4 Sheets—Sheet 1.

N. S. CLEMENT.

Machine for Folding and Counting Paper.

No. 199,354. Patented Jan. 22, 1878.

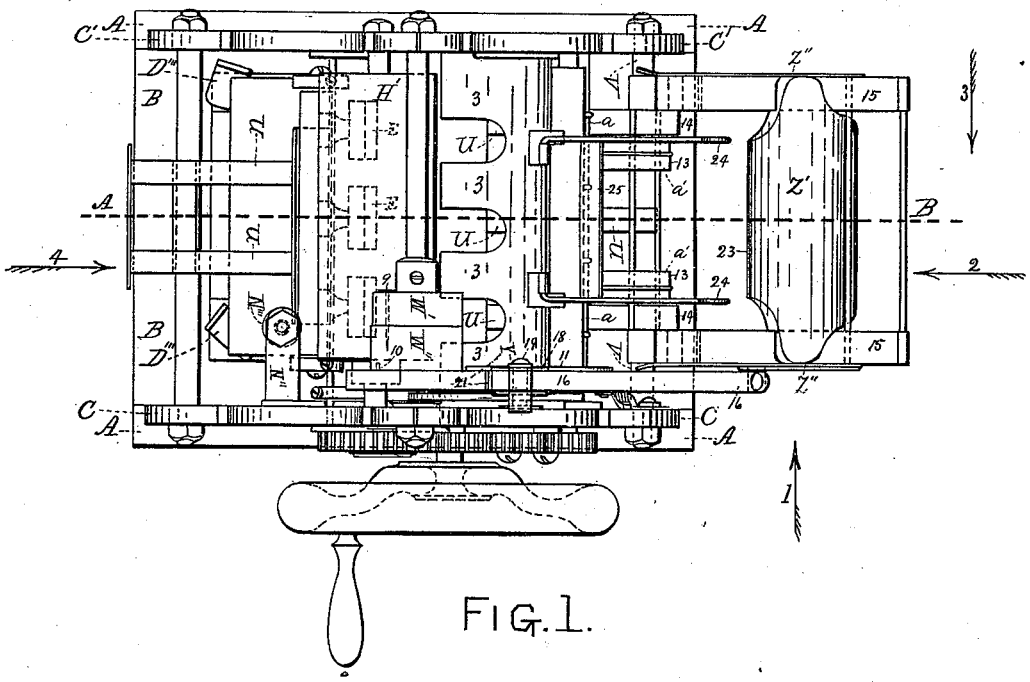

FIG. 1.

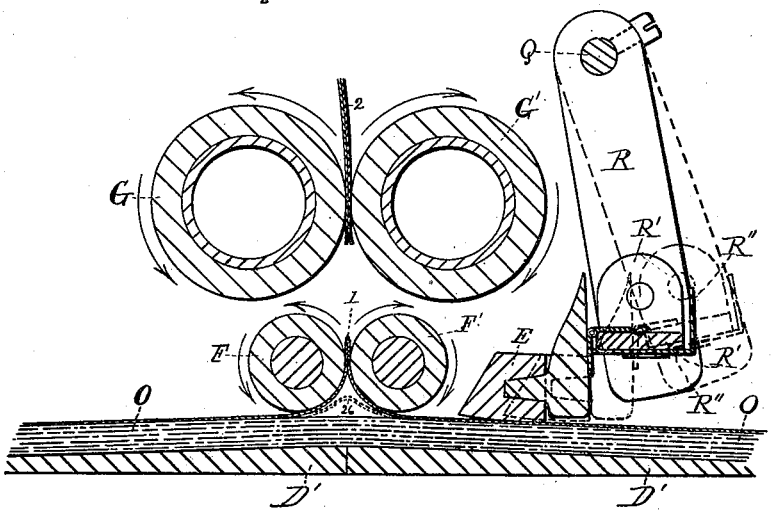

FIG. 8.

WITNESSES:

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Edwin E. Moore

INVENTOR:

Nathan S. Clement

4 Sheets—Sheet 2.

N. S. CLEMENT.

Machine for Folding and Counting Paper.

No. 199,354. Patented Jan. 22, 1878.

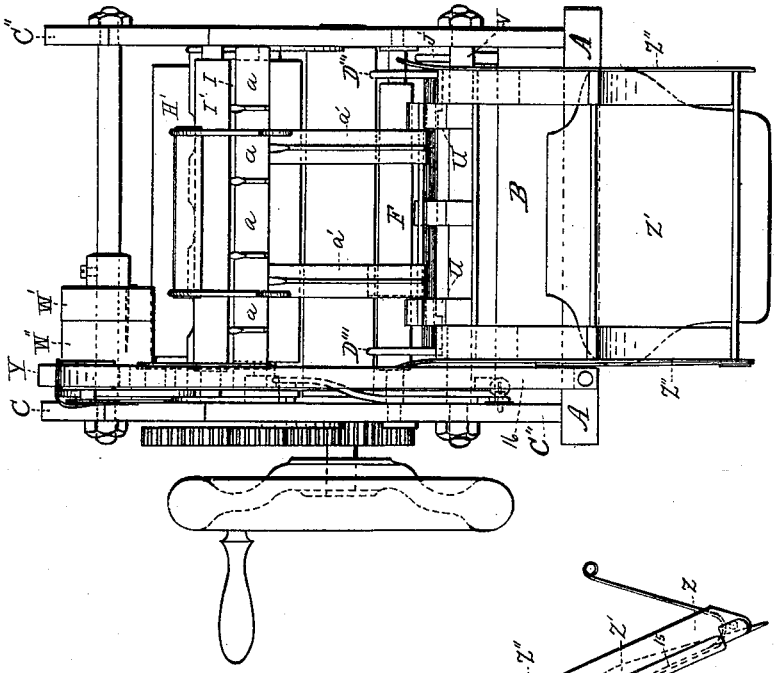

FIG. 3.

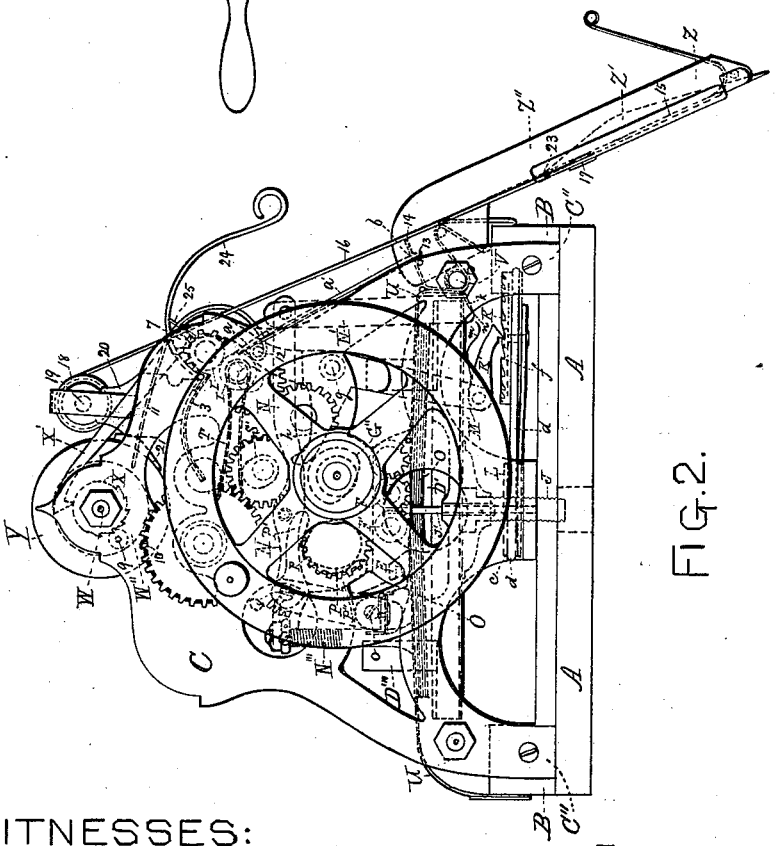

FIG. 2.

WITNESSES:

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Nathan S. Clement.

4 Sheets—Sheet 3.

N. S. CLEMENT.

Machine for Folding and Counting Paper.

No. 199,354. Patented Jan. 22, 1878.

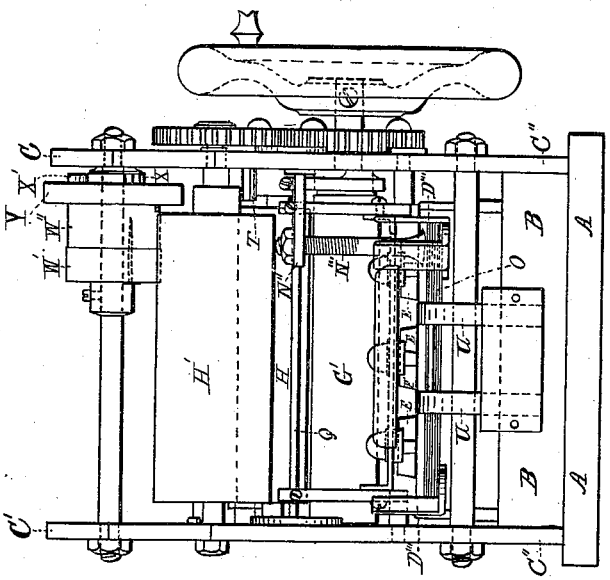

FIG. 5.

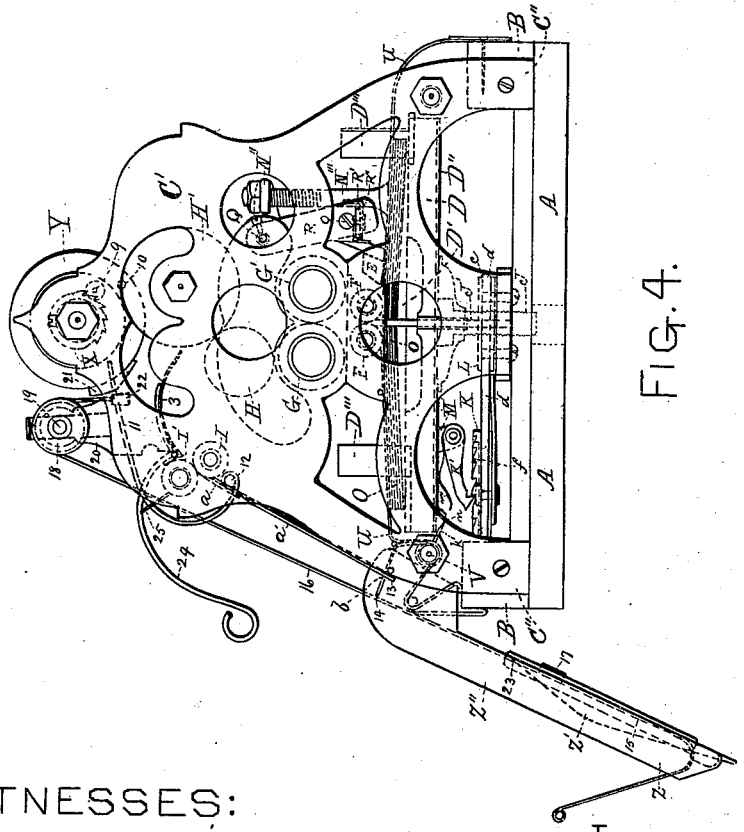

FIG. 4.

WITNESSES:

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INVENTOR:

Nathan S. Clement

4 Sheets—Sheet 4.

N. S. CLEMENT.

Machine for Folding and Counting Paper.

No. 199,354. Patented Jan. 22, 1878.

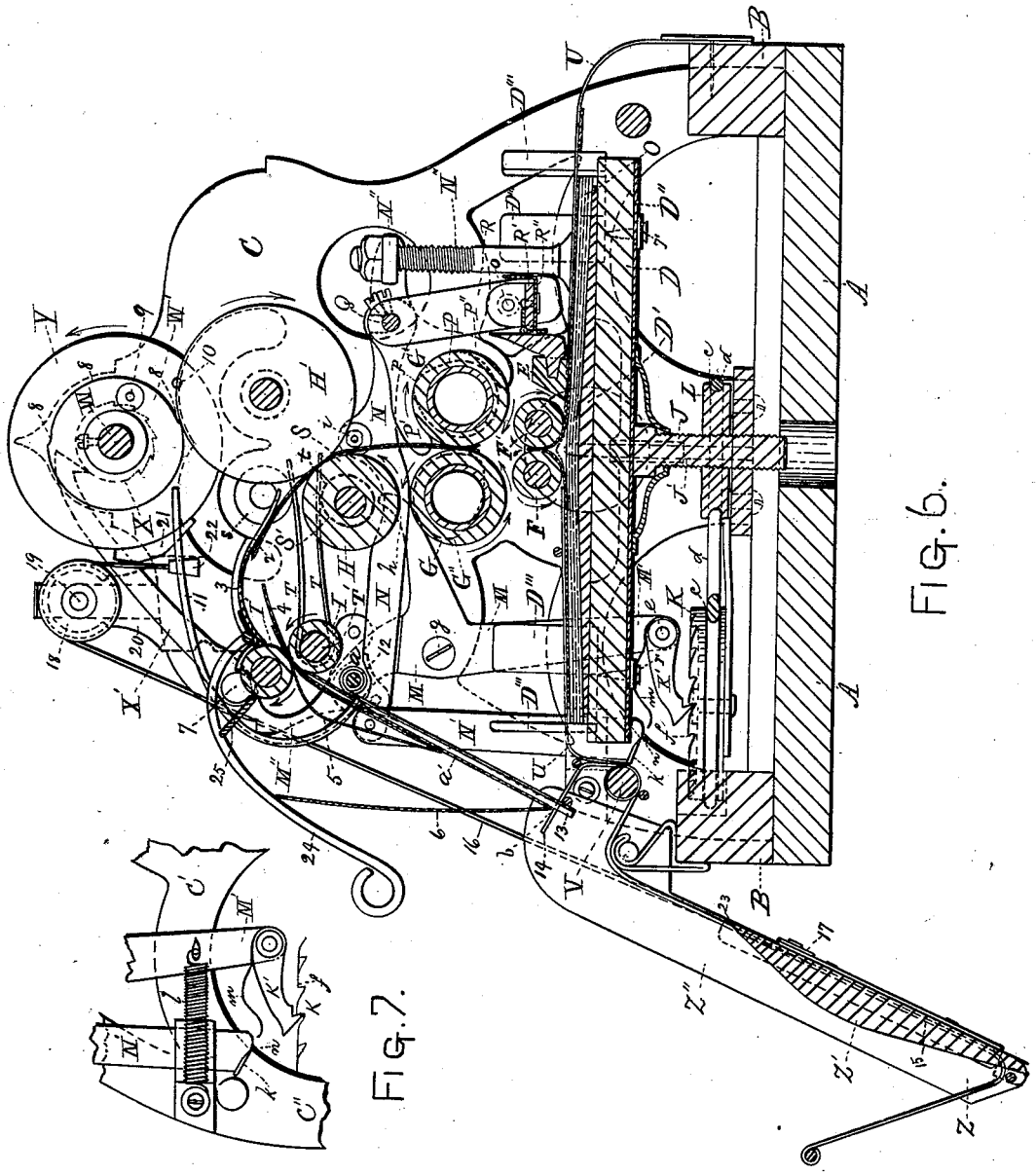

FIG. 6.

FIG. 7.

WITNESSES:

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INVENTOR:

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UNITED STATES PATENT OFFICE.

NATHAN S. CLEMENT, OF NORTHAMPTON, ASSIGNOR OF ONE-HALF HIS RIGHT TO RICE, BARTON & FALES MACHINE AND IRON COMPANY, OF WORCESTER, MASSACHUSETTS.

IMPROVEMENT IN MACHINES FOR FOLDING AND COUNTING PAPER.

Specification forming part of Letters Patent No. **199,354**, dated January 22, 1878; application filed March 8, 1877.

To all whom it may concern:

Be it known that I, NATHAN S. CLEMENT, of Northampton, in the county of Hampshire and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Self Feeding, Folding, and Counting Paper-Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and the letters and figures marked thereon, forming a part of this specification, and in which—

Figure 1 represents a top or plan view of my improved self feeding, folding, and counting paper-machine. Fig. 2 represents a side view of the same, looking in the direction indicated by arrow 1, Fig. 1. Fig. 3 represents the front, or end, view of my said improved machine, looking in the direction indicated by arrow 2, Fig. 1. Fig. 4 represents a side view of the machine, looking in the direction indicated by arrow 3, Fig. 1. Fig. 5 represents the other end, or rear, view of the machine, looking in the direction indicated by arrow 4, Fig. 1. Fig. 6 represents, upon an enlarged scale, a vertical central longitudinal section of the machine, taken on line A B, Fig. 1, looking in the direction indicated by arrow 3 of the same figure. Fig. 7 represents, also upon an enlarged scale, a side view of a portion of the machine, as will be hereinafter more fully explained; and Fig. 8 represents, upon a still larger scale, a section of a portion of the machine, as will also be hereinafter more fully explained.

To enable those skilled in the art to which my invention belongs to make and use the same, I will proceed to describe it more in detail.

In the drawings, the part marked A represents the bed-piece or table of the machine, and B B two pieces secured to said table, one at each end of the machine, upon the ends of which are secured, by means of screws, the legs C″ of main frames or standards C C′, thus holding the machine securely in position. D is the table, upon which the paper to be folded and counted is placed, the upper portion D′ of which, as will be seen by Figs. 2, 4, 6, and 8, is made thicker at the center, and slanted downward toward each end, for the purpose of facilitating the operation of curving the paper as it is pushed forward between the first two feed-rolls.

The paper is first pushed forward by pressure-feet or starters E, which will be hereinafter more fully explained, until it is taken up by feed-roll F′, which carries the sheet up, where it is acted upon by both feed-rolls F F′, and doubled in the center. It is then carried forward and delivered or fed to the breaking or compressing rolls G G′, which press the back, folded by the first two rolls, tightly together to form a sharp edge. It is then carried forward between feed-rolls H H′, thence, through delivery-rolls I I′, over delivery-plate *a* and guide-plate *a′*, into a counting-receiver, *b*, after which it is dropped into the general receiver in single packages as they are made up, by suitable mechanism hereinafter described.

In order that the paper may be kept firmly packed or pressed down and held in position, pressure-plates U are provided, the ends of which extend nearly up to the center of feed-rolls F F′—those upon the forward portion of the machine being secured to shaft V, and those upon the rear or back side to the piece B. If such plates were not provided, the sheets would curve outside of feed-rolls F F′ instead of between them.

Suitable gages D‴ are combined with the sides and ends of the machine, by means of which the paper is regulated, so that it will be folded squarely and evenly in the center.

Table D is operated as follows: Upon its under side is arranged a metallic plate, D″, upon the under side of the center of which is secured, in some suitable manner, a screw-standard, J.

K is a ratchet wheel or pulley, grooved out, as shown at *c*, to receive a belt, *d*, corresponding in shape to said groove, which ratchet operates, by means of a pawl, K′, fulcrumed at *e*, in combination with ratchet-teeth *f*, wheel or pulley L, which is fitted to turn upon screw-standard J, said pulley L being provided with a corresponding groove, *c*, to receive belt *d*.

Upon the end of compressing-roll G, next

to standard C, is arranged and secured a cam, G″, (shown in dotted lines, Figs. 2 and 6 of the drawings,) which operates a T-lever, M, pivoted at *g*. As the end *h* of lever M is raised by cam G″, the end M′ is also raised or drawn back at the same time, which operation draws back pawl K′, which catches into one of the ratchet-teeth *f*, and thereby turns ratchet-wheel K and pulley L the distance which one notch will carry them, thus raising the table.

To provide against the package of paper being raised too fast—viz., faster than it can be taken off and folded—a self-regulating device is arranged, by means of which the paper is always kept at the proper level for the top sheet to be acted upon by the pressure-feet or starters E. This is accomplished in the following manner: A lever, N, is pivoted at *i*, and provided at one end with a swinging lever, N′, and at the other end with a device consisting of a flat, rectangular piece, N″, one end secured to the end of lever N, and the other end projecting in over the package of paper O and provided with an adjustable regulating-foot, N‴, projecting down, and adapted to rest upon the paper, as indicated in Fig. 6. As the greatest weight is upon this end of lever N, the foot of piece N‴ always rests upon the paper, thereby adjusting the lower end of swinging lever N′ (upon which is arranged and secured an inclined blade, *k*) to the level of the paper. When the end *h* of T-lever M is lowered by the action of cam G″ the lower end M′ is drawn forward by means of a spiral spring, *l*, to the point at which it again catches into the next notch, *f*.

If the table is at a proper level for pressure-feet E to act upon the paper, the end of spring *m*, secured to the upper side of pawl K′, will pass over the edge *n* of blade *k*, thus keeping the end of pawl K′ elevated, so that it will not catch into the next notch of ratchet-wheel K; but as the paper is taken off and the package lowered the foot of piece N‴ also drops, thereby raising blade *k* and allowing the end of spring *m* to pass under it, so that the end of pawl K′ is allowed to drop upon ratchet-wheel K, and, as it is drawn back, catches into a notch, thereby raising the table the required distance by means of ratchet-wheel K and pulley L, as before explained.

Suitable guides J′ are combined with the sides of the table, by means of which the latter is secured against a revolving motion.

Table D is represented in the drawings as being adjusted laterally by means of set-screws *r*; but in practice other suitable devices may be employed, if preferred.

Upon the end of compressing-roll G′, also next to standard C, is arranged and secured a cam P, (shown in dotted lines, Figs. 2 and 6,) which operates cam-lever, having two arms, P′ and P″, keyed to shaft Q. There are also secured upon the same shaft two levers, R, one at each side of the machine, upon the lower ends of which is secured, at *o o*, a plate, R′, upon which the pressure-feet or starters are pivoted. As cam P revolves in connection with compressing-roll G′, and the part *p* comes in contact with the arm P′ of cam-lever, the latter is raised, thereby carrying forward the lower ends of levers R, upon which the pressure-feet or starters E are arranged, and as said feet are manufactured from rubber, they adhere to the paper, thereby pushing it forward to form a curve, which curve, coming in contact with the first feed-roll F′, is drawn forward and carried up between feed-rolls F and F′, and folded; thence forward through or between each succeeding set of rolls, as before explained.

It often occurs that several sheets are more or less curved at the same time by the action of pressure-feet E. It is, therefore, necessary that the surfaces of feed-rolls F F′ travel faster than pressure-feet or starters E, in order to draw the upper sheet forward, and thereby relieve the action of said pressure-feet E, thus allowing all save the first sheet to drop back to their normal position; otherwise more than one sheet would be liable to be drawn in at the same time.

When the point *p* of cam P comes in contact with arm P″ of lever P′, levers R, in connection with pressure-feet E, are carried back into the position for pushing another sheet forward, as shown by dotted lines, Fig. 8, of the drawings.

Upon the under side of plate R′ is arranged a sliding plate, R″, which, when pushed forward, will strike against the back of pressure-feet E, raising them off of the paper, and thus disconnecting the feeding operation, and vice versa.

In order that the pressure-feet may work freely, it is quite essential that they shall be pivoted at a particular angle above the point of contact, as their operation will be greatly impaired if set at too acute or obtuse an angle.

Pressure-feet or starters E are applicable not only for pushing the paper up to form a curve, then to be caught up and folded by feed-rolls F and F′, as illustrated in the drawings, but may be used with good effect, in combination with said rolls, for feeding sheets without folding the same. In the latter case feed-roll F′ would be raised, and gage D‴, on the opposite end from pressure-feet E, would be arranged under roll F, and the package of paper placed upon the table of the machine so that the ends to be fed would abut against said gage D‴. Pressure-feet E will then move the paper forward, and form the curve in the same manner as when it is to be folded, the end being caught between the rolls instead of the center of the sheet.

Upon shaft S is arranged and secured a cam, S′, (shown in dotted lines, Figs. 2 and 6,) which operates a spring, T, arranged loosely upon shaft T′, the upper half of spring T being held from springing up by bearing against a hub, *s*. When the lower half is sprung up by coming in contact with the part *t* of cam S′ spring T is held tightly about shaft T′, thus

securing the latter from being turned when it is required to remain stationary.

As sheet 1 passes up through carrying or feed rolls H H′, the folded end 2 comes in contact with a concaved plate, 3, which guides the paper down into delivery-rolls I I′. When it has been fed through the latter about half the length of the sheet, the lower roll I is stopped, as before explained, thereby holding the lower half of the sheet, as shown at 4, while the upper half is carried forward by roll I′, which opens the sheet, as shown at 5, and by this time the folded end 2 of the succeeding sheet has been carried forward by feed-rolls H H′ a sufficient distance to carry it over the end 4. The pressure is then released upon spring T by cam S′, and allows roll I to turn, which carries the part 4 forward, and allows the sheet to drop into receiver *b*, where it occupies the position shown by Sheet 6, and the next succeeding sheet to pass within that sheet, and so repeating until the package is completed.

Upon shaft W is arranged and secured a counting device, consisting of two rubber or friction pulleys, W′ W″, which are so formed and arranged that, in combination with a ratchet-wheel, X, operated by a pawl, X′, pivoted at 7 upon the end of arm M″ of T-lever M, any number of sheets desired may be folded and dropped into receiver *b* while pulley Y is making one revolution. By cutting away the surfaces part way around pulleys W′ W″, as shown at 8, so that they will not bear upon roll H′, their driving-power, I am enabled, by simply withdrawing pin 9 and turning pulley W′, to set it so that pulley Y will revolve once to any number of sheets I wish to count off into a package, the counting being done in this manner: As pulley Y revolves, a pin, 10, strikes the end of arm 11, and the other end being keyed to the upper end of delivery-guide *a′*, and both pivoted at the same point upon a small shaft, 12, the lower end 13 of delivery-guide *a′* is thrown up beyond the end 14, thus allowing the package of paper containing the desired number of sheets, folded one sheet within another, to drop down into the general receiver Z.

To facilitate the operation of packing the packages in receiver Z, I have arranged a guide-piece, Z′, which operates, in connection with the operation of the counting-device, as follows: The guide-piece Z′ is arranged to slide up and down upon plates 15, secured to the lower edge of guide-plates Z″. A belt, 16, is secured to a projecting piece, 17, secured to the under side of guide-piece Z′, which passes up over a pulley, 18, pivoted at 19 upon a standard, 20, the latter being secured to frame or standard C.

Upon pulley Y is secured a piece of rubber, 21, of just sufficient thickness to bear firmly against belt 16, so that as the former revolves, and piece 21 comes in contact with the belt, the latter will be drawn up in connection with guide-piece Z′, which allows the last package of paper to drop down to the bottom of receiver Z, the latter being so formed that it holds the top of each preceding package forward, thus allowing the incoming package to pass back of, instead of into, it.

To secure against the belt 16 becoming slack, and thus preventing the operation of guide-piece Z′, a weight, 22, is secured to the end, which keeps it taut at all times. The upper edge 23 of guide-piece Z′ must be below the top of plates 15, or the package is liable to become caught at that point as it is dropped into the receiver.

24 is a guard-arm, by means of which the paper, as it is counted off into receiver *b*, is kept from falling over out of its proper relative position; and 25 is a thin plate, secured to said arm, and bearing against the surface of the upper delivery-roll I′, for the purpose of preventing the upper half of the sheet, as it springs out from under the roll, passing up over and around said roll; and delivery-plate *a* operates in like manner to prevent the lower half of the sheet from passing down and around the lower roll I.

In the drawings I have represented my regulating device for raising and lowering table D only upon one side, since, in practice, the arrangement of another set upon the other side would be but a duplication of parts, a screw-standard, J, and the operating mechanism connected with it, being also arranged upon each side of the machine.

It often occurs that a package of paper one foot in height will vary from a level one-half inch. It therefore becomes necessary to regulate the table upon each side, each regulating mechanism acting independent of the other.

The operation of the machine may be briefly summed up thus: Table D having first been lowered, the package of paper O is then placed upon it and regulated by gages D‴, so that the paper shall be folded squarely and evenly in the center. Pressure-feet or starters E having first been raised by pushing forward sliding plate R″, the table is then raised by turning ratchet-wheel K until the top of the paper is within about one-sixteenth of an inch of the bottom of feed-rolls F F′, when the feet are then lowered by drawing back slide R″ and the machine set in operation, when pressure-feet or starters E then push the paper forward to form a curve, 26, as shown in dotted lines, Fig. 8, which, when coming in contact with feed-roll F′, is drawn up by the latter between both rolls and folded. It is then fed forward between breaking or compressing rolls G G′, where the fold made by rolls F F′ is pressed to form a sharp edge; thence up through carrying or feed rolls H H′, which carry it forward through delivery-rolls I I′, where, by means of stop-roll I, the paper is carried one sheet within another, as before explained, and dropped into counting-receiver *b*. When the desired number of sheets have been counted off into a package the latter is pushed out of receiver *b*, over the end 13, and dropped into

general receiver Z by suitable mechanism, hereinbefore described, a suitable device, Z′, being provided by means of which each package, as it is dropped into the receiver, passes in back of the preceding one instead of into it.

Thus it will be seen that by my invention I am able, by a continuous and automatic process, to feed and fold each sheet of paper separately; to carry, when so folded, one sheet within another; to count off any desired number of sheets to a package; and to pack into a general receiver said packages without dropping one package within another.

Having described my improvements in self feeding, folding, and counting machines, what I claim therein as new and of my invention, and desire to secure by Letters Patent, is—

1. The combination, with the table D, the pressure-feet E, and feed-rolls F F′, of mechanism, substantially as herein described, controlled in its action by the paper upon the table, for raising said table for adjustment of the paper thereon to the action of said pressure-feet and feed-rolls, substantially as shown and described.

2. The combination, with feed-rolls F F′ and pressure-plates U, of the pressure-feet or starters E, substantially as described.

3. The combination, with delivery-roll I′, of guard-arm 24 and its plate 25, substantially as and for the purpose set forth.

4. The combination, with the guide-piece Z′, of mechanism, substantially as described, for raising and lowering the same, substantially as and for the purposes set forth.

5. The combination, with the guide-piece Z′ and pulley Y, of the weighted belt or strap 16, substantially as and for the purposes set forth.

6. The combination, with the bottom delivery-roll I and spring T, of cam S′, substantially as and for the purposes set forth.

7. The combination, in a machine for folding and counting paper, of delivery-rolls I I′, one of which is arranged to retard or check the movement of one-half of the folded sheet until the fold of the next sheet overlaps it, substantially as and for the purposes described.

8. The combination, with the hinged pressure or starting feet E, of sliding piece R″, substantially as and for the purposes set forth.

9. The mechanism, substantially such as above described, for folding paper, in combination with mechanism, substantially as described, for counting and resting the same in separate packages, as shown and set forth.

NATHAN S. CLEMENT.

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