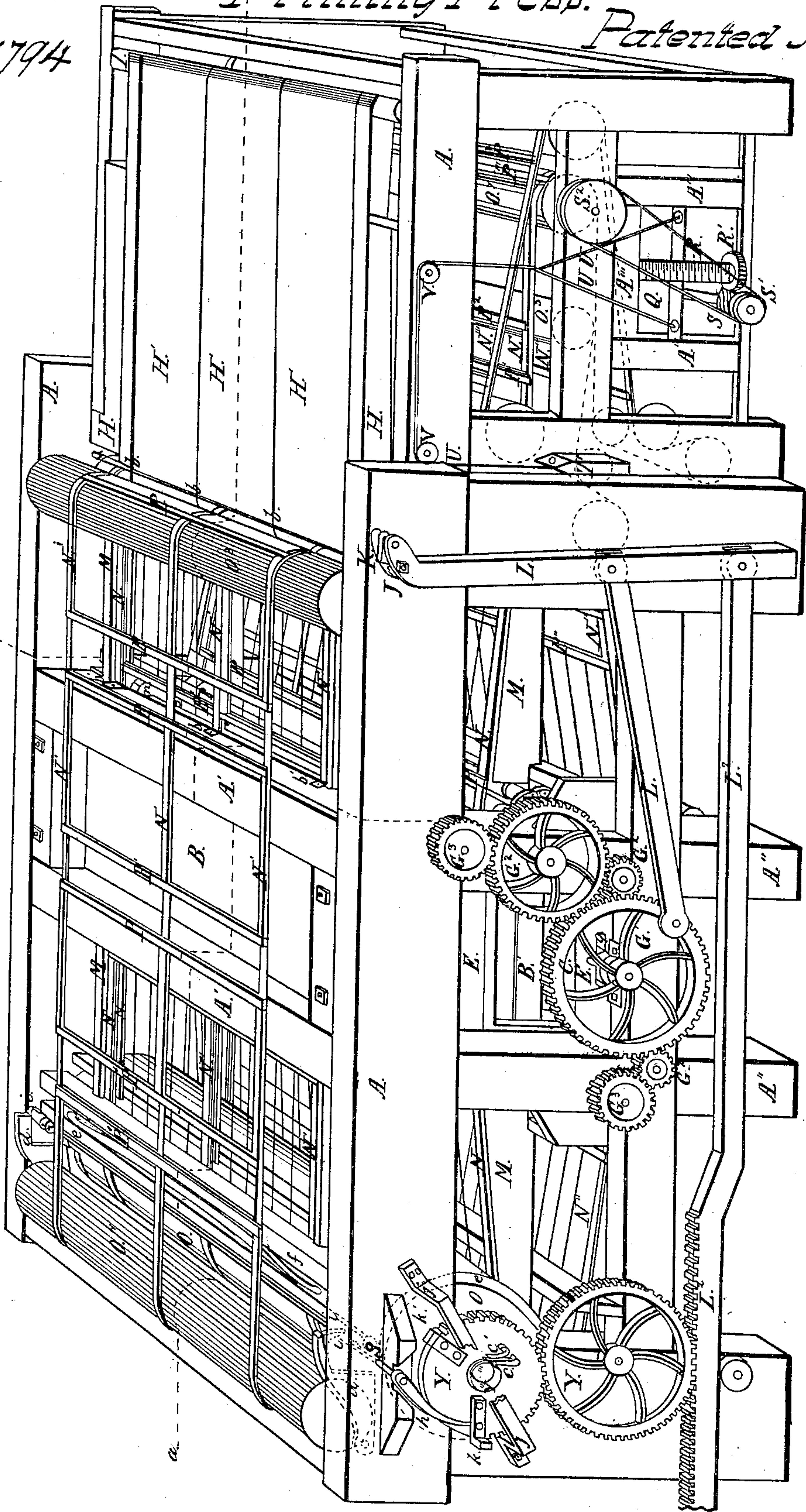


W. H. Danforth. Sheet 1. 3 Sheets.  
Printing Press.

Patented June 21.  
1853.

N<sup>o</sup> 9794

Fig. 1.



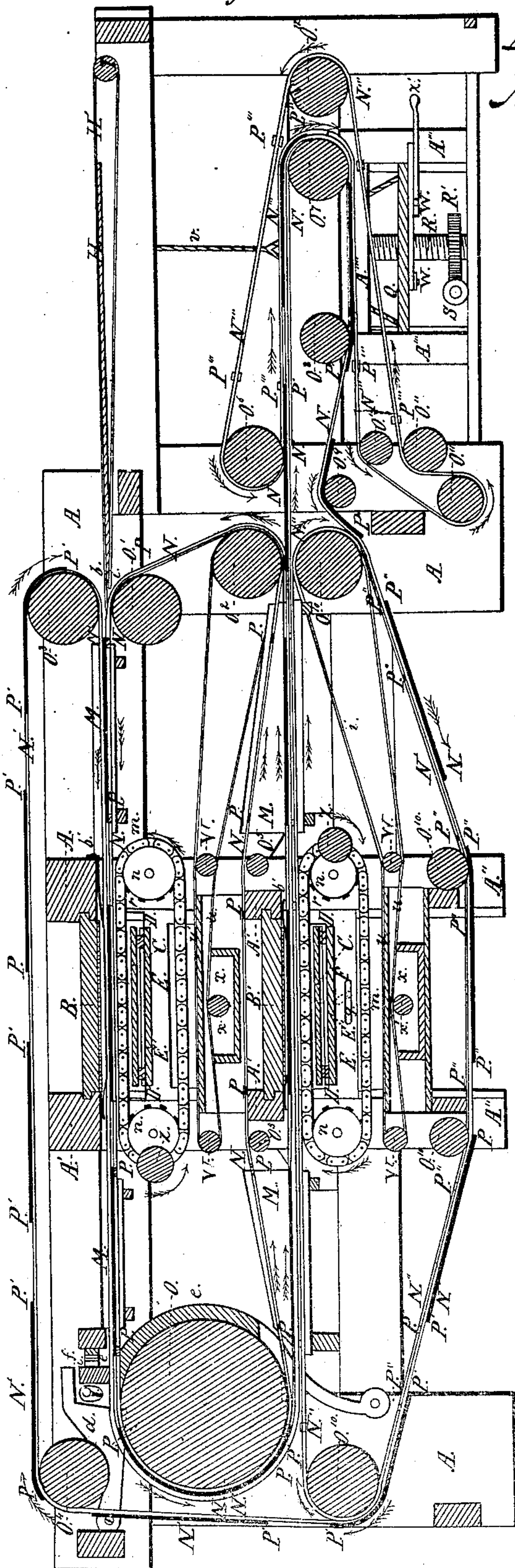


W. H. Danforth. *Sheet 2. 3 Sheets.*  
 Printing Press.

No 9794.

Patented  
 Jun. 21. 1853

Fig. 2.



W. H. Danforth. Sheet 3. 3 Sheets.

Printing Press.

N<sup>o</sup> 9794.

Patented Jun. 21. 1853.

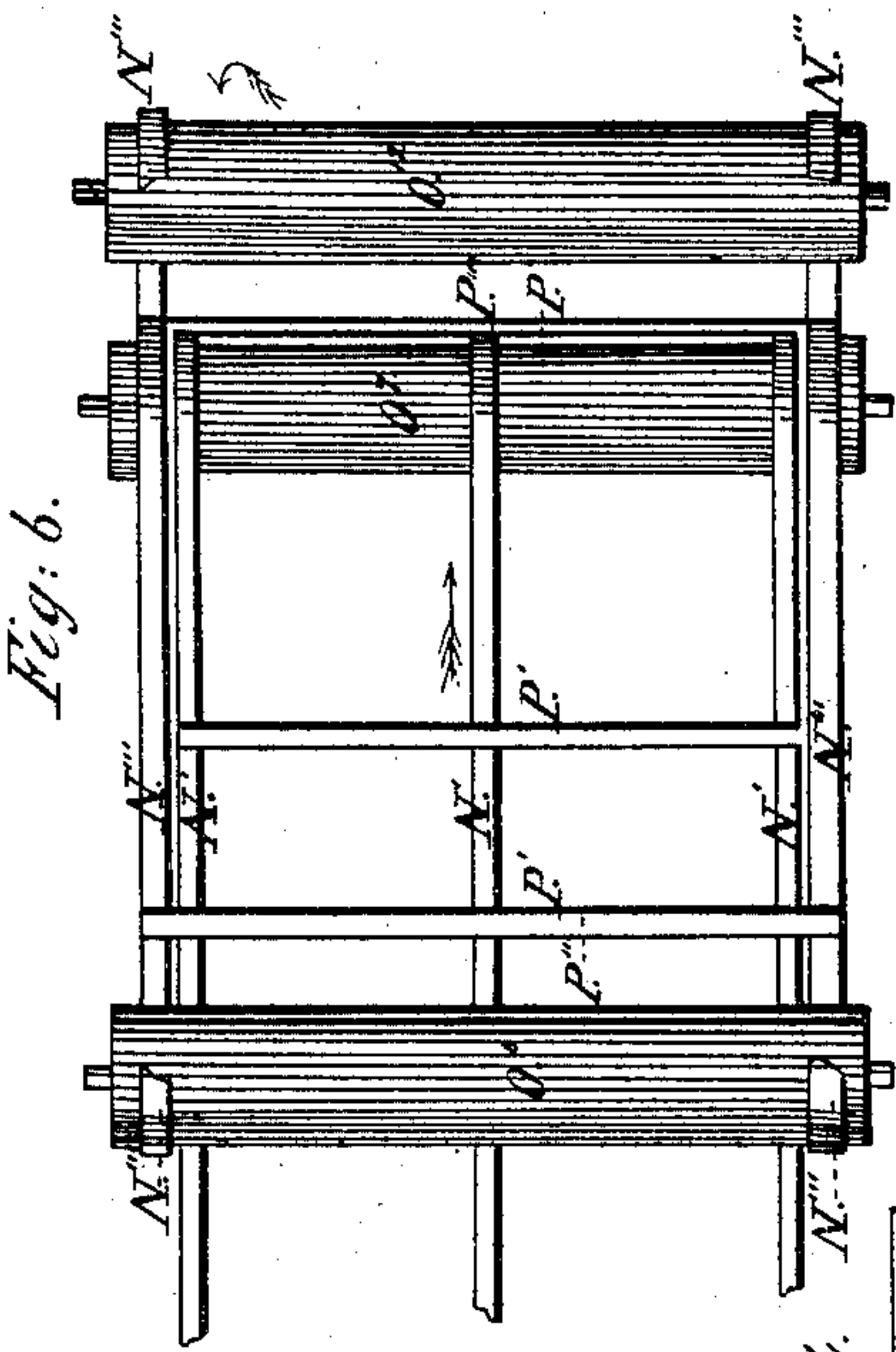


Fig. 3.

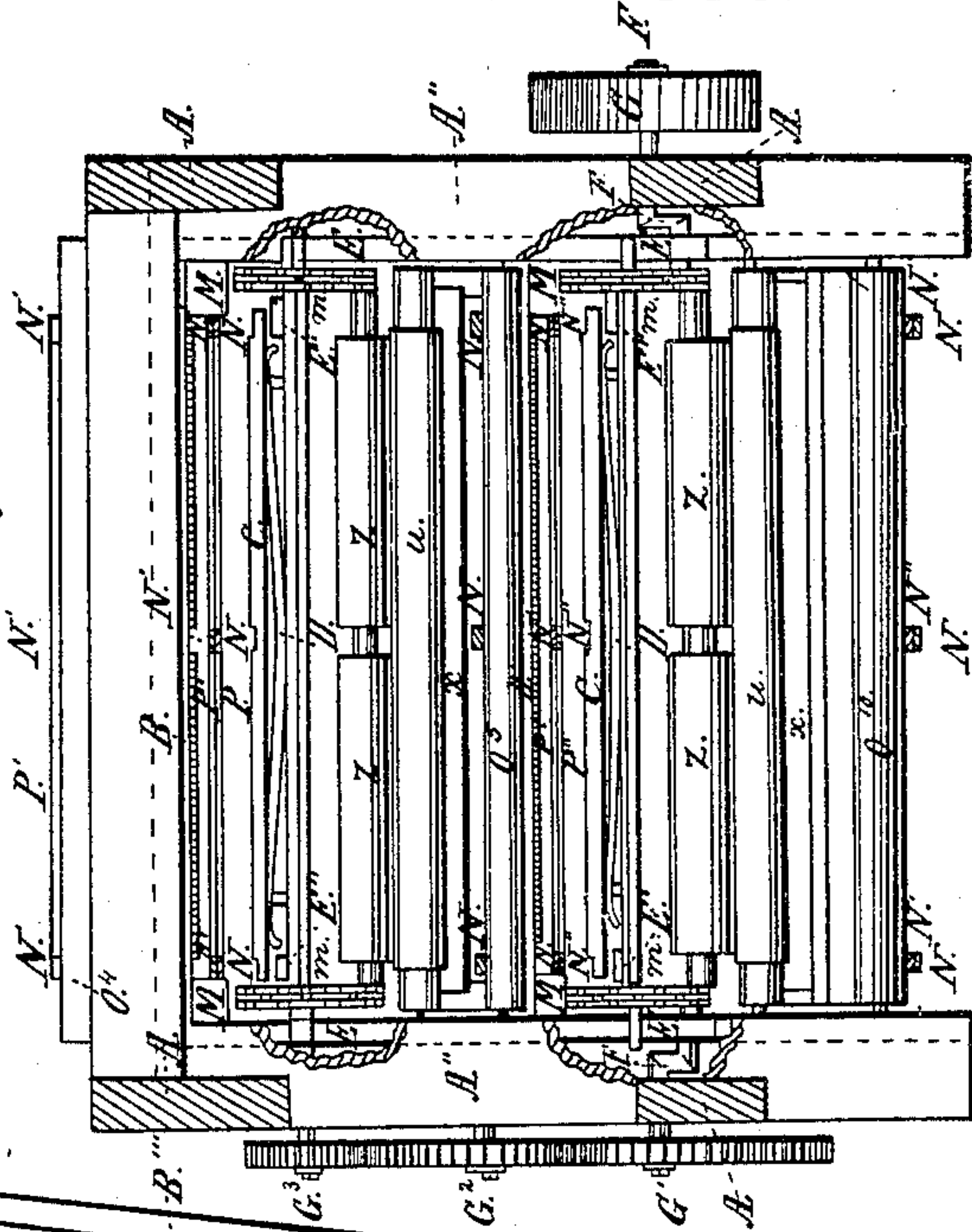


Fig. 4.

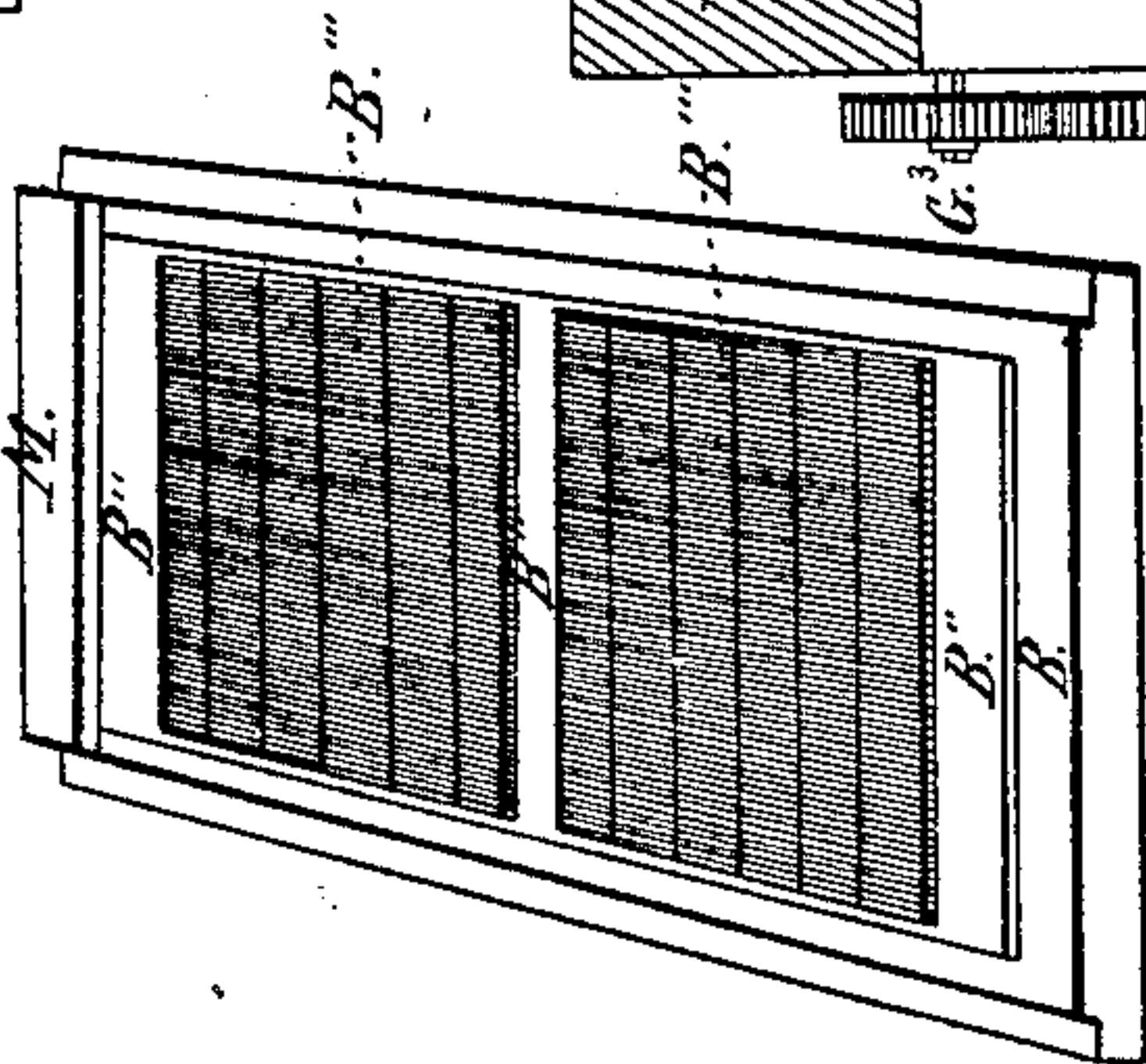


Fig. 8.

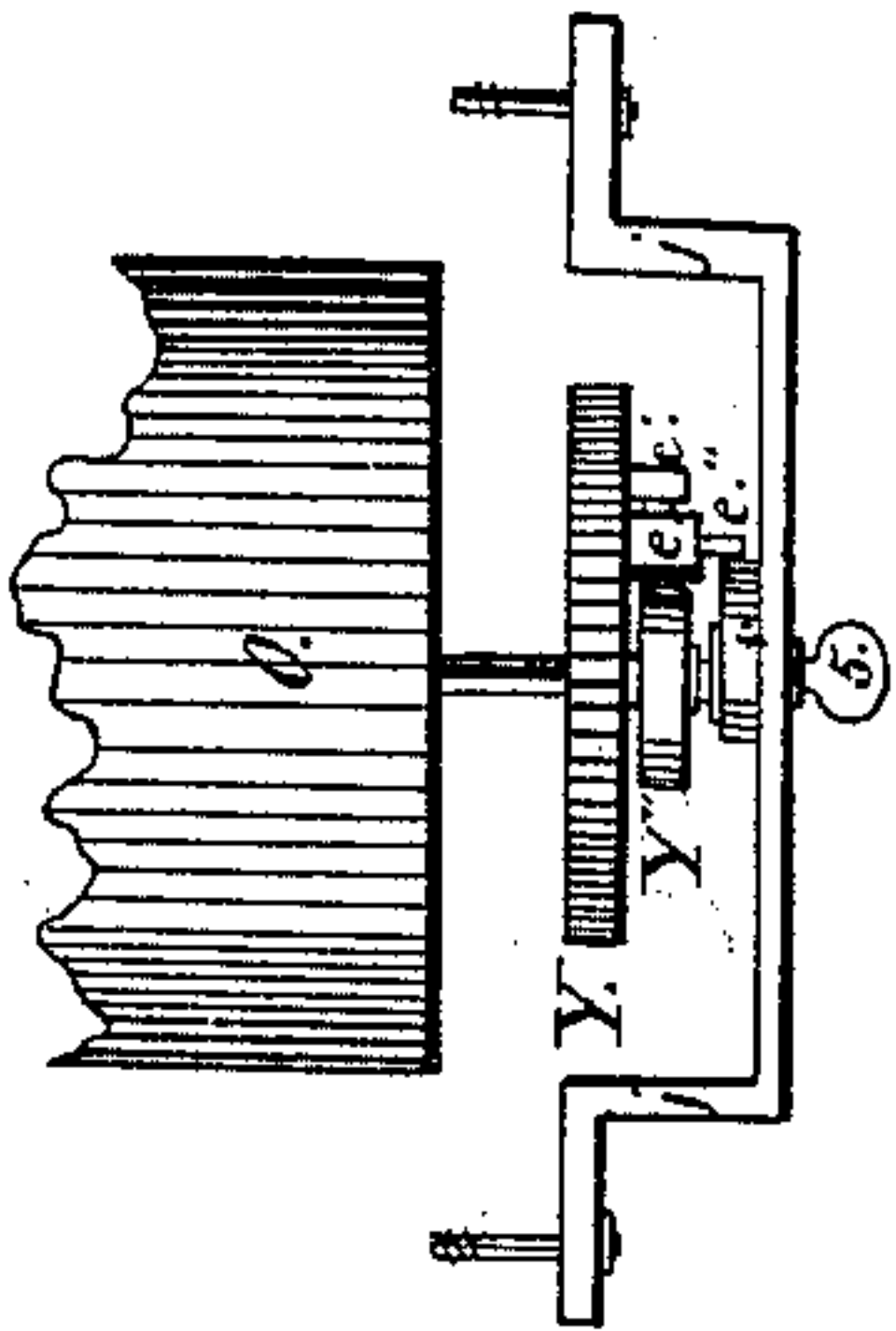


Fig. 7.

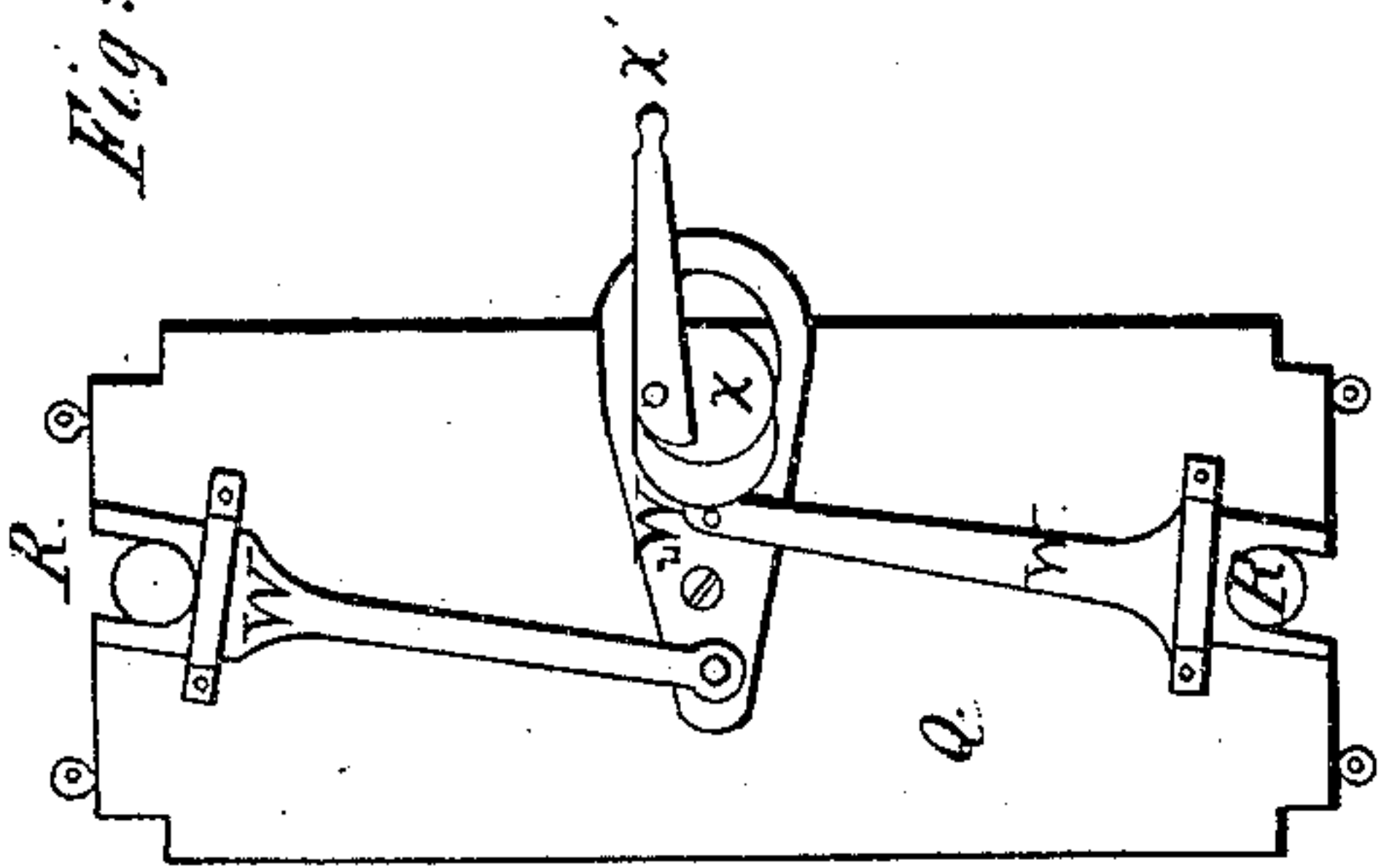
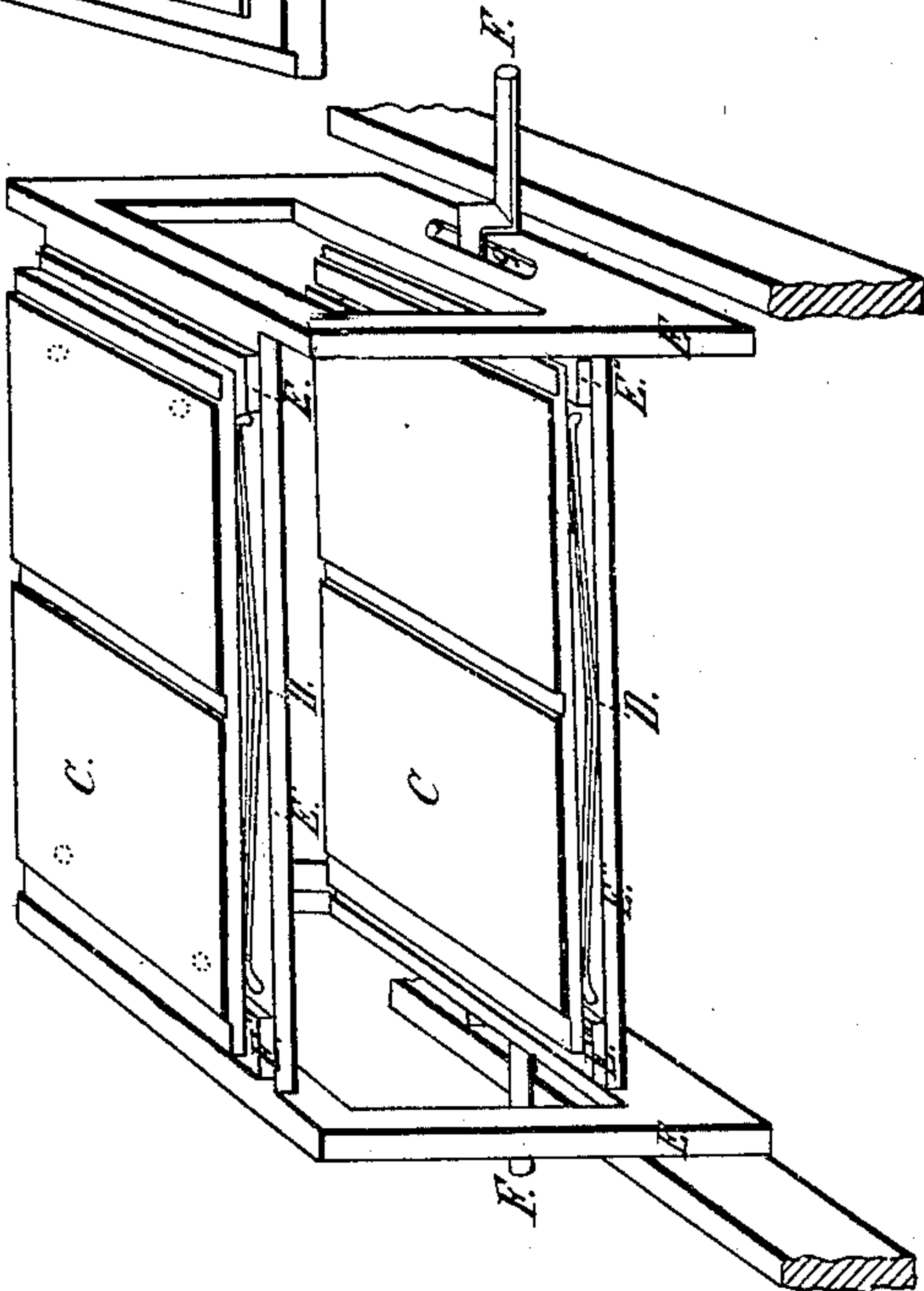


Fig. 5.





# UNITED STATES PATENT OFFICE.

WILLIAM H. DANFORTH, OF SALEM, MASSACHUSETTS.

## IMPROVEMENT IN POWER PRINTING-PRESSES.

Specification forming part of Letters Patent No. 9,794, dated June 21, 1853.

*To all whom it may concern:*

Be it known that I, WILLIAM H. DANFORTH, of Salem, in the county of Essex and the State of Massachusetts, have invented new and useful Improvements in Power Printing-Presses; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is a perspective view of the press. Fig. 2 is a longitudinal section, it being taken at the red line *a* in Fig. 1, showing the operation of the feed-bands, &c. Fig. 3 is a cross-section, it being taken at the red line *a'* in Fig. 1, showing the standards *A'' A''* with a piece broken out of the center of each to show the operation of the sliding frame, to which the platens are attached. Fig. 4 is a face or perspective view of one of the type-beds. Fig. 5 shows the two platens and the sliding frames to which they are attached disconnected from the frame-work of the machine. Fig. 6 is a top view of the discharging bars and bands. The top part of said bands or the part that leads from the top of the roller *O*<sup>6</sup> to *O*<sup>12</sup> is broken out to show the operation of the bars, &c. Fig. 7 is a view of the under side of the sliding platform *Q*, showing the manner of ungearing it from the screw-rod *R R*. Fig. 8 is a top view of the feeding-wheel, cam, &c.

In the following description like parts are represented by the same letters in all of the figures.

The nature of my invention consists in the employment of two parallel type-forms and two platens in one printing-machine, so arranged one above the other that both platens can be operated together, so that a sheet of paper can be printed by each form at one impression; also, in the manner of feeding the paper into the machine between a series of gripping bars and bands that hold it in place to receive the impression and pass it forward afterward, while the inking-roller is so arranged as to follow closely after it across the face of the types to ink them and be followed in turn by the blank sheet that is to receive the next impression; also, in the manner of providing an opening between the feed-bands at the time that the sheets are entered from the tympan; also, in the arrangement for operating the

feed-bands, so that they will be stationary at the time that the impressions are given.

*A* is a strong frame, which is to be made of any suitable material.

*B B'* are two type-beds, to which the forms are secured in any suitable manner. (Both seen in Fig. 2.) These type-beds are to be firmly secured in their bearings, so that they will be stationary, they being fitted to slide in grooves in the cross-bars *A' A'* when they are put into or taken from the machine.

*C C*, Figs. 3 and 5, are two platens. They are to have their faces covered with cloth or with very thin india-rubber to prevent their doing injury to the types when driven rapidly. Each of them rests upon two springs *D D*, which are secured to the cross connecting bars *E'* of the sliding frame *E*. The object of these springs is to permit the platens to be yielding, so as to lengthen the time of their contact with the types. When the impressions are given, the ends of the platens are to bear against the gage-rests *E'' E''*, which are placed under each of them.

*F* is a crank-shaft, which works in the slots 9 in the bottom parts of the sliding frame *E*, so that when the crank-shaft is made to revolve by the power being applied to the pulley *G* on one of its ends, (seen Fig. 3,) this sliding frame will be made to travel up and down between the standards *A'' A''*, carrying the platens with it to and from the types alternately.

The arrangements for feeding the sheets of paper to the types are as follows: *H* is the tympan. *H' H' H'* are endless tympan-aprons running round the rollers *I I*, the top half of them dragging over the top of the tympan *H*, and upon them the sheets are to be laid one at a time. These aprons receive an alternate forward movement from the ratchet-wheel *J* on the shaft of one of the rollers *I*, being operated upon by the pawl *K*, which is hung to the top end of the vibrating lever *L*. This lever is hung to the shaft of the ratchet-wheel *J*, and is made to vibrate back and forth by being connected by the bar *L'* with a pin or stud upon the side of the wheel *G'*, which is attached to the opposite end of the crank-shaft from the driving-pulley *G*. This is so arranged that while the crank-shaft *F* is carrying the platens in its revolutions through the top half of their race to give the impressions, &c., the



tympan-aprons will receive a forward movement sufficiently to carry the sheet that has been laid upon them forward and enter one edge between the two sets of feed-bands  $N N'$ , to be taken in by them to the types, as will be shown hereinafter.

The sheet is prevented from dropping as it passes from the tympan-aprons to the feed-bands by the wires  $b b b$ , which have one of their ends wound loosely round the roller  $I$  between the aprons  $H'$  and their other end dragging upon the roller  $O'$ . The tympan-aprons can be used stationarily, if desired, by simply unpawling the ratchet-wheel  $J$ , which may be preferred for some kinds of work, but in general I presume that they will be preferred to be movable, as the sheets can be more uniformly presented than they can well be by hand.

The feed-bands  $N N'$  are to be made of any suitable material that will not be liable to stretch by constant use, and as the two sets are somewhat differently arranged and are of different lengths, I will describe the short set  $N$  first. This set plays round the feeding-cylinder  $O$  and the rollers  $O'$  and  $O^2$ , (seen in Fig. 2) and are so placed that they will come under the sinkages  $B''$  in the type-bed between and outside of the forms  $B'''$ , so that they will act upon the sheets upon the parts to be left blank for margins, (seen in Figs. 3 and 4,) and are kept always at this distance apart by being attached to the cross-bars  $P$ , the ends of which act against the stationary guides  $M M$ , which are so placed as to permit them to pass freely along without having any sidewise motion. The cross-bars  $P$  are so placed that every other space between them will be such as to permit said cross-bars to act upon the margins at the two ends of the sheets, and as the sheets are to cover these spaces there are a series of threads running across from one cross-bar to the other; or these spaces may be covered entirely with cloth is preferred, as the object is simply to provide something to hold up the sheets between the bands  $N$ . The remaining spaces between said cross-bars will be generally not far from twelve inches, and will be termed the "open" or "inking" spaces, as the inking-rollers will pass up through these spaces far enough to ink the types, as will be shown hereinafter. The other or long set of feed-bands  $N'$  are arranged the same as the set just described, only this is considerably longer than that, and has no cloth or threads covering the spaces which are covered by the sheets, and are made thicker in these spaces than they are in the inking-spaces by having strips of india-rubber or other pliable substance attached to them. The face of the cross-bars  $P'$  are to be even with this raised surface. The object of this is to provide an opening between the two sets of bands while the open or inking spaces are passing between the two entering rollers  $O'$  and  $O^3$ , so as to permit the edge of the sheets to be entered freely between them from the tympan, which edge be-

comes nipped by the raised surface as it enters and fills up the space between the two rollers and takes the sheet into the machine. The cross-bars  $P P'$  of the two sets are intended to lock into each other in any suitable manner, so as to insure both sets traveling at the same speed always. When the impressions are taken, one of the sets will come into the sinkages  $B''$  in the type-bed and the other will come into corresponding sinkages in the platen  $C$ .

$b' b' b'$  are springs. There are three to each set of forms. They are attached by one end to one of the cross-bars  $A'$  of each set and extend across under the sinkages  $B''$  in the type-bed to the opposite cross-bar. (Seen in Fig. 2.) They act against the feed-bands to keep them away from the face of the types when the feed-bands are in motion, so that the sheets shall not be soiled when passing under the types, and are pressed up into said sinkages  $B''$  by the platens  $C$  when the impressions are taken.

The long set of feed-bands run through the machine as follows: starting at a point over the roller  $O^4$ , Fig. 2, thence running in the direction of the arrows round the roller  $O^3$ , thus bringing the raised surface on top of the short set  $N$ . From this point the two sets pass through the machine together under the top type-bed, thence round the cylinder  $O$ , thus reversing the bands and bringing the long set underneath the short set, and when the sheets are between them reversing their sides also, thus presenting a blank side to the second set of forms as they pass under it. At the bottom of the cylinder  $O$  the short set leaves the long set and passes up over the rollers  $O^5 O^5$ , and thence down again under the roller  $O^2$ . The object of this is to keep the threads which sustained the sheets between the bands while passing under the top type-bed out of the way, as they would now come between the second set of type-forms and the sheet to be printed, and in order to have something act in their stead to prevent the sheets from being displaced there is an endless tape running over each of the short set  $N$ . These pass across the machine, with the long set  $N'$  under the bottom type-bed, until they reach the roller  $O^2$ . Here the endless tapes pass up to the top again with the short set  $N$ , (in the direction of the arrow,) and the long set  $N'$  proceeds on under the roller  $O^6$ . Here there are a series of discharging cross-bars  $P'''$ , that unite with it, which are so arranged upon and secured to the two endless discharging-bands (or chains)  $N''' N'''$ , which run outside and alongside of the long set of feed-bands  $N'$  round the roller  $O^7$ , as seen more fully in Fig. 6, that when these two sets are operated together there will be one of these discharging cross-bars  $P'''$  ready to act upon the leading edge of each of these sheets as they pass along under the roller  $O^6$  to hold it against the cross-bar  $P'$  of the feed-bands that is under said edge until they have both passed together



round under the roller  $O^8$ , which is so placed as to allow nearly the whole length of the sheet to have passed under the roller  $O^7$  before said cross-bars arrive under it. After passing this roller  $O^8$  the two cross-bars become separated by the feed-bands  $N'$  passing up over the roller  $O^9$  out of the line that the discharging-bars  $P'''$  and bands  $N'''$  are traveling, said bands  $N'''$  passing along round the rollers  $O''$  back in the direction of the arrows round the roller  $O^{12}$  to the roller  $O^6$  again. Thus it will be seen that the cross-bars slack their hold upon the sheet at the time that the opposite end, as there is nothing to hold it up against the feed-bands  $N'$ , begins to fall, thus allowing it to be laid smoothly upon the platform  $Q$ , which is made to descend as fast as the sheets are piled upon it, so as to keep the top of the pile always at the same distance from the discharging-bars  $P'''$ , as will be shown hereinafter. The ends of the discharging-bars  $P'''$ , when passing underneath the feed-bands  $N'$ , rest upon the stationary guides  $A'''A'''$  to prevent their sagging away from said bands by their own weight, and thus relax their hold upon the sheet before the proper time. After reaching the roller  $O^9$  the feed-bands  $N'$  pass along in the direction of the arrows under the rollers  $O^{10}$  up to the roller  $O^4$  again.

As the long set of feed-bands when passing under the bottom type-bed has nothing provided for holding up the sheets between them, there is an auxiliary set  $N''$ , which play round the rollers  $O^{10}$ , and which are provided with cross-bars  $P''$ , (shown by dark shadings, Fig. 2<sup>a</sup>.) and threads or cloth arranged the same as the short set  $N$ , described above, for this purpose.

All of the above-described endless bands are driven by turning the cylinder  $O$ , which is to be made as light as it can be consistent with suitable strength, so that its momentum may be as little as possible when stopped suddenly after being turned quickly, as it is to be driven with an intermittent rotary motion. The diameter of it may be such that by turning it half-round the feed-bands, &c., will be taken along the length of a sheet and an open or inking space, or it may be made small enough to make an entire revolution to accomplish this. This cylinder is operated as follows:  $L^2$  is a reciprocating rack, which is attached by one end to the vibrating lever  $L$ . The teeth upon the other end take into the gear-wheel  $Y'$ , and this into the feeding-wheel  $Y$ . This feeding-wheel is loose upon the shaft of the cylinder  $O$ , and is of sufficient size to cause it to turn half-round each way as the rack  $L^2$  plays back and forth, and has a pawl  $c$ , operated by a spring  $c'$ , attached to one side, which springs into notches in the periphery of the small wheel  $Y''$ , which is fast to the shaft of said cylinder, thus making the feeding-wheel  $Y$  alternately fast or loose upon its shaft and allowing it to turn the cylinder  $O$  half-round, and thus take the feed-

bands ahead or to allow them to be stationary, according as it is fast or loose.

$d d$  are two pawls which are to drop into notches in the periphery of the cylinder  $O$  the instant that it has been turned half-round, so that the momentum may not carry the feed-bands ahead too far.

The feeding-cylinder is to have points or studs upon its periphery to take into the two outside bands, so that when said cylinder is stopped suddenly the feed-bands, &c., will not be carried along by the momentum of the other rollers, over which they play. These rollers will also be made as light as possible, and as they have no studs or points upon them will permit said bands to slip upon them sufficiently for this, thus leaving only the momentum of the cylinder  $O$  to be overcome when the feed-bands are to be stopped. This is done by having the brake  $e$  pressed against the side of said cylinder before the pawls  $d d$  take effect upon it. These are operated as follows:  $g$  is a rocking shaft, which has the arm  $h$  upon one end, which hangs down outside the feeding-wheel  $Y$ . It has also two cams  $i i$  near each of its ends, which are so arranged that when said feeding-wheel is moving back loosely upon its shaft, after having taken the cylinder once half-round, so that the spring-pawl  $c$  may take another hold upon the fast wheel  $Y''$  for the next movement of said cylinder, the arm  $h$  will be struck by the stud  $k$  on the side of the feeding-wheel, which will cause the rocking shaft to be turned sufficiently to cause the cams  $i i i i$  to lift the pawls  $d d$  out of the notches in the cylinder and also to press the brake  $e$  out of contact with it and hold them so, thus permitting the cylinder to be turned freely at the instant that the motion of the feeding-wheel is reversed until another stud  $k'$  acts against the opposite side of the arm  $h$ , which will let the spring  $f$  press the brake  $e$  against the side of the cylinder again and also let the pawls  $d d$  down upon its periphery, which will slip round upon it until the notches come round, into which they are to drop.

In order that the force applied to the feeding-wheel  $Y$  may not continue to act upon the cylinder  $O$  after the brake has begun to operate upon it, the spring-pawl  $c$  has a pin or stud upon one side near the movable end, which plays round upon the edge of the adjustable cam  $'''$ , which is secured to the inside of the bracket  $j$  by the set-screw 5. A piece of this bracket is broken out in Fig. 1, but is shown whole in Fig. 8. The cam  $'''$  is so adjusted that after a sufficient force has been given to the cylinder to cause its momentum to carry it half-round within the time required, the pin or stud  $C''$  (seen enlarged in Fig. 8) by acting against its edge will have drawn the spring-pawl  $c$  out of the notch in the fast wheel  $Y''$ , thus permitting the whole force of the brake  $e$  to act upon the cylinder to check its speed before it is pawled.

The platform  $Q$  is made to descend gradu-



ally between the standards  $A''' A'''$  as fast as the printed sheets are laid upon it by having two slides  $W W$ , Fig. 7, upon its under side, which are made to take into the side of the screw-rods  $R R$  at the outer end of each, the inner ends being attached to the cross-lever  $W'$  at equal distances from the pivot 2 on which it turns. This lever has a loop at one end, which has an eccentric  $X$  fitted into it, so that when this is turned by the handle  $X'$  the slides  $W$  will move in or out, according to the direction turned, thus causing said platform to be geared or ungeared with the screw-rods at pleasure. The screw-rods  $R$  run in stationary bearings. Each of them has a toothed wheel  $R'$  attached to the bottom end, which takes into the worm  $S$  upon and near each end of the shaft of the pulley  $S'$ . This pulley is operated by an endless cord or strap running round the pulley  $S^2$ , which is upon the end of the shaft of the feed-roller  $O^7$ . Thus it will be seen that when this roller is made to revolve by the feed-bands  $N'$  when they are set in motion to discharge a sheet, &c., these screw-rods  $R$  will be turned sufficiently to lower the platform the thickness of the next sheet that is to follow. This platform is hung to the weights  $T T$  (one on each side of the machine) by means of the cords  $U U$ , which play round the pulleys  $V V$ , so that after the platform has descended to the bottom of its race it will be taken up again by these weights  $T$  as soon as the pile of sheets has been removed and it is ungeared from the screw-rods  $R$ .

The types are inked as follows: As there are two sets and both alike I will describe one.  $m m$ , Figs. 2 and 3, are two endless chains on opposite sides of the machine from each other, each of which runs over two pulleys or heads  $n n$ . There are two on a shaft, which shaft runs in stationary bearings attached to the standards  $A''$ . To the endless chains  $m$  the inking-roller  $z$  is attached by its shaft, so as to be carried round said pulleys  $n$  in the direction of the arrow with said chains when said pulleys are set in motion by the gear-wheel  $G^3$ , Fig. 1, which is on the shaft of one of the sets of chain-pulleys  $n$ , and which takes its motion by means of the connecting-wheels  $G^2$  from the gear-wheel  $G'$  on the driving crank-shaft  $F$ , the diameter of the wheels  $G^3$  being in such proportion to that of wheel  $G'$  as to cause the inking-roller  $z$  to make a revolution round the platen  $C$  and the pulleys  $n$ , Fig. 2, for every revolution of said wheel  $G'$  and crank-shaft  $F$  and for every impression taken, the shafts of the chain-pulleys  $n$  being so placed in relation to the type-bed that when the inking-roller  $z$  is passing under the forms they will come in contact with them, there being grooves in the periphery of the inking-roller corresponding to the feed-bands  $N N'$  and of sufficient depth to permit it to pass up through the open spaces in said feed-bands without lifting them, so that the sheets may pass under the types without injury at

the same time that the inking-roller is passing across them. The endless chains  $m$  are kept from sagging out of a straight line by the weight of the roller  $z$  while passing under the types by the rests  $r r$ , (shown by a broad black line under the top half of the endless chain, Fig. 2,) which project out under them, so as to sustain the weight of both.

The inking-roller is kept supplied with ink as follows:  $VI VI$  are two rollers having the endless apron  $u$  running round them. The shafts of these rollers run in fixed bearings and are so placed that when the top half of the inking-apron  $u$  is drawn in a straight line from the top of one roller to the top of the other it will be as far below the endless chains as the face of the types are above them, so that when the inking-roller is carried across under the platen the under side of it will come in contact with this apron, which is kept always in one line by means of the platform  $u'$  under the top half of it, thus providing a flat inky surface for the inking-roller to run over to supply itself with ink. This ink-apron is kept supplied with ink as follows:  $x$  is a box containing a supply of ink.  $x'$  is a roller running in it. The top of this roller is pressed upon by the bottom half of the ink-apron  $u$ , so that when this apron is set in motion by the belt  $t$ , which connects one of the rollers  $VI$  with one of the feed-rollers, this roller  $x'$  will take up the ink out of box  $x$  and spread it out upon the apron  $u$ , and as this is constantly changing for the top will keep said top always covered with ink.

Operation: Thus it will be seen that when the power is applied to the driving-pulley  $G$  its crank-shaft  $F$  will set the platens  $C$  in motion, and at the same time the wheel  $G'$  on the other end of said crank-shaft, by means of the gear-wheels  $G^2$  and  $G^3$ , will cause the inking-rollers  $z z$  to revolve round the platens  $C C$ , which will take up a supply of ink while passing across under said platens while they are being carried through the bottom half of their race and while the feed-bands  $N N'$  are stationary, and at the same time the crank-pin on the side of wheel  $G'$ , by means of the bar  $L'$  and vibrating lever  $L$ , and ratchet and pawl  $K$ , will during one half-revolution of wheel  $G'$  cause the sheet laid upon the tympan-aprons  $H'$  to be entered between the feed-bands. The other half-revolution causes the reciprocating rack  $L^2$ , by means of the connecting-wheel  $Y'$  and the feeding-wheel  $Y$ , &c., to set the feed-bands in motion, thus causing the sheet that had been entered to be taken into the machine. The second movement of the feed-bands places it under the top type-bed. The inking-roller  $z$ , having entered the open space in the feed-bands at the instant that they started, passes across the types to ink them at the same speed with which the blank sheet is being taken in, and while the inking-roller is passing under the platens again to receive a fresh supply of ink said platens are giving the impressions, and



as soon as the platens begin to be drawn away from the sheet the spring  $b' b' b'$  presses the feed-bands and printed sheet away from the face of the types, and after the platens have passed half-way down the inking-roller  $z$  will have passed round and entered the open space between the printed sheet and the blank sheet that is to take its place, and at this instant the feed-bands move forward again and thus withdraw the printed sheet and place a blank sheet into its place at the same time that the types are inked. This operation being continued, the fourth movement after this of the feed-bands places the sheet that has been thus printed while under the top type-bed under the bottom type-bed, with its sides reversed, ready to receive an impression upon its other side at the same time that the blank sheet that the same movement of the feed-bands placed under the top type-bed receives its first impression. The fourth movement of the feed-bands after this places the sheet by means of the discharging-bars, &c., upon the pile. Thus it will be seen that there will be a blank sheet entered and a sheet printed upon both of its sides discharged for every movement of the feed-bands.

Having thus pointed out the nature of my invention, I would state that I do not wish to limit myself to the precise method of constructing and arranging the parts specified, as these may be varied at pleasure so long as the principle or character of my invention is retained.

What I claim as of my invention, and desire to secure by Letters Patent, is—

1. The employment in one printing-press of two parallel type-forms, one above the

other, and two platens so arranged in a frame as that a sheet of paper can be printed by each form at one impression, substantially as above described.

2. The mode of feeding the paper between the gripping-bars and bands, which hold it in place to receive the impression and pass the sheet forward while the inking-roller occupies the intermediate space to ink the type.

3. Making the feed-bands unequal in thickness, as described, for the purpose of furnishing an opening between the two sets at the time that the sheets are to be entered from the tympan.

4. The employment of a series of gripping or discharging cross-bars  $P'''$ , in combination with and so arranged upon two endless bands  $N''' N'''$  as to be made to act upon the leading edges of the sheets as they pass along and hold them against the feed-bands  $N'$  until they have passed across over the top of the pile upon the platform  $Q$ , substantially as shown, for the purpose of piling the printed sheets.

5. The device for giving and checking the motion of the feed-bands alternately, as required, consisting of the vibrating lever  $L$ , bar  $L'$ , reciprocating rack  $L^2$ , connecting-wheel  $Y'$ , feeding-wheel  $Y$ , fast wheel or disk  $Y''$ , spring-pawl  $c$ , adjustable cam  $'''$ , stud or pin  $C''$ , studs  $k k$ , arm  $h$ , rocking shaft  $g$ , cams  $i i i i$ , pawls  $d d$ , brake  $e$ , spring  $f$ , and cylinder  $O$ , arranged and operated substantially as shown.

WILLIAM H. DANFORTH.

Witnesses:

JOHN K. DANFORTH,  
S. G. DANFORTH.