J. F. Weeks. Sheet 1. 4 Sheets.

Paper Folder.

No. 17,535. Patented Jun. 9, 1857.

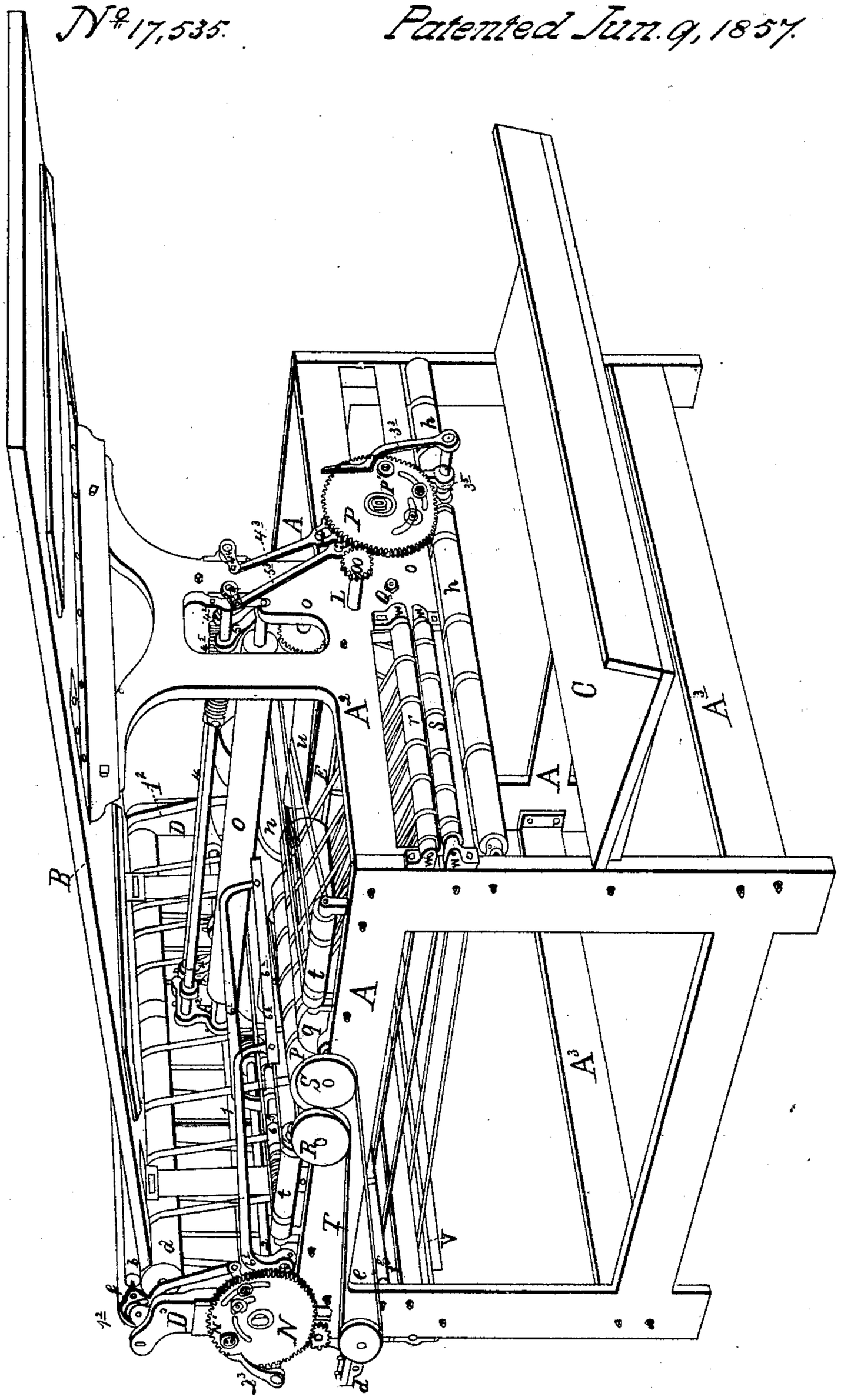


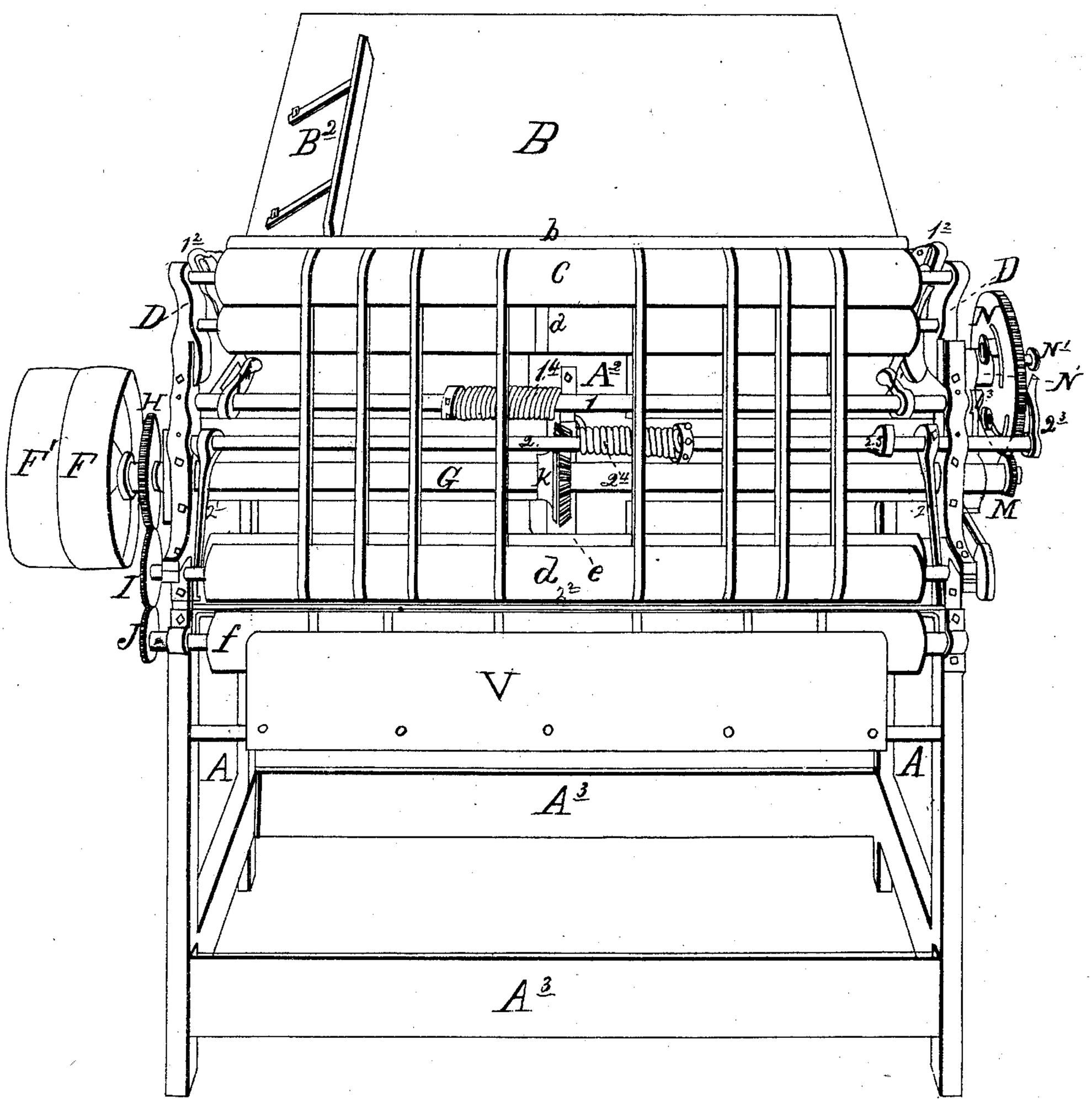
Fig. 1.

J. F. Weeks. Sheet 2. 4 Sheets

Paper Folder.

No. 17,535. Patented Jun. 9, 1857.

Fig. 2.



J. F. Weeks. Sheet 3. 4 Sheets

Paper Folder.

No. 17,535. Patented Jun. 9, 1857.

Fig. 3.

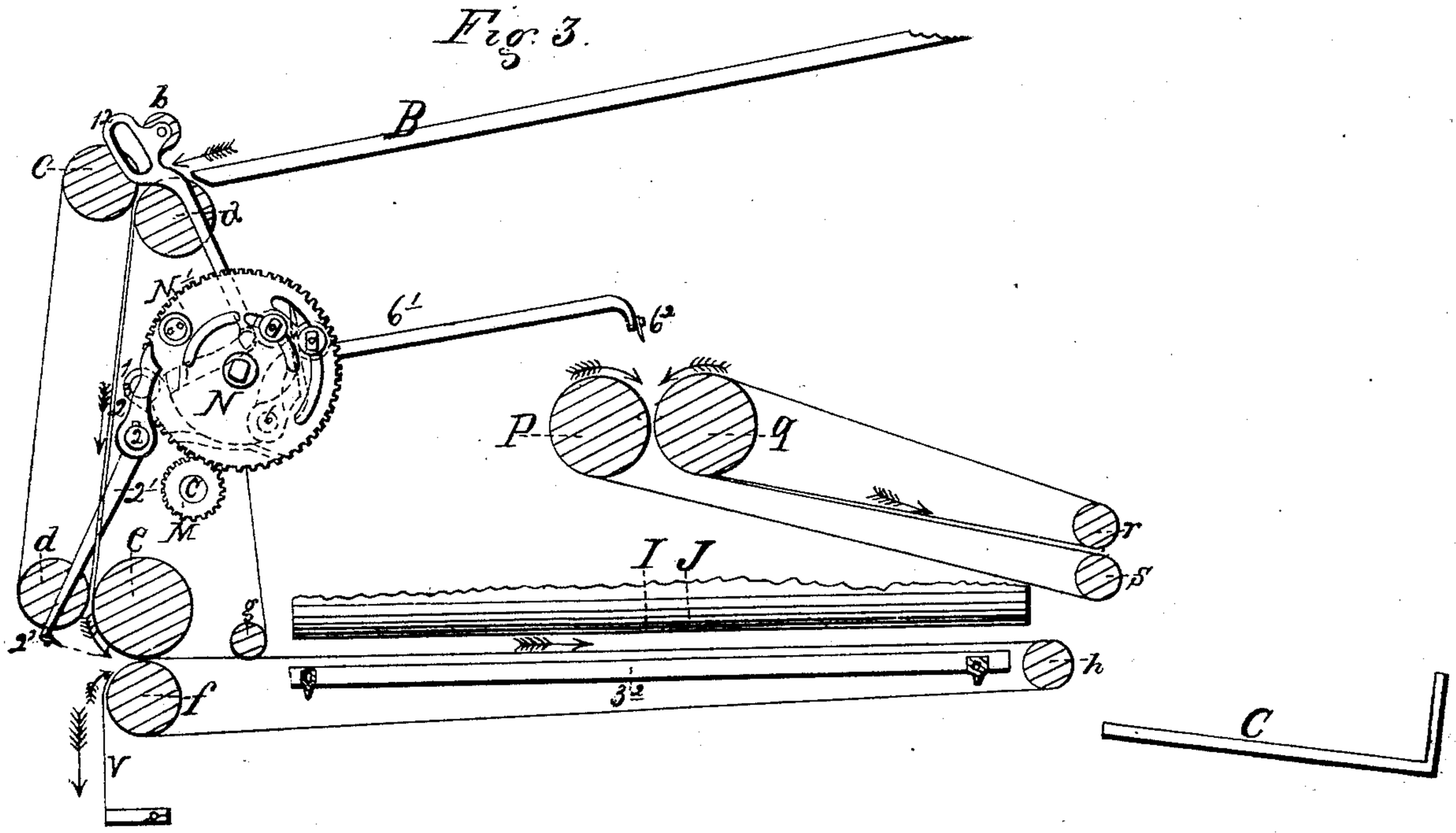
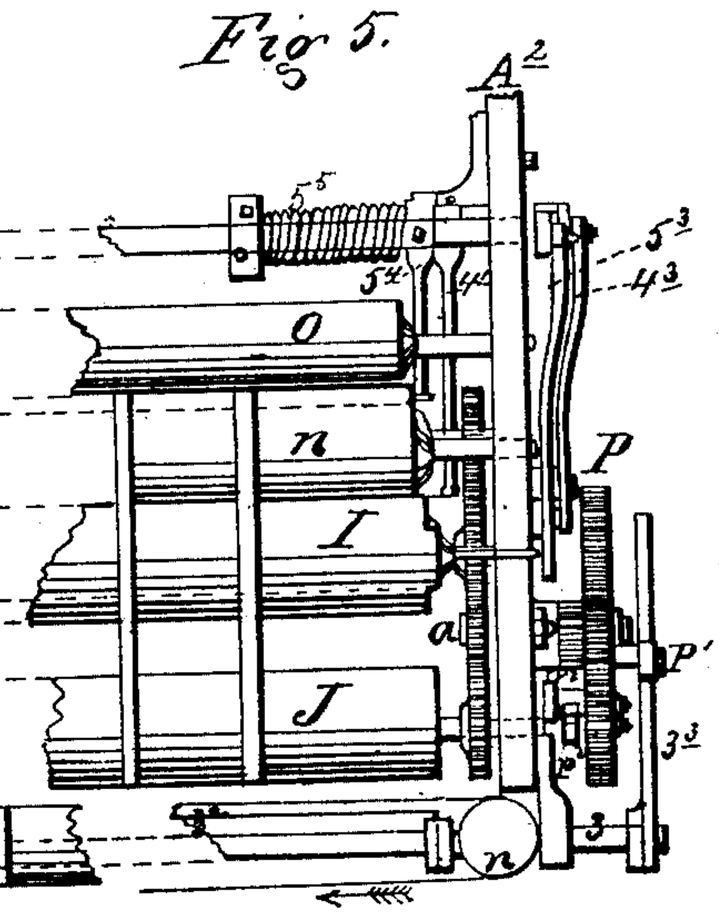


Fig. 4.

Fig. 5.



J. F. Meeks. Sheet 4. 4 Sheets.

Paper Folder.

No. 17,535. Patented Jun. 9, 1857.

Fig: 6.

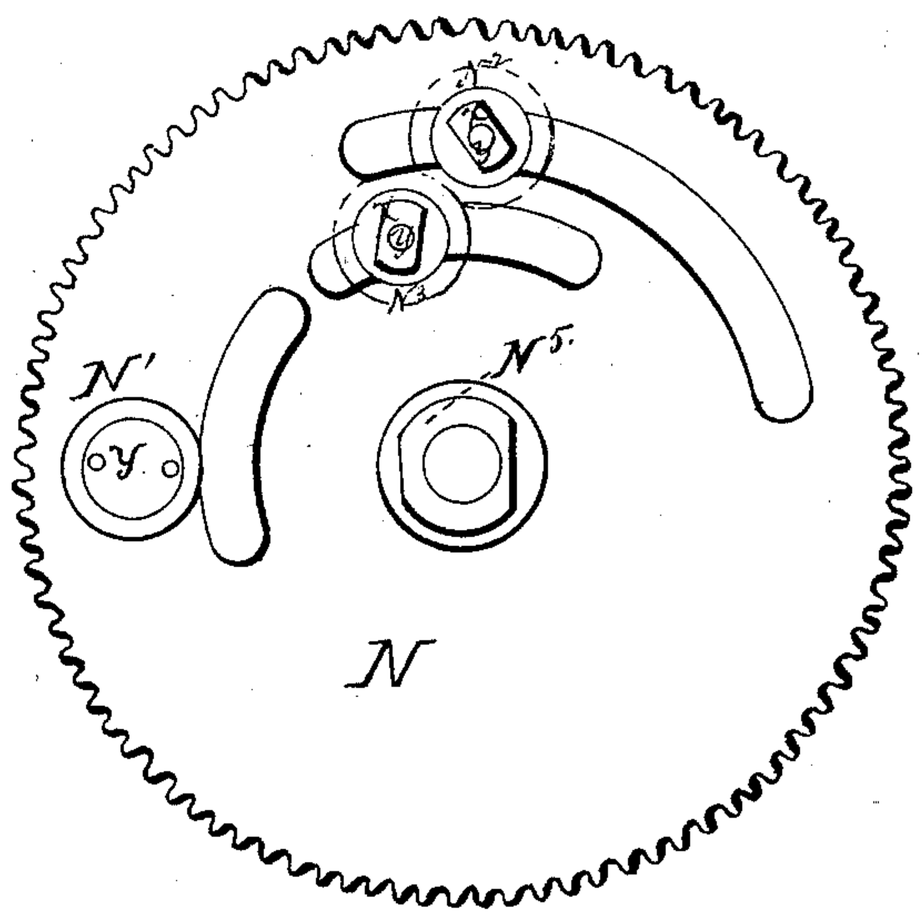


Fig: 7.

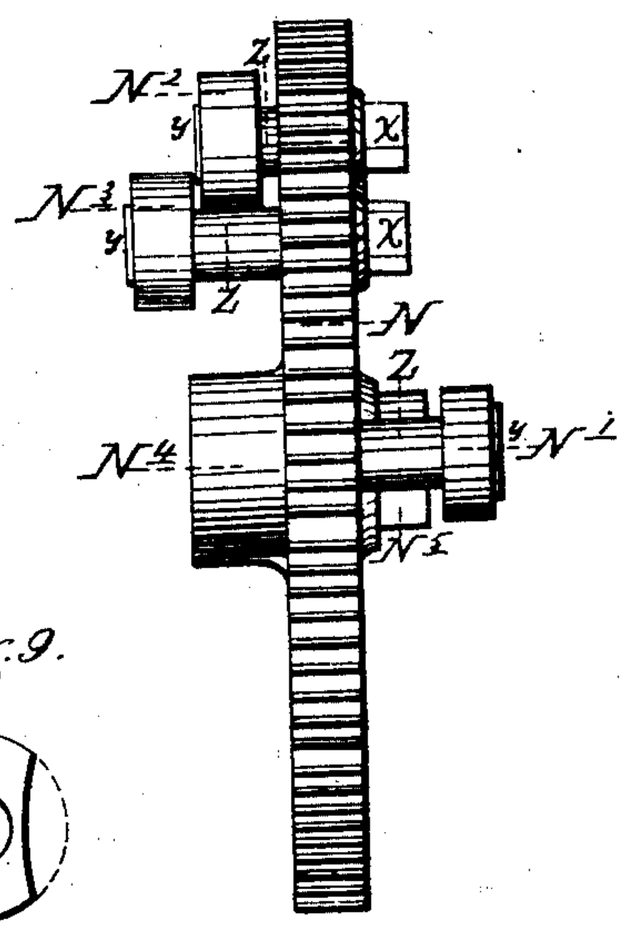


Fig: 9.

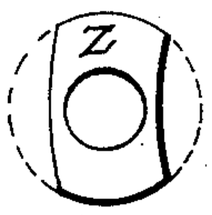


Fig: 10.

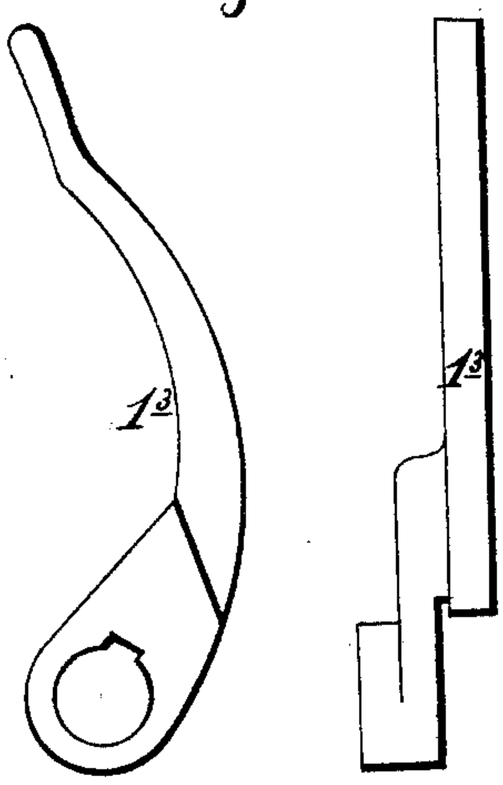


Fig: 11.

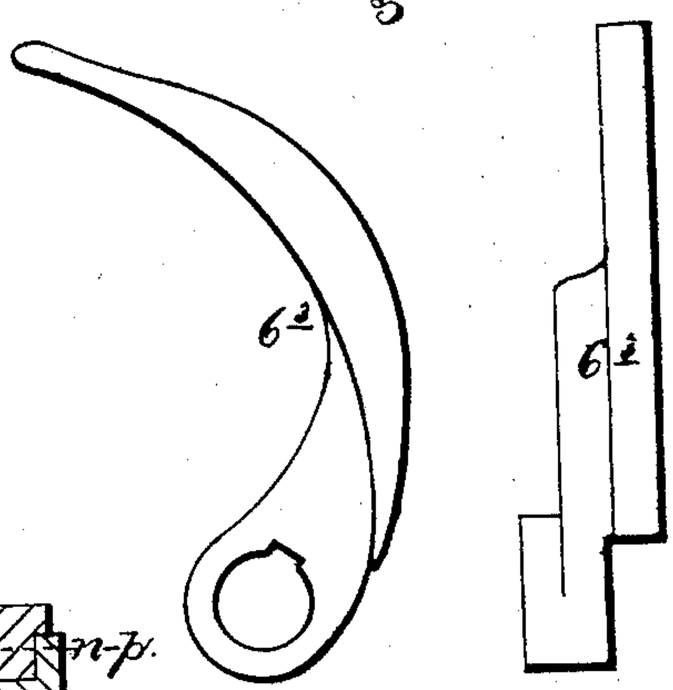
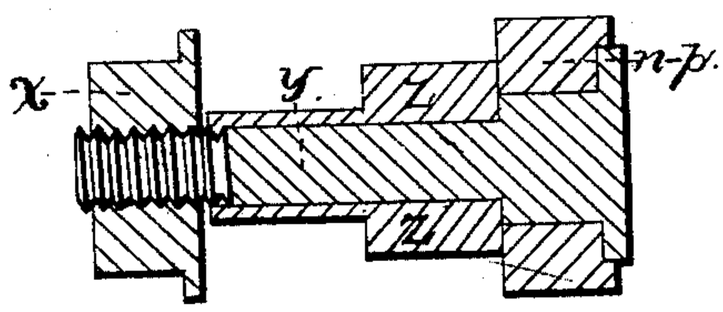


Fig: 8.



UNITED STATES PATENT OFFICE.

JAMES F. WEEKS, OF COLUMBUS, OHIO.

MACHINE FOR FOLDING PAPER.

Specification of Letters Patent No. 17,535, dated June 9, 1857.

To all whom it may concern:

Be it known that I, JAMES F. WEEKS, of the city of Columbus, in the county of Franklin and State of Ohio, have invented a new and useful improvement in machinery for producing the reciprocating motion to the straight edges or folders in machines for folding paper, by which I facilitate the rapid working of the machine and avoid a great degree of the wear and its liability to get out of order; and I do further declare that the following is a clear, full, and exact description of the construction and operation of a machine suitable for folding folio newspapers, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is a perspective view; Fig. 2, a front elevation; Fig. 3, a sectional view of the shaft, rollers and rockshafts, connected with the feed and first and fifth folds, the frame being omitted; Fig. 4 is a sectional view of the countershaft, rollers and rockshafts of the second, third and fourth folds, the frame being removed; Fig. 5 is sectional side view of Fig. 4; Fig. 6 is a plan of the slots and friction rollers of a wheel by which I produce the required motion; Fig. 7 is a longitudinal sectional view of the same wheel, showing the plane and orbits of the different friction rollers; Fig. 8 is a longitudinal view of a stud showing the manner of forming the bearing to the friction rollers, in which *x* is the nut, *y* the bolt, *z* the thimble, and *n*—*p* the friction roller, loose upon the bolt; Fig. 9 is a sectional view of the thimble *z* cut through the dotted line, showing the fitting of the thimble to the slots in the wheel; Fig. 10 is a sectional and side view of the finger, or tripping arm, operating the rockshaft 1; and Fig. 11 is a sectional and side view of the finger operating the rockshaft, 6; Figs. 1, 2, 3, 4, and 5 are $\frac{1}{6}$th size; Figs. 6, 7, 10 and 11 are one half size, and Figs. 8 and 9 are full size of the machine.

Like letters and figures refer to the same parts in all the drawings.

The ends of the frame, A, A, Fig. 1, are of iron, cast whole, three feet wide and two feet eight inches high, the body three eighths of an inch thick and four inches wide, with moldings projecting on each side of each edge, so as to make it an inch thick around the whole frame, placing suitable bosses for the journals and caps, and for drilling, where necesary, and having an elevation on the front side of seven inches, to which is bolted the pieces, D, D, which form bearings for the rollers *a*, *c*, and a pin which passes through the slot in the pieces 1^2, coupled to the arms 1^1 of the rockshaft 1, and by which the feed roller, *b*, is raised, lowered and guided to take the sheets. The side pieces of the frame, A^2, A^3, are three feet two inches long, with flanges on the ends to receive the bolts and stiffen the frame; the upper pieces A^2 are so enlarged near the middle as to form the necessary bearings to all the rollers, rockshafts, countershaft and studs required, and also to support the feed board, B. The roller, *a*, Fig. 2, three inches in diameter, has a bearing three feet five and a half inches from the floor, in the pieces D, D. The roller *c*, three inches in diameter, is raised one and a half inches higher, and in front of *a*, and lies in slotted bearings, so that its weight rests on *a*. The feed roller *b*, one and a half inches in diameter, has bearings in the slotted arms 1^2, in which it revolves easily to the touch, and is driven by the friction from the roller *a*. The roller *e*, four inches in diameter, has bearings two feet and two inches from the floor, on the front sides of the ends of the frame. The roller *d*, two and three fourth inches in diameter, has bearings three eighths of an inch above the bearings of *e*, in pieces suspended by bolts, passing through slots, in projections cast on the caps of the roller *e* (see *d*, Fig. 1) in order that it can be always kept tightly pressed against *e*, to hold the sheet firm while it passes downward in front of the roller *f*, as indicated by the arrow in Fig. 3, until it is struck between *e* and *f*, forming the first fold. The roller *f*, Fig. 2, is three inches in diameter, and has bearings in the same perpendicular line with *e*, thereby leaving a space of half an inch for the sheet to pass without touching its periphery, until forced by the folder at the proper time, and as a further prevention of the sheet being drawn in by the motion of *f*, I place a piece of sheet zinc *v* in front of it, riveted to a rod bolted to the frame below *f*.

The rollers *a*, *b*, *c*, *d*, *e* and *f* are of wood, having iron gudgeons driven in about four or five inches, projecting to form the bearings, the wood reaching to within about an inch of the frame. The rollers *g*, Fig. 3, are of wood, one and a half inch in diam-

eter, and extend to bearings cast projecting on the upper front side piece A^2 near the center of the frame, and are received in small pieces bolted to the end of the frame A, so that their lower side shall be one fourth of an inch lower than the lower side of the roller *e*, in order that the set of tapes which pass from *f* to *h*, shall bind the sheet against *g*, and thus secure its advance until fully delivered beneath the rollers *i*, *j*. The rollers *h*, are two inches in diameter, resting in bearings bolted to the frame so that their upper edge will be horizontal with the lower edge of *g*. The rollers *i*, *j*, Fig. 4, have horizontal bearings in the lower part of the upper side pieces A^2, and equidistant from the center of the machine, and so that their lower sides are half an inch above the tapes from *f* to *h*. Four and seven eighths inches above *i*, is roller *l*, in front of which is roller *k*, two inches in diameter, around which the set of tapes from *i* return. Above *l* is roller *m*, two and a half inches in diameter and horizontal with *m* is *n*, seven and five eighths inches above *j*. Above *n* is *o*, two and a half inches in diameter, bearing in slots and resting its weight on *n*. The rollers *i*, *j*, *l* and *n* are of wood, each three inches in diameter, and reaching in length nearly across the width of the frame, with iron gudgeons driven in the ends to form bearings. The rollers *k*, *m* and *o* are of wood, of the same length and bearing. Parallel with *n*, and even with the top of the end pieces of the frame, I bolt a cross piece E, Fig. 1, forming bearings for the rollers *p*, *q*, *u*, *u*, and the rockshaft 6. The rollers *u*, *u*, Fig. 1, are about eight inches long and one and a fourth inch in diameter, and lie entirely below the top of the roller *n*, being parallel with and about half an inch from it. The rollers *t*, *t*, are about eight inches long and one and a half inches in diameter, parallel with and their tops level with the top of *n*, having bearings in pieces bolted to the end piece of the frame A. The rollers *p*, *q*, four inches in diameter, have horizontal bearings in the top of the end piece A and the crosspiece E, at right angles to the center of *n*, the tops of *p*, *q*, being about half an inch below the tops of *n*, *t*. The delivery rollers *r*, *s*, one and a half inches in diameter, have bearings in the pieces *w*, *w*, *w*, *w*, projecting from and bolted to the frame, so as to deliver the sheet about six inches from the top of the frame. The receiving board C is about fifteen inches wide and the length of the machine, and is supported by pieces bolted to the end pieces A, of the frame, about ten inches below the delivery rollers.

The rockshaft 1, Fig. 2, has bearings in the front of the frame, eight and a half inches above the bearings of the roller *e*, and recessed half an inch from the edge of the frame A, having an arm 1^1 on each end, inside the frame, four inches long, to which are coupled the slotted pieces 1^2, 1^2, bearing the feed roller *b*, Fig. 3. On the end of the rockshaft 1, between the frame and the slotted wheel N, Fig. 2, is a finger or tripping arm, 1^3, of which Fig. 10 is a sectional and side view, which operates the rockshaft as it is pressed downward by the revolution of the friction roller N^3, on the slotted wheel N, the motion being returned by the action of the spiral spring, 1^4, on the rockshaft near its center—thus causing the feed roller, *b*, to fall and rise at the proper time. Rockshaft 2, has bearings six and three fourths inches above the roller *e*, in the front edge of the frame, having an arm on each end, 2^1 2^1, Fig. 3, to which is bolted the steel straight edge or folder, 2^2, extending across the front of the machine and so adjusted as to force the sheet precisely into the recess between the rollers *e*, *f*, forming the first fold, by the action of the friction roller, N^1, against the finger 2^3 on the end of the rockshaft, outside of the slotted wheel N, which motion is returned by the action of the spiral spring, 2^4, near the center of the shaft—the arms, 2^1, reciprocating between the gudgeons, or journals, of the rollers *e* and *f*. Rockshaft 3, Fig. 4, lies below the line of tapes from *f* to *h*, with bearings parallel and about three inches below the roller *i*, having arms, 3^1, on each end inside the frame, to which is bolted the folder, 3^2, Fig. 3, adjusted to strike the sheet upward from the tapes *f*, *h*, precisely into the recess between the rollers *i*, *j*, Fig. 4, by the action of the friction roller P^1 against the finger 3^3 on the outer end of the rockshaft 3, Fig. 1, outside of the slotted wheel P, which motion is again returned by a spiral spring on the rockshaft. Nine inches above the countershaft L, Fig. 1, and one inch in front of the roller *m*, Fig. 4, is rockshaft 4, with arms 4^1 and folder 4^2, which strike the sheet between the roller *l*, *m*, making the third fold by the action of the slotted piece, 4^3, coupled to the finger, 4^4, as it is moved by the upward pressure of the friction roller P^2, which motion is again returned by the action of the spiral spring 4^5. Parallel with 4, and two and a half inches from it, is rockshaft 5, on which are arms, 5^1 and folder 5^2 which strike the sheet between the rollers *n*, *o*, making the fourth fold, by the action of the friction roller P^3, in the same manner as the third fold is formed. The lower ends of the pieces 4^3 and 5^3 have slots in which a friction stud or pin is inserted, screwed into bosses projecting from the frame, bringing them in line with the orbits of the friction rollers P^2 and P^3. Rockshaft 6 is situated half an inch above and parallel with the rollers *p*, *q*, near the front top piece of the

frame, A^2, thirteen inches from the bearings of *p*, having bearings in the end of the frame A and the cross piece E, having arms 6^1 and folder 6^2 which strikes the sheet between the rollers *p*, *q*, forming the last fold, Fig. 3, by the action of the friction roller N^3, against the finger 6^3, (of which Fig. 11 is a sectional and side view) which motion is returned by the action of the spiral spring. I make the rockshafts seven eighths of an inch in diameter, and 2, 3 and 6 are provided with adjustable stops 2^5 3^5 and 6^5, to prevent their going too far. 1, 4 and 5 are governed by the slots in the pieces coupled to the fingers on the rockshafts. All the arms are fastened to the rockshafts by set screws so as to adjust the advance of the folders to a proper distance. All the spiral springs are firmly secured to the frame at one end, the other passing through a hole in a washer on the rockshaft, provided with lever holes and set screw, so that the strength of the spring can be governed at pleasure. All the fingers are firmly keyed to the rockshafts, and their length from the rockshafts to the striking point of the friction rollers is such that the motion of the folders is equal to the speed of the sheet, so that the paper is folded just where the folder strikes it, without any wrinkle.

On the end of the main shaft G, Fig. 1, is a pinion M, two inches in diameter with twenty four teeth, which gears with and drives the slotted cog wheel N, eight inches in diameter with ninety six teeth, making one revolution to four of the pinion M. The slotted wheel N, is three fourths of an inch face, having a hub N^4, Fig. 7, affording a lateral bearing of about two inches upon a stud one inch in diameter, and is kept in place between a collar next the frame and a left hand threaded nut N^5, the stud passing through the frame A and firmly secured with a screw and nut. The friction roller N′, Fig. 6, one and a fourth inches in diameter and half an inch face, has a bearing between the head of a bolt or stud and a thimble five eighths of an inch from the face of N, said stud or bolt being screwed into the wheel N three inches from its center. About four inches back of this stud a half inch slot commences and extends about five inches, the middle of the slot being on a pitch line of three inches radius, and which receives a nut, bolt, thimble and friction roller as represented in Figs. 6, 7, 8, and 9, where *x* is the nut, *y* the bolt, *z* the thimble and *n*—*p* the friction roller, the whole forming a movable stud easily adjusted and secured at any point, the manner of fitting the thimble, *z*, to the slot being shown at Fig. 9, the thimble projecting one eighth of an inch from the inner face of the wheel (Fig. 9). Two other half inch slots are cut in the wheel N, as represented in Fig. 6, on a pitch line of two and one eighth inch radius, each slot being about two and a quarter inches long, which support the friction roller N^3, five eighths of an inch from the inner face of the wheel, by means of the thimble, bolt and nut, in the manner similar to N^2 above described. On the delivery side of the machine, on the outer end of the countershaft L, Fig. 1, is another pinion, O, of the same size as the pinion M, before described, which gears and drives another slotted wheel P, of the same size, face, gear, bearing and support as the wheel N, above described, except that the friction roller P^1 on the outer face is close to the end of the outer slot and the inner slot is continuous on the pitch line of two and a quarter inch radius and about one half in rear of the outer slot, as shown in Figs. 1 and 4—the nuts, bolts, thimbles, and friction rollers being like those above described on the wheel N.

Motion is given to the whole by a band on the loose pulley F^1 being thrown upon the driving pulley F, Fig. 2, on the main shaft G, which passes through and has bearings in the end pieces of the frame A, A, five inches above the bearings of the roller *e*, and two inches from the front edge. On the shaft G, between the pulley F, and the frame A, I place a cog wheel, H, six inches in diameter, which gears with and drives the cog wheel, I, on the roller *e*, four inches in diameter, which gears and drives another cog wheel, J, three inches in diameter, on the roller *f*. On the shaft G, near the middle of the frame, is a miter wheel, K, which gears, through a slot in the upper frame piece A^2, with another miter wheel on the counter shaft L, inside the frame. On the opposite inner side, on said countershaft, is a three inch cog wheel, which gears and drives similar cog wheels on the rollers *l*, *m*, and also by an intermediate on the stud Q, with the roller *i* (Fig. 5). On the outer ends of the main shaft G and the counter shaft L, are the pinions M and O, which drive the slotted wheels N and P, causing the revolutions by which the friction rollers N^1, N^2, N^3, P^1, P^2 and P^3 operate upon the fingers or tripping arms of the several rockshafts, alternately, operating the feed roller and the several folders, in the manner described. On the outer ends of the rollers *p*, *q*, are grooved wheels, three and three fourths of an inch in diameter R, S, Fig. 1, which receive a half inch round belt, driven by a similar grooved wheel upon the roller *e*, two and a half inches in diameter, imparting motion to *p*, *q*, and by the two sets of tapes thereon also the rollers *r*, *s*, by which the sheet is deposited upon the receiving table C. The series of tapes passing around the rollers driven by cogwheels carry the other rollers around which they pass and

deliver the paper at the proper time and place to produce the proper folds in the desired manner.

The top piece of the frame A^2, Fig. 1, of the side on which the sheets are delivered is raised sufficiently high (about 18 inches) to form a support to the feed board, B, in the manner represented, which is of the width of the length of the machine, and about five feet long.

B^2, Fig. 2, is a gage fixed on arms, so that it can be swung to adjust the sheet to different sizes and produce accuracy in the second fold.

Operation:—The sheets are fed similar to the manner of feeding a cylinder printing press, by being advanced to a mark attached to the feed board and lying in a groove turned in the roller *a*, near the middle of its length, where it remains until the feed roller, *b*, is brought down by the motion of the rockshaft 1, when the sheet is rolled between *a* and *c*, and carried downward between two sets of tapes and the rollers *d*, *e*, and in front of *f*, until the proper place for the fold has arrived, when the motion of rockshaft, 2, operates the folder 2^2, to force the sheet between the rollers *e*, *f*, forming the first fold, the sheet passing into the machine horizontally between two sets of tapes on the rollers *a*, *e*, *g* and *f*, *h*. The tapes which pass from *c* return upward around the roller *d*. The tapes from *a* to *e* pass around *g* and return upward to *a* again. The sheet with one fold, emerging from beneath the rollers *g*, *g*, on the tapes *f*, *h*, advances horizontally beneath the rollers *i*, *j*, Figs. 3 and 4, until the action of the rockshaft 3 operates the folder 3^2, to strike the sheet upward between the rollers *i j* and forms the second fold at right angles to the first and is received between two sets of tapes, which carry it upward between the rollers *k*, *l*, until the action of the rockshaft 4, operates the folder 4^2 to strike the sheet horizontally between the rollers *l*, *m*, making the third fold parallel to the second. The sheet passing under the roller *m*, and rising upward again between *m* and *n*, advances until the action of the rockshaft 5, operates the folder 5^2, to strike the sheet between the rollers *n*, *o*, making the fourth fold parallel to the second and third, the sheet advancing horizontally from *n*, *o*, upon the tapes *n*, *t* (which have guided it from the roller *j*) above the rollers *p*, *q*, until the action of the rockshaft 6 operates the folder 6^2 to strike the sheet between the rollers *p*, *q*, at right angles to the last formed fold, and the sheet passes between two sets of tapes between the rollers *r*, *s*, and is thus delivered upon the receiving table C. The set of tapes from the roller *i* pass around *k* and return downward to *i*. The tapes from *j* over *l* and *n*, return around *t* and over *u*, passing downward to *j* again.

By removing the roller *o* and placing in its bearings a rod with a piece of sheet zinc, or its equivalent, to turn the sheet horizontally as it rises from *m*, over *n*, and removing the friction roller P^3 by taking the movable stud from the wheel P, the fourth fold above described may be omitted whenever desired. In the same manner, substituting a rod and zinc or their equivalents, in the bearings of the roller *m*, replacing the roller *o*, and removing P^2 and its movable stud from the slot in the wheel P, the rockshafts 4 and 5 will remain stationary, and the sheet will pass from the second to the fifth folds, above described, and be delivered from the machine with but three folds, or in a quarto form.

Having thus described a newspaper folding machine, I do not claim the folding of paper by passing the sheets between revolving rollers; neither do I claim the arrangement of the rollers in the above described form, as they can be easily arranged to produce any other form of fold desired; but

What I do claim as my improvement, and desire to secure by Letters Patent, is—

1. The manner of operating the feed roller and folders, by means of friction rollers, or their equivalents, revolving upon the plane of a wheel, or wheels, (N, Fig. 6) striking against fingers, or tripping arms, or their equivalents, keyed upon the rockshafts to which the feed roller and folders are attached, substantially in the manner described, in combination with spiral springs upon said rockshafts, to return the feed roller and folders to their places, substantially in the manner specified, the whole tending to facilitate the rapid, easy and certain operation of the machine.

2. I also claim making slots in said wheel, or wheels, in which to fasten said friction rollers, or their equivalents, at any desired point by means of the thimble, bolt, and nut, constituting the movable stud (Fig. 8,) substantially in the manner specified and shown in Figs. 6, 7, 8 and 9, so that said friction rollers may be moved forward or backward, to cause the motion of said rockshafts to be sooner or later as may be desired, in combination with the rockshafts, spiral springs, rollers and tapes, the whole operating substantially in the manner described, for the purpose of forming any desired folds in paper;—using any number of said slotted wheels, friction rollers, rockshafts, spiral springs, rollers and tapes, or their equivalents, in combination, necessary for the purpose of producing any number or form of fold required.

Columbus, Ohio, May 6, 1857.

JAMES F. WEEKS.

Attest:

J. F. KELLY,

T. SHILLING.