

(No Model.)

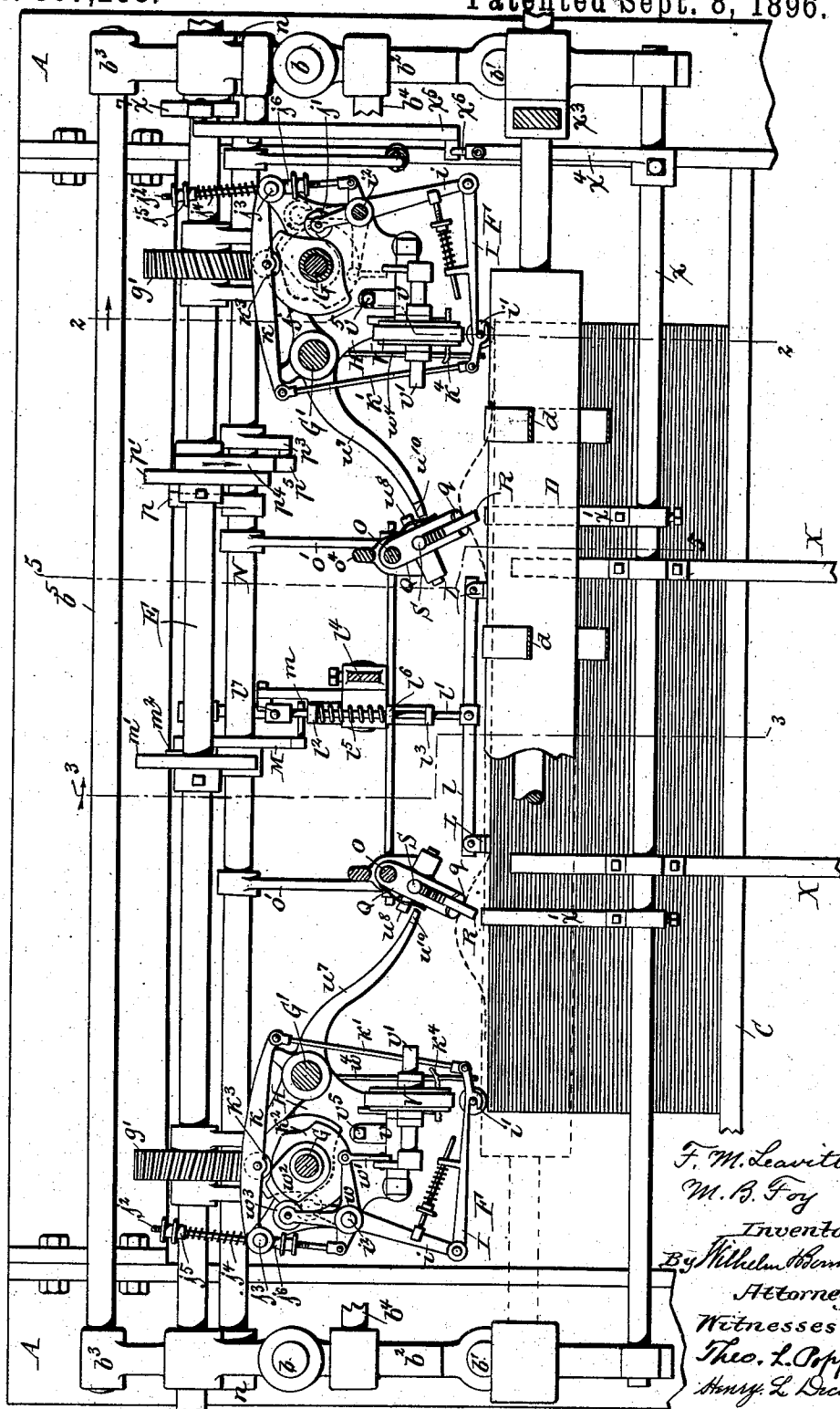
4 Sheets—Sheet 1.

M. B. FOY & F. M. LEAVITT.
PAPER FEEDING MACHINE.

No. 567,268.

Patented Sept. 8, 1896.

Fig. 1.



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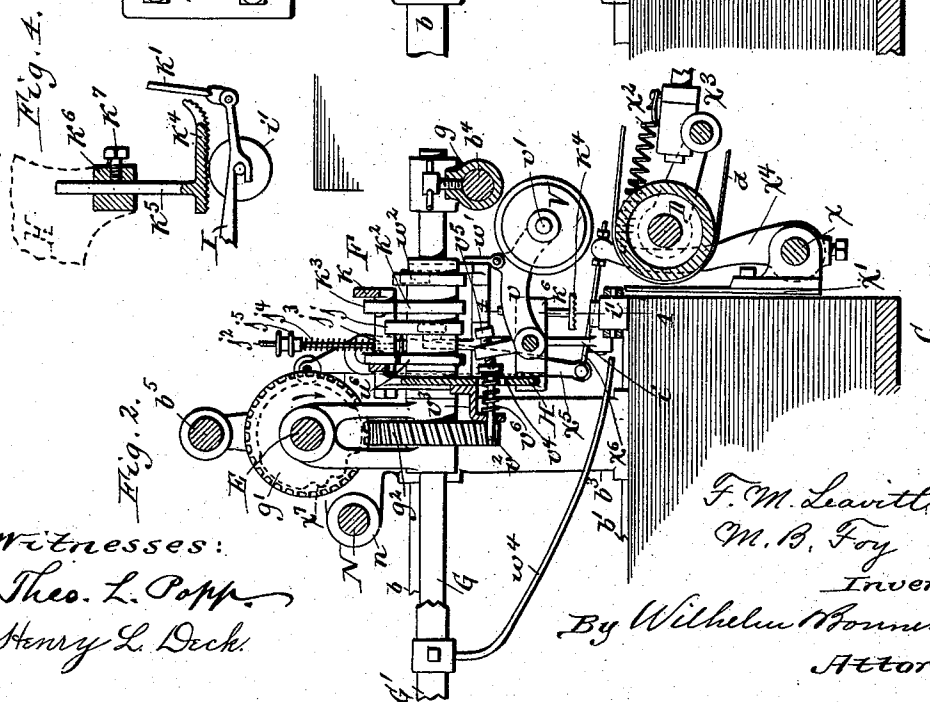
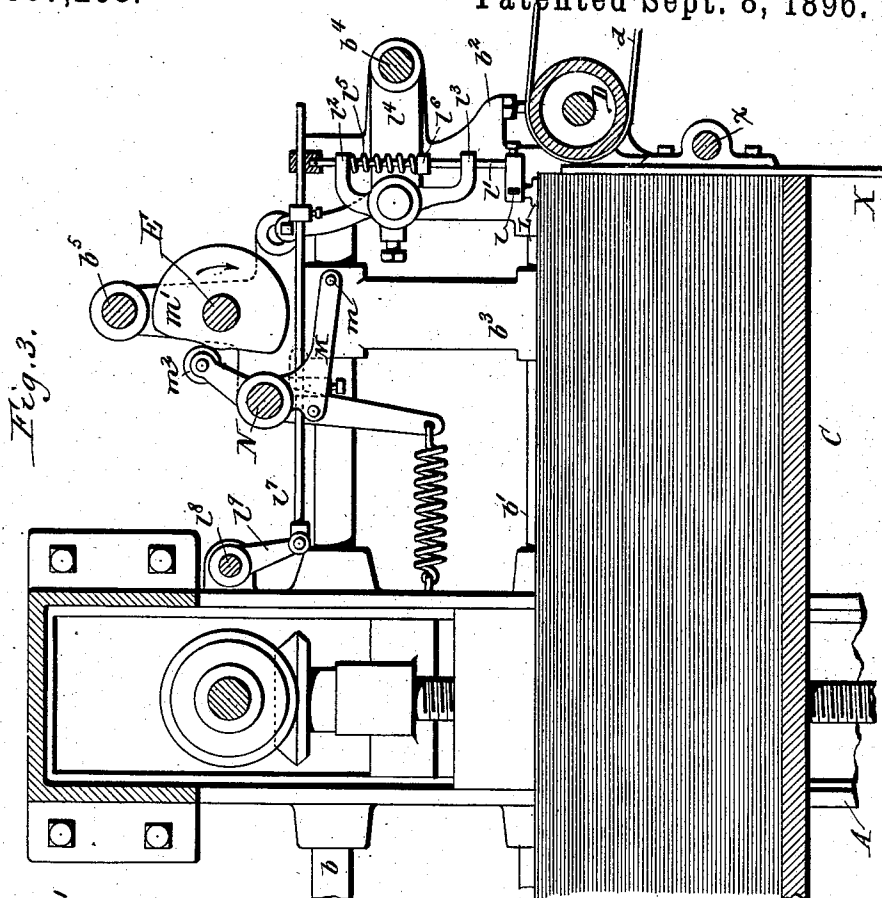
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4 Sheets—Sheet 2.

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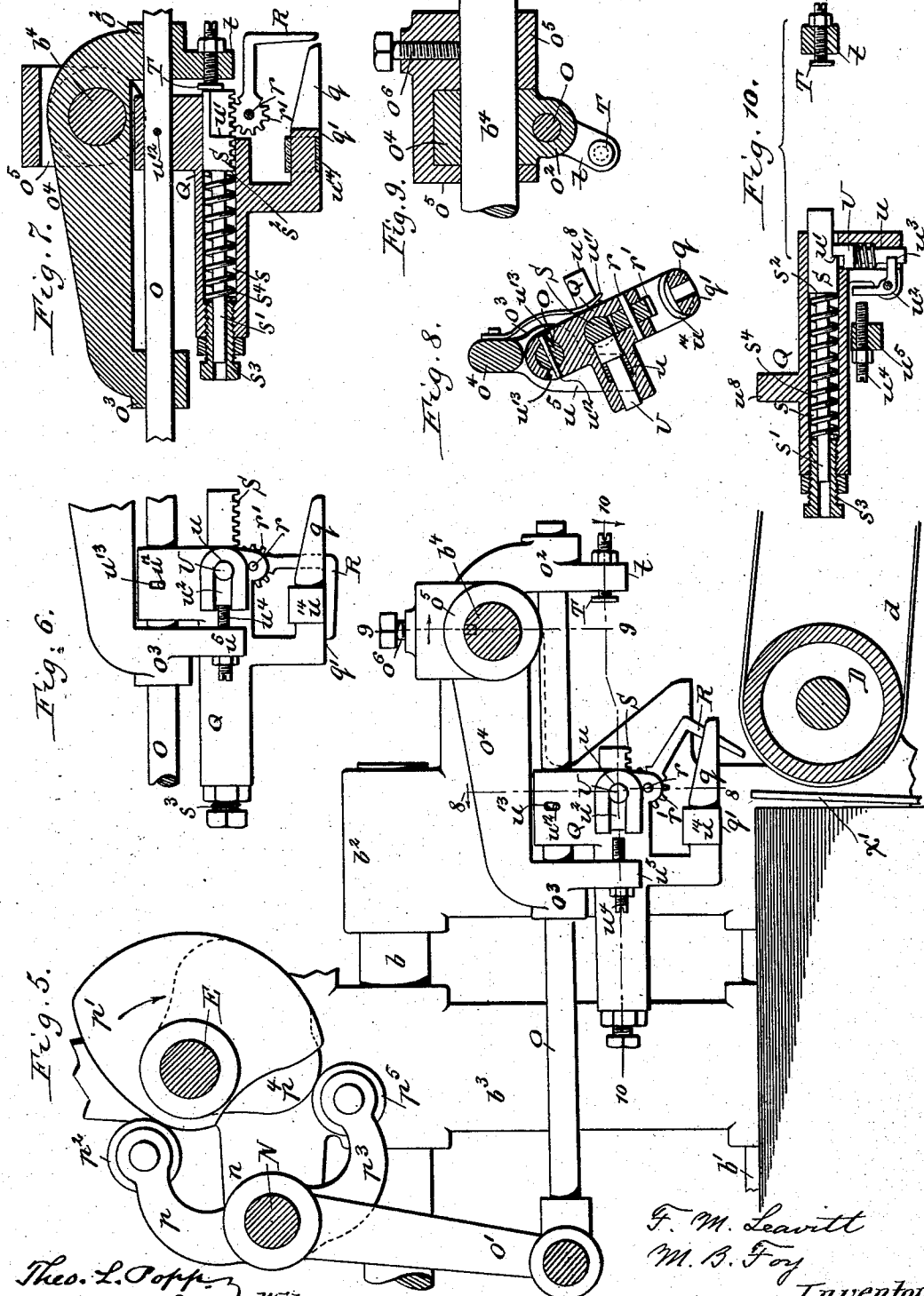
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4 Sheets—Sheet 3.

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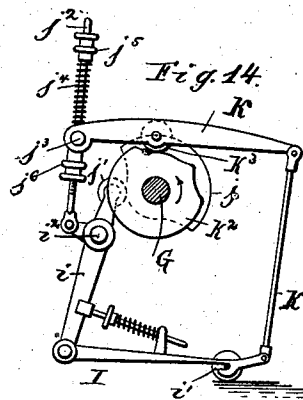
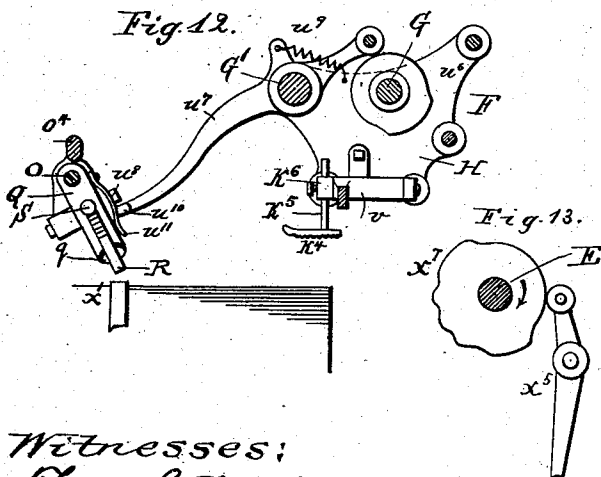
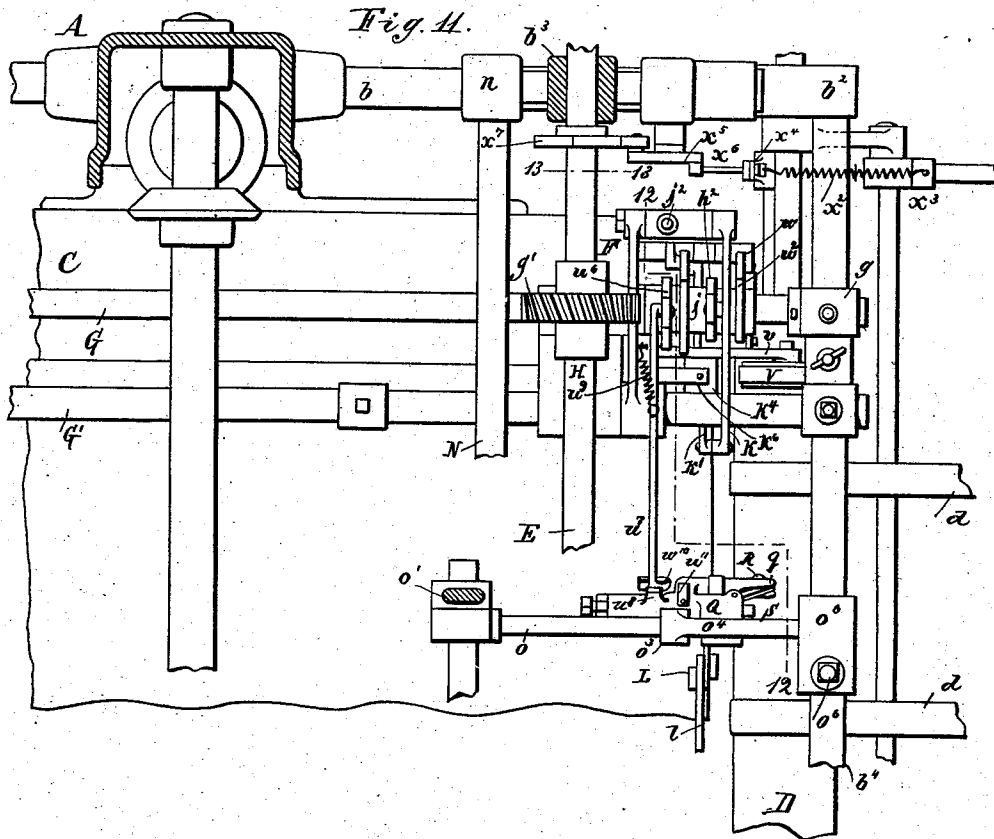
(No Model.)

4 Sheets—Sheet 4.

M. B. FOY & F. M. LEAVITT.
PAPER FEEDING MACHINE.

No. 567,268.

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UNITED STATES PATENT OFFICE.

MICHAEL B. FOY, OF NEW YORK, AND FRANK M. LEAVITT, OF BROOKLYN, NEW YORK, ASSIGNORS TO THE ECONOMIC MACHINE COMPANY, OF NEW YORK, N. Y.

PAPER-FEEDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 567,268, dated September 8, 1896.

Application filed September 23, 1895. Serial No. 563,414. (No model.)

To all whom it may concern:

Be it known that we, MICHAEL B. FOY, of the city and county of New York, and FRANK M. LEAVITT, of Brooklyn, Kings county, State of New York, have invented new and useful Improvements in Paper-Feeding Machines, of which the following is a specification.

This invention relates to a paper-feeding machine which is more particularly designed for feeding sheets of paper automatically from a pile, to a lithographic printing-press, although the improvements herein described may also be used for feeding sheets of paper to other machines in which sheet-paper is operated upon.

In feeding to a lithographic press sheets which have previously been printed upon in one or more colors only the marginal portions of the sheets can be operated upon for feeding the sheets, in order to avoid injuring the imprint on the same or causing the sheets to stick together, which otherwise would occur if the bodies of the printed portions of the sheets were pressed or rubbed.

One object of our invention is to provide efficient and reliable feeding devices which operate only on the marginal portions of the sheets and whereby the sheets are properly carried from the pile to the tape mechanism.

Another object of our invention is to provide means for keeping the roller of the buckling-finger clean and preventing said roller from becoming smooth or glazed.

Another object of our invention is to improve the front guides against which the pile of sheets is placed.

In the accompanying drawings, consisting of four sheets, Figure 1 is a fragmentary transverse section of our improved paper-feeding machine, looking at the front side of the same. Figs. 2 and 3 are vertical longitudinal sections thereof in lines 2 2 and 3 3, Fig. 1. Fig. 4 is a fragmentary transverse section of the buckling-finger and the abrasion-plate, taken in line 4 4, Fig. 2, and showing the finger in contact with the plate. Fig. 5 is a vertical longitudinal section, on an enlarged scale, in line 5 5, Fig. 1, showing the position of the gripper preparatory to grasping the front edge of the sheet. Fig. 6 is a

fragmentary elevation of the gripper, showing the same closed upon the sheet. Fig. 7 is a vertical longitudinal section of the gripper, showing the gripper opened for releasing the sheet. Figs. 8 and 9 are vertical transverse sections in lines 8 8 and 9 9, Fig. 5, respectively. Fig. 10 is a horizontal section in line 10 10, Fig. 5. Fig. 11 is a sectional top plan view of the buckling mechanism of our improved paper-feeding machine. Fig. 12 is a vertical transverse section in line 12 12, Fig. 11. Fig. 13 is a vertical section in line 13 13, Fig. 11, showing the cam for moving the front guides. Fig. 14 is a detached front elevation of the buckling-finger, its elevating rock-arm, and the cam for actuating same.

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

A A represent the side standards of the main frame; $b b'$, a pair of longitudinal supporting-bars secured to the standards; b^2 , the brackets connecting the front ends of each pair of longitudinal supporting-bars; b^3 , the intermediate brackets or cross-heads connecting the longitudinal supporting-bars between the standards and the front brackets; b^4 , a transverse supporting-bar connecting the front brackets, and b^5 a transverse bar connecting the upper portions of the intermediate brackets.

C represents the vertically-movable feed-table which supports the pile of sheets, and which is raised automatically in the usual manner as the sheets are fed off from the top of the pile.

D represents the tape-roller, arranged in front of the feed-table, and d the tapes, which pass around the tape-roller and carry the sheets deposited upon the same from the pile to the press.

E represents the transverse driving-shaft, journaled in the upper portions of the intermediate brackets and driven from any suitable source.

F F represent two buckling devices whereby the front corners of the sheets are simultaneously buckled inwardly, as shown in Fig. 1, and which may be of any suitable construction. Each of these buckling devices is preferably constructed as follows:

G represents a longitudinal shaft journaled with its front end in a bearing formed in a bracket *g*, which latter is mounted on the transverse supporting-bar *b*⁴. Motion is transmitted from the transverse shaft to the longitudinal shaft by means of a pair of spiral gear-wheels *g'* *g*², secured, respectively, to these shafts.

G' represents a supporting-rod arranged parallel with the longitudinal shaft and secured with its front end to the bracket *g*.

H represents a carrying-head supporting the buckling mechanism and mounted on the longitudinal shaft and the supporting-rod G'.

I represents the reciprocating buckling-finger, pivoted to the lower arm of a rock-lever *i* and provided at its free inner end with a buckling-roller *i'*, which rests on the corner of the pile of paper. The rock-lever is pivoted between its upper and lower arms upon a horizontal arbor *i*², secured to the front side of the carrying-head. The forward movement of the buckling-finger is produced by a cam *j*, secured to the longitudinal shaft and engaging with a roller *j'* on the upper arm of the rock-lever.

*j*² is a guide-rod pivotally connected at its lower end with a lug on the outer side of the rock-lever and passing with its upper portion through a stud or arbor *j*³, arranged on the front side of the carrying-head. The backward movement of the buckling-finger is produced by a spring *j*⁴, surrounding the upper portion of the guide-rod and bearing with its ends against the top of the stud and a screw-nut *j*⁵, arranged on the threaded upper end of the guide-rod. The backward movement of the buckling-finger may be regulated by means of a thumb-nut *j*⁶, arranged on the guide-rod and adapted to bear against the under side of the stud. At the end of the forward movement of the buckling-finger the latter is raised from the pile and retained in an elevated position until it reaches the end of its backward movement by means of a rock-arm *k*, which is pivoted at its outer end on the stud *j*³ and connected at its inner end by a rod *k'* with the buckling-finger and a cam *k*², secured to the longitudinal shaft and bearing against a roller *k*³ on the rock-arm. The buckling-finger is raised slightly near the end of its forward stroke and then lowered again upon the pile at the end of its forward stroke for the purpose of freeing the lower sheets from the top sheet, if more than one sheet has been buckled, the lifting-cam *k*² being constructed to produce this effect, as shown in Fig. 14. While the buckling-finger is slightly raised it still retains a sufficiently firm grip on the top sheet to preserve the buckle in the same; but the pressure is removed from the lower sheets, so that if more than one sheet has been buckled all the sheets below the top sheet will slip along the under side of the top sheet and straighten out again.

*k*⁴ represents an abrasion-plate whereby the

face of the rubber buckling-roller is kept clean and prevented from becoming smooth or glazed. This plate is arranged above the buckling-roller with its toothed or roughened under side in that portion of the path of the buckling-roller which the latter traverses during its backward movement while in an elevated position, as shown in Fig. 4. As the buckling-roller rolls along the toothed lower face of the abrasion-plate the latter digs into the surface of the roller and removes any grit, fibers, or other matter adhering to the roller, and also roughens the same, thereby preventing the roller from becoming smooth and insuring a firm grip of the same upon the paper. The inner end of the abrasion-plate is curved upwardly, so as to direct the buckling-roller to the under side of the same. The plate is supported so as to be capable of vertical adjustment toward and from the buckling-roller by means of a stem *k*⁵, arranged on the upper side thereof and secured in a lug *k*⁶ on the front side of the carrying-head by a set-screw *k*⁷.

By shifting the bracket *g* on the transverse supporting-rod the buckling device may be adjusted transversely in the machine for feeding different sizes of sheets.

L represents two vertically-movable buckling or gage feet which bear upon the pile in front of the buckling-fingers and which serve the double purpose of abutments against which the top sheet is buckled by the fingers during the forward movement of the latter and also as gage-feet whereby the upward movement of the feed-table is regulated and controlled. This regulating mechanism forms no part of this application for patent and can be of any suitable and well-known construction, and only a portion of the same is shown in the drawings to illustrate the means for raising and lowering the buckling or gage feet. These feet are arranged at opposite ends of a transverse bar *l*, which latter is connected with its central portion to the lower end of a vertical guide-rod *l'*. This rod is guided in upper and lower eyes *l*² *l*³, connected with the front supporting-bar by an arm *l*⁴. The buckling or gage feet are depressed by a spring *l*⁵, interposed between the upper eye *l*² and a collar *l*⁶, secured to the guide-rod *l'*.

*l*⁷ is a horizontal shifting rod connected at its front end with the upper end of the guide-rod and connected with its rear end to the transverse regulating-shaft *l*⁸ by an arm *l*⁹. The buckling or gage feet are raised from the pile by an elbow-lever M, provided in its lower arm with a pin *m*, which bears against the under side of the shifting rod and a cam *m'*, arranged on the transverse shaft and engaging with a roller *m*² on the upper arm of the elbow-lever. The elbow-lever is pivoted loosely on a transverse rock-shaft N, which is journaled with its ends in bearings *n*, arranged on the rear portions of the intermediate brackets.

After the front corners of the top sheet have

been buckled the sheet is carried from the pile to the tape-roller by two gripping-carriers, each of which is constructed as follows:

O, Figs. 1 and 5, represents a reciprocating actuating-rod arranged lengthwise over the pile between one of the buckling-fingers and the adjacent buckling-foot. This rod is pivotally connected at its rear end with a depending rock-arm o' , secured to the transverse rock-shaft N and sliding with its front portion in front and rear eyes o^2 o^3 , formed on a supporting-yoke o^4 . The latter is hung loosely on the transverse supporting-bar b^4 and is held against sliding lengthwise thereon by means of two connected collars o^5 , Fig. 9, arranged on the supporting-rod on opposite sides of the yoke, and a set-screw o^6 , arranged in one of the collars. The forward movement of the reciprocating rod is produced by an upper rock-arm p , secured to the rock-shaft N, and a cam p' , secured to the transverse shaft and engaging with a roller p^2 on the rock-arm p . The backward movement of the reciprocating rod is produced by a lower rock-arm p^3 , secured to the same rock-shaft, and a cam p^4 , arranged on the transverse shaft and engaging with a roller p^5 on the lower rock-arm.

Q represents a gripper-head which is mounted on the actuating-rod and which carries the gripping devices whereby the sheet is grasped and carried from the pile to the tape-roller. q represents the upper jaw of the gripper, which is arranged horizontally and connected at its rear end with the lower portion of the gripper-head, while its front end is bifurcated. R represents the lower jaw of the gripper, which is L-shaped and pivoted at its upper end by a transverse pin r to the lower portion of the gripper-head. The lower portion of the lower jaw is adapted to pass through the space in the bifurcated portion of the upper jaw and to bear against the lower face q' of the upper jaw, as shown in Fig. 6.

r' is a gear-segment formed concentrically with the pivot on the upper end of the lower gripper-jaw, and S represents a gear-rack arranged to slide in a horizontal socket s , formed in the gripper-head above the gripper-jaws and engaging with the gear-segment of the lower jaw, so that upon moving the gear-rack lengthwise in the gripper-head the lower jaw will be opened or closed. The rear portion of the gear-rack is provided with a contracted stem s' , which forms a shoulder s^2 in rear of the rack and which is guided in a hollow screw-sleeve s^3 , arranged in the screw-threaded rear portion of the socket. The gear-rack is moved forwardly for the purpose of closing the lower jaw by means of a spring s^4 , surrounding the stem s' and bearing with its ends against the shoulder on the rack and the front end of the screw-sleeve. The tension of the spring s^4 may be regulated by screwing the screw-sleeve into the socket more or less.

T, Fig. 7, is a stop against which the gear-

rack strikes during the last portion of the forward movement of the gripper-head and whereby the gear-rack is shifted for opening the gripper and releasing the sheet. This stop consists, preferably, of a screw arranged in a depending lug t on the front eye of the gripper-head, so that by adjusting this screw the time of opening the gripper can be regulated.

U, Figs. 8 and 10, represents a spring bolt or catch whereby the lower jaw is held in an open position preparatory to closing upon the sheet. This spring-bolt is arranged to slide at right angles to the gear-rack in a socket u , formed, preferably, on the outer side of the gripper-head, and is adapted to engage its inner end with a shoulder u' , formed on the outer side of the gear-rack for holding the same against forward movement in the gripper-head.

u^2 is an elbow-lever whereby the spring-bolt is retracted for releasing the gear-rack. This lever is pivoted on the gripper-head in rear of the spring-bolt and extends with one of its arms into a notch u^3 , formed in the rear side of the spring-bolt.

u^4 is a stop against which the other arm of the elbow-lever engages during the last portion of the backward movement of the gripper-head for withdrawing the spring-bolt and permitting the gear-rack to close the lower gripper-jaw. This stop consists, preferably, of a screw u^4 , arranged in a depending lug u^5 on the reareye of the gripper-head, so that by adjusting this screw the closing of the gripper can be regulated.

For the purpose of thoroughly separating the top sheet from the pile the grippers of both heads are swung first outwardly and then inwardly after they have grasped the sheet. The simultaneous outward movement of both grippers raises the middle portion of the sheet from the pile, thereby allowing air to enter between the top sheet and the next lower sheet and effectually separating these sheets. The subsequent inward movement of the grippers permits the central portion of the sheet to descend loosely upon the pile. This outward and inward movement of each gripper is effected by the following mechanism:

u^6 , Figs. 2, 11, and 12, is a cam which is secured to the longitudinal shaft in front of the carrying-head. u^7 is a rock-lever which is pivoted on the supporting-rod G' adjacent to the front side of the carrying-head and engages with its short outer arm against said cam while its long inner arm engages against the under side of a lug u^8 on the outer side of the gripper-head. The rock-lever is held against the face of the cam by a spring u^9 . The gripper-head is so mounted on its actuating-rod that it can rock on the same and the cam and lever just described produce a rocking movement of the gripper-head in the direction in which the gripper-jaws swing outwardly. As the gripper-head moves for-

wardly in feeding off the sheet the lug u^8 slides off the inclined or curved front face u^{10} , Fig. 11, of the rock-lever, which latter does not partake in this forward movement, and the gripper is swung inwardly by a flat spring u^{11} , secured to the yoke and bearing against the gripper-head below the actuating-rod. The inclined or curved face of the rock-lever allows the gripper-head to leave the lever gradually. When the gripper-head makes its backward stroke, the cam has depressed the inner arm of the rock-lever and the gripper-head takes position with its lug u^8 above the inner arm of the lever. The extent of the rocking movement of the gripper-head is limited by a cross-pin u^{12} , which is secured in the actuating-rod and projects into slots u^{13} in the hub of the gripper-head.

If desired, only one of the grippers may be provided with mechanism for producing said lateral movement, in which case the other gripper holds one side of the sheet, while the other gripper moves outwardly to lift and loosen the sheet.

During the forward movement of each buckling-finger the adjacent buckling-foot bears upon the pile, the adjacent carrying-gripper is open and stands with its upper jaw over the front edge of the pile, as represented in Fig. 5, and the corner of the sheet is buckled against the lower face of the upper jaw, as represented in Fig. 1 by dotted lines. At the end of the forward movement of the buckling-finger the latter and the buckling-foot remain upon the pile, so as to preserve the buckle in the sheet. At this time the gripper-head completes its backward movement, which causes the elbow-lever u^2 to strike the rear stop u^4 , thereby withdrawing the spring-bolt, releasing the gear-rack, and closing the lower jaw upon the sheet, as represented in Fig. 6. The buckling-finger and buckling-foot are now raised and the gripper is swung outwardly and inwardly for loosening and separating the central portion of the sheet, and the gripper is moved forward in this closed position until the front end of the sheet arrives over the tape-roller. The front end of the gear-rack now strikes the front stop, whereby the forward movement of the gear-rack is arrested, while the gripper-head continues its forward movement independently of the gear-rack, thereby causing the lower gripper-jaw to be turned on its pivot in the proper direction to open the jaw and release the sheet, as shown in Fig. 7. The lower jaw is turned to such an extent in opening that it passes above the face of the upper jaw, thereby preventing the edge of the sheet from being caught by the lower jaw upon withdrawing the sheet from the pile. While the sheet is being withdrawn from the pile the buckling-finger moves backward to the place of beginning, and when the sheet has been wholly withdrawn from the pile the buckling-finger and buckling-foot are again lowered upon the pile, and the gripper-head

moves backwardly almost to the end of its backward movement until its elbow-lever stands close to the rear stop. During the forward movement of the gripper-head independently of the gear-rack the spring-bolt is carried in front of the shoulder of the gear-rack, so that the latter upon being projected by its spring during the subsequent backward movement of the gripper-head will catch with its shoulder against the spring-bolt, thereby permitting only a partial downward movement of the lower gripper-jaw and holding the same in an oblique position, but sufficiently open to permit of buckling the sheet properly against the upper jaw, as represented in Fig. 5.

The face of the lower gripper-jaw is smooth, so as to offer only slight resistance to the paper, while the upper gripper is preferably provided in rear of its bifurcated portion with a facing u^{14} of rubber or similar material which offers considerable resistance to the paper. When two sheets have been buckled accidentally at the same time, this construction of the jaws causes the upper jaw to grasp the upper sheet, while the lower jaw slips on the second or lower sheet, so that the latter is left behind and only the top sheet is carried to the tape-roller, thereby preventing more than one sheet from being fed at a time.

It has been found in practice that the grippers do not always close upon the sheet properly and often miss a sheet when the two jaws stand vertically in line, because the buckled portion of the sheet is generally presented to the jaws at an angle thereto. In order to avoid this difficulty, the two jaws are preferably placed obliquely and at right angles, or nearly so, to the buckled portion of the sheet on that side of the crown of the buckle nearest the buckling-foot, as shown in Figs. 1 and 8, thereby better enabling the jaws to grasp the sheet.

After the sheet has been deposited with its front edge upon the tape-roller and tapes it is pressed against the tape-roller by two vertically-movable pressure-rollers V, which bear upon the longitudinal margins of the sheet. Each of these pressure-rollers is raised and lowered by the following mechanism:

v is a lower elbow-lever pivoted on the front side of the head carrying the buckling mechanism so as to swing vertically and provided on its front arm with a transverse arbor v' on which the pressure-roller is journaled.

v^2 is a follower-rod extending horizontally through openings in the carrying-head and a bracket v^3 , secured to the rear side of the head and provided at its front end with a head v^4 . The upper arm of the elbow-lever is provided with a screw v^5 , which engages with a seat formed in the front side of the head on the follower-rod.

v^6 is a spring which tends to depress the pressure-roller and which bears with its ends against the head of the follower and the bracket of the carrying-head.

w is an upper elbow-lever pivoted on the arbor z^2 at right angles to the lower elbow-lever and having its lower arm connected with the lower arm of the lower lever by a link w' . The upper elbow-lever is turned in the proper direction for raising the pressure-roller by a cam w^2 , mounted on the longitudinal shaft and engaging with a roller w^3 on the upper arm of the upper elbow-lever. While the sheet of paper is being carried with its front edge by the grippers upon the tape-roller and tapes the pressure-rollers are elevated by the cams w^2 . After the grippers have released the sheet and deposited the same on the tape-roller and tapes the springs v^6 lower the pressure-rollers, so that they press the sheet against the tape-roller, whereby the sheet is carried away upon the tapes to the press. By mounting the pressure-rollers on the head which carries the buckling devices these parts are always adjusted together for different-sized sheets, whereby the relative position of the buckling devices and pressure-rollers is always preserved.

When comparatively stiff or heavy paper is being fed, the corner portions of the sheets bear against the under sides of the buckling-rollers and pressure-rollers with considerable friction while being carried off from the pile by the grippers, and sometimes the resistance of these rollers causes the sheet to be pulled out of the jaws of the grippers. In order to avoid this, a guard w^4 is arranged in rear of each buckling-finger in such a position that the marginal portions of the sheets are thereby depressed below the buckling and pressure rollers as the sheets are carried away by the grippers and prevented from coming in contact with said rollers. These guards are preferably composed of bent rods or heavy wires and supported at their rear ends on the supporting-rod, as shown in Fig. 2.

X represents the stationary guides against which the front of the pile is placed and whereby it is kept in position while being elevated. These guides are mounted loosely on a transverse rock-shaft x , which is journaled in bearings on the front brackets, and extend to within a short distance from the top of the pile.

x' represents movable front guides which have a movement toward and from the upper front side of the pile for the purpose of removing the resistance from the sheets during the buckling operation and straightening the pile after the buckling operation. These movable guides are secured with their lower ends to the guide rock-shaft and extend with their upper ends a short distance above the top of the pile. These guides are swung forward, away from the front of the pile, by a spring x^2 , secured at one end to the tape-frame x^3 and with its other end to an upwardly-extending rock-arm x^4 , secured to the guide rock-shaft.

x^5 is a rock-lever pivoted on one of the intermediate brackets and connected with its

lower arm by a rod x^6 with the rock-arm of the guide rock-shaft. The movable front guides are moved backwardly against the front side of the pile by a cam x^7 , secured to the transverse driving-shaft E and engaging with the upper arm of the rock-lever x^5 .

During the forward movement of the buckling-fingers the movable front guides are swung forwardly out of contact with the top portion of the pile, as shown in Fig. 2, whereby the front edge of the top sheet is relieved from resistance and the top sheet is left free to be buckled. The upper ends of the movable front guides are arranged in front of the points where the buckles in the sheet are formed and extend a short distance above the pile, as shown in Fig. 1. This enables the grippers which are arranged adjacent to these movable guides to carry the top sheet over the same, but the latter intercept any lower sheets which may be pulled forward by friction and prevent them from leaving the pile.

After the buckled top sheet has been grasped by the grippers and before the latter begin their forward movement the front guides are moved rearwardly against the pile, so as to prevent the following sheets from being pulled forward and displaced to any considerable extent. After the greater portion of the top sheet has been carried from the pile to the tape mechanism the front guides are vibrated back and forth several times in quick succession, whereby any lower sheets which may have been displaced are loosened and pushed back in line with the front side of the pile and returned to the proper position.

We claim as our invention—

1. The combination with the feed-table supporting the pile of sheets and a buckling device having a transverse movement with reference to the pile of sheets and adapted to produce a transverse buckle in the front portion of the top sheet of a longitudinally-reciprocating carrying-gripper arranged in front of the point where the sheet is buckled and adapted to seize the margin of the buckled portion of the sheet and remove the sheet from the pile, substantially as set forth.

2. The combination with a transversely-moving buckling-finger adapted to engage with the front portion of the top sheet and form a transverse buckle in the same and a buckling-foot against which the sheet is buckled, of a longitudinally-reciprocating carrying-gripper arranged between the buckling-finger and the buckling-foot and adapted to seize the front margin of the buckled portion of the sheet and remove the same from the pile, substantially as set forth.

3. The combination with a transversely-moving buckling device adapted to engage with the front portion of the top sheet and form a transverse buckle in the same, of a longitudinally-reciprocating carrying-gripper, having its upper jaw arranged over the top sheet, and forming a stop against the under

side of which the buckled portion of the sheet abuts and having its lower jaw adapted to clamp the buckled portion of the sheet against the upper jaw preparatory to removing the sheet from the pile, substantially as set forth.

4. The combination with the gripper-head having a forward and backward movement and provided with a fixed gripper-jaw, of a movable gripper-jaw pivoted on said head and provided with a gear-segment, a gear-rack having a reciprocating movement in said head independent of the fixed gripper-jaw and engaging with the segment of the movable jaw, and mechanism whereby said gear-rack is actuated, substantially as set forth.

5. The combination with the gripper-head having a forward and backward movement, of a fixed gripper-jaw arranged on said head, a movable gripper-jaw pivoted on said head and provided with a gear-segment, a gear-rack arranged on said head and engaging with said segment, a spring whereby the gear-rack is moved forwardly in said head, and a stop whereby the gear-rack is moved rearwardly in said head, substantially as set forth.

6. The combination with the gripper-head having a forward and backward movement, of a fixed gripper-jaw arranged on said head, a movable gripper-jaw pivoted on said head and provided with a gear-segment, a gear-rack arranged on said head and engaging with said segment, a spring whereby the gear-rack is moved forward in said head, a stop whereby the gear-rack is moved rearwardly in said head, a spring-bolt whereby the forward movement of the gear-rack is arrested for holding the gripper open, and a stop whereby the spring-bolt is withdrawn, substantially as set forth.

7. The combination with the gripper-head having a forward and backward movement, of a fixed gripper-jaw arranged on said head, a movable gripper-jaw pivoted on said head and provided with a gear-segment, a gear-rack arranged on said head and engaging with said segment, a spring whereby the gear-rack is moved forwardly in said head, a stop whereby the gear-rack is moved rearwardly in said head, a spring-bolt whereby the forward movement of the gear-rack is arrested for holding the gripper open, an elbow-lever engaging with the spring-bolt, and a stop adapted to engage with the elbow-lever for disengaging the spring-bolt from the gear-rack, substantially as set forth.

8. The combination with the feed-table supporting the pile of sheets, of two buckling devices whereby the front portion of the sheet is buckled at two points, two longitudinally-movable grippers adapted to seize the buckled portions of the sheet, and mechanism whereby one gripper is moved laterally with reference to the other, before beginning the forward stroke of the grippers whereby the front portion of the sheet between the buckled portions is raised from the pile and the sheet is

thoroughly loosened before being removed from the pile, substantially as set forth.

9. The combination with the feed-table supporting the pile of sheets, of two buckling devices whereby the front portion of the sheet is buckled at two points, two grippers having a reciprocating forward and backward and a lateral movement and adapted to seize the buckled portions of the sheet while the same rests on the pile and a cam and rock lever whereby each gripper is moved away from the other gripper before the grippers begin their forward movement, substantially as set forth.

10. The combination with the feed-table supporting the pile of sheets, of two buckling devices whereby the front portion of the sheet is buckled at two points, two gripper-heads having a longitudinally-reciprocating and a laterally-oscillating movement and provided with gripping-jaws which grasp the buckled portions of the sheet while the same rests on the pile, and rock-levers which are held against longitudinal movement with the gripper-heads and which are adapted to engage with the gripper-heads before the latter begin their forward movement and move the gripper-jaws of one head away from the gripper-jaws of the other head, substantially as set forth.

11. The combination with the feed-table and the tape-roller arranged in front of the table, of a carrying-head arranged above the feed-table and capable of transverse adjustment in the machine, a buckling mechanism arranged on said head, and a vertically-movable pressure-roller also mounted on said head and adapted to bear against the tape-roller, substantially as set forth.

12. The combination with the tape-roller and the carrying-head of the buckling mechanism, of a vertically-movable pressure-roller adapted to move toward and from the tape-roller, a lower elbow-lever pivoted on said head and supporting the pressure-roller, a spring engaging with the lower elbow-lever for lowering the pressure-roller, an upper elbow-lever pivoted on said head and connected with the lower elbow-lever, and a lifting-cam mounted on said head and engaging with the upper elbow-lever, substantially as set forth.

13. The combination with the feed-table and the buckling-finger arranged over the front portion of the pile, of a gripper arranged over the front portion of the pile and a guard arranged over the pile in rear of the buckling-finger and adapted to hold the sheet out of contact with said finger while the sheet is being removed from the pile by the gripper, substantially as set forth.

14. The combination with the buckling-finger and its roller, of an abrasion-plate arranged in the path of said roller, substantially as set forth.

15. The combination with the carrying-head and the buckling-finger mounted thereon and

having a buckling-roller, of an abrasion-plate arranged above the buckling-finger and made vertically adjustable on the carrying-head, substantially as set forth.

5 16. The combination with the feed-table supporting the pile of sheets, of a buckling-finger having a forward and backward movement and a cam constructed to hold the finger down upon the pile during the first portion of
10 its forward movement, slightly raising the finger near the end of its forward movement, and then lowering the finger upon the pile at the end of its forward movement, substantially as set forth.

15 17. The combination with the feed-table and the buckling device, of stationary front guides which do not extend to the top of the pile, a movable front guide which extends above the stationary guides, and mechanism
20 whereby the movable guide is moved toward and from the pile, substantially as set forth.

18. The combination with the feed-table and the buckling device, of stationary front guides which do not extend to the top of the
25 pile, a movable front guide which extends above the stationary guides, and a rock-shaft upon which the stationary guides are loosely hung and to which the movable guide is secured, substantially as set forth.

30 19. The combination with the feed-table and the tape mechanism arranged in front of the table, of a transversely-movable buckling device whereby a transverse buckle is formed in the front portion of the sheet, a carrying-
35 gripper adapted to carry the sheet from the

pile to the tape mechanism and arranged in front of the point where the sheet is buckled, and a front guide bearing against the front side of the pile adjacent to the gripper and extending with its upper end above the top 40 of the pile, substantially as set forth.

20. The combination with the feed-table and the tape mechanism arranged in front of the table, of a transversely-movable buckling device whereby a transverse buckle is formed 45 in the front portion of the sheet, a carrying-gripper adapted to carry the sheet from the pile to the tape mechanism and arranged in front of the point where the sheet is buckled, a front guide bearing against the front side 50 of the pile adjacent to the gripper and extending with its upper end above the top of the pile, and mechanism whereby the front guide is moved away from the pile during the operation of buckling the top sheet and pressed 55 against the pile while the top sheet is being carried from the pile, substantially as set forth.

Witness my hand this 31st day of August, 1895.

MICHAEL B. FOY.

Witnesses:

EDWARD WILHELM,
THEO. L. POPP.

Witness my hand this 5th day of September, 1895.

FRANK M. LEAVITT.

Witnesses:

BRainerd W. CHILD,
FRED T. BENSON, Jr.