No. 622,682. Patented Apr. 11, 1899.

O. H. HICKS.

MACHINE FOR PERFORATING PAPER.

(Application filed Dec. 23, 1889.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

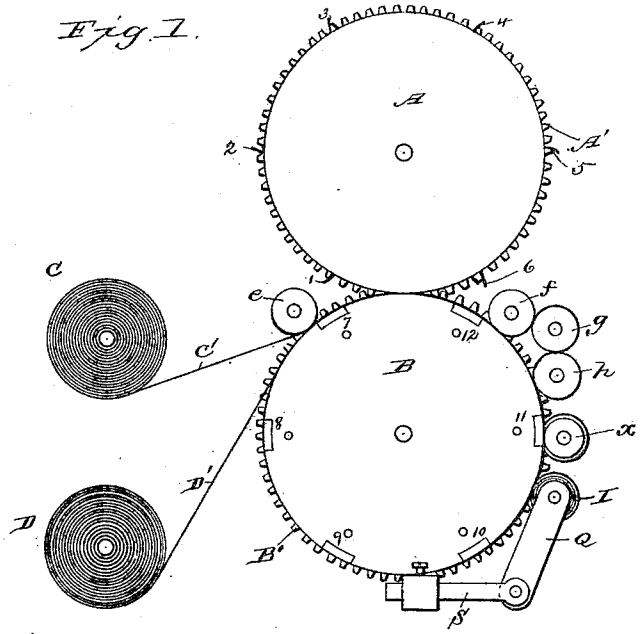


Fig. 2

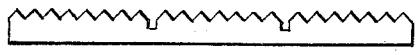


Fig. 3

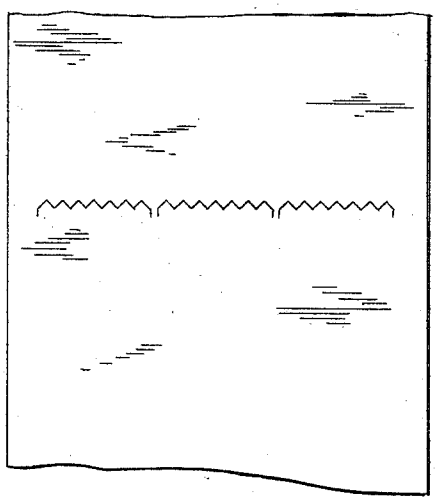
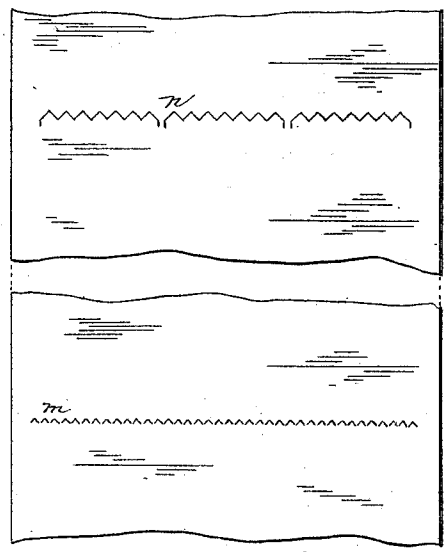


Fig. 4.



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Fig. 5.

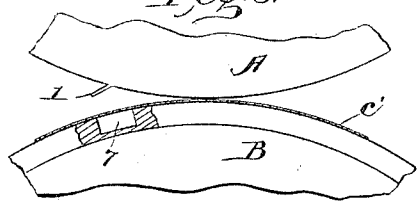


Fig. 6.

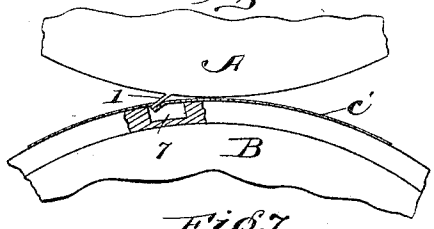


Fig. 7.

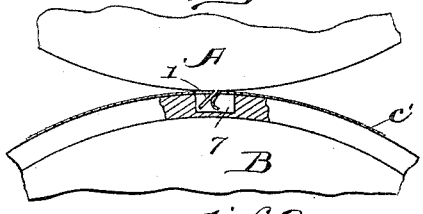


Fig. 8.

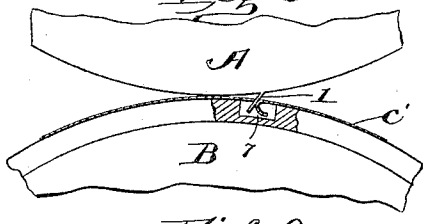
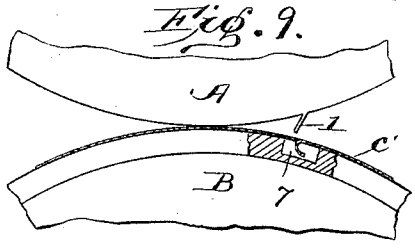


Fig. 9.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR PERFORATING PAPER.

SPECIFICATION forming part of Letters Patent No. 622,682, dated April 11, 1899.

Application filed December 23, 1889. Serial No. 334,737. (No model.)

To all whom it may concern:

Be it known that I, OLIVER H. HICKS, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Machines for Perforating and Winding Paper; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the figures and letters of reference marked thereon.

My improved machine is designed particularly for perforating and winding toilet-paper, though other kinds of paper for different uses may be operated upon by it with equal effect.

I will first described the machine and the manner in which it operates and will then point out what I believe to be its particular points of novelty in the claims at the end of this specification.

In the accompanying drawings, Figure 1 represents an end view of the essential parts of a machine embodying my invention. Fig. 2 is a view of one of the perforating-knives detached. Fig. 3 is a view of a web of paper that has been perforated by the machine. Fig. 4 is a view of a web perforated, so as to exhibit lines of greater and less weakness. Figs. 5, 6, 7, 8, and 9 are detailed diagrammatic views of a portion of the two cylinders, illustrating the action of the perforating and folding knives in perforating the web and folding back portions to leave apertures.

Similar letters and numerals of reference in the several figures indicate the same parts.

A and B are two cylinders of equal diameter, geared together by gears A′ B′, so as to have the same surface speed, one of said cylinders A being provided with a series of knives 1 2 3 4 5 6 and the other B with a corresponding series of slots 7 8 9 10 11 12 for coöperating with the knives to cut or perforate the paper.

C and D represent rolls of paper that are to be perforated and rewound, C′ being the web leading from roll C and D′ the web leading from roll D.

e f h are frictional feeding-rolls receiving motion from the cylinder B and between which and said cylinder B the webs of paper pass.

g is an idler-roll over which one of the webs is passed for the purpose of causing said web to lag behind the other after the perforating operation, and thereby bring its perforations between those of its fellow web.

x is a rotary slitting-knife which coöperates with a groove in cylinder B to divide the webs into strips of proper width, and I is the roll upon which the webs are finally rewound into roll form, said roll I being mounted upon a swinging arm Q and receiving its motion from contact with the cylinder B, the pressure between the two being regulated by means of a weighted arm S or its equivalent applied to said arm Q.

I preferably employ a serrated knife, such as shown in Fig. 2, and set the cutting portion at a slant, as shown in Fig. 1, so that a longer cut will be made and so that as the knives leave the paper the points will not tend to raise the paper from the cylinder upon which it is supported.

Knives such as shown in Fig. 2 will produce perforations or cuts upon the web like those shown in Fig. 3; but I do not desire to limit myself to any particular form of knives, as the form must be varied according to the style of cut or perforation desired to be made.

Where perforations of only one kind are desired to be applied to the paper—such, for instance, as shown in Fig. 3, or as shown in my Patent No. 405,412, of June 18, 1889—all the knives are formed alike; but should different kinds of perforations or cuts be desired in the same web the knives would have to be arranged accordingly. For instance, it might be desirable to produce a web having lines of extreme weakness for defining each sheet and lines of less weakness for defining the half of each of said sheets, in which case it would only be necessary to arrange the knives so that the knives for producing the lines of extreme weakness would alternate with those for producing the lines of less weakness. Fig. 4 illustrates a web of the

character mentioned, *m* indicating the lines of extreme weakness and *n* the lines of less weakness.

The machine represented in the drawings is designed particularly for the manufacture of rolls of paper consisting of two webs, each weakened transversely at intervals and wound together, with the lines of weakness of one web between those of the adjacent web, as covered by my Patent No. 400,913, dated April 9, 1889, which accounts for there being two supply-rolls C D upon the said machine, and also for the necessity of the idle roll *g*, which latter operates to delay the web C′ after it is perforated, so as to bring its perforations or lines of weakness between those of the web D′, when both the said webs are finally wound together upon roll I. Where a single web only is to be perforated and wound into roll form, one of the supply-rolls and the said roll *g* may be dispensed with.

By my invention the perforating and winding of the paper are accomplished by a continuous process, and I am enabled to wind paper of less than half the strength of the ordinary perforated paper now upon the market, because, first, of the peculiar construction of the perforating contrivances, and, secondly, of the fact that both the guiding and feeding and winding rolls are run by frictional contact of the paper with the lower cylinder alone, and a minimum amount of longitudinal strain is thrown on the web while being operated upon.

It should perhaps be noted that the portions of the paper cut or struck out by the perforating-knives are not entirely detached, but are folded back on the under side of the web, as shown in my Patent No. 405,412, of June 18, 1889.

The knives preferably project rearwardly to the direction of their travel at an angle to lines drawn radially of the roll, and in operation they project way through the paper, the result being that they first enter the paper transversely to the width of the knife or by a "side push," so to speak, tearing the paper down into the recess in the lower roll. As the rotation is continued the knives assume a position substantially radial to the lower roll, and because their ends travel faster than the surface of either roll and paper they continue tearing and cutting the paper, causing the section displaced by the knife to turn back upon itself to some extent and in position to be folded down flat when the web passes between smooth rollers or when the webs are superposed in rolls.

I claim as my invention—

1. The combination with the driven main cylinders as described and provided the one with transverse perforating-knives, and the other with slots to receive said knives, of a winding-roll driven by contact of the paper being wound thereon with the lower cylinder, and a paper-feeding roll bearing against the lower cylinder in advance of the point where the knives operate on the paper whereby the paper is held taut over the cylinder at this point; substantially as described.

2. The combination with the main cylinders geared together as described, and provided, the one with perforating-knives and the other with slots to receive said knives, of a paper-feeding roll, a rotary cutter in advance of the winding-roll coöperating with and driven by the lower roll to sever the web into proper widths and a winding-roll driven by contact of the paper being wound thereon with the lower cylinder; substantially as described.

3. The combination with the two cylinders geared together as described, and provided, the one with perforating-knives and the other with slots to receive said knives, of a paper-feeding roll driven by frictional contact with the lower cylinder and a winding-roll driven by contact of the paper being wound thereon with said lower cylinder; substantially as described.

4. The combination with the main cylinders geared together as described, and provided the one with the perforating-knives and the other with slots to receive said knives, of a winding-roll and a series of rolls *f*, *g*, *h* for causing one of the perforated webs to be presented to the winding-roll with its perforations between those of its fellow; substantially as described.

5. In a machine for perforating and winding superposed webs of paper, the combination with the perforating mechanism; substantially as described, adapted to simultaneously perforate superposed webs of paper, of separate guides for the webs after passing the perforating mechanism, whereby the relative positions of the perforations in the webs may be changed; substantially as described.

6. In a machine for perforating and winding paper, the combination with the perforating mechanism, substantially as described, adapted to perforate superposed webs of paper, and a winding-roller for said superposed webs, of an independent guide-roller for one of said webs located between the perforating mechanism and winding-roller, whereby the path of the web is lengthened and the relative position of the perforations in the two webs changed; substantially as described.

7. The combination with the perforating-cylinders having knives and slots as described, of the rolls, *e*, *f*, *g*, *h* and the winding-roll I, all said rolls being driven by frictional contact and the two supply-rolls; substantially as described.

8. In a machine for perforating and winding paper, the combination with the two cylinders geared together for simultaneous movement, one of said cylinders having longitudinal slots therein, and the other being provided with knives having perforating por-

tions and non-perforating portions, the perforating portions only projecting into the slots of the coöperating cylinder, said knives being inclined backwardly at an angle to radii from the axis of the cylinder, the angle of inclination of the knives being less than a tangent with the surface of the cylinder, whereby the portions of the web cut or torn down by said knives will be given a forward set with respect to the body of the web to form apertures, of feed-rolls for holding the web against the slotted cylinder on both sides of the perforating-point; substantially as described.

OLIVER H. HICKS.

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