(No Model.) 4 Sheets—Sheet 1.

T. A. BRIGGS.

MACHINE FOR SEPARATING AND FEEDING SHEETS.

No. 560,153. Patented May 12, 1896.

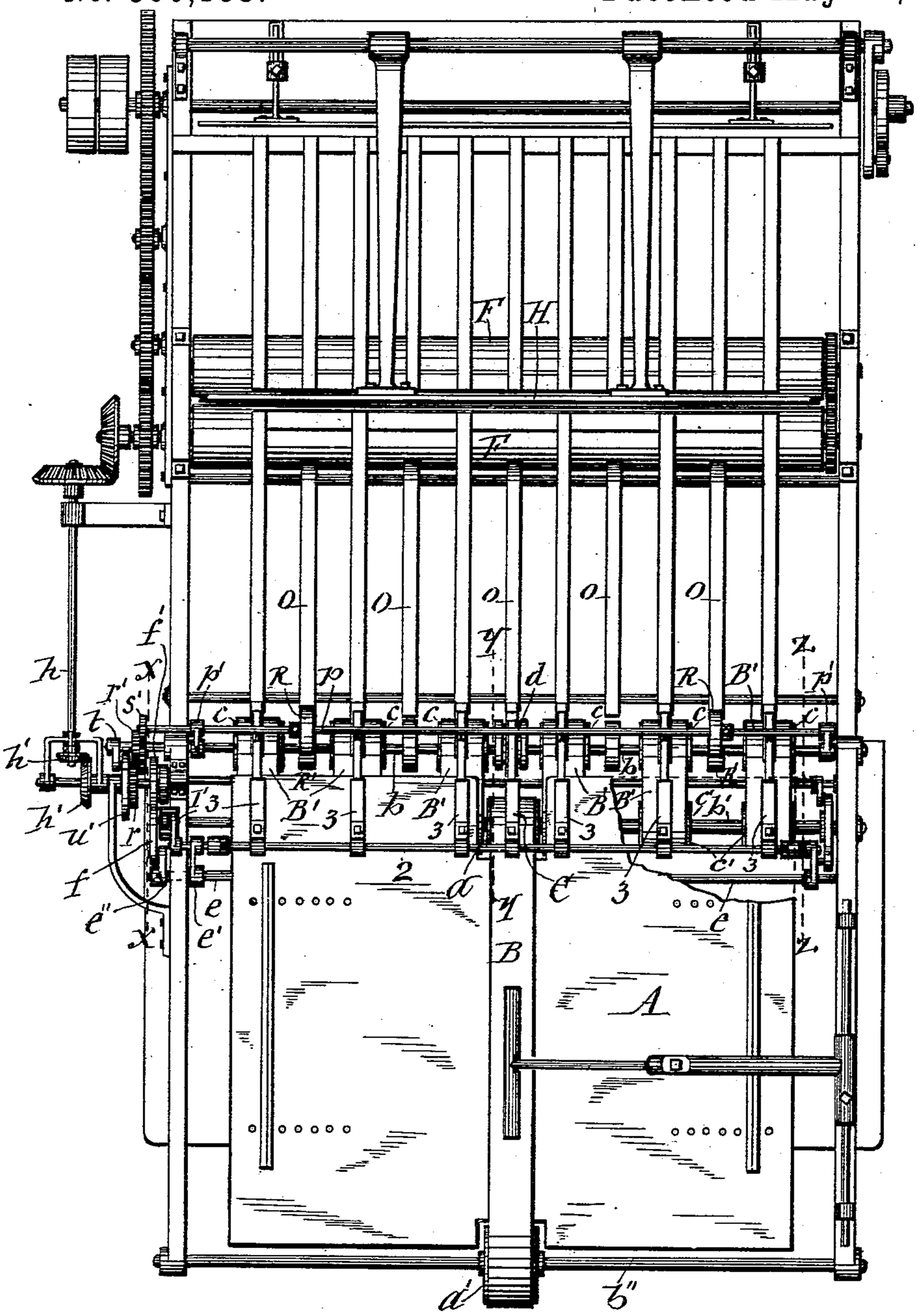

Fig. 1

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By E. Laass

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(No Model.) 4 Sheets—Sheet 2.

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MACHINE FOR SEPARATING AND FEEDING SHEETS.

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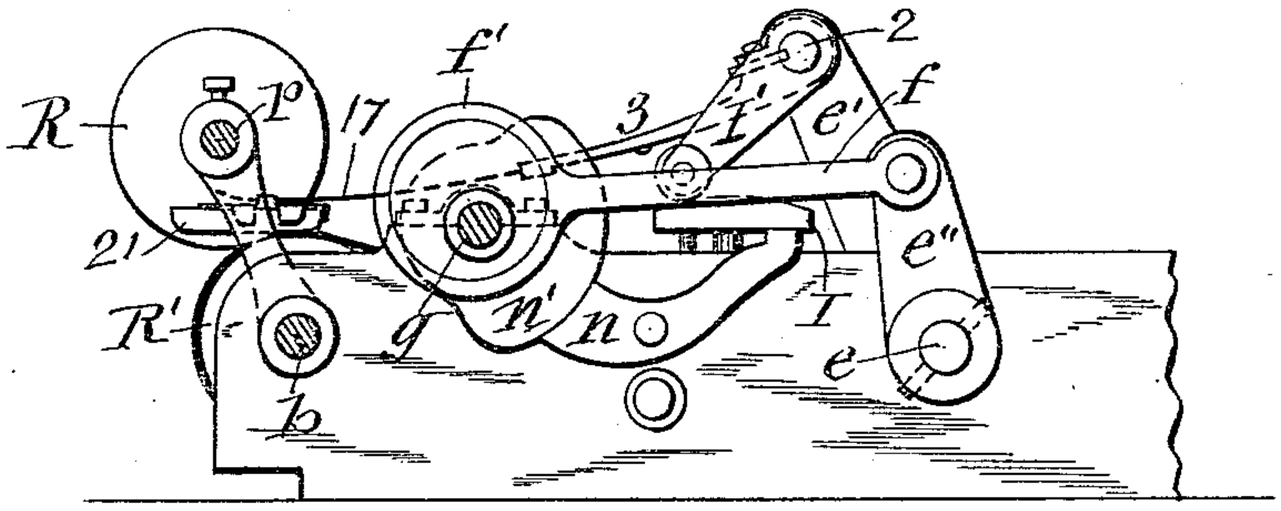

Fig. 2

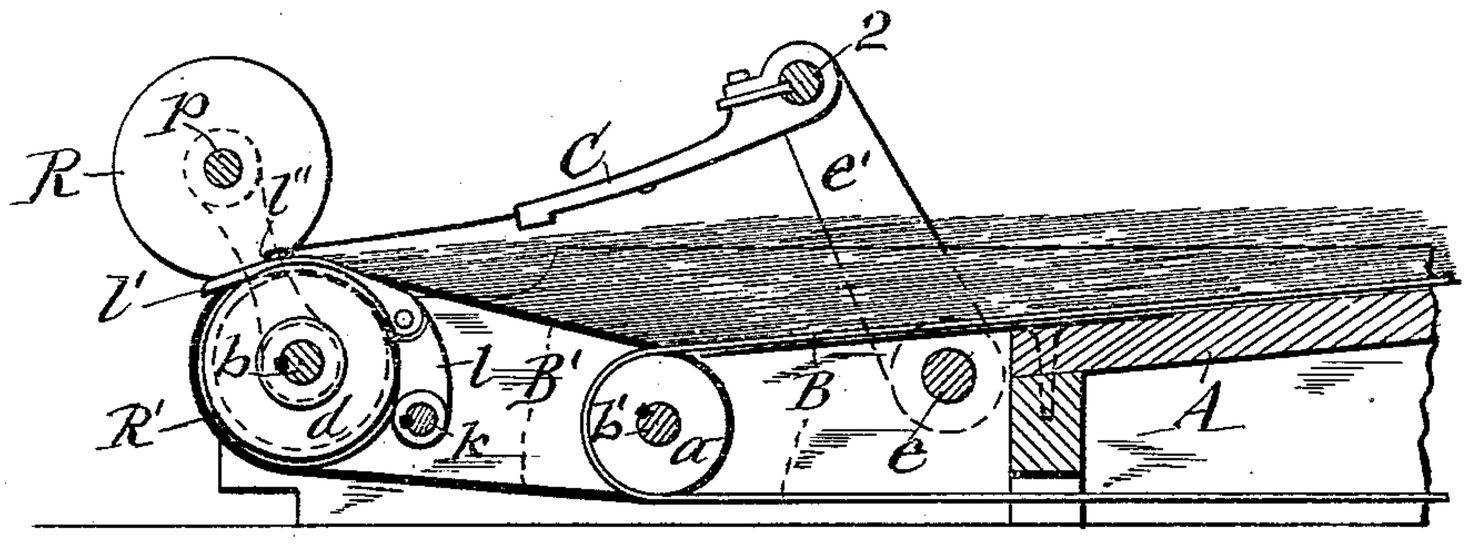

Fig. 3

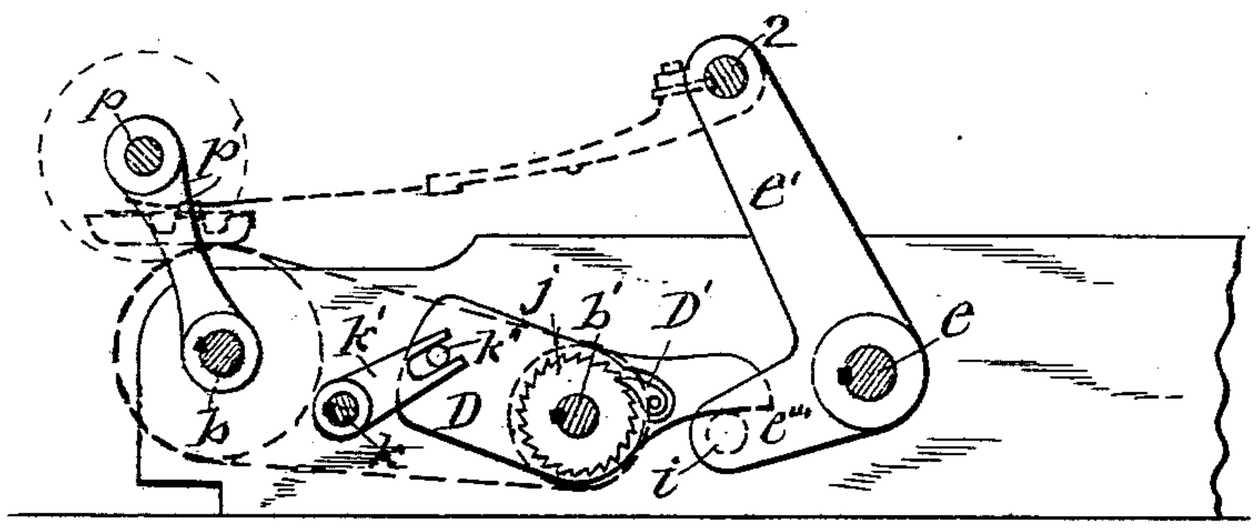

Fig. 4

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(No Model.) 4 Sheets—Sheet 3.

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MACHINE FOR SEPARATING AND FEEDING SHEETS.

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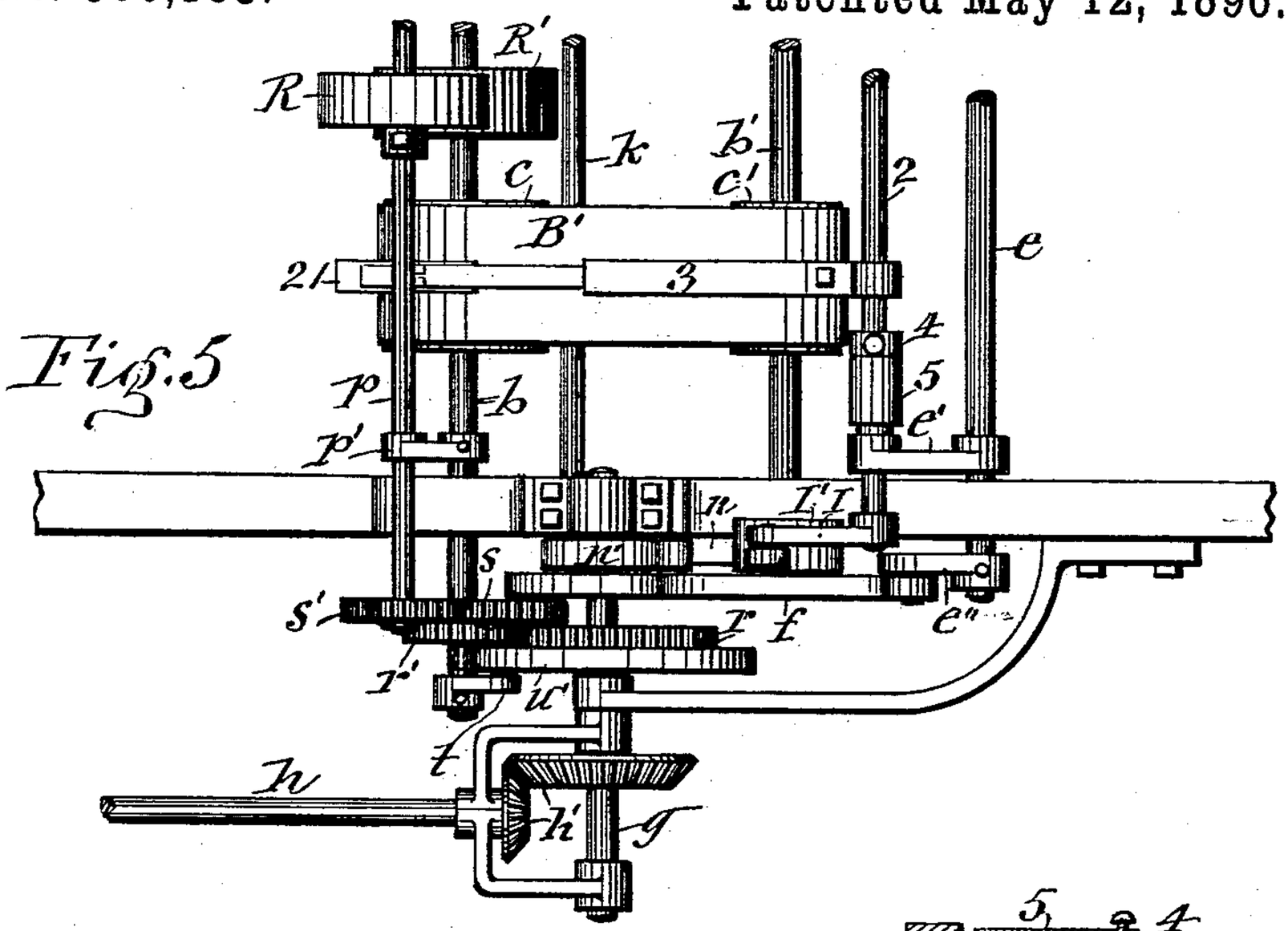

Fig. 5

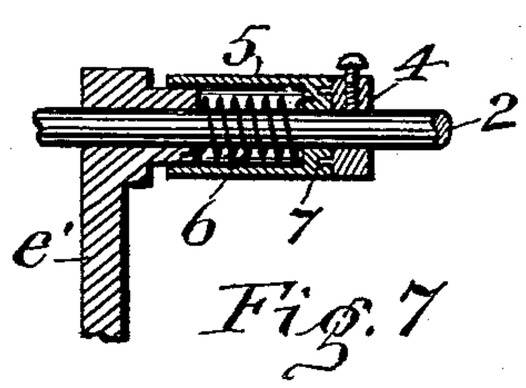

Fig. 7

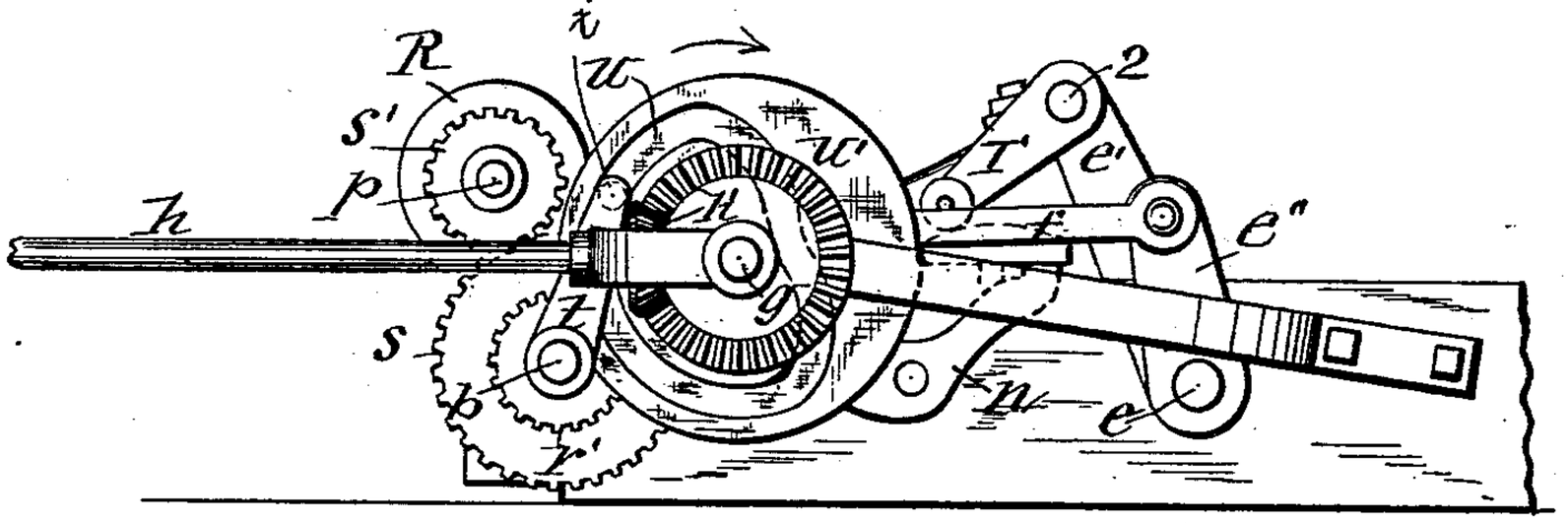

Fig. 6

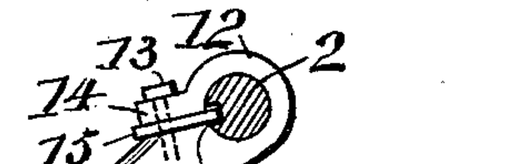

Fig. 8

Fig. 10

Fig. 9

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T. A. BRIGGS.

MACHINE FOR SEPARATING AND FEEDING SHEETS.

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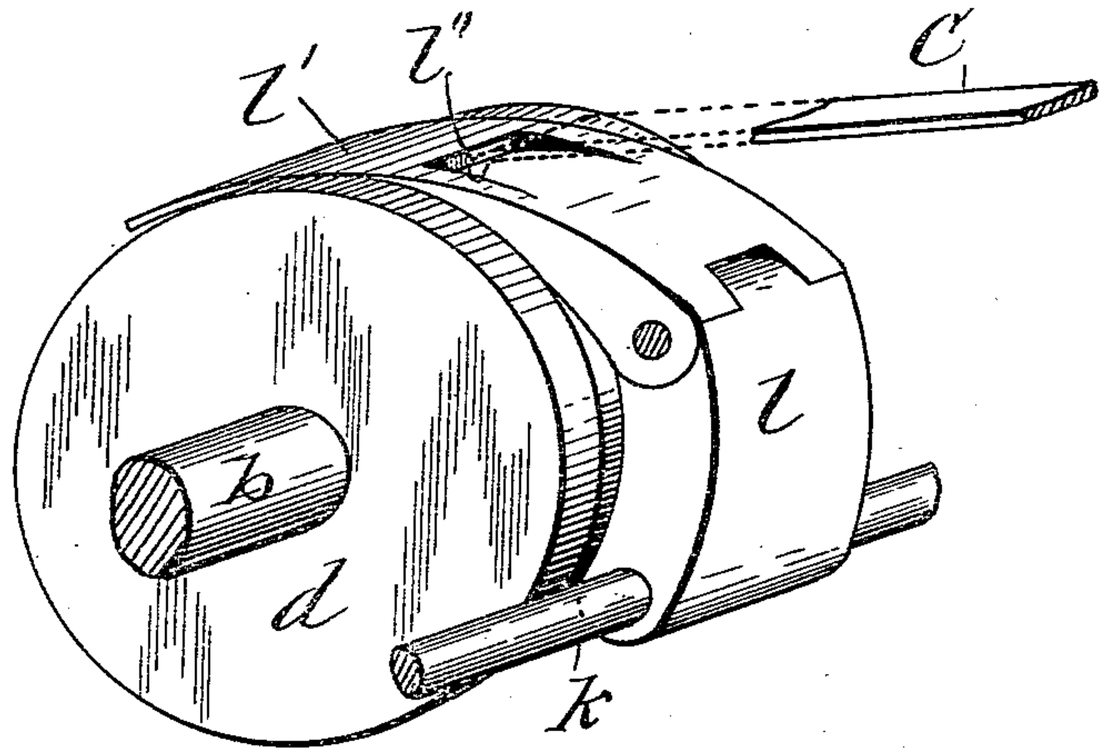
Fig. 11



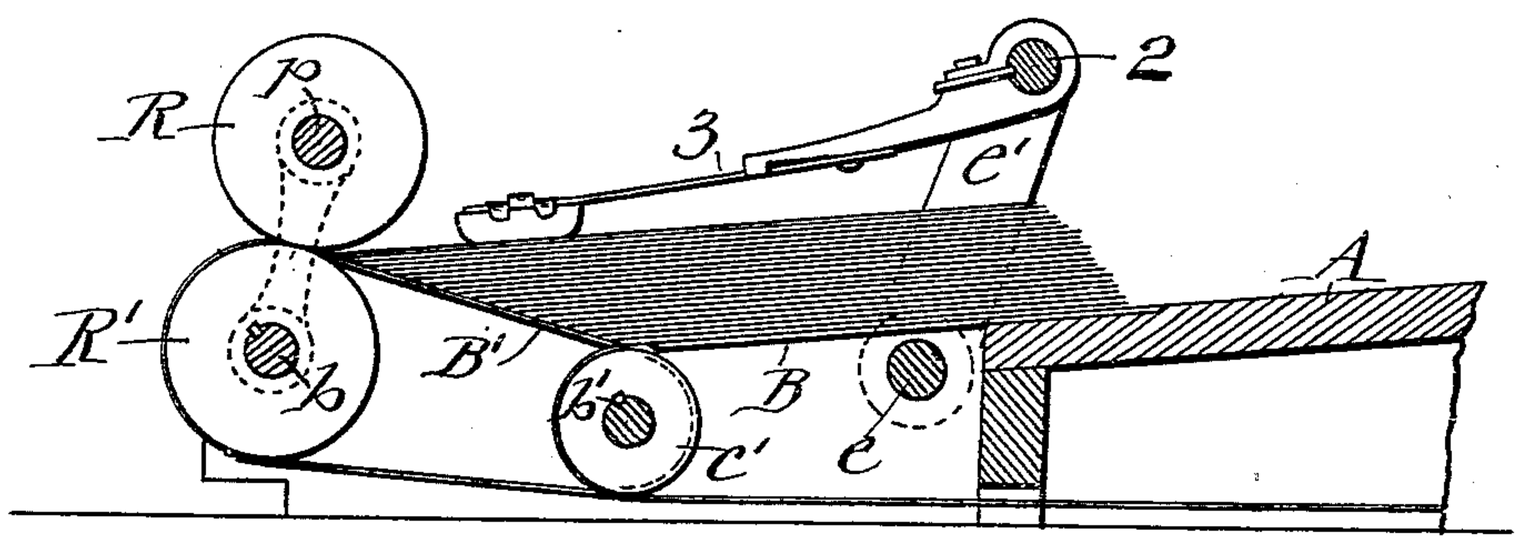


Fig. 12

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UNITED STATES PATENT OFFICE.

THOMAS A. BRIGGS, OF ARLINGTON, MASSACHUSETTS.

MACHINE FOR SEPARATING AND FEEDING SHEETS.

SPECIFICATION forming part of Letters Patent No. 560,153, dated May 12, 1896.

Application filed March 1, 1894. Serial No. 501,918. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. BRIGGS, of Arlington, in the county of Middlesex, in the State of Massachusetts, have invented new and useful Improvements in Paper-Feeding Machines, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates, chiefly, to the class of paper-feeding machines which require the paper to be piled on the supporting-table in such a manner as to cause each successive overlying sheet to project with its advance edge beyond that of the subjacent sheet, which pile is successively moved toward the delivery end of the paper-supporting table by endless belts running lengthwise of said table and carrying said pile.

My present invention consists, chiefly, in improved means for expeditiously and reliably feeding the successive sheets singly from the pile carried on the supporting-table; and the invention also consists in simple and efficient means for imparting at the proper times the requisite motion to the conveyers, which advance the pile of paper toward the delivery end of the supporting-table; and the invention furthermore consists in certain novel features of the details of the feeding mechanism, as hereinafter fully described, and specifically set forth in the claims.

In the accompanying drawings, Figure 1 is a plan view of my improved paper-feeding machine in connection with a paper-folding machine. Figs. 2, 3, and 4 are enlarged vertical longitudinal sections, respectively, on lines X X, Y Y, and Z Z in Fig. 1. The dotted lines in Fig. 4 merely indicate the attachment of the paper-feeding devices located back of the plane in which said figure is taken. Fig. 5 is an enlarged plan view of the mechanism for transmitting motion from the driving-shaft to the feed-machine. Fig. 6 is a side view of the same. Fig. 7 is a detached longitudinal section of the adjustable connection of the feeding-finger shaft to its supporting-arm. Fig. 8 is an enlarged side view of one of the paper-pushing fingers, and Figs. 9 and 10 are sections at 8 8 and 9 9. Fig. 11 is a detail perspective view of the automatic feed-controlling devices; and Fig. 12 is a vertical longitudinal sectional view of the feeding-finger and feed-roller, showing the same in their rearmost positions.

A represents the table upon which the paper to be fed is piled, so as to cause the successive top sheet to project with its advance or front edge beyond that of the next underlying sheet, as indicated in Fig. 3 of the drawings.

B denotes the main paper-conveyer, consisting of an endless belt running on pulleys $a\ a'$, which are fastened to shafts $b'\ b''$, extending across opposite ends of the table A and mounted in suitable bearings in the sides of the frame of said table.

In front of the shaft b' and parallel therewith and in a higher plane is another shaft b, also journaled in the aforesaid sides of the frame. On this latter shaft are loosely mounted a plurality of pulleys c, which are connected by short belts B' B' with pulleys c', fastened to the shaft b'. Said belts ascend from the plane of the top of the main belt B and form a slanting abutment for the front of the pile of paper carried on said main belt, which has frictional hold on the pile of paper to carry the same forward when said belt is in motion. This motion is intermittent and derived from the main driving-shaft h by mechanism hereinafter described, and the action of which is controlled automatically by the paper in process of being fed in the following manner: Back of the shaft b' and parallel therewith is a rock-shaft e, mounted in bearings in the side bars of the table A. To opposite ends of said rock-shaft are fastened arms $e'\ e'$, the free ends of which are formed with journal-bearings, in which is mounted a shaft 2, to which the feeding-fingers 3 3 are attached. The rock-shaft e receives its motion by the oscillation of an arm e'', attached to one end of said shaft and connected to the pitman or eccentric-rod f of an eccentric f', attached to the counter-shaft g, which receives rotary motion from the driving-shaft h by suitable gears $h'\ h'$. The arrangement of the driving-shaft and the means for imparting rotary motion to the same depend on the character of the machine to which the feeding mechanism is connected. Said paper-feeding machine is adapted to be connected to either a paper-folding machine, as shown, or to a printing-press, and almost any me-

chanic conversant with that class of machines can readily devise a plan for transmitting motion from the folding-machine or from the printing-press to the aforesaid driving-shaft, either by sprocket-wheels and chain or by shafting and gears, so as to cause the feeding-machine to operate in harmony with the machine or press to which it is connected.

One of the arms e' is formed at its lower end with a forward extension e''', to the free end of which is pivoted a roller i. In front of this extension is a lever D, mounted loosely on the shaft b', to which is fastened a ratchet-wheel j. A pawl D′ is connected to the lever and engages the ratchet-wheel and thus turns the shaft when the rear end of the lever D is lifted by the extension e''' of the arm e'. The turning of the shaft b' with the pulleys c' c' attached thereto propels the belt B, and thereby moves the pile of paper toward the delivery end of the table A. To control this movement to accord with the speed of feeding the sheets from the pile, a shaft k is interposed between the front shaft b and shaft b' and parallel therewith. Said shaft k is pivoted to the side frame of the table A and has fastened to it, at or near the center of its length, an upwardly-extending arm l, to the free end of which is connected a forwardly-extending plate l', supported with its top in the plane of feeding, preferably by a subjacent roller d, mounted on the front shaft b and provided with a circumferential groove for the reception of the aforesaid plate, as shown in Fig. 3 of the drawings, in which the groove is indicated by dotted lines. To the end of the shaft k is fastened an arm k', the free end of which is bifurcated and straddles a pin k'' on the end of the lever D nearest the front shaft b, as shown in Fig. 4 of the drawings.

Inasmuch as each of the successive top sheets of the pile lies with its front edge farther from the top of the rollers R′ R′, as shown in Fig. 3 of the drawings, the feeding-fingers 3 3 lose in time their hold on the top sheet unless the pile of paper is moved forward. This is effected automatically and at the proper time by mechanisms controlled by the finger C, which is attached to the same shaft 2 to which the feeding-fingers 3 are attached, and thus said feed-controlling finger moves in unison back and forth with said feeding-fingers. In the path of the free end of the controlling-finger C is the plate l', which is provided with a notch or shoulder l'' in its top. So long as the pile of paper is in such a position as to allow the feeding-fingers 3 to engage the top sheet of the pile and push said sheet forward onto the rollers R′ and plate l' the feed-controlling finger C is prevented from engaging the notch l'' of the plate l', and thus leaves at rest the mechanisms employed for propelling the pile of paper; but as soon as sufficient sheets have been fed from the pile to prevent the feeding-fingers 3 from obtaining the requisite hold on the top sheet to push the same forward the plate l' becomes exposed, so as to allow the free end of the finger C to drop into the notch l'' in the finger l' and in the forward movement of said finger it pushes the plate l' ahead and by means of the arm l turns the shaft k and causes the arm k' of said shaft to lift the forward end of the lever D. The opposite end of this lever is thereby correspondingly depressed, so that in the rearward swinging of the arm e' the extension e''' thereof lifts the depressed rear end of the lever D, and in this movement the engagement of the pawl D′ with the ratchet-wheel j turns the shaft b', and thus motion is imparted to the belts B and B′. The belt B carries the pile of paper forward sufficient to allow the feeding-fingers 3 3 to engage the front portion of the top sheet and push said sheet forward and cause the free end of the controlling-finger to ride thereon, and thus prevent said finger from engaging the notch l'' of the plate l', and thereby cause the paper-conveying belt B to remain at rest until a sufficient number of sheets are removed from the pile by the feeding-fingers 3 3 to allow the controlling-finger C to reëngage the plate l'. To cause the feeding-fingers 3 3 to push the top sheet forward, as aforesaid, and release said sheet in the rearward movement of the finger, I connect to one of the side rails of the table A a vertically-movable arched bridge I and fasten to the supporting-shaft 2 of the feeding-fingers a lever I′, which rides with its free end on the arched top of the bridge I, as shown in Fig. 2 of the drawings. To the aforesaid side rail is pivoted a lever n, one end of which engages the under side of the bridge I, and the opposite end engages a cam n', fixed to the counter-shaft g, hereinbefore referred to. The rotation of this cam imparts an oscillatory motion to the lever n, which latter is thereby caused to intermittently lift the bridge I. The resultant lifting of the free end of the lever I′ turns the shaft 2, so as to lift the free ends of the feeding-fingers 3 3. The cam n' is set in such a position as to produce the aforesaid effect during the rearward movement of the feeding-fingers, and thus cause said fingers to be lifted out of contact with the paper. In the forward movement of said fingers the cam n' releases the lever n in time to allow the bridge I and the lever I′ to drop, so as to cause the feeding-fingers to engage the top sheet and push the same forward with the forward movement of said fingers.

In connection with the described paper-feeding mechanism and suitable means for advancing the pile of paper on its supporting-table I employ my improved means for transferring the sheets from the feeding-machine either to the feed-board of a printing-press or to the sheet-conveyers of a paper-folding machine or other machine designed to operate successively on single sheets.

For exemplification of my invention I have shown the same in the annexed drawings as arranged for transferring the sheets to a pa-

per-folding machine, in which F F designate the folding-rollers; H, the folding-blade; *o o*, the tapes which carry the sheet to the folding-rollers. The means for operating said parts being well understood by persons conversant with the art to which said machine pertains, and being immaterial to my present invention, said means need not here be shown or described. My said sheet-transferring devices consist, essentially, of the rollers R R, which are carried back and forth over the line of delivery of the sheet from the table A and are rotated continually with their lower peripheral portions in the direction of the feeding and by frictional contact of said portions of the rollers with the sheet of paper brought forward by the feeding-fingers 3 3 propel said sheet to the folding-machine or other machine designed to operate on the sheet. These rollers I designate "feed-rollers" in contradistinction to coöperating rollers R′ R′, which latter I denominate "carrying-rollers," inasmuch as they partly carry the sheet in transit. These carrying-rollers are in lines with the rollers R R and mounted loosely on the front shaft *b*, and are thereby supported with the top portions of their peripheries in the plane of the feeding.

The feeding-rollers R R are rigidly mounted on a shaft *p*, which is parallel with the shaft *b* and journaled at opposite ends in the free ends of the supporting-arms *p′ p′*, mounted rigidly on the shaft *b*, which shaft receives a rocking motion, as hereinafter described, and thereby causes said arms to oscillate in unison and swing the feeding-rollers back and forth in arcs concentric to said shaft and contiguous to the carrying-rollers R′ R′.

The aforesaid feeding-rollers R R receive their aforesaid continuous rotary motion from the counter-shaft *g* by means of a gear-wheel *r*, fixed to said shaft and meshing with a pinion *r′*, mounted loosely on the shaft *b*. To the side of this pinion is firmly attached a gear-wheel *s*, which meshes with a pinion *s′*, fixed to the supplemental shaft *p*, which carries the feeding-rollers R R. The back-and-forth swinging movement of said rollers is effected by means of an arm *t*, fastened to the shaft *b* and having on its free end an anti-friction-roller *t′*, which travels in a cam-groove *u* in the side of the disk or wheel *u′*, mounted on the counter-shaft *g* and attached to the side of the aforesaid gear-wheel *r*, as more clearly shown in Figs. 5 and 6 of the drawings. The rotation of this cam-wheel imparts a rocking motion to the arm *t*, which is transmitted to the arms *p′ p′* by the shaft *b*. The belt-pulleys *c* and *d* and the rollers R′ R′ being loose on said shaft, the rocking motion of the latter does not disturb said pulleys and rollers.

In the operation of the machine the feeding-fingers 3 3 push the advance edge of the top sheet over onto the carrying-rollers R′ R′ at the same time the feeding-rollers R R are swinging rearward to a position to bear on the aforesaid sheet, and while the feeding-fingers 3 3 release the sheet and retreat to engage the next top sheet the frictional contact of the revolving and immediately forwardly swinging rollers upon the sheet propels the latter from the feeding-machine. In the rearward swinging movement the rotation of the feed-rollers is accelerated and thus causes said rollers to obtain a quick grip on the top sheet of the pile when striking the same in said movement. In the forward swinging movement the rotation of said rollers is slightly retarded, but this is compensated for by the forward swinging movement of the rollers. The propulsion of the sheet by these rollers obviates the employment of the usual reciprocating grippers and their expensive actuating mechanism, and renders my improved feeding-machine specially adapted to be connected to a paper-folding machine.

I further improve my feeding-machine by firmly attaching a clutch-collar 4 to the shaft 2 of the paper-feeding fingers 3 and mounting on the said shaft between the clutch-collar and adjacent arm *e′* a revoluble and longitudinally-movable sleeve 5, which is provided on the end adjacent to the clutch-collar with a suitable clutch-face adapted to engage and release said collar, said clutch mechanism being represented in the form of pins 7 7, projecting from the side of the clutch-collar and entering sockets in the end of the sleeve, as shown in Fig. 7 of the drawings; but I do not limit myself specifically to such construction of the clutch, as other well-known forms will answer the purpose. Within the sleeve 5 is a spiral spring 6, surrounding the shaft and attached at opposite ends, respectively, to the arm *e′* and end of sleeve 5. The spring exerts an expansive force longitudinally and thereby holds the clutch normally in engagement. At the same time said spring exerts a resistance about its axis, whereby the downward pressure on the feeding-fingers 3 3 is obtained. This downward pressure can be increased or diminished, according to the character of the paper to be moved by the feeding-fingers, by pushing the sleeve out of engagement with the clutch-collar and then turning the sleeve to wind up or partly unwind the spring, and thus increase or diminish the tension thereof, as may be desired. The spring is subsequently retained in its adjusted condition by allowing the sleeve to spring into engagement with the clutch-collar. It will thus be observed that said adjustment of the engaging power of the feeding-fingers is readily and accurately effected.

Another improvement involved in my present invention consists in the detail construction of the feeding-fingers 3, which is adjustably mounted on its supporting-shaft, so as to allow said finger to be set in different angles of inclination to the plane of the feed, and possesses the proper elasticity to render it more efficient in its operation. Said finger I provide with a stout metal arm 11, formed at one end with a radially-split collar or sleeve

12, which embraces the shaft 2, and is clamped thereon by a screw 13, passing through a lip 14 on the collar 12 and entering a screw-threaded socket in the arm. A key 15 is clamped between the aforesaid lip and arm and enters a longitudinal groove 16 in the shaft 2. In order to allow said arm to be raised or lowered and thus adjusted to different angles of inclination to the plane of the feed, I widen the groove 16 sufficiently to allow the key to be moved to a certain degree circumferentially on the shaft.

The under side of the arm 11 is formed with a longitudinal groove, in which is secured a spring-metal plate 17 by means of a screw 18 passing through the plate and into the arm near the collar 12. The free end of the arm is provided with inward-projecting flanges 19 19, which serve to retain the plate 17 on said portion of the arm. There is sufficient room between the tops of the flanges and under side of the arm to allow a limited vertical play to the free end of the plate 17, which extends some distance from the arm and terminates with an upward curvature to allow a rocking motion to the shoe 20, which carries the rubber pad 21, and is connected to the under side of the plate by ears 22, projecting therefrom and embracing the edges of the plate.

What I claim as my invention is—

1. A paper-feeding machine comprising a paper-supporting table, and feeders consisting of rollers carried back and forth over the line of delivery of the sheets from said table and rotating continually with their lower peripheral portions in the direction of the feeding as set forth.

2. A paper-feeding machine comprising a paper-supporting table, endless belts carrying the pile of paper on the said table toward the delivery end thereof, and feed-rollers carried back and forth over the line of delivery and rotated continually with their lower peripheral portions in the direction of the feed, as set forth.

3. In combination with the paper-supporting table, and endless belts carrying the pile of paper toward the delivery end of said table, a shaft extending across the table at said end beneath the plane of the feeding, rollers mounted on said shaft and in contact with the advance edge of the sheet in process of being fed, rock-arms mounted on said shaft, a supplemental shaft pivoted to said rock-arms, rollers fixed to said shaft and carried thereby upon the top of the advance edge of the aforesaid sheet, and gears transmitting to said supplemental shaft continuous rotary motion in the direction of the feed, as set forth.

4. In combination with the paper-supporting table and conveyers moving the pile of paper toward the delivery end of said table, carrying-rollers under said end of the table and in contact with the advance edge of the sheet in process of being fed, feed-rollers swinging backward and forward in an arc over the aforesaid carrying-rollers and geared to revolve in the direction of the feed, and feed-fingers pushing the top sheet between the two sets of rollers as set forth.

5. In combination with the paper-supporting table, shafts extending across opposite ends of said table, pulleys on said shafts, belts on said pulleys carrying the pile of paper toward the delivery end of said table, rollers mounted loosely on the front shaft, and feed-rollers swinging backward and forward in an arc directly over said loose rollers and geared to revolve with their lower portions in the direction of the feed, as set forth.

6. In combination with the paper-supporting table, a shaft extending across the delivery end of said table and beneath the plane of feeding, carrying-rollers mounted on said shaft, rock-arms on said shaft, a supplemental shaft pivoted to said rock-arms, feed-rollers fixed to said supplemental shaft, gears transmitting rotary motion to the supplemental shaft, and feed-fingers pushing the top sheet between the two sets of rollers, as set forth.

7. In combination with the driving-shaft, paper-supporting table, and conveyers carrying the pile toward the delivery end of said table, a shaft extending across said end of the table beneath the plane of the feeding, carrying-rollers mounted loosely on said shaft and in contact with the sheet in process of being fed, rock-arms swinging in arcs concentric to said shaft, a supplemental shaft pivoted to the free ends of said arms, feed-rollers fastened to the supplemental shaft and carried thereby contiguous to the aforesaid carrying-rollers, and gears transmitting rotary motion to the said feed-rollers, as set forth.

8. In combination with the driving-shaft, paper-supporting table and conveyers carrying the pile of paper toward the delivery end of said table, a shaft extending across said end of the table beneath the plane of feeding, carrying-rollers and a gear-wheel all mounted loosely on said shaft, rock-arms fixed to said shaft, a supplemental shaft pivoted to the free ends of said rock-arms, feed-rollers fastened to said supplemental shaft, a pinion fixed to said shaft meshing with the aforesaid gear-wheel, gears transmitting motion from the driving-shaft to the aforesaid loosely-mounted gear-wheel, an arm fixed to the shaft of the aforesaid carrying-rollers, and a cam-wheel actuated by the driving-shaft and imparting oscillatory motion to the said crank, as set forth.

9. In combination with the driving-shaft, paper-supporting table and conveyers moving the pile of paper toward the delivery end of said table, a shaft extending across said end of the table beneath the plane of feeding, carrying-rollers and gear-wheel all mounted loosely on said shaft, rock-arms fixed to said shaft, a supplemental shaft pivoted to the free ends of said rock-arms, feed-rollers fixed to the supplemental shaft, a pinion fixed to

said shaft meshing with the aforesaid gear-wheel, a counter-shaft receiving rotary motion from the driving-shaft, a gear-wheel on said counter-shaft transmitting motion to the aforesaid gear-wheel, a cam-wheel and an eccentric fixed to the counter-shaft, an arm attached to the shaft of the aforesaid carrying-rollers and actuated by said cam-wheel, a rock-shaft extending transversely under the paper-supporting table, a crank fixed to said rock-shaft, a pitman transmitting oscillatory motion from the eccentric to said crank, arms fastened to opposite ends of said rock-shaft, a shaft pivoted to the free ends of said arms, paper-feeding fingers attached to the latter shaft, a vertically-movable arched bridge, a lever on said shaft riding on the bridge, a cam fixed to the counter-shaft, and a lever actuated by said cam and intermittently lifting the bridge, substantially as set forth.

10. In a paper-feeding machine, the combination with the paper-supporting table, and driving-shaft, of shafts extending across opposite ends of said table, a shaft between said end shafts, two sets of pulleys fastened to the intermediate shaft, a set of pulleys on the rear shaft connected by paper-conveying belts with one of the sets of pulleys on the intermediate shaft, a set of pulleys mounted loosely on the front shaft and connected by paper-conveying belts with the other sets of pulleys of the intermediate shaft, a shaft interposed between the front shaft and intermediate shaft and parallel therewith, an arm fixed to said interposed shaft, a plate on the upper end of said arm, supported with its top in the plane of the feeding and provided with a notch, a rock-shaft back of and parallel with the interposed shaft, arms fixed to the ends of said rock-shaft, a shaft on the upper ends of said arms, a feed-controlling finger on the latter shaft having its free end riding on the aforesaid plate and adapted to engage the notch thereof when bare of the sheet in transit, a lever engaging one of the arms of the aforesaid rock-shaft, and a crank on the aforesaid interposed shaft actuating said lever, as set forth.

11. In combination with the paper-supporting table A, rock-arms *e' e'*, the shaft 2 and feeding-fingers 3 3 fastened to said shaft, the clutch-collar 4 rigidly secured to the shaft 2, the clutch-sleeve 5 movable longitudinally and adapted to engage and release the aforesaid collar, and the spring 6 connecting said sleeve to the rock-arm, substantially as described and shown.

12. In combination with the rock-shaft 2 provided with a longitudinal groove, the improved feeding-finger 3 composed of the arm 11 grooved longitudinally on its under side and formed at one end with the split collar 12, the key 15 inserted in the said split and fitted loosely in the groove of the shaft, the screw 13 clamping the collar on the shaft and securing the key on the arm, the flanges 19 on the free end of the arm, the spring-plate 17 seated in the groove of the arm and retained therein by the screw 18 and by the aforesaid flanges, and the shoe 20 connected to the free end of the spring-plate as set forth.

In testimony whereof I have hereunto signed my name this 13th day of December, 1893.

THOMAS A. BRIGGS. [L. S.]

Witnesses:
JOHN J. LAASS,
C. L. BENDIXON.