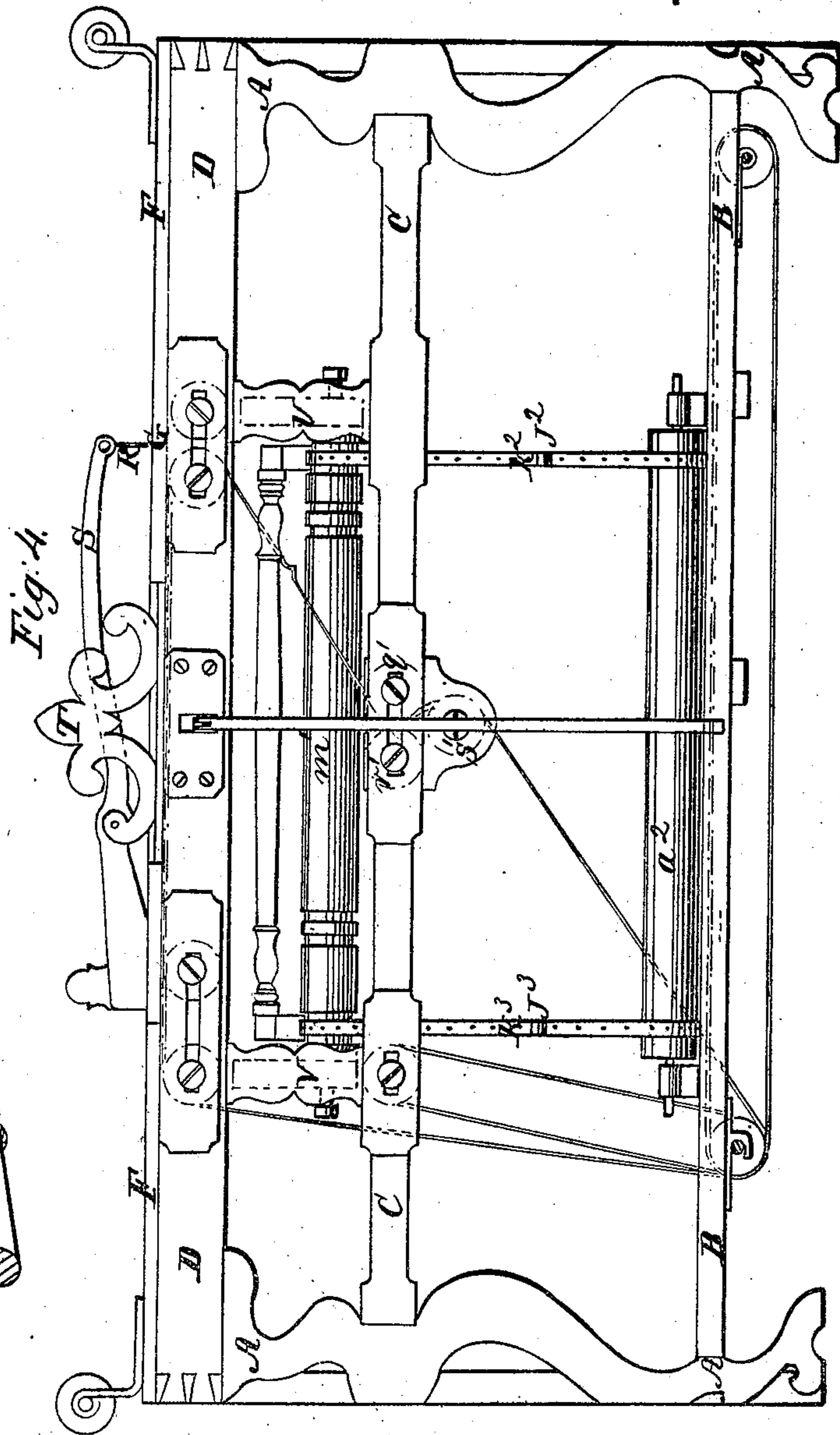
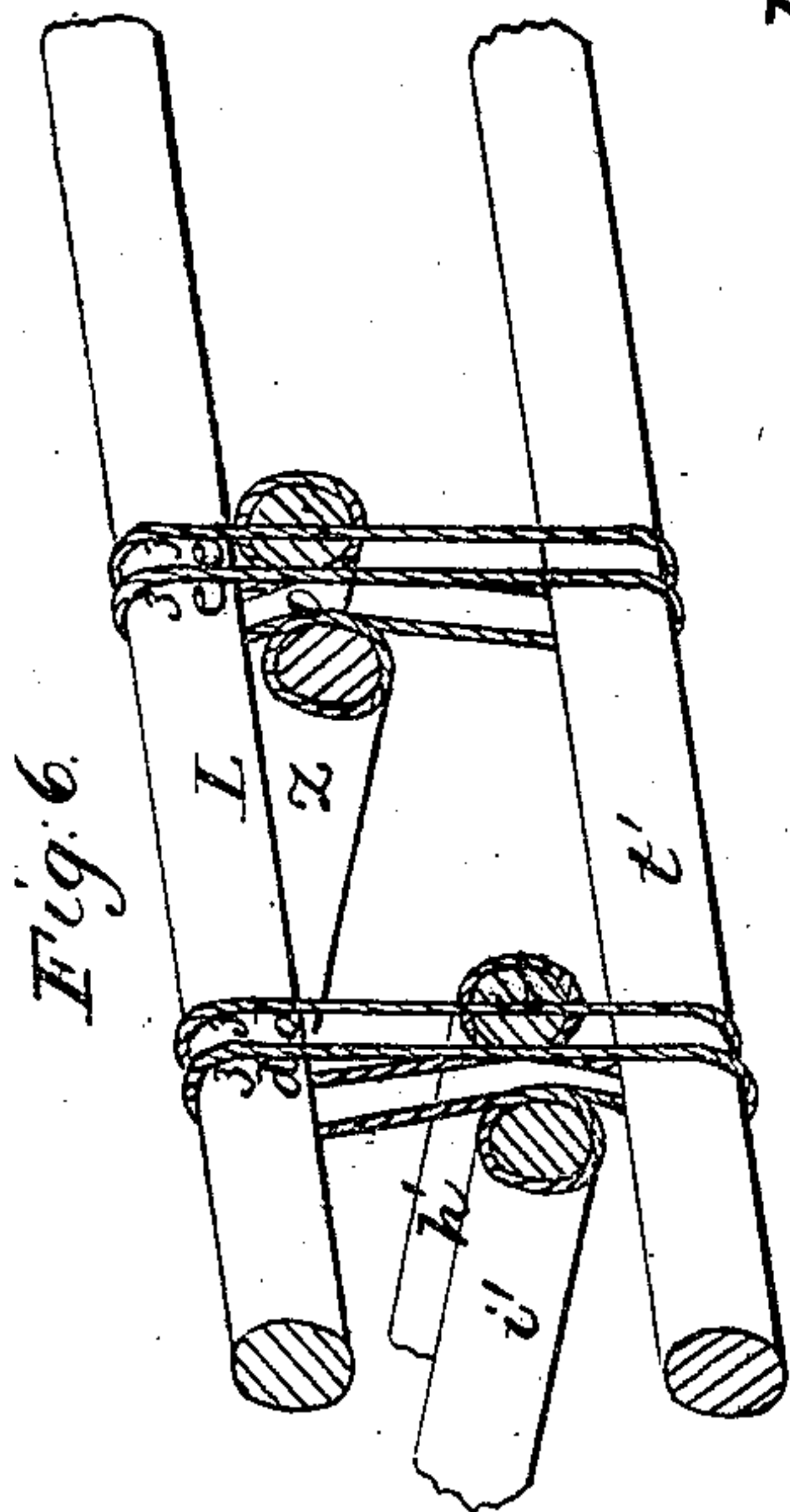
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Sheet 4. 4 Sheets.

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N<sup>o</sup> 30853

Patented Dec. 4. 1860



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# UNITED STATES PATENT OFFICE.

JOHN S. GALLAHER, JR., OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO EDWIN CHAMBERS AND CYRUS CHAMBERS, JR., OF PHILADELPHIA, PENNSYLVANIA.

## MACHINE FOR FOLDING PAPER.

Specification of Letters Patent No. 30,853, dated December 4, 1860.

*To all whom it may concern:*

Be it known that I, JOHN S. GALLAHER, Jr., of the city of Washington, in the District of Columbia, have invented certain new and useful Improvements in Machines for Folding Paper and other Similar Materials; and I do hereby declare the following to be a correct description of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a plan of the machine; Fig. 2, a front elevation; Fig. 3, a right hand end elevation, and Fig. 4 a rear elevation of the same. Fig. 5 is a top view of the mechanism connected with the packing box for receiving the completely folded sheets. Fig. 6 is a perspective view of detached parts, to illustrate the peculiar arrangement of the cords for transmitting motion. Figs. 7 and 8 are separate views of two devices for supporting the sheet in its passage through the machine.

The same part is marked by the same letter of reference wherever it occurs.

The nature of my invention consists in the construction of machinery, substantially as hereinafter described, for folding paper automatically, said machinery being capable of being adapted to sheets of different sizes, and of being converted at will from a newspaper folding machine, to a book folding machine, as hereinafter more fully described and shown.

To enable others to construct and use my machine, I will proceed to describe in detail its construction and operation, referring to the figures of the drawings by the letters of reference marked thereon.

A marks the upright portions of the frame work; B, the side bottom rails; C, the central side rails; D, the top rails; and E, the end top rails.

On the top of the frame is arranged a flat table F, having a slot across its width, as shown at G, Figs. 2 and 4, the edges of the slot being beveled as represented. Immediately below this slot, are arranged, in suitable bearings, two revolving cylinders or folding rollers H, I, having channels J, K, at their extremities, in which are inserted, at equal distances apart, pegs or pins.

L marks a driving roller which has channels M at its ends, and central ones at N. O marks a guiding roller also having end channels P, Q. These four upper rollers are all arranged in the same horizontal plane.

Immediately above the first pair of rollers H, I, over the table F, parallel with slot G, and suspended at the required distance above it is the first balanced pendent folding knife R, hung from the long arms of balance levers S, which are supported on standards T attached to the table F. The shorter arms of said levers, being properly balanced, rest in suitable openings formed beneath them in the table F.

To the central cross rails U, V, (Figs. 2, 3, and 4) and immediately beneath the rollers H, I, L, O, and at right angles to them, is arranged an adjustable, sliding fork device W, having long fingers or rods X (Fig. 1). The rods X are held in position by the aid of eye brackets Y, as shown in Fig. 3, affixed to the rails U, V. At the proper distance below the first pair of rollers H, I, are placed the second pair Z, &, supported by the rails U, V. These rollers are at right angles to the first pair and extend from the middle thereof to the right, and are provided with end channels and pins  $a'$ ,  $b'$ , like the preceding ones. They are placed slightly apart from each other so as to admit the folded sheet between their surfaces. Over these second rollers is placed the second pendent folding knife C', suspended by an arm  $d'$  held in position by a bracket  $e'$  affixed to the inside of the upper side rail as shown in Fig. 1. This knife may be balanced by a weighted arm  $f'$ , if desired, or a supporting spring may be employed if preferred.

At the required distance from the rollers Z, & and in a plane below them are arranged a third and similar pair of rollers  $h'$ ,  $i'$ , sufficiently apart from each other to admit between their surfaces the refolded sheet, and paving channels with pins inserted therein like the preceding pairs. In the same plane with the second and third pairs of rollers on the front of the frame, are guide rollers J' K', see Figs. 1 and 2, formed and supported in the same manner as the other rollers and having channels and pins like them.



Beneath the second pair of rollers Z, &, is placed, nearly in contact therewith, an auxiliary roller  $V'$ , and situated in the same plane as the third rollers  $H' i'$ ; and this auxiliary roller has also a guide roller  $m'$  arranged on the rear side of the frame, as in Fig. 3.

On a range with the third pair of rollers  $h', i'$ , is placed a grating  $n'$  to support the refolded sheet. Immediately over the rollers  $h', i'$ , is suspended the third folding knife  $O'$ , suspended by balance levers  $p'$  arranged within the cross rails U, V. Immediately beneath the third pair of rollers  $h' i'$  at right angles thereto, are arranged the two lowermost or fourth pair of rollers  $q', r'$ , and immediately beneath and parallel therewith is a third guide and pressure roller  $s'$ . These last three rollers have, like their predecessors, grooves provided with pins. In the same plane with the last pair of rollers, to the right thereof and in a vertical line with roller O, is situated a fifth guide roller  $T'$ , similarly provided with grooves or channels.

At one end of the frame, near the lower cross rails is placed the driving cam shaft or lower guide roller  $W'$  provided with the cam  $X'$  and the eccentric X, and with projecting pins  $Z'$ . At the left hand end is arranged a guide roller  $\&, \&$ , which may be used or not as occasion requires. On the rear side of the frame supported in bearings on the side rail is placed a lateral guide roller  $a^2$ . On the front side of the frame, slightly to the left of the lower or fourth pair of rollers is arranged the packing box or paper receptacle  $b^2$ , which is formed of a bottom  $c^2$ , back  $d^2$ , sides  $e^2$  and a hinged door or falling flap  $f^2$ . The back has a vertical slot in which fits a sliding guide  $g^2$ , having a flanch or clamp plate  $h^2$  working on the inside of the back. Attached to this flanch is a sliding, self-adjusting, depressible bottom  $i^2$  (Figs. 2 and 5) and riveted onto guide  $g^2$  is an endless belt  $J^2$  which passes around rollers  $k^2, l^2$ , connected to the box by side bearings  $m^2$ , said rollers supporting the belt in position and keeping it at the proper tension. To the end of the upper roller is affixed a small ratchet  $m$  in connection with which works a lever pawl  $O^2$ , attached to the side of the box as shown the claw end thereof being the heaviest, so as to fall into position by its own gravity. Within the open end of the box is arranged a reciprocating platform  $P^2$  working in guide grooves  $Q^2$  formed in the side of the box. Across the inner end of the carriage  $P^2$  is attached a hinged falling jaw  $q^2$  having a small spur or projection  $r^2$ . To the sides of carriage  $P^2$  are connected oscillating levers  $S^2$ , the long arm thereof formed with a suitable slot  $t^2$  in which play bolts  $U^2$ . The slots in

the levers are designed to afford the requisite play to the pin  $v^2$  as the lever moves in the arc of a circle. The short arm  $V^2$  is connected with a pitman  $X^2$  connecting with the eccentric X on the driving shaft  $W'$ . Across the mouth of the packing box, near the back thereof is a stop  $y^2$ , and at the door front end, within the box, is placed transversely the tongue like strip  $z^2$  (see Fig. 5).

Over the end grooves of the first roller H and the guide roller O, and around the driving shaft L are the main driving and transmitting belts  $a^3$  having grommets at regular intervals corresponding with those between the pins of the channels. Said belts continue down around roller  $W'$ , thence obliquely to the left, upwardly in contact with the left hand side of the larger or auxiliary bottom roller  $S'$ , thence up between the rollers  $q' r'$ , obliquely to the left thereof, and up over the outer circumference of roller H. Extending over the grooves J of roller H and the channels P of guide roller O, are conveying tapes or bands  $b^3$  formed also with grommets.

Across the bands or tapes  $b^3$ , parallel to the upper rollers H, I, is attached a hinged or traversing grip  $C^3$ ; and in order that it may pass between the surfaces of the rollers H, I, the rollers can be grooved, or shaved off longitudinally, so as to allow the thickness of the grip  $C^3$  to be slightly below the plane of circumference, and thus prevent the checking or choaking of the rollers H, I.

Passing over the driving shaft L and the fifth guide roller  $t'$ , are short cords or bands  $d^3, e^3$ . These cords also pass around and enwrap respectively the ends of the second and third pairs of rollers Z &  $h' i'$  in such manner that the rollers of each pair will turn inwardly toward each other. The peculiar arrangement of these transmitting cords will be clearly understood by reference to Fig. 6. The second and third pairs of rollers Z, &,  $h', i'$ , are also provided with traversing belts provided on their upper surfaces with fixed or adjustable cams  $f^3 f^3$  arranged at the required distances. The conveying tapes  $g^3$  are also connected to a hinged or jointed grip  $h^3$ , as are also the succeeding endless traversing tapes or bands  $i^3$  (Fig. 2).

*Operation:* The operation of my paper and book sheet folding machine is as follows: The machine being set in motion by suitable power the sheet to be folded may be deposited either mechanically or by hand on the table of the machine, the center margin of the sheet being arranged immediately over and parallel with the slot or converging edges, and also with the rollers H, I, the first folding knife R being suspended at suitable height above the sheet. As the ma-



machinery moves the rollers H, I, revolve inwardly toward each other. The belts or bands  $a^3$ , being provided with small cams on their upper surfaces, and moving in the direction of the rollers H, I, the cams at the required time come in contact with the short arm of the reciprocating knife R, when the arm is lifted up, causing the knife to descend suddenly striking or forcing the sheet between the converging edges and rollers H, I. Simultaneously therewith, the tapes  $b^3$  carry forward between the rollers H, I, the grip  $C^3$ , which, receiving the fold of the sheet between its edges, grips or holds it, passing with it between and under to the right of the rollers, resting the while on the rods X of the fork W. When the grip arrives at the elbow or deflection  $J^4$  on those rods (seen in Figs. 7 and 8) the hinged or falling edge of the grip opens and thus releases the sheet at the required time. The sheet having thus received the first fold, is situated immediately over the second pair of rollers Z, &, when, at the required time, the second traversing grip  $h^4$  comes immediately in between the second pair of rollers Z, &, when the grasping edge falls open outwardly. Immediately thereupon the second folding knife  $C'$  is actuated by the spur  $X^4$  on the lower driving shaft  $W'$  whereby the sheet is forced into the grip, and carried between the rollers and downwardly over supporting cords, or rods constructed and made adjustable like the fork and rods beneath the first pair of rollers. The sheet having thus received the second fold, and being in proper position is released from the grip. The sheet being now directly over the third pair of rollers  $h' i'$ , is ready to receive the third fold by the operation of the third knife  $O'$ , which is actuated by means of the traversing cams  $J^3$  on the endless belts  $K^3$  (Fig. 4). After thus receiving the third fold, the sheet passes beneath the third pair of rollers, and on to a suitable supporting grate, when being in proper position, it receives the last or fourth fold, from the lowermost or fourth pair of rollers  $q', r'$ . It then passes out to the left, and over the pressure or auxiliary smoothing rollers  $S'$ , when the completely folded sheet is seized by the falling jaw  $r^2$ , which being attached to the reciprocating carriage of the packing box, advances at the proper time, the spur projection  $q^2$ , striking against the stop  $Y^2$ . The jaw  $r^2$  rises to receive the folded sheet and then the sliding table recedes carrying with it the completely folded sheet. When this arrives at the proper point, the tongue  $Z^2$  (Fig. 5) enters beneath the jaw  $r^2$ , and pushes the sheet out on to the depressible bottom  $i^2$ , which is situated far enough below the plane of the carriage  $P^2$ , to allow the carriage to pass over without disarranging the sheet.

In the advance movement of the sliding platform or carriage  $P^2$  the long arm of the oscillating lever  $S^2$  strikes the long arm of the lever pawl  $O^2$  thereby lifting the claw part from out the detents of the ratchet wheel  $m$  causing the depressible bottom  $i^2$  to fall the distance of one tooth or detent, corresponding with the thickness of the completely folded sheet. Thus the packing box  $b^2$  is gradually filled, when the pile of folded sheets may be removed through the door  $f^2$ . If desired the pawl and ratchet device can be so arranged as to provide for the counting of the folded sheets.

In Fig. 1 around the circumference of rollers H, I, are represented small collars or creasing edges  $l^3, m^3$ , said devices being situated at the required intervals to indicate and mark the creases for the second and third folds. They also assist materially in guiding and holding the sheet true upon the rollers H, I. These creasing collars are movable and adjustable so as to answer for sheets of different sizes. They are slipped on to the rollers and held in place by sleeves also slipped over the rollers.

For folding sheets of different sizes, the cams on the traversing belts, together with the traversing grips are all susceptible of being adjusted so as to adapt them to the varied sizes of the sheets, and to the calculated movements and harmonious operation of the machinery. And when it is desired to fold a sheet in book form, the belts and bands are removed from the third pair of rollers and the direction of the sheet in its movement is changed to the rear side of the second pair of rollers, and conveyed down over suitable supports onto the lower or fourth pair of rollers  $q', r'$ , where the book sheet receives the last required fold by means of a folding knife operated as before described. The folded sheet may be received into any suitably arranged box or receptacle.

Having thus fully described my invention what I claim and desire to secure by Letters Patent of the United States, is—

1. The construction and use of traversing grips, or their equivalents, connected with moving endless belts, for the purpose described, irrespective of any special arrangement, or combination of the same, or mode of operating them.

2. The use of the traversing cams, or their equivalents, in combination with moving endless tapes, or bands, whether arranged as fixtures, or as adjustable devices for the purposes herein set forth.

3. The vibrating pendent, counterpoised folding blades, or their equivalents, irrespective of any special manner of arranging or operating the same, as described and shown.

4. The creasing collars, on the rollers or



cylinders, constructed and operating substantially as and for the purpose specified.

5 5. The adjustable, graduating fork device W, W, X, X, X, X, or its equivalent, for the purpose as set forth, constructed and operating substantially as described and shown.

6. The invention of the automatic packing box, or paper receptacle  $b^2$  when constructed

and operated substantially in the manner 10 hereinbefore set forth and shown.

The above specification, signed and witnessed this ninth day of August, A. D. 1860.

JOHN S. GALLAHER, JR.

Witnesses:

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F. W. HOWARD.