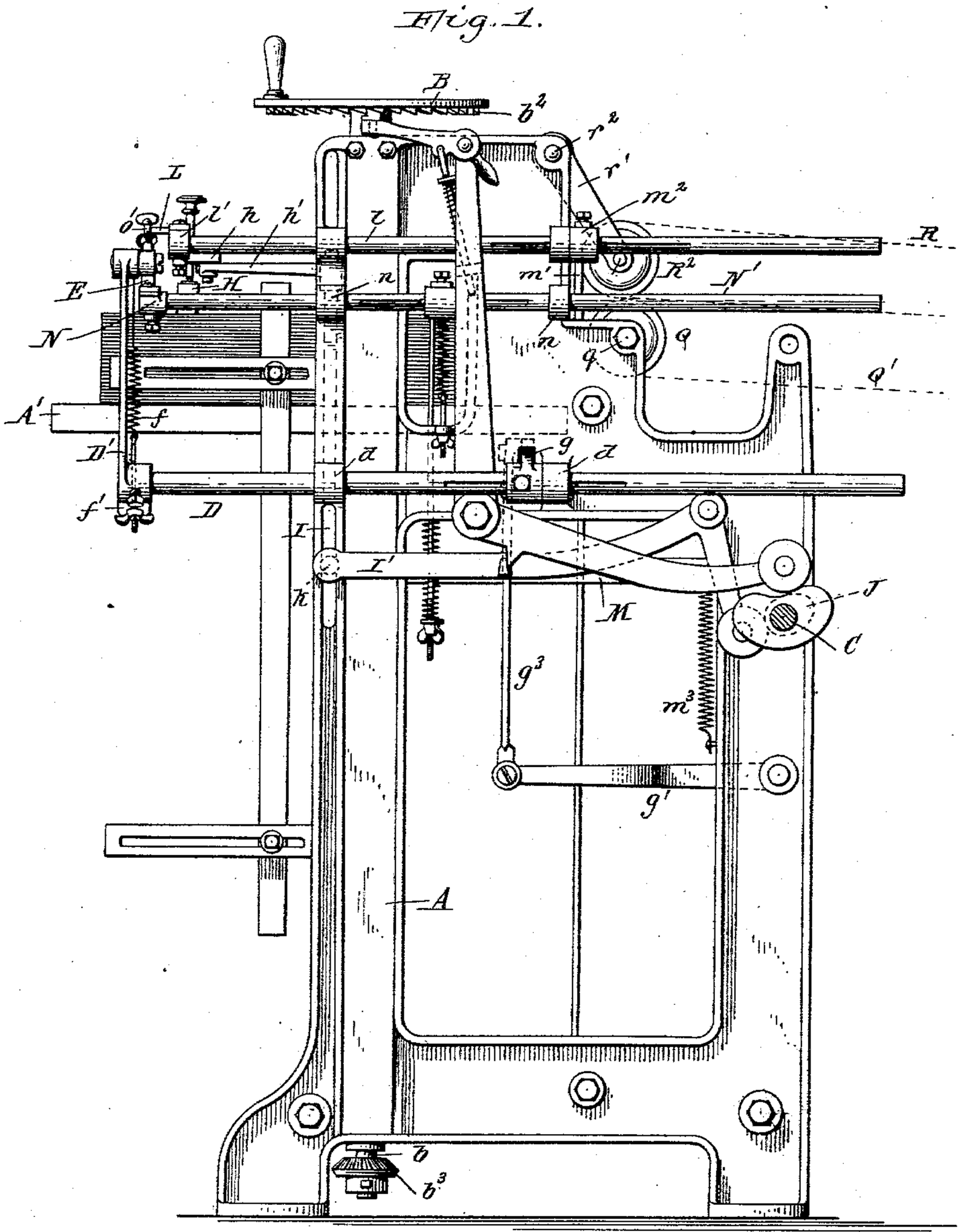
(No Model.) 5 Sheets—Sheet 1.

W. WOMERSLEY.

PAPER FEEDING MACHINE.

No. 434,649. Patented Aug. 19, 1890.

Fig. 1.



Witnesses:
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Attorney.

(No Model.) 5 Sheets—Sheet 2.

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PAPER FEEDING MACHINE.

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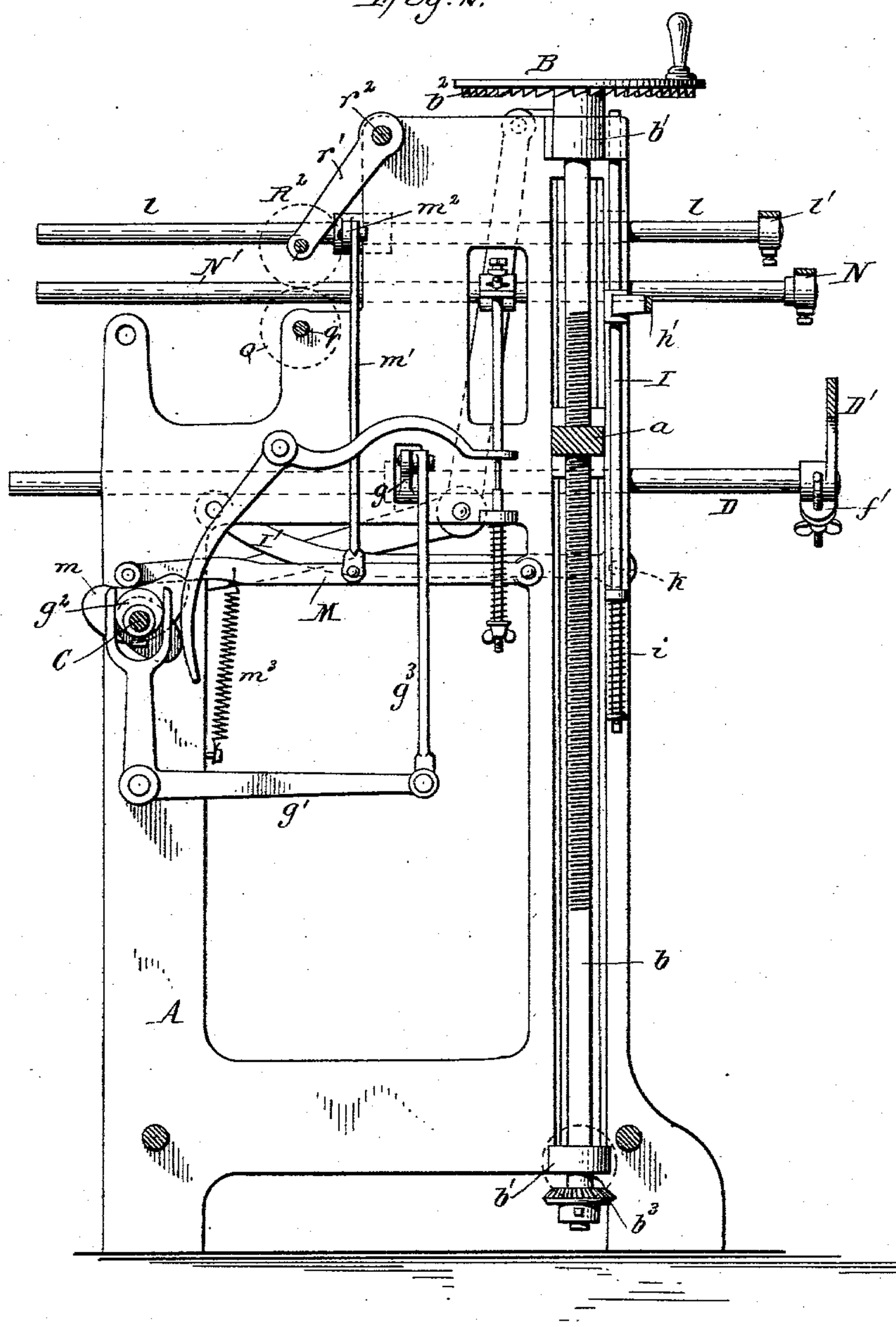
Fig. 2.



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(No Model.) 5 Sheets—Sheet 3.

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Fig. 3.

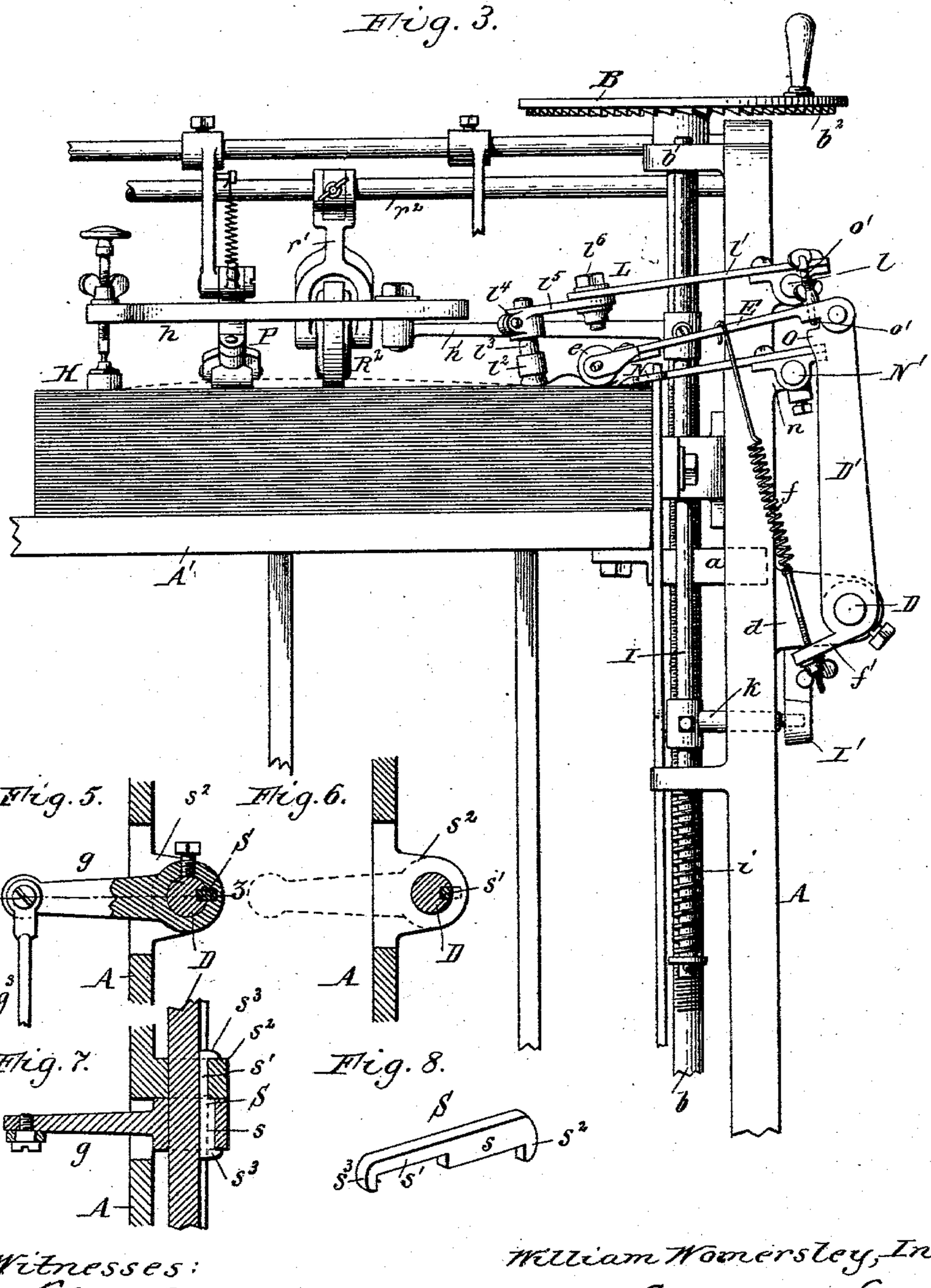

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

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(No Model.)

5 Sheets—Sheet 4

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PAPER FEEDING MACHINE.

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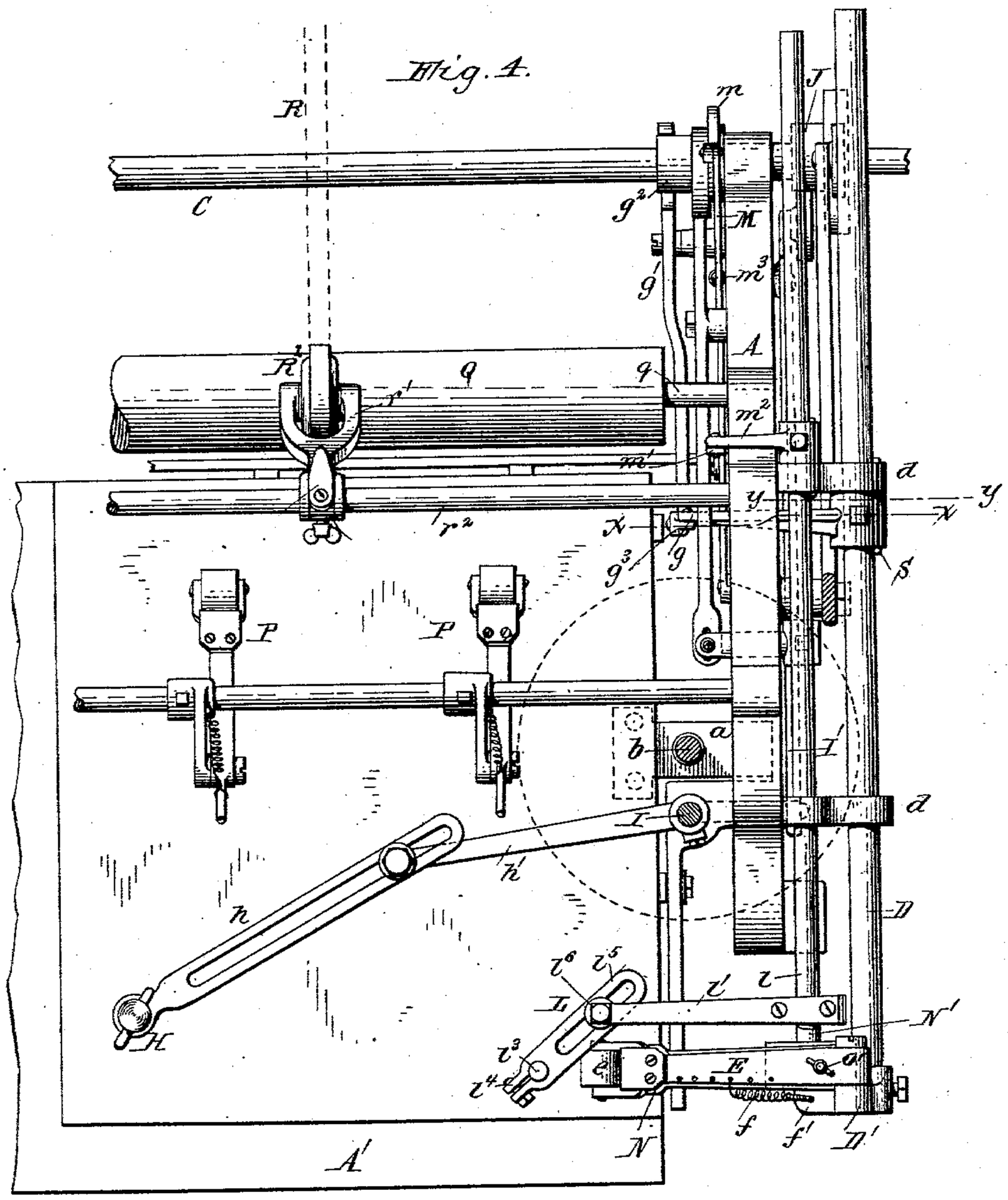
Fig. 4.



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(No Model.) 5 Sheets—Sheet 5.

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PAPER FEEDING MACHINE.

No. 434,649. Patented Aug. 19, 1890

Fig. 9.

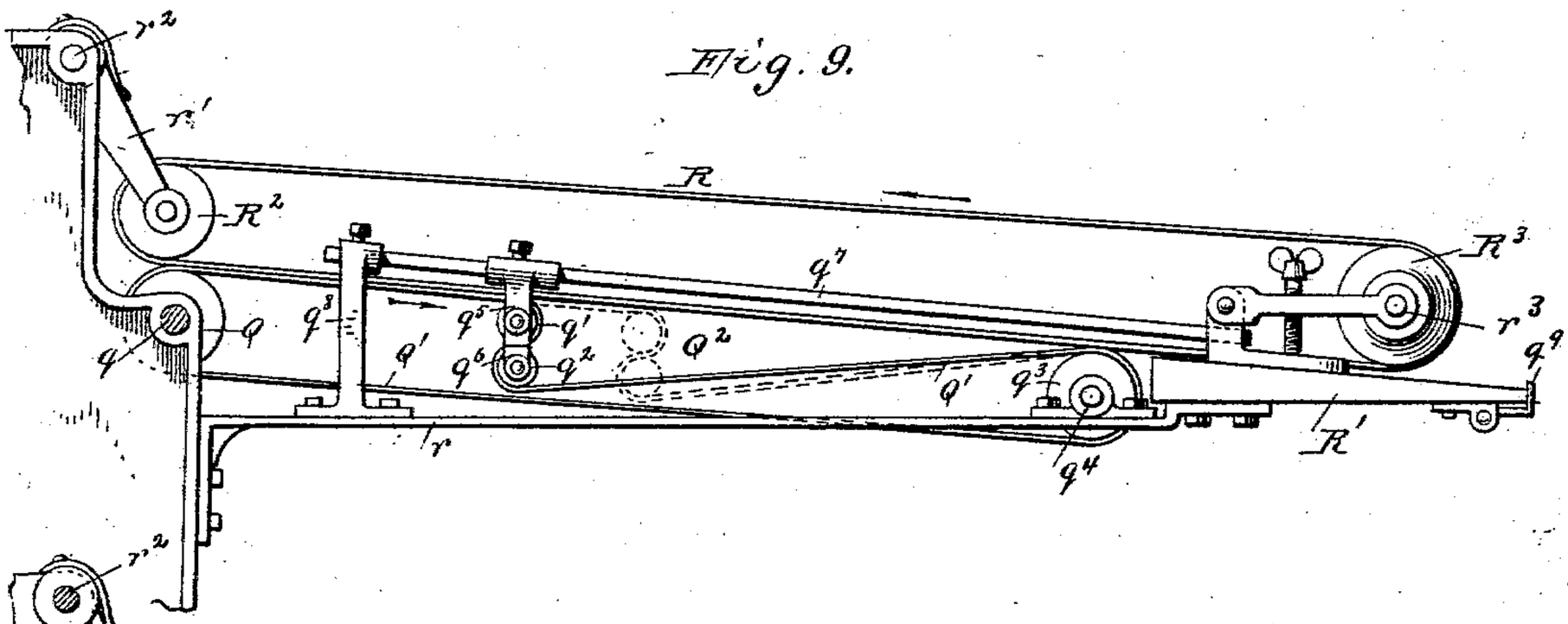


Fig. 10.

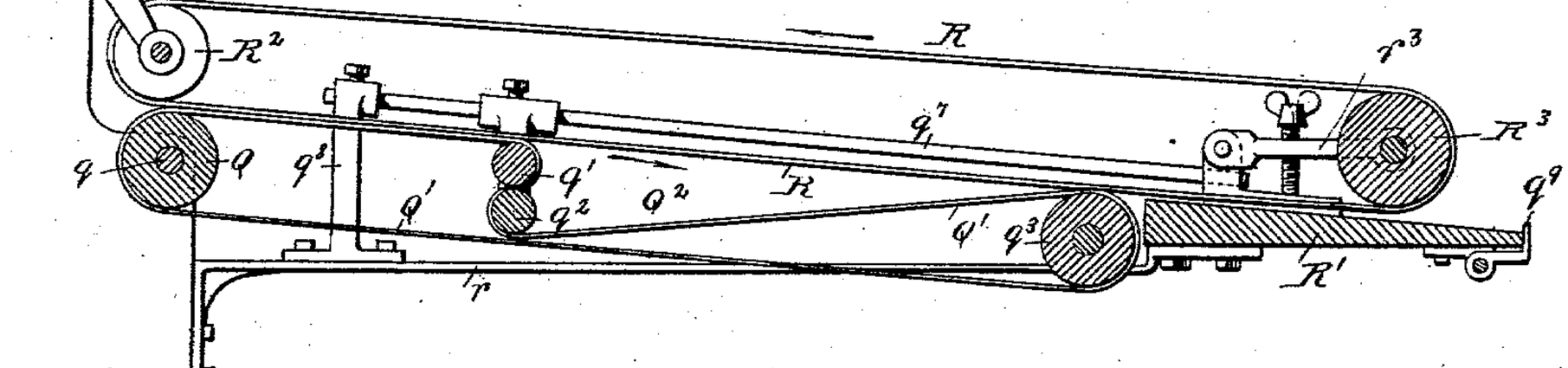
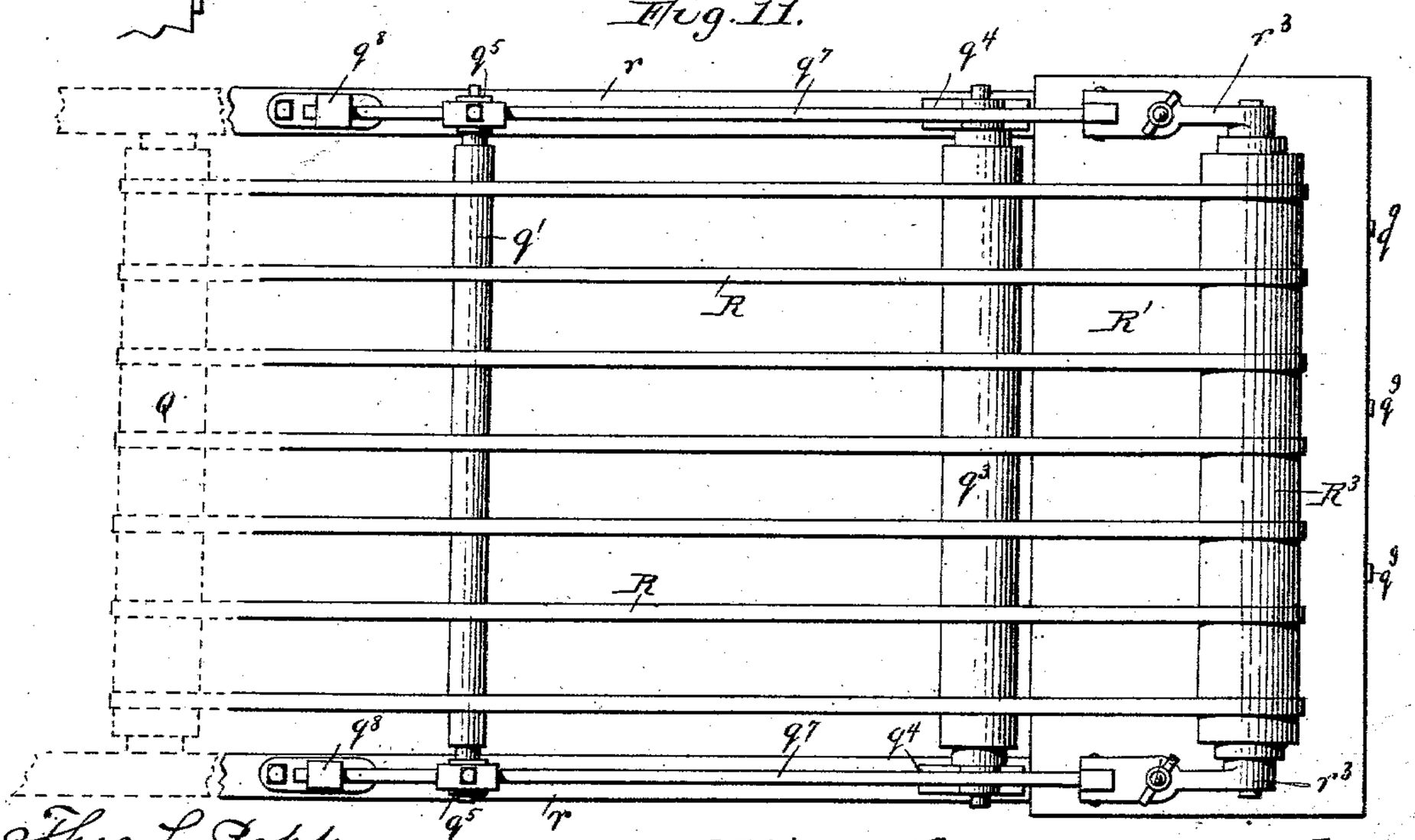


Fig. 11.



Witnesses.
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William Womersley, Inventor.
By Edward Wilhelm Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM WOMERSLEY, OF POUGHKEEPSIE, ASSIGNOR TO D. H. BURRELL & CO., OF LITTLE FALLS, NEW YORK.

PAPER-FEEDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 434,649, dated August 19, 1890.

Application filed September 25, 1889. Serial No. 325,061. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WOMERSLEY, a citizen of the United States, residing at Poughkeepsie, in the county of Dutchess and State of New York, have invented a new and useful Improvement in Paper-Feeding Machines, of which the following is a specification.

This invention relates to paper-feeding machines by which sheets of paper are successively fed from a pile to a printing-press, ruling, folding, or other machine, and which have a buckling device for loosening or separating the top sheet from the pile, feed-fingers for removing the separated sheet and delivering it to the carrying-tapes or other devices whereby the sheet is conveyed to the printing-press or other machine, and a holding-down finger for retaining the pile of paper in place while the top sheet is being removed therefrom.

It has been found in practice that by placing the point of resistance or stop against which the sheets are buckled closely to the buckling-finger, and thus buckling the sheets over a small portion of their surface, the liability of separating more than one sheet from the pile at a time is avoided and a positive separation is insured; but while a short buckling of the sheet renders the separation positive, it does not separate a sufficient portion of the sheet from the pile to enable the feed-fingers to freely remove the separated sheet from the pile. On the other hand, by placing the resistance point or stop at a considerable distance from the buckling-finger, so as to produce a long buckling of the sheet, a sufficient portion of the sheet is separated, but the large space between the points at which the point of resistance and buckling-finger press upon the pile of paper leaves the portion of the pile in this space loose, and thereby increases the liability of buckling and separating several sheets at a time.

The object of my invention is to insure a positive buckling of a single sheet at a time and to separate the sheet over a sufficient distance to avoid removing more than one sheet from the pile at a time.

The invention consists to that end of devices which produce, first, a short positive buckling of the sheet, and then a longer buckling thereof, as will be hereinafter fully described, and pointed out in the claims.

In the accompanying drawings, consisting of five sheets, Figure 1 is a side elevation of my improved paper-feeding machine. Fig. 2 is a sectional elevation of the machine, looking from the side opposite to that shown in Fig. 1. Fig. 3 is a fragmentary front elevation of the machine on an enlarged scale. Fig. 4 is a top plan view of the buckling and feeding devices and their actuating mechanism. Figs. 5 and 6 are vertical sections, on an enlarged scale, in lines *x x* and *y y*, Fig. 4. Fig. 7 is a horizontal section in line *z z*, Fig. 5. Fig. 8 is a perspective view of the key or feather whereby the actuating rock-shaft of the buckling-finger and the actuating-arm of said shaft are secured together. Fig. 9 is a side elevation of the tape mechanism. Fig. 10 is a longitudinal sectional elevation of the same. Fig. 11 is a fragmentary top plan view of the same.

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

A A represent the side frames of the machine.

A′ is the vertically-movable feed-table upon which the pile of paper is placed, and which is provided with laterally-projecting screw-nuts *a*, which are guided in upright ways or grooves on the inner sides of the side frames.

b represents the vertical feed-screws, which work in the screw-nuts *a* of the feed-table, and which are held against lengthwise movement in bearings *b′*, arranged on the side frame.

B represents a hand-wheel secured to the upper end of one of the feed-screws and provided on its under side with a ratchet-rim b^2. The feed-screws are provided at their lower ends with bevel-wheels b^3, and are connected by a horizontal shaft having bevel-wheels which mesh with the wheels of the feed-screws, so as to actuate both feed-screws simultaneously. The mechanism for operating these feed-screws, so as to automatically raise the

feed-table as the sheets are fed from the pile, is described in Letters Patent of the United States, Serial No. 336,070, dated February 9, 1886, to which reference is made for a complete description of such mechanism.

C represents the transverse horizontal driving-shaft supported in bearings in the side frames.

D represents a horizontal rock-shaft arranged at right angles to the driving-shaft C, and supported in bearings *d*, formed on one of the side frames A, and D′ is a rock-arm mounted on said rock-shaft.

E represents the buckling-finger pivoted to the upper end of the rock-arm D′, and provided at its free end with a buckling-roller *e*, which rests upon the pile of paper. This roller is preferably journaled in the bifurcated front end of the buckling-finger in such manner that it is held against turning during the advancing stroke of the buckling-finger, so as to buckle the paper, and allowed to revolve and roll over the paper during the backward stroke of the buckling-finger. The buckling-finger is yieldingly held down upon the pile of paper by a spiral spring *f*, secured at its upper end to the buckling-finger and at its lower end to an inward projection *f′* of the rock-arm D′. As represented in Fig. 2, the rock-shaft D is actuated from the main shaft C by an actuating-arm *g* secured to the shaft and projecting through an opening in the adjacent side frame, a bell-crank lever *g′* embracing with its forked arm a cam g^2 on the main shaft, and a connecting-rod g^3 connecting the actuating-arm of the rock-shaft with the other arm of said bell-crank lever.

H represents the usual gage or foot which rests upon the pile of paper and serves the double function of regulating the upward feed motion of the table A′ and acting as a main holding-down finger against which the top sheet is buckled. This main holding-down finger is arranged at a comparatively long distance from the buckling-finger and at least the distance of the stroke of the buckling-finger therefrom. It is attached to a slotted horizontal arm *h*, which is adjustably secured to an inwardly-projecting arm *h′*, so that the foot can be adjusted toward and from the buckling-finger. The carrying-arm *h′* is secured to a vertically-movable rod I, which is held in a depressed position by a spiral spring *i*, as clearly represented in Fig. 3. The rod I, with the carrying-arms *h h′*, and the main holding-down finger are lifted by an elbow-lever I′, pivoted to the side frame and engaging with its short arm against a cam J, secured to the main shaft and attached with its long arm to a pin *k*, secured to the vertically-movable rod. The cam J is so formed that the main holding-down finger H is lifted from the pile of paper to release the top sheet when the latter is ready to be seized by the feeding devices. The holding-down finger is connected with the feed mechanism by which the pile-supporting table is raised, as described and shown in Letters Patent No. 336,070, already referred to, or in any other suitable manner.

L represents an auxiliary holding-down finger arranged a short distance in front of the buckling-finger, between the latter and the main holding-down finger H, and against which the top sheet is buckled by the initial portion of the forward stroke of the buckling-finger before it is buckled against the main holding-down finger beyond. This auxiliary holding-down finger has a vertical movement toward and from the surface of the pile of paper, and is provided with actuating mechanism whereby it is lifted from the top sheet just before the buckling-finger reaches it, so as to make room for the advancing buckling-finger and release the sheet between the buckling-finger and the main holding-down finger and cause the sheet to be buckled and separated over the entire distance from the buckling-finger to the main holding-down finger.

l is a transverse horizontal rock-shaft arranged above the rock-shaft D and journaled in bearings formed on the adjacent side frame of the machine, and *l′* is a rock-arm mounted on said shaft and which carries the auxiliary holding-down finger. The latter preferably consists of a block of rubber or other elastic material seated in a socket l^2, having a shank l^3, which is clamped in a split collar l^4, arranged at the front end of an adjustable arm l^5. This arm is secured to the outer end of the rock-arm *l′* by a clamping-bolt l^6, secured to the rock-arm and passing through a longitudinal slot in the adjustable arm. Upon loosening the clamping-bolt l^6 the auxiliary holding-down finger may be adjusted with reference to the buckling-finger, and after the adjustment has been made the bolt is again tightened. A rocking motion is imparted to the rock-shaft *l* in one direction by a lever M pivoted at its inner end to the side frame and bearing with its free outer end upon a cam *m*, mounted on the main shaft C, and a rod *m′*, connecting the lever with an actuating-arm m^2, secured to the rock-shaft *l*, as represented in Fig. 2. The shaft is rocked in the opposite direction by a spring m^3, attached at its lower end to the side frame and at its upper end to the lever M. The auxiliary holding-down finger is pressed upon the top sheet by the spring and lifted therefrom by the cam *m*, thereby giving the finger a yielding pressure upon the paper and a positive upward movement away from the paper.

N represents the usual vertically-movable pile-retaining finger, which bears upon the corner of the pile of paper in rear of the buckling device and holds the pile in place while the top sheet is being removed. This pile-retaining finger is secured at its inner end to a horizontal rock-shaft N′, arranged between the rock-shafts D and *l*, and mounted in bearings *n*, formed on the adjacent side

frame. The rock-shaft of the retaining-finger is actuated from the main shaft C, as described and shown in the aforesaid Letters Patent No. 336,070, or in any other suitable manner, so that the retaining-finger is lifted to permit the removal of the top sheet and pressed upon the paper immediately after the buckling-finger has withdrawn the top sheet from under the retaining-finger.

O represents an inwardly-projecting stop or nose formed at the upper end of the rock-arm of the buckling-finger, and o' is an adjustable stop or screw-stem arranged on the buckling-finger. The stop of the buckling-finger strikes the nose O before the buckling-roller in its return movement comes in contact with the serrated plate of the retaining-finger N, thereby lifting the buckling-finger above the pile during the last part of its stroke and holding its roller above said plate, so as not to disturb the position of the plate.

P P represent the feed-fingers, whereby the top sheet is moved from the pile to the tape mechanism.

Q represents the lower delivery-roller mounted on the shaft q and arranged at the rear end of the feed-table with its upper surface in line with the top of the pile, so as to receive the top sheet as the same is removed from the pile by the feed-fingers.

Q′ represents the lower carrying-tapes, which run around the roller Q, thence with their upper portions forwardly to and around an intermediate roller q', thence rearwardly and downwardly and around another intermediate roller q^2, which is arranged below the intermediate roller q', thence forwardly and obliquely upwardly to a roller q^3, which is arranged at the front end of the feed-board, and thence backwardly to the roller Q.

R represents the upper carrying-tapes, which are arranged above the lower tapes and run with their lower portions over the lower tapes Q′. The upper and lower tapes run in contact with each other along the upper portions of the lower tapes, between the roller Q and the upper intermediate roller q', and also over the rear roller q^3, while the upper and lower tapes are out of contact between the upper intermediate roller q' and the rear roller q^3 by reason of the depression of the lower tapes between the rollers q^2 and q^3. The upper tapes run around the wheels R^2, which are arranged over the lower delivery-roller Q, and thence forwardly and around a roller R^3, which is arranged near the delivery end of the feed-board R′. The latter is supported on the printing-press or any other suitable frame, and is connected with the paper-feeder by means of horizontal bars $r\,r$. The wheels R^2 are journaled in arms r', which are mounted on a transverse rod r^2 in the usual way. The roller R^3, around which the delivery portions of the upper tapes run, is journaled in bearings r^3, which are adjustably secured to the feed-board R′. The rear roller q^3, around which the delivery portions of the lower tapes run, is journaled in bearings q^4, secured to the receiving end of the feed-board. The intermediate rollers q' q^2 are journaled in bearings q^5 q^6, adjustably supported upon inclined longitudinal rods q^7, arranged on each side of the tape mechanism. The rods q^7 are supported at their front ends on the bars $r\,r$ by standards q^8, and at their rear ends on the feed-board. The intermediate rollers are capable of longitudinal adjustment on the rods q^7, so that the distance from the lower roller q^2 to the front guides q^9 at the rear end of the feed-board can be adjusted with reference to the length of the sheet of paper which is fed to the press. The intermediate rollers q' q^2 are placed in such a position that when the front edge of the sheet rests against the front guides q^9 the rear edge of the sheet has cleared the intermediate rollers and dropped into the pocket or space Q^2 above the depressed portions of the lower tapes, whereby the sheet is to a large extent relieved or withdrawn from the carrying action of the tapes and permitted to be squarely registered before it is fed out. The sheet after dropping into the space Q^2 is carried forward by the slight friction between the lower tapes and the sheet and between the sheet and the upper tapes above the roller q^3 until it strikes squarely against all of the front guides q^9. After the sheet is aligned it is carried away by the nippers of the printing-press or other machine.

The uppermost surfaces of the rollers Q q' q^3 of the lower tapes and the incline of the feed-board are arranged in line, so as to maintain the upper portion of the lower tapes parallel with the lower portion of the upper tapes running in contact therewith. This alignment is effected by inclining the rods q^7 supporting the intermediate rollers q' q^2, so as to be parallel with the line of contact between the upper and lower tapes, which enables the rollers q' q^2 to be freely adjusted longitudinally to conform to the size of the sheet which is being fed to the press and at the same time maintain the proper adjustment of the tapes with reference to each other.

The several rock-shafts carrying the buckling-finger, the pile-retaining finger, and the auxiliary holding-down finger are made lengthwise adjustable in their bearings, so that the position of the buckling and holding devices may be adjusted in accordance with the size of the sheets of paper to be fed. To accomplish this adjustment and at the same time prevent the rock-arms of the shafts from turning on the shafts, a feather or key S, of the form represented in Fig. 8, is employed for connecting the parts. The shaft is provided with a longitudinal groove or feather way, as represented in Figs. 5, 6, and 7, and the hub of its rock-arm is provided in its bore with a similar groove. The key S consists of a wide portion s, which is seated in the grooves of the rock-arm and shaft, so as to compel the arm and shaft to turn together, and a reduced extension or shank s', which extends through

the smooth ungrooved bearing s^2 of the shaft and is seated wholly in the groove of the shaft, so as to allow the shaft to turn in its bearing. The key is provided at both ends with hooks or lips s^3, which bear, respectively, against the outer ends of the bearing of the shaft and the hub of the rock-arm, so as to prevent the key from slipping out of place in sliding the shaft lengthwise in its bearings. This construction forms a simple and convenient fastening which permits the shaft to be freely adjusted lengthwise and to turn in its bearings, while compelling the shaft to turn with the rock-arm or the arm with the shaft. The parts are connected together by placing the key in the rock-arm and shaft-bearing before inserting the shaft and then passing the shaft through the bearing and the hub of the arm by bringing its groove into register with the key. All of the several rock-arms and shafts are connected together in this manner. After being adjusted, the shafts are secured in position by set-screws arranged in the rock-arms.

The operation of my improved machine is as follows: The pile of paper being placed upon the feed-table and the latter being raised to the proper height, the retaining-finger N, buckling-finger E, main and auxiliary holding-down fingers H L, and feed-fingers P all rest upon the top sheet. The forward movement of the buckling-finger E draws the corner of the top sheet from under the pile-retaining finger N and buckles the corner of the sheet against the auxiliary holding-down finger L, thereby forming a comparatively short buckle in the paper and positively loosening and separating only the top sheet from the pile. Just before the buckling-finger in its forward movement reaches the auxiliary finger and before it approaches it sufficiently close to break the paper, the auxiliary finger is quickly raised from the top sheet, thereby releasing the top sheet between the buckling-finger and the main holding-down finger and allowing the former to pass beyond the auxiliary finger. The buckling-finger, continuing its advancing movement, buckles the partly-separated top sheet against the main holding-down finger and thus separates the sheet across the entire distance from the buckling-finger to the main holding-down finger. During the last portion of the forward stroke of the buckling-finger the pile-retaining finger is caused to press upon the corner of the pile and hold the same in place. After the sheet has been buckled and separated the main holding-down finger is lifted from the top sheet and the feed-fingers begin their forward movement, seize the sheet and present it to the roller and carrying-tapes which latter deliver it into the depression Q^2 of the lower tapes, in which the sheet rests momentarily until it is aligned and registered by suitable mechanism. While the sheet is so resting and being aligned, the next succeeding sheet is carried forward by the tapes and partly overlaps the sheet in the depression before the resting sheet is carried away by the nippers of the printing-press. As soon as the feed-fingers have completed their forward movement and removed the sheet from the pile, the main and auxiliary holding-down fingers are again lowered upon the pile of paper, and during the receding movement of the feeding-fingers the buckling-finger again advances and buckles the next top sheet, when the operation of separating and feeding the sheet is repeated, and so on until the sheets are all fed from the pile. It will thus be observed that by my improved manner of separating the sheets preparatory to feeding the same, the sheet is first buckled between two points which are so closely together as to insure a positive buckling of a single sheet at a time, and the buckle or bulge is then elongated or extended over a considerable portion of the sheet, so as to sufficiently separate it to enable the feed devices to easily remove the sheet from the top of the pile without liability of disturbing other sheets. This manner of buckling effectually prevents the simultaneous loosening or separating of the last two sheets of superposed reams, which is liable to happen when the sheets are separated by a single comparatively long buckling thereof, owing to the slight degree of adherence between the contiguous outside sheets of the adjacent reams. By allowing one sheet of paper to overlap the preceding sheet which is resting it permits the tape mechanism of the feeder to be considerably shortened.

I claim as my invention—

1. The combination, with a pile-supporting table, of a buckling-finger, an auxiliary holding-down finger arranged in front of the buckling-finger against which the sheet is first buckled, a main holding-down finger arranged beyond the auxiliary holding-down finger against which the sheet is buckled after the auxiliary finger has been raised, and a feed device whereby the separated sheet is removed from the pile, substantially as set forth.

2. The combination, with the pile-supporting table, of a buckling-finger moving across the pile, an auxiliary holding-down finger against which the sheet is first buckled and which has a vertical movement toward and from the pile, and a main holding-down finger arranged beyond the auxiliary holding-down finger and having a movement toward and from the pile, substantially as set forth.

3. The combination, with the stationary frame and the feed-table, of a buckling-finger, a main holding-down finger, a horizontal rock-shaft having a rock-arm, a carrying-arm attached to said rock-arm and having a clamping-collar, and an auxiliary finger attached to the carrying-arm and consisting of an elastic block seated in a socket secured in said clamping-collar, substantially as set forth.

4. The combination, with the stationary

frame, the main shaft having a cam, and the feed-table, of a buckling-finger, a main holding-down finger, a rock-shaft having an actuating-arm, an auxiliary holding-down finger arranged in front of said buckling-finger and mounted on said rock-shaft, an actuating-lever engaging against the cam of the main shaft and connected with the actuating-arm of the rock-shaft, whereby the latter is swung in one direction, and a spring whereby the shaft is swung in the opposite direction, substantially as set forth.

5. The combination, with the stationary frame and the feed-table, of a buckling-finger, a lengthwise-adjustable rock-shaft mounted in a bearing in the frame and having a groove or feather-way, a rock-arm mounted on said shaft carrying the buckling-finger and having a groove or feather-way in its hub, and a key or feather composed of a wide portion seated in the grooves of the shaft and rock-arm and a narrow portion seated in the shaft and passing loosely through the bearing of the shaft and having at both ends lugs or lips which bear against the adjacent ends of the rock-arm and shaft-bearing and confine the key in place, substantially as set forth.

6. The combination, with the pile-retaining finger N, of the buckling-finger E, provided with a stop *o'*, and the rock-arm provided with a nose O, whereby the buckling-finger is lifted during the last portion of its backward movement, substantially as set forth.

7. The combination, with the upper feed-tapes, of lower feed-tapes having their receiving portions arranged contiguous to the upper tapes and intermediate rollers, one arranged underneath the other, around which the lower tapes run between their receiving and delivery ends, whereby the delivery portions of the lower tapes are permanently depressed and the rear portion of the sheet is enabled to drop directly from the upper intermediate roller into the resting-space so formed in the lower tapes, substantially as set forth.

8. The combination, with the feed-board and upper feed-tapes, of the lower feed-tapes provided with end rollers and two intermediate rollers, bearings in which the intermediate rollers are journaled, and longitudinal rods or ways on which said bearings are adjustably mounted, substantially as set forth.

Witness my hand this 14th day of September, 1889.

WILLIAM WOMERSLEY.

Witnesses:
JOHN F. RINGWOOD,
J. S. VAN CLEEF.