(No Model.).

4 Sheets—Sheet 1.

E. DUMMER.

PAPER FEEDING MACHINE.

No. 566,670. Patented Aug. 25, 1896.

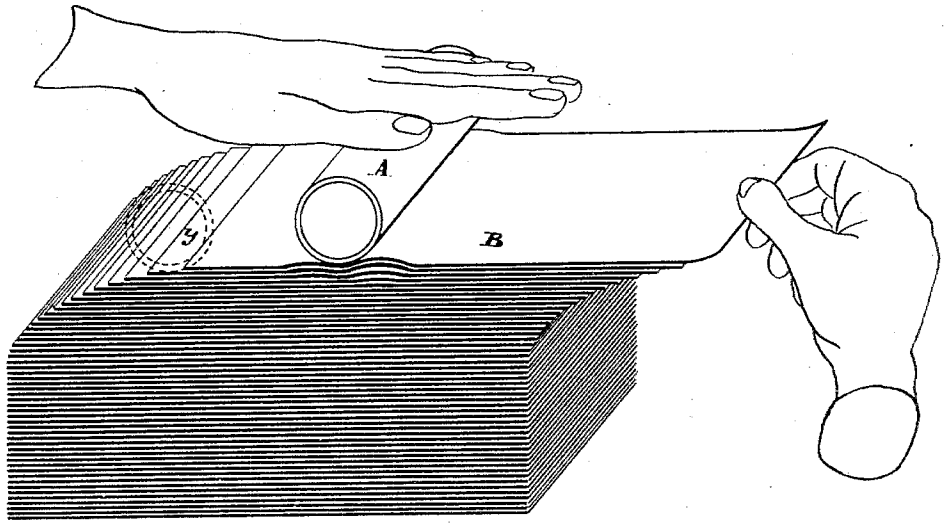


Fig. 1.

WITNESSES.
L. S. Burbank
Irving W. Fay

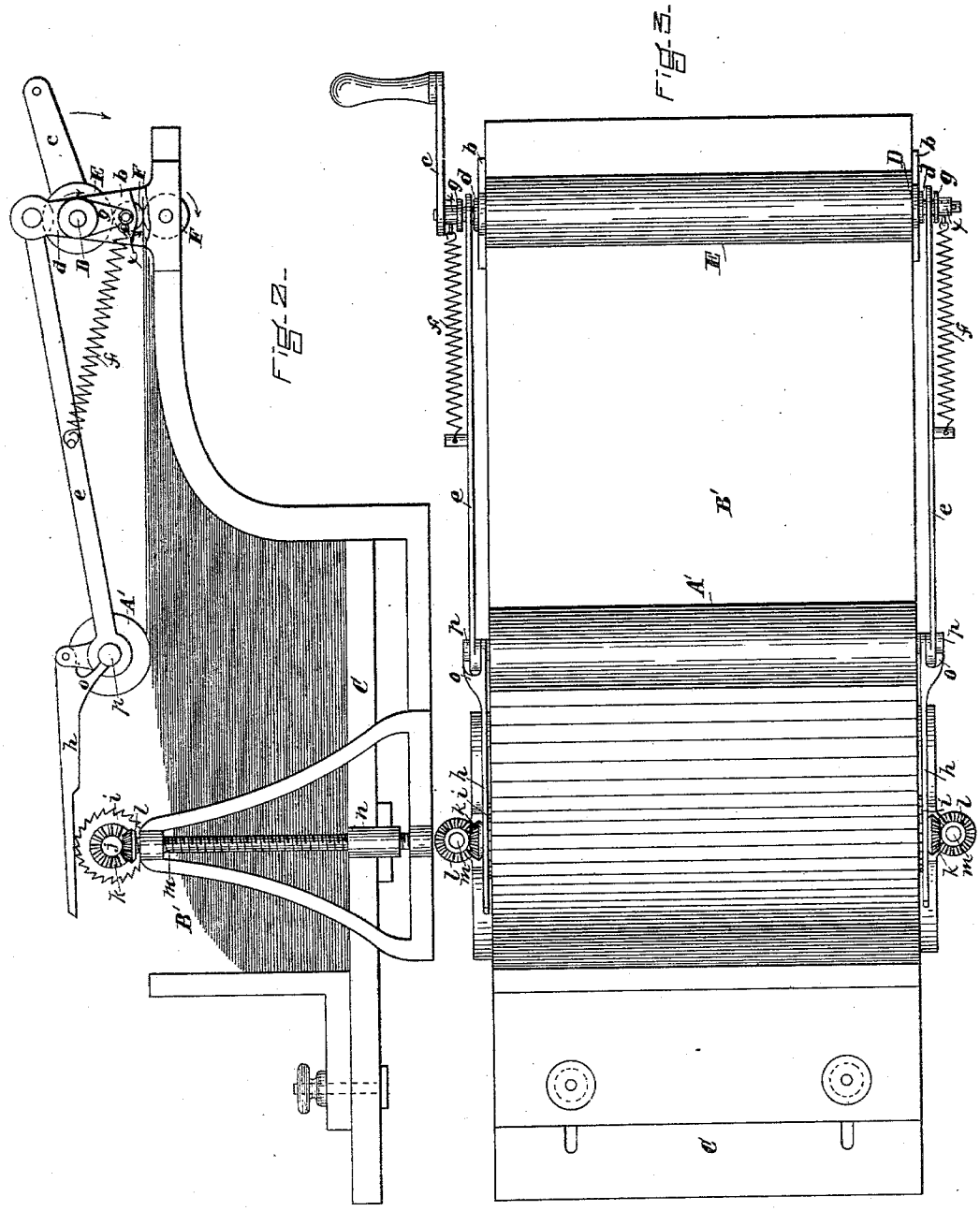
INVENTOR.
Edward Dummer.

(No Model.) 4 Sheets—Sheet 2.

E. DUMMER.

PAPER FEEDING MACHINE.

No. 566,670 Patented Aug. 25, 1896.



WITNESSES.
A. D. Grant.
Charles H. Jones.

INVENTOR.
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(No Model.)

4 Sheets—Sheet 3.

E. DUMMER.

PAPER FEEDING MACHINE.

No. 566,670. Patented Aug. 25, 1896.

Fig. 4.

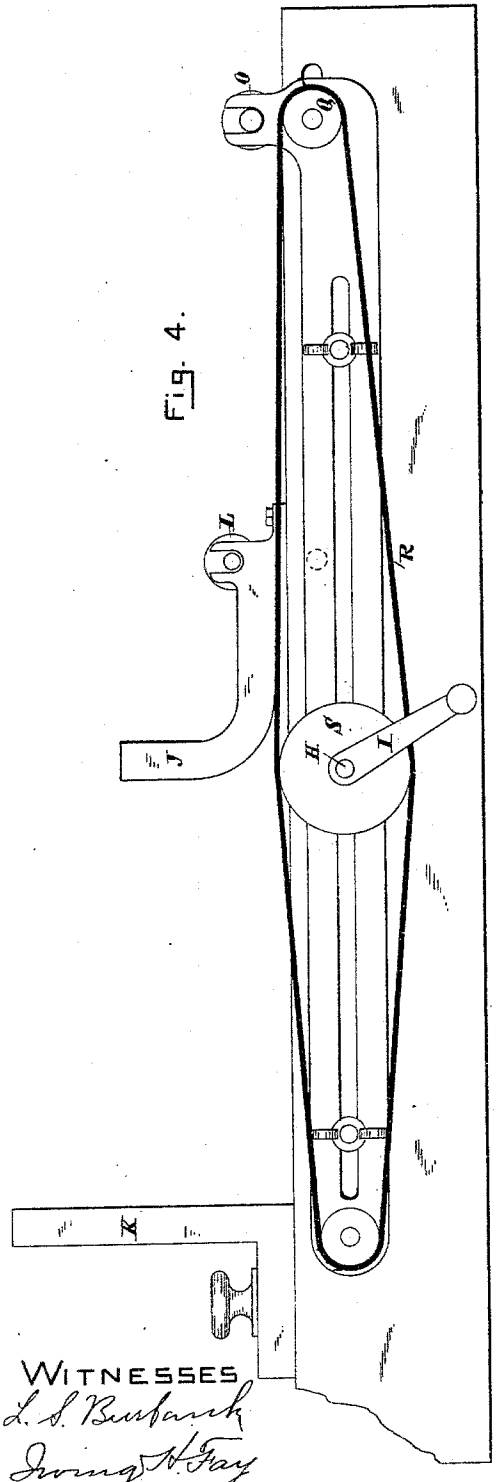
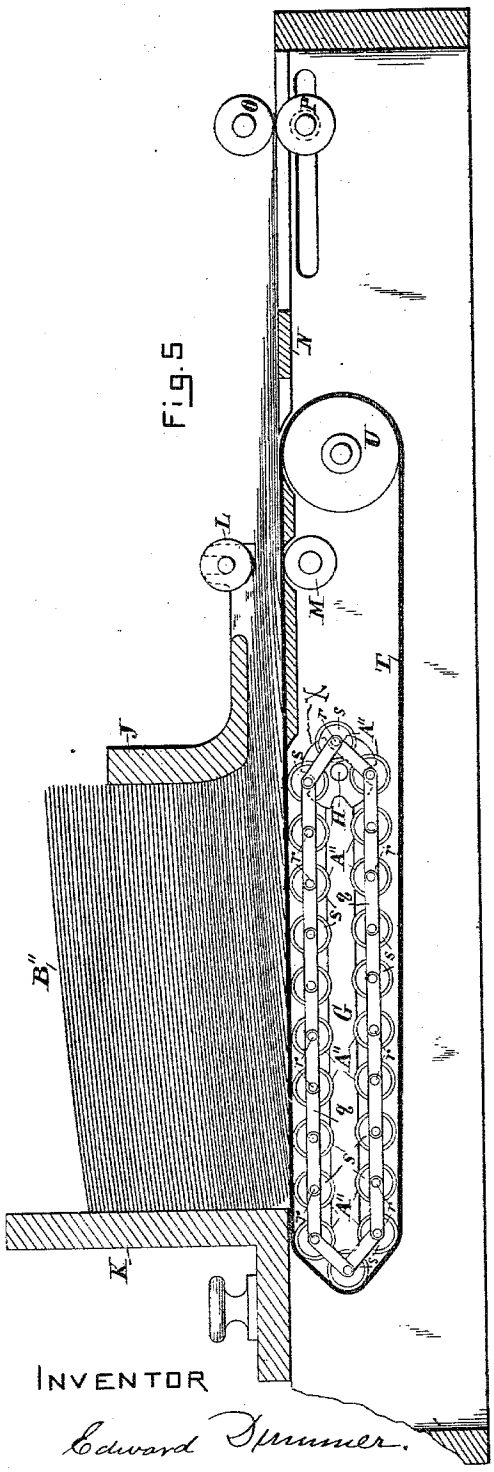


Fig. 5.



WITNESSES

L. L. Burbank

Irving W. Fay

INVENTOR

Edward Dummer.

(No Model.) 4 Sheets—Sheet 4.

E. DUMMER.

PAPER FEEDING MACHINE.

No. 566,670. Patented Aug. 25, 1896.

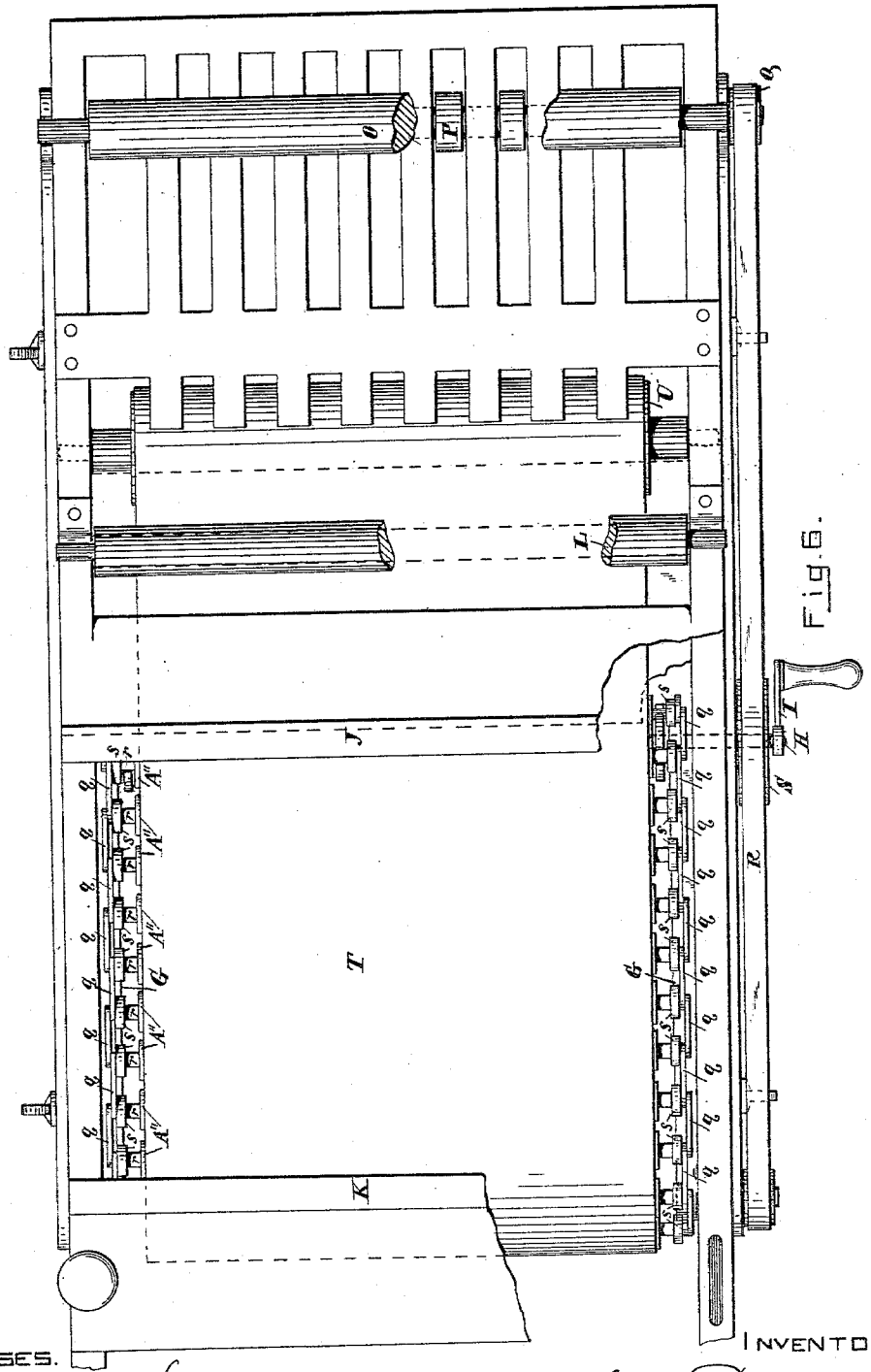


Fig. 6.

WITNESSES.
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INVENTOR
Edward Dummer

UNITED STATES PATENT OFFICE.

EDWARD DUMMER, OF AUBURNDALE, MASSACHUSETTS.

PAPER-FEEDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 566,670, dated August 25, 1896.

Application filed November 23, 1893. Serial No. 491,760. (No model.)

To all whom it may concern:

Be it known that I, EDWARD DUMMER, a citizen of the United States, residing at Auburndale, county of Middlesex, and State of Massachusetts, have invented certain new and useful Improvements in Mechanism for Feeding Sheets of Paper or other Material, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to separating sheets of paper or like flexible material individually from a pile of sheets and delivering the same for a printing, folding, or ruling machine, or for any other purpose.

The invention consists in the devices and mechanism hereinafter set forth, and specifically pointed out in the claims.

In the drawings, four sheets, Figure 1 is a perspective view illustrating the fundamental features of the method of my invention. Fig. 2 shows a side view, and Fig. 3 a plan view, of mechanism, and Fig. 4 a side view, Fig. 5 a vertical section, and Fig. 6 a plan, of a more desirable arrangement of mechanism, for carrying out said method, certain parts being broken away in the drawings for better illustration. Fig. 5 shows a section of the frame of the machine, but a side view of the inclosed moving parts.

Referring to Fig. 1, a pile of sheets in the form of a cube is operated upon as follows: A roller A is placed upon the pile B in a direction substantially at right angles to the surface thereof, and, being pressed upon the pile, is rolled forward, (toward the right, as shown in the drawings.) Then, the pile being wholly or partially relieved of pressure by the roller, the latter is moved or rolled in the reverse direction. During such forward movement of the roller a certain number of the outer or upper sheets are bent slightly inward or downward under the roller, so as to cause these sheets to bend slightly outward or upward and become slightly loosened or separated one from the other immediately before the roller, and hence to slide slightly forward on the pile and with reference to each other. The result is an offsetting of these upper sheets, that is, forcing them into such condition that the front edge of each sheet will project beyond the corresponding edge of the adjacent sheet. The extent of such projection will be determined by the amount of pressure by the roller on the pile and the distance which the roller is moved forward. The distance which each sheet moves will be in a certain definite ratio to the distance moved by the adjacent sheet. A continued repetition of such forward and backward movement of the roller will result in such movement of the outer or upper sheets on the pile and with reference to each other that the outermost or top sheet may be grasped at or near its front edge without touching the adjacent sheet and, when the roller has been moved backward off or nearly off from the rear edge thereof, may be removed from the pile. If the outermost or top sheet is removed from the pile when the roller, during its backward movement, bears on the sheet adjacent to outermost or top sheet, as indicated by dotted lines at *y*, the adjacent sheet will not be misplaced or disturbed thereby.

To explain the method still further, let it be noticed, first, that if, several sheets having been offset, as shown in Fig. 1, the roller be rolled backward when pressed on the pile these sheets will be moved backward, so that the number of such backward movements of the roller, (the roller being carried forward when exerting less or no pressure on the pile,) the degree of pressure of the roller on the pile, and the distance of each movement of the roller being as required, the upper sheets will be brought back and the pile be restored to its original cubical form. It appears that the action by the roller under pressure is to compress the pile immediately thereunder and to cause an elevation of the pile and corresponding loosening or separation of the upper sheets at both sides of the roller, such elevation, loosening, or separation being greater on that side of the roller toward which the roller moves, and that the motion of the sheets is due to the progressive compression of the pile caused by the movement of the roller when pressed on the pile in the direction above specified. In short, fundamentally considered, the method consists in progressively compressing the pile in the direction that the sheets thereof are to be moved or offset,

whereby the sheets are brought into condition to be grasped and removed one by one, as above set forth. Such progressive compressing is very simply, effectively, and preferably done by means of a simple roller, as above explained, but may be otherwise accomplished, as will readily appear. Such method of feeding is suitable for sheets of very thin paper, as tissue paper, or quite thick paper or cardboard, which is somewhat flexible, as well as paper of average thickness, or for sheets of other material, such as cloth, or even for quite flexible metallic sheets. Thus by repeatedly rolling or progressively compressing the pile and removing at suitable intervals each sheet as it becomes the outermost or top sheet and is sufficiently offset with reference to the adjacent sheet the whole pile may be removed sheet by sheet, as desired.

The several operations above specified may be performed by means of the mechanism illustrated in Figs. 2 and 3. The pile of sheets B′ is placed on a table C. Having bearings in stands *b* is a transverse shaft D, which is to be revolved by suitable means, as by the hand applied to a crank *c*. Two crank-arms *d* are also secured to this shaft. To the outer end of each of these crank-arms is pivoted one end of a rod *e*, which has a bearing for a roller A′. To each of these rods *e* is secured one end of a spring *f*, the other end of each of these springs being secured to a sleeve *x* on the pin of the arm of a crank *g* fastened on the shaft D opposite to an arm *d*. On rotation of the shaft D the roller A′ will be rolled forward and backward on the pile, and (since the arms of the cranks *g* and the ends of the springs secured thereto will be below the rods *e* on the forward movement of the roller and above these rods on the backward movement of the roller) the action of the springs *f* will be to increase the pressure of the roller A′ on the pile on the forward movement of the roller and decrease said pressure on the backward movement of the roller. Thus the upper sheets of the pile will be offset, as explained above.

On the shaft D is secured a roller E, which presses rollers F toward each other, these rollers being driven by friction of the roller E and performing the office of grippers. When the top sheet has moved sufficiently forward to enter between the rollers F, which will seize the sheet, pull it from the pile, and carry it as required, as, for instance, to be seized by the grippers of a printing-machine. Since the movement of the sheets by means of the roller A′ is very slight, for each movement of this roller there will be ample time for the rollers F to remove a sheet before the next sheet will be thrust between these rollers. Furthermore, the rollers F may be so located, according to the size of the sheets, with reference to the roller A′ that the latter roller will not press on the top sheet, but will press on said next sheet to prevent the same being carried forward by the friction of the top sheet on the adjacent sheet.

To each of the rods *c* is pivoted a pawl *h*, which engages with a ratchet-wheel *i*, revoluble on a fixed stud *j*. Each of these ratchet-wheels has a bevel-gear *k* to revolve therewith and secured thereto, which engages with a bevel-gear *l* secured on a vertical screw *m*. Each of these screws revolves in fixed bearings and has a nut *n* thereon, which is fastened to the table C. Thus, when on the backward motion of the rods *e* the pawls *h* engage with the ratchet-wheels, the table will be correspondingly raised. The raising of this table will be as required by the removal of sheets from the pile, since a projection *o* on each of the pawls will come in contact with a stop *p*, and therefore (the rods *e* and pawls *h* forming levers pivoted on the crank-arms *d* and raised by the raising of the pile and roller A′ thereon, so as to carry the outer ends of these levers or pawls *h* so high as not to engage with the ratchet-wheels) not engage with the corresponding ratchet-wheel when the pile is at the required height.

To secure more rapid feeding and greater convenience in operation, I prefer the arrangement of mechanism illustrated in Figs. 4, 5, and 6. In this case several rollers are employed and the pressure required of the rollers on the pile is obtained by causing the pile of sheets to press on the roller, the pile B″ (shown only in Fig. 5) being placed upon rollers A″. The corresponding ends of these rollers are connected together by links *q*, which thus form an endless chain. The shaft *r* of each of these rollers is revoluble in the links thereon, and has at each end and revoluble thereon a pulley *s*, which rolls on stationary ways G. Sprocket-wheels X engage with the chain, being secured on a shaft H, revoluble in fixed bearings by suitable means, as by the crank I. The pile of sheets in the cubical form is placed on the rollers A″. Revolution of the shaft H will cause the rollers A″ to move forward and roll against the surface of the pile adjacent thereto, thus causing the pile to assume the form shown in Fig. 5 and the sheets of the pile to be offset, as above explained. The rollers A″ will pass down and be carried backward out of contact with the pile, as will be readily understood. A transverse abutment J will prevent the pile from being carried bodily forward, and an adjustable abutment K will further support the pile. Two transverse revoluble rollers L and M are located at a suitable position and will be revolved by and pinch the sheets, which are carried forward onto a support N by the action of the rollers A″. (In order to indicate the sheets clearly, the roller L appears in the drawings not to bear on the sheets, but of course in action it presses by its weight thereon.) Transverse rollers O and P on shafts in adjustable bearings are secured at such

distance from the rollers L and M as to seize the undermost sheet of those sheets on the table or support N at its forward edge after the rear edge of this sheet has passed from between the rollers L and M, and while the sheet adjacent to said undermost sheet is still held by the rollers L and M. The rollers O and P are revolved by means of a pulley Q on the shaft of one of the rollers and a belt R, passing in contact with a pulley S on the shaft H. The bearings for the shafts of the rollers O and P are adjustable by being in long pieces, one at each side of the machine, having slots therein, through which screws extend to be screwed into the frame of the machine, as shown. Since the surfaces of the rollers O and P travel much faster than the sheets are moved by the action of the rollers A″, there will be ample time for a sheet to be seized and carried by these rollers or grippers away from the balance of the sheets on the support N while the adjacent sheet is held by the rollers or pincers L and M.

On the forward movement of the roller A in Fig. 1 or the roller A′ in Figs. 2 and 3 care must be taken when the roller rolls over and thus somewhat against the rear edge of those sheets on the pile which are offset that these edges are not bent up so that the sheets will be displaced. Such a result may be prevented to a degree by having this roller of some considerable diameter, but this action is much more effectually guarded against by means of an apron T. (Shown in Figs. 5 and 6.) This apron, which is of flexible material, such as cloth or paper, is endless and extends, preferably, around the rollers A″ and the roller U, so that it will travel with the sheets as they are moved by the rollers A″. This apron will also aid in securing proper movement and relative position of these sheets and will still further protect the sheets, the latter thus being free from direct contact with the moving rollers A″.

I am aware that machines have heretofore been invented provided not only with rubbing instruments which do not rotate, but also with wheels or disks each free to revolve about its axis when brought into contact with the upper or under surface of a pile to cause the sheets to be offset or fanned out; but such wheels or disks have always (to the best of my knowledge) been heretofore designed, constructed, adapted, and operated so as to be carried while in contact with the pile rapidly in a curved direction, while the surface of the pile acted on has been flat, whereby the wheels or disks have rapidly approached and receded from the pile, and thus have exerted a concussive and jogging action on the pile. Furthermore, whatever pressure such wheels or disks have exerted on the pile has been in a direction considerably inclined with reference to the surface, so that they have pressed angularly against said surface and have, by a pushing and frictional action, like that of an ordinary feed-stick, moved the sheets. Such concussive, jogging, pushing, and frictional action, though effecting a fanning out of the pile, results in an irregularity in such fanning out, so that the degree of offset of any sheet with reference to the adjacent or other sheets cannot be predetermined, and there is great liability that at intervals several sheets will not be offset with reference to each other, but be carried forward to be entered together into the printing-press or other machine to be fed. On the other hand, according to the method of operation of the device and mechanism of my invention, there is no concussive, jogging, and angularly-pushing action on the pile. Each roller is pressed toward the surface of the pile in a direction substantially at right angles thereto, and the compression of the pile thus caused is simply carried forward, thus rolling or pressing together the sheets loosened or slightly separated from each other in front of the roller, and therefore causing the offset. Moreover, the offset or fanning out is regular and can be predetermined, being according to the degree of said pressure or compression and the rapidity of its forward progress. The sheets are so held with reference to each other by such pressure or compression that, while they can move only a certain distance with reference to each other, they must (if at all free to move one on the other) move a distance proportional to the aforesaid loosening or slight separation of the sheets in front of the roller or transverse line of compression.

I claim as my invention—

1. In a machine for separating sheets from a pile of sheets, devices for compressing the pile progressively in the direction of the required motion of the sheets, the pressure of said compression being always in a direction at right angles to the surface of the pile, substantially as set forth.

2. In a machine for feeding sheets from a pile of sheets, devices for successively subjecting the surface of the pile in a direction from the rear to the front of the pile to a pressure acting always at right angles to the plane of the surface of the pile, substantially as set forth.

3. In a machine for separating sheets from a pile of sheets, devices for continuously and progressively subjecting the surface of the pile in the direction from the rear to the front of the pile to a pressure acting always at right angles to the plane of the surface of the pile, substantially as set forth.

4. In a machine for separating sheets from a pile of sheets, a roller in combination with mechanism for causing the roller to roll in the plane of the surface of the pile and press the roller against the pile during the forward motion of the roller, said pressure being always in a direction at right angles to the pile, substantially as set forth.

5. In a machine for separating sheets from a pile of sheets, several rollers in combination with mechanism for causing the rollers to follow each other while in the plane of the surface of the pile and to simultaneously compress the pile progressively while moving in the direction of the required movement of the sheets, substantially as set forth.

6. In a machine for separating sheets from a pile, a roller in combination with mechanism for causing the roller to roll forward in the plane of the surface of the pile and to press on the pile, and with mechanism for seizing and removing the outermost sheet, the pressure of the roller on the pile being at right angles to said surface and such as to progressively compress the pile while the roller is moving a considerable distance in said plane, substantially as set forth.

7. In a machine for separating sheets from a pile, the combination of several rollers, devices for causing the rollers to follow each other while in the plane of the surface of the pile and to roll forward and press on the surface of the pile, and devices for seizing and removing the outermost sheet, substantially as set forth.

8. In a machine for separating sheets from a pile, devices for progressively compressing the pile in the direction of the required movement of the sheets and for protecting the surface of the pile from actual contact with said devices, substantially as set forth.

9. In a machine for separating sheets from a pile, a roller and devices for causing the roller to roll forward opposite the surface of the pile and press toward the pile and to protect said surface from actual contact with said roller, substantially as set forth.

10. In a machine for feeding sheets from a pile, the combination of a roller and mechanism for moving said roller forward and backward opposite said pile, and causing the roller to press the pile with greater force on its forward than on its backward movement, the roller rolling during its forward movement for a considerable distance in the plane of the surface of the pile and pressing on the pile for said distance at right angles to said surface, substantially as set forth.

11. In a machine for feeding sheets the combination of a roller, means for maintaining a pile of sheets so as to press by gravity on the roller on its forward movement, and means for carrying the roller forward and backward under said pile, the roller rolling during its forward movement for a considerable distance along the plane of the surface of the pile to cause the pile to press on said roller continuously through said distance at right angles to said surface, substantially as set forth.

12. In a machine for feeding sheets the combination of several rollers following each other in the plane of the surface of the pile and serving as a support for a pile of sheets connected together as an endless band, guides for said rollers whereby they travel forward and backward in different planes, and means for carrying said rollers on said ways, substantially as set forth.

13. In a machine for feeding sheets the combination of several rollers connected together as an endless band, means for maintaining a pile of sheets opposite said rollers, pulleys on the axis of each roller to rotate independently of the roller, ways for said pulleys, and wheels on a driving-shaft to cause movement of said pulleys on said ways and movement of said rollers, substantially as set forth.

14. In a machine for feeding sheets the combination of several rollers, means for maintaining a pile of sheets opposite said rollers, links connected to form endless chains and having bearings for the shafts of said rollers, pulleys and shafts therefor having bearings in said chains, ways for said pulleys whereby the pulleys and rollers are carried forward and backward in different planes, a driving-shaft and wheels thereon to cause said movement of the pulleys and rollers, and an endless apron surrounding said rollers, substantially as set forth.

15. In a machine for feeding sheets, the combination of a roller rolled forward under pressure against and along the plane of the surface of a pile of sheets, and moved backward with less pressure or no pressure on the pile, and two adjustable rollers for seizing each sheet as it becomes the outermost sheet and removing it from the pile, said pressure being at right angles to said plane throughout a considerable distance thereof substantially as set forth.

16. In a machine for feeding sheets the combination of several rollers connected as an endless band and forming a support for the pile of sheets, ways for said rollers, a driving-shaft with pulleys to propel said rollers on said ways, two pinching-rollers in stationary bearings between which the several sheets when offset will pass, and two rollers in adjustable bearings to seize each sheet as it becomes the outermost sheet and passes from between said pinching-rollers, substantially as set forth.

17. The combination of several rollers independently revoluble, a support to maintain said rollers opposite a pile of sheets, an apron between said rollers and said pile, a carrier to carry the rollers against said apron, pincers to pinch those sheets which have been moved by said rollers, and devices to seize the outermost sheet after it has passed from said pincers, substantially as set forth.

18. The combination of several rollers independently revoluble, a support to maintain said rollers opposite a pile of sheets, an apron between said rollers and pile, a carrier to carry the rollers against said apron, and devices to

seize the outermost sheet, substantially as set forth.

19. In a machine for separating sheets from a pile, several rollers in combination with mechanism for causing the rollers to roll opposite the surface of the pile and to press toward the pile while following each other in a plane corresponding to the plane of said surface, and to protect said surface, from actual contact with said rollers, substantially as set forth.

EDWARD DUMMER.

Witnesses:
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RICHARD T. LAFFIN.