

No. 649,997.

Patented May 22, 1900.

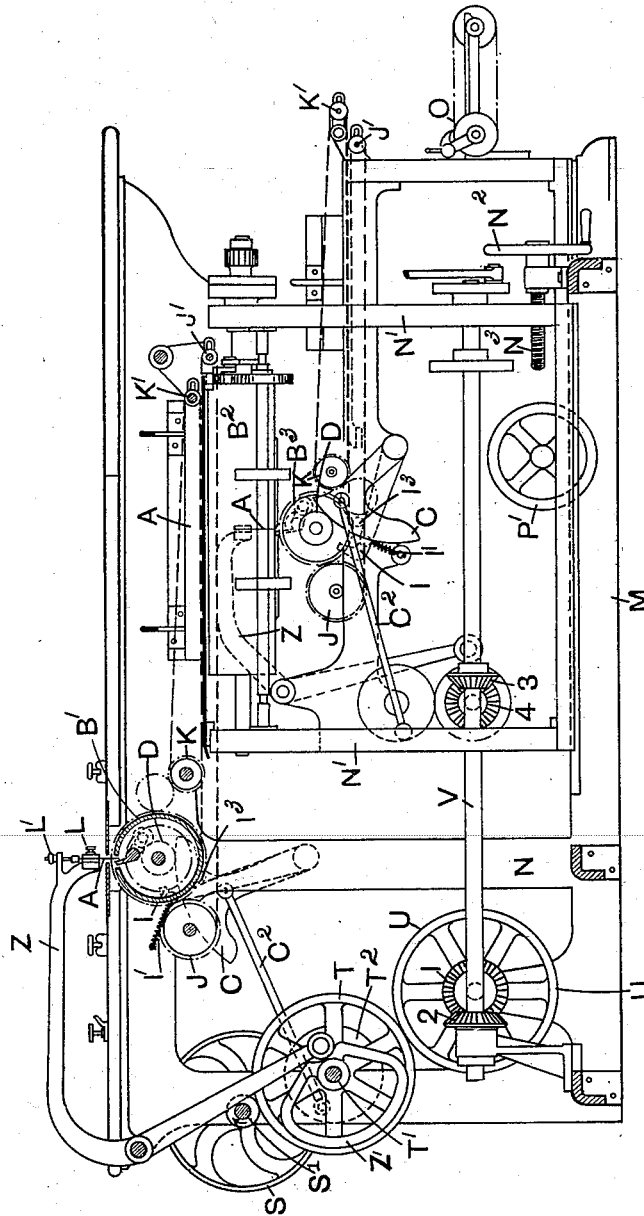
M. SMITH.
PAPER FOLDING MACHINE.

(Application filed Dec. 21, 1897.)

(No Model.)

4 Sheets—Sheet 1

FIG. 1.



WITNESSES

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4 Sheets—Sheet 2.

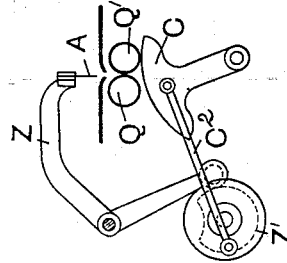
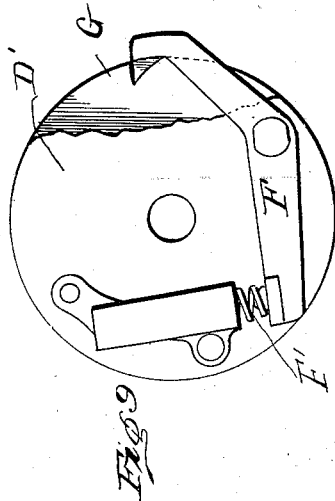
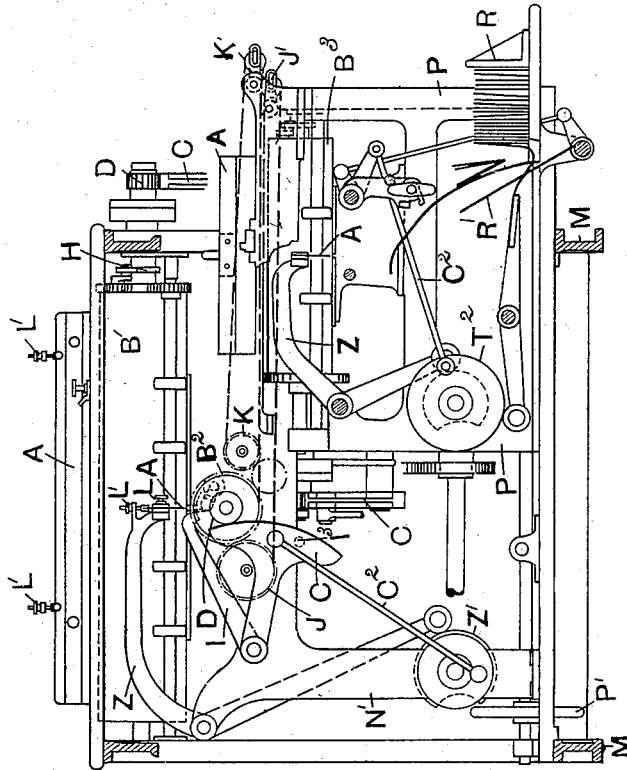


FIG. 3.

FIG. 2.



WITNESSES

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4 Sheets—Sheet 4.

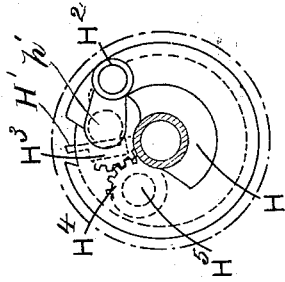


FIG. 6.

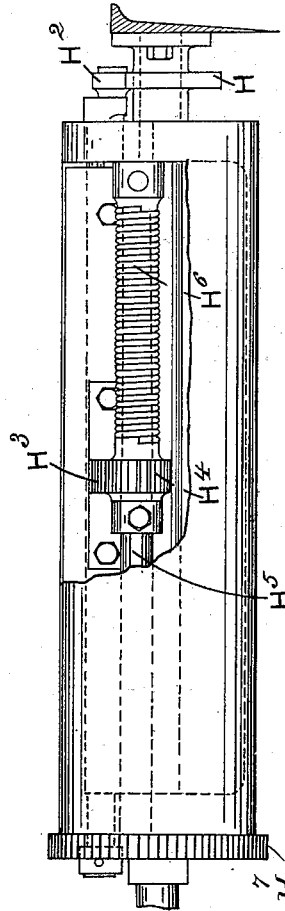


FIG. 5.

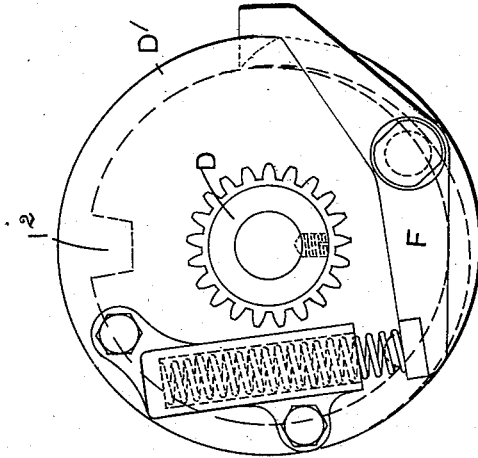


FIG. 7.

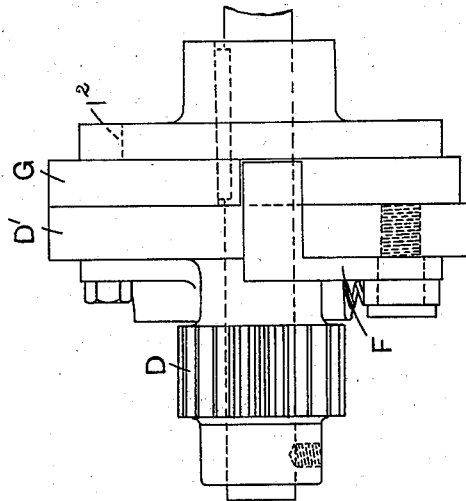


FIG. 8.

WITNESSES

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UNITED STATES PATENT OFFICE.

MARK SMITH, OF MANCHESTER, ENGLAND.

PAPER-FOLDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 649,997, dated May 22, 1900.

Application filed December 21, 1897. Serial No. 662,886. (No model.)

To all whom it may concern:

Be it known that I, MARK SMITH, a citizen of the United Kingdom of Great Britain and Ireland, residing at Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Paper-Folding Machines, of which the following is a specification.

This invention has been patented in part in Great Britain, November 25, 1895, No. 22,462.

Paper-folding machines are commonly constructed with pairs of continuously-rotating rollers, between which the fold is thrust by a reciprocating knife and from which the folded sheet is conveyed by continuously-running endless tapes, or, in a modification, a pair of gripper-cylinders with intermittent motion have been substituted for the pair of rollers. There are other types of folding-machines also, to which this invention has no affinity.

My present invention has been designed with the object of simplifying the construction and rendering more certain in action paper-folding machines of the gripper-cylinder and roller type. At the same time I am enabled thereby to dispense with the use of the paper-stops and with the continuous motion of the rollers and tapes, and, further, to deliver the folded paper after the second or any subsequent fold.

I will describe my said improvements with reference to the accompanying drawings, in which—

Figure 1 represents a sectional side elevation; Fig. 2, a transverse section; Fig. 3, details of folding-rollers; Fig. 4, a plan view below the upper part of the machine; Fig. 5 a side view, and Fig. 6 a sectional end view, of one of the gripper-cylinders. Fig. 7 shows an end view, and Fig. 8 a side view, of the mechanism for rotating the cylinder.

According to these improvements I employ both gripper-cylinders and pairs of rollers, a gripper-cylinder for the first fold, and either gripper-cylinders or rollers for the subsequent folds, but rollers preferably for the last fold or folds only. The paper to be folded when laid with its edges against the points or gages has the line where the first fold is to be made exactly over the slot in the table and the gap in the gripper-cylinder. The fold is made

by a knife, which inserts the fold through the slot into the cylinder-gap, whereupon the gripper is closed and the cylinder is caused to make one complete revolution. The endless-tape rollers are geared with the cylinder and therefore move and stop therewith. During the motion of the cylinder and tapes the paper is released from the gripper, received by the tapes, and conveyed by them to a point where the line of the second fold comes exactly over the line of gap of the second cylinder, at which instant the first cylinder and the tapes and the paper thereon stop and the second knife folds the paper into the second cylinder. Thus the necessity for fixed stops for the second and subsequent folds is avoided. The operation repeats itself for the third and fourth folds, which may advantageously be made by the rollers, hereinafter described, for the fourth fold only. Whether or not rollers are to be used for the fourth fold only or for both the third and fourth folds will be determined by the character of the paper to be folded on the machine. Thus for jobbing work, or when thin papers have to be folded, the fourth fold may be made by rollers. When only thick paper has to be folded, the first fold only may be made with the cylinder and the others with the rollers. For intermediate work there may be two cylinders and two pairs of rollers.

As, except in necessary modifications of shape and arrangement, all the grippers, cylinders, and accessories are alike, a description of one will apply to each. I will therefore describe one only, with reference to the accompanying drawings, in which similar letters and figures are used to denote similar parts throughout. The cylinders are denoted by B' B² B³. The knife A of each cylinder is carried at the end of a curved lever Z, the opposite end of which is fitted with a friction-bowl riding upon the cam Z'. The gripper in the cylinder is operated to seize the folded paper at the proper moment, as hereinafter described. The suitable intermittent rotation of the cylinder always in the same direction is effected by means of the pinion D, a toothed segment C, and connecting-rod C², which is attached to a crank-pin on the shaft carrying the cam Z' and to the toothed segment. The pinion D is loose upon the cylinder-shaft and at-

tached to a disk D', upon which there is pivoted a click or pawl F', which is engaged by a spring F' to cause it to drop into a notch in a disk G, fixed on the cylinder end. This notch and click insure the rotation of the cylinder in one direction only, the click running free in one direction over the eccentric edge of the disk G. (See Figs. 7 and 8.) The gripper H' is operated by the cam H, fixed on the frame side. (See Figs. 5 and 6.) In contact with this cam there is a friction-bowl H² on an arm fixed upon the gripper-shaft h', on which shaft there is also fixed a toothed segment H³, gearing with a pinion H⁴ on the spindle H⁵, having coiled thereon a strong spiral spring H⁶, the two ends of which abut, respectively, against a shoulder on the shaft and a shoulder on a fixed stop. It will be seen by reference to the figures that if the cylinder is rotated from the position shown to the left the bowl will drop into the hollow of the cam H, being compelled to do so by the tension of the spring H⁶ acting through the parts H⁴ and H⁵. The fold will thus be seized in the usual manner and held for a half-revolution, when the bowl is lifted to the larger radius of the cam and the grip is released. The grip-cylinder B' is temporarily locked in the position shown in Fig. 1 by a pivoted catch I, which engages with the notch I², Figs. 7 and 8, on the cylinder end, which is held in engagement by the compression-spring I'. Its disengagement at the proper instant is made by means of a stop-pin I³ on the toothed segment C.

Below the cylinder there runs a series of endless tapes on the pulleys J J' and above these another series of endless tapes on the pulleys K K'. When the cylinder has made a half-revolution, the gripper is freed, whereupon the folded paper is delivered therefrom to the tapes between which it is conveyed to the next cylinder B², where it stops to be again folded, if required, or whence it will be carried forward and delivered at the next motion. These tapes are driven by gearing H' on the cylinder, so as to move and stop therewith.

The knife can be adjusted in its holder by the screws and nuts L L'.

To enable the machine to be used for different sizes of paper and different foldings, I arrange to move the second and following cylinders in right lines relatively to the first and to each other. The folding-rollers also when employed are arranged to be moved in like manner. The base of the machine has the frame N, carrying the first cylinder, securely bolted to it or cast with it. The frame N', carrying the second cylinder, slides upon M and can be moved by means of the hand-wheel N² and the screw N³, working in a nut fixed in the framing N'. The second cylinder and its cooperating mechanism are driven from the main shaft of the machine by the shaft V and the miter-wheels 1 2, as is hereinafter described, and the adjustment of the

frame N' is permitted by forming the shaft V with a feather or the like, so that although it rotates with the miter-wheel 2 it is capable of longitudinal motion thereon. The frame P, carrying the third and fourth folders, is similarly moved at right angles to N' by means of the hand-wheel P'.

As already stated, I prefer to use for the later folds or for the last fold when the substance of the folded sheet is comparatively bulky the parallel rollers Q Q', which are geared together and driven in the same manner as the cylinders by the quadrant or toothed segment C. (See Fig. 3.) If these rollers are to rotate intermittently in one direction, one of them may be provided with a loose pinion and click and be driven by a toothed segment precisely as described for the gripper-cylinders.

The completely-folded sheets drop from the rollers Q Q' into the box R, into which they are pressed by the flier R', or they may be delivered after any fold into a box or upon known arrangements of endless tapes and fliers, such as O, Fig. 1.

The machine is driven by the pulley S on the first motion-shaft S', on which is fixed a pinion S², gearing with a wheel T on the second motion-shaft T', on which are fixed the crank-disk T², driving the first gripper-cylinder, and the cam Z', operating the knife. The wheel T gears with an equal wheel U on the third motion-shaft U', which has fixed on its end a miter-wheel 1, meshing with another miter-wheel 2 on the shaft V, on which are the crank-disk and cam for actuating the second cylinder and knife. On shaft V is fixed another miter-wheel 3, meshing with a similar miter-wheel 4 on the shaft W, which carries the crank-disk and cam for operating the third cylinder and knife. It also carries the miter-wheel 5, meshing with a similar miter-wheel 6 on the shaft X, which carries the crank-disk and cam for actuating the fourth folder and knife.

It will be noted that in the drawings all the accessories for the second and following folders are not fully repeated, some being omitted for the sake of clearness. It will be understood, however, that the successive folders of like construction are practically repeats in all details and that details which cannot be clearly shown in the general drawings are separately illustrated.

Having now described my invention, I declare that what I claim, and desire to secure by Letters Patent, is—

1. In a paper-folding machine, the combination with grip-cylinders, of means for giving them intermittent rotation in one direction only and making a single revolution for each fold, reciprocating knives for folding a sheet of paper and feeding it to the grip-cylinders, endless traveling tapes and rollers carrying said tapes and geared with the cylinders so that the tapes move and stop with the cylinders, substantially as set forth.

2. In a paper-folding machine, means which enable different sizes of paper and different foldings to be employed, consisting in the combination with the first folding appliance on
5 the main frame, of a second folding appliance on a second frame at right angles with the first frame, the third and fourth folding appliances on a third frame at right angles with the second frame, means for adjusting said
10 second and third frames, and sets of traveling tapes intermittently moving with the folding appliances and stopping while the fold is made over the second and following appliances, substantially as set forth.

15 3. In a paper-folding machine, the combination of folding appliances each comprising

an intermittently-rotating gripper-cylinder, means for rotating same, tapes moving therewith, and a reciprocating knife, with folding appliances each comprising a pair of inter- 20 mittently-rotating rollers, means for rotating same, tapes moving therewith, and a reciprocating knife, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in pres- 25 ence of two witnesses, this 3d day of December, 1897.

MARK SMITH.

Witnesses:

WILLIAM GEO. HEYS,
ARTHUR MILLWARD.