No. 640,368

Patented Jan. 2, 1900.

F. L. CROSS.

PAPER FEEDING MACHINE.

(Application filed Mar. 31, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

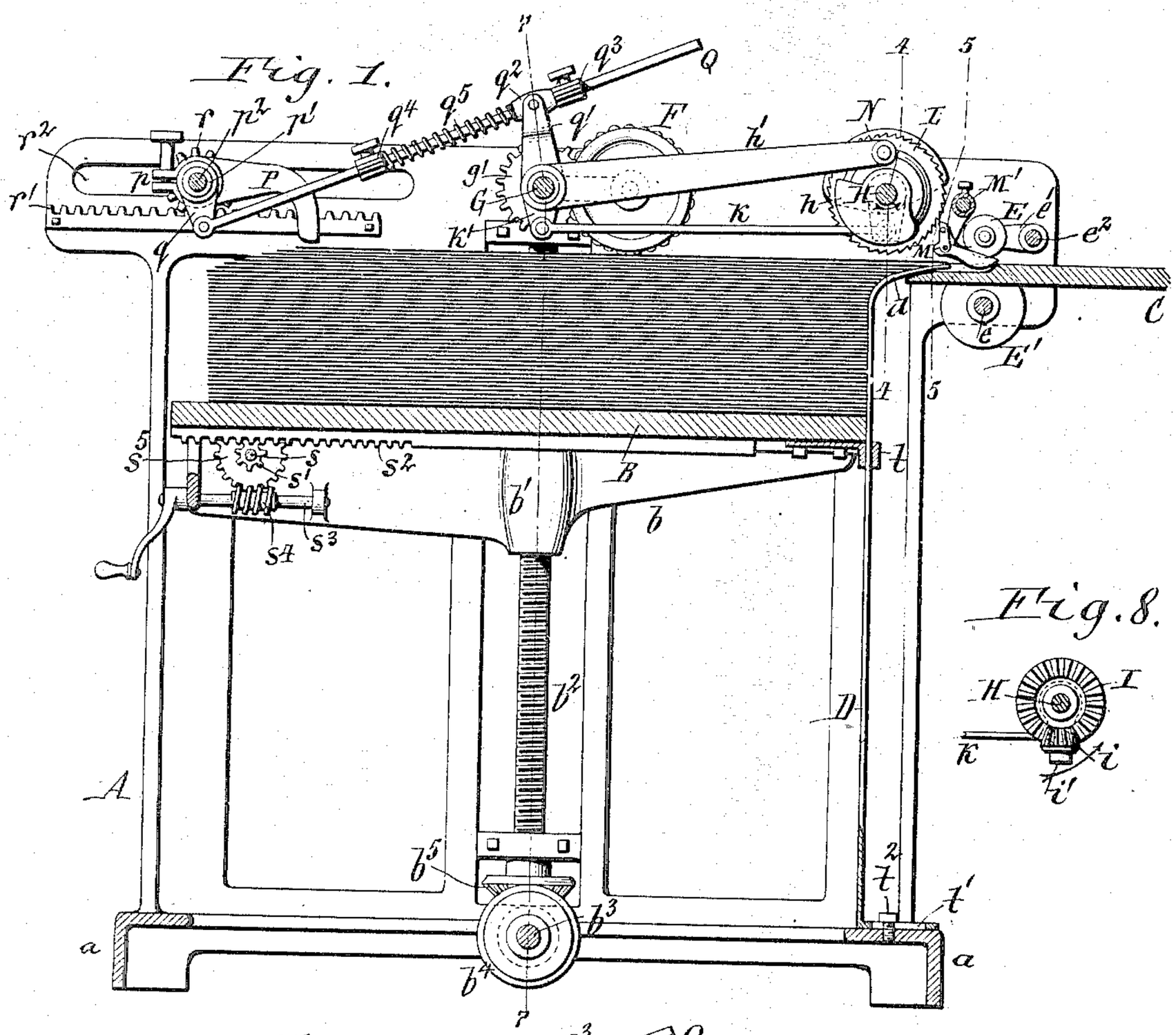


Fig. 8.

Fig. 2.

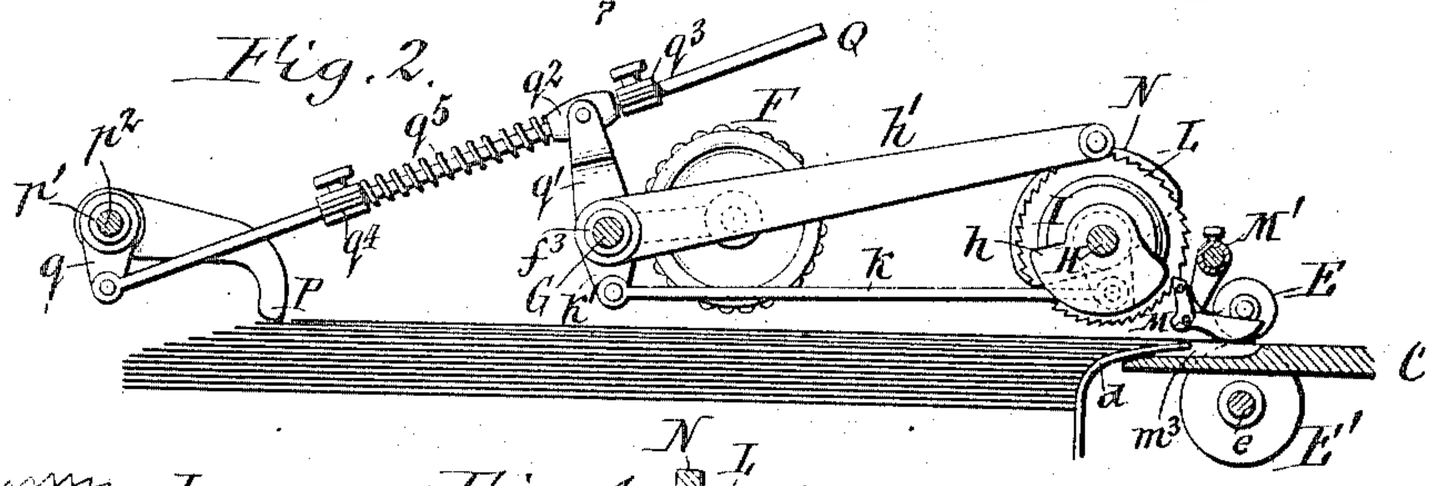


Fig. 3.

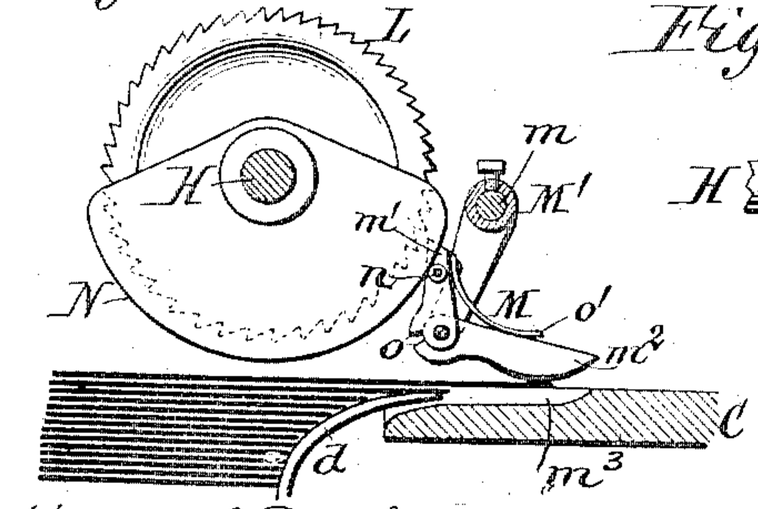


Fig. 4.

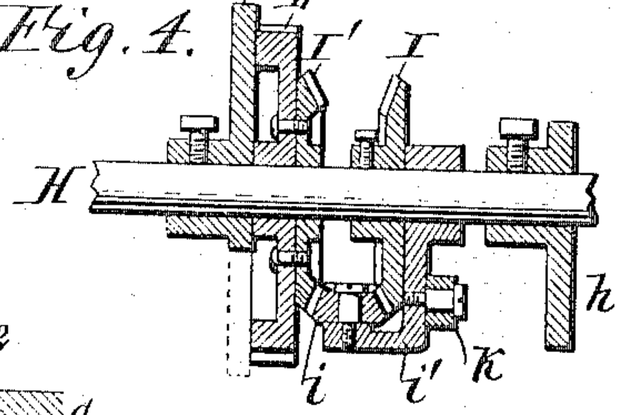
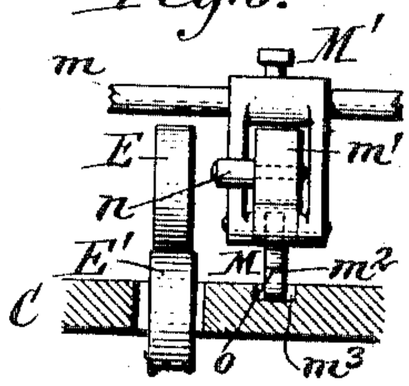


Fig. 5.



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PAPER FEEDING MACHINE.

(Application filed Mar. 31, 1899.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 6.

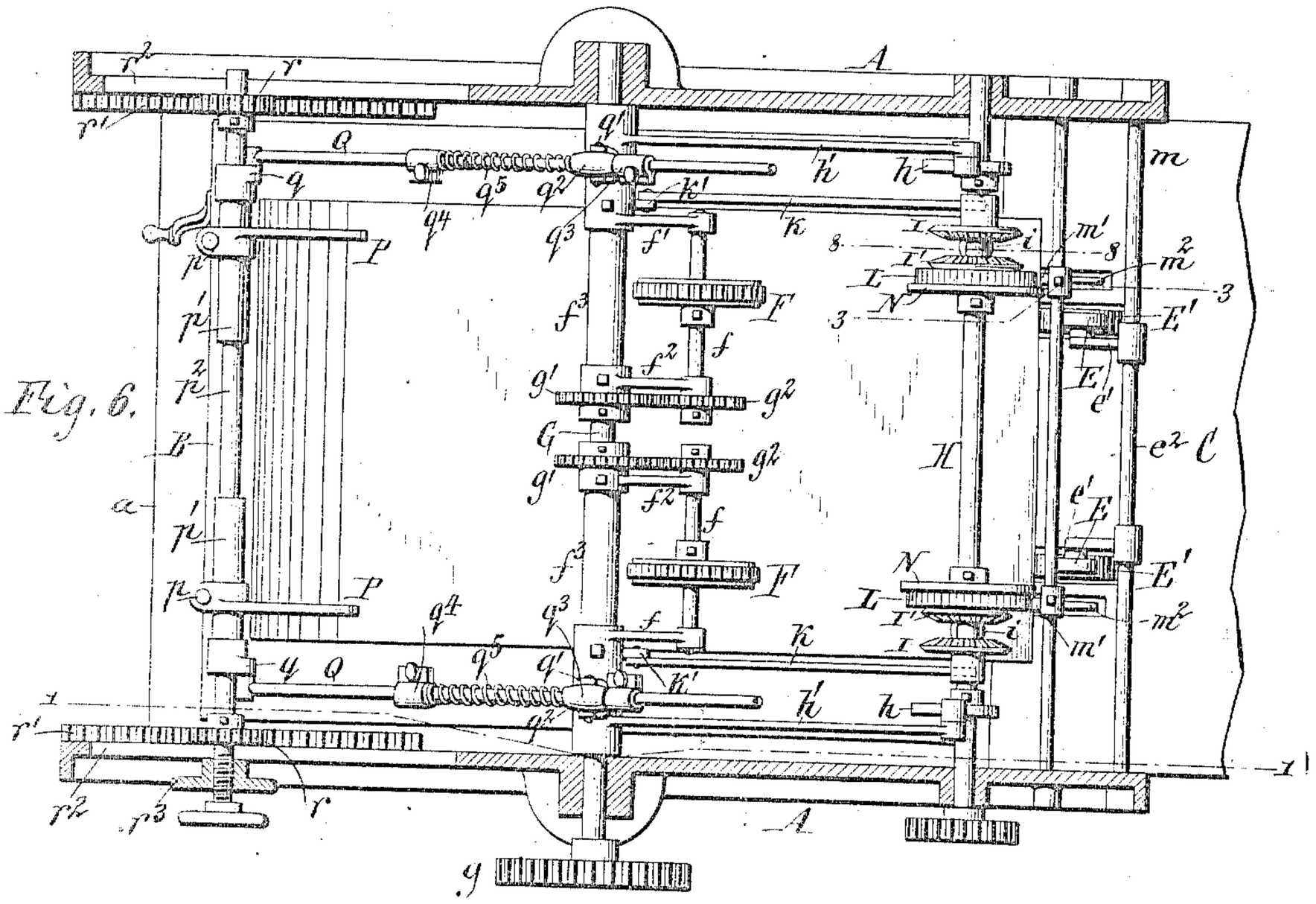
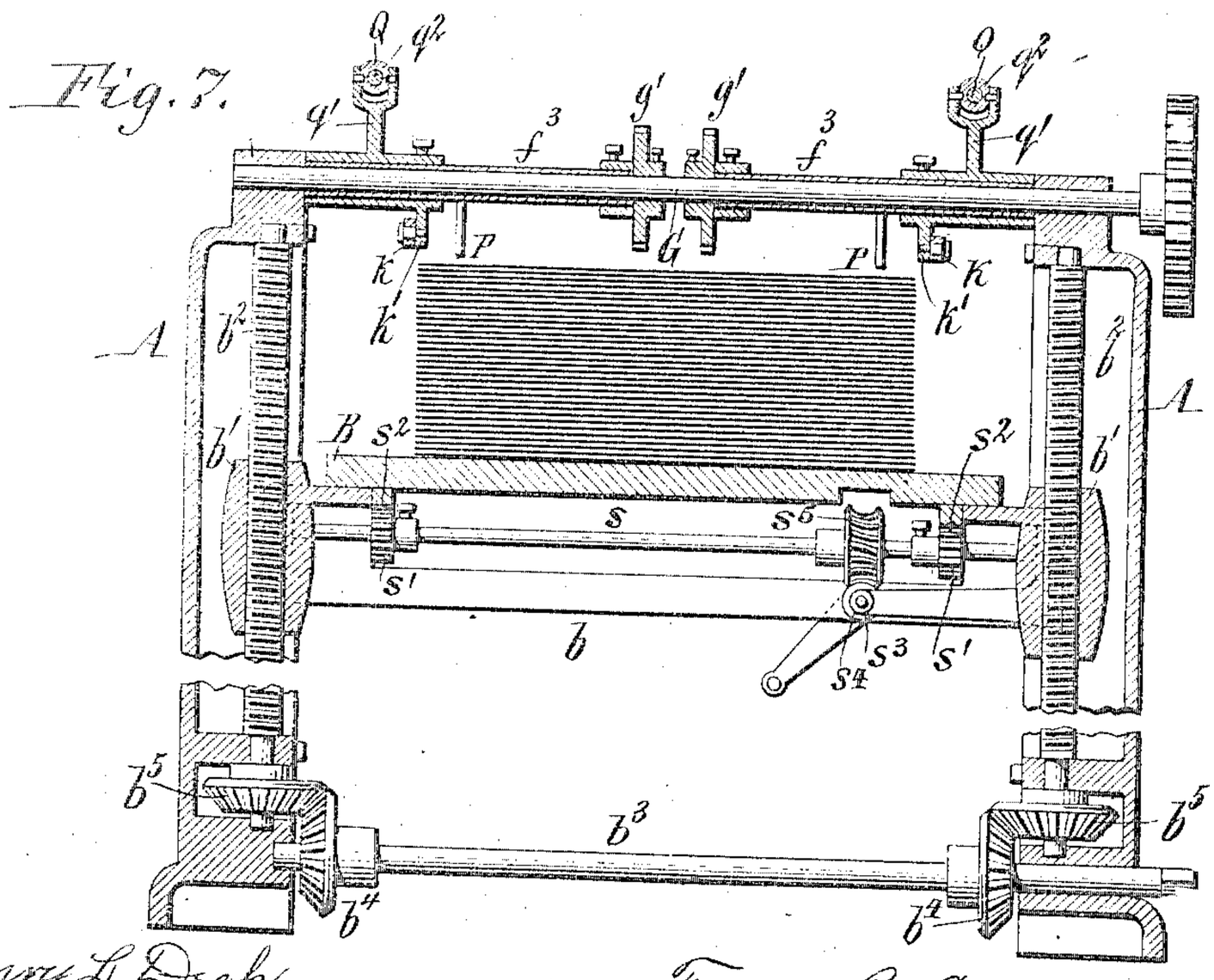


Fig. 7.



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UNITED STATES PATENT OFFICE.

FRANK L. CROSS, OF MYSTIC, CONNECTICUT.

PAPER-FEEDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 640,368, dated January 2, 1900.

Application filed March 31, 1899. Serial No. 711,286. (No model.)

To all whom it may concern:

Be it known that I, FRANK L. CROSS, a citizen of the United States, residing at Mystic, in the county of New London and State of Connecticut, have invented new and useful Improvements in Paper-Feeding Machines, of which the following is a specification.

This invention relates to that class of paper-feeding machines whereby sheets of paper are automatically fed, one at a time, from a pile-bank of sheets to a printing-press, ruling-machine, folding-machine, or other machine which operates upon sheet-paper, and more particularly to such machines in which the feeding of the sheets from the top of the pile is controlled wholly by mechanical means.

The objects of my invention are mainly to improve and simplify the mechanism whereby the sheets are separated and fed from the top of the pile and the mechanism whereby the pile is retained against displacement under the action of the sheet-separating mechanism and to provide means for adjusting the feed-table and the pile of sheets resting thereon toward and from the front of the machine.

In the accompanying drawings, consisting of two sheets, Figure 1 is a longitudinal sectional elevation of my improved paper-feeding machine, taken in line 1 1, Fig. 6, and showing the sheet-separating device in its operative position. Fig. 2 is a similar view of the upper portion of the machine, showing the sheet-separating device in its inoperative position. Fig. 3 is a fragmentary sectional elevation in line 3 3, Fig. 6, on an enlarged scale, of the shifting mechanism for stopping the separation of the sheets, showing the trip-pawl disengaged from the ratchet-wheel by the releasing-cam. Figs. 4 and 5 are fragmentary transverse sections, on an enlarged scale, of the shifting mechanism, taken in lines 4 4 and 5 5, Fig. 1, respectively. Fig. 6 is a top plan view, partly in section, of my improved paper-feeding machine. Fig. 7 is a fragmentary transverse section thereof in line 7 7, Fig. 1. Fig. 8 is a transverse vertical section in line 8 8, Fig. 6.

Like letters of reference refer to like parts in the several figures.

A represents the main frame of the machine, consisting, essentially, of two side pieces A A and connecting cross-pieces *a a*.

B represents the vertically-movable feed or pile-supporting table, upon which the pile of sheets rest and which is raised as the sheets are fed off from the top of the pile, so as to retain the top of the pile in the proper relative position with reference to the sheet-separating devices. This movement of the table may be effected in various ways, the means shown in the drawings consisting of a vertically-movable frame *b*, supporting the table and provided on opposite sides with screw-nuts *b'*, vertical screw-shafts b^2, journaled in the side pieces and engaging with the screw-nuts, and a transverse adjusting-shaft b^3, provided with bevel gear-wheels b^4, meshing with bevel gear-wheels b^5 b^5 on the screw-shafts.

C represents the feed-board, which is arranged on the delivery side of the pile-table and which receives the sheets successively from the top of the pile.

D represents one of the front pile-guides, arranged vertically in front of the table and the pile thereon and having a forwardly-curved upper end *d*, which overhangs the feed-board.

E E' represent the upper and lower delivery-rollers, whereby the sheets are carried from the pile to the feed-board. The lower rollers are mounted on a transverse shaft *e*, which is journaled in stationary bearings, and the upper rollers are mounted on rock-arms *e'*, which are connected with a rock-shaft e^2, and whereby the upper rollers are moved intermittently toward and from the lower rollers.

F F represent two constantly-rotating comb-wheels, whereby the upper portion of the pile of sheets is combed or feathered out, and the top sheets are successively separated from the lower sheets and presented one after another to the delivery-rollers. As shown in the drawings, two comb-wheels are arranged above the pile about midway of the length thereof and on opposite sides of the longitudinal center line of the pile. These wheels are moved bodily toward and from the pile for producing an intermittent action of these wheels. Each of the comb-wheels is mounted on a short transverse shaft *f*, which is journaled in the front ends of horizontal rock-arms f' f^2. The rear ends of the latter are secured to a supporting-sleeve f^3, which is

mounted loosely on a transverse driving-shaft G. The supporting-sleeves of both comb-wheels are arranged side by side on the driving-shaft and are capable of turning on the same independently of each other, so as to permit the comb-wheel on one side to be lifted from the pile for arresting the separating action of the same when the front edge of the respective side of the top sheet has reached the delivery-rollers, while the comb-wheel on the other side is permitted to remain on the pile until the front edge of that side of the sheet has also reached the delivery-rollers. The driving-shaft is arranged transversely above the pile and journaled in bearings on the main frame and is driven in any suitable manner—for instance, by a gear-wheel *g*, applied to the shaft and geared with the driving mechanism. Motion is transmitted from the driving-shaft to each of the comb-wheels by a pair of intermeshing gear-wheels g' g^2, secured, respectively, to the driving-shaft and the comb-wheel shaft. The comb-wheels can be adjusted lengthwise of their shafts for adapting the same to sheets of different widths, and, if desired, several comb-wheels may be mounted on each of the comb-wheel shafts.

H represents a counter-shaft which drives the mechanism whereby the comb-wheels are lowered into an operative position and raised into an inoperative position. This shaft is arranged transversely over the front portion of the pile and rotates once in the direction of the arrow, Fig. 1, during each cycle of operations of the printing-press or other machine to which the sheets are fed.

h h represent two cams secured to the counter-shaft and engaging with the under side of the front ends of rock-arms h' h', which are secured at their rear ends to the supporting-sleeves f^3 of the comb-wheels, respectively. The cams *h* are so shaped and timed that when the delivery-rollers are raised and ready for receiving a sheet the rock-arms h' h' drop from the high to the low parts of the cams *h*, thereby lowering the comb-wheels upon the pile and causing them to separate or comb the upper sheets of the pile forwardly, while when the upper delivery-rollers are lowered upon the lower delivery-rollers the cams *h* lift the arms h' and the comb-wheels connected therewith, thereby arresting the combing or separating action of the comb-wheels.

The comb-wheels are provided with shifting devices, whereby the wheels are elevated into an inoperative position in advance of the lifting action of the cams *h* when the front edge of the top sheet reaches the delivery-rollers before the upper delivery-rollers descend. One of these shifting devices is provided for each comb-wheel for elevating the same into an inoperative position independent of the other comb-wheel when the front edge of the respective side of the sheet reaches the delivery-rollers, thereby permitting the other comb-wheel to continue combing or separating the other side of the pile until the trailing side of the sheet has also been fed with its front edge to the delivery-rollers, whereby the top sheet is alined before being carried from the pile by the delivery-rollers. Each of these shifting devices is constructed as follows:

I I′ represent two bevel gear-wheels which are mounted on the counter-shaft with their teeth facing each other, and *i* is a planet bevel gear-wheel which is arranged between the wheels I I′ and meshes with both. The gear-wheel I is secured to the counter-shaft, while the gear-wheel I′ is mounted loosely thereon. The planet-wheel *i* is arranged with its axis radially to the gear-wheels I I′ and journaled on a depending planet-arm *i′*, which is hung loosely on the counter-shaft.

k is a link which is connected at its front end to the planet-arm *i′* and at its rear end to a depending arm *k′*, secured to the comb-wheel-supporting sleeve f^3 on the same side of the machine.

L represents a ratchet or stop wheel mounted loosely on the counter-shaft adjacent to the back of the bevel gear-wheel I′ and secured to the latter, so as to turn therewith. When the comb-wheel is in its lowered or operative position, the ratchet-wheel is free and is turned in a direction opposite to that of the rotation of the counter-shaft by the planet-wheel *i*, which transmits the rotary movement of the bevel gear-wheel I, fixed on the counter-shaft, to the bevel gear-wheel I′, which is mounted loosely on the shaft, together with the ratchet-wheel. While the ratchet-wheel is turning in this direction, the axis of the planet-wheel is not shifted and the planet-arm remains in the pendent position shown in Figs. 1 and 8. Upon stopping the rotation of the ratchet-wheel it acts as an abutment for the planet-wheel and causes the latter to be rolled circumferentially in the direction of the arrow, Figs. 1 and 8, around the bevel gear-wheel I′ by the rotation of the bevel gear-wheel I. This bodily movement of the planet-wheel causes the planet-arm connected therewith to be moved forward slowly at one-half the speed of the counter-shaft, thereby producing a forward pull on the rod *k* and turning the supporting-sleeve f^3 in the direction for lifting the comb-wheel from the pile, as shown in Fig. 2, and stopping its feeding operation. Upon releasing the ratchet-wheel the comb-wheel drops upon the pile by its weight, and this movement causes the rod *k* to move the planet arm and wheel back to the initial pendent position.

M represents a trip pawl or lever, which is shifted by the movement of the top sheet for arresting the operation of the comb-wheel. This pawl is pivoted to a hanger M′, secured to a transverse rod *m*, and consists of an upper arm *m′*, which is adapted to engage with the toothed periphery of the ratchet-wheel, and a lower forwardly-inclined arm m^2, which

projects downwardly into a recess m^5, formed in the top of the feed-board below the path of the sheets passing to the delivery-rollers. When the comb-wheel is in its lower position, the trip-pawl projects with its lower arm m^2 into the recess m^5 in the feed-board, and its upper arm m' is disengaged from the ratchet-wheel, as represented in Fig. 1. The trip-pawl is held in this position by the preponderating weight of its lower arm. While the trip-pawl is in this position, the ratchet-wheel is free to be turned by the planet-wheel and the comb-wheel remains in its lower position and combs and feeds the top sheet forwardly beyond the next lower sheet. The front edge of the top sheet as it passes between the delivery-rollers engages with the lower arm of the trip-pawl and lifts the same out of the recess m^5, thereby moving the upper arm thereof into engagement with the ratchet-wheel, whereby the rotary movement of the latter is arrested and the comb-wheel is raised into an inoperative position for stopping the feeding and separating action of the comb-wheel in the manner before described.

The cam h, by which the comb-wheel is positively and regularly raised and lowered, is so constructed that it always engages with the rock-arm h' during the last portion of the upward movement of the latter, regardless of the fact whether the first portion of the upward movement of the arm h' was effected by the cam h or by the partial turning of the planet-arm, thereby relieving the trip-pawl from the pressure of the comb-wheel and connecting parts and transferring the same to the cam h. The trip-pawl is disengaged from the ratchet-wheel by a releasing-cam N, secured to the counter-shaft and engaging with a roller or projection n on the upper arm of the trip-pawl. The releasing-cam engages with the trip-pawl during the last portion of the upward movement of the rock-arm h', at which time the trip-pawl is relieved from the pressure of the comb-wheel, and its release from the ratchet-wheel can be effected easily. The comb-wheel is retained in its elevated position until the separated top sheet has been carried off the pile by the delivery-rollers and the upper delivery-rollers rise, at which time the cam h presents its receding or low portion to the rock-arm h', thereby permitting the comb-wheel to drop on the pile for separating and feeding the next top sheet to the delivery-rollers. The cam N is so constructed that it holds the trip-pawl out of engagement with the ratchet-wheel until the comb-wheel has been again lowered upon the pile by the cam h, thereby preventing the trip-pawl from being accidentally engaged with the ratchet-wheel, which would have the effect of shifting the planet-arm and connecting parts an abnormal distance and injuring the same.

In order to permit the upper arm of the trip-pawl to be disengaged from the ratchet-wheel while its lower arm is resting on the front portion of the top sheet, these arms are made separate and are loosely connected, so that the arms can move toward each other to a limited extent on one side of the pivot, but are prevented from moving toward each other on the opposite side of the pivot. For this purpose the arms of the trip-pawl are provided below the pivot with opposing shoulders o, which are yieldingly held in engagement by a spring o', arranged above the pivot and secured to one arm and bearing against the other arm of the trip-pawl. When the upper arm of the trip-pawl is moved forwardly by the releasing-cam N out of engagement with the ratchet-wheel while the lower arm thereof is resting on the sheet, the spring o' is strained, and when the sheet is carried away by the delivery-rollers, so as to uncover the recess in the feed-board, the lower arm of the trip-pawl is depressed into the recess, and its shoulder is engaged with that of the upper arm.

P P represent two pile-retaining fingers, whereby the lower sheets of the pile are held in place and prevented from being carried away with the top sheet by the delivery-rollers. These fingers are arranged above the rear portion of the pile, near the sides thereof, and bear with their front ends upon the pile in rear of the top sheet when the comb-wheels are raised, and the fingers rise from the pile when the comb-wheels rest upon the pile and separate the top sheets. Each of these fingers is provided at its rear end with a clamp p, whereby it is secured to a transverse supporting-sleeve p', and the sleeves of both fingers are mounted loosely on a transverse supporting-rod p^2, so as to be capable of turning independently thereon. Each of the pile-retaining fingers is operated in unison with the comb-wheel on the same side of the machine by the following mechanism:

Q represents a longitudinal shifting rod which is connected at its rear end to a rock-arm q, depending from the supporting-sleeve p'.

q' is an upright rock-arm secured to the supporting-sleeve f^3 and provided at its upper end with a vertically-swiveling sleeve q^2, which receives the front portion of the shifting rod.

q^3 q^4 represent collars secured adjustably to the shifting rod in front and in rear of the upright rock-arm q'. The swiveling sleeve of the latter is yieldingly held in engagement with the front collar q^3 by a spring q^5, surrounding the shifting rod and interposed between the swiveling sleeve and the rear collar q^4. Upon turning the supporting-sleeve f^3 in the direction for raising the comb-wheel the upright arm q' moves rearwardly and turns the supporting-sleeve of the finger P in the proper direction for lowering the finger upon the pile. Upon reversing the movement of the supporting-sleeve f^3 the comb-wheel is lowered upon the pile and the retaining-finger is raised therefrom. The backward

movement of the upright arm q' is such that the retaining-finger strikes the pile before the upright arm completes its backward movement, whereby the spring q^5 is strained during the last portion of this movement. During the first portion of the forward movement of the upright arm the latter moves independent of the retaining-finger and shifting rod until the arm engages with the front collar q^8, when the retaining-finger is raised from the pile during the last portion of the forward movement of the upright arm. By this means the retaining-finger is lowered upon the pile during the first portion of the upward movement of the comb-wheel and held down on the pile until the last portion of the downward movement of the comb-wheel, thereby preventing displacement of the uppermost sheets of the pile.

The pile-retaining fingers can be shifted on their supporting-sleeves for adjusting them transversely to sheets of different widths. For the purpose of permitting the pile-retaining fingers to be adjusted to sheets of different lengths the transverse rod p^2, supporting the fingers, is made adjustable lengthwise of the machine. This adjustment is effected by means of two gear-pinions r r, mounted near opposite ends of the supporting-rod p^2 and meshing with longitudinal gear-racks r' r', arranged on the inner sides of the side frames. Upon turning the supporting-rod in either direction it is compelled to move bodily backward or forward by reason of its pinions rolling over the racks. The pinions are held in mesh with the racks by extending the ends of the supporting-rod through horizontal slots r^2 r^2 in the side frames, and the supporting-rod is held in its adjusted position by any suitable means—for instance, by a clamping screw-nut r^3, arranged upon the screw-threaded end of the supporting-rod and bearing against the outer side of the adjacent side piece. When the rod supporting the pile-retaining fingers is adjusted backward or forward, the collars q^3 q^4 are correspondingly adjusted on the rod Q.

It has been found in practice that thin sheets of paper respond more readily to the feeding and separating action of the comb-wheels than thick sheets of paper. This causes thin sheets to be combed out farther than thick sheets by the same number of turns of the comb-wheels. In order to adapt the machine for feeding sheets of paper of different thicknesses, the pile-supporting table is made longitudinally movable on its supporting-frame, so that the pile of sheets can be adjusted toward and from the delivery-rollers. This adjustment is effected by means of a transverse shaft s, journaled in the table-supporting frame and provided with gear-pinions s' s', meshing with longitudinal gear-racks s^2 s^2 on the under side of the pile-supporting table, and a crank-shaft s^3, journaled on the pile-supporting frame and provided with a worm s^4, meshing with a worm-wheel s^5 on the shaft s. When feeding thick paper, the pile-table is moved forwardly, so that a given number of turns of the comb-wheels will carry the sheets from the pile to the delivery-rollers. When feeding thin paper, the pile-table is moved rearwardly, so that the same number of turns of the comb-wheels will not feed the sheets too rapidly to the delivery-rollers.

The upper portion of each front paper-guide D passes through a bracket t, secured to the front end of the pile-table, and the lower end of this guide is provided with a horizontal slotted foot t', which receives a screw t^2, secured to the frame. This means of supporting the front guide always retains the latter in its proper position with reference to the pile-table and also permits the latter to move vertically for feeding the pile to the comb-wheels and also lengthwise for adjusting the table to the kind of paper which is to be fed.

The operation of my improved paper-feeding machine, briefly stated, is as follows: When starting to feed from the top of an uncombed or new pile of sheets, the front edges of the sheets may be so far from the delivery-rollers that the comb-wheels descend several times upon the pile before the upper sheets of the pile have been combed out sufficiently to carry the top sheet to the delivery-rollers. During this operation the cams h h drop the comb-wheels upon the pile when the upper delivery-rollers rise and raise the comb-wheels when these rollers descend. When no sheet has been carried to the delivery-rollers before the upper delivery-rollers descend, the comb-wheels are raised solely by the cams h without the aid of the variable lifting mechanisms which are controlled by the trip-pawls and sheet. The upper portion of the pile is thus combed out intermittently until the top sheet reaches the delivery-rollers, when the normal operation of the machine begins and the uppermost sheets are thereafter fed successively to the delivery-rollers. As the top sheet is fed forwardly by the comb-wheels to the delivery-rollers the upper rollers are in their elevated position and the front edge of the advancing sheet engages under the lower arms of the trip-pawls and lifts the same, thereby engaging the upper arms thereof with the ratchet-wheels and effecting the lifting of the comb-wheels and the interruption of their feeding action in the manner hereinbefore described. If one side of the sheet reaches the delivery-rollers in advance of the other side, the trip-pawl on the advancing side of the sheet will be operated first and stop the operation of its companion comb-wheel, while the comb-wheel on the trailing side of the sheet will continue to operate until that side of the sheet also reaches the delivery-rollers, when the trip-pawl on the trailing side of the sheet will also arrest the operation of its companion comb-wheel. The upper delivery-rollers now drop upon the sheet resting on the lower rollers and remove the sheet from the pile. Just before the upper delivery-

rollers descend the cams *h h* engage under the arms *h' h'* and complete the lifting of the comb-wheels, thus relieving the trip-pawls from the pressure and permitting the trip-pawls to be easily disengaged from the ratchet-wheels by the cams N N. It will thus be seen that the lifting of the comb-wheel is always effected by the sheet-controlled lifting mechanism when a sheet is fed forward to the delivery-rollers, that the cam *h* of the positive lifting mechanism will then complete the lifting movement of the comb-wheel and will take the comb-wheel under control, thus relieving the sheet-controlled mechanism from the weight of the comb-wheel and connecting parts, and that the cam of the positive mechanism controls the lowering of the comb-wheel upon the pile. When no sheet is fed forward, the sheet-controlled mechanism does not act and the comb-wheel is raised and lowered solely by the positive mechanism until the sheet-controlled mechanism is called into action by the feeding of the sheet to the delivery-rollers.

While the preferred sheet separating and propelling mechanism is a rapidly-rotating comb-wheel, I do not wish to limit myself to the same, as other suitable or well-known sheet-separating mechanism may be substituted for such comb-wheel and can be raised and lowered by the above-described positive and sheet-controlled mechanisms.

I claim as my invention—

1. The combination with the feed-table supporting the pile of sheets, the sheet-separating mechanism, and the driving mechanism, of a movable ratchet member which is operated from the driving mechanism, a trip-pawl which is shifted by the movement of the sheet into engagement with the ratchet member for arresting the latter, and shifting mechanism which connects the sheet-separating mechanism with the driving mechanism and the ratchet member and whereby the sheet-separating mechanism is rendered inoperative when the movement of the ratchet member is arrested by the trip-pawl, substantially as set forth.

2. The combination with the feed-table supporting the pile of sheets, the sheet-separating mechanism, and the driving mechanism, of a movable ratchet member, a pinion geared with the ratchet member and the driving mechanism, a trip-pawl which is shifted by the movement of the sheet into engagement with the ratchet member for arresting the latter, and a shifting mechanism which connects said pinion with the sheet-separating mechanism and whereby the latter is rendered inoperative when the movement of the ratchet member is arrested by the trip-pawl, substantially as set forth.

3. The combination with the feed-table supporting the pile of sheets, the sheet-separating mechanism, and the driving mechanism, of a movable ratchet-wheel, a trip-pawl which is shifted by the movement of the sheet into engagement with the ratchet-wheel for stopping the latter, a planet-pinion meshing with a gear-wheel connected with the ratchet-wheel and with a gear-wheel connected with the driving mechanism, and a shifting mechanism which connects the planet-pinion with the sheet-separating mechanism and whereby the latter is rendered inoperative when the movement of the ratchet-wheel is arrested by the trip-pawl, substantially as set forth.

4. The combination with the feed-table supporting the pile of sheets, the comb-wheel whereby the sheets are separated, the rocking support which carries the comb-wheel and whereby the latter is lowered into an operative position on the pile or raised therefrom into an inoperative position, of a driven shaft arranged above the feed-table, a movable ratchet-wheel mounted loosely on said shaft, a trip-pawl which is shifted by the movement of the sheet into engagement with the ratchet-wheel for arresting the latter, a planet gear-pinion meshing on opposite sides with a gear-wheel secured to the ratchet-wheel and with a gear-wheel secured to said shaft, a rock-arm supporting the planet gear-pinion and mounted loosely on said shaft, and a rod connecting said arm with the rocking support of the comb-wheel, substantially as set forth.

5. The combination with the feed-table supporting the pile of sheets, the sheet-separating mechanism, and the driving mechanism, of a movable ratchet-wheel, a trip-pawl which is shifted by the movement of the sheet into engagement with the ratchet-wheel for stopping the latter, a planet-pinion meshing with a gear-wheel connected with the ratchet-wheel and with a gear-wheel connected with the driving mechanism, a shifting mechanism which connects the planet-pinion with the sheet-separating mechanism and whereby the latter is rendered inoperative when the ratchet-wheel is engaged by the trip-pawl, and a cam which is connected with the driving mechanism and whereby the trip-pawl is disengaged from the ratchet-wheel, substantially as set forth.

6. The combination with the feed-table which supports the pile of sheets, the sheet-separating mechanism, the feed-board which receives the sheets from the feed-table, and the driving mechanism, of a movable ratchet-wheel, a pinion meshing with a gear-wheel which is connected with the ratchet-wheel and with a gear-wheel which is connected with the driving mechanism, a shifting mechanism connecting the pinion with the sheet-separating mechanism, a pivoted trip-pawl consisting of two loosely-connected arms, the lower one of which is arranged over the feed-board and the upper one of which is adapted to be engaged with the ratchet-wheel by the movement of the sheet against the lower arm, coöperating shoulders arranged on the arms of the trip-pawl on the lower side of its pivot, a spring whereby the arms are turned so that

their shoulders engage, and a cam connected with the driving mechanism and adapted to disengage the upper arm of the trip-pawl from the ratchet-wheel, substantially as set forth.

7. The combination with a feed-table, a comb-wheel capable of being raised and lowered and the driven shaft, of a ratchet-wheel which is operated by said shaft, a sheet-controlled pawl which is engaged with said ratchet-wheel and stops the same when a sheet is fed forward, a lifting mechanism whereby the comb-wheel is raised by the stopping of said ratchet-wheel, and a lifting-cam whereby the comb-wheel is raised and lowered, substantially as set forth.

8. The combination with a feed-table, a comb-wheel capable of being raised and lowered, and the driven shaft, of a ratchet-wheel which is operated by said shaft, a sheet-controlled pawl which is engaged with said ratchet-wheel and stops the same when a sheet is fed forward, a lifting mechanism whereby the comb-wheel is raised by the stopping of said ratchet-wheel, a lifting-cam whereby the comb-wheel is raised and lowered, and a cam whereby said pawl is disengaged from said ratchet-wheel when the lifting-cam has taken control of the comb-wheel, substantially as set forth.

9. The combination with the feed-table supporting the pile of sheets, the comb-wheel whereby the sheets are separated, the rocking support which carries the comb-wheel and whereby the latter is lowered into an operative position and raised into an inoperative position, of a driven shaft, a cam secured to said shaft and engaging with an arm which is connected with said rocking support, a ratchet-wheel mounted loosely on said shaft a trip-pawl which is moved by the sheet into engagement with the ratchet-wheel for arresting the latter, a pinion meshing with a gear-wheel secured to the ratchet-wheel and with a gear-wheel secured to said shaft, an arm supporting said pinion and connected with said rocking support, and a cam secured to said shaft and adapted to disengage the trip-pawl from the ratchet-wheel, substantially as set forth.

10. The combination with the feed-table supporting the pile of sheets, of a sheet-separating comb-wheel, a rocking support carrying said comb-wheel, a rocking pile-retaining finger movable toward and from the rear portion of the pile, and intermediate mechanism which connects the support of the comb-wheel with the pile-retaining finger and whereby said wheel and finger are moved toward and from the pile alternately, substantially as set forth.

11. The combination with the feed-table supporting the pile of sheets, of a sheet-separating comb-wheel movable toward and from the pile, a rocking support carrying said wheel and provided with an upright arm, a pile-retaining finger movable toward and from the pile, a rocking support carrying said finger and provided with a depending arm, a rod connected at one end with said depending arm and passing with its opposite end through a sleeve on said upright arm, a collar or shoulder arranged on the connecting-rod and bearing against the front side of said sleeve, and a spring mounted on the rod and bearing against the rear side of said sleeve, substantially as set forth.

12. The combination with the main frame and the feed-table supporting the pile of sheets, of a sheet-separating comb-wheel movable toward and from the pile, a rocking sleeve carrying the comb-wheel, a pile-retaining finger movable toward and from the pile and secured to a rocking sleeve, intermediate mechanism which connects said rocking sleeves and which causes the comb-wheel and pile-retaining finger to move alternately toward and from the pile, a supporting-rod carrying the rock-sleeve of the pile-retaining finger, and gear-pinions which are mounted on said rod and mesh with gear-racks on the frame, whereby upon turning the rod, the pile-retaining finger may be adjusted backward or forward, substantially as set forth.

13. The combination with the feed-table supporting the pile of sheets, of a separating mechanism whereby the sheets on the upper portion of the pile are combed out or separated, a sheet-delivery mechanism which is arranged in front of the pile and whereby the sheets are carried from the pile, an adjusting device whereby the feed-table may be moved lengthwise toward or from the sheet-delivery mechanism, and front pile-guides arranged vertically in front of the table and adjustable lengthwise of the machine together with the table, substantially as set forth.

14. The combination with a vertically-movable frame and the feed-table capable of longitudinal movement on said frame and supporting a pile of sheets, of a comb-wheel whereby the uppermost sheets of the pile are successively separated, delivery-rollers which are arranged in front of the pile and which carry the sheets from the pile, a transverse shaft journaled in said frame and provided with gear-pinions which mesh with gear-racks on said table, and an adjusting-shaft journaled on said frame and provided with a worm which meshes with a worm-wheel on the transverse shaft, substantially as set forth.

Witness my hand this 25th day of March, 1899.

FRANK L. CROSS.

Witnesses:
FRANK H. HINCKLEY,
FRANK SMITH.