R. E. & A. KEMPER.

SHEET FEEDING MACHINE.

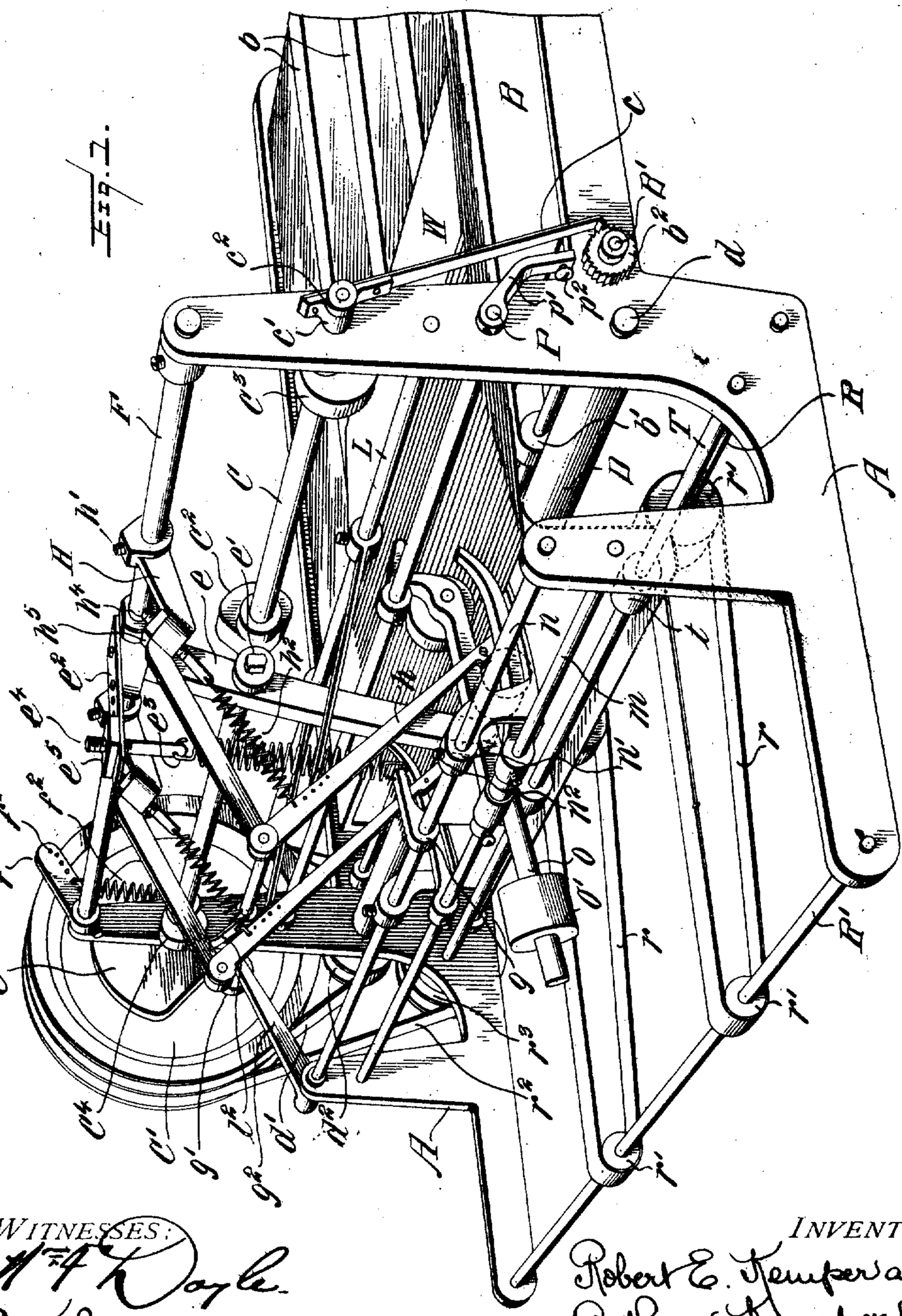
APPLICATION FILED FEB. 6, 1908.

903,386.

Patented Nov. 10, 1908.

4 SHEETS—SHEET 1.

Fig. 1.



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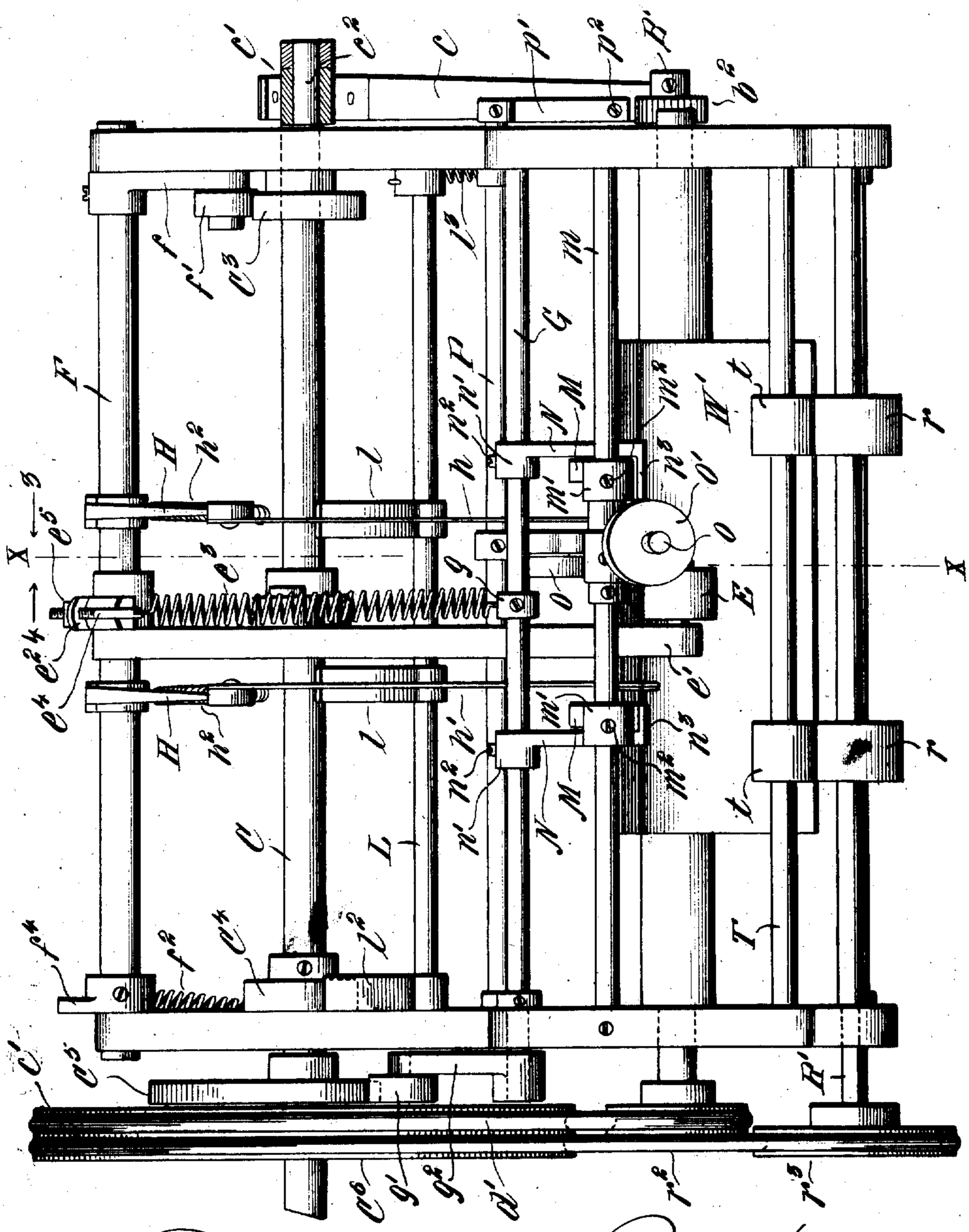
4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

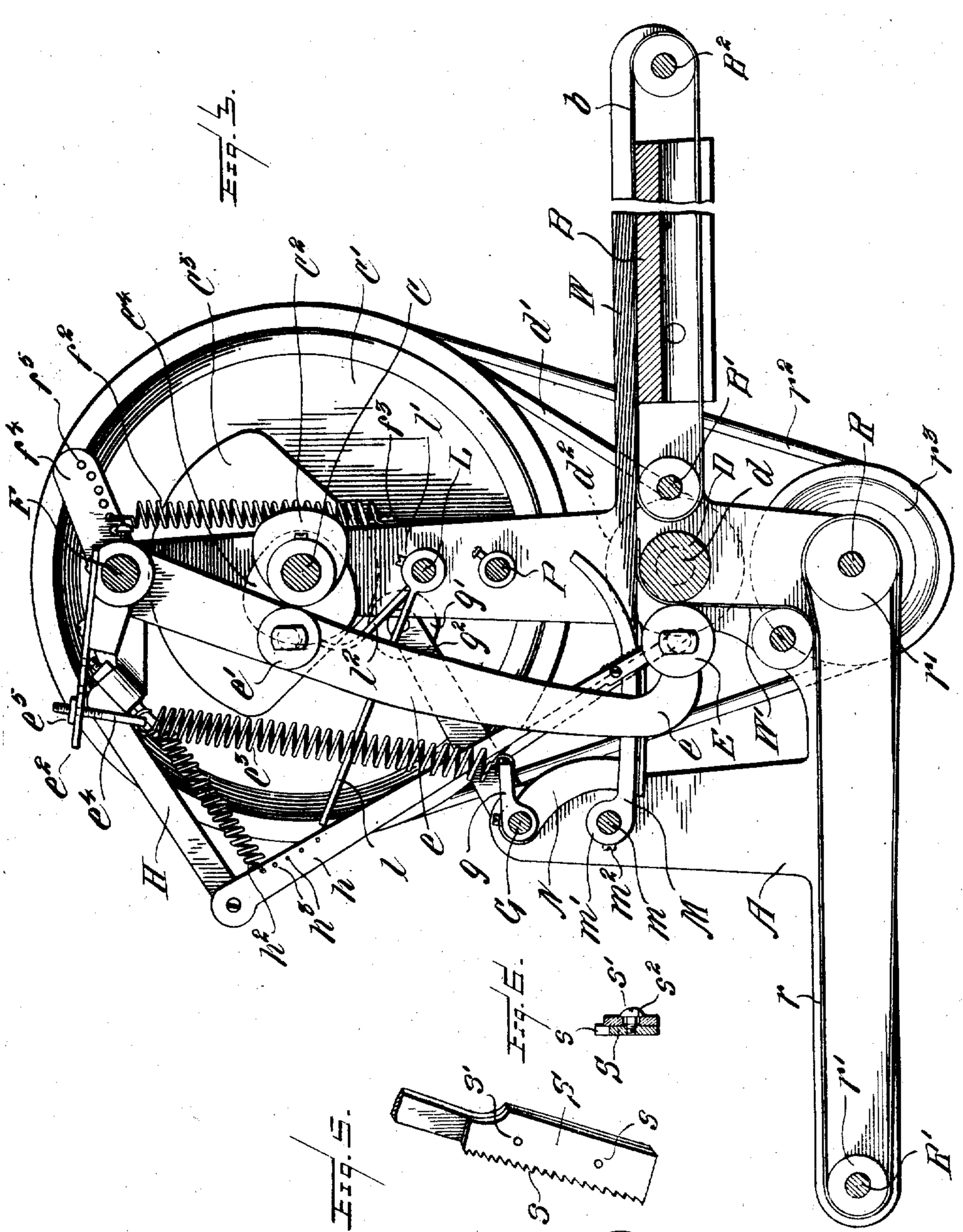

Fig. 4.

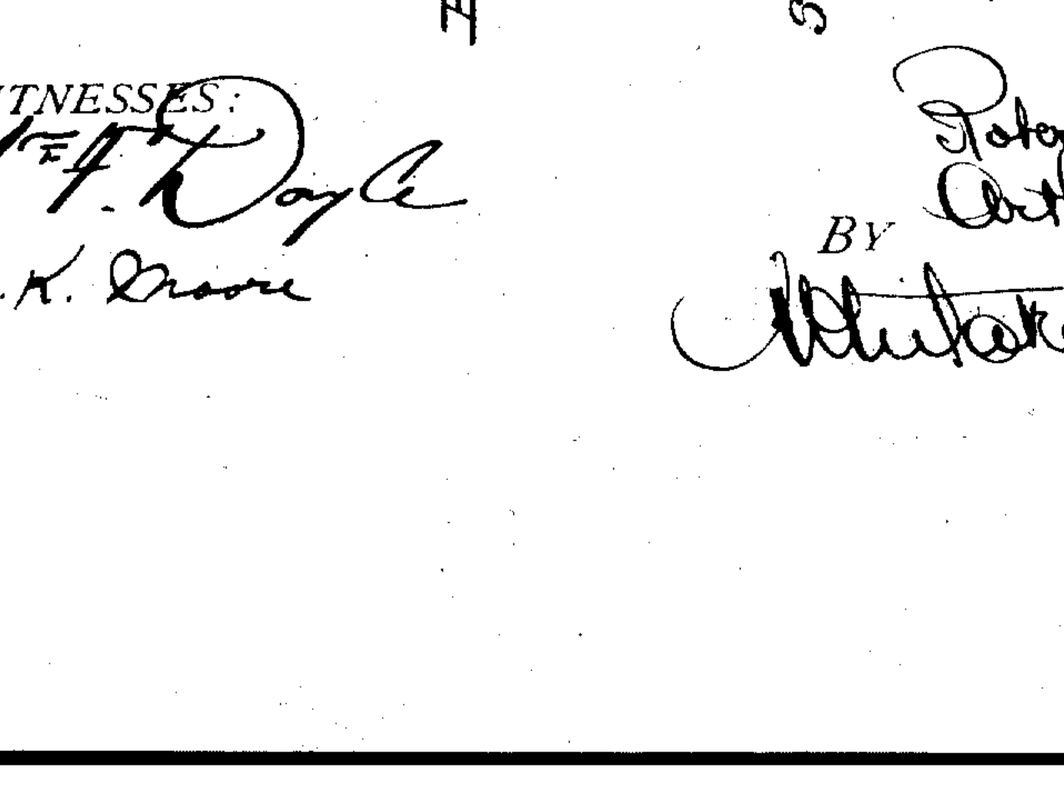

Fig. 5.

Fig. 6.

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4 SHEETS—SHEET 4.

Fig. 4.

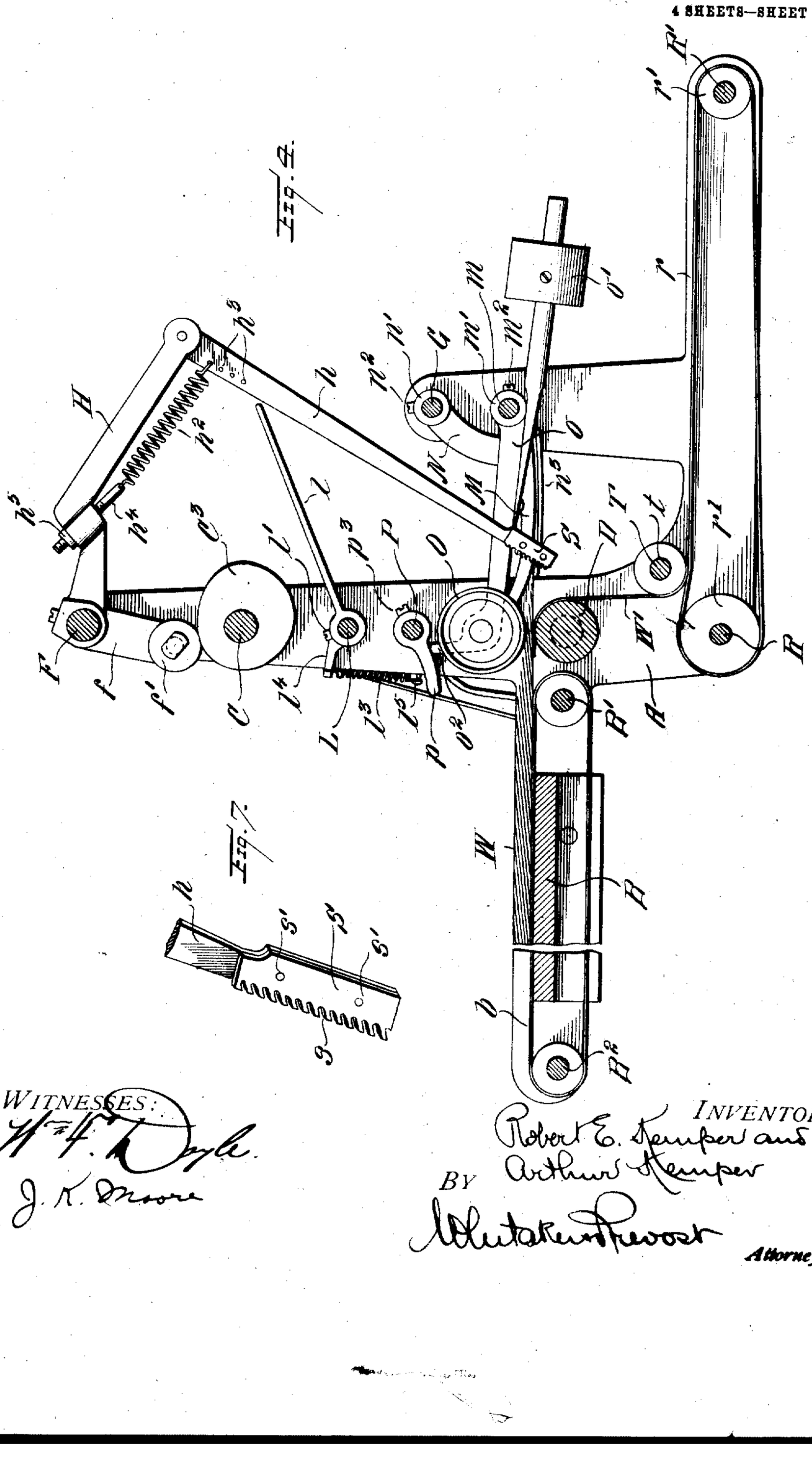

Fig. 7.

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UNITED STATES PATENT OFFICE.

ROBERT E. KEMPER AND ARTHUR KEMPER, OF RENSSELAER, NEW YORK.

SHEET-FEEDING MACHINE.

No. 903,386. Specification of Letters Patent. Patented Nov. 10, 1908.

Application filed February 6, 1908. Serial No. 414,646.

To all whom it may concern:

Be it known that we, ROBERT E. KEMPER and ARTHUR KEMPER, citizens of the United States, residing at Rensselaer, in the county of Rensselaer and State of New York, have invented certain new and useful Improvements in Sheet-Feeding Machines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention consists in the novel features hereinafter described reference being had to the accompanying drawings which illustrate one form in which we have contemplated embodying our invention and said invention is fully disclosed in the following description and claims.

Referring to the said drawings, Figure 1 is a perspective view (partly broken away) of a machine for feeding sheets, etc., embodying our invention. Fig. 2 is a front elevation of the same. Fig. 3 is a vertical longitudinal sectional view of the machine on line *x*—*x* Fig. 2, looking in the direction indicated by the arrow 3. Fig. 4 is a similar view on line *x*—*x* of Fig. 2 looking in the direction indicated by arrow 4. Fig. 5 (Sheet 3) is a detail perspective view of one of the separating devices, and its supporting arm. Fig. 6 is a sectional view of the same. Fig. 7 is a view similar to Fig. 5, showing a slightly modified form of separator.

The object of our invention is to provide mechanism for automatically feeding sheets of paper, (and analogous articles, such as envelops, cards and the like,) singly, and it may be conveniently employed in feeding the sheets successively to a printing press or other device, to which it may be desirable to present them.

In the drawings A A represent the side frames of the apparatus which are constructed to receive and support the operating parts.

B represents a table secured between the side frames A, over which an endless conveyer moves. In this instance the conveyer consists of a plurality of endless bands or tapes *b*, *b*, supported on pulleys or drums *b'*, carried by horizontal shafts B', B², mounted in the side frames A A. The shaft B' is the driving shaft for the conveyer and is provided with suitable operating means. To this end shaft B' is provided with a ratchet wheel b^2, which is engaged by a pawl *c*, carried by an eccentric strap *c'*, engaging an eccentric c^2 on the main driving shaft C, extending across the machine, and journaled in the side frames thereof. The driving shaft C is operated as hereinafter described and imparts motion to the shaft B' intermittently, thereby operating the bands (or conveyer) *b*.

Adjacent to shaft B' is a continuously rotating feeding roller D mounted on a shaft *d*, journaled in the side frames, and having its upper surface in substantially the same horizontal plane as the table B and conveyer bands *b*. The shaft *d* is driven in any suitable manner as by belt *d'* passing over a drive pulley C' on shaft C, and a pulley d^2 on shaft *d*.

E represents a movable pressure roller, adapted to engage the feed roller D, and carried on the outer end of an arm *e*, pivotally mounted above said roller, and in this instance loosely mounted on a rock shaft F journaled in the upper portions of the side frames A, A. The arm *e* is provided between its ends with a friction roll *e'*, which engages a cam C^2 on shaft C, in such manner that the pressure roller is intermittently moved away from the feeding roller D by the cam. The arm *e* is provided with an angularly disposed arm or plate e^2 having a series of holes for the attachment of a spring e^3, one end of which is provided with an adjustable threaded rod e^4 which is passed through one of said holes, in the arm or plate e^2, and secured by a nut e^5. The other end of spring e^3 is secured to some suitable part of the machine, in this instance, to an arm *g*, secured to a rock shaft G mounted in the main frame, but the spring could be attached to the shaft itself if desired. By the present construction, however, the one spring e^3 is enabled to operate on the pressure roller, and also on the rock shaft G, as will hereinafter appear. It will be seen that by tightening the nut e^5 the tension of spring e^3 may be adjusted, and further adjustments may be obtained by inserting the screw threaded rod e^4 in one or other of the holes in the angularly disposed arm e^2, as will be readily understood.

The sheets of paper to be fed are "fanned out" in a well known way, and as illustrated in the drawings and are laid upon the conveyer bands *b*, and by them are fed up until the lowest sheet, which projects beyond all others, lies upon the continuously operated feed roller D, as shown. The friction of this

roller alone will not be sufficient to move the lowest sheet and we provide means for separating the lowest sheet of the pile from the others and bending it into a position where it may be clamped between the roller D and the pressure roller E, whereupon the said lowest sheet will be drawn from the pile and delivered, the remaining sheets being held meanwhile against movement.

For the purpose of separating the lowest sheet and bending it as aforesaid, we employ a separating device S which consists preferably of a thin metal or other plate having one edge provided with teeth, or notched or serrated portions, *s*, which may be of a variety of shapes, two of which are illustrated in Figs. 5 and 7, and which engage the extreme edge or end face of the bottom sheet and bend the sheet downward over the roller D, in such position that the rearward movement of roller E will cause it to compress the separated sheet between rollers E and D and feed the sheet. The separator S is adjustably secured to the lower end of a yielding arm *h*, the upper end of which is pivotally secured to the outer end of a rock arm H rigidly but adjustably mounted on the rock shaft F and secured in its adjusted position by set screw *h'*. In order to hold the separator yieldingly against the edge of the bottom sheet, with a very delicate pressure, we provide a light spiral spring h^2 one end of which is connected to the arm *h*, in which a series of holes h^3 are provided to secure a wide range of adjustment of the tension of the spring. The other end of the spring is adjustably secured to the arm H, by means of a threaded rod h^4 passing through a hole in said arm H and secured by a nut h^5 by means of which a further and more delicate adjustment of the tension of the spring h^2 may be obtained. The separator S is adjustably secured to the yielding arm *h*, by means of screws *s'* passing through transverse slots s^2 in the arm *h*, as shown in Fig. 6. By adjusting the separator S, with respect to the arm *h*, the teeth or projecting portions *s* may be made to project a greater or less distance beyond the edge of the arm *h*, as will be readily seen from Fig. 6, so that the effective length of said teeth or projections can be adjusted to secure the best results with different weights or thicknesses of paper.

The rock shaft F is provided with a rigid arm *f* (see Fig. 4) having a friction roll *f'* engaging a cam C^3, on driving shaft C, to rock the shaft F and throw down the separator S, by means of arms H and *h*, so that the separator will engage the edge of the bottom sheet of paper and depress it into position to be gripped between the rollers D and E as previously described. The friction roll *f'* is held in engagement with the cam C^3 by a spring f^3, secured at its lower end at f^3 to one of the side frames A, and having its upper end connected to an arm f^4, provided with a plurality of holes f^5 to permit of adjusting the tension of the spring.

We may employ one or more of the separating devices just described, as may be found desirable. In the drawings we have shown two of these devices, the construction of which is identical and the corresponding parts are identically lettered on the drawings, and we may employ a larger number if desired, as in feeding very large sheets. It will be understood that the separating devices operate at the same time and in the same manner, and that they differ merely in engaging the bottom sheet at different points along its edge.

In order to prevent the separating devices from dragging across the edge of the sheet next above the bottom or separated sheet, on its return movement we prefer to provide what we term a kick-off, which consists of an arm *l*, adjustably mounted on a rock shaft L, journaled in the frames A, A and held in position thereon by set screw *l'*. The outer end of the kick-off arm *l* is moved into engagement with the yielding arm *h*, of the separator, during the upward or return movement thereof and pushes said arm outwardly away from the paper, so that the separator shall not engage the paper during its return movement, but the kick-off is moved to permit the separator to engage the bottom sheet on its down or operative movement. The kick-off arm *l* is operated by a cam C^4 on the driving shaft C which engages the outer end of an operating arm l^2 (or a friction roll thereon) secured to the rock shaft L, the cam C^4 being so shaped as to rock shaft L at the proper times and impart the desired movements to the kick-off arm. The operating arm l^2 is held in engagement with cam C^4, by a spring l^3 (see Fig. 4) one end of which is secured to an arm l^4 rigidly attached to the rock shaft L, the other end of the spring being secured to one of the frames A, as at l^5. The rock shaft L is provided with a kick-off arm *l* for each of the arms *h*, as shown and as will be readily understood. We also provide means for holding the sheets of paper above the bottom sheet, firmly against displacement while the bottom sheet is being drawn out from beneath them and delivered, as previously described. This mechanism which we term the locking mechanism comprises one or more pairs of locking jaws, or arms, one of each pair being preferably stationarily supported and the other being movable, although both may be movable if preferred.

M, M represent a pair of stationary locking jaws or arms which are rigidly but adjustably secured to a transverse bar *m* supported in the side frames A, A of the machine, forward of the feed roller D. In this instance the jaws M are each provided with a sleeve por-

tion m' fitting the bar m and rigidly secured thereto by set screw m^2. This enables the arm M to be adjusted transversely of the machine and also up and down (or rotarily around the bar m) to bring it to the desired position.

N, N represent movable locking arms or jaws having sleeve portions n' mounted on a rock shaft G supported in bearings in the side frames A, A and held rigidly in their adjusted relation to the shaft by set screw n^2. Each of the arms N is provided with a broad gripping portion n^3 which coöperates with one of the arms M in gripping and locking the paper, and in this instance extends below the said arm M, as shown, and is moved upward into locking position by the partial rotation of the rock shaft G. The shaft n is rotated at the proper point in the cycle of operation of the machine by means of a cam C^5 on the main shaft C, which cam engages a roll g' on the outer end of an arm g^2, said roll being held in engagement with the cam C^5 by the spring e^3, connected to arm g, as before described.

In order that the pile of sheets on the feeding conveyer bands b, may not be advanced too rapidly, so as to interfere with the proper operation of the device, we provide a throw off mechanism to disconnect the actuating pawl c, from the ratchet wheel b^2, when the paper has been fed to the proper position. The paper before being placed on the bands b, is "fanned" or spread out in such manner that the edge of each sheet is slightly in rear of the one below it, as shown in the drawing. This fanning of the paper is well understood in the printing art, and it is ordinarily accomplished by seizing the pile of sheets, bringing their edges into alinement, and then, holding opposite edges of the pile between thumb and fingers, bending the pile of sheets in first one direction and then the other and releasing the pressure alternately at opposite ends of the pile. It follows, therefore, that as the pile of sheets is fed toward the feed roller D, the forward edges of the pile present the appearance of an incline.

O represents an idle roller, supported at the outer end of a trip lever o freely pivoted between its ends, (in this instance being loosely mounted on the bar m) and carrying a counterbalance weight o' at the end opposite said roll O. The roll O is so located that as the pile of sheets is advanced, it will travel up the incline presented by the forward edges thereof, as clearly shown in the drawings. (See particularly, Figs. 1 and 4). The arm o is here shown as made in two pieces, but this is not important and it may be made as one piece. The arm o is provided adjacent to roller O, with a projection o^2, which engages an arm p secured to a throw off rock shaft P, supported in the side frames A, A, and on the outer side of one of said frames, adjacent to the pawl c, the shaft P is provided with a throw off arm p', carrying adjacent to its outer end an adjustable device, here shown as a set screw p^2, for engaging the pawl c, and lifting it off of the ratchet wheel b^3. As soon as the pawl is lifted off of the ratchet the forward movement of the pile of sheets on the conveyer bands b is arrested, and the pile of sheets remains stationary until a sufficient number of sheets have been removed to permit the roll O to fall sufficiently to restore the pawl c to operative relation with the ratchet b^2 when the forward feeding of the pile of sheets is resumed and continues until the throw off mechanism again lifts the pawl c. It is found that this throw off mechanism maintains the pile of sheets in the proper position and insures the necessary advance of the pile until all the sheets have been removed. The adjustment of set screw p^2 permits the throw off mechanism to be adjusted to accommodate paper or sheets of different thickness. Such adjustment may be obtained by changing the position of the arm p with respect to the shaft P, by loosening the set screw p^3 by which said arm is secured to the shaft setting the arm and tightenting the set screw, and this adjustment may also be provided in other ways, but the screw p^2 provides a convenient means of adjustment without disturbing any of the other parts of the throw off mechanism and is our preferred means of adjustment.

When the sheets are to be delivered horizontally, we prefer to provide an auxiliary conveyer below the feed roller D, and extending forwardly thereof, consisting in this instance of delivery bands r r running on drums or pulleys r', mounted on the transverse shafts R and R'. The shaft R is here shown as the driving shaft, and is operated by a belt r^2, engaging a pulley r^3 on shaft R, and pulley C^6 on the main shaft C. In order to assist in guiding the sheets onto the delivery bands r, we also provide an idle shaft T above the said bands r, and provided with drums or pulleys t t which frictionally engage the bands so as to be rotated thereby as clearly shown in Fig. 4.

The operation of the device in feeding sheets will be clearly apparent from the foregoing description, but the cycle of the machine may be stated for greater clearness. The main or driving shaft C is driven continuously by power (or by hand) in any suitable manner. The paper represented at W is fanned out and placed upon the feed table B, upon the feeding conveyer bands b b, and the ratchet wheel b^2 may be turned by hand to advance the paper to approximately the proper position, when the pawl c will advance it slowly until the roll O riding upon the incline presented by the forward edges of the sheets, throws off the pawl c. The next downward movement of the separator

or separators will cause them to engage the edge of the lowest sheet, indicated by W', which will then extend over the continuously moving feed roller D and below the locking arms M, and bend it downward into position to be engaged by the clamping roller E (see Fig. 3). At the same time the locking arms N will be lowered so as to pass the lowest sheet and clamp the next adjacent sheets above the same between the locking jaws or arms M and N, and hold them from forward movement. As soon as the lowest sheet is gripped between the rollers E and D the frictional engagement of the latter roll therewith will pull it forward and downward as shown in the drawings until its lower edge engages the traveling delivery bands *r r*, which carry the edge portions forward between the bands *r r* and the idle pulleys *t*, in a horizontal direction and deliver the sheet horizontally. If the sheet is to be delivered vertically the bands *r r* and pulleys *t t* can be dispensed with. The parts of the machine are so assembled and timed as represented in the drawings as to perform the various operations described in the proper sequence. As soon as the bottom sheet is drawn out and fed the locking mechanism releases the pile of sheets and repetitions of the cycle of operations causes the separation and feeding of the sheets successively. As soon as the feeding of a number of sheets has lowered the position of the roll O sufficiently to bring the pawl *c* into operative relation with the ratchet wheel, the bands *b b* will be actuated to move up the pile of sheets, which is thus maintained in such position that the lowest sheet can always be separated and delivered.

What we claim and desire to secure by Letters Patent is:—

1. In an automatic sheet feeding device, the combination with means for supporting the sheets in horizontal position, feeding devices for delivering the sheets singly, located adjacent thereto, a separating device provided with serrated portions, means for drawing said separating device across the edge of the bottom sheet in a downward direction to bend it into position to be engaged by the feeding devices, and clamping devices for holding the remaining sheets against movement while the bottom sheet is drawn out including a jaw located above the plane of the bottom sheet, and a coöperating movable jaw having portions below the plane of the bottom sheet, substantially as described.

2. In an automatic sheet feeding device, the combination with a horizontally disposed conveyer upon which the sheets are supported, the forward edge of each sheet being slightly in advance of the sheet above it, means for operating the conveyer to advance the sheets, feeding mechanism adjacent to said conveyer for delivering the sheets singly therefrom, a separating device for engaging the bottom sheet and bending it downward into position to be engaged by the feeding mechanism, a stationary gripping jaw having portions extending above a portion of said sheets, adjacent to the bottom sheet, and a movable gripping jaw, having portions below the plane of the bottom sheet, for holding the remaining sheets while the bottom sheet is drawn out, substantially as described.

3. In an automatic sheet feeding device, the combination with a horizontally disposed conveyer upon which the sheets are supported, the forward edge of each sheet being slightly in advance of the sheet above it, means for operating the conveyer to advance the sheets, feeding mechanism adjacent to said conveyer for delivering the sheets singly therefrom, a separating device for engaging the bottom sheet and bending it downward into position to be engaged by the feeding mechanism, means for holding the remaining sheets while the bottom sheet is drawn out, a throw off mechanism for the conveyer, operating means, including a movable part provided with a roller, adapted to engage the inclined surface presented by the retreating front edges of the sheets, substantially as described.

4. In an automatic sheet feeding device, the combination with a horizontally disposed conveyer, upon which the sheets are supported, the forward edge of each sheet being slightly in advance of the one above it, means for operating the conveyer, a feed roll adjacent to the end of said conveyer, and beneath the plane of travel of the sheets, a clamping device movable toward and from the feed roll, a separating device, for engaging the front edge of the bottom sheet and move it into position to be engaged between said feed roll and clamping device, and clamping means for holding the remaining sheets from movement while the bottom sheet is drawn out, substantially as described.

5. In an automatic sheet feeding device, the combination with a horizontally disposed conveyer, upon which the sheets are supported, the forward edge of each sheet being slightly in advance of the one above it, means for operating the conveyer, a feed roll adjacent to the end of said conveyer and beneath the plane of travel of the sheets, a clamping device movable toward and from the feed roll, a separating device, mechanism for reciprocating the same across the edge of the bottom sheet, a rock shaft, a kick off arm carried thereby, and constructed to engage the separating device, during its movement in one direction and hold it out of engagement with said sheets, and clamping means for holding the remaining sheets from movement while the bottom sheet is drawn out, substantially as described.

6. In an automatic feeding device, the combination with means for supporting a

plurality of articles to be fed, of feeding mechanism located adjacent thereto, a separating device consisting of a metal blade having projections or teeth on one edge, a supporting device for said blade, means for reciprocating said blade and its support, said support having a portion adjacent to the blade, provided with an edge disposed substantially parallel to the row of projections or teeth of the blade, and means for adjusting the blade transversely with respect to said support to vary the amount of projection of said teeth beyond the adjacent edge of said support, substantially as described.

7. In an automatic feeding device for sheets and the like articles, the combination with a conveyer for supporting the articles to be fed in a horizontal position, means for actuating said conveyer, a feeding device adjacent to said conveyer, a separating device constructed to engage the edge of one of said articles and move it into position to be engaged by the feeding mechanism, a throw off mechanism for said conveyer actuating mechanism, including a vertically movable device extending above a portion of said conveyer, and means for adjusting said throw off mechanism, to accommodate it to sheets or articles of different thickness, substantially as described.

8. In an automatic feeding device for sheets and the like articles, the combination with a conveyer for supporting the articles to be fed in a horizontal position, means for actuating said conveyer, a feeding device adjacent to said conveyer, a separating device constructed to engage the edge of one of said articles and move it into position to be engaged by the feeding mechanism, a throw off mechanism for said conveyer actuating mechanism including a vertically movable trip arm provided with a friction roller, adapted to ride up on the articles to be fed, and a counter balance for said trip arm and roller, substantially as described.

9. In an automatic feeding device for sheets and the like articles, the combination with a conveyer for supporting the articles to be fed in a horizontal position, a feeding device adjacent to said conveyer, pawl and ratchet mechanism for actuating said conveyer, a separating device constructed to engage an edge of one of the articles and move it into position to be engaged by the feeding mechanism, a vertically movable trip extending above the path of the articles on said conveyer, a throw off arm, an adjustable device interposed between the throw off arm and the pawl of said pawl and ratchet mechanism and operative connections between said trip and throw off arm, substantially as described.

10. In an automatic feeding device for sheets and the like articles, the combination with a conveyer for supporting the articles to be fed in a horizontal position, a feeding device adjacent to said conveyer, pawl and ratchet mechanism for actuating said conveyer, a separating device constructed to engage an edge of one of the articles and move it into position to be engaged by the feeding mechanism, a vertically movable pivoted trip arm, provided with a friction roll extending above said conveyer, a counter balance for said trip arm, a throw off arm provided with an adjustable part for engaging the pawl of the pawl and ratchet mechanism and operative connections between said trip arm and said throw off arm, substantially as described.

11. In an automatic feeding device for sheets and the like articles, the combination with means for supporting the articles in horizontal position, feeding mechanism adjacent thereto, for delivering the sheets singly, a separating device for engaging an edge of one of the articles at a time and bending it into position to be engaged by the feeding mechanism, a horizontal delivery conveyer below said feeding mechanism, and a rotary device located below the feeding mechanism, and forward of the rear end of said delivery conveyer, said rotary device being located above the travel of the sheet upon said conveyer, substantially as described.

12. In an automatic feeding device for sheets and like articles, the combination with a horizontal conveyer for supporting the sheets in a horizontal position, with the forward edge of each sheet in advance of the one above it, a feed roller adjacent to the end of said conveyer, a pressure roller movable toward and from the feed roller, a separating device for engaging the edge of the bottom sheet and bending it into position between the feed roller and pressure roller, a horizontally disposed delivery conveyer below the feed and pressure rollers and a guiding roller located below the feed roller above the delivery conveyer and forward of the rear end of the same, substantially as described.

13. In a feeding device for sheets and like articles, the combination with a horizontally disposed conveyer for supporting the sheets, operating mechanism for said conveyer, a continuously operating feed roller adjacent to the delivery end of said conveyer, a pressure roll movable to and from the feeding roll, a throw off mechanism for the operating mechanism for said conveyer, a vertically movable trip lever having a roller adapted to engage the articles to be fed; and operatively connected with the throw off mechanism for actuating the same, a counter balance for said trip lever, a separator having teeth for engaging an edge of one of said articles and bending the same into position to be engaged by the feed and pressure rolls,

means for reciprocating the separator, a stationary clamping jaw, and a movable clamping jaw coöperating therewith, mechanism for operating said movable jaw to clamp the articles adjacent to the selected article and holding them while the selected article is fed, a movable kick-off device for holding the separator out of contact with the articles to be fed during its return movement, a horizontal delivery conveyer below the plane of the aforesaid conveyer and rotating devices coöperating with the delivery conveyer for causing the separated articles to take a horizontal position on said delivery conveyer, substantially as described.

In testimony whereof we affix our signatures in the presence of two witnesses.

ROBERT E. KEMPER.
ARTHUR KEMPER.

Witnesses:
C. G. KEMPER,
R. KEMPER.