R. E. & A. KEMPER.

SHEET FEEDING MACHINE.

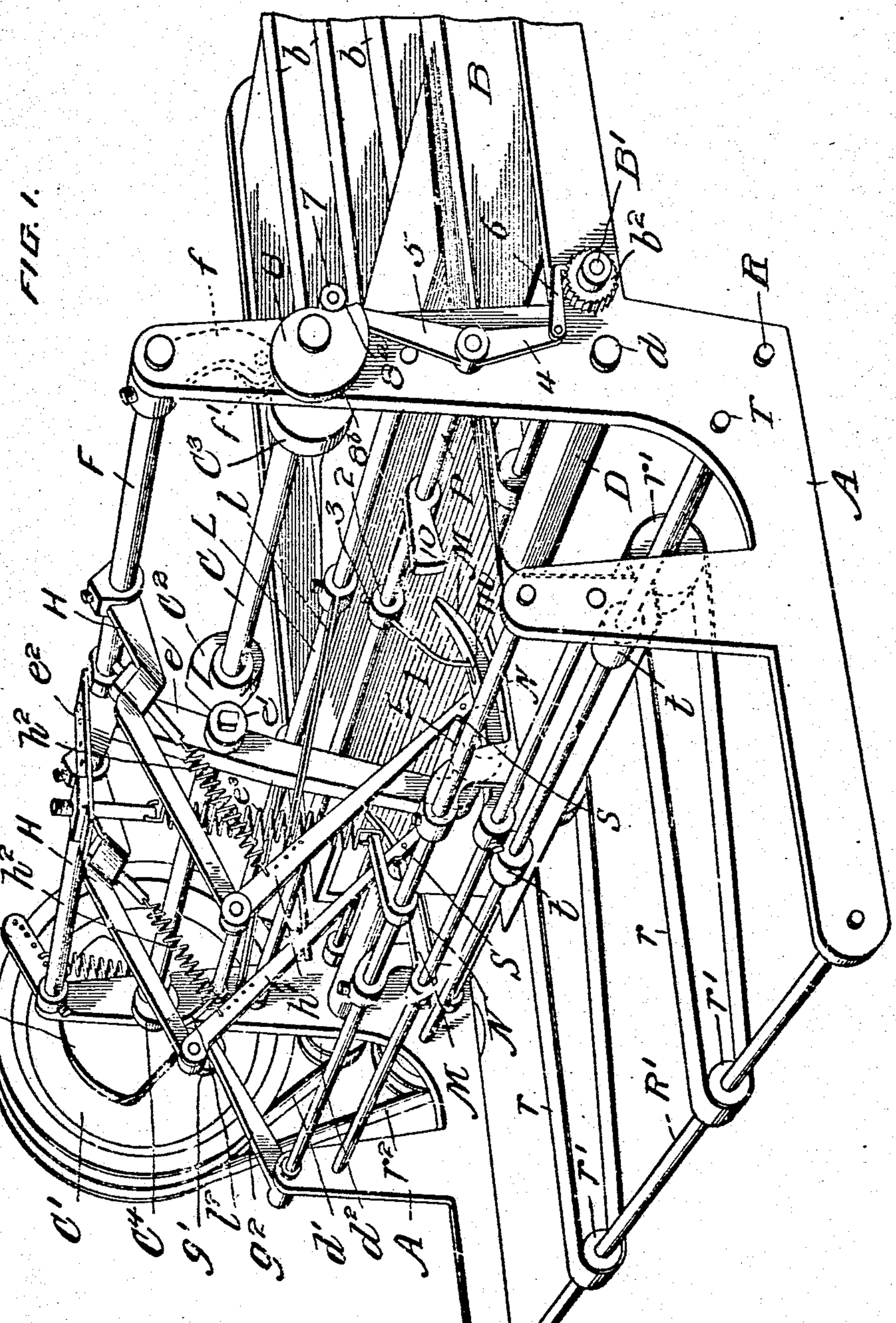
APPLICATION FILED APR. 4, 1910.

975,252.

Patented Nov. 8, 1910.

3 SHEETS—SHEET 1.

FIG. 1.



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3 SHEETS—SHEET 2.

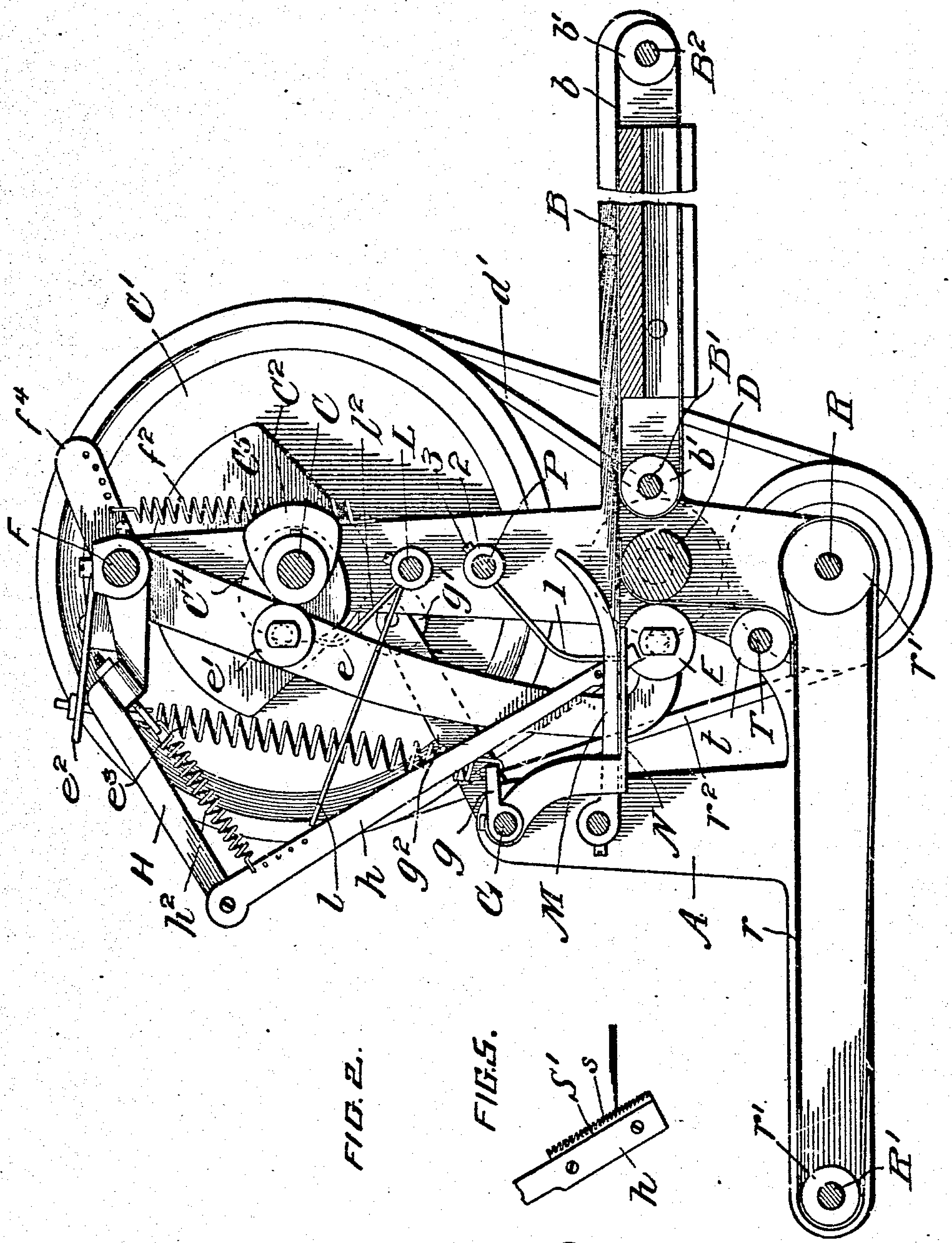

FIG. 2.

FIG. 5.

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3 SHEETS—SHEET 3.

FIG. 3.

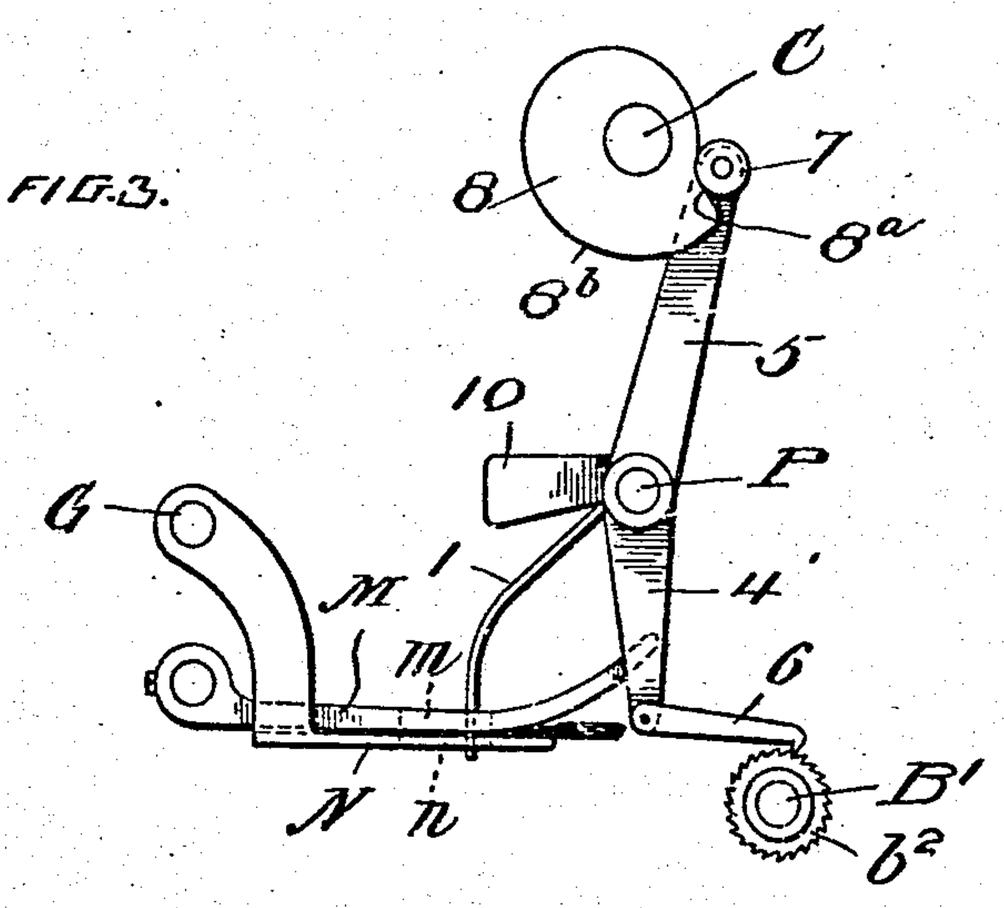
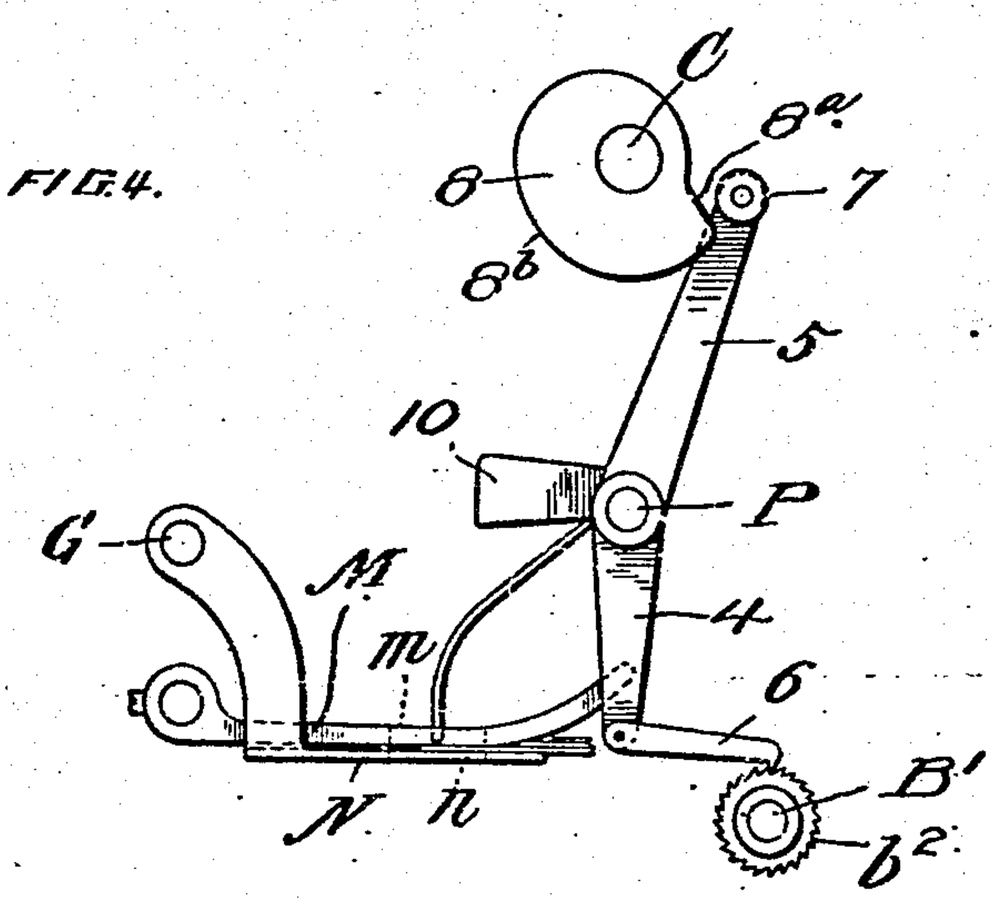


FIG. 4.



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UNITED STATES PATENT OFFICE.

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SHEET-FEEDING MACHINE.

975,252. Specification of Letters Patent. **Patented Nov. 8, 1910.**

Application filed April 4, 1910. Serial No. 553,391.

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 the best 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 represents a perspective view of a machine for feeding sheets, etc., embodying our present invention. Fig. 2 is a vertical longitudinal sectional view of the machine. Fig. 3 is a detail view of the mechanism for regulating automatically the advancement of the pile of sheets or other articles to the separating and feeding devices. Fig. 4 is a similar view to Fig. 3 showing the parts in different positions. Fig. 5 is a detail view showing the separating device.

Our present invention relates to mechanism for automatically feeding sheets, etc., to a printing press or for other purposes, and is an improvement upon the machine which forms the subject matter of our former Letters Patent of the United States No. 903,386 granted to us Nov. 10, 1908 for improvements in sheet feeding machine, although our present invention is capable of use with other types of feeding devices than those specifically shown and described in the aforesaid patent.

Our present invention relates particularly to the mechanism of a feeding machine for sheets, etc., which advances the supply or pile of sheets, or other articles, which are to be separated, and fed singly by the separating and feeding mechanism, and consists in devices for automatically regulating the advancement of the supply or pile of articles to be fed, to insure a regular and uniform feed of the same, notwithstanding the variations in the thickness of said articles.

The embodiment of our invention which we have selected for the purposes of illustrating our present invention follows closely the form and arrangement of parts illustrated in our former patent above referred to, and which may be briefly described as follows.

A, A represent the side frames of the machine, B the feed table, provided with an endless conveyer comprising separated bands *b* carried by pulleys or drums *b'* on shafts B', B² of which B' is the driving shaft, provided with a ratchet wheel *b*² by means of which motion may be imparted to said shaft.

D is a continuously operating feed roller, carried by shaft *d*, driven in this instance by belt *d'* passing over pulley *d*² on shaft *d*, and pulley C' on driving shaft C.

E is a movable pressure roller for engaging the separated sheets or articles and pressing them into frictional contact with the feed roller so as to draw them singly from the pile of sheets or articles. The roller E is carried on the end of an arm *e*, pivotally mounted in the frame, in this instance loosely mounted on the rock shaft F, said arm being operated by a cam C² on shaft C, which engages a friction roll *e'* on arm *e*. Said arm *e* is provided with a spring *e*³ adjustably connected to an arm *e*² for forcing the roller E toward the roller D, when such movement is permitted by the cam C².

The sheets of paper, or other articles (as cards, envelops, etc.) to be fed are "fanned out" in a well known way, as illustrated in the drawing; the pile of sheets is laid on the conveyer with the lowest sheet in advance of the remainder, and the sheets are moved forward until the said lowest sheet lies upon the continuously rotating feed roller D, the frictional contact of which with the flat sheet is not sufficient to move the sheet.

In order to feed the sheets, we provide means for separating the bottom sheet from the others, and for bending it around the feed roller D, and the separated sheet is then pressed upon the feed roller by the pressure roller E so as to cause it to be fed or drawn out from beneath the pile of sheets. The separating device here shown consists of a thin plate S' having notched or serrated portions *s*, to engage the edge of the lowest sheet. The separator is carried by a yieldingly mounted arm *h* pivoted at its upper end to a rock arm H secured to rock shaft F, and a light spring *h*² tends

to draw the separator arm *h* rearwardly to bring the separator against the edge of the sheet to be fed, with a delicate pressure, and is made adjustable to secure accuracy of operation. The rock shaft F is operated by an arm *f* having a roll *f'* engaging a cam C^3 on shaft C, to move the separator downwardly, and is retracted by a spring f^2. One or more separators S may be employed, two being here shown, and to prevent the serrated edge of the separator from dragging across the edges of the sheets on the upward stroke, it is held out of engagement with the sheets on the back stroke by a blade or arm *l*, which we term a "kick off" and which is carried on a rock shaft L operated by a cam C^4 on shaft C, by means of an arm l^2.

M, M are a pair of stationary locking jaws, and N, N are a pair of movable jaws coöperating therewith for clamping the forwardly projecting sheets above the bottom, separated sheet, and holding the pile of sheets against displacement while the bottom sheet is drawn out. The arms N, N are mounted on a rock shaft G operated at the proper time in the cycle of operations by a cam C^5 on shaft C, which engages a roll *g'* on an arm g^2 secured to the rock shaft G.

The separated sheets may be discharged in any desired manner, but in the device here illustrated they are deposited by roller D upon a horizontal delivery conveyer, consisting of endless bands *r*, *r* mounted on rollers *r'* carried by shafts R, R', the shaft R being driven by belt r^2 (or otherwise) from shaft C.

T represents an idle shaft carrying rollers *t t* which rest upon the bands *r r* and assist in laying the separated sheets upon the delivery conveyer.

The parts as thus far described are all constructed, combined and operated, as set forth in our former patent above referred to and as they do not in their specific form constitute part of our present invention they will not be further described nor particularly claimed herein.

In feeding sheets or articles, it is necessary that the forward feeding of the pile or supply of articles should be advanced just sufficiently so that the bottom sheet or article may be separated or removed, and the pile may require to be advanced more slowly or more rapidly according to the thickness of the articles, or the manner in which they are "fanned out" before they are placed on the feeding conveyer or table. In order to accomplish this result, we provide means for operating the conveyer and combine therewith a delicately acting movable detector which is constructed to engage the top face of the second sheet from the bottom, (that is to say, the one immediately above the sheet which has been separated from the pile) when the pile of sheets has been advanced to or slightly beyond the desired extent, and prevent the further feeding movement of the pile, until after enough sheets have been removed from the bottom to carry the leading edge of the sheet next the bottom back of the path of the detector, when the movement of the pile is again resumed by the feeding mechanism for the conveyer, and thus the accurate feeding forward of the stock is delicately, accurately and automatically regulated at all times. To this end we have shown one of the stationary clamping jaws M and its corresponding movable jaw N provided with registering apertures *m* and *n*.

1 represents the detector which consists of a slender arm or finger secured to a rock shaft P mounted in the side frames. The finger or detector 1 is preferably secured to a collar 2, which is secured to shaft P by a set screw 3, to permit of securing the desired adjustment of the finger, and the free end of the finger 1 is adapted to pass vertically through the registering apertures in the jaws M and N, when the same are in closed position, providing the sheet next to the bottom of the pile has not been advanced far enough to lie over the aperture in the lower of said jaws. While in the drawings we have shown this detector in connection with one set of clamping jaws, we may and preferably, employ such a detector with each pair of clamping jaws.

On the side of the machine adjacent to the ratchet wheel b^2 on shaft B', the rock shaft P is provided with a two armed lever rigidly secured thereto, the lower arm 4 being provided with a pivoted pawl 6 which engages the ratchet wheel b^2, while the upwardly extending arm 5 carries a stud or friction roll 7, adapted to engage cam 8 mounted on the shaft C. This cam is provided with an actuating grade 8^a and a peripheral portion 8^b of gradually decreasing radius, extending from the outer end of the grade 8^a to its inner end. Yielding means are provided for normally holding the friction roll 7 in engagement with the cam 8, which consists in this instance of a weighted lever 10 secured to the rock shaft P.

The operation of the automatic feed regulating mechanism just described is as follows. When the device is in operation, and supposing that the pile of sheets has not been advanced too far, the friction roll 7 will remain in engagement with the periphery of the cam, and as it reaches the lowest portion of the surface 8^b, at the foot of the grade 8^a the detector or finger will pass through the registering apertures *m* and *n* in the jaws M and N, and the further revolution of the cam 8 will cause the grade 8^a to give the arms 5 and 4 their full stroke, and thus cause the pawl 6 to move the ratchet wheel the greatest distance to which

it can be moved, say two teeth or one tooth as the case may be and simultaneously lifting the detector or finger 1 above the jaws M, N. If, however, the sheets have been fed forward far enough to bring the sheet next above the bottom sheet (which is separated by the device S) far enough forward to lay its marginal portion in the path of the finger 1, then as the finger or detector descends, it will strike the sheet, as shown in Fig. 4, and arrest the movement of rock shaft P under the influence of the weighted lever 10 (or an equivalent light spring), thus holding the friction roll 7 away from the low portion of the cam, so that it only rides up a very small portion of the cam grade 8^a, just sufficient to slightly lift and hold up the finger 1, but not enough to operate the pawl 6, except for a short distance, say one tooth or less than one tooth as the case may be, hence the feeding movement would be reduced, or no forward movement at all of the pile is effected according to the arrangement of the teeth of the ratchet and the normal throw of the pawl. At the next cycle of the machine, the sheet which arrested the detector being now the bottom sheet, is removed by the separating and feeding mechanism, and if the next succeeding sheet is far enough back to permit the detector finger to pass through the apertures *m*, *n* in the jaws M and N, the normal forward feed of the pile of sheets is resumed. It will thus be seen that the device is automatic and should the sheets be advanced too rapidly at any time the feeding is either interrupted, or the extent of the feeding movement reduced, until the proper relation of the pile is again secured.

It will be obvious that our invention can be used with other forms of separating and feeding devices than those herein shown and described, and it is our desire to claim the invention in all relations in which it can be advantageously employed.

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

1. In a feeding device for sheets and like articles, the combination with a horizontally disposed conveyer, for supporting the articles in a fanned out condition, means for separating and feeding the bottom article, and clamping devices for holding the remaining articles from movement while the bottom article is drawn out, of actuating mechanism for said conveyer, including a continuously operating cam, pawl and ratchet mechanism operatively connected with said conveyer and having an actuating part for engaging said cam, a yielding device for normally holding said actuating part in engagement with said cam, and a detector finger rigidly connected to said actuating part, for determining its position in respect to the actuating grade of said cam, and movable transversely across the plane of the conveyer.

2. In a feeding device for sheets and like articles, the combination with a horizontally disposed conveyer for supporting the articles in a "fanned out" condition, means for separating and feeding the bottom article, and clamping devices for holding the remaining articles from movement while the bottom article is drawn out, of actuating mechanism for said conveyer including an actuating cam, a rock-shaft, arms connected with said rock-shaft, carrying, the one an actuating part for engaging said cam, and the other a pawl, a ratchet wheel for said pawl, operatively connected with said conveyer, a detector finger connected with said rock-shaft and having a part having a normal movement across the plane of the conveyer, and yielding means for normally holding said actuating part in engagement with said actuating cam.

3. In a feeding device for sheets and like articles, the combination with a horizontally disposed conveyer, for supporting the articles in a "fanned out" condition, means for separating and feeding the bottom article, and clamping devices for holding the remaining articles from movement, provided with registering orifices, of actuating mec anism for said conveyer including an actuating cam, a rock shaft, arms connected with said rock shaft carrying the one, an actuating part to engage said cam, and the other a pawl, a ratchet wheel for said pawl, operatively connected with the said conveyer, a detector finger operatively connected with said rock shaft and having a part adapted to normally pass through the apertures in said clamping jaws, and yielding means for normally holding said actuating part in engagement with said actuating cam.

4. In a feeding device for sheets and like articles, the combination with a horizontally disposed conveyer, an actuating part for said conveyer provided with ratchet teeth, means for separating the forward edge of the bottom article, means for engaging and feeding the bottom article, means for holding the remaining articles against movement on the conveyer, a continuously rotating cam for operating said conveyer actuating part, a pivotally mounted part for engaging said cam, a pawl connected therewith for engaging the said actuating part and an oscillating detector finger located adjacent to the delivery end of said conveyer, rigidly connected with said pivotally mounted part and movable therewith, said detector finger being capable of swinging across the plane of the conveyer.

5. In a feeding device for sheets and like articles, the combination with a horizontally disposed conveyer, an actuating part for said conveyer provided with ratchet teeth,

means for separating the forward edge of the bottom article, means for engaging and feeding the bottom article, means for holding the remaining articles against movement on the conveyer, a continuously rotating cam for operating said conveyer actuating part, a rock-shaft adjacent to the delivery end of the conveyer, an oscillating part secured thereto and provided with a cam engaging part for engaging said continuously operating cam, and a pawl for engaging said ratchet teeth, an oscillating detector finger secured rigidly to the said rock shaft, and capable of moving transversely across the plane of said conveyer, and yielding means connected with said rock shaft for normally holding said cam engaging part in engagement with the cam.

6. In a feeding device for sheets and like articles, the combination with a horizontally disposed conveyer, for supporting the articles in a fanned out condition, of feeding devices for delivering 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 on the conveyer, in a downward direction to bend said sheet into position to be engaged by said feeding devices, actuating means for said conveyer including a continuously operated cam and pawl and ratchet mechanism having a part for engaging said cam, and a detector finger rigidly connected to the cam engaging part of the pawl and ratchet mechanism, and movable therewith, and having a portion capable of movement across the plane of the conveyer at the delivery end of same, to determine the throw of the pawl and ratchet mechanism, and yielding means for normally holding the pawl and ratchet mechanism in operative relation with said cam so as to receive the full throw thereof.

7. In a feeding device for sheets and like articles, the combination with a horizontally disposed conveyer, a feed roller adjacent to the delivery end of said conveyer, and below the plane thereof, a pressure device coöperating with and movable toward and from said feed roller, a separating device, means for reciprocating the same across the edge of the bottom sheet, a ratchet wheel operatively connected with said conveyer, a continuously operating cam for actuating said conveyer, a rock shaft extending above the plane of said conveyer, an oscillating part connected with said rock shaft having a part to engage said cam, a pawl for engaging said ratchet connected to said oscillating part, a yielding device for normally holding the cam engaging part in engagement therewith, and a detector finger connected rigidly with said rock shaft and extending downwardly therefrom across the plane of the conveyer.

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

ROBERT E. KEMPER.
ARTHUR KEMPER.

Witnesses:
RICHARD M. COZINE,
C. G. KEMPER.