(No Model.) 5 Sheets—Sheet 1

F. M. LEAVITT.

PAPER FEEDING MACHINE.

No. 567,276. Patented Sept. 8, 1896.

Witnesses:
Theo. L. Popp.
Chas. F. Burkhardt.

F. M. Leavitt Inventor.
By Wilhelm Bonner.
Attorneys

(No Model.) 5 Sheets—Sheet 2.

F. M. LEAVITT.

PAPER FEEDING MACHINE.

No. 567,276. Patented Sept. 8, 1896.

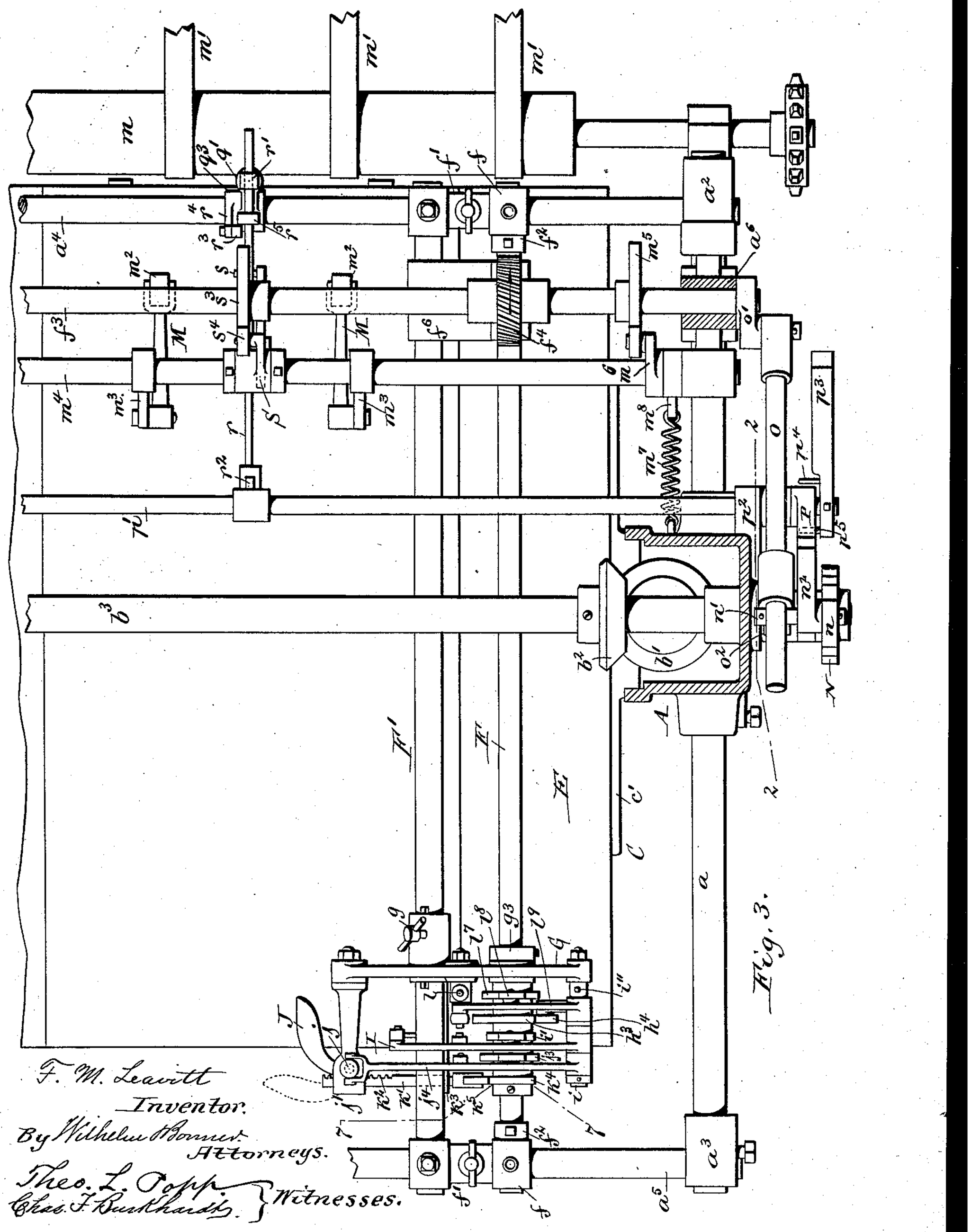

Fig. 3.

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(No Model.) 5 Sheets—Sheet 3.

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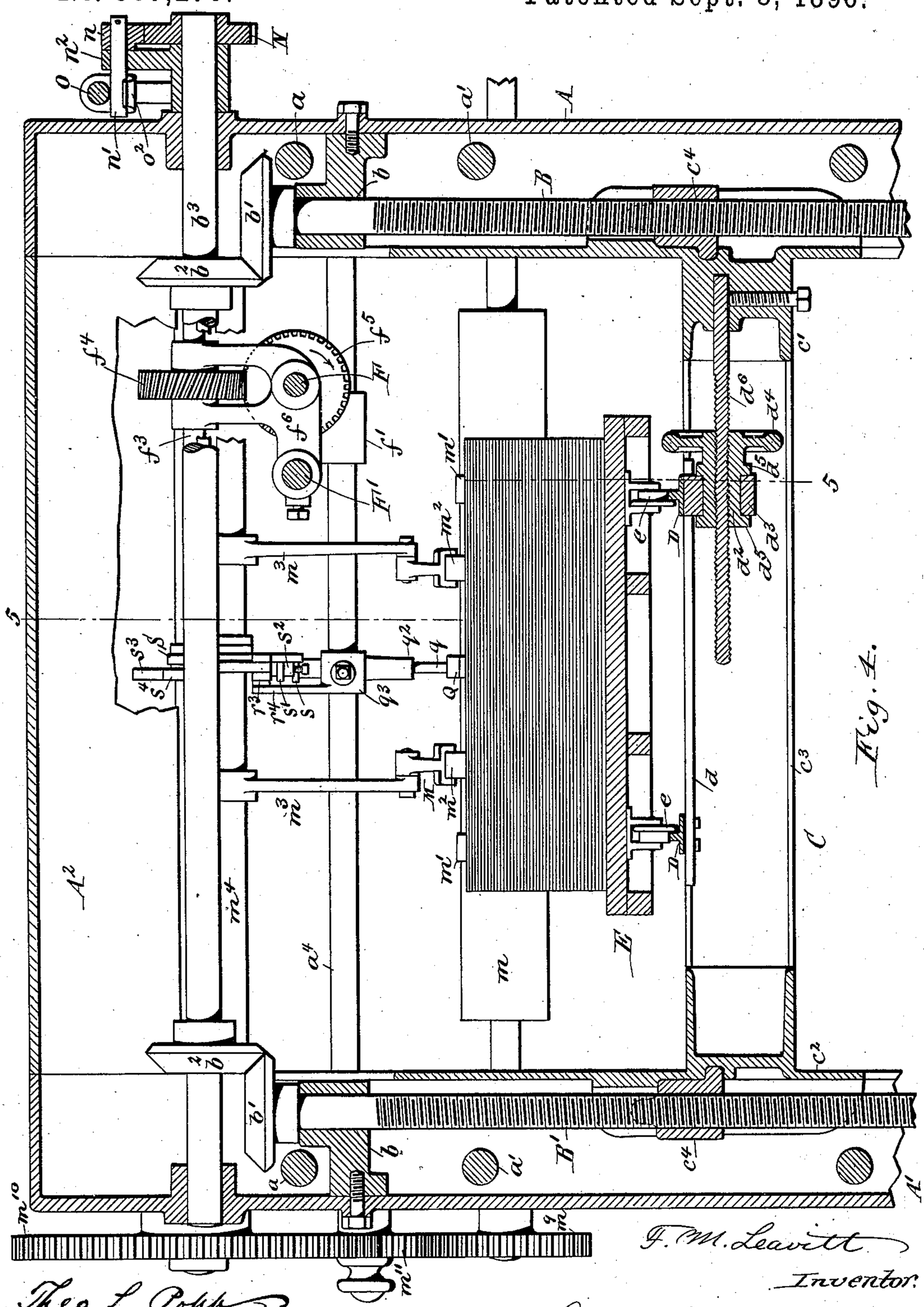

Fig. 4.

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(No Model.) 5 Sheets—Sheet 4.

F. M. LEAVITT.

PAPER FEEDING MACHINE.

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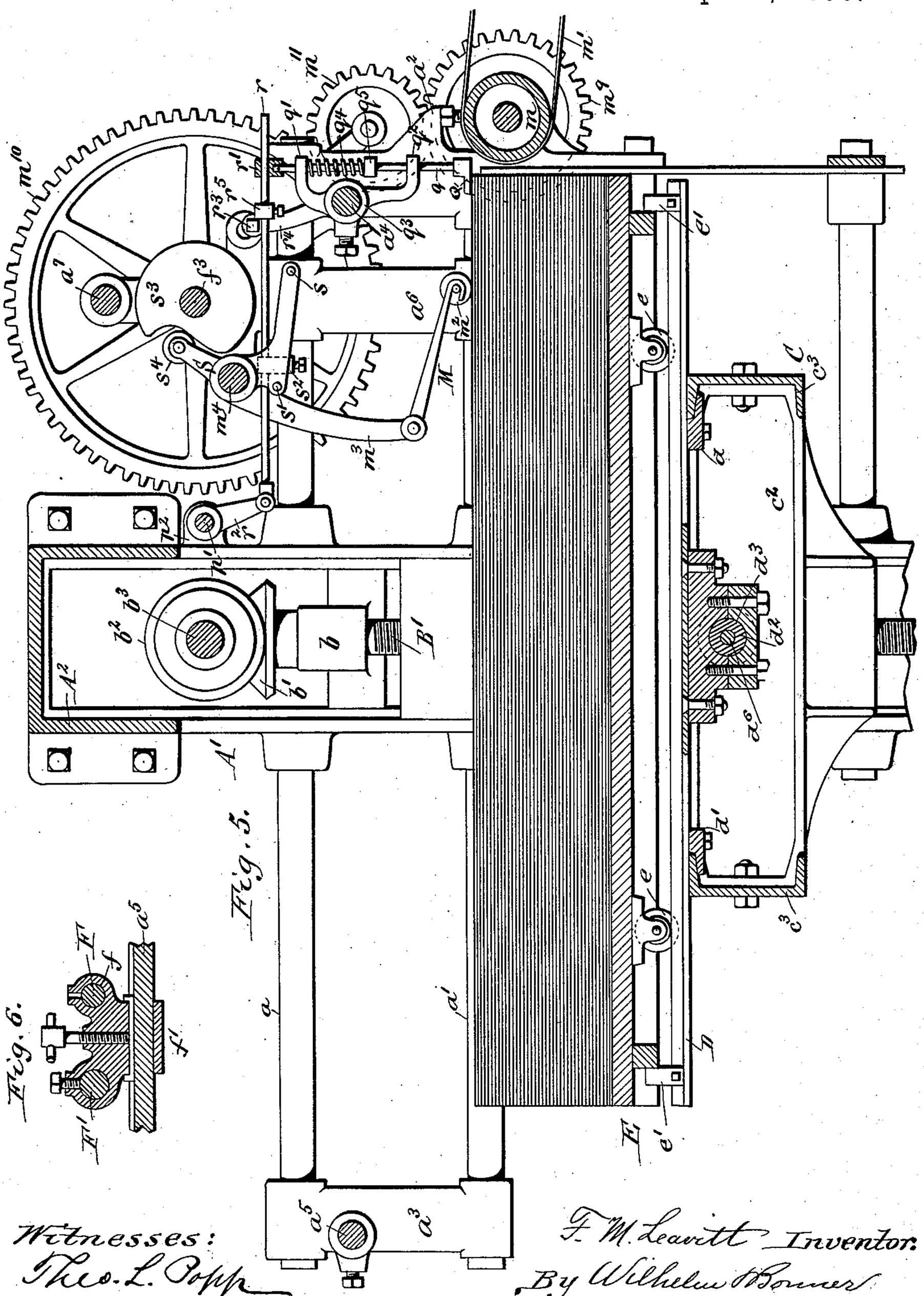

Fig. 5.

Fig. 6.

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(No Model.) 5 Sheets—Sheet 5.

F. M. LEAVITT.

PAPER FEEDING MACHINE.

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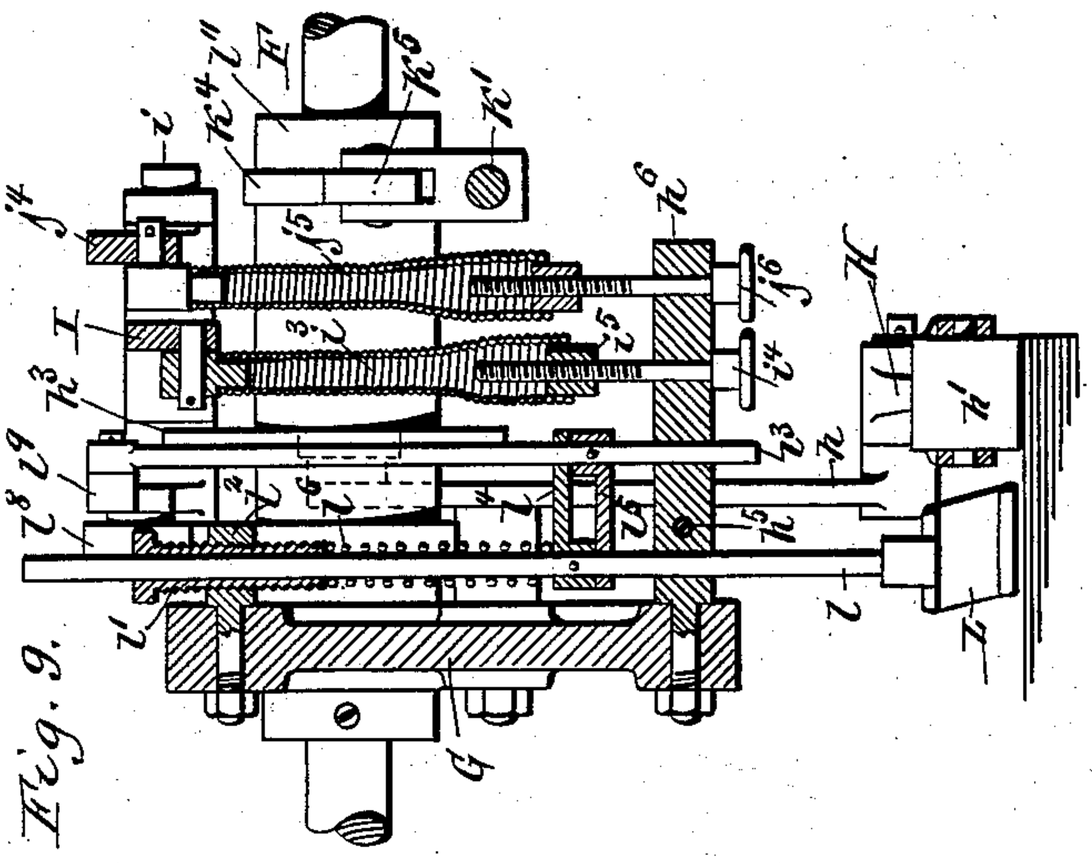

Fig. 9.

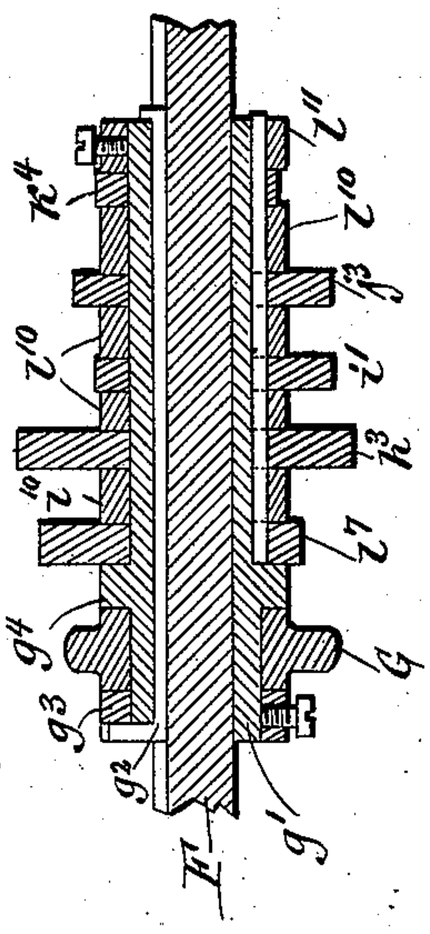

Fig. 10.

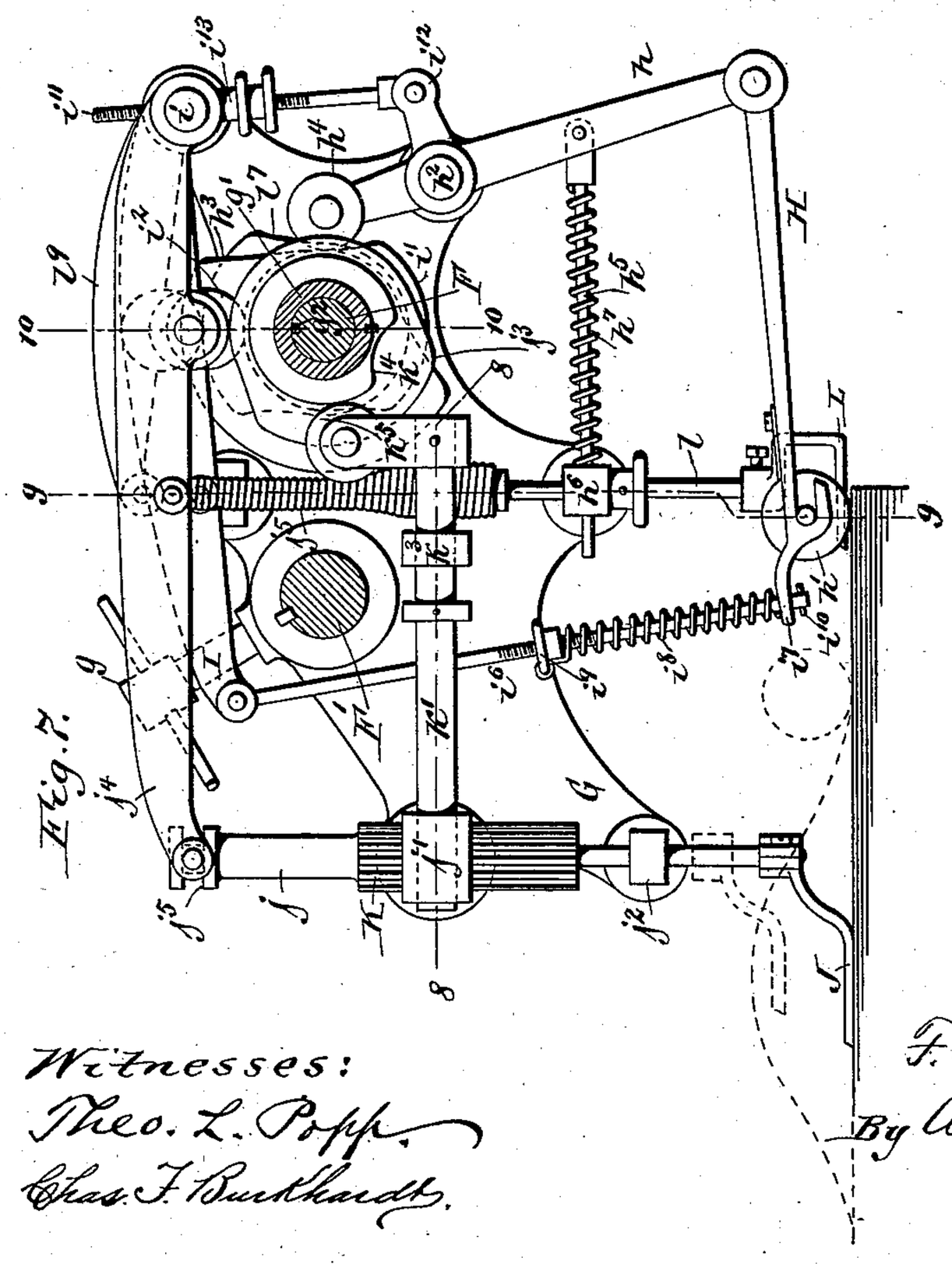

Fig. 7.

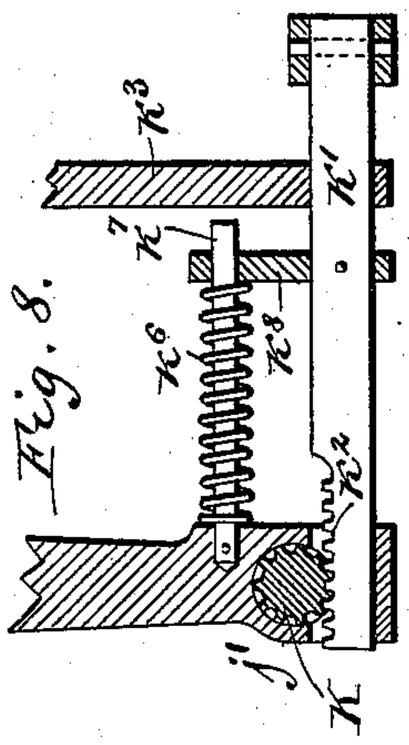

Fig. 8.

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UNITED STATES PATENT OFFICE.

FRANK M. LEAVITT, OF BROOKLYN, NEW YORK, ASSIGNOR TO THE ECONOMIC MACHINE COMPANY, OF NEW YORK, N. Y.

PAPER-FEEDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 567,276, dated September 8, 1896.

Application filed September 11, 1895. Serial No. 562,123. (No model.)

To all whom it may concern:

Be it known that I, FRANK M. LEAVITT, a citizen of the United States, residing at Brooklyn, in the county of Kings 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 a paper-feeding machine whereby sheets of paper are fed successively from a pile to a printing-press or other machine which operates upon sheet-paper.

My invention has the objects to improve the means for supporting the feed-table so that the pile of paper may be easily adjusted to the feeding devices, to improve the construction of the buckling mechanism, and to provide simple and reliable means for regulating the upward movement of the feed-table as the sheets are fed off from the top of the pile.

In the accompanying drawings, consisting of five sheets, Figure 1 is a fragmentary side elevation of my improved paper-feeder. Fig. 2 is a fragmentary sectional view of the ratchet feed mechanism taken in line 2 2, Fig. 3. Fig. 3 is a top plan view of the machine, partly in horizontal section, taken in line 3 3, Fig. 1. Fig. 4 is a vertical transverse section taken through the feed-screws of the pile-supporting table in line 4 4, Fig. 1. Fig. 5 is a vertical longitudinal section taken in line 5 5, Fig. 4. Fig. 6 is a vertical transverse section in line 6 6, Fig. 1. Fig. 7 is a vertical transverse section, on an enlarged scale, of the buckling-head, taken in line 7 7, Fig. 3. Fig. 8 is a horizontal section in line 8 8, Fig. 7. Figs. 9 and 10 are vertical longitudinal sections in lines 9 9 and 10 10, Fig. 7, respectively.

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

The main frame of the paper-feeder consists, essentially, of two hollow standards A A′, a cross-beam A^2, connecting the upper ends of the standards, a pair of upper and lower longitudinal supporting-bars a a', secured about midway of their length to each standard, front and rear end pieces or brackets a^2 a^3, connecting the front and rear ends, respectively, of each pair of longitudinal supporting-bars, a transverse bar a^4, connecting the front brackets, a transverse supporting-bar a^5, connecting the rear brackets, an intermediate bracket or cross-head a^6, mounted on each pair of longitudinal bars between one of the standards and front brackets, and an intermediate cross-bar a^7, connecting the upper ends of the cross-heads.

B B′, Figs. 3, 4, and 5, represent the vertical feed-screws whereby the pile of paper is elevated and which are journaled in bearings b, arranged in the hollow standards. These feed-screws are provided at their upper ends with bevel-wheels b', which mesh with similar wheels b^2, secured to a transverse shaft b^3, journaled in bearings in the upper ends of the standards.

C, Figs. 1, 4, and 5, represents a pile-elevating frame arranged between the standards and composed of two longitudinal side pieces or slides c' c^2, which are guided to move vertically in the standards, and two transverse bars c^3, which connect the ends of the slides. The feed-screws are provided with screw-nuts c^4, which are connected with the slides, so that upon turning the screw-shafts the elevator-frame will be raised or lowered. For the purpose of permitting the pile of paper to be shifted laterally for adjusting the same to the sheet-feeding mechanism the pile is adjustably supported as follows:

D represents two longitudinal rails or tracks, which are arranged loosely on the transverse bars of the elevator-frame, so as to be capable of sliding transversely thereon, and d d' are two transverse angle-bars, which connect the rails and engage under the flanges on the upper portions of the transverse bars of the elevator-frame, so as to hold the rails both against vertical and longitudinal movement on the elevator-frame while permitting the same to slide laterally thereon. The rails and their transverse connecting-bars constitute a laterally-movable frame, which rests on the vertically-movable elevator-frame, and this laterally-movable frame is connected with the vertically-movable frame by some suitable adjusting mechanism, preferably the following:

d^2 represents a screw-nut journaled in a bearing d^3 on the under side of one of the rails and provided with a hand-wheel d^4 for

turning the same and with flanges d^5 on opposite sides of the bearing, which hold the nut against lengthwise movement in the same. d^6 is a transverse adjusting-rod secured at its outer end to one of the longitudinal members of the elevator-frame and arranged with its inner screw-threaded end in the screw-nut of the movable tracks.

E represents a removable table on which the pile of sheets rests and which is provided on its under side with wheels e, resting on said rails. The pile of paper is preferably placed upon the supporting-table while the latter is supported on a transporting-truck, and the loaded table is then rolled from the truck upon the rails of the elevator. After this table has been placed on the rails the table is held against longitudinal movement thereon, preferably by blocks e', secured to the rails and bearing against the front and rear cleats of the table, as shown in Fig. 5. By turning the hand-screw of the elevator-frame the pile of paper is shifted laterally for adjusting it to the position of the mechanism, whereby the sheets are fed off from the top of the pile. This feeding mechanism is constructed as follows:

F represents a longitudinal shaft which is journaled with its ends in bearings f, formed in brackets f', but held against lengthwise movement therein by collars f^2, bearing against the inner sides of the brackets. The brackets f' are mounted on the front and rear transverse supporting-rods and are capable of transverse adjustment thereon.

F′ is a longitudinal supporting-rod arranged parallel with the inner side of the longitudinal shaft and secured with its ends to the brackets f'.

f^3 is a transverse counter-shaft which is journaled in bearings formed in the upper portions of the intermediate cross-heads a^6 and from which motion is transmitted to the longitudinal shaft by means of a pair of intermeshing spiral gear-wheels f^4 f^5, secured, respectively, to the transverse and longitudinal shafts. The upper spiral gear-wheel f^4 is splined to the counter-shaft, so as to permit of longitudinal adjustment of this gear-wheel on said shaft while compelling the same to turn therewith.

f^6 is a yoke which is secured to the longitudinal supporting-rod and which embraces the transverse and longitudinal shafts on opposite sides of the spiral gear-wheels.

G represents a carrying-head which supports the buckling mechanism, whereby one of the rear corners of the top sheet is buckled. This head is mounted directly upon the supporting-rod and capable of longitudinal adjustment thereon by a thumb-screw g, and is indirectly mounted on the longitudinal shaft by means of a sleeve g', interposed between the carrying-head and the shaft. This sleeve is capable of sliding on the shaft, but held against turning thereon by a spline g^2, and is capable of turning in the carrying-head, but held against lengthwise movement therein by means of collars g^3 g^4, arranged on the sleeve on opposite sides of the head.

H represents the reciprocating buckling-finger, pivoted to the lower arm of a rock-lever h and preferably provided at its free end with a buckling-roller h', which rests upon the pile of paper in the usual manner. The rock-lever h is pivoted between its upper and lower arms upon a horizontal arbor h^2, secured to the rear side of the carrying-head, so that the rock-lever will swing in a vertical plane transversely of the pile. The forward movement of the buckling-finger is produced by a cam h^3, secured to the supporting-sleeve g' and engaging with a roller h^4 on the upper arm of the rock-lever, and the backward movement of the same is produced by a guide-rod h^5, pivoted at one end to the lower arm of the rock-lever and passing with its other end through a guide arm or bar h^6 on the carrier-head and a spring h^7, bearing with its ends against the guide-arm and a shoulder on the guide-rod.

I represents a vertically-oscillating rock-arm whereby pressure is applied to the buckling-finger during its forward stroke and the latter is lifted from the pile during its backward movement. This rock-arm is arranged transversely above the supporting-sleeve and pivoted at its outer end to a horizontal arbor i, arranged on the carrying-head. The upward movement of the rock-arm is effected by a cam i', secured to the supporting-sleeve and engaging with a roller i^2 on the rock-arm, and the downward movement is effected by a spring i^3, connected at its upper end to the rock-arm and adjustably connected at its lower end with the guide-arm by a screw i^4, passing through the guide-arm and engaging with a screw-nut i^5, secured to the lower end of the spring.

i^6 is a connecting-rod which is pivoted with its upper end to the free end of the rock-arm and passes with its lower end through an eye i^7, formed on the inner free end of the buckling-finger.

i^8 is a tension-spring surrounding the connecting-rod between the eye of the buckling-finger and a thumb-nut i^9, arranged on the screw-threaded portion of the connecting-rod. During the forward movement of the buckling-finger the same is pressed against the top of the pile of paper by the tension-spring i^8, the latter being compressed by the preponderating pressure of the spring i^3, which pulls the rock-arm downwardly. During the backward movement of the buckling-finger the rock-arm is lifted, and this lifting movement is transmitted to the buckling-finger by a pin i^{10}, arranged on the lower end of the connecting-rod and engaging with the under side of the eye of the buckling-finger, thereby raising the buckling-finger from the pile on its return stroke. The backward movement of the buckling-finger can be regulated by a regulating-rod i^{11}, pivoted with its

lower end to a lug i^{12} on the outer side of the rock-lever and passing loosely with its upper end through the arbor i and a thumb-nut i^{13}, arranged on a screw-threaded portion of said rod and adapted to strike the under side of the arbor.

J represents the buckling or holding-down foot, which is arranged at a short distance in front of the buckling-finger and against which the top sheet is buckled by the buckling-finger during the forward movement of the latter. This foot has a vertical reciprocating movement toward and from the surface of the pile of paper, and also a horizontally-oscillating movement for the purpose of enabling the foot to clear the buckle in the top sheet and bear upon the next lower sheet. The buckling-foot is secured to the lower end of a spindle j, arranged in rear of the pile of paper and journaled in bearings j' j^2, arranged on the rear side of the carrying-head. The upward movement of the buckling-foot is produced by a cam j^3, secured to the supporting-sleeve and bearing against a roller on the under side of a rock-arm j^4, which is journaled at its outer end on the arbor i and provided at its inner end with a fork which engages with an annular groove j^5 in the upper end of the spindle. The downward movement of the buckling-foot is produced by a spring j^5, connected at its upper end to the rock-arm j^4 and adjustably connected at its lower end to the guide-bar h^6 by a thumb-screw j^6, arranged in said bar and engaging with a screw-nut secured to the lower end of the spring j^5.

K is an elongated gear-wheel or pinion formed centrally on the spindle, and k' is a horizontally-sliding bar provided with a gear-rack k^2, meshing with the gear-wheel and guided in ways formed in the upper bearing of the spindle and an arm k^3, secured to the rear side of the carrying-head. The spindle is turned for the purpose of moving the buckling-foot rearwardly to clear the pile by a cam k^4, secured to the supporting-sleeve and engaging with a roller k^5, mounted on the outer end of the sliding bar. The buckling-finger is swung forwardly by a spring k^6, which surrounds a horizontal guide-rod k^7 and bears with its ends against the upper spindle-bearing, and a guide-lug k^8, secured to the gear rack-bar.

L represents the vertically-movable pile-retaining finger, which bears upon the pile of paper in rear of the buckling-finger and holds the pile in place while the top sheet is being removed. This pile-retaining finger is secured to the lower end of a vertically-movable guide-rod l and which is guided at its lower end in the guide-bar h^6 and with its upper portion in an externally-screw-threaded sleeve l', which engages with an internally-screw-threaded eye l^2, arranged on the rear side of the carrying-head.

l^3 is a vertical lifting-rod arranged parallel and in rear of the guide-rod l and passing with its lower portion through the guide-bar.

l^4 l^5 represent two coupling-bars arranged one above the other on the guide and lifting rods, each of said bars being secured to one of said rods and capable of sliding on the other rod. The pile-retaining finger is yieldingly held in a depressed position in engagement with the top of the pile by a spring l^6, surrounding the guide-rod l and bearing with its ends against the lower end of the screw-sleeve and the upper coupling-bar secured to the guide-rod.

l^7 is a cam whereby the pile-retaining finger is lifted from the paper and which is secured to the supporting-sleeve. This cam bears against the under side of a roller l^8, arranged upon a rock-arm l^9, the latter being pivoted with its outer end on the arbor i and connected at its inner end with the upper end of the lifting-rod. During each revolution of the cam the rock-arm l^9 is lifted, which causes the lower coupling-bar, connected with the lifting-rod, to bear against the upper coupling-bar, connected with the guide-rod, whereby the pile-retaining finger, connected with the latter, is lifted from the pile and then the rock-arm is again lowered sufficiently to permit the pile-retaining finger to bear on the pile and the lower coupling-bar to recede from the under side of the upper coupling-bar, so that the spring l^6 can exert its pressure freely upon the pile-retaining finger. The several cams on the supporting-sleeve are separated by collars l^{10} and secured to the sleeve by a key, so that all of the cams are compelled to turn with the sleeve and are also held against lengthwise movement on the sleeve by the collar g^4, bearing against the foremost cam, and a collar l^{11} bearing against the rearmost cam. Upon loosening the clamping-screw g the buckling device can be shifted backward or forward on the longitudinal supporting-rod and shaft for adjusting the same to sheets of different size without disturbing the adjustment of the buckling devices and the relative position of the cams. The buckling devices can also be adjusted transversely by loosening the clamping-bolts of the brackets and shifting the latter on the transverse supporting-rods, together with the buckling devices, spiral gears, and longitudinal rod and shaft. During the forward movement of the buckling-finger the holding-down foot is depressed and the pile-retaining finger is slightly elevated, whereby the corner of the top sheet is pulled from underneath the latter and buckled against the holding-down foot, as shown in Fig. 7. When the buckling-finger reaches the end of its forward movement, the pile-retaining finger is depressed and the holding-down foot is raised, thereby allowing the buckle in the sheet to pass in front of the holding-down foot. As the holding-down foot moves upwardly it is also turned rearwardly, so as to clear the top of the pile, as shown in dotted lines in Figs. 3 and 7, and during the subsequent downward movement the foot swings forwardly and enters underneath the buckled

portion of the top sheet and also descends until it bears upon the pile below said sheet. During the first portion of the backward movement of the buckling-finger it is raised, as usual, to allow the buckled portion of the sheet to straighten out, and then lowered again during the last portion of the backward movement. In order to prevent the top sheet, while straightening out, from getting under the pile-retaining finger, in which case the sheet would be clamped by the retaining-finger, the latter is lowered upon the pile before the buckling-finger is raised from the top sheet at the end of its forward movement, so that, when the buckling-finger rises and the straightening out of the sheet takes place, the sheet will pass over the top of the retaining-finger and so be left free to be fed off from the top of the pile.

M represents the usual reciprocating feeding-fingers, whereby the top sheet, after being buckled, is removed from the pile to the tape-roller m and tapes m', which deliver it to the printing-press or other machine. The tape-roller is journaled in bearings formed on the front brackets of the supporting-rods. One end of the tape-shaft is provided with a sprocket-wheel which is driven from any suitable source. The front end of the feeding-fingers are provided with rollers m^2, which bear upon the pile, and their rear ends are pivoted to the lower ends of depending rock-arms m^3, secured to a transverse rock-shaft m^4. The latter is arranged in front of the transverse counter-shaft and journaled in bearings on the intermediate brackets. The feeding-fingers are moved forward by a cam m^5, which is mounted on the transverse counter-shaft and which engages with a roller mounted on a rock-arm m^6, secured to the rock-shaft. The backward movement of the feeding-finger is effected by a spring m^7, secured with one end to one of the standards and with its other end to depending rock-arm m^8, secured to the rock-shaft. Motion is transmitted from the tape-roller to the transverse counter-shaft by gear-wheels m^9 m^{10}, secured, respectively, to the roller-shaft and the driving-shaft and an idler gear-wheel m^{11}, meshing with both gear-wheels m^9 m^{10}. As the sheets are fed off from the top of the pile, the feed-table is raised for maintaining the proper relation between the surface of the pile and the feeding devices by automatic mechanism, which is constructed as follows:

N, Figs. 1, 2, 3, 4, and 5, represents a ratchet-wheel secured to the transverse feed-shaft, and n is an actuating-pawl engaging with the ratchet-wheel. This pawl is pivoted by a transverse pin n' to a rock-plate or pawl-carrier n^2, which is hung loosely on the feed-shaft. The rock-plate projects forwardly from the feed-shaft, so that its weight always tends to swing the rock-plate downwardly in front of the feed-shaft and moves the pawl forwardly independent of the ratchet-wheel.

O represents an actuating-rod which is pivoted at its front end to a crank o', arranged on one end of the counter-shaft and resting with its rear portion on the inwardly-projecting portion of the pin, whereby the pawl is attached to the rock-plate. The rear portion of the actuating-rod is provided with a depending hook o^2, which is adapted to engage with the pin of the pawl and move the latter rearwardly. During the rearward movement of the pawl it is in engagement with the upper portion of the ratchet-wheel and turns the same for elevating the feed-table. The pawl is always moved rearward to the same point by the crank of the counter-shaft, but its forward movement is varied according to the height of the pile of paper, so that the extent of the rearward movement of the pawl is always dependent upon the previous forward movement thereof.

P is a detent-pawl whereby the forward movement of the actuating-pawl is controlled and which is adapted to engage with a shoulder p, formed on the front side of the rock-plate. The detent-pawl is mounted loosely on the outer end of a regulating rock-shaft p', which is journaled in bearings p^2 on the standards.

p^3 is a forwardly-projecting weight-lever which is secured to the regulating-shaft outside of the detent-pawl and provided with two inwardly-projecting pins p^4 p^5, which are arranged, respectively, in front and in rear of the detent-pawl. When the top of the pile is in an abnormal position, the extent of the turning movement of the regulating-shaft in the direction of the arrow, Fig. 1, is such that the rear pin p^5 of the weight-lever strikes a shoulder p^6 on the rear side of the detent-pawl, Fig. 2, and moves the same forwardly out of the path of the shoulder on the rock-plate, thereby permitting the latter to move forwardly and downwardly its full extent during the forward movement of the actuating-rod and causing the actuating-pawl to take up a new tooth on the ratchet-wheel, so that the latter will be turned the extent of one tooth during the subsequent rearward movement of the actuating-rod. When the top of the pile is in a normal position, the extent of movement of the regulating-shaft in the direction of the arrow, Fig. 1, is not sufficient to move the detent-pawl out of the path of the shoulder on the rock-plate, and the detent-pawl therefore arrests the forward movement of the rock-plate during the forward movement of the actuating-rod by coming in contact with the shoulder of the rock-plate and prevents the actuating-pawl from taking up a new tooth on the ratchet-wheel, so that the latter will not be turned during the subsequent rearward movement of the actuating-rod. When the forward movement of the rock-plate has been arrested by the detent-pawl, the actuating-rod moves forwardly independent of the rock-plate, and during this movement the rod slides upon the pin of the actuating-pawl and the hook thereof is dis-

engaged from said pin. The front pin of the weight-lever serves to prevent the actuating-pawl from being displaced.

Q, Figs. 4 and 5, is a pile-regulating foot which is adapted to bear upon the pile of paper every time a sheet has been removed therefrom and which controls the elevating mechanism of the feed-table. This foot is arranged centrally over the front portion of the pile and is secured to the lower end of a vertically-movable guide-rod q. The latter is guided in upper and lower eyes q' q^2, formed on a sleeve q^3, which is secured to the front transverse supporting-rod. When the guide-rod is unrestrained, it is depressed, for the purpose of bringing the regulating-foot to bear upon the pile by means of a spring q^4, surrounding the guide-rod between the upper guide-eye q' and a collar q^5, secured to the guide-rod.

r is a horizontal shifting-rod which passes loosely with its front end through an eye r', secured to the upper end of the guide-rod of the regulating-foot and which is pivotally connected at its rear end with a depending rock-arm r^2, secured to the regulating-shaft.

r^3 is a stop-lug arranged on one side of the shifting-rod and secured to the upper end of an arm r^4, formed on the sleeve q^3.

r^5 is a tappet secured to the shifting-rod and adapted to engage with the front side of the stop-lug. Every time the regulating-foot is lowered upon the pile the weight-lever is permitted to turn the regulating-shaft in the direction of the arrow, Fig. 1, thereby exerting a rearward pull upon the shifting-rod through the depending rock-arm. If the top of the pile of paper is in a normal position, the descent of the regulating-foot is not sufficient to carry the front tappet below the stop-lug, and in this relative position of the tappet and lug, which is shown in Fig. 5, the tappet strikes the stop-lug during the subsequent rearward movement of the shifting-rod produced by the pull of the weight-lever, whereby the rearward movement of the shifting-rod is arrested and the regulating-shaft is prevented from being turned sufficiently in the direction of the arrow, Fig. 1, to throw the detent-pawl out of the path of the rock-plate, whereby an effective feeding movement of the actuating-pawl is prevented. When the height of the pile of paper has been reduced considerably, the regulating-foot, while being lowered upon the pile, descends a sufficient distance to permit the tappet of the shifting-rod to pass below the stop-lug, so that the shifting-rod can be pulled rearwardly and the regulating-shaft is free to be turned a sufficient distance in the direction of the arrow, Fig. 1, to permit the detent-pawl to be moved out of the path of the shoulder on the rock-plate, thereby enabling the latter and the actuating-pawl to move forwardly to the extent of one tooth of the ratchet-wheel during the forward movement of the actuating-rod and causing the ratchet-wheel to be turned during the subsequent rearward movement of the actuating-rod for elevating the feed-table.

S represents an elbow-lever whereby the regulating-foot is raised from the pile while the top sheet is being fed off and the regulating-shaft is turned for restoring the detent-pawl to its operative position. This elbow-lever is mounted loosely on the transverse rock-shaft and is provided on its lower arm with horizontal front and rear shifting-pins s s', arranged on the under side of the shifting-rod.

s^2 is a rear tappet secured to the shifting-rod in front and in the path of the rear shifting-pin. Upon raising the lower arm of the elbow-lever, after the regulating-foot has been lowered upon a pile of normal height and the front tappet has not cleared the stop-lug, the front shifting-pin engages against the under side of the shifting-rod and lifts the regulating-foot from the pile. Upon raising the lower arm of the elbow-lever after the regulating-foot has been lowered upon the pile while the latter is below the normal height and the shifting-rod has been moved rearwardly by the weight-lever by reason of its front tappet having cleared the stop-lug, the rear shifting-pin s' first engages with the rear side of the rear tappet and moves the shifting-rod forwardly sufficiently to carry the front tappet in front of the stop-lug, after which the front shifting-pin s engages with the under side of the shifting-rod and lifts the regulating-foot from the pile. The upward movement of the lower arm of the elbow-lever is produced by a cam s^3, secured to the counter-shaft and engaging with a roller s^4, mounted on the upper arm of the elbow-lever. After the shifting-rod has been raised by the lower arm of the elbow-lever the latter returns to its normal position by gravity.

I claim as my invention—

1. The combination with the main frame and the sheet-feeding devices, of a vertically-movable pile-support arranged in the main frame, a longitudinal track capable of being shifted transversely on said support, an adjusting device whereby said track can be shifted transversely on said pile-support, and a removable feed-table resting on said track, substantially as set forth.

2. The combination with the main frame and the sheet-feeding devices, of a vertically-movable pile-support arranged in said frame, a longitudinal track capable of being shifted transversely on said support, a removable feed-table resting on said track, a rotary screw-nut journaled in a bearing connected with said track and a screw-threaded rod connected at one end with said support and engaging with its opposite end in said screw-nut, substantially as set forth.

3. The combination with the carrying-head and the buckling-finger, of a rock-lever pivoted on said head and carrying said finger, a cam mounted on said head and engaging with said lever for moving the buckling-fin-

ger forward, a spring for moving the buckling-finger backward, a perforated stud arranged on the carrying-head, a screw-rod pivotally connected at one end to said lever and passing with its other end through the perforated stud, and a screw-nut arranged on said rod and adapted to engage with said stud and limit the backward movement of the finger, substantially as set forth.

4. The combination with the buckling-finger and mechanism whereby the same is moved backward and forward, of a lifting rock-arm, a cam engaging with said rock-arm, a rod connected at its upper end with said arm and passing loosely with its lower end through the opening in the buckling-finger, a spring interposed between said finger and rod, and a stop arranged on said rod below the buckling-finger, whereby said rod can perform the double function of compressing the spring for increasing the downward pressure of the buckling-finger and of lifting the buckling-finger, substantially as set forth.

5. The combination with the buckling-finger having a forward and backward movement, of a buckling-foot adapted to bear upon the pile during the forward movement of the buckling-finger so as to cause the sheet to be buckled between said finger and said foot, and mechanism whereby a vertically-reciprocating and a horizontally-rocking movement is imparted to the buckling-foot and whereby said foot is raised and swung rearwardly, away from the pile, to allow the buckle to extend beyond the buckling-foot and then swung forwardly and down upon the pile below the buckled portion of the sheet, substantially as set forth.

6. The combination with the buckling-finger having a forward and backward movement, of a buckling-foot adapted to bear upon the pile during the forward movement of the buckling-finger so as to cause the sheet to be buckled between said finger and said foot, a vertically-reciprocating spindle carrying said foot and provided with a gear-wheel, and a reciprocating gear-rack meshing with said gear-wheel and imparting a horizontally-rocking movement to said spindle, substantially as set forth.

7. The combination with the buckling-finger, of a buckling-foot provided with an elongated gear-wheel arranged to turn in a horizontal plane, a reciprocating gear-rack meshing with said gear-wheel, a cam actuating said gear-rack, a lifting rock-arm connected with the buckling-foot and arranged to move the same vertically, and a cam whereby said rock-arm is actuated, substantially as set forth.

8. The combination with the pile-retaining finger provided with an upwardly-extending stem and a vertically-movable rock-arm whereby the finger is elevated, of a lifting-rod connected with the rock-arm and means whereby said rod is coupled with the stem of the finger during the upward movement of the lifting-rod, for lifting the finger, substantially as set forth.

9. The combination with the pile-retaining finger having an upwardly-extending stem and the vertically-movable rock-arm whereby the finger is elevated, of a lifting-rod connected with the rock-arm, a coupling-bar connected with said stem, and a coupling-bar connected with the lifting-rod and adapted to engage with the coupling-bar of the stem, substantially as set forth.

10. The combination with the carrying-head supporting the buckling devices and the driving-shaft, of a supporting-sleeve connected with the carrying-head so as to turn therein but held against lengthwise movement therein and mounted on said shaft so as to slide thereon and turn therewith, and cams secured to said supporting-sleeve and operating the buckling devices, substantially as set forth.

11. The combination with the vertically-movable pile-support and the elevating mechanism thereof provided with a ratchet-wheel, of a pawl-carrier provided with an actuating-pawl capable of moving with said carrier or independent of the ratchet-wheel, a reciprocating actuating-rod engaging with said carrier, a regulating rock-shaft provided with a detent-pawl which is adapted to engage said carrier or to clear the same, and a vertically-movable regulating-foot adapted to bear upon the pile and connected with said rock-shaft, substantially as set forth.

12. The combination with the vertically-movable pile-support and the elevating mechanism thereof provided with a ratchet-wheel, of a pawl-carrier provided with an actuating-pawl engaging with the ratchet-wheel, an actuating-rod provided with a hook engaging with a pin on said carrier, a regulating rock-shaft provided with a weight-lever, a detent-pawl mounted loosely on said shaft and adapted to engage with said carrier or to clear the same, means connecting said weight-lever with said detent-pawl and a vertically-movable regulating-foot adapted to bear upon the pile and connected with said rock-shaft substantially as set forth.

13. The combination with the vertically-movable pile-support and the elevating mechanism thereof provided with a ratchet-wheel, of a pawl-carrier provided with an actuating-pawl engaging with the ratchet-wheel, an actuating-rod engaging with said carrier, a regulating rock-shaft provided with a detent-pawl adapted to engage with said carrier or to clear the same, a vertically-movable regulating-foot adapted to bear upon the pile, a rock-arm connected with said rock-shaft, a shifting-rod connected with said rock-arm and with the regulating-foot, a rock-lever engaging with said shifting-rod, a cam engaging with said rock-lever for lifting the regulating-foot, and a spring for depressing said foot, substantially as set forth.

14. The combination with the vertically-

movable pile-support, and the elevating mechanism thereof provided with a ratchet-wheel, of a pawl-carrier provided with an actuating-pawl engaging with the ratchet-wheel, a regulating rock-shaft provided with a detent-pawl adapted to engage with said pawl-carrier or to clear the same, a vertically-movable regulating-foot adapted to bear upon the pile, a rock-arm connected with said regulating rock-shaft, a shifting-rod connected with said rock-arm and with said regulating-foot, and a stop device whereby an effective movement of said shifting-rod is prevented when the regulating-foot is supported at the normal height of the pile, substantially as set forth.

15. The combination with the vertically-movable pile-support and the elevating mechanism thereof provided with a ratchet-wheel, of a pawl-carrier provided with an actuating-pawl engaging with the ratchet-wheel, an actuating-rod engaging with said rock-plate, a regulating rock-shaft provided with a detent-pawl adapted to engage with said carrier or to clear the same, a vertically-movable regulating-foot adapted to bear upon the pile, a spring for depressing the regulating-foot, a rock-arm connected with said rock-shaft, a shifting-rod connected with said rock-arm and with said regulating-foot, front and rear tappets secured to the shifting-rod, a stop-lug arranged in rear of the front tappet, a rock-lever provided with projections adapted to engage with the shifting-rod and with the rear tappet, and a cam for actuating said rock-lever, substantially as set forth.

Witness my hand this 30th day of August, 1895.

FRANK M. LEAVITT.

Witnesses:
F. V. BENSON, Jr.,
BRAINERD W. CHILD.