

E. NORDBLOM & L. HANSEN.  
Paper-Folding Machine.

No. 200,838.

Patented March 5, 1878.

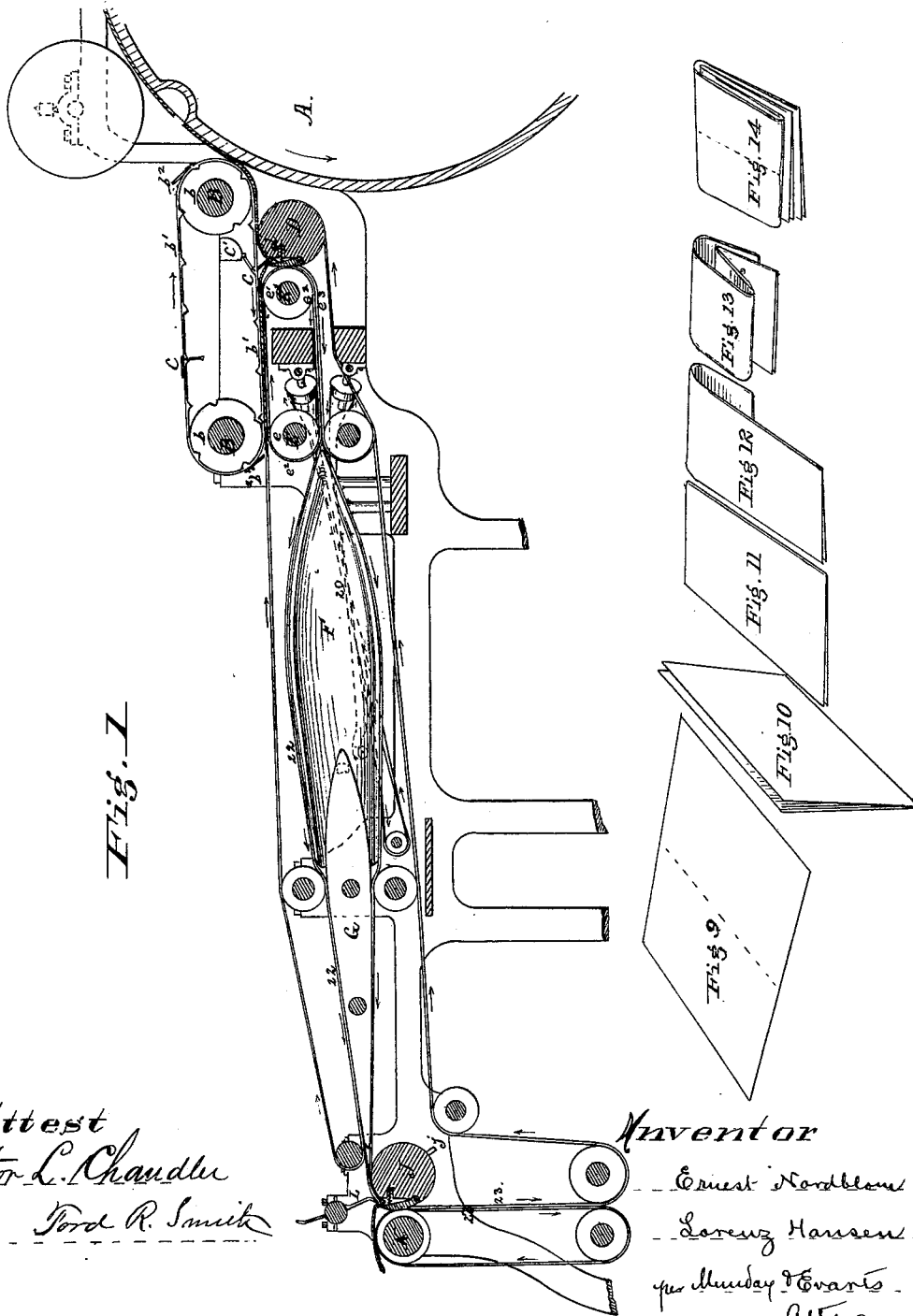


Fig. 1

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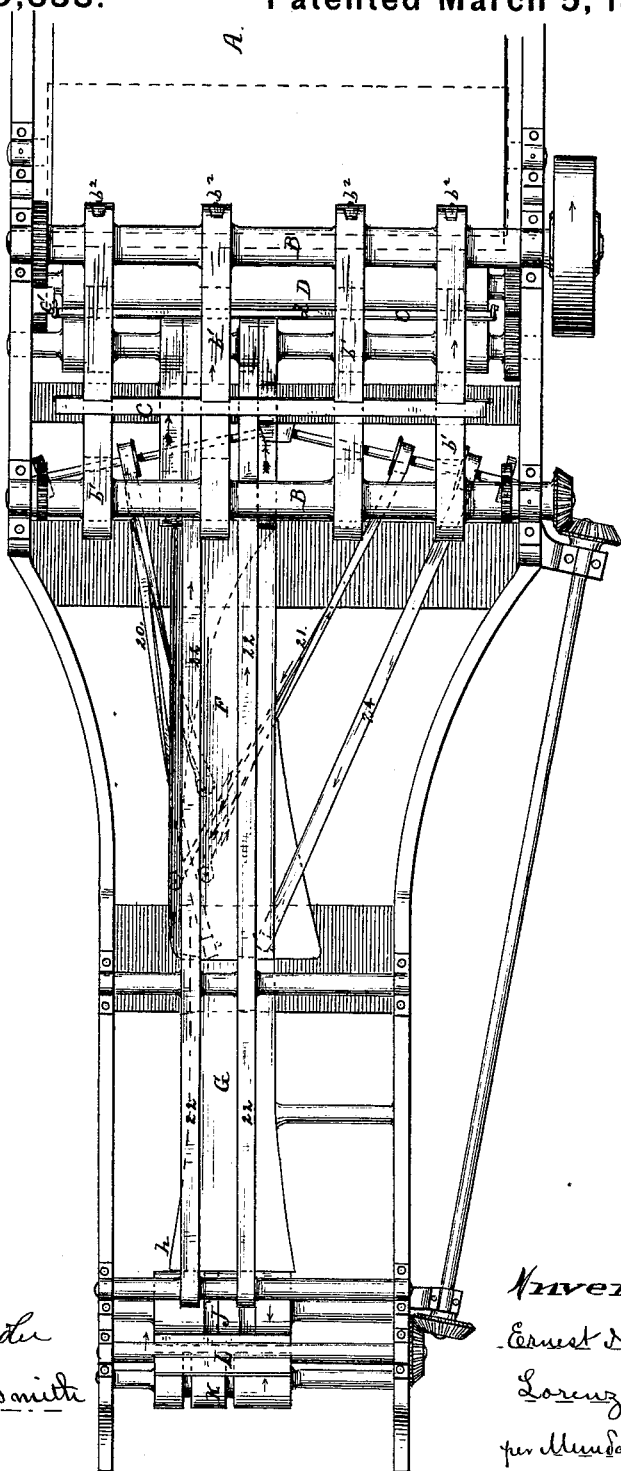


Fig. 2

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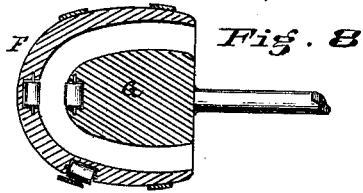


Fig. 8

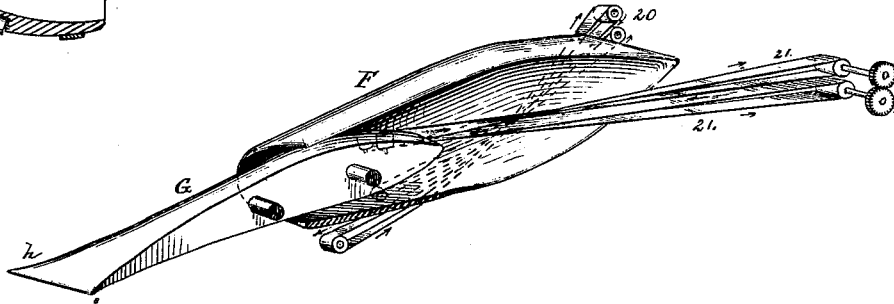


Fig. 5

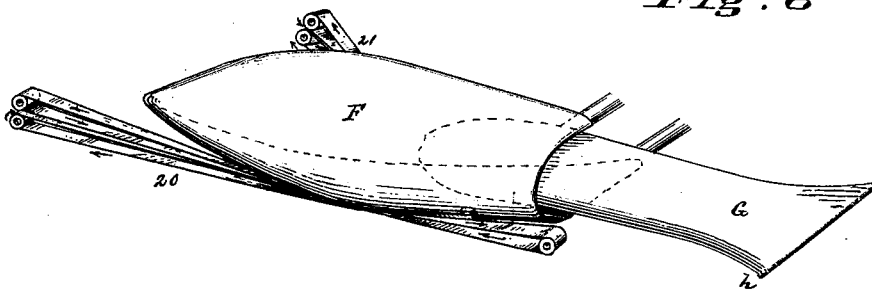


Fig. 6

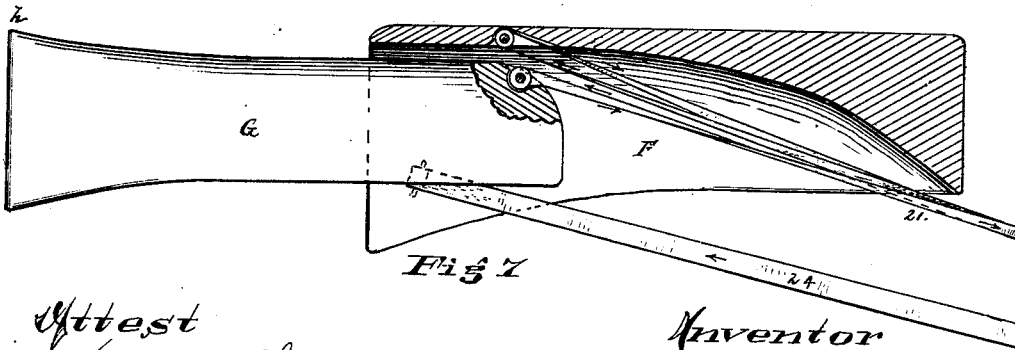


Fig. 7

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## UNITED STATES PATENT OFFICE.

ERNST NORDBLOM AND LORENZ HANSEN, OF CHICAGO, ILLINOIS.

### IMPROVEMENT IN PAPER-FOLDING MACHINES.

Specification forming part of Letters Patent No. **200,838**, dated March 5, 1878; application filed April 8, 1876.

*To all whom it may concern:*

Be it known that we, ERNST NORDBLOM and LORENZ HANSEN, of Chicago, in the county of Cook and State of Illinois, have invented certain Improvements in Paper-Folding Machines, of which the following is a specification:

The nature of our invention will be understood by those skilled in the art from the following description and accompanying drawings, which form a part thereof.

In the said drawings, Figure 1 is a longitudinal vertical section of the machine. Fig. 2 is a top or plan view of the same. Fig. 3 is a transverse vertical section of the machine below the folding shoes or shields. Fig. 4 is a sectional view, similar to Fig. 1, but upon a larger scale, of a portion of the apparatus. Fig. 5 is a perspective view of the folding shoes or shields detached. Fig. 6 is a similar view of the same from the other side. Fig. 7 is a sectional top view of same. Fig. 8 is a transverse section of same. Figs. 9, 10, 11, 12, 13, and 14 are perspective views of the sheet in its various progressive stages during the operation of folding.

Like letters of reference made use of in the several figures indicate like parts wherever used.

In the said drawings, A represents the final cylinder of the printing-press, from whence the printed paper is delivered. B B are shafts parallel to cylinder A, and bearing pulleys *b*, over which pass the endless belts *b*<sup>1</sup>, moving in the direction of the arrows. These belts are provided at suitable intervals with nippers *b*<sup>2</sup>, for grasping the paper to take it from the cylinder. They are flat pieces of metal riveted to the belt, so that by the tension of the belt they are made to lie flat against the belt-surface, except when passing around the pulleys. These nippers are so adjusted upon the belts, and the movement of the belts is so contrived, that the nippers arrive at the cylinder A at the proper moment to receive the edge of the sheet turned off by said cylinder, and, being closed by their onward motion, gripe said sheet and carry it away from the cylinder horizontally, until the nippers are again opened by the farther pulleys. Extending across the entire series of belts are one or more folding-

blades, C, pivoted to swing out at right angles or to lie flat upon the belt-surface, and moving with the belts.

Below these belts is arranged a folding-roll, D, provided with spring-lip *d*, hinged to the roll, and held open by its spring. A pair of shafts, E E', are fitted with pulleys *e e'*, which carry tapes *e*<sup>2</sup>, moving in the direction of the arrows shown upon the drawing contiguous thereto. The sheet A' as it comes from the cylinder A, griped and carried by the nippers, as above explained, at the moment of its release from said nippers is struck in the middle, along the dotted line shown in Fig. 9, by the folding knife or blade C, which, for this purpose, is caused to tilt by means of a cam, C', and the bight or fold of the sheet forced down into the open lip. The further revolution of the roll D causes the lip to close upon the paper by rolling the open lip against the periphery of the pulleys *e'*, and the sheet thus brought between the pulleys and the roll is carried down folded in the middle. The tapes *e*<sup>2</sup> serve to assist in carrying the portion of the paper which has been carried past, in order to bring the center of the sheet to the right position for the action of the blade, as above.

The sheet folded, now with one fold, as shown at Fig. 10, is taken between the tapes *e*<sup>2</sup> at their lower position and the tapes *e*<sup>3</sup>, and carried fold first toward the folding-shields, the paper lying horizontally, as indicated at Fig. 11.

Before the folding-shields are reached, however, the sheet is acted upon by a series of guiding-tapes, which act, in conjunction with the shields, to produce the fold.

The second fold given to the sheet—that shown at Fig. 12—is a fold of one-fourth of the length of the sheet, as shown at Fig. 11. This fold is produced by means of a set of tapes marked 20, consisting of two tape-bands placed one above the other, the lower limb of the upper band and the upper limb of the lower band of which run in the same direction toward the shield. This set of tapes 20 are arranged in a diagonal direction, as shown, and they seize the sheet at one end, and, twisting in their course, carry said end under the first or outer shield F. At the same time another set of diagonally-arranged tapes, 21, similar to 20, and with a twist in their course, take the

long end of the sheet at about the middle thereof, and carry it to the inside of shield F, bringing the sheet into the condition shown at Fig. 13. The action of the folding-tapes is now at an end, and the sheet, acted upon solely now by the through-tapes 22, is carried forward over the inner shield G, which passes through the part marked *g* of the sheet, as shown at Fig. 13. This inner shield smooths and flattens the folded sheet by means of its tapering form, and, by reason of the flaring edge at *h*, sets the fold, so that the sheet at this stage assumes the condition shown at Fig. 14. The sheet in this condition is delivered above the final folding-roll, J, made in all essential respects like the first folding-roll, D, and furnished in like manner with a spring-lip, which is closed by contact with the pulleys upon a roller, K. The sheet having moved along until in a proper position, a revolving blade, L, strikes it at the dotted line shown upon Fig. 14, and, the fold being seized by the spring-lip, the sheet, with its final fold, is drawn, folding along the dotted line at Fig. 14, between the tapes 23, from whence it is finally delivered.

The tapes at 24, which, like 20 and 21, are a double set, are for the purpose of supporting the long end of the sheet from the moment of its leaving the tapes *e*<sup>2</sup> until it is fairly upon the folding-shields.

We have, for the purpose of avoiding confusion, shown only such sets of tapes as are necessary for the working of the machine. Additional tapes may be used, in practice, to obviate friction, and should be used wherever they can be applied. For this purpose the surfaces of the shields may be fitted with tapes, if desired.

The gearing, which may be traced upon the drawing, is such as to give the motion to the parts indicated by the arrows, and with the timing required, as above indicated.

The outer shield F is made of the form shown in the drawing. It commences with a flattened front end, which lies horizontally and near the point at which the paper is delivered from the apparatus which produces the first fold. The form from this point is a gradual swell exteriorly to the rear or last portion, one side of the shell being rounded or convex and the other side hollowed with a cavity. (Shown in plan at Fig. 7 and in cross-section at Fig. 8.) The inner shield is made somewhat in the form of a fish, the head whereof is partially enveloped by the outer shield. The paper, in the act of folding, passes these shields in the condition shown at Fig. 13. The uppermost ply in said figure shown in the act of passing will lie upon the upper surface of the outer shield. The ply next below will lie between the upper surface of the inner shield and the outer shield. The next ply below will lie between the lower surface of the inner shield and the outer shield. The lowest ply will lie in contact with the lower surface of the outer shield. Of course, this condition is not preserved throughout the en-

tire contact of the sheet with the shields, but may be taken as the medium condition of transit. The form of the shields is such that the fold is made gradually, and the form is such that it is impossible to describe it in words, while it is very easy to comprehend it from the drawing when the nature of its operation is explained. It may be generally said of the shields that one surrounds partially the other, and that both are rounded off and formed to offer the least resistance possible to the passage of the sheet, while the fold is at the same time supported in the proper places. The sheet is induced by the form of the shields and their arrangement, substantially as shown in the drawing, to take the double fold, as described.

The shields are located between the mechanism for forming the first fold and the mechanism for forming the last fold, and it is their function to form the double intermediate fold which is given at right angles to the first and last fold.

In order that the sheet may be sure to be properly adjusted over the final folding-roll J, we provide said roll with short arms *j*, placed opposite the lip, which, in the revolution of the roll, strike the first end of the incoming sheet as it is fed by the tapes over the roll, and lift it up far enough to carry it upon guard-fingers not shown in the drawing, but which stand over the shaft or roller K, to keep the sheet from contact with said roller before the revolving blade L strikes it. The blade L is duplicated, in order that one blade may strike the sheet before it is in place to assist in placing it. This is accomplished because there is but a single nipping-lip upon the roll J, which, at the time the second or duplicate blade L strikes the sheet, is not in position to grasp the sheet, and consequently the blade lifts the sheet along. This action may be further assisted by placing a bar or series of pegs upon the roll J opposite to the nipping-lip, so that this projection will strike the sheet at the same time as the duplicate blade, and, moving in the same direction, will serve to assist the sheet along to place.

We do not claim the combination of a mechanism for automatically controlling the leading end of a sheet and delivering it within the range of action of the folding mechanism with a rotating folding mechanism; nor the combination of a folding-blade mounted in a revolving carrier automatically projected to double a sheet, a companion revolving carrier provided with a receiving-recess which is supplied with means for holding said double sheet, and mechanism for automatically controlling the forward end of the sheet, so that its central portion shall be acted upon by said folding devices; nor the combination of a folding-blade mounted in a revolving carrier and automatically projected to double a sheet, nipping devices mounted in a companion revolving carrier which receive said doubled sheet, and grippers for controlling the position of the sheet,

so that its central portion shall be acted upon by said folding devices; nor the combination of a cylinder and grippers pivoted directly and independently to the cylinder, and separate holding-springs; nor the combination of a rotating creaser, rotating grooved folding-bar, and grippers arranged at the front side of the groove, so that the sheet will be bent back upon the folding-bar, and thus support its entire width. All of these several combinations, we are informed, have been the subject of interfering applications and patents in an interference in which this application was involved. We have therefore disclaimed them specifically.

Having thus described the construction and operation of our machine, that which we consider new, and desire to secure by Letters Patent, is—

1. The combination, with the final cylinder of a printing-press, of the folding-roll D, its feeding-belts and knife, and the folding-shields, the guiding-tapes, and final folding-roll and its appliances, substantially as specified.

2. As a means for producing folds in newspapers, the double-shield contrivance, along which the paper is carried, and which produces the fold or folds by the form of the shields, substantially as specified.

3. The pivoted folding-blade C, attached to the belts  $b'$ , in combination with the cam C' and belts  $b$ , substantially as specified.

4. The combination of the folding-shields

and the guiding-tapes, constructed and arranged, substantially as described, so that the sheet is carried upon the shields in the shape shown at Fig. 13, substantially as specified.

5. The combination of the guiding-tapes 20 and 21, the shields F G, and through-tapes 22, substantially as specified.

6. The combination of the guiding-tapes 20 and 21, the shields F and G, the through-tapes 22, and the supporting-tapes 24, substantially as specified.

7. The combination of the shields F and G with tapes twisted and arranged in diagonal lines, one set leading to the outside of shield F and one to inside thereof, substantially as shown at Figs. 5, 6, and 7.

8. The shield G, provided with the flaring edge  $h$ , in combination with the shield F, substantially as specified.

9. The combination of the appliances for producing the first fold, substantially as specified, and the folding-shields and guiding-tapes with the final folding-roll J and its appliances, substantially as specified.

10. The combination of the appliances, substantially as specified, for producing the first fold with the shields and guiding-tapes, substantially as specified.

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Witnesses:

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