

(No Model.)

4 Sheets—Sheet 1.

E. DUMMER.

MACHINE FOR SEPARATING AND FEEDING SHEETS OF PAPER.

No. 557,656.

Patented Apr. 7, 1896.

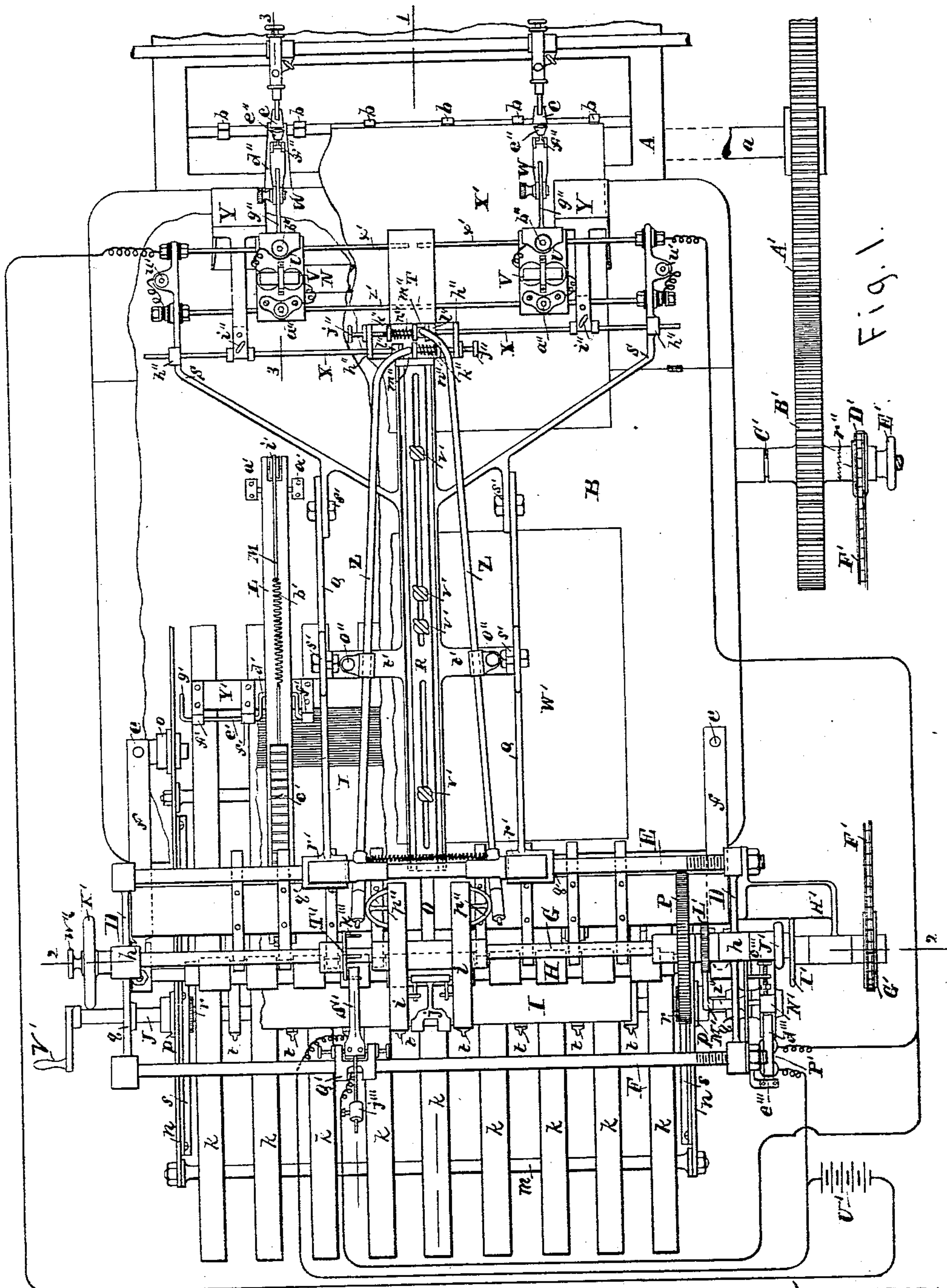


Fig. 1.

WITNESSES:

A. H. Bushing,
J. F. Bryant.

INVENTOR:

Edward Dummer.

(No Model.)

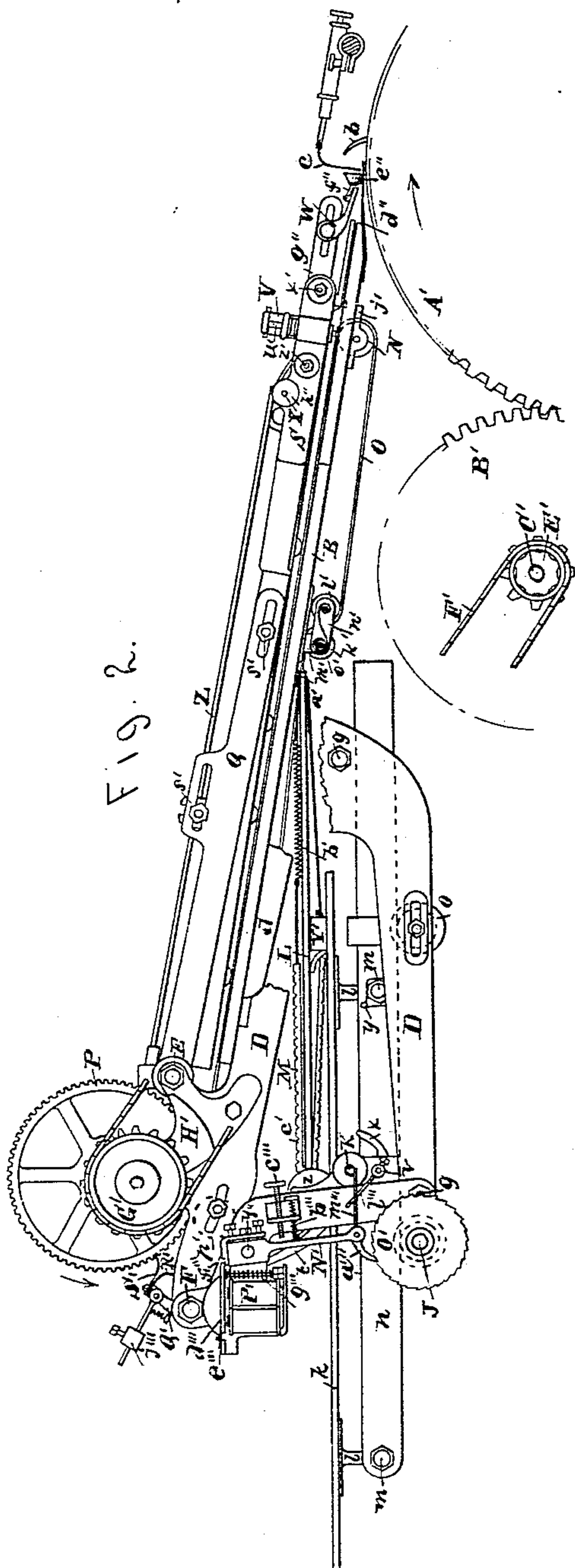
4 Sheets—Sheet 2.

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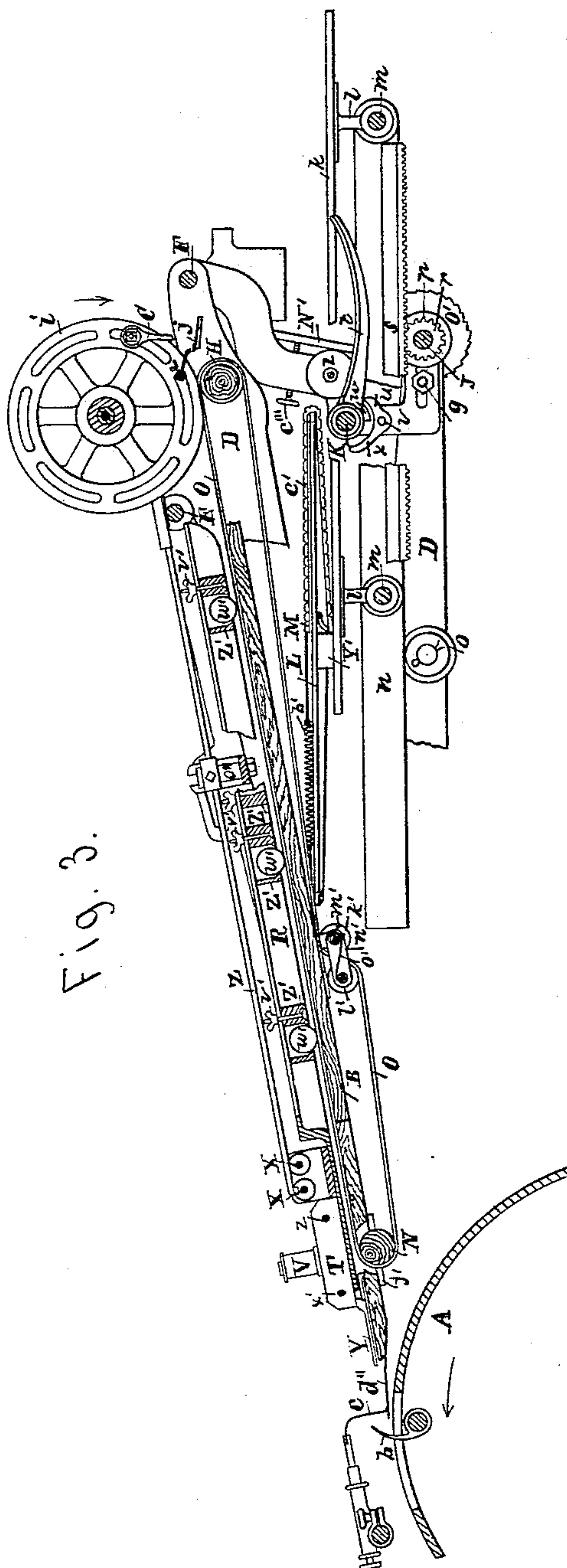


Fig. 3.

WITNESSES:

A. H. Cushing,
J. F. Bryant.

INVENTOR:

Edward Sumner.

(No Model.)

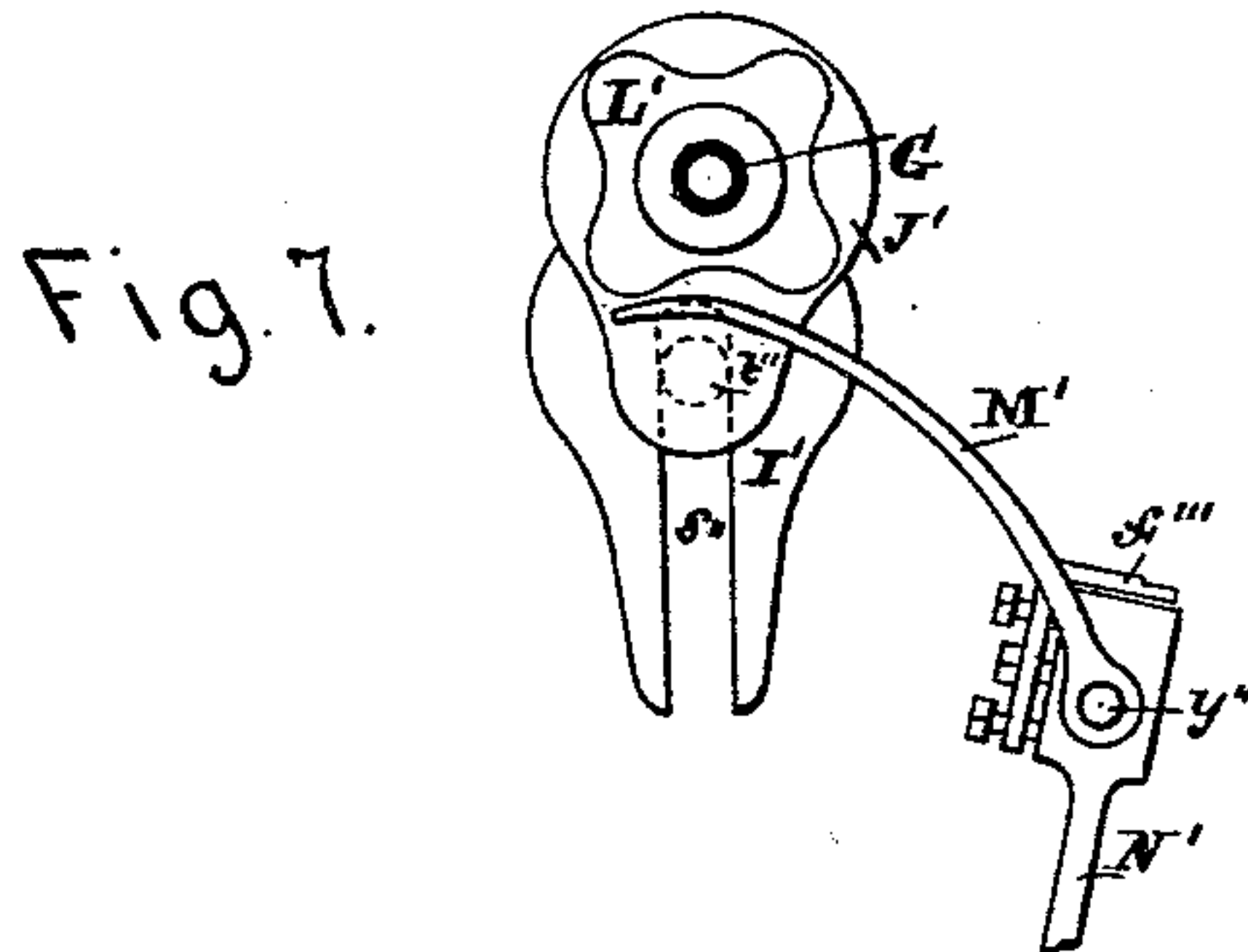
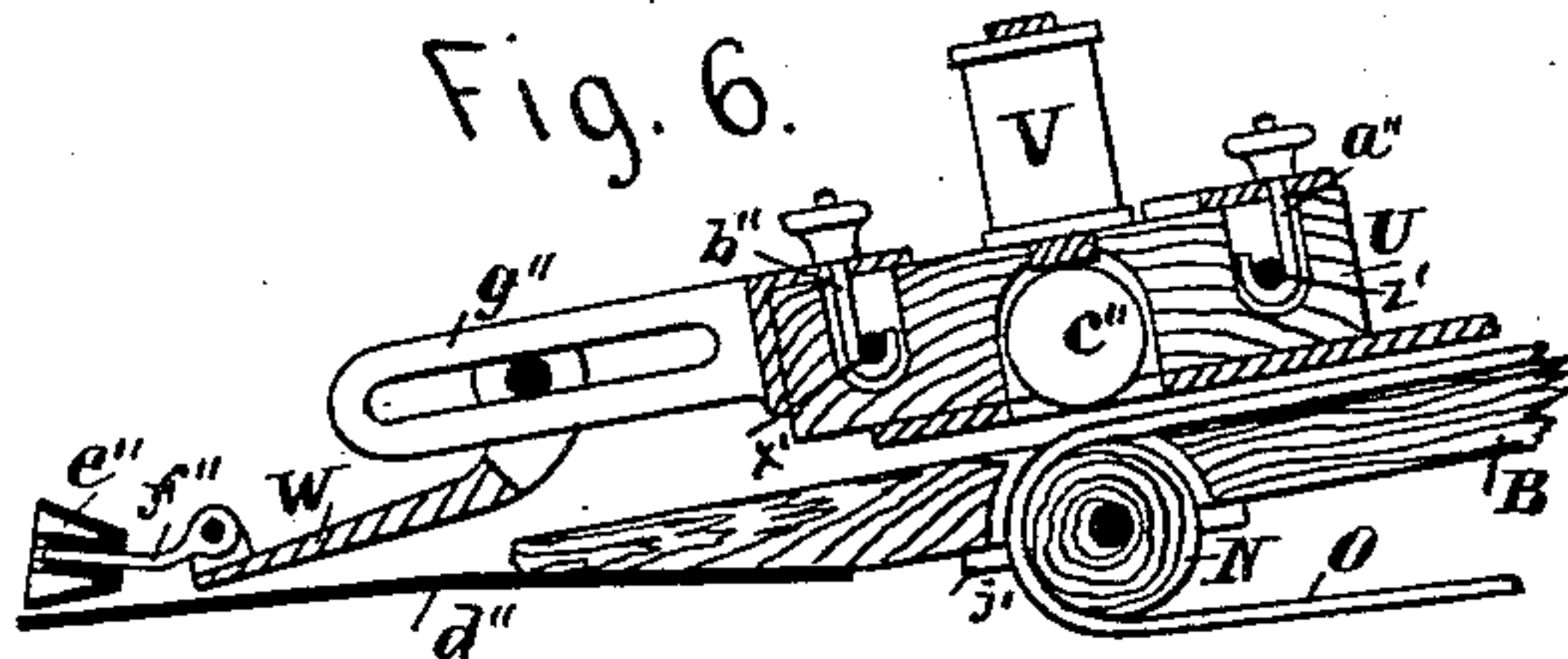
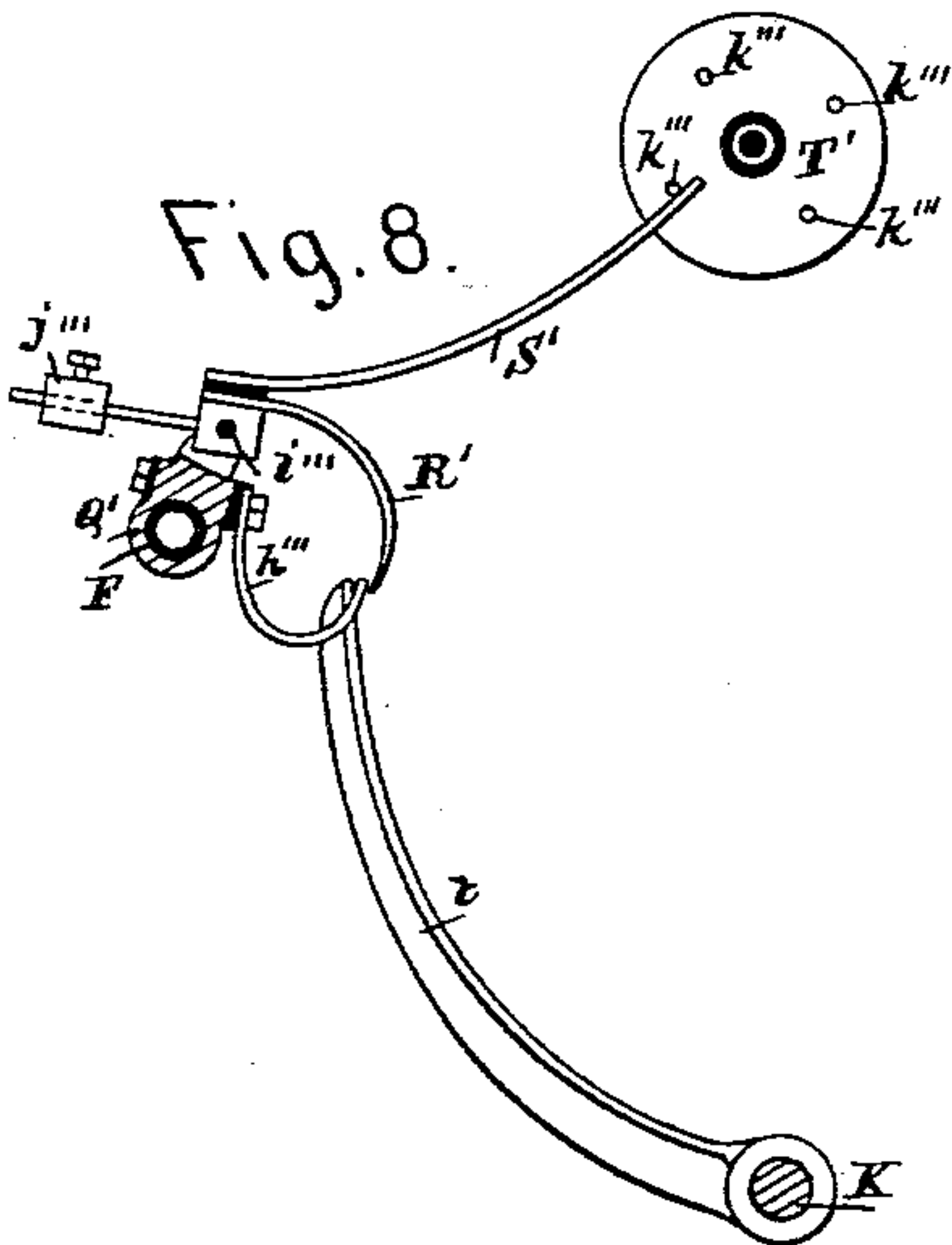
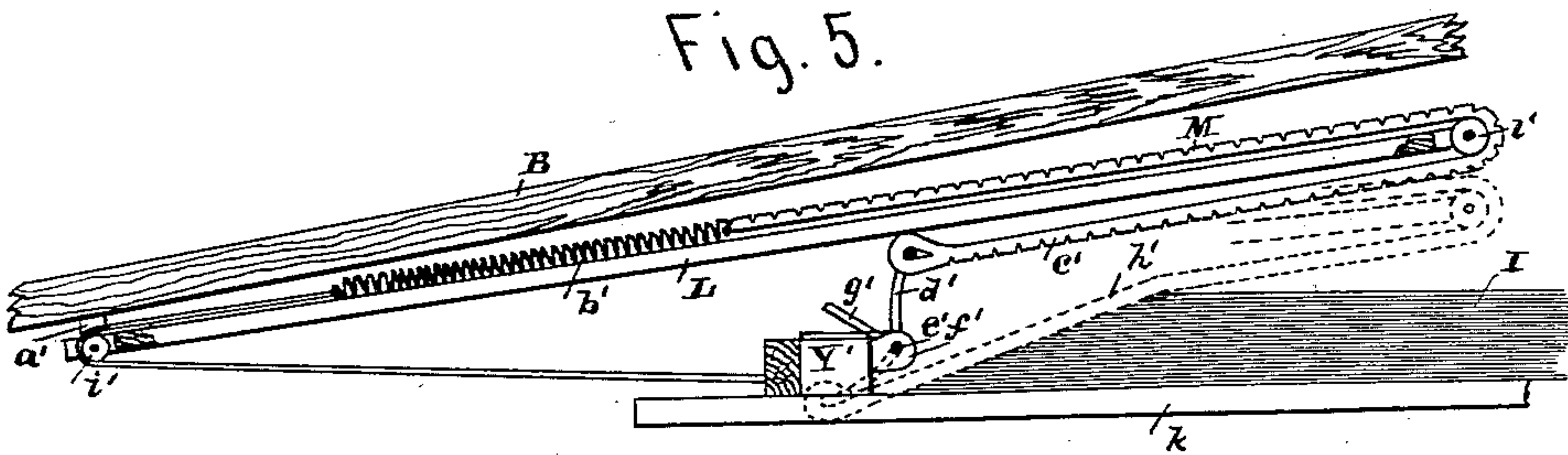
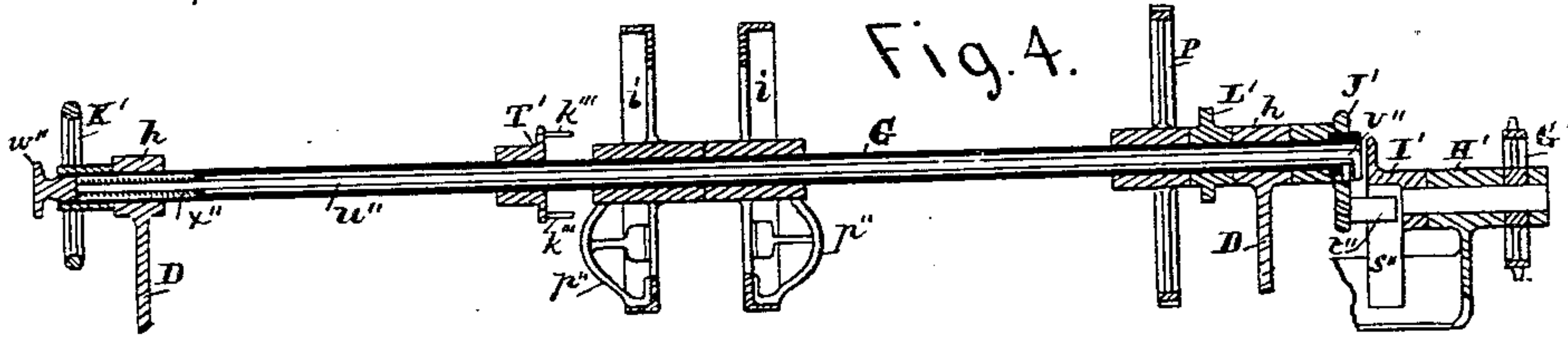
4 Sheets—Sheet 3.

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MACHINE FOR SEPARATING AND FEEDING SHEETS OF PAPER.

No. 557,656.

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WITNESSES:

A. H. Cushing -
J. F. Bryant.

INVENTOR:

Edward Dummer.

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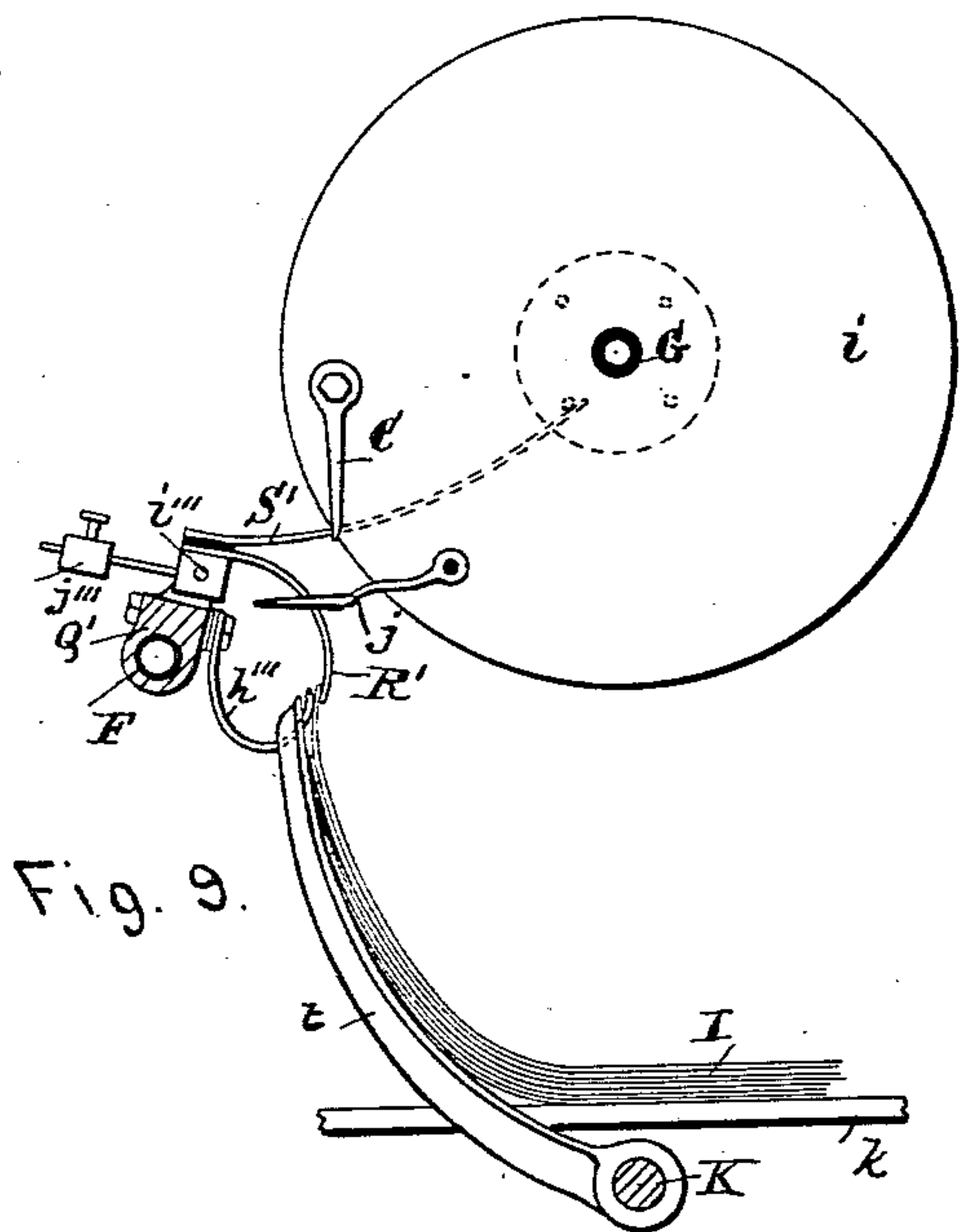


Fig. 9.

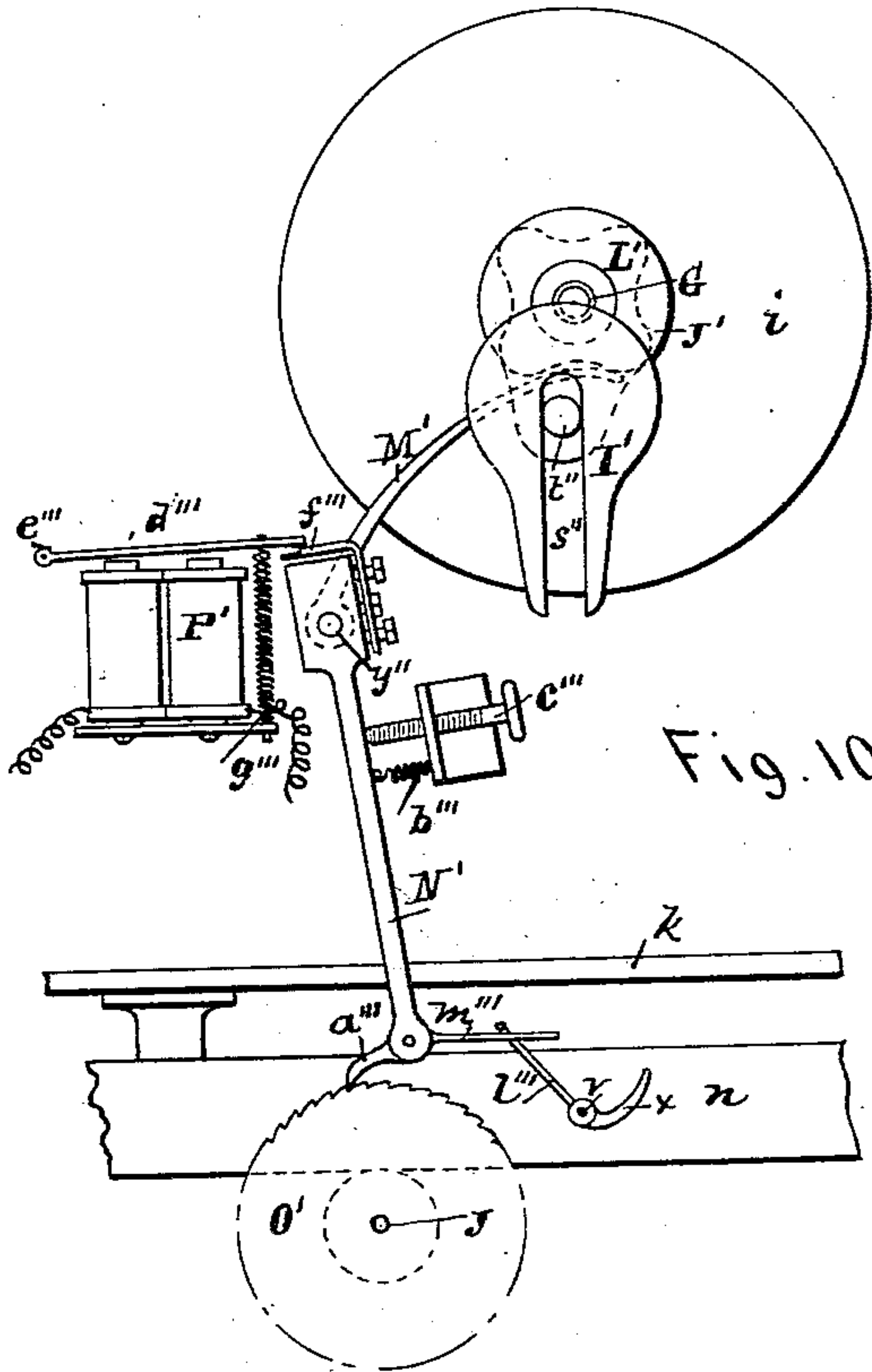


Fig. 10.

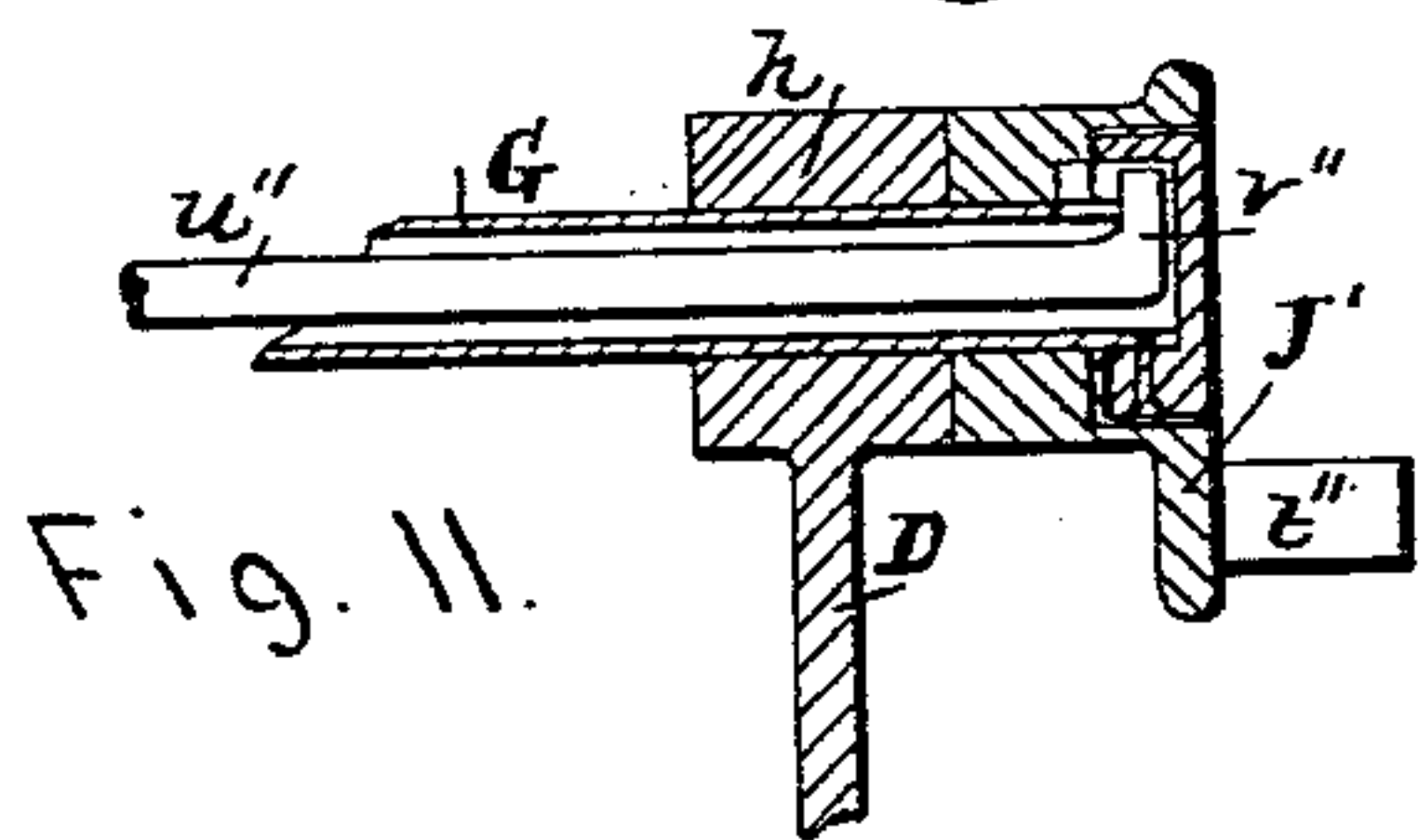


Fig. 11.

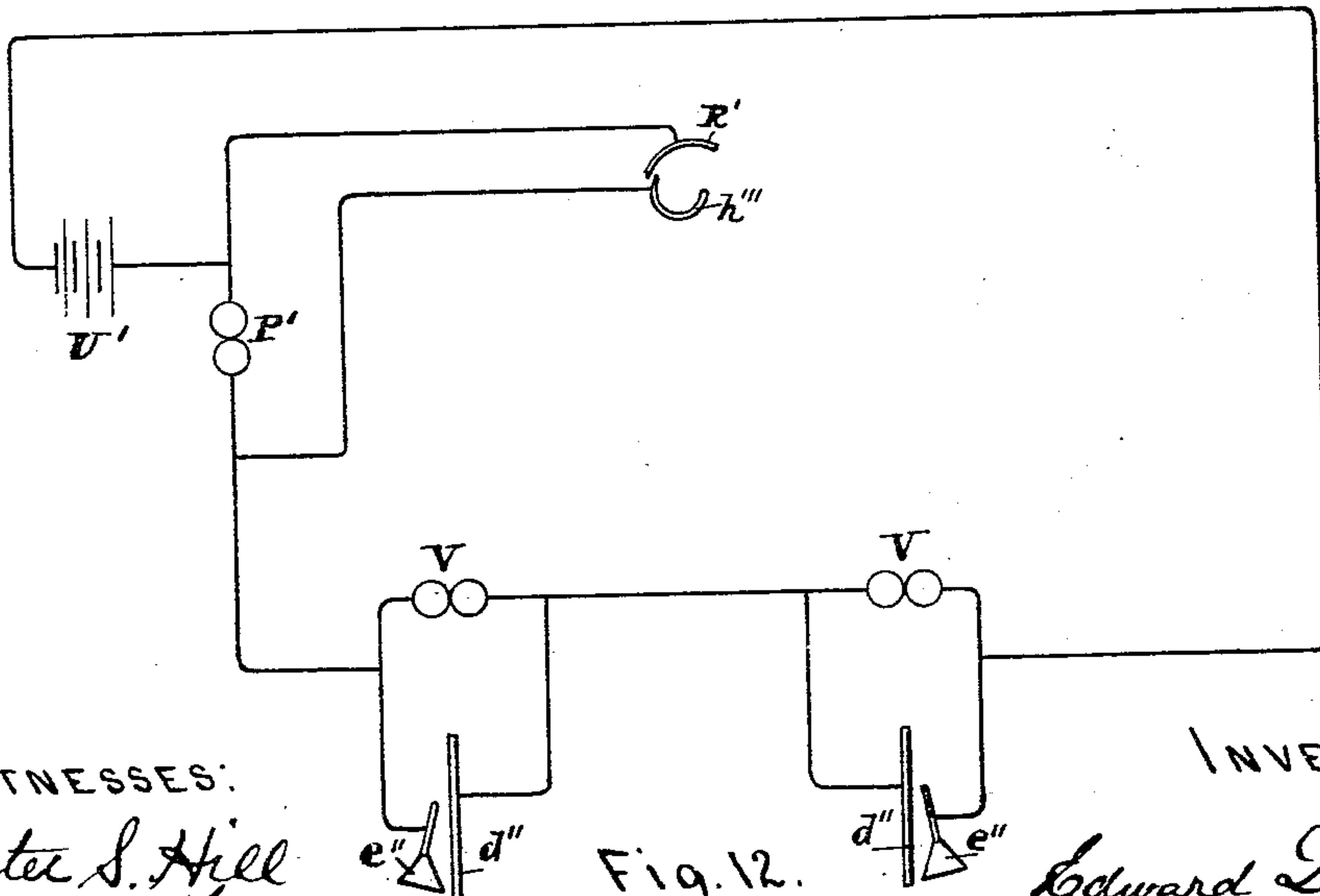


Fig. 12.

WITNESSES:
Master S. Hill
Edward Tymau

INVENTOR:
Edward Dummer

UNITED STATES PATENT OFFICE.

EDWARD DUMMER, OF NEWTON, MASSACHUSETTS, ASSIGNOR TO THE
DUMMER PAPER FEEDER COMPANY, OF PORTLAND, MAINE.

MACHINE FOR SEPARATING AND FEEDING SHEETS OF PAPER.

SPECIFICATION forming part of Letters Patent No. 557,656, dated April 7, 1896.

Application filed February 18, 1892. Serial No. 422,017. (No model.)

To all whom it may concern:

Be it known that I, EDWARD DUMMER, a citizen of the United States, residing at Auburn-dale, in the city of Newton and State of Massachusetts, have invented certain new and useful Improvements in Paper-Feeding Mechanism, of which the following is a specification, reference being had to the accompanying drawings.

10 The object of my invention, in part, is to provide for the support and movement of a pile or bank of sheets of paper and presentation of the edges of said sheets to an instrument called a "finger," by which is caused
15 the initiatory movement of each sheet in removing the same from the bank, the office and operation of said finger having been set forth and illustrated in Patent No. 414,147, granted to me October 29, 1889.

20 My invention further relates to means for gaging said movement of the bank of paper.

It is also the purpose of my invention to provide means for carrying each sheet to the gages of a printing-machine and adjusting the edges
25 of each sheet to said gages, as required in printing.

My invention has also for its object certain other improvements in mechanism for feeding sheets of paper to a printing-machine.

30 In the drawings, four sheets, Figure 1 shows so much of a paper-feeding mechanism and of a printing-machine as is sufficient in a plan view to illustrate my invention. Figs. 2 and 3 show certain parts, the former being a side
35 view and the latter a central section taken in the direction of lines 1 1 in Fig. 1. Fig. 4 is a section of shaft G and devices thereon and cooperating therewith, taken in the direction of lines 2 2 in Fig. 1. Fig. 5 is a section of
40 some of the parts, taken in the direction of lines 1 1 in Fig. 1. Fig. 6 is a section of certain parts between and in the direction of lines 3 3 in Fig. 1. Figs. 7, 8, 9, 10, and 11 are sections and side views of certain details. Figs.
45 5, 6, 7, 8, 9, 10, and 11 are drawn on a larger scale than the other figures. In some of the figures some parts are broken away for clearer illustration of other features, as will be well understood. Fig. 12 is a diagrammatic view
50 showing the electric circuits, circuit-closers, and electromagnets.

The cylinder A on a shaft *a*, grippers *b*, gages *c*, and feed-board B, secured to the frame in the usual manner, are those of a well-known cylinder printing-machine. To
55 this frame, a portion of which is shown at *d*, and to the feed-board I secure, as by means of bolts *e* and straps *f*, the frame to support the feeding mechanism. This frame is composed of the two side pieces D, held with ref-
60 erence to each other by cross-rods at *g* and by the cross-bars E and F.

Supported in suitable bearings *h* is a transverse shaft G, on which is fixed a cylinder, consisting in the present case substantially
65 of two disks *i*, between which is pivoted the finger *j*. A roller H, having a shaft to rotate in adjustable bearings, is located under the cylinder or disks *i* and in contact with said cylinder or disks. Sheets of paper I being
70 brought into such relation to the cylinder or disks *i* that the finger will be brought into contact with the edge or edge face of the uppermost sheet on rotation of the cylinder or
75 disks, the edge of the sheet will be carried to the line of contact of cylinder and roller, and by them the sheet will be lifted from the bank and carried onto the feed-board B, as more fully explained in my patent above named.

To support the bank of paper and move
80 the sheets thereof into the required position that their edges may be successively seized upon by the finger *j*, I now provide a table, which is also a carriage, formed of slats *k*, fastened on and held in suitable relation to
85 each other by projections *l* on cross-pieces *m*, secured to two longitudinal pieces *n*. These pieces *n* are fitted to move on rollers *o*, which may rotate on studs fixed to the frame and on rollers *p*, which are fastened on a trans-
90 verse shaft J, which has suitable bearings *q* in the frame, the rollers forming ways, so that the carriage and table may move substantially in the direction of its length. On this shaft are also secured pinions *r*, which
95 engage with racks *s*, fastened to the pieces *n*, so that by revolving the shaft J in one or the other direction the table for supporting the bank of paper may be moved forward or backward, as required. Fixed on another trans-
100 verse shaft K are bows *t*, so that in one position of this shaft the bows will be down be-

low the surface of the table or slats k , as illustrated in Fig. 3, and on a partial revolution of this shaft the bows will be brought up between the slats of the table into the position shown in Figs. 1, 2, and 8, and raise and curve the paper in part, so that the edges thereof may be brought into suitable relation to the finger j , as illustrated in Fig. 1. To hold the shaft K in position to have the bows raised, a pawl u is pivoted at v and engages with a projection w , fixed to the shaft. The pawl u has an arm x , with which a projection y , fixed to the table or a piece n thereof, engages, so that when this table is moved a sufficient distance backward the pawl will be tripped thereby and allow the bows to drop. A roller z , pivoted to an arm fixed on the shaft K , will, being made of rubber, serve the double purpose of gaging the distance through which the bows may drop and preventing any great blow resulting from such motion, and also will provide for a rolling contact on the moving frame or piece n thereof.

In order to prevent the sheets of paper from accidentally sliding on the table or slats k or becoming misplaced with reference to each other, I provide as follows for pressure on the inner edges of the sheets, the sheets being offset with reference to each other, as shown. I prefer to cause such pressure at two places, for each of which there is a longitudinal piece L , pivoted to a stationary stand a' , near one end, and extending over the table and paper, as illustrated. Around each piece L extends a flexible band M , having an elastic portion, as a spiral spring b' , and preferably a friction-surface c' , where the band comes in contact with the paper. One end of this band is fastened to the table or an abutment Y' for the paper secured adjustably on the table. The other end of the band is fixed to a crank-arm d' on a rod or shaft e' . This rod or shaft has bearings f' , fixed to the table or abutment thereon, so that the rod or shaft may be partially revolved, as by means of an arm g' thereof. When the crank-arms d' are turned down, the bands will press on the edges of the paper forming the bank, as illustrated in Fig. 1 and by the dotted lines at h' in Fig. 5. When the crank-arms are up, they will hold up the pieces L and also the band, so that the latter will not press on the paper and will be out of the way when another bank is to be placed on the table. When the table is moved in either direction, the band will be carried around the pieces L , so that there will be no sliding movement of the band on the paper, there being rollers i' at the ends of each piece L , whereby the band may readily move thereon.

About the roller H and a transverse roller N is an endless belt O , centrally located, as shown. The roller N has bearings in fixed stands j' under the feed-board B and projects through a slot in this feed-board a suffi-

cient distance so that the upper surface thereof is about in the same plane as the surface of the feed-board. This belt extends also about binding-pulleys k' and l' . The pulley k' having bearings in fixed stands m' , and the pulley l' having bearings in arms n' , which are pivoted, preferably, on a line central with the pulley k' , the belt will be kept taut by the action of a spring o' , and also by gravity, as will be readily understood. The upper surface of the belt O should also be nearly or quite in the same plane with the upper surface of the feed-board B , a groove of slight depth being formed in this board therefor. To insure the required rotation of the roller H , and hence movement of the belt O and rotation of the roller N , a gear P is fixed on the shaft G , which engages with a pinion (indicated by dotted lines at p' in Fig. 2,) fixed on the shaft of the roller H .

A frame is pivoted on the cross-bar E at q' . This frame is composed mainly of two arms Q , which have the bearings r' on the cross-bar E , and to which is adjustably bolted at s' a central piece R , having projections t' and branches S . This frame may be swung up or down, moving on the cross-bar E , the frame when down being held a slight distance above the surface of the feed-board B , and such distance being gaged by means of adjusting-screws w' . Blocks Z' may be slid along the central part of the frame and be fixed in position by thumb-screws v' . Each of these blocks holds a roller w' , preferably a loose ball in a socket, as shown, in such position that it will bear on the belt O or on the sheet of paper W' , Fig. 1, between this belt and the roller, so that when the belt is in motion the roller will revolve and the paper will be carried along by the belt and the rollers. On transverse rods x' and z' , which are held at their outer ends by the branches S and at the center by a center block T , fastened to the frame, are blocks U . Each of the blocks U may be slid on the rods transversely with reference to the machine and be secured in any desired position by means of loops or hooks a'' and b'' and thumb-nuts, as shown. Each of the blocks U maintains in position just above the roller N a metallic roller c'' , preferably a loose ball in a socket in the block, so that when down the rollers c'' will bear on the roller N or on a sheet of paper X' , Fig. 1, between the roller N and the rollers c'' , so that on revolution of the roller N the paper will be carried along, the roller N serving as a motive roller for the rollers c'' , the latter moving by friction. When either of the rollers c'' are raised up so as not to touch the paper thereunder, the paper will not be moved by that roller c'' and the roller N , since the friction of the latter roller against the under side of the paper would not be sufficient to move the paper, the pressure resulting from the weight of the roller c'' being removed. I prefer to raise each of the rollers

c'' by means of an electromagnet V, placed above in suitable position to attract and directly lift the roller.

Fixed adjustably in the usual manner to the feed-board B are the ordinary plates d'' , which the gages c meet when down and which support the lower portion of a sheet of paper when in position to be seized by the grippers b .

I provide presser-feet e'' , one for each of the plates d'' . I prefer to have each of these presser-feet in the form of a conical roller, so that the lower edge thereof may be set very near to a gage c and may roll, to make as little friction as possible on the sheet of paper when the same is moved sidewise for adjustment thereof, on a pivot f'' . This pivot is itself pivoted to an arm W, so that the presser-foot, being thus flexibly connected with the arm W, may by gravity meet the corresponding plate d'' or the paper thereon. The arm W is adjustably secured to a block U or to slotted projection g'' thereon. By means of these adjustments and that of the blocks U on the rods the presser-foot may be secured in the required positions with reference to the plates d'' and gages c whatever be the necessary positions of these plates and gages. I prefer to have each arm W in the form of a plate and to adjust it in close proximity to the plate d'' thereunder, as shown.

Two rods X are fitted to slide transversely with reference to the machine in bearings h'' . To each of these rods is adjustably secured, by means of a clamp and thumb-screw, at i'' a pusher Y, the office of which is to push against the edge face of each sheet of paper at whichever side may be required and to form a gage at that side. I prefer that each pusher should have a top and bottom plate, as shown, between which a portion of the sheet passes as well as the part which meets the edge face of the sheet. The inner end of each rod X meets, when slid inward, a thumb-screw j'' , by which the movement of the rod and the position of the side pusher and gage may be accurately determined. On the inner end of each rod is a collar k'' fastened to the rod. Another collar l'' is fixed to each rod. Between these two collars is a sliding collar m'' , and between the latter and the collar at the end is a spiral spring n'' . To work freely in a socket or groove in each sliding collar is the end of a lever Z, which is pivoted at o'' to the frame above the feed-board. The other end of each lever Z is opposite one of the disks i , in such position that a cam p'' on the disk will swing this end of the lever Z outward, and hence cause the lower end of the lever to swing inward, thus sliding the corresponding rod X and side pusher and gaging the position of the sheet, as required. The sliding collars m'' and the springs n'' will provide for any excess of movement of the levers. A spring q'' connecting the two levers Z will cause the latter to swing and the side pushers to slide in the reverse direction

to allow for the passage of the next sheet of paper.

In the particular printing-machine, parts of which are shown in the drawings, there is a gear A' on the shaft, on which is the cylinder A, with which engages a gear B' on a shaft C'. On this shaft C', I have placed a sprocket-wheel D', which is caused to revolve with the shaft by means of teeth at r'' on the hub of the sprocket-wheel and a collar or hub of the gear B' fixed on the shaft. A hand-nut E' on the threaded end of the shaft permits sliding this sprocket-wheel on the shaft, so that the teeth at r'' will not engage. The sprocket-wheel can then be revolved on the shaft, whereby the required position of the cylinder and coacting parts of the feeding mechanism with reference to that of the cylinder and coöperating parts of the printing-machine may be obtained. By means of the nut E' and the teeth at r'' this sprocket-wheel and shaft C' may be caused to revolve as one, and such required position be maintained during the operation of the printing-machine and feeding mechanism.

A chain F' extends around the sprocket-wheel D' and a sprocket-wheel G', which is secured on a short shaft, which is fitted to revolve in an adjustably-fixed stand H'. On this shaft is also fastened an arm I' having a radial slot s'' . On the shaft G is a disk and arm J', having a crank-pin t'' , which may slide lengthwise of the slot s'' . The shaft G is hollow, so that a rod u'' therein may slide a slight distance in the direction of the length of the shaft and rod. To the end of the rod u'' is fixed a radial pin or projection v'' , which may be, by means of the rod, moved along a slot in the shaft G and into or out of an opening in the outer side of the disk J'. There is shown a collar let into the disk J', which, being fastened on the shaft G, as by the screw shown, will revolve therewith and serve to keep said disk in place on the shaft. The pin v'' is shown pushed out of the opening in the disk J' along the slot in the shaft and into a recess formed in said collar. There is a knob w'' on the other extended end of the rod u'' and a spiral spring x'' between this knob and an internal annular projection in the shaft G. This spring acts to slide the rod so that the pin v'' will enter the opening in the side of the disk J', whereby this disk and arm will be caused to revolve with the shaft G. By pushing on the knob w'' the pin v'' will be thrown out of engagement with the disk and arm J', so that the shaft G may be revolved, as by means of the hand-wheel K', independently of the disk and arm J'.

Since the cylinder or carrier of the finger j should make one revolution for each impression given by the printing-machine—that is, for the drum-cylinder machine (parts of which are shown in the drawings)—the finger-carrier shaft G should make a revolution for each revolution of the cylinder A, and since

for rapid feeding and printing a revolution of the finger-carrier must be made in a very short space of time, while it is very desirable, if not necessary, that the finger *j* should move quite slowly when in contact with the edge or edge-face of a sheet, the shaft *G* is caused to have a varying motion. The shaft bearing the sprocket-wheel *G'* and the slotted arm *I'* being located eccentrically with reference to the shaft *G*, such varying motion is obtained, and to any required degree, according to the degree of such eccentricity, which may be determined and maintained by a suitable adjustment of the stand *H'*.

On the shaft *G* is a cam *L'*, which swings an arm *M'*, fixed on a short shaft *y''*, which may oscillate in a fixed bearing at *z*. To this shaft *y''* is also adjustably fastened an arm *N'*, having pivoted thereto a pawl *a'''*, which engages with a toothed wheel *O'*, fastened on the shaft *J*. The cam *L'* swings the arm *M'*, and hence the pawl *a'''*, in one direction, while the pawl is moved back by means of a spring *b'''*. The distance through which the pawl is moved backward, and hence through which it will thereafter be moved while in engagement with a tooth of the wheel *O'*, may be gaged by means of a screw *c'''*. Thus the table for supporting the bank of paper will be moved so as to bring the edges of the paper into suitable relation to the finger *j*, and the rate of such motion may be gaged. To further regulate this motion, I pivot a lever *d'''* at *e'''*, which when swung down will engage with a projection or stop *f'''* adjustably fixed on the arm *N'*, thus preventing the pawl *a'''* from being carried backward. While the arm *N'* and pawl are so held, of course, there will be no movement of the wheel *O'*, and hence of the table supporting the paper. When the lever *d'''* is swung up, which is done by means of a spring *g'''*, it is out of engagement with the stop *f'''*, and the pawl will be free to move backward by the action of the spring *b'''* and to be afterward moved by the cam *L'* to cause a movement of the wheel *O'* and of the table. The lever, which is also an armature, is swung downward by means of an electromagnet *P'*.

On the cross-bar *F* is adjustably fixed a stand *Q'*, to which is fastened an electrically-insulated metallic piece *h'''*. This piece is so located and adjusted that a portion of the paper at and near the edge about to be seized by the finger *j* will enter thereon on movement of the table and sliding the paper on the bows *t*. Pivoted at *i'''* to the stand *Q'* is an electrically-insulated metallic arm *R'*; the end of which may be swung into and out of contact with the piece *h'''* at or very near the line at which it is deemed best for the finger *j* to come into contact with the edge of the upper sheet of paper. The arm *R'* is swung out of such contact by means of a weight *j'''* and into such contact by means of an arm *S'* fixed to the arm *R'* (preferably electrically insulated therefrom) and by means of a cam

or pins *k'''* fixed to a collar or disk *T'* adjustably fastened on the shaft *G*, there being as many limbs of this cam or pins *k'''* as there are limbs of the cam *L'*. To assure a good contact between the arm *R'* and the piece *h'''*, it is preferred to make the arm *S'* somewhat elastic to act as a spring.

To operate the electromagnets *V* and *P'*, I employ any suitable electric current from any convenient source *U'*. For the purposes of electric connection, while providing for adjustment of the rollers *c''* and presser-feet *e''*, I electrically insulate each of the two short rods *x' x'* and the long rod *z'* with respect to each other, the movable blocks *U* and the fixed center block *T* being, as to the whole or in part, of insulating material, and there being insulation at the connection of these rods with the branches *S*. For the purpose of conveniently placing and protecting the electric wires the cross-bars *E* and *F* are made hollow, and longitudinal grooves are formed in the central piece *R*; but by indicating the electric wires and connections, as in the drawings, the purpose of the present description will be best served. It will be noticed that the current of electricity is not at any time broken, but is cut out of the coils of each magnet as required.

One end of the coils of each magnet *V* is connected with the long rod *z'* by means of a hook *a''*, and the other to a short rod *x'* by means of a hook *b''*, this latter having also an electric connection with the corresponding presser-foot *e''*. The long rod *z'* is electrically connected with the screws *u'* and thence by metallic connections in and under the feed-board with the plates *d''*. The line from one pole of the electric source is connected with one rod *x'*, and the line from the other pole with the other rod *x'*.

A line extends from one pole to one end of the coils of the magnet *P'* and also (directly with reference to this magnet) to the metallic piece *h'''*, and a line from the other pole extends to the other end of the coils of the magnet *P'* and (directly with reference to this magnet) to the metallic arm *R'*.

For operation, the gages *c* and plates *d''* having been adjusted in the usual manner for printing, the presser-feet *e''* are adjusted over the plates *d''* and very near to the gages *c*. The pushers *Y* are adjusted to gage each sheet at one or both sides, as desired. The action of the feeding mechanism is so timed with reference to that of the printing-machine by means of the sprocket-wheel *D'* and the adjusting devices thereat that each sheet will meet the gages *c* in proper time to be seized by the grippers *b*. By means of a crank *V'* the shaft *J* may be revolved, so as to carry the table backward and outward in a convenient position to place the bank of paper thereon. This bank is prepared by manipulation in a manner well understood by a printer, so that an edge of every sheet will project beyond the corresponding edge of the adjacent

sheet. When the table has been thus moved backward, the projection *y* will have swung the pawl *u*, so as to release the bows *t* (if in a raised position) and allow them to fall.

5 The bank of paper having been placed on the table in the position illustrated the band *M* is swung down by means of the arm *g'*, so as to press on the inner edges of the sheets, and the table is moved by means of the crank *V'* 10 to carry the same and the paper thereon somewhat under the feed-board. When the pawl *u* is swung to disengage the bow-shaft, an arm *l'''* fixed to this pawl will meet an arm *m'''* fixed to the pawl *a'''* and lift the latter away 15 from the wheel *O'*, so that this latter movement of the table may be effected by rotation of the shaft *J*. The bows *t* are then raised to curve and raise the bank in part, and the table is then moved to bring the edge of the 20 uppermost sheet in position to be seized by the finger *j*, the bows being locked in position by the pawl *u* acting by gravity, and the pawl *a'''* dropping onto the wheel *O'*.

Since the cylinder of the printing-machine 25 should not revolve to make an impression until a sheet of paper is in position to be seized by the grippers, before starting the machine the operator presses on the knob *w''*, thus releasing the shaft *G*, so that the same may be 30 revolved and the feeding mechanism be operated while the printing-machine is not working. Such revolution of the shaft *G* the operator makes by means of the hand-wheel *K'*. In order to have the feeding mechanism well 35 back with reference to the printing-machine, so as not to occupy space required for printing, preparing the machine and form for printing, &c., and also to readily apply my devices to printing-machines already constructed and 40 at the same time leave the ordinary feed-board of the usual size and unobstructed for feeding by hand, if desirable, the finger-carrier is located (in this particular printing-machine) at such distance from the cylinder of 45 the printing-machine that two sheets must be lifted from the bank and carried onto the feed-board to bring a sheet down to the gages *c*, which may be done by making two revolutions of the hand-wheel *K'*, the shaft *G* being 50 released, for each revolution, by pressing on the knob *w''*, as explained above. It should be further noted that the finger-carrier can be so located with reference to the gages *c* that, since the sheets are carried down the 55 feed-board by a varied movement corresponding to that of the finger-carrier, while the finger during its slow movement seizes on a sheet, the edge of a sheet meets the gages during the same slow motion, so that said edge 60 is not jammed against the gages, whereby it might be bent or indented. The printing-machine and the feeding mechanism are now put into action and coöperation simply by means of the belt-shipper of the former. If the edge 65 of the upper sheet of the bank is not quite high enough to be in the best position to meet the finger, then electric contact is made by

the arm *R'* and the piece *h'''*. Hence the electric current will be cut out of the magnet *P'* 70 and therefore (the cam or pins *k'''* being suitably adjusted with reference to the cam *L'*) the lever *d'''* will be out of engagement with the stop *f'''* on the arm *N'*, so that the pawl *a'''* will operate on the wheel *O'* and the table 75 will be moved to carry the bank and slide the same up the bows to the required extent. If the edge of the upper sheet is in position for best contact with the finger, then this sheet will be just between the arm *R'* and the piece *h'''*, thus preventing electric contact thereby, 80 and hence the electric current will pass through the coils of the magnet *P'* and the lever *d'''* will be placed to engage with the stop *f'''* and there will be no movement of the table and bank of paper. To get this result, the 85 cam or pins *k'''* is suitably adjusted with reference to the cam *L'*, as above stated, so that the arm *R'* and the piece *h'''* will be in contact when the arm *N'* is swung by means of the cam *L'* to nearly its extreme limit. The 90 movable arm *R'* and the piece *h'''* form a circuit-closer which will not close the circuit if the paper has been moved therebetween. Owing to the position of the cam or pins *k'''* 95 with reference to the finger the arm *R'* will always be, by the action of the weight *j'''*, swung out of the way of the edge of each sheet when moved by the finger.

When either presser-foot *e''* is in contact 100 with the plate *d''*, the electric current is cut out of the corresponding magnet *V*. Therefore the roller *c''* thereunder will fall and coöperate with the roller *N* to move the sheet therebetween. The sheet thus moved will be carried to the corresponding gage *c* and pass be- 105 tween the presser-foot and the plate thereunder so as to break the contact thereby. A presser-foot and the plate thereunder form a circuit-closer, which is operated by the sheet passed therebetween. The electric current 110 is thus caused to pass through the coils of the magnet, which will lift the roller and relieve this portion of the sheet of any pressure forward. The lower roller *w'* is so set, according to the size of the sheets, that each sheet 115 will pass entirely from under the same when the lower edge of the sheet is at a small distance away from the gages *c*, so that the movement of the sheet will thereafter be controlled by the action of the rollers *c''*. Each 120 roller is convex with respect to its axis of rotation, (this curvature being, of course, eminently attained when they are balls,) so that if a greater movement of the sheet is caused by one roller than by the other roller the 125 sheet may swivel or swing in its plane, the rollers bearing on the paper at pivotal points rather than in lines. Before the grippers *b* seize each sheet the pushers *Y* will move to place the sheet and gage it sidewise, and this 130 movement may also be during the slower part of the varying motion of the feeding mechanism, thus preventing any displacement of the sheet resulting from momentum thereof.

It will be noticed that each presser-foot e'' can be adjusted in such close proximity to the corresponding gage c that very accurate gaging can be attained. Moreover, if each arm or plate w is sufficiently near to the corresponding plate d'' the forward part of the sheet will be so restrained by these plates that it cannot curl or wrinkle if by any chance the circuit-closers do not operate instantaneously, or if either of said arms or plates W is not quite so close to the corresponding plate d'' they, coöperating with the presser-foot, will prevent such curling or wrinkling of the sheet as to move the edge of the sheet from the gage-line. Such will be the result, since if a sheet of paper be closely confined between two flat surfaces, as those of the plates, the sheet will be kept flat, so that it will not curl or wrinkle between said surfaces though considerable force be exerted to push the sheet against an abutment, and hence will not move back from the abutment when said force is removed, as it would do if curled or wrinkled, owing to the recoil resulting from the action of the sheet in springing back to its normal flat condition.

Under certain conditions it is desirable, in order to make sure that upon every revolution of the finger-carrier the sheet of paper will be moved sufficiently—in this case, to the line of contact of the finger-carrier with the roller thereunder—that a further hold be made upon the sheet than may be made by the friction of the finger upon the edge or edge face. For such purpose I attach to the finger-carrier a follower C , preferably pivoted thereto, as shown in Fig. 3. After the finger has come in contact with the sheet and has moved that portion thereof at the edge a slight distance, the follower, its lower end swinging outward by gravity from the circumference of the carrier, will be carried by the carrier to the rear or under said portion of the sheet and prevent the same from falling back, even though the finger may lose its hold thereon.

I claim as my invention—

1. In combination with a finger-carrier and finger therefor to move a sheet of paper or part thereof by contact with the edge or edge face thereof a carriage or table for supporting a bank of paper movable in the direction of the plane thereof, and pivoted bows to raise or bend a portion of said bank to bring the edges of the paper into position to meet said finger, substantially as set forth.

2. In combination with a finger-carrier, a finger therefor, and a roller to coöperate with said finger-carrier, whereby a sheet of paper may be lifted and removed from a bank of sheets, a carriage or table for supporting said bank, movable in the direction of its plane, and bows movable with reference to said table to bring the edges of said sheets in position to meet said finger, substantially as set forth.

3. The combination of a carriage or table, ways for said carriage or table, a rack on said

carriage or table, a pinion to engage with said rack on a revoluble shaft, bows movable with reference to said carriage or table, a locking device for maintaining said bows in a position to raise or bend a portion of a bank of paper on said carriage or table, and a finger and carrier therefor so located with reference to said bows as to come in contact with the edges of said paper when raised or bent by said bows, substantially as set forth.

4. In a paper-feeding machine the combination of a carriage providing a movable table, bows pivoted on stationary bearings and so located with reference to said carriage as to raise a portion of a bank of sheets on said table or to bend said sheets when the carriage or table is moved, substantially as set forth.

5. In a paper-feeding machine the combination of a table, bows pivoted with reference to the table, for raising or curving sheets of paper on the same, substantially as set forth.

6. In a paper-feeding machine the combination of a table and bows for supporting a bank of sheets, the table being movable in the direction of its length while the bows remain stationary, substantially as set forth.

7. In a paper-feeding machine a table having slots for supporting a bank of sheets, in combination with arms or bows movable through said slots to rise above or fall below the surface of said table, said arms or bows when raised being in position to support said bank in part above the surface of the table substantially as set forth.

8. In a paper-feeding machine the combination with a belt extending about rollers or pulleys and movable opposite one surface of a sheet of paper, of a roller loosely sustained between said rollers or pulleys to bear against the other surface of the sheet and press the sheet against the belt whereby the sheet is carried, substantially as set forth.

9. In a paper-feeding machine the combination of a movable belt with a ball maintained loosely in a position opposite the belt whereby a sheet of paper between said belt and ball will be carried thereby, substantially as set forth.

10. The combination of two rollers, a belt extending around said rollers, a ball maintained loosely opposite said belt between said rollers, whereby said belt and said ball will carry a sheet therebetween, substantially as set forth.

11. In a paper-feeding machine, the combination of a roller and a loose ball maintained in position opposite said roller, whereby on rotation of the roller a sheet of paper between the roller and ball will be carried, substantially as set forth.

12. In a paper-feeding machine the combination of a motive roller, a ball maintained in position opposite said roller, and an automatic lifting device for removing said ball from contact with the motive roller or a sheet of paper between said motive roller and the ball, substantially as set forth.

13. The combination of a motive roller, a

roller loosely maintained opposite the motive roller, and a magnet to move and hold when energized said roller away from the motive roller, substantially as set forth.

5 14. In a paper-feeding machine the combination of an electric circuit, a circuit-closer in said circuit, two plates in close proximity to each other, and a carrier to carry a sheet between said plates and the members of said closer, one of said plates being one member of said closer, and the other member of said closer being flexibly connected to the other of said plates, substantially as specified.

15 15. In a paper-feeding machine the combination of an electric circuit, a circuit-closer in said circuit, two plates opposite to each other, and a carrier to carry a sheet between said plates and the members of said closer, one of said plates being one member of said closer, and the other of said plates being adjustable and having the other member of said closer flexibly connected thereto, substantially as specified.

25 16. The combination of an electric circuit, a circuit-closer in said circuit, an electromagnet in said circuit, a carrier embodying a roller controlled by said magnet, and two plates in close proximity to each other one of said plates being one member of said closer, and the other plate being adjustable and having flexibly connected therewith the other member of said closer, said carrier being in such position with reference to said plates and members as to force a sheet therebetween, substantially as specified.

40 17. In combination with a gage to meet the edge of a sheet of paper, an electric circuit, a plate to support the sheet at said gage and forming a member of a circuit-closer in said circuit, another plate adjustably located opposite to said member and having the other member of said closer flexibly connected thereto, substantially as specified.

45 18. In combination with a gage to gage the position of a sheet of paper, and a plate for supporting that part of the sheet of paper near the gage, a presser-foot which forms with said plate a circuit-closer, substantially as set forth.

50 19. In combination with a gage to meet the edge of a sheet of paper, and a plate for supporting the sheet at the gage, a presser-foot embodying a roller having an axis at angles with said gage, substantially as set forth.

55 20. In combination with the gages of a printing-machine, a plate to support a sheet of paper at the gages and a conical roller pressing on said plate or the sheet of paper therebetween, substantially as set forth.

60 21. In combination with gages to meet the edge of a sheet of paper, and plates to support said paper at said edge, a presser-foot, and an electromagnetic controller of the paper-carrier, the said presser-foot and roller constituting a circuit-closer, substantially as set forth.

22. In combination with gages to meet the edge of a sheet of paper, and a support for the sheet, a presser-foot embodying a roller, and a side pusher to move said sheet while the sheet is in contact with said roller, substantially as set forth. 70

23. In combination with the feed-board of a printing-machine, a belt propelled along said board, and a frame above said board maintaining rollers loosely and independently with reference to each other in position above said belt, substantially as set forth. 75

24. In combination with the feed-board of a printing-machine, a movable belt and roller set in said board, and a frame supported above said board maintaining balls above said belt and roller, substantially as set forth. 80

25. The combination of feed-board of a printing-machine, a belt and roller in said board, a frame pivoted to be swung up, or down into close proximity to the feed-board and rollers maintained loosely and independently with reference to each other in position by said frame to cooperate with said motive belt and roller to propel a sheet of paper, substantially as set forth. 85 90

26. The combination of a support for a bank of paper, a finger to meet the edge or edge face of a sheet of paper, a carrier for said finger, a roller under said carrier to cooperate therewith to move the sheet, a belt extending around said roller and another roller nearer the gages of a printing-machine, and rollers maintained in position above said belt, substantially as set forth. 95 100

27. In a paper-feeding machine a circuit-closing mechanism for causing at intervals one member of the circuit-closer to approach the other and a carrier for a bank of paper to move the paper between said elements when not in contact, substantially as set forth. 105

28. In a paper-feeding machine the combination of a circuit-closer the members of which are caused to approach at intervals, a support for a bank of paper in such relation to the circuit-closer that when moved it will cause the paper to enter between and thus prevent contact of the members of the circuit-closer a carrier for said support, and an electromagnetic controller of said carrier which is governed by said circuit-closer and the paper, substantially as set forth. 110 115

29. The combination of a revoluble carrier and finger therefor, a support for paper in suitable relation to said carrier a ratchet-wheel for moving said support a cam on the shaft of said carrier, a lever bearing a pawl to engage with said ratchet-wheel swung in one direction by said cam and in the other by a spring, and a lever operated by an electromagnet to engage with the pawl-lever, substantially as set forth. 120 125

30. The combination of a revoluble carrier and finger therefor, a support and carriage to carry a bank of paper in the direction of the plane thereof, a pawl and ratchet-wheel there- 130

for to move said carriage, a cam to operate said pawl, and a stop for said pawl electrically controlled, substantially as set forth.

31. In a paper-feeding machine the combination of the finger-carrier shaft bearing a crank, a driving-shaft eccentric to said finger-carrier shaft having an arm to engage with said crank, whereby a varying motion of said finger-carrier shaft is obtained, substantially as set forth.

32. In a paper-feeding machine the combination of the main shaft, and a rod extending through said shaft having a device as a knob at one end by which said rod may be moved lengthwise in said shaft, said rod having at the other end a locking device to engage with the motive mechanism, substantially as set forth.

33. In combination with a table for a bank of paper, a flexible band held in position to bear upon the edges of the sheets forming the bank when the edges of the sheets are offset, substantially as set forth.

34. In a paper-feeding machine in combination with a table and carriage for supporting and moving a bank of paper, a band having each end secured to said table and carriage and extending around a piece secured to a stationary part of the machine, whereby said band is moved around said piece, caused to bear on the edges of the sheets of said bank and have no motion with reference to said edges, substantially as set forth.

35. In a paper-feeding machine in combination with a table and carriage for supporting and moving a bank of paper, an elastic band secured at each end to said table and carrier, and extending around a piece pivoted to a stationary part of the machine, substantially as set forth.

36. In combination with a finger to seize upon a sheet of paper and a carrier therefor, of a follower, which, being caused to pass to the rear or under said sheet, will by its continued movement carry said sheet, substantially as set forth.

37. The combination of a carrier for a sheet of paper embodying a roller to engage with

said sheet and operating to carry the sheet in the plane thereof, a gage to be met by the edge of the sheet, an electric circuit, a circuit-closer, and two plates secured opposite and near to each other and near said gage, one of said plates being one of said members, and the other of said plates being adjustable and having flexibly connected thereto the other of said members, so that the sheet (on being moved between said plates and members to meet said gage by said carrier) will be restrained by said plates from curling and will break the circuit by entering between said members; substantially as specified.

38. The combination with a suitable sheet-support, of a continuously-rotating roller and several independent rollers opposite thereto for carrying a sheet, and independent means governed by the moving sheet for controlling said independent rollers, whereby when a part of the sheet comes into position the corresponding one of the independent rollers is thrown out of engagement with the sheet, substantially as set forth.

39. The combination with a suitable sheet-support, of a continuously-rotating roller and several independent rollers opposite thereto for carrying a sheet, front registering devices, and means operated by each of said registering devices for causing the corresponding one of said independent rollers to be thrown out of engagement with the sheet when that part of the sheet in front of it comes into register, substantially as set forth.

40. In a paper-feeder the combination with a support for the main part of a sheet and a gage to be met by the edge of the sheet, of two plates at the gage to receive the sheet between them, and a presser-foot to rest on the sheet near the gage, one of said plates forming a support for that part of the sheet near the gage, and the other plate having the presser-foot flexibly connected therewith, substantially as set forth.

EDWARD DUMMER.

Witnesses:

A. H. CUSHING,
Z. F. BRYANT.