(No Model.) 2 Sheets—Sheet 1.

R. BURNET & T. S. CRANE.

AUTOMATIC PAPER FEEDER.

No. 467,128. Patented Jan. 12, 1892.

Fig. 2.

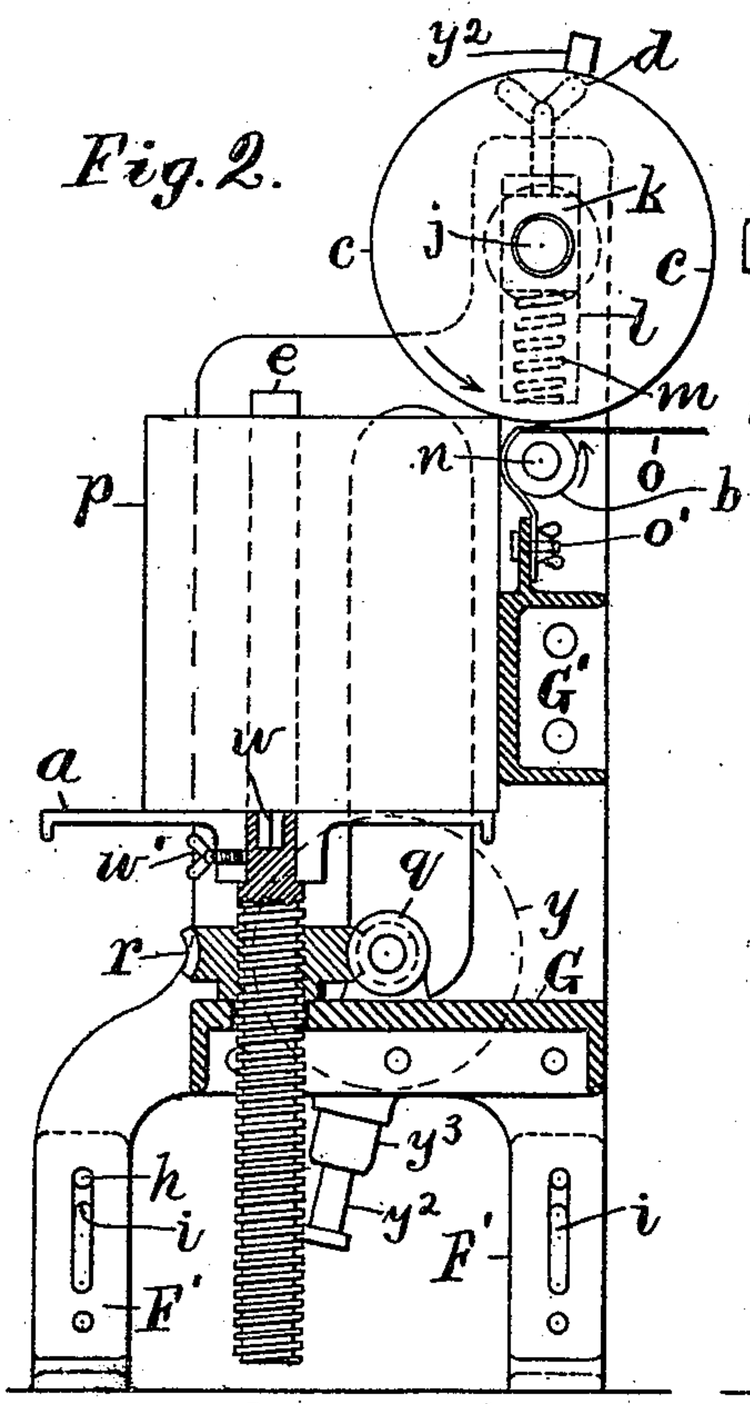
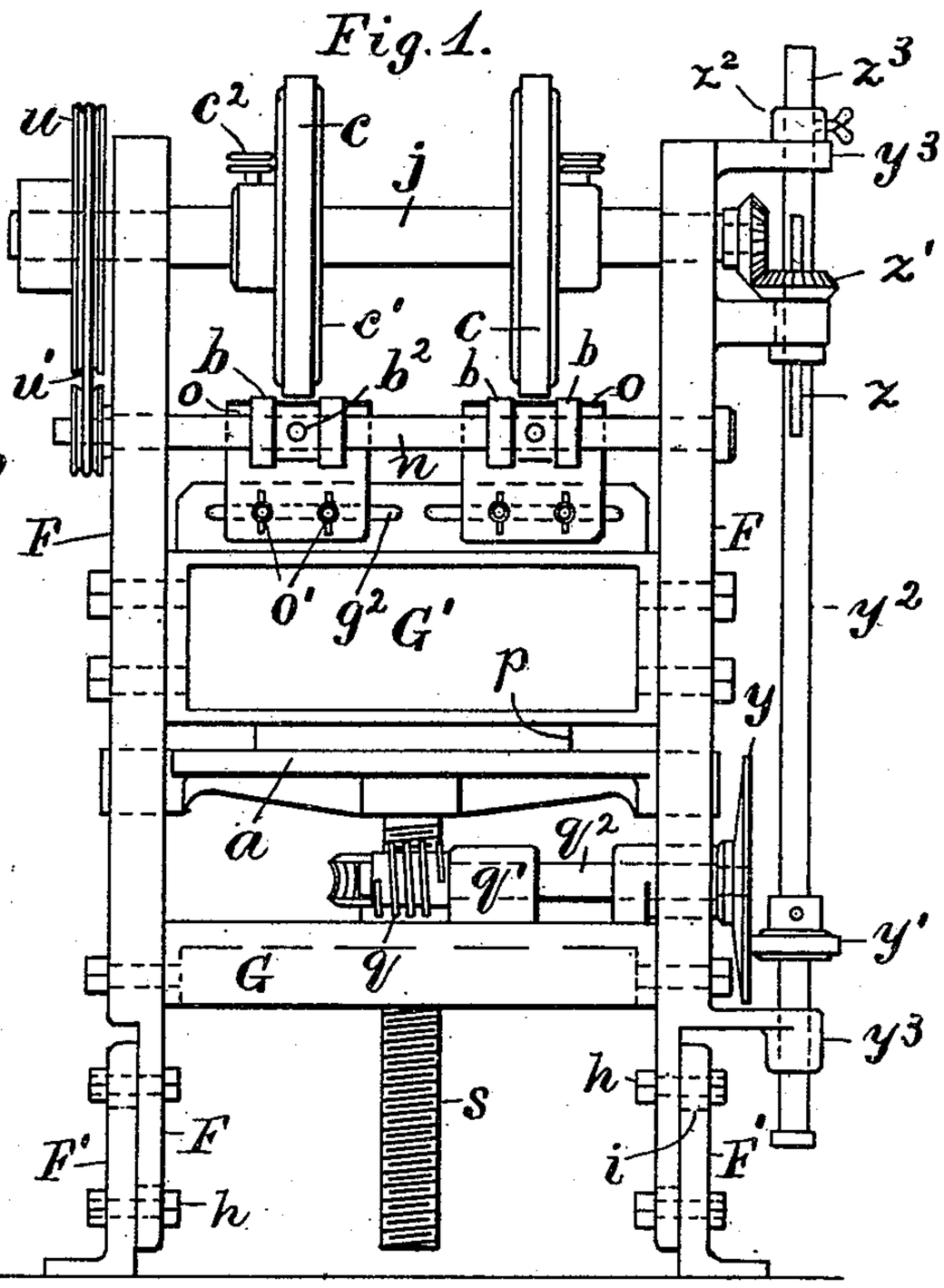


Fig. 1.



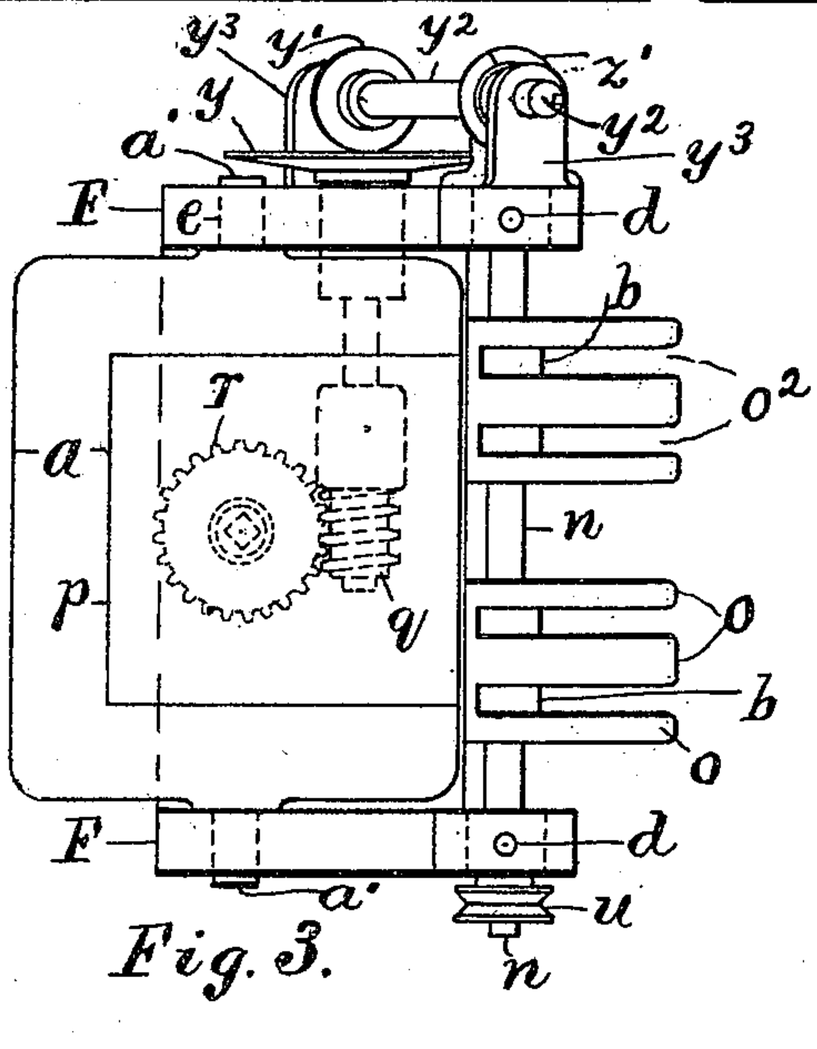


Fig. 3.

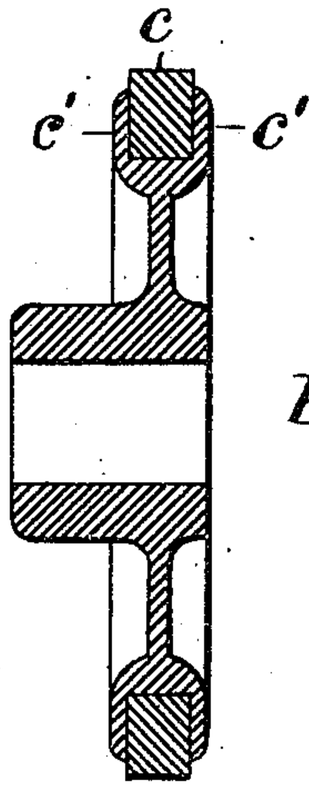


Fig. 4.

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R. Burnet and T. S. Crane per
Crane & Miller, attys.

(No Model.) 2 Sheets—Sheet 2.

R. BURNET & T. S. CRANE.

AUTOMATIC PAPER FEEDER.

No. 467,128. Patented Jan. 12, 1892.

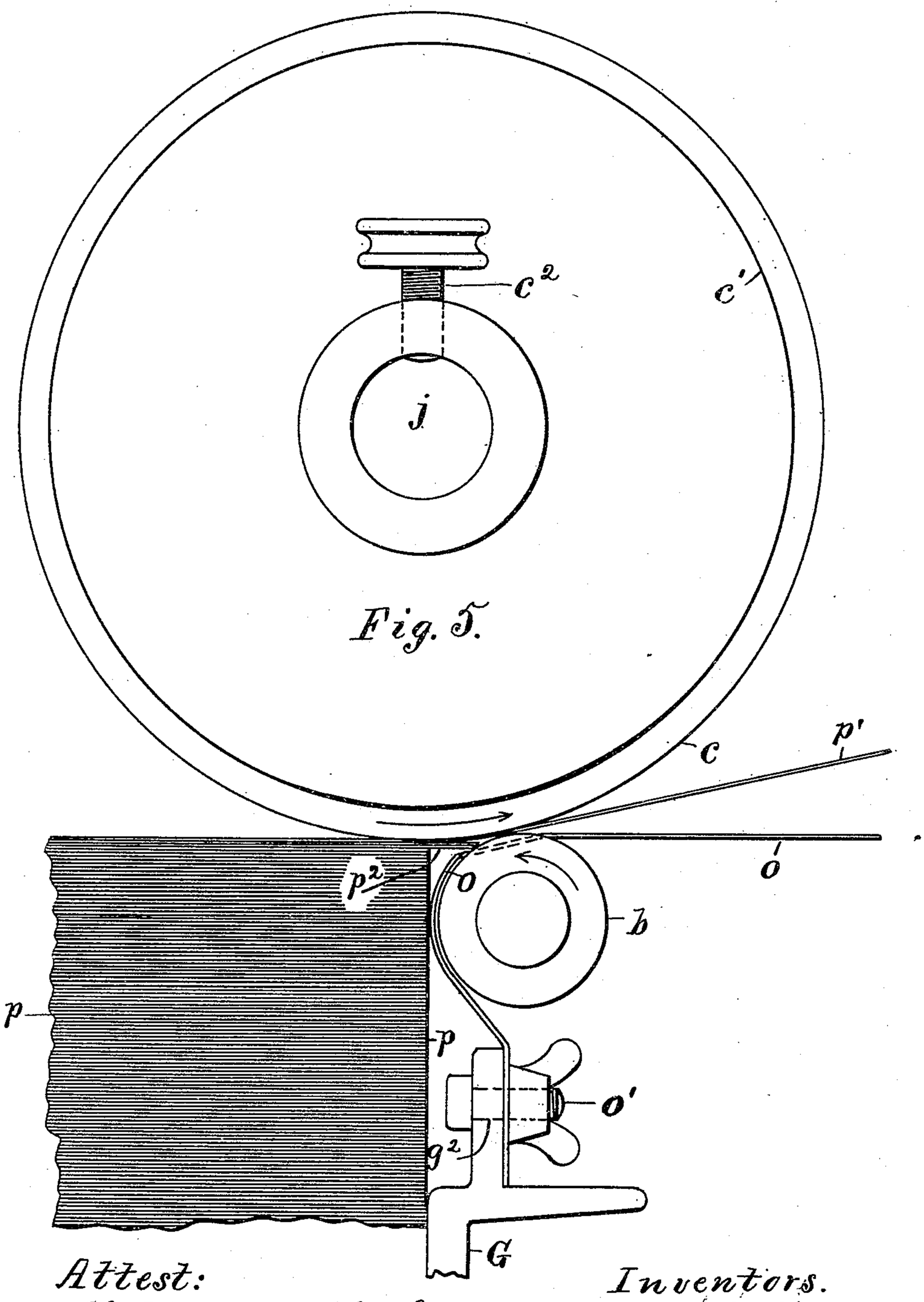

Fig. 5.

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UNITED STATES PATENT OFFICE.

ROBERT BURNET AND THOMAS S. CRANE, OF EAST ORANGE, NEW JERSEY; SAID BURNET ASSIGNOR, BY MESNE ASSIGNMENTS, TO SARAH BURNET, OF SAME PLACE.

AUTOMATIC PAPER-FEEDER.

SPECIFICATION forming part of Letters Patent No. 467,128, dated January 12, 1892.

Application filed February 2, 1891. Serial No. 379,913. (No model.)

To all whom it may concern:

Be it known that we, ROBERT BURNET and THOMAS S. CRANE, citizens of the United States, residing at East Orange, Essex county, New Jersey, have invented certain new and useful Improvements in Automatic Paper-Feeders, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of this invention is to cheapen the cost and simplify the operation of the paper-feeding mechanism which is used in feeding single sheets of paper successively from a pile to other mechanism, as to a ruling-machine or printing-press.

It has been common heretofore to use a frictional roll coated with emery or india-rubber to propel a sheet of paper or a letter from a pile of the same, and it has also been common to furnish in front of such propelling-roll a pair of separator-rolls having their adjacent faces rotated in opposite directions to prevent more than one sheet or letter from passing at a time. It has also been common to use a stationary friction-stop or separator formed of india-rubber in connection with a friction-roll to prevent the friction-roll from propelling more than one sheet of paper from a pile of sheets, and in machines for canceling postmarks it has been common to press a pile of letters upward against a stationary plate or stop and to rotate over an adjacent separator-roll a wheel or chain provided with elastic fingers moved in succession over such stop-plate and upon the top of the pile to draw the letters forward one at a time.

Our invention differs from such postmarking-machine in pressing the pile of sheets continuously against the surface of the friction-roll without the intervention of any stop.

We hereby disclaim the construction just described.

In the present invention we employ a friction-roll consisting in separate wheels adjustable upon a shaft to suit different widths of paper and having the forward corner of a pile of sheets fed regularly upward toward the same, and we employ a separator-roll of much smaller diameter inserted beneath the friction-roll as close as possible to the pile of paper with its surface rotated in an opposite direction to that of the friction-roll.

To deliver the sheets of paper in a direct line from the top of the pile it is absolutely essential to use a very small separator-roll, so as to bring the surface of the roll and the corners of the sheets (both of them) very nearly under the center of the friction-roll; but such roll operates to agitate the edges of the sheets that may be drawn forward into contact with the same, and thus separates them one from another much more effectively than a stationary stop. Where a stationary stop is used, the top sheet of paper propelled by the friction-roll is liable to draw the under sheets forcibly forward and to jam the same between the stationary stop and the friction-roll, whereas a revolving separator-roll, such as we use, operates, no matter how small its diameter, to push back such under sheets, and thus prevents their crowding between the two rolls. The apparatus is thus prevented from clogging and the delivery of single sheets is rendered as regular and continuous as possible.

Heretofore in machinery for pressing a pile of paper sheets toward a friction-roll it has been common to employ an intermittent feed, so as to arrest the movement of the pile after each sheet was grasped by the friction-roll; but our present invention differs from others in using a continuous feed for the paper-table, as we find that it is less expensive and more smooth in operation than an intermittent feed, and effects the desired object just as well, as a sheet of paper requires but a very slight advance of the table, and the feeding mechanism possesses sufficient elasticity to prevent the paper from crowding the friction-wheel.

The invention will be understood by reference to the annexed drawings, in which—

Figure 1 is a front elevation of a machine embodying our invention. Fig. 2 is a vertical section of the same where hatched upon the center line of Fig. 1. Fig. 3 is a plan of the machine with the friction-roll removed. Fig. 4 is a section of one friction-wheel, and Fig. 5 a diagram showing the operation of the roll upon the paper.

The machine is shown herein with an in-

dependent frame, but may, if preferred, be built as an attachment to a printing-press or other apparatus, and in such case the operative parts would be sustained upon projections from such frame without requiring an independent support, as shown in the annexed drawings. The frame of the apparatus shown in the drawings is, however, provided with extension-legs by which it may be secured to the floor adjacent to any other machine and the legs adjusted for the friction-roll to deliver the paper at the desired level.

Two side frames F are shown connected by ties G G′ and provided with adjustable legs F′, attached to the frame by bolts *h*, inserted through slots *i*.

a is the table, having guide-lugs *a′* fitted to vertical slots *e* in the side frames and provided with a screw *s*, which is elevated by a rotary nut sustained upon the tie-bar G. The rotary nut is formed as a worm-wheel *r*, with teeth upon its periphery to engage a worm *q*, rotated by connection to the friction-roll *c*. Such roll is preferably formed of several wheels, two of which are shown in the drawings with the roller-surface *c* formed of an india-rubber band fitted between flanges *c′*, as shown in Fig. 4. The roll-shaft *j* is fitted to boxes *k*, which are movable vertically in slots *l* in the upper part of the frame. Springs *m* are inserted in the slots below the boxes to hold the roll normally upward, and screws *d* are inserted through the top of the frame above the slots to adjust the roll toward the separator-roll *b*, which is mounted beneath the same upon a shaft *n*. The separator-roll is formed to present a rotating friction-surface *b* to the edges of the paper sheets at each side of the friction-wheel *c*. The edge of the table nearest the separator-roll is arranged to clear the same as the table is pushed upward, the path of the table being approximately indicated by the forward side of the pile of sheets *p*, which is laid thereon with the forward corner of its upper surface in contact with the friction-roll. To deliver the sheets horizontally, as is desired in most cases, it is essential that the separator-roll should be as nearly as possible under the center of the friction-roll, as shown in the drawings, and it is also necessary that the corner of the pile of sheets should be pressed toward the friction-roll as near as possible to its vertical center line, so that the sheets may press tangentially upon the roll. The slots *o*² are extended entirely to the edge of the shield toward which the paper is moved by the friction-roll *c* to prevent the advancing edge of the paper from catching by accident upon the forward ends of the slots, which we have found by experience it is liable to do if the slots are closed. By such construction the shield consists in a series of tongues which project forward between the slots. The sheets are thus drawn forward by the friction of the roll with much less resistance than if the corner of the pile were pressed toward the roll at an angle. It is essential, therefore, in our invention to make the separator-roll much smaller than the friction-roll, that the periphery of the latter may be projected over the pile of sheets to engage the corner of the same. To effect these objects we prefer to arrange the separator-roll, as shown in Fig. 2, directly beneath the center of the friction-roll and to feed the table upward vertically with the forward side of the pile of sheets *p* as close to the separator-roll as possible.

The tie-bar G′ is shown with its inner face upon a line with the inner face of the separator-roll to guide the operator in setting the pile of sheets upon the table *a*. The worm *q* is mounted in bearings *q′* upon the tie-bar G, and its shaft *q*² is provided at the end with a plate *y*, driven by contact with a rotary friction-wheel *y′*, constructed like the wheels *c*. The shaft *y*², carrying the wheel *y′*, is mounted in bearings *y*³ upon the frame F, and is fitted by a spline *z* to a bevel-wheel *c′*, driven by a similar wheel upon the shaft *j*. By shifting the shaft *y*² vertically and sustaining it there by a set-screw collar *z*² the friction-wheel *y′* may be caused to rotate at any distance from the center of the plate *y*, and thus impart any desired speed to the worm.

The wheels forming the friction-wheels are formed of rubber bands *c*, molded or shrunk between flanges *c′* upon the rims of the wheels, and are adjustable upon the shaft to operate upon paper of different widths. Thumb-screws *c*² are shown in the hubs of the wheels to clamp them upon the shaft *j*.

The friction-surfaces of the separator-roll consist in two disks (lettered *b*) upon the opposite ends of the hub *b′*, which is provided with a set-screw *b*² for adjusting the disks upon the shaft *n*. The separator-disks are constructed at a suitable distance apart to clear the opposite corners of the friction-wheel *c*, and such wheels are in practice adjusted so that the upper sides of the separator-disks are in a line with the lower surfaces of such wheels without touching the same or resisting their rotation by contact. By this arrangement the separator-disks are raised to a level with the sheet passing between the rolls, and thus operate more effectively to intercept the sheets beneath the one in contact with the friction-wheel, as the edges of such sheets are by the upper sheet held positively below the upper surface of the separator-disks.

When several sheets are drawn forward from the top of the pile at once by the action of the friction-roll, the moving surface of the separator-roll tends to agitate and loosen such sheets from one another, and would, if the edges of the sheets were unsupported, tend to force them downward and bend them over the corner of the pile *p*. To prevent such effect we provide shields *o*, which project at each side of the separator-disks *b* a little below their upper surfaces. These shields are secured adjustably to the brace or cross-bar G′

by means of screws o', fitted to slots g^2 in the bar, and are formed with slots o^2, through which the disks b project.

It is obvious that any number of the friction-wheels c may be applied to the shaft j to form a friction-roll and the disks b be provided in suitable number to co-operate therewith.

We have found in practice that it is desirable to furnish one of the friction-wheels for each six inches in the width of the paper.

In Fig. 1 the shafts j and n are shown connected together by pulleys u and cord u', which rotate the shafts in the same direction and thereby cause the adjacent surfaces of the rolls b and c to move past one another in opposite directions, as indicated by the arrows in Fig. 2. By the connection of the worm q with the friction-roll shaft j the nut-wheel r is rotated continuously and the table is thus elevated with a smooth continuous motion, pressing the pile of paper p against the under side of the friction roll or wheel, where it overlaps such pile.

The operation of the friction and separator rolls upon the paper is fully shown in Fig. 5, which is drawn upon an enlarged scale to exhibit the construction clearly. The rotation of the friction-wheels c draws one or more of the sheets from the top of the pile p, a single sheet being forced forward in opposition to the resistance of the separator-roll, as shown at p'. To prevent the resistance of the separator-roll from obstructing the forward movement of such sheet, the disks forming the roll are made with surfaces harder and smoother than those of the friction-wheel c.

We have found in practice that the frictional surfaces of the separator-roll may be made of india-rubber having a light coat of shellac varnish applied thereto, or they may be made of smooth wood or brass, if the latter be not highly polished. Their effect upon the paper is to agitate and loosen the sheets and to hold back any that lie beneath the surface of the sheet p', as indicated at p^2 in Fig. 5. Such sheets, when held back by the separator-roll, would, by its rotation, be bent downward at their forward edges, except the shield o were provided to sustain them; but the edge of the shield adjacent to the pile p requires to be sloped downward to avoid obstructing the sheets in their movement toward the separator-roll. The slots o^2 in the shield are extended to the end of the shield, as the paper is liable to catch upon the closed end of a slot. The rotation of the roll prevents a number of the sheets from being jammed between the moving sheet j and the surface of the shield, which would materially prevent the uniform delivery of the upper sheets from the pile.

It is not essential that the separator-roll should revolve at the same surface speed as the friction-wheel c; but the adjacent faces of the rolls must rotate in opposition to one another, as indicated by the arrows in Figs. 1 and 5.

It is desirable to lower the table quickly after the pile of paper has been consumed, and for this purpose a square hole w is shown in the upper end of the screw s and a thumb-screw w' is shown applied to the hub beneath the table a, in which the upper end of the screw is fitted. By loosening the screw w' a crank with square shank thereon may be applied to the hole w and the screw rotated rapidly in the nut-wheel r, so as to lower the table with the utmost dispatch. The tightening of the screw w' then holds the screw from rotation in the table, so that the nut may raise it during the feeding operation.

From the above description it will be seen that the table may be lowered very quickly to apply a fresh pile of paper and may then be fed upward at any desired rate of speed by adjusting the wheel y' at a suitable distance from the center of the plate y.

Gage-marks may, if desired, be applied to the shaft y^2 adjacent to the collar z^2 to indicate the setting of the collar upon the shaft to feed the table at a predetermined rate. As the thickness of paper is readily measured by a vernier-gage, it is obvious that such marks may be arranged to correspond with thousandths of an inch in the thickness of the paper and the table thus adjusted to feed paper of any thickness uniformly against the friction-roll.

The paper may be delivered from the feeding-rolls to an apron, a tape, or any other device that may be used in connection with other mechanism to supply the paper thereto.

Having thus set forth the nature of our invention, what we claim is—

1. An automatic paper-feeder comprising the friction-roll, consisting in the shaft j, with the wheels c adjustable thereon, a table and means for moving the same vertically and pressing a pile of sheets upward into continuous contact with the friction-roll near its vertical center line, and the separator-roll of suitable dimensions to fit beneath the friction-roll adjacent to its vertical center line and contiguous to the pile of sheets, the friction-roll being rotated to draw the sheets of paper forward and the separator-roll being rotated to push them backward, as and for the purpose set forth.

2. An automatic paper-feeder comprising the table a, a friction-roll for feeding the paper from the table, a table-feeding mechanism provided with the disk y, and a shaft y^2, rotated continuously with the friction-roll and provided with the friction-wheel y', pressed upon the disk y, and adjustable to and from the center of the disk to vary the speed of the table-feeding devices, as and for the purpose set forth.

3. An automatic paper-feeder comprising the table movable vertically, the separator-roll consisting of the shaft n, with disks b ad-

justable thereon to fit paper of different widths, the friction-roll consisting of the shaft *j*, with the wheels *c*, adjustable thereon, mounted above the separator-roll, with the peripheries of the wheels *c* projected over the pile of sheets to engage the corner of the same, as set forth, and the slotted shields *o*, secured near the upper surface of the disks *b*, with the slots o^2 extended from the disks to the forward edge of the shield, as and for the purpose set forth.

4. In an automatic paper-feeder, the combination, with a friction-roll consisting in the wheels *c*, adjustable upon a shaft, as described, of a separator-roll consisting in the shaft *n*, having the hubs *b'* fixed adjustably thereon and provided at their opposite ends with the disks *b*, adapted to rotate, respectively, adjacent to the opposite edges of the wheel *c*, as and for the purpose set forth.

5. In an automatic paper-feeder, the combination, with a frame having a paper-supporting table movable vertically thereon and a friction-roll and separator-roll operated substantially as described, of the adjustable legs F' to adjust the delivery-opening of the rolls at the desired height, substantially as herein set forth.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

ROBERT BURNET.
THOMAS S. CRANE.

Witnesses:
L. LEE,
H. J. MILLER.