



United States Patent Office.

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Letters Patent No. 68,450, dated September 3, 1867.

MACHINE FOR CUTTING AND FOLDING PAPER.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, ENOS H. McARTHUR, of Hillsdale, county of Columbia, and State of New York, have invented a certain new and useful Machine for Cutting and Folding Paper; and I do hereby declare that the following is a full and exact description thereof.

The object of my invention is to produce a machine which cuts paper from the endless rolls, either singly or by the quire, and to fold the same in the middle, which latter operation has been done hitherto, as I believe, by manual labor. My machine performs these operations much more perfectly and faster than can be done by hand.

The nature of my invention consists, firstly, in means for feeding the paper; secondly, in means for cutting the paper by a peculiar and novel draw-cutting motion; thirdly, in means for folding the paper, which is done by three distinct motions: first, by placing a sharp or thin folding-plate on the top of the paper over which the same is to be folded; second, the motion of the folding-table, folding the paper by its action over the edge of the thin folding-plate; third, in a motion to remove, by the action of the folding-plate, the paper which has been operated upon from the table; fourth in means for regulating the length of the paper which is to be cut before it is acted upon by the folder.

To enable others skilled in the art to make and use my invention, I will proceed to describe the same by the aid of the accompanying drawing.

Similar letters of reference indicate like parts in the different figures.

Figure 1 is a side elevation, parts of the frame of the machine being removed to allow the working of the mechanism better to be seen.

Figure 2 is an end elevation, with parts of the end frame likewise removed, to show the working parts more clearly.

I will now proceed to describe the means by which the different operations are performed in the order given above.

First. The feeding apparatus consists of two rollers, $B B^1$, resting in bearings $b b^1$ of the framing A of the machine. The roller B has mounted on the end of its shaft a pinion, B^2 , to which is given an intermittent motion, necessary for feeding the paper-roller. B is the feed-roller proper, the roller B^1 being only a counter-roller, producing the necessary friction to draw the paper through. The intermittent motion is produced by a gear segment, C , mounted on the shaft c , and gearing into the pinion B^2 of large roller B . The amount of feed is regulated by the length or number of teeth in this segment C , by which the amount of turn of roller B is governed. Shaft c has on its other end a gear-wheel, C^1 , which is acted upon by a gear-wheel, D^1 , on the main driving-shaft D of the machine, through an intermediate gear, C^2 . The motion of the gear-wheel D^1 , as well as that of the gear segment C , is intermittent, and I will proceed to describe the means by which said intermittent motion is produced. Gear-wheel D^1 is loose on the main shaft D ; it is coupled to the shaft by a clutch, d . This latter engages and disengages D^1 by the following mechanism: E is a small pinion, gearing into a gear-wheel, E^1 , secured by a stud to frame A . In front of this latter gear-wheel E , is placed a horizontal slide-rod, E^2 , guided in the bearings $a a^1$, and having two studs $e e^1$, secured to it, which pass inward radially towards the centre of E^1 , in the manner embracing the two sides of E like a fork. On the two opposite faces of E are circular cams $e^2 e^3$, which act successively, substantially as shown in the drawing, on the two studs e^1 and e , which are placed apart the breadth of the wheel and the amount of throw of one of the cams, and in this manner give to the bar or slide-rod, E^2 , a to-and-fro motion. An arm, E^3 , reaches down from E^2 , and encircles the groove in clutch d . The clutch takes part in this manner of the to-and-fro motion of the sliding-bar E^2 , and places in or out of gear a gear-wheel, D^1 , which intermittent motion is transmitted to the feed-roller B by the means above described.

When quires are to be folded the feeding must take place as often as necessary to make up the quire to one of the folding motions, and the paper being drawn from four, five, or more endless rolls, it is necessary to take correspondingly many feeds and cuts to make up the quire before the action of folding takes place.

After each feed the cutting of the paper must be done, which constitutes the second operation. On the same shaft c , on which is mounted the segmental gear-wheel C , is mounted on the opposite side another segmental

gear-wheel, F. The teeth of this latter are so arranged as to begin to act as soon as the feed motion is stopped, that is, as soon as the segment C stops to act on pinion B². This gear segment F acts on a pinion, F¹, on the shaft f. The pinion F¹ has on its inner surface a stud, f¹, which gives an up-and-down motion to a cam frame, f², and rod f³. This latter takes hold on one of the arms of an angle-lever, the arms of which I will call f⁴ and f⁵, and which turns on centre f⁶. It is readily understood that when arm f⁴ is moved upward by the stud f¹ and cam frame f², the end of arm f⁵ will describe an arc of a circle from centre f⁶, and is at the same time lowered. This latter arm is fastened to the knife G by a small bolt, g. The knife is guided on the frame in bearings a¹ a². This knife is well sharpened, and passes along the edge of a stationary knife-blade, G¹, secured to frame A of the machine. The other end of the knife G has a slanting slot, g', surrounding a stationary pin, fixed to the guide-bearing of the knife, and the whole arranged in such a manner that when the knife is pulled towards the left, it will be moved sidewise, and at the same time be depressed so as to pass by the edge of the stationary knife-blade G, and cut the paper or any other material interposed.

The motion produced by these mechanical means is the one best adapted for cutting, and is known under the name of draw shearing cut.

After the paper is cut it falls on the folding-table ready to be folded, which constitutes the third or folding operation. The paper coming from the feed-rollers B B¹, is guided on top of the folding-table. The table is formed of two halves, H H¹, the latter being stationary, and the former movable and folding over H¹, by means of the hinge which connects the two halves at the point h. Before this movement takes place, the thin folding-plate L places itself on the top of the paper to be folded; it reaches from the back of the stationary part H¹ of the folding-table to the joint h, where the part H connects to H¹. The paper is therefore held firmly at the point where the fold is to be made.

The means by which the motion of this operation takes place are as follows: The motion must be an intermittent one, acting at the time when the feed-rollers and the knife are at a stand-still: The clutch d on the main shaft is a double one, engaging in a clutch on a bevel-wheel, J, loose on shaft D. This is done by the same means that the clutch engages and disengages the gear D¹ of the feed motion. When D¹ is disengaged, the teeth on the opposite end of the double clutch d engage in the teeth on bevel-gear J. By the motion of the latter the folding operation is performed. This motion of J is transmitted by bevel-gear J', shaft j, by bevel-gear J² and J³, to a shaft, K. From this shaft the folding part H of the folding-table is operated. On each end of shaft K is placed a pitman-wheel, K K¹, with crank-pins k¹ k². On H are secured two lever-arms, h h¹, formed, for the sake of stability, of the shape of an arc of a circle. The points k² k³ of these lever-arms are connected to the crank-pins k¹ k², by the two rods K² K³. The amount of motion of crank-pins k¹ and k² is such as to turn the folding part H, swinging on the point h to an angle of one hundred and eighty degrees, or from its original horizontal position to the horizontal position over the stationary part H¹, thereby folding the paper placed on the same. Before this action of H takes place, the thin folding-plate L, over which the paper is folded, is placed on the paper. This is done by the following means: On shaft k, between the pitman-wheels, is a pinion, I, geared into a wheel, M, of double the size, on a shaft, m. From here the motion is transmitted by bevel-gears N O, shaft o, bevel-gear O¹ and P to shaft p. On p is a cam-wheel Q, the cam part q of which acts on a tappet, L¹, on a wheel, L², on a shaft, l, giving this latter a partial turn. On this shaft l is secured the folding-plate L, which is operated by these means: Wheel L² has a groove worked out on its circumference; over it passes a cord, down to spring L³; the action of this latter brings folding-plate L over the paper in the position shown in the drawings. When L is brought to an upright position by the means hereinbefore described, it will carry along with it the paper folded over its edge, which can now be readily removed by hand. L remains for a certain time, necessary for feeding and cutting, in that position.

To fold paper of less width, (accepting the machine now to fold the largest ever necessary,) the frame part A¹, carrying the feeding-table, can be shortened by bringing the joint h of the folding part H¹ nearer to the cutting-knife G, to the amount to which the breadth of the folded sheets is to be reduced, and moving in the gauge L⁴ to the same distance against which the paper is fed. The feed must be changed in the manner hereinbefore described. To allow the shifting of the frame A¹, the latter is secured to A by four bolts, R R¹ R² R³; the frame A¹ is slotted, in which slot the bolts R pass. To make a change the bolts R R¹, etc., are loosened, the frame A¹ set, the bolts R R¹, etc., tightened again, and the machine is ready to operate. The plate H, reaching up close to the knife, must be shortened; for this purpose it is formed at the end of slats or narrow strips of wood, secured to the main body of H by bolts. According to the change in width, more or less slats are taken from the table H.

The operation is now as follows: First, the feed takes place, bringing the paper on the folding-table up to gauge L⁴. The feed being arrested, the cutting takes place. This being done, the motion is transferred to the folding apparatus, which has remained at rest during the first operation. The cam q releases the tappet L¹ on shaft l, and the folding-plate comes down on the top of the paper to be operated upon, and holds the same. Now the folding part H is worked and the fold is produced over the edge of the folding-plate L. The part H now moves back to its original horizontal position. The cam part q now acts again on tappet L¹, and L is brought to a vertical or nearly vertical position, bringing along with it the paper folded. Here the motion to the folding mechanism is ended; the motion of the feeding and cutting mechanism begins anew. During this latter time the folded paper is removed from L, and so on.

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

1. I claim the application of a folding apparatus to a paper-cutting machine, substantially as and for the purposes herein set forth.

2. I claim the movable part H of a folding-table, in combination with the stationary part H¹ of the same, and the folding-plate L, operating substantially as and for the purposes herein set forth.

3. I claim, in combination with a folding machine, the folding-plate L, substantially as and for the purpose herein specified.

4. I claim, in a folding apparatus, the folding-plate L, in combination with tappet L¹, cam-wheel Q, spring L³, operating substantially as and for the purpose herein set forth.

5. I claim, in paper-cutters, the knife G, in combination with angle-levers $f^1 f^3$, slot g , and pin, operating substantially as and for the purpose herein set forth.

6. I claim the provisions for adjusting the folding-table to the different widths of paper to be folded, substantially as and for the purpose herein specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ENOS H. McARTHUR.

Witnesses:

EMIL VOSSNACK,

A. HOERMANN.