(No Model.) 3 Sheets—Sheet 1.

D. R. SMITH & J. McCREARY.

METHOD OF AND MACHINE FOR RADIAL CRIMPING.

No. 283,360. Patented Aug. 14, 1883.

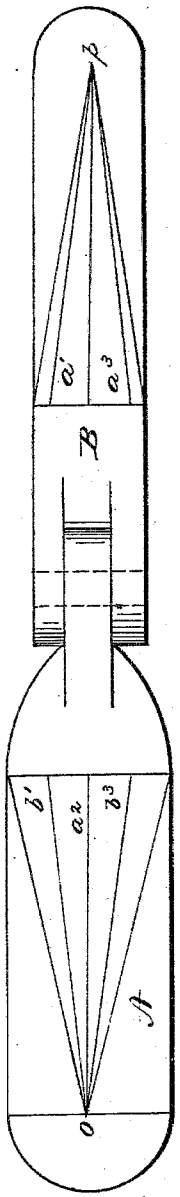


Fig. 2.

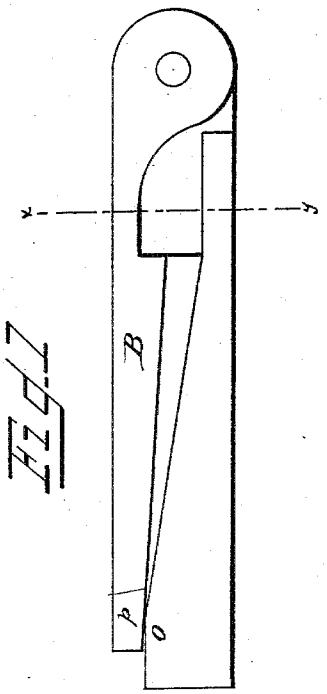


Fig. 1.

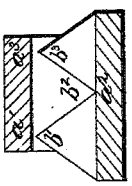


Fig. 3.

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Fig 4.

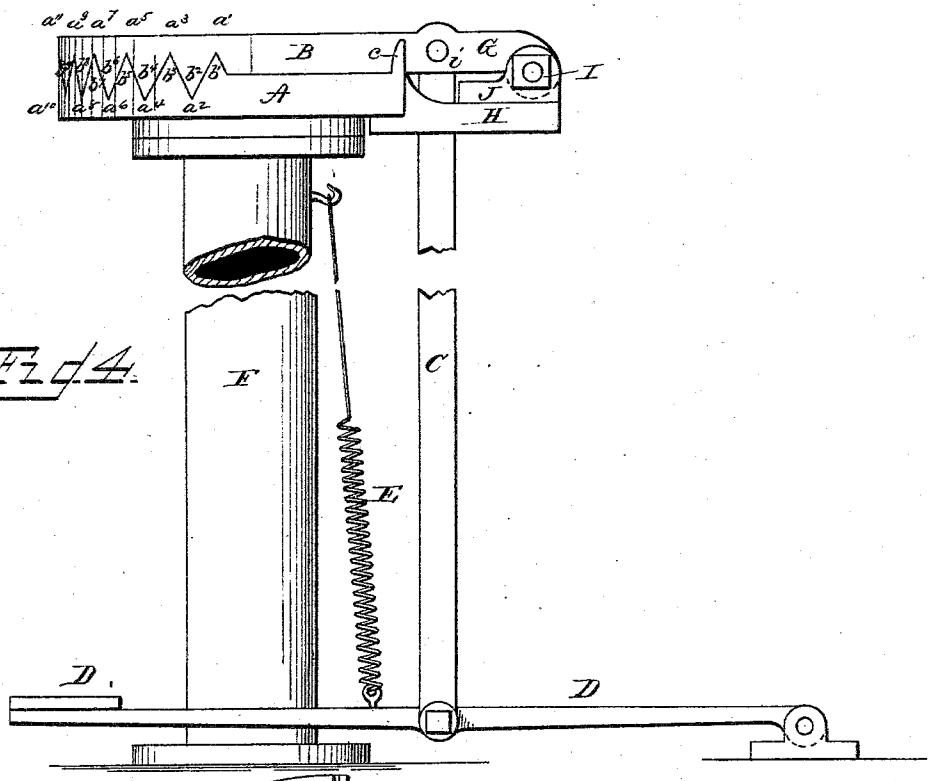
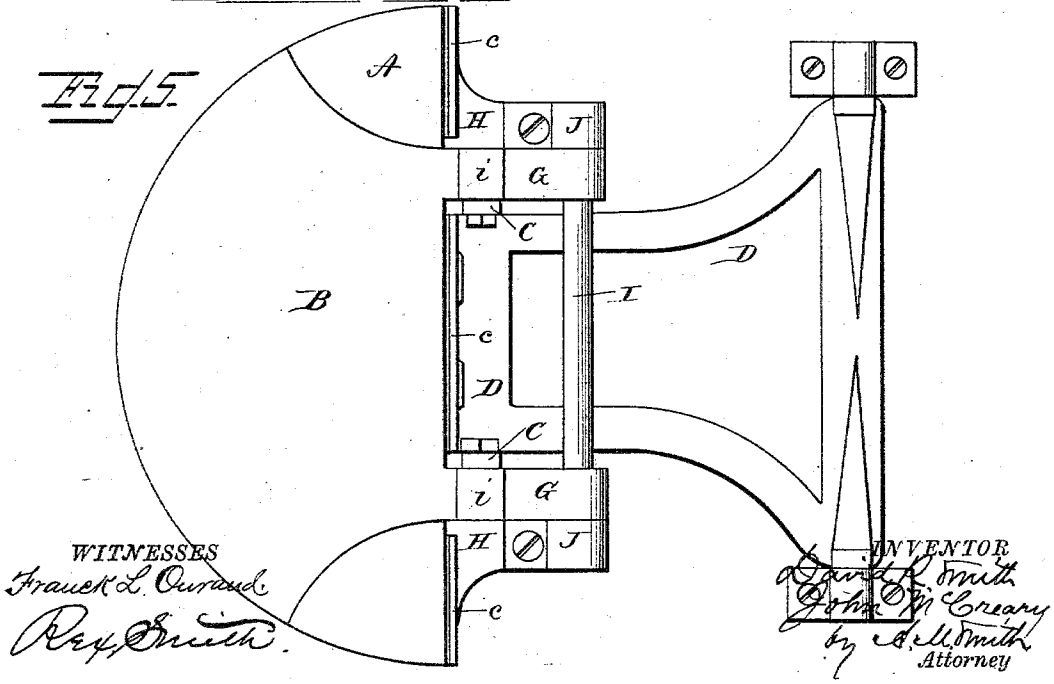


Fig 5.



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Fig. 6

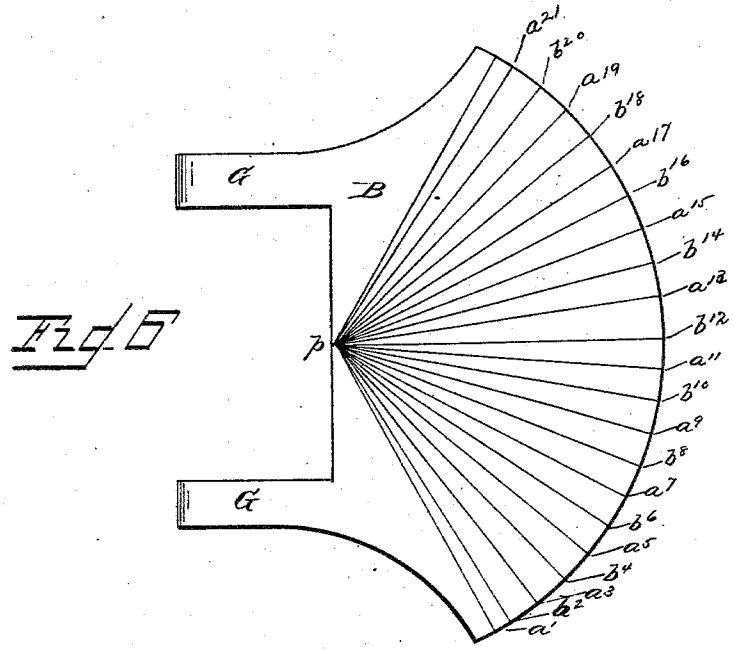
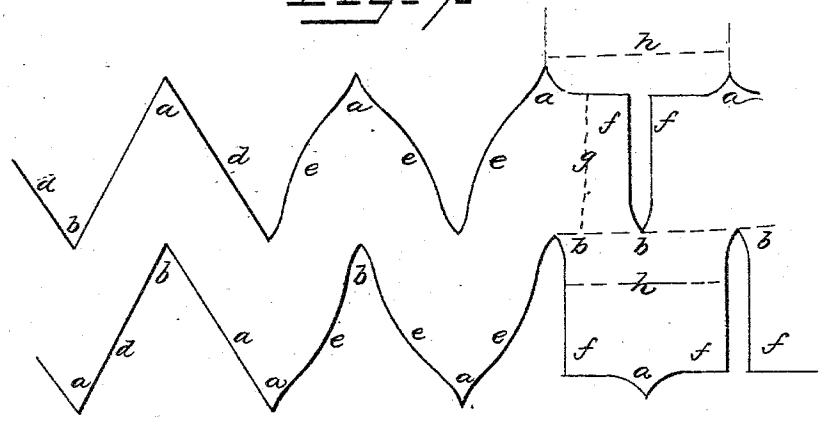


Fig. 7



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UNITED STATES PATENT OFFICE.

DAVID R. SMITH, OF TROY, AND JOHN McCREARY, OF COHOES, ASSIGNORS OF ONE-HALF TO GEORGE H. BILLINGS AND EZRA W. CARTER, BOTH OF COHOES, NEW YORK.

METHOD OF AND MACHINE FOR RADIAL CRIMPING.

SPECIFICATION forming part of Letters Patent No. 283,360, dated August 14, 1883.

Application filed December 26, 1882. (No model.)

To all whom it may concern:

Be it known that we, DAVID R. SMITH, of Troy, county of Rensselaer, State of New York, and JOHN MCCREARY, of Cohoes, county of Albany, State of New York, have invented new and useful Improvements in Methods of and Machines for Radial Crimping, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification.

The object of our invention is to provide a method and a machine by which filtering-paper may be crimped or folded more suitably and more uniformly than the same can be done by hand, by which method and machine suitably crimped or folded filtering-paper may be manufactured for sale to consumers, thereby relieving druggists and others from loss of time and the annoyance incident to the folding or crimping of such paper by hand.

The filtering-paper of commerce is ordinarily sold to consumers in sheets, and, so far as we are informed, has always heretofore had to be crimped for use by hand—an operation which can be well performed only by persons who have acquired skill by long practice. For lack of the requisite skill or of time to exercise that skill many druggists and others are compelled to use the filtering-paper folded in an imperfect or unsatisfactory manner, thereby always suffering serious loss by evaporation, and sometimes greater loss by the breaking of the paper.

The crimps or folds of filtering-paper when ready for use should all radiate or diverge from or converge toward the center of the sheet, preferably to or from a common center or point at or near the center of the sheet, and the adjacent radial lines upon which the several folds are made should be at equal angular distances from each other, so that at equal distances from the common center the several folds would be as nearly as possible of equal width. The width of the folds or the number of the folds required in each sheet will vary with the quality of the paper and the nature of the liquid to be filtered. The alternate folds or crimps should be in opposite directions, like the folds of a fan, in such manner that when placed in the funnel for use one-half of the lines of folding will describe a cone, and will coincide with and rest upon the inner surface of the conical funnel, and the other half or alternate lines of folding will arrange themselves in positions corresponding to lines on the surface of an inner, smaller, and concentric cone having a common apex with the outer or larger one. Channels are thus formed between the paper and the containing-funnel for the escape of the filtered liquid. If the folds are too wide in proportion to the stiffness of the moistened paper, the outward pressure of the contained liquid will close the channels.

Our invention consists of an improved method of producing in filtering-paper or other material radial or diverging or converging crimps or folds or fold-marks suitable for filtering-paper, by compressing the paper or material, on the lines of the several folds, between suitable and suitably-arranged radial or diverging or converging grooves and edges; and it further consists of a machine for radial crimping and of certain details of method and construction hereinafter specified.

In the accompanying drawings, Figure 1 is a side elevation of a machine designed to illustrate our improved method of radial crimping, in which figure the hinged edge and groove carriers or holders are closed, thereby bringing the edges of each into the grooves of the other. Fig. 2 is a plan of the same machine with the upper carrier or holder thrown over to show the under side of same with its grooves and edges. Fig. 3 is a transverse section of Fig. 1 on the line *x y*. Fig. 4 is a side elevation of a radial crimping-machine embodying our invention and suitable for manufacturing radially-crimped filtering-paper for market. Fig. 5 is a plan of Fig. 4. Fig. 6 is an under side view of the upper movable hinged and guided edge and groove carrier or holder, showing the edges and grooves of same. Fig. 7 is a diagram illustrating the development of the edges and grooves.

In all the figures like parts are indicated by the same letters of reference.

A and B are suitable edge and groove carriers or holders, so arranged, guided, and operated that the several grooves and edges are opened and closed in the manner required for the purposes of our invention. The several grooves *a* and edges *b* are numbered, respectively, a' a^2 a^6 a^{10}, &c., and b' b^6 b^2 b^5, &c., for convenience of reference. The grooves *a* and edges *b* are straight, and are so arranged on or attached to the several holders that when they close upon the intervening paper the edges *b* of one holder will press the paper or material into the corresponding and opposite grooves *a* of the other, forming in the material crimps, fold-marks, or folds radiating or diverging from or converging toward a common center or point at or near the center of the sheet of filtering-paper or other material operated on. In order that this effect may be produced, and that the material may be folded or crimped in the manner specified, as required in filtering-paper, the edges and grooves acting on the same face of the paper alternate with each other, as shown in the drawings, whereby the alternate folds produced are in opposite directions; and, further, the grooves *a* and edges *b* are so arranged on or attached to the several holders that when closed, as in the act of compressing the paper, all the grooves *a* and edges *b* in contact with one side of the paper will radiate from a common center, *o*, and those on the other side from another common center, *p*, the centers *o* and *p*—one on each side of the intervening paper or material—coinciding with the central point of the paper or material from which the crimps, folds, or fold-marks radiate. It is not to be understood, however, that by our improved method the lines of the several folds must necessarily be made to converge to a point or toward a point, as the term "point" is mathematically defined, because in practice the points *o* and *p* may be expanded into circles of small diameter, corresponding to an uncrimped space or area in the center of the sheet of paper or material, in which case the grooves *a* and edges *b* may be tangential to the said circles diverging therefrom, as from a center; and centers *o* and *p*, so expanded, would be in practice, and for the purposes of our invention, the equivalents of points, and the said tangential disposition of the grooves and edges would be practically equivalent to a strictly radial disposition of the said points.

Referring to diagram Fig. 7, representing possible transverse sections of the grooves *a* and edges *b*, if the lines *d* are straight, the intervening paper or material will be unnecessarily compressed between the opposite faces represented by those lines, which possible defect may be avoided by substituting the curved lines *e*. For convenience or for facility of construction the lines *f* may define the forms of the grooves and edges. The edges *b* should be smooth and slightly rounded, to prevent unnecessary friction and the consequent tearing of or injury to the paper or material. The proportion of height *g* to distance *h* may increase when the material is tough and strong, and decrease for delicate or easily-torn material.

In the machines represented in the drawings the carriers or holders A and B are hinged to each other in such a manner that the hinges serve as suitable guides, and provide for the necessary opening and closing of the several grooves and edges to receive, compress, and release the paper or material. If in the machine represented in Figs. 1, 2, and 3 the grooves and edges are opened or separated by raising the carrier B from the position shown in Fig. 1 sufficiently to admit a sheet of filtering-paper between them, and the sheet of paper is then placed with its center immediately over the point *o*, and the grooves and edges are then closed upon the paper by forcibly lowering the carrier B, the several edges *b* will compress the paper into the several grooves *a*, and crimps, folds, or fold-marks will be formed in the paper corresponding to the number of grooves and edges carried by the holders A and B. If a single pair only, as a^2 and b^2, were employed, only one fold, crimp, or fold-mark would be made, and the width of the folds would not thereby be determined; but by having a plurality of grooves and edges, as a' a^2 a^3, &c., and b' b^2 b^3, &c., two or more fold-marks are made at one operation, determining the width of the folds, and the sheet of paper can be successfully crimped with the machine represented in Figs. 1, 2, and 3 by moving it (the paper) around the center, *o*, shifting the fold or mark made by the pair a' b' to the pair a^3 b^3 each time an impression or fold is made, and holding it there by a hand on the paper until a new impression is made; but our improved method carried into effect in that manner is not sufficiently rapid in its operation, and we have therefore devised the machine represented in Figs. 4, 5, and 6 for making all—or, more exactly, all but two—of the folds required in a sheet of radially-crimped filtering-paper.

In or on carriers A and B in Figs. 4, 5, and 6 a sufficient number of grooves a' to a^{21} and edges b' to b^{21} are provided, radiating or diverging from the point *o* (concealed in the drawings) of carrier A and point *p* of carrier B. The carrier A is fixed to and supported by a suitable column or frame, F. The movable carrier B is suitably hinged to carrier A by lugs G and H, bolt I, and boxes or blocks J, the hinge serving as a proper guide to the grooves and edges and to the carriers to which they are fixed. The movable carrier B is operated by means of a treadle, D, connecting-rod C, and spring E in such manner that the action of the spring raises the movable carrier, opening the grooves and edges to receive or release the paper, and the pressure of the foot

of the operator on the treadle brings down the movable carrier, closes the grooves and edges, and compresses the paper.

c is a guide or stop projecting upward from the face of the fixed carrier or holder A, and placed transversely of the machine just behind the center *o*.

To operate the machine represented by Figs. 4, 5, and 6 the sheets of filtering-paper are first folded through the center on the line of one diagonal if the sheet is square, or on one diameter if the sheets are circular. The operator, standing in front of the machine, releases the treadle, allowing the grooves and edges to open; then places one of the sheets thus folded through the center, upon the upper face of the carrier A, resting upon edges b^1 b^3 b^7 b^9, &c., with the center of the sheet over the center *o*, and the fold of the sheet against the guide or stop *c*. Then by the pressure of a foot on the treadle the carrier B is brought down, the several edges pressing the paper into the several grooves, and by the compression of the paper between the grooves and edges producing the crimps, folds, or fold-marks required.

The folds thus produced will be expanded like the folds of a partially open or expanded fan, and by hand may be readily contracted or closed together like the folds of a closed fan, and in that condition may be subjected to pressure and bound in bundles or packages for market.

We do not confine ourselves, however, to the details of construction above described, for it is evident that a revolving shaft with a crank or eccentric may be substituted for the treadle D and spring E, and that the various details of construction may be varied indefinitely; but,

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The method herein described of producing radially-crimped filtering-paper, consisting in first folding the sheets through the center, and then compressing the folded sheets between intermeshing clamping-edges radiating from a common center.

2. In a machine for radial crimping, the combination of a fixed edge and groove holder, A, carrying radial or diverging or converging grooves *a* and edges *b*, and provided with a suitable guide or stop, *c*, with a movable edge and groove-holder, B, carrying radial or diverging or converging edges *b* and grooves *a*, and means for guiding and operating the said movable holder B, substantially as herein specified.

In testimony whereof we have hereunto set our hands this 14th day of December, A. D. 1882.

DAVID R. SMITH.
JOHN McCREARY.

Witnesses:
CHAS. O. EVEANS,
SAML. H. EDGERLY.