E. W. BLACKHALL.

Paper-Perforating Machine.

No. 209,448 Patented Oct. 29, 1878

Fig. 1.

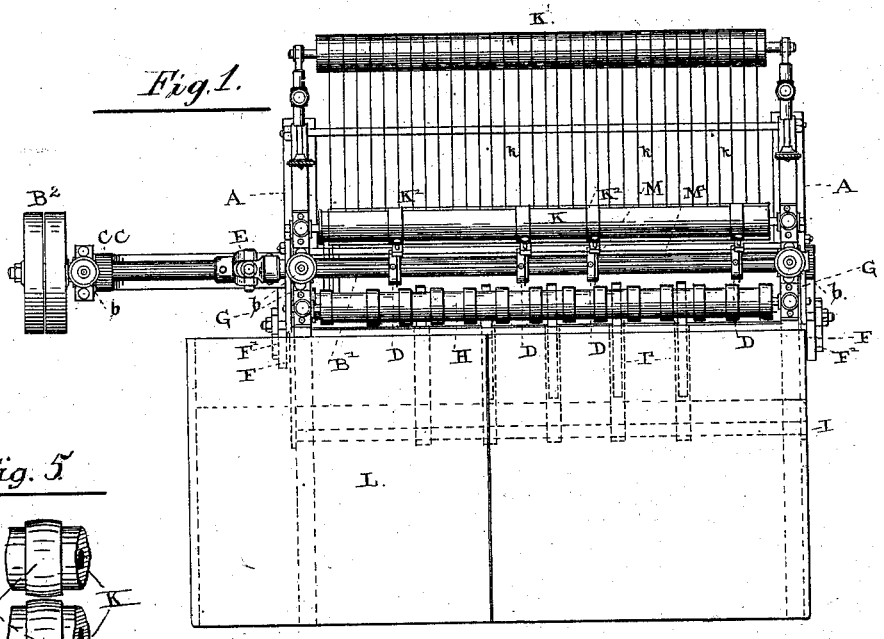
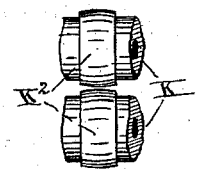


Fig. 5



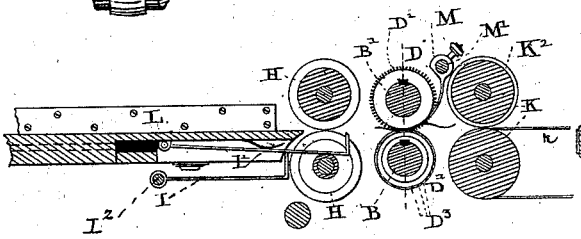


Fig. 5.

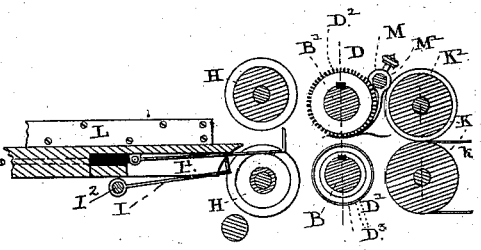


Fig. 4.

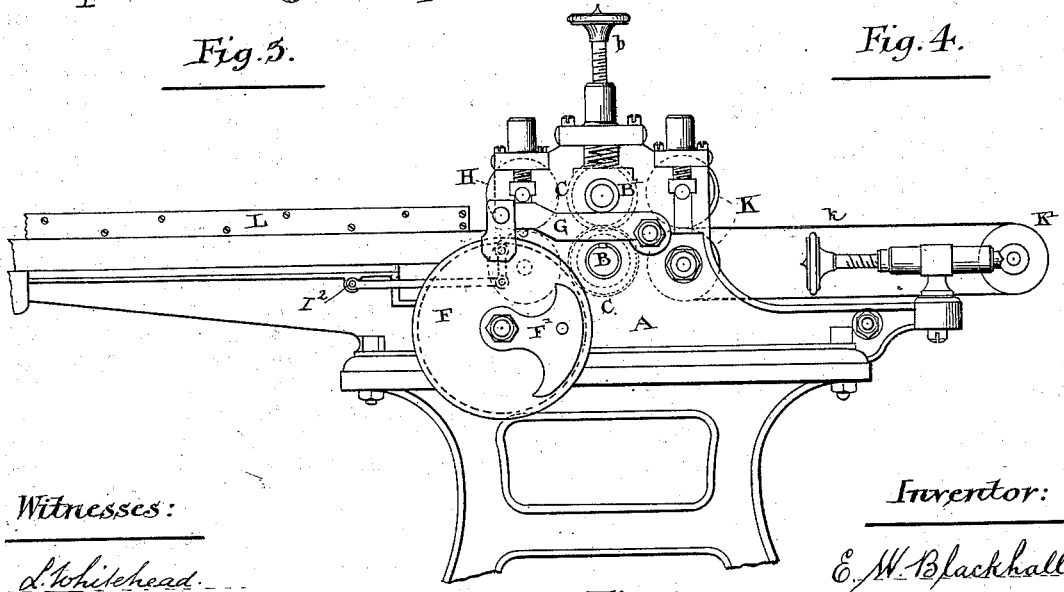


Fig. 2.

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EDWARD W. BLACKHALL, OF TORONTO, ONTARIO, CANADA.

IMPROVEMENT IN PAPER-PERFORATING MACHINES.

Specification forming part of Letters Patent No. **209,448**, dated October 29, 1878; application filed June 18, 1878.

To all whom it may concern:

Be it known that I, EDWARD W. BLACKHALL, of the city of Toronto, in the county of York and Province of Ontario, Canada, have invented certain new and useful Improvements in Paper-Perforating Machines, which improvement is fully set forth in the following specification and accompanying drawing.

My invention has relation to improvements in that class of perforating-machines in which the cutters rotate; and it consists, first, in the combination, with one of the cutter-shafts, of a universal joint, for the purpose of enabling the cutter attached thereto to be lifted out of and returned into operative connection, and to be driven by gear-wheels continuously in one direction without alteration of their relative positions; secondly, in the general construction and arrangement of various parts of the machine, embracing the feeding in, cutting, and conveying appliances, together with devices operating as stops, and an intermittent lifting mechanism common to certain of the parts, whereby the machine is adapted for the production of "stop" and many varieties of work, as hereinafter more particularly described; and, thirdly, in a construction of the conveyer-rolls by which the roughness of the perforations is flattened down and the neatness of the work produced thus materially enhanced.

In the accompanying drawings, Figure 1 is a plan, and Fig. 2 a side view, of a machine embodying my improvements, the latter view being on an enlarged scale. Figs. 3 and 4 are sectional details. Fig. 5 is a view of a portion of the conveyer-rolls.

A is the frame of machine; B, the lower cutter-shaft, and B^1 the upper cutter-shaft. To the lower shaft, B, are attached pulleys B^2, for driving by power; or, instead of the pulley, a suitable crank-wheel may be applied for foot-power. The rotary motion communicated to the lower shaft is transmitted directly to the upper shaft by the toothed wheels C C, which always remain in gear, and, being of exactly the same size and the teeth cut and fitted carefully, necessarily rotate the shafts with a precise and equal motion. The several bearings of the upper shaft are placed in connection with springs and adjustment-screws *b b b*, in order that the shaft and attached cutters may be held down to the work of cutting with the necessary firmness, but not with rigidity.

D are the upper cutters, and D^1 the lower cutters. The upper cutters are provided with a series of cylindrical punches, D^2, placed equidistant around the whole periphery of the block. The lower cutters are provided with a shell-face, divided and cut by round holes D^3 to correspond with the upper cutter. The contact of the two cutters when the paper is passed between them will, it can readily be understood, produce a series of perforations in the paper corresponding in size and pitch to the punches and holes of the cutters.

So far, it is seen the cutters will produce a continuous series of perforations; but the machine would be very imperfect if its usefulness ended here, as the requirements of trade demand a variety of work—notably, stop work, as for blank, check, voucher, and other books. To this end the upper shaft, B^1, is provided with a universal joint, E, at a suitable point beyond the cutters and between the cutters and the driving-gear, which joint, as is well understood in mechanics, will permit the shaft to work out of a straight line and still preserve a uniform motion throughout its length. In connection with the upper shaft with universal joint, revolving-wheels F, having detachable wipers F′, are used one on each end of the shaft, for the purpose of lifting said shaft and attachments at stated intervals, in order that the cutters may stop cutting but not stop continuously revolving. The lift to the upper shaft is communicated from the wiper-wheels by a pivoted lifting-bar, G, which bars are also arranged to engage with the projecting ends of the upper feeding-in roller, H, lifting it simultaneously with the cutters, and thus stopping the forward feed of the paper.

Immediately in front of the feeding-in roller is placed a bar or bars, I, the ends of which are suitably connected by intermediate mechanism to the lifting-bar G, and has communicated to it an equivalent lift upward. By this bar are operated a series of finger-bars, I′, which bars are bent upwardly at the end to form stops, which, when the cutters are operating, are depressed below the level of the running paper by springs, but which, when

the cutters and feeding-in roll are lifted, are elevated by the bar I to form a stop, against which the edge of the paper is placed prior to the lowering of the feed-roll, &c., for the purpose of executing the perforated work to gage.

The lifting connection between the bar I and the finger-bars permits the latter to be moved to or from the cutters, for the purpose of varying the position of the perforations in the paper.

In operation, each time the feeding-in roller is lifted the operator pushes the sheets of paper through and between the rolls against the upwardly-bent ends of the finger-bars. So soon as the upper roll is lowered, the paper is caught and fed forward between the cutters, which perforate until the upper cutters are again lifted. Should this be done, as in stop-work, the paper is carried through and out of the machine by the set of conveyer-rolls K K, which do not lift, and may be further carried by means of conveyers *k* and the roller K^1 and deposited in hoppers.

It will be observed, as a point of great advantage in my machine, that the feeding for gage-work can be done with the greatest accuracy, and that it is not necessary for the operator to see his sheets or the stop, but simply to feed in until he feels the edge of his paper square against the stops.

By means of the finger-bars the position of the perforations in stop-work is fixed; but the length of the perforated work is varied by the length of the wipers on the wheels F.

Paper after perforation is slightly roughened on the under side along the line of perforation, causing the sheets, when laid one over the other in piles, to be uneven. To obviate this difficulty collars K^2 are placed on the rolls K opposite the cutters, having convex faces, the crests of which are adjusted to flatten down the roughness caused by perforation. This construction is shown in Fig. 5.

L is an adjustable laterally-sliding board, placed on the feeding-table for the purpose of gaging the position of the lines of the perforations.

M are cutter-guards, supported on a rod or bar, M′, in such manner that they, with the cutters, may be adjusted as desired for different widths of perforation. The ends of these guards curve downwardly, and are slitted to engage with the punches D^2, for the purpose of preventing the paper after perforation adhering to the cutters, and also for the purpose of guiding the paper to the next set of rolls.

The operation of the cutters employed in that class of machines to which this invention belongs is to cut out the holes with a clear shearing cut, as contradistinguished from the action of other machines in use, wherein punches are used to make the perforations. In the latter operation the connecting bars of paper between the holes are not left as perfect as in the use of my machine, the strength of the sheet being in consequence impaired.

In the setting up of my machine the cutters are made adjustable on the driving-shafts, and as many may be used as desired, and their position changed as often as required. The punches do not pass into the punch-holes of the lower cutter, but simply into the mouth sufficiently to insure that the cutter-edges come together with a shearing action, cutting the paper clean and puncturing a perfectly round hole, without damaging the intervening bars between the perforations.

From the fact of the cutters shearing out a clean hole, the sheets do not stick together after perforation, as is usually the case in perforated work.

The punches are sharpened by slightly tapping them on the face with a hammer.

I claim as my invention and desire to secure by Letters Patent—

1. In a paper-perforating machine, a universal joint introduced into one of the cutter-shafts and combined therewith, for the purpose of enabling the cutters attached thereto to be lifted out of and returned into working connection, and to be driven by gear-wheels continuously in one direction without altering their relative position, substantially as shown and described.

2. The feeding-in rolls H, rotary cutters D D^1, and finger-bars I′, the latter, the upper roll, and the upper cutter being provided with a common intermittent lifting mechanism, as specified, combined with the adjustable cutter-guards M and conveying-rolls K, all arranged substantially as and for the purpose specified.

3. The wiper-wheels F, with detachable wipers F′, and lifting-bar G, in combination with the feeding-in roller H and driving-shaft B^1, provided with a universal joint, substantially as shown and described.

4. The conveyer-rolls K, provided with collars K^1, having a convex face, and arranged for the purpose of flattening down the roughness of the perforations, substantially as shown.

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