(No Model.)

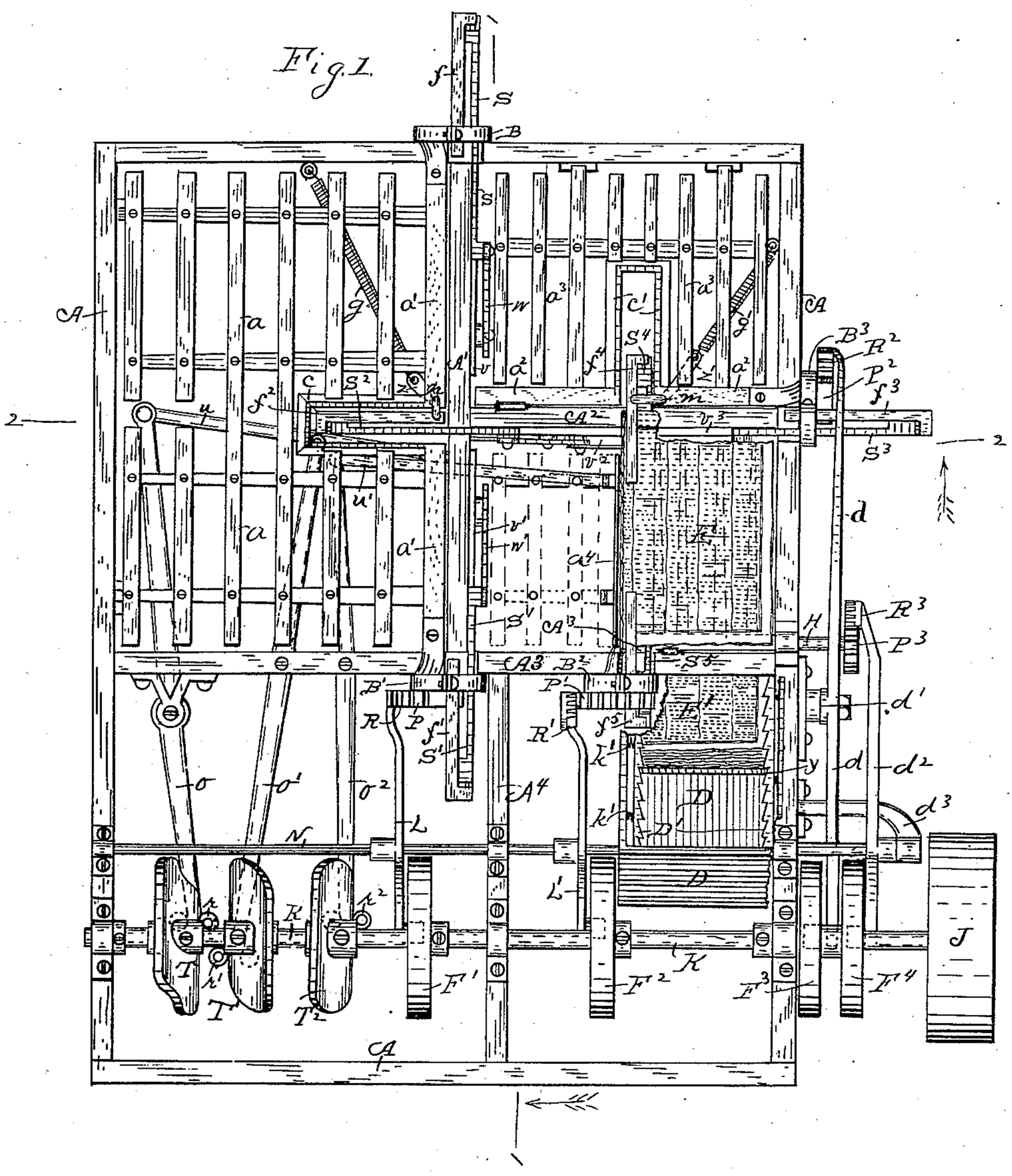
3 Sheets—Sheet 1.

A. H. GALE.

PAPER FOLDING MACHINE.

No. 302,558. Patented July 29, 1884.

Fig. 1.



Witnesses.

Thos H. Hutchins.
Wm J Hutchins.

Inventor.

Ansel H. Gale.

(No Model.) 3 Sheets—Sheet 2.

A. H. GALE.

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Fig. 2.

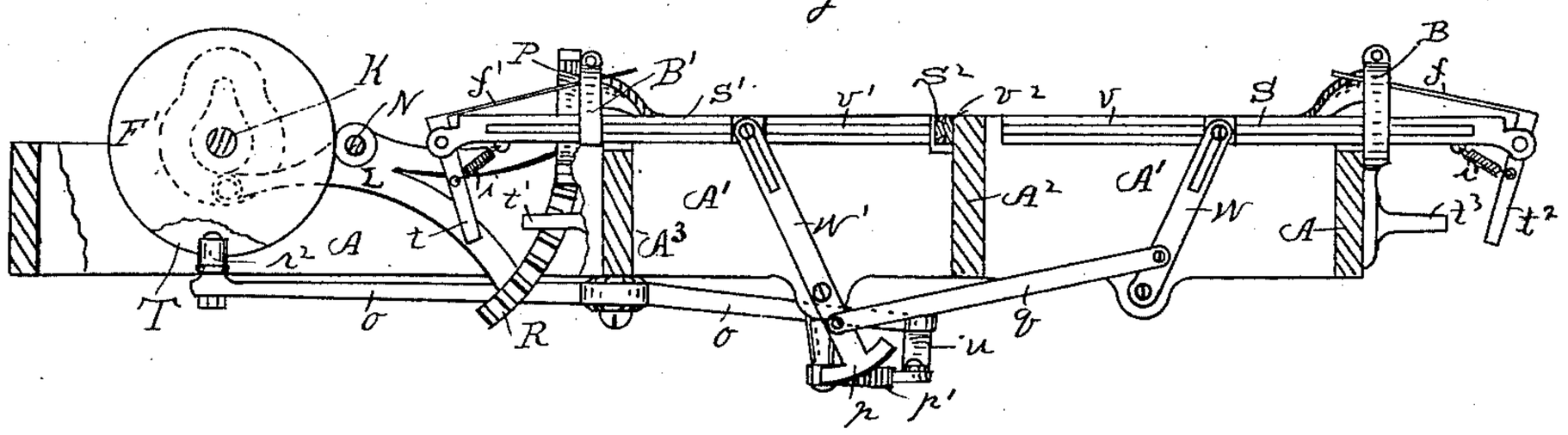


Fig. 3.

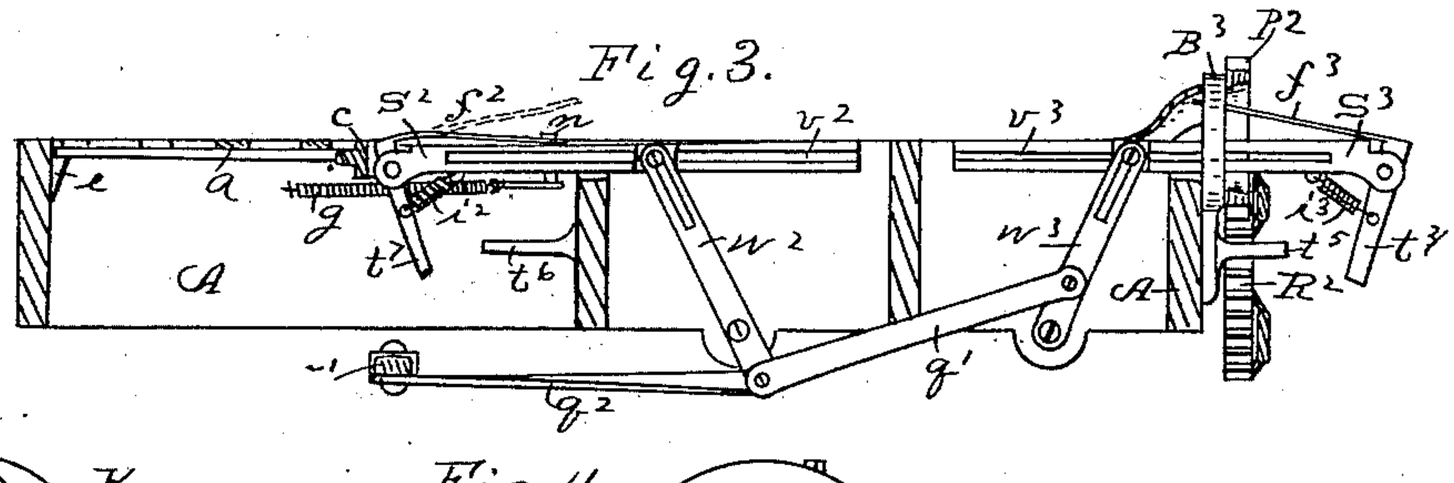
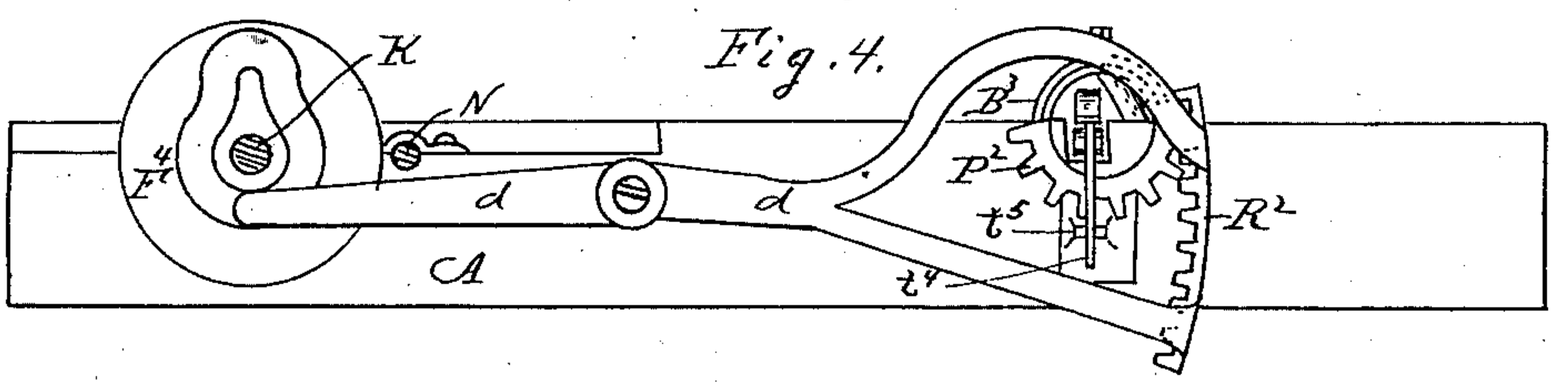


Fig. 4.



Witnesses.

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Inventor.

Ansel H. Gale.

(No Model.) 3 Sheets—Sheet 3.

A. H. GALE.

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Fig. 5.

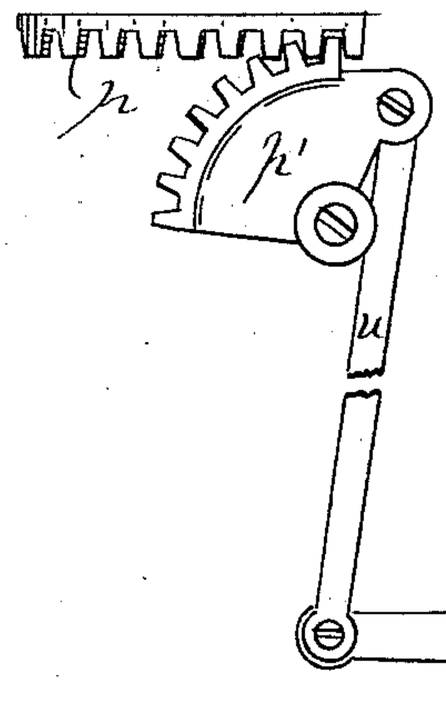


Fig. 6.

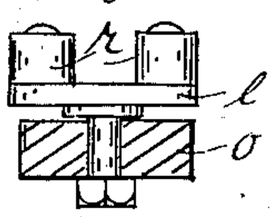


Fig. 7.

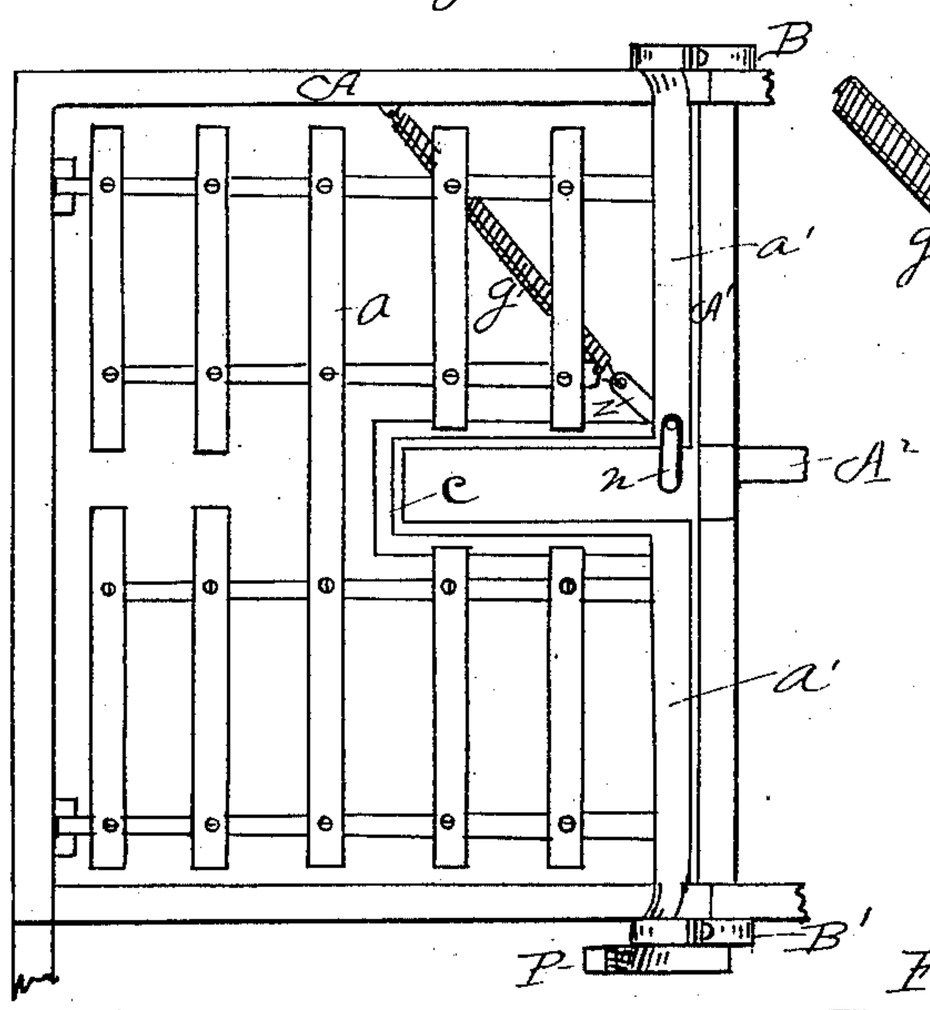


Fig. 8.

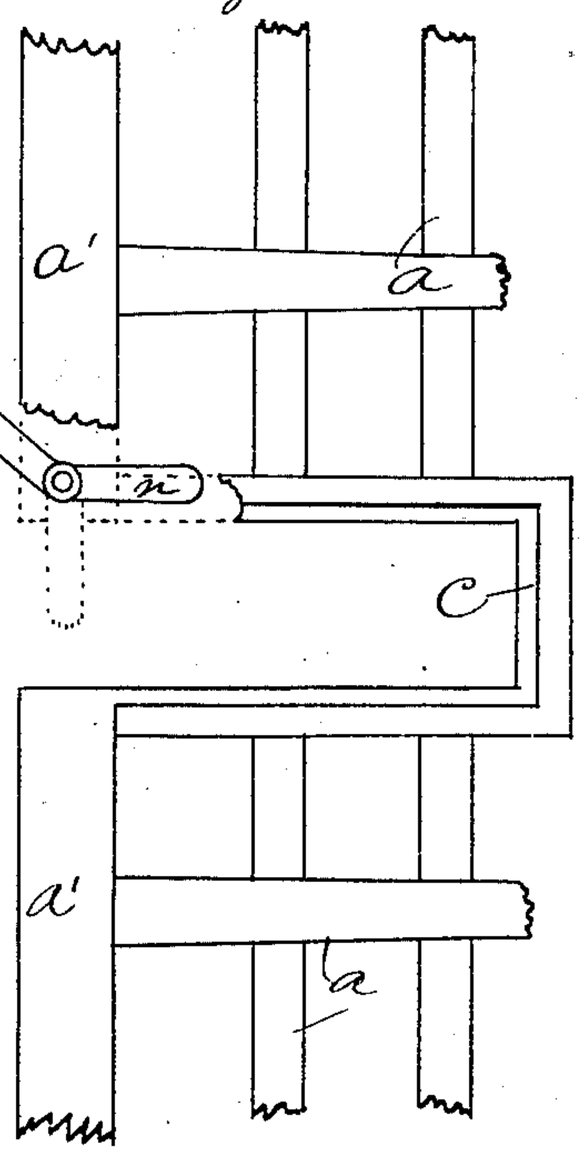
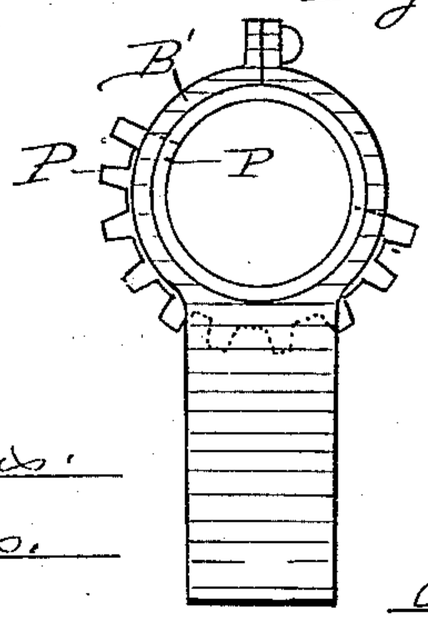


Fig. 9.



Witnesses

Thos. H. Hutchins.

Wm. J. Hutchins.

Inventor.

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UNITED STATES PATENT OFFICE.

ANSEL H. GALE, OF JOLIET, ILLINOIS.

PAPER-FOLDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 302,558, dated July 29, 1884.

Application filed June 16, 1883. (No model.)

To all whom it may concern:

Be it known that I, ANSEL H. GALE, a citizen of the United States of America, residing at Joliet, in the county of Will and State of Illinois, have invented certain new and useful Improvements in Paper-Folding Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 is a plan view on the top; Fig. 2, a vertical sectional view on line 1 of Fig. 1, looking in the direction of the arrow, with certain parts broken away; Fig. 3, a vertical sectional view on line 2 of Fig. 1, looking in the direction of the arrow; Fig. 4, a side view of Fig. 1, looking at it from the right, leaving pulley J off; Fig. 5, a bottom view of the central portion of Fig. 2; Fig. 6, a view of one of the swiveled roller-wrists on the ends of the levers O O′ O²; Fig. 7, a plan view on the top of a section of the machine, showing a single one of the fliers *a*; Fig. 8, a bottom view of a section of one of the fliers *a*, and Fig. 9 a side view of the segment-cog which operates the fliers.

This invention relates to a machine designed to be attached to any printing-press for the purpose of folding up the paper into several or any number of folds—such as is necessary in the case of newspapers and book printing, &c.

For the construction and operation of the machine reference is made to the drawings.

Looking at Fig. 1, A represents a rectangular frame, which may be constructed of either wood or metal, and which is divided up into several sections by means of the cross bars or beams A′ A² A³ A⁴.

The machine is designed to make three folds in the paper, which is intended to be first laid so as to cover all the machine above the central cross-beam, A³, on the fliers *a a³ a⁴*. These fliers consist of a row of slats fastened to suitable fingers, which are attached to rocking shafts hinged in the frame, so the fliers can vibrate or swing up and down. In Fig. 1 flier *a*, which occupies the portion or section of the machine above beam A³ and to the left of beam A′, is represented as hinged in the machine by means of its head *a′* being hinged at either end in the hollow boxes B and B′. One end of the flier-head *a′* is provided with a segment-gear, P, which engages with the segment-cogged rack R on arm L, which turns on shaft N, which acts as its fulcrum. The other end of arm L is provided with a roller-wrist, which runs in the cam-channel of cam F′ on shaft K. By the revolution of cam F′ a rocking motion is given to arm L, so that the rack R will partially rotate pinion P back and forth, and thus operate the flier *a* so it will fold over, so it will lie on the other fliers, *a³ a⁴*, which occupy the other half of the machine above beam A³, and thus fold the paper that lies on the machine once, so it will only lie on the fliers *a³ a⁴* when the flier *a* returns to the position shown in Fig. 1, on account of the form of the channel in cam F′. These parts and movements are shown more clearly in Fig. 2. The other two fliers, *a³* and *a⁴*, are operated on precisely the same plan. The head *a²* of the flier *a³* is provided with the pinion P², which engages with the toothed rack R² on the end of arm *d*, which pivots near its center, at *d′*, to the side of the frame A, and its opposite end being provided with a roller-wrist to operate in the channel of cam F³. When cam F³ rotates, it will cause flier *a³* to fold over on flier *a⁴*, to give a second fold to the paper, and then return to its position the same as flier *a*. Flier *a⁴* is operated in the same manner as the other fliers by means of the segment-cogged rack R′ on the end of arm L′, which is also provided with a roller-wrist that operates in the channel of cam F². This gives the third fold in the paper. The flier *a⁴* is represented in Fig. 1 as standing on its edge half-way over in the act of folding over the paper on the flier-table E, the dotted lines on the flier-table E representing the paper. The lower edge of the table E is attached to the head or rock-shaft H, which receives its rocking motion from the pinion P³, segment-rack R³, arm *d²*, and cam F⁴. This mechanism tilts the table E so the paper will be delivered into the box or receptacle D.

Any suitable kind of box or receptacle may be used in which to deliver the folded paper. I do not further describe it, as I make no claim for that particular portion of this machine.

The description thus far has been to show the operation of giving the paper the three folds. It will be observed that the mechanism that makes each fold is substantially the same, so that the number of folds can be in-

creased by multiplying the number of fliers and the parts that operate them. When the paper to be folded is placed upon the machine, it could not be folded successfully unless it were held down in the center on a line where the fold is to be made, so it cannot move until the fold is made. This is accomplished by means of fingers adapted to advance from either side and clasp the paper, and then after the fold is made recede to be out of the way of the next fold. The fingers that operate to hold the paper while the first fold is being made are shown at $f\,f'$ both in Figs. 1 and 2.

Fig. 2 is a cross-section of the machine on line 1, looking in the direction of the arrow at the side of the mechanism that operates these fingers f and f'. Looking at Fig. 2, the fingers $f\,f'$, which are made of spring-steel, are shown as forming a sort of bell-crank hinged near its elbow into the outer end of the slides S S', which travel on the ways V V' back and forth by means of their connection to the slotted upright levers W' W. These levers W W' are connected with each other by the connecting-rod q, as shown in said figure, so their upper ends can move to and from each other. The lower end of lever W' is provided with the segment-rack p, to engage with the segment-pinion p', which receives its motion from its connection with link u, connected with the arm O. Arm O is pivoted at or near its center to cross-beam A^3, and is operated by the waved cam T on shaft K, so that when cam T rotates it gives a reciprocating motion to fingers $f\,f'$, to and from each other. The bottom view of Fig. 2 (shown in Fig. 5) shows more clearly the parts which form the connection between cam T and the fingers $f\,f'$. In order to locate these fingers $f\,f'$ so they will be over the center of the paper, the slides S and S' have to run back through the hollow boxes B and B'. When the fingers $f\,f'$ are in the position shown in Fig. 2, they are held up by means of the coil-springs $i\,i'$, as shown, so that when they start toward each other they are elevated above the paper. When they are brought toward each other the parts $t\,t^2$ will press against the parts $t'\,t^3$, so as to bring the fingers down to their work on the paper. The fingers $f\,f'$ thus described hold the paper while the first fold is being made. Fingers f^2 and f^3, (shown more clearly in Fig. 3) hold the paper while the second fold is being made. They are operated in the same manner as the first-described fingers by means of the waved cam T', arms O', and link q^2, connecting-rod q', and shafts or arms W^2 and W^3, slides S^2 S^3, and ways V^2 V^3. The flier a would be in the way of the slide S^2 were it not for the yoke c, which permits it to slide back far enough so it will carry the finger f^2 beyond the paper as it lies on fliers a^3 a^4, so it can advance over it to hold it down until the fold is made as stated. A mechanism precisely similar is used to operate the fingers $f^4\,f^5$ by means of the waved cam T^2 and arm O^2, (shown in Fig. 1, and not necessary to recapitulate, as the description of it would be but a duplicate of that just given in relation to the other fingers.) When the fingers f^2 and f^4 loose their pressure on the paper and move back, they would point obliquely upward and be in the way of the next incoming paper were they not held down, as shown in the case of finger f^2 in Fig. 3. This is accomplished by means of the buttons m and n. Referring to Figs. 7 and 8, the button n is shown in flier a. A bolt passes through the head a' of the flier, and has attached to it the button n on its upper end and the arm Z at its lower end, both integrally attached thereto, and the arm Z attached by means of the coil-spring g to the frame A. When the flier a is in its first position, the button n extends across the yoke c, or partially across it, so the finger f^2 can slide back under it, as shown in Fig. 3. As the flier a makes the first fold in the paper, the button n turns off the finger f^2, which permits said finger to rise, as shown by the dotted lines in Fig. 3. The fingers $f^2\,f^3$ then move forward toward each other over or above the once-folded paper until depressed upon it by the parts t^5 and t^6, (shown in said figure,) so as to hold the paper for the next fold, and after the next fold is made they are withdrawn from within said fold. Finger f^2 slides back under button n, as shown in Fig. 3, to be thereby depressed and under the next incoming sheet. It is not necessary to hold finger f^3 down by a button, as it is out of the way of the paper when it is in the position shown in said figure. The same description applies to the use of button m, to hold down finger f^4, so there is no need to repeat it. The several fliers, it will be observed, are intended to be operated consecutively, one after the other, commencing with flier a, to give the first fold.

In order that the waved cams T T' T^2 may be the same thickness throughout their entire periphery, the roller-wrists are set upon their respective arms by means of a wrist running through the arm, as shown in Fig. 6, so the rollers r may oscillate and accommodate themselves to the curve of the cams.

Any means desired may be used to deliver the paper on the machine to be folded, and any number of folds may be made by duplicating the parts. The power is intended to be applied to the machine by the pulley J, and the several cams are so set with reference to each other that they consecutively operate the several parts to perform the duties required of them. After flier a has delivered the paper onto the other fliers and has begun to return, the second flier, a^3, begins to rise to turn over and make the second fold, and so on with the next flier, a^4, so that the next flier in succession begins to move to make a fold as soon as it can, and the preceding one rises out of its way also. The fingers $f\,f'$ are so arranged that they retain their pressure on the paper until the next fingers, $f^2\,f^3$, begin to press on it to hold it, and so on with the next fingers, $f^4\,f^5$, so there is no time when the paper is not held by some

of the fingers to prevent it from getting out of place. One revolution of shaft K makes one complete operation of the machine to fold and deliver the paper, as stated, and return the parts ready to take, fold, and deliver the next paper in succession.

To make it clear how the buttons *m* and *n* operate, I will refer to Figs. 7 and 8, showing one button. Fig. 7 shows the button *n* pointing parallel with the head of the flier *a*, so as to extend nearly across the yoke *c* on its upper side, and connected to the arm Z by a short shaft running through the head *a'*, which arm Z is constantly held in one direction by the coil-spring *g*, and as the flier *a* folds over, as shown in Fig. 8, the short shaft which connects the button *n* and arm Z will turn; but as the spring holds the arm Z in the same direction the button will be turned to point in a direction at right angles to where it pointed when right-side up, leaving the yoke *c* uncovered, as shown in Fig. 8.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows, to wit:

1. In the paper-folding machine described, the combination of the frame A, shaft K, cam T, arm O, link *q*, levers W W', rack *p*, segment-pinion *p'*, link *u*, slides S S', ways V V', reciprocating spring-fingers *f f'*, springs *i i'*, parts $t' t^3$, and flyer *a*, all adapted to operate as and for the purpose set forth.

2. In the paper-folding machine described, the fliers *a* and a^3, having the divided heads, and provided with the yokes *c* and *c'*, in combination with the reciprocating spring-fingers $f f' f^3 f^4$, all adapted to operate, as and for the purpose set forth.

3. In the paper-folding machine described, the buttons *m* and *n*, in combination with the fliers *a* and a^3, arms Z and Z', and coil-springs *g* and *g'*, all adapted to hold down the fingers f^2 and f^4, in the manner and for the purpose set forth.

ANSEL H. GALE.

Witnesses:
THOS. H. HUTCHINS,
WM. J. HUTCHINS.