No. 704,444. Patented July 8, 1902.

E. DUMMER.

PAPER FEEDER.

(Application filed Dec. 27, 1898.)

(No Model.) 3 Sheets—Sheet 1.

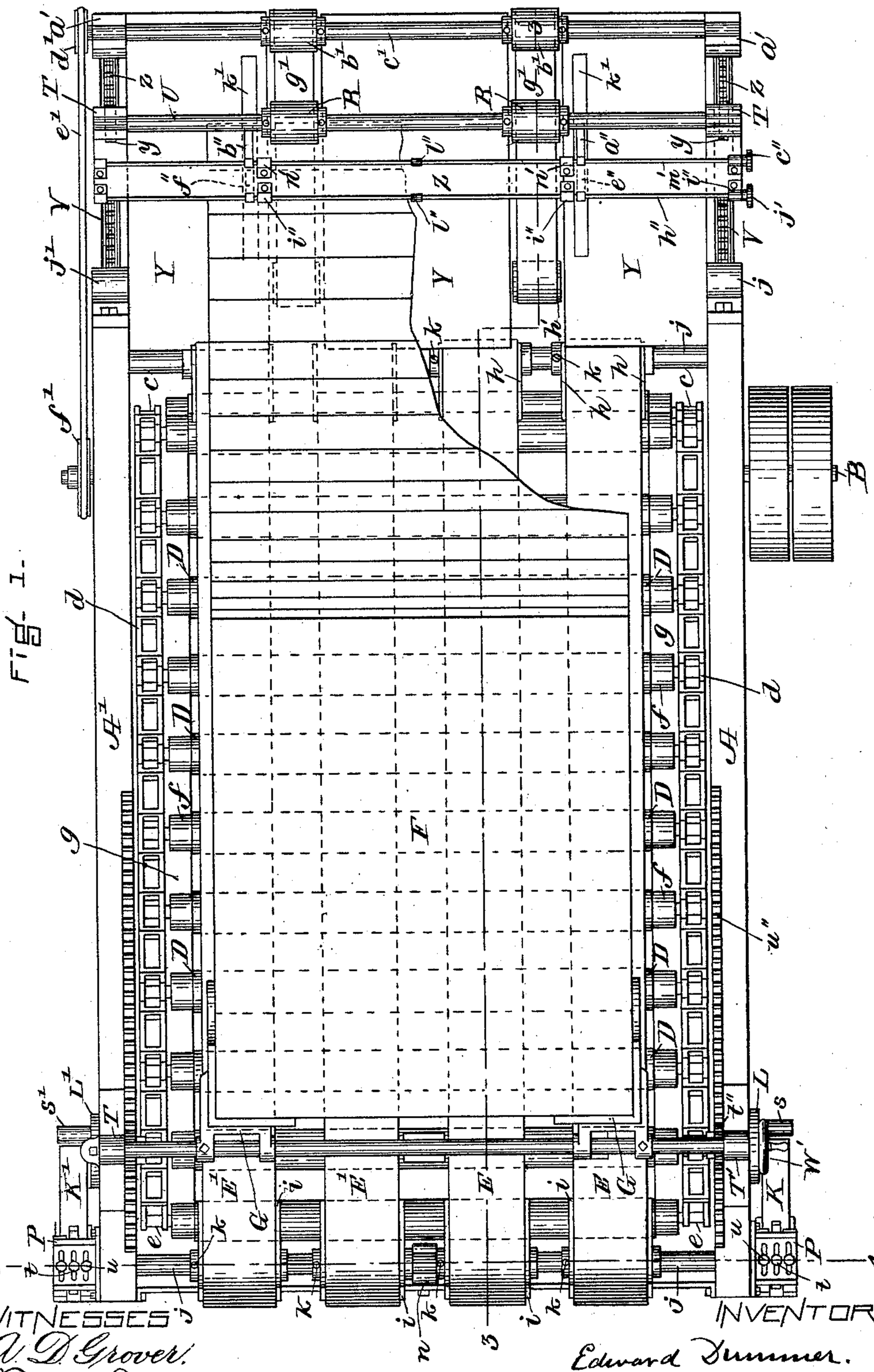

FIG. 1.

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(Application filed Dec. 27, 1898.)

(No Model.) 3 Sheets—Sheet 2.

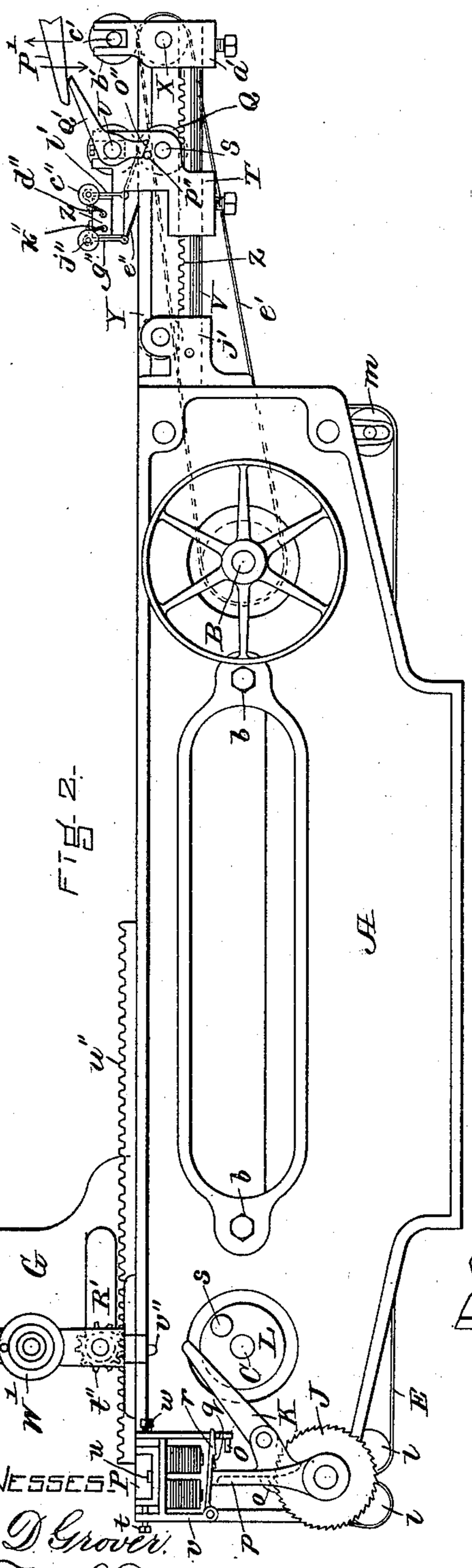

FIG. 2.

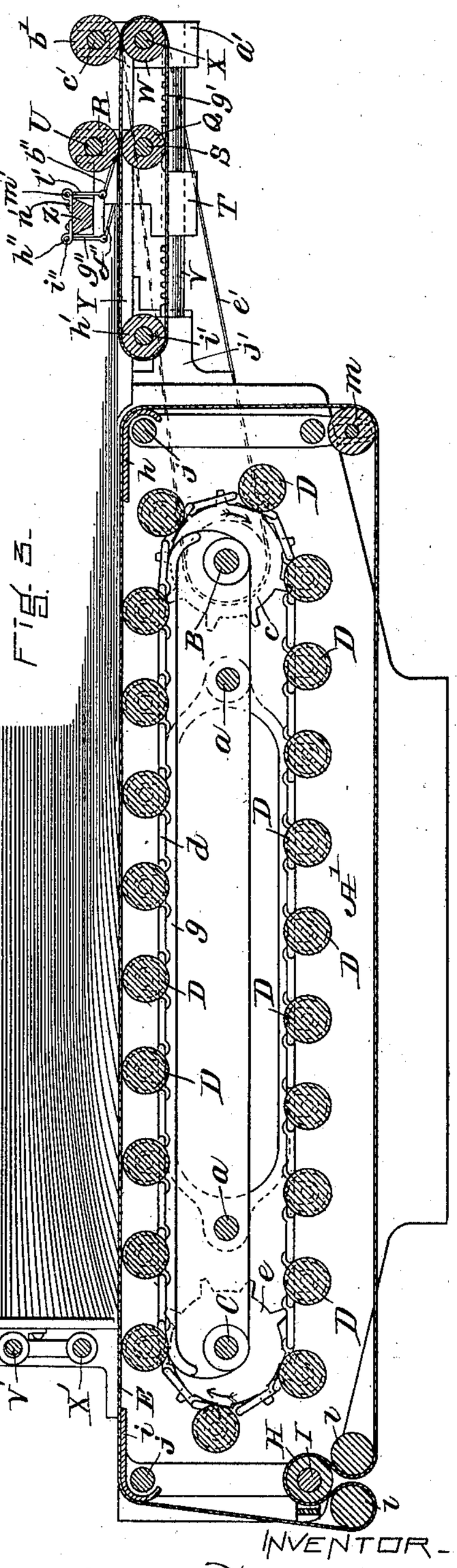

FIG. 3.

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(Application filed Dec. 27, 1898.)

(No Model.) 3 Sheets—Sheet 3.

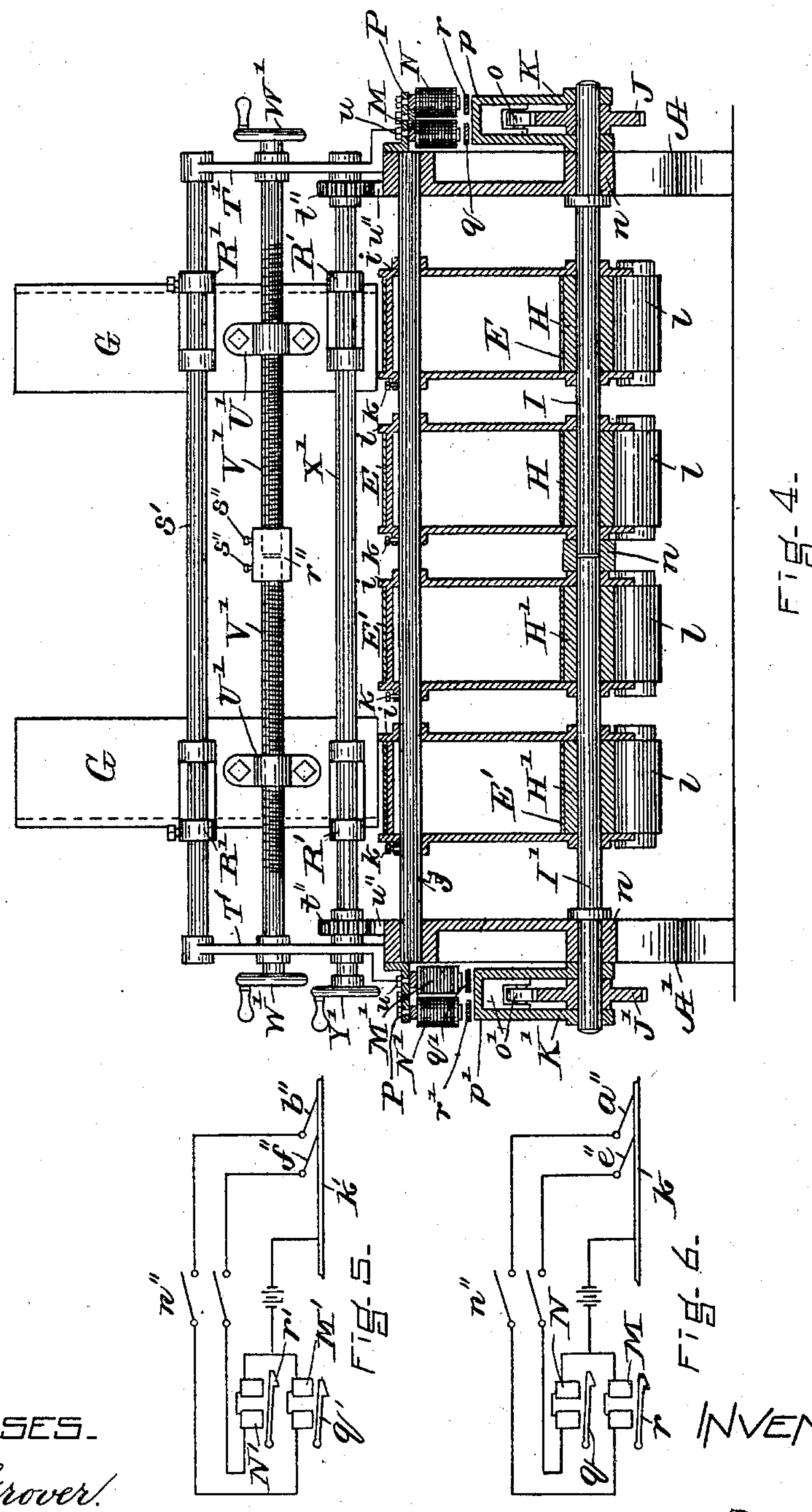

Fig. 4.

Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

EDWARD DUMMER, OF NEWTON, MASSACHUSETTS.

PAPER-FEEDER.

SPECIFICATION forming part of Letters Patent No. 704,444, dated July 8, 1902.

Application filed December 27, 1898. Serial No. 700,436. (No model.)

To all whom it may concern:

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

My invention relates to machines for feeding sheets of paper individually from a pile of sheets to a printing, folding, or other machine, the object of the invention being to regulate the movement and delivery of the sheets as required by the machine to be fed.

Means for separating sheets individually from a pile are set forth in Patents Nos. 566,670 and 566,671, granted to me and dated August 25, 1896. The improvements of my present invention are herein set forth as adapted to said means.

In the drawings, three sheets, Figure 1 is a plan, and Fig. 2 a side elevation, of a machine embodying my invention. Fig. 3 is a vertical section taken on line 3 3 in Fig. 1. Fig. 4 is a vertical section taken on line 4 4 in Fig. 1. Figs. 5 and 6 are diagrams illustrating the electric connection of certain devices. In Figs. 1 and 3 a pile of sheets is shown, a part of the sheets being broken away in Fig. 1.

The sides A A′ are maintained in suitable relative position by transverse stays *a*, secured to the sides by means of nuts *b*. In suitable bearings at the forward end of the machine revolves a transverse shaft B, on which are fastened two sprocket-wheels *c*, each of which drives an endless chain *d*, which also passes around one of two suitable sprocket-wheels or pulleys *e*, secured on a transverse shaft C in bearings at the rear of the machine. Between the two chains are transverse rollers D, arranged at suitable intervals. At each end of each roller D is a roll *f*. These rollers and rolls are so maintained (by shafts held by the chains) in suitable relative position that each may revolve independently about on its own axis, while the chains, rollers, and rolls are carried by the sprocket-wheels as an endless band forward and backward through the machine and about the shafts B and C. The rolls *f* bear on longitudinal stationary ways *g* during their forward movement, thus supporting the rollers during such movement in the desired position, preferably so that their upper surfaces will move in a horizontal plane, as shown. Endless bands E E′ extend parallelly and longitudinally through the machine, around the rollers D, and around guides and pulleys, as hereinafter described. If a pile of sheets F be placed on the bands E E′ and rollers D, as shown, and the sprocket-wheels be revolved in the direction indicated by the arrows, the sheets will be fanned out by the action of the rollers against the surface of the pile, (or against the surface of the bands E E′, which are between the rollers and pile,) the pile being prevented from moving backward by means of abutments G (adjustably secured in the required position, as shown.)

In Patent No. 566,670 I have shown (in combination with sprocket-wheels, chains, and rollers substantially as herein described) an endless apron surrounding the rollers, the upper part to move freely forward, (the forward motion being caused by the action of the rollers,) and in Patent No. 566,671 an apron restrained from a forward movement, in each case the apron being between the rollers and pile. When the apron (between the rollers and pile) is free to move forward to the full extent possible by the action of the rollers, the abutment which prevents the movement of the pile bodily must be against the forward end of the pile, as shown in Patent No. 566,670; but when the apron cannot thus move forward said abutment must be against the rear end of the pile, as shown in Patent No. 566,671. Moreover, if during the action of the machine said apron is free to move forward a greater portion of the pile will be in the condition of being fanned out, (and the movement of the sheets will be much faster,) but the offset (or space between the edge of each sheet and corresponding edge of the adjacent sheet) will be much less than if the apron cannot move forward. Now I herein set forth means whereby the said apron, which takes the form of several endless bands E E′, may move and such movement so regulated that these three results may be gained—namely, the offset-sheets may be guided, each sheet may be brought into position to be seized to be drawn into the ma-

chine to be fed at the time required, and the degree of offset—that is, the space between the corresponding edges of adjacent sheets—may be as desired, while the rollers D and their driving mechanism are in constant action.

Each of the bands E E′ extends at the upper part over guides *h* at the forward part of the machine and guides *i* at the rear. These guides are adjustable transversely, being on transverse rods *j*, and can be secured in the required position by means of set-screws *k*. For restraining and controlling the movement of the bands E E′, I prefer to have each one pass over the rolls, of which two, *l*, serve as guides and to provide sufficient contact of the band with the third roll. Each of these latter rolls H or H′ is secured to a shaft I or I′, so as to revolve therewith. At the forward part of the machine each band E or E′ passes around a roll *m*, which is free to revolve and move bodily downward, so as to press on the band and act as a binder to prevent any undesirable slackness of the band.

Of the bands E E′ there may be two or any other desirable number, according to the size of the machine and the nature and quality of the material of which they are formed. Four are shown in the drawings, two, E, extending around the pulleys H and the other two around the pulleys H′. The shafts I and I′ are independent of each other, having stationary bearings at *n*. The shaft I has fastened thereon a ratchet-wheel J and the shaft I′ a ratchet-wheel J′. For the wheel J there is a lever K, pivoted to swing freely on the shaft I, and a pawl *o*, pivoted to the lever, and for the wheel J′ a like lever K′ and pawl *o*′. The lever K has an arm *p*, with which latches *q* and *r* engage, and the lever K′ a like arm *p*′, with which latches *q*′ and *r*′ engage, as hereinafter set forth. Each of the levers K and K′ is swung upward by a projection *s* or *s*′ on a disk L or L′, secured to the shaft C, on each revolution of this shaft, and falls by gravity when released by the projection *s* or *s*′. When each lever is thus swung upward, its pawl engages with a tooth of the corresponding ratchet-wheel.

Each of the latches *q* and *q*′ is raised, so as not to engage with the arm *p* or *p*′, by an electromagnet M or M′, and each of the latches *r* or *r*′ is in like manner raised by an electromagnet N or N′. When the magnets are demagnetized, the latches fall by gravity to be in position to engage with the arms *p p*′, respectively. While a latch *q* or *q*′ engages with an arm *p* or *p*′ the corresponding lever K or K′ is held up, so as not to be moved by the projection *s* or *s*′; but while a latch *r* or *r*′ is in position to engage with said arm the corresponding lever may move so as to be swung a certain distance by said projection to rotate the ratchet-wheel J or J′ corresponding by means of the pawl thereat. Thus a latch *r* or *r*′ serves as a stop to limit the drop of said lever, and consequently the extent of motion of the ratchet-wheel at each throw of the lever—that is, at each revolution of the shaft C. There is another stop O or O′ for the lever K or K′, which stop is stationary and limits a greater throw of the corresponding lever and ratchet-wheel, as will be readily understood. Each of the latches *q q*′ is adjusted and secured in position (to operate as above set forth) by means of an adjusting-screw *t* and tightening-screw *u*, which secures an extension *v* (to which the latches are pivoted) to a stand P. In like manner each of the latches *r r*′ are adjusted and secured in position. The stop O or O′ is adjusted by means of a screw *w* and fastened in position by a screw *x*, which screws engage with said stand, as illustrated.

When the sheets at the bottom of the pile are sufficiently fanned out by the action of the rollers D, the undermost sheet is drawn out by means of the lower rolls Q and upper rolls R, between which the sheet enters. The rolls Q revolve on a shaft S, which has bearings in stands T, and the rolls R on a shaft U, which is in slots in the stands T, so as to rise and fall as required. These stands are on longitudinal ways V (which are secured at one end to the frame of the machine) and may be adjusted on said ways by rotating the shaft S, gears *y* being fastened on this shaft S, engaging with racks *z*, secured to said ways. Other rolls are shown for carrying each sheet still farther—lower rolls W, fastened on a shaft X, having bearings in fixed stands *a*′, and upper rolls *b*′ on a shaft *c*′, which is held so as to move vertically in slots in these stands. The shaft X is driven by means of a pulley *d*′ and a belt *e*′, which extends around this pulley and a pulley *f*′, fastened on the shaft B. Bands *g*′ extend around the rolls W and rolls *h*′ on a shaft *i*′, which is supported in stands *j*′, as shown. These bands, passing between the rolls Q and rolls R, cause a revolution of these rolls, whatever the position of these rolls may be when adjusted as required.

Between the ways V and the bands *g*′ the space is filled in, so as to form a table Y or support for the sheets. Two longitudinal metallic strips *k*′ are inserted in this table to complete electric circuits, as hereinafter set forth. Two metallic pieces *a*″ and *b*″ are supported one above each strip *k*′, so that a sheet will raise them from contact with the strips when moved therebetween. I prefer to pivot said pieces to arms *l*′, which are secured on a transverse rod *m*′, which may rotate in bearings *n*′, secured to a cross-bar Z, fastened to the stands T. By means of a notched wheel *c*″, fastened on the rod *m*′, and a catch *d*″, this rod may be rotated so as to swing the said pieces and determine the point of contact of each piece with the corresponding strip *k*′, as required. In like manner two metallic pieces *e*″ and *f*″ are supported and adjusted with reference to the strips *k*′, but to the rear of the pieces *a*″ *b*″, by being pivoted to arms *g*″, secured to a cross-rod *h*″, having bearings

i'', fastened on the cross-bar Z and provided with notched wheel j'' and a catch k''. The pieces a'', b'', e'', and f'' are electrically insulated from each other, as by having the cross-bar Z and a part l'' of each of the rods m' and h'' of insulating material.

For feeding sheets individually to a folding, printing, or other machine that operates intermittently and at regular intervals it is necessary that the sheets be in like manner seized and drawn from the pile by the gripping and carrying device of the feeder. Such device, as herein shown, consists of the rolls Q and R, which are caused to act on the sheets intermittently by raising and lowering the rolls R from and onto the rolls Q, (and the sheet therebetween.) Such movement of the rolls R may be caused by a suitable connection with some part of the machine to which the feeder is attached, said part acting at regular intervals. It is sufficient for the present description to suppose an arm, a portion of which is shown at P', has such movement up and down (being an extension of or operated by one of the well-known vertically-swinging levers of a folding-machine) and that this arm swings downward a lever Q', fastened on the shaft U. Such action will cause a slight rotary movement of the shaft U, so that, an inclined projection o'' bearing on a fixed pin p'', the shaft and rolls R thereon will be raised. These rolls and shaft will fall when the arm P' is carried upward. The wiring for electrical action being such in detail as may be most convenient is of a character to produce the results illustrated by the diagrams shown in Figs. 5 and 6, there being four independently-acting circuits, in each of which is one of the metallic strips, contact-pieces, and electromagnets above described. I have shown at n'' circuit-breakers which (conveniently located) may be useful at times for operation by hand to control the movement of the sheets—as, for instance, when the sheets are being first fanned out to bring the lowest sheet in position to be drawn out.

For operation the shaft B is driven at such speed with reference to the folding or other machines to be fed that after the sheets have been fanned out the front edge of the lowest sheet will be sufficiently advanced to have the rolls R drop onto that part of this sheet which is extended beyond the adjacent sheet. The abutments G and rolls Q and R are so adjusted according to the size of the sheets that this lowest sheet may be easily drawn out from under the fanned-out portion of the pile by the rolls Q and R. While the contact-pieces a'', b'', e'', and f'' are in contact with the strips k', the levers K and K' will drop so far as to have the arms p p' meet the stops O and O', all the latches q, q', r, and r' being raised by action of the magnets, thus allowing by the action of the pawls on the ratchet-wheels J and J' and revolution of the rolls H and H' the bands E E' to move (as also the sheets operated upon) at the fastest speed, which speed is determined by the position of said stops. When the lowest sheet reaches the pieces e'' and f'' and breaks their contact with the strips k and k', the bands E E' and the sheets will continue to move forward, but only so fast as is permitted by the latches r and r', which drop (because the circuit of their magnets is broken) and act as stops for the lever K K'. When the lowest sheet reaches the pieces a'' and b'' and breaks their contact with the strips k and k', the bands E E' will be prevented from moving forward, (because the latches q and q' will prevent the levers K and K' from falling, and therefore the ratchet-wheels and rolls H and H' will remain stationary,) but the sheets will continue to move forward, but at a very slow speed relatively. Now if the speed of the machine is such that the front edge of the lowest sheet is sure to reach a transverse line which is in a vertical plane, in which are the centers of the rolls Q, Q', R, and R' and in which line is the contact of the pieces a'' and b'' with the strips k and k' before the rolls R and R' drop onto the sheet and rolls Q and Q', then these rolls will seize this sheet and no more sheets than the lowest one, because although the sheets are still moving forward their speed is comparatively very slow when the bands E E' do not move forward.

In order to do the most rapid feeding at a certain rate of speed of machine, it is desirable to have the offset of the sheets—that is, the distance between the front edges of adjacent sheets, as aforesaid—as small as may be to insure the drawing out from the pile of only one sheet at a time. If this drawing out of the sheets individually commences with a certain degree of said offset and continues in the manner just set forth by the employment of only the contact-pieces a'' and b'' and their corresponding magnets and latches, there is a tendency to increase the offset to an undesirable extent unless the speed and parts of the machine be quite accurately adjusted. In order to dispense with such nicety of adjustment, I introduce the contact-pieces e'' and f'' with their corresponding magnets and latches. If the pieces e'' and f'' be set with reference to the pieces a'' and b'', so that the distance from the line of contact of the former with the line of contact of the latter with the strips k and k' is suitable with reference to the desired offset of the lowest sheet, then this offset will be quite or approximately maintained, the action being as follows: If the distance between the front edge of the lowest sheet and that of the adjacent sheet becomes greater than is desired, then when the lowest sheet has been withdrawn (by the action of the rolls Q, Q', R, and R') the pieces e'' and f'' will come into contact with the strips k and k' and the bands E and E', and consequently the sheets will travel faster than they would otherwise do, so that there will be an increase of motion of the sheets to compensate for any loss of such motion

which may have occurred. The device consisting of the pieces e'' and f'' and the cooperating parts may be regarded as a corrective agent and will not act at every time a sheet is withdrawn, but only occasionally if the speed and other parts of the machine are adjusted with approximate accuracy.

Owing to some accidental irregular movement in the bands E E′ or inaccuracy in the operation of other parts of the machine or lack of homogeneousness throughout the pile of sheets, there may be a tendency of the fanned-out portion of the sheets to so move forward that the front edge of a sheet will be at an angle with the drawing-out rolls. If this occurs, said edge will arrive at the point of contact of one of the pieces e'' and f'' or one of a'' and b'' on one side of the machine before the point of contact of the other corresponding piece. In such case the sheets will be brought to a slower movement on that side, and therefore the sheets will be straightened, so that the front edge of the lowest sheet will be brought parallel with the drawing-out rolls when they act on the sheet. For instance, suppose the front edge of a sheet breaks the contact of the piece a'' with a strip k' before it breaks the contact of the piece b'' with a strip k', then the lever K′ will drop to the extent permitted by the stop of the latch r', while the latch q will keep the lever K from falling, and the bands E′ will travel, while the bands E cannot; or suppose (while otherwise the pieces e'' and f'' might come into contact with the strips k') the edge of a sheet breaks the contact of the piece e'' with the strip k' before said edge breaks contact of the piece f'' with the strip k', then the lever K′ will drop so far as is permitted by the stop O′, while the lever K will fall only so far as the latch r (acting as a stop on the arm p) will allow and the bands E′ will travel faster than the bands E.

The abutments G are preferably in the form of uprights, each of which is opposite a part of the rear and part of the side of the pile, as shown. For adjustment sidewise the abutments are fastened to arms R′, which slide on transverse rods S′ and X′, supported at their ends in stands T′. Blocks U′ are secured to the abutments, each of which is fitted to move on one of the two rods V′, one of which rods having a right and the other a left hand thread therefor. These rods having bearings in the stands T′ may be rotated independently or together by means of hand-wheels W′, there being a coupling r'' on the rods, which may be fastened to the rods by set-screws s''. The stands T′ may slide on the sides A A′ for adjustment of the abutments lengthwise of the machine, such motion being effected by revolving the rod X′ by means of a hand-wheel Y′, the rod X′ having gears t'' fastened thereon, which engage with racks u'' on the sides A A′. By means of a screw and bolt at v'' the stands may be rigidly secured in position.

It appears from the foregoing description that the prominent and essential feature of the present invention is controlling the forward movement of the apron or bands (between the fanning-out devices or rollers and the pile of sheets) as a whole and in providing for a forward movement of a part of said apron or bands independent of a forward movement of another part of the apron or bands or while said other part may be restrained from moving forward. While I prefer the special devices and arrangement (for effecting this result) herein described and in which electricity is employed, yet I am well aware that other devices with or without the use of electricity may be adapted to produce a like result. Therefore I would not restrict my invention to said special devices and arrangement.

When the feeder is used in connection with certain machines—as, for instance, ruling-machines—it is only necessary to provide for a movement forward of the sheets individually in close succession. Such movement is readily attained by suitably speeding a continuous motion of the fanning-out and drawing-out mechanism by well-known devices. Accurate timing the output is necessary, however, in a large portion of the work required of a sheet-feeding machine.

I claim as my invention—

1. In a sheet-feeder and in combination with devices for fanning out the sheets from a pile, said devices acting on the surface of the pile, an apron between said devices and surface, and means for preventing and permitting a forward movement of said apron to determine the rapidity of said fanning out and the extent of offset of the sheets, substantially as set forth.

2. In a sheet-feeder the combination with rollers acting on the surface of a pile of sheets maintained in position opposite said rollers, and devices for operating said rollers, an apron between said rollers and surface, and means for preventing and permitting a forward movement of said apron to regulate said fanning out and the offset of the sheets, substantially as set forth.

3. In a sheet-feeder in which the sheets are fanned out by action of devices on the surface of a pile of sheets, the combination of several bands between said devices and surface, and means for preventing and permitting a forward movement of one of said bands independently of another of said bands, substantially as set forth.

4. In a sheet-feeder in which the sheets are fanned out by action of rollers on a pile of sheets maintained in position opposite said rollers, the combination of several bands between said rollers and surface, and means for preventing and permitting a forward movement of one of said bands independently of another of said bands, substantially as set forth.

5. In a sheet-feeder in which the sheets are

fanned out by action of devices on the surface of a pile of sheets maintained in position opposite said devices, the combination of several endless bands, a part of each band being between said devices and surface, means for guiding and restraining the movement of one of said bands, means for guiding and restraining another of said bands, and devices operated by the forward edge of said fanned-out sheets for controlling said means independently of each other, substantially as set forth.

6. In a sheet-feeder in which the sheets are fanned out by action of rollers on the surface of a pile of sheets maintained in position opposite said rollers, the combination of several endless bands, a part of each band being between said rollers and said surface, two independent shafts on each of which is a roll having a frictional grip on one of said bands, a ratchet-wheel on each of said shafts, a pawl for each of said wheels, means for reciprocating said pawls, and a latch to prevent action of each of said pawls on the corresponding ratchet-wheel, and a device operated by the front edge of the fanned-out sheets for controlling said latch, substantially as set forth.

7. In combination with mechanism for fanning out sheets from a pile of sheets by action of devices on the surface of the pile, two endless bands, a part of each band being between said devices and pile to have a forward movement, and means operated by electricity for controlling the movement of said bands, substantially as set forth.

8. In combination with mechanism for fanning out sheets from a pile of sheets by action of rollers opposite the surface of the pile, two endless bands, a part of each band being between said rollers and pile and to have a forward movement by action of said rollers thereon, and means for gaging said forward movement controlled by electricity and the edge of the fanned-out sheets, substantially as set forth.

9. In combination with mechanism for fanning out sheets from a pile of sheets embodying rollers acting on the surface of the pile, two, endless bands, a part of each band being between said rollers and pile to have a forward movement by action of said rollers thereon, two rolls to revolve independently of each other, each roll having a frictional grip on one of said bands, a ratchet-wheel connected with each of said rolls to revolve therewith, a lever bearing a pawl for each of said wheels, means for swinging said levers, and a latch operated electrically and controlled by means of the edge of said sheets to engage with each of said levers, substantially as set forth.

10. In combination with an endless band in part between the surface of a pile of sheets and devices opposite said surface to act on said pile and band, means for gripping said band and preventing the movement thereof, an electromagnet for releasing said means and permit movement of said band and a contact-breaker in position to be operated by said sheets moved by said devices and in circuit with said magnet, substantially as set forth.

11. In combination with two endless bands and means for causing movement of sheets from a pile and movement of said bands which are in part on the surface of said pile acted on by said means, a device for gripping each of said bands independently of the other band, mechanism embodying an electromagnet for releasing each of said devices and thus permitting motion of the corresponding band, an electric circuit for each magnet, and a contact-breaker in each circuit in position to be operated by said sheets moved by said means, substantially as set forth.

12. The combination with means for fanning out sheets from a pile, an endless band in part on the surface of said pile operated on by said means, and a device for gripping the edge of the outermost sheet and drawing out this sheet, of an electric circuit, a contact-breaker and electromagnet in said circuit, said breaker being in near position to said device and to be operated by said sheet, and mechanism controlled by said magnet for permitting and restraining the movement of said band, substantially as set forth.

13. In combination with mechanism for fanning out sheets from a pile, two electric circuits, an electromagnet and contact-breaker in each circuit, and a device governing the movement of said sheets controlled by said magnets, said contact-breakers being one at the rear of the other in the path of the fanned-out sheets, substantially as set forth.

14. In combination with mechanism for fanning out sheets from a pile, two electric circuits, an electromagnet in each circuit, an adjustable contact-breaker in each circuit, one of said breakers being at the rear of the other in the path of said sheets, and a device governing the movement of said sheets controlled by said magnets, substantially as set forth.

15. In combination with mechanism for fanning out sheets from a pile, embodying two bands which intervene between the fanning-out devices and said pile, two devices, each governing the movement of each of said bands independently of the other, two electromagnets controlling each of said devices, an electric circuit for each of said magnets, and contact-breakers for each of said circuits in the path of said sheets, substantially as set forth.

16. The combination of mechanism for fanning out sheets from the bottom of a pile, embodying rollers forming a support for the pile, devices causing a forward movement of that part of the sheets at either side of the pile independently of the forward movement of that part of the same sheets at the other side of the pile, and means for governing the action of said devices controlled by the front edges of the sheets, substantially as set forth.

17. In combination with devices acting on the surface of a pile of sheets to move the sheets forward, two endless bands intervening (as to a part of such) between said devices and the pile, mechanism for gripping said bands and for preventing or permitting the forward movement of one of said bands independently of the other band, means operated by the front edges of the sheets for controlling the action of said mechanism, and adjustable rolls located as required to seize and carry each sheet moved forward the necessary distance by said devices, substantially as set forth.

18. A paper-feeder embodying mechanism for moving forward the sheets of a pile individually one on another, a table or support over which the sheets pass, two rolls which receive each sheet therebetween, located transversely with reference to said table and adjustable lengthwise of said table, and means operated by the front edges of the sheets for controlling the action of said mechanism, connected with the supports of said rolls to be adjusted therewith in combination with a folding or other machine to be fed, and devices for moving one of said rolls out of contact with the other roll, substantially as set forth.

19. In a paper-feeder and in combination with mechanism for moving forward the sheets of a pile one on another, a device governing the movement of said sheet embodying a ratchet-wheel, a pivoted lever bearing a pawl to engage with said wheel, means for swinging said lever in the direction for the pawl to engage with said wheel, a stop to permit or prevent a reverse motion of the lever and pawl, another stop adjustable to gage the further return of the lever and pawl, and means controlling the action of said stops operated by the sheets as they move forward, substantially as set forth.

20. In mechanism for controlling the movement forward of sheets from a pile of sheets the combination of a ratchet-wheel and pawl therefor, means for carrying said pawl to and fro in a suitable path with reference to said wheel, a latch to prevent the return motion of said pawl as required, an adjustable latch to prevent the further return of said pawl if required, and an adjustable stop to limit the return movement of said pawl, two electric circuits, an electromagnet in each circuit in position to operate one of said latches, and a contact-breaker in each of said circuits and in the path of said sheets, substantially as set forth.

EDWARD DUMMER.

Witnesses:
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EDWARD WYMAN.