

(No Model.)

2 Sheets—Sheet 1.

L. C. CROWELL.  
FOLDING MACHINE.

No. 480,422.

Patented Aug. 9, 1892.

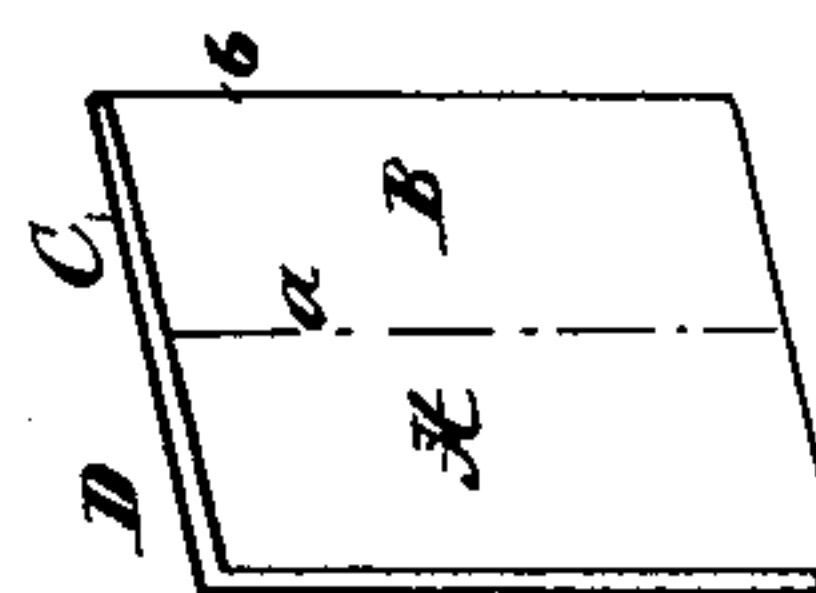
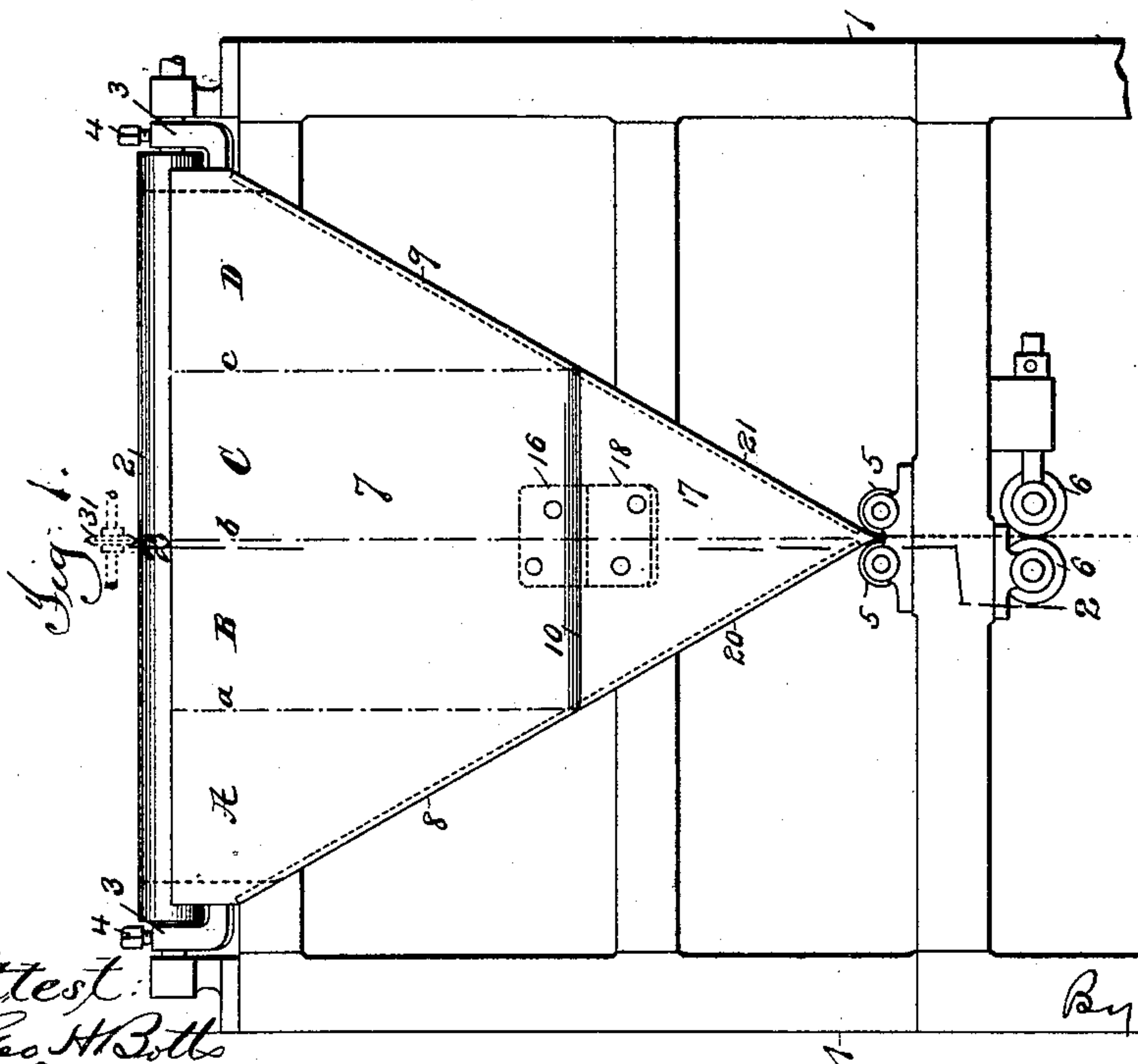
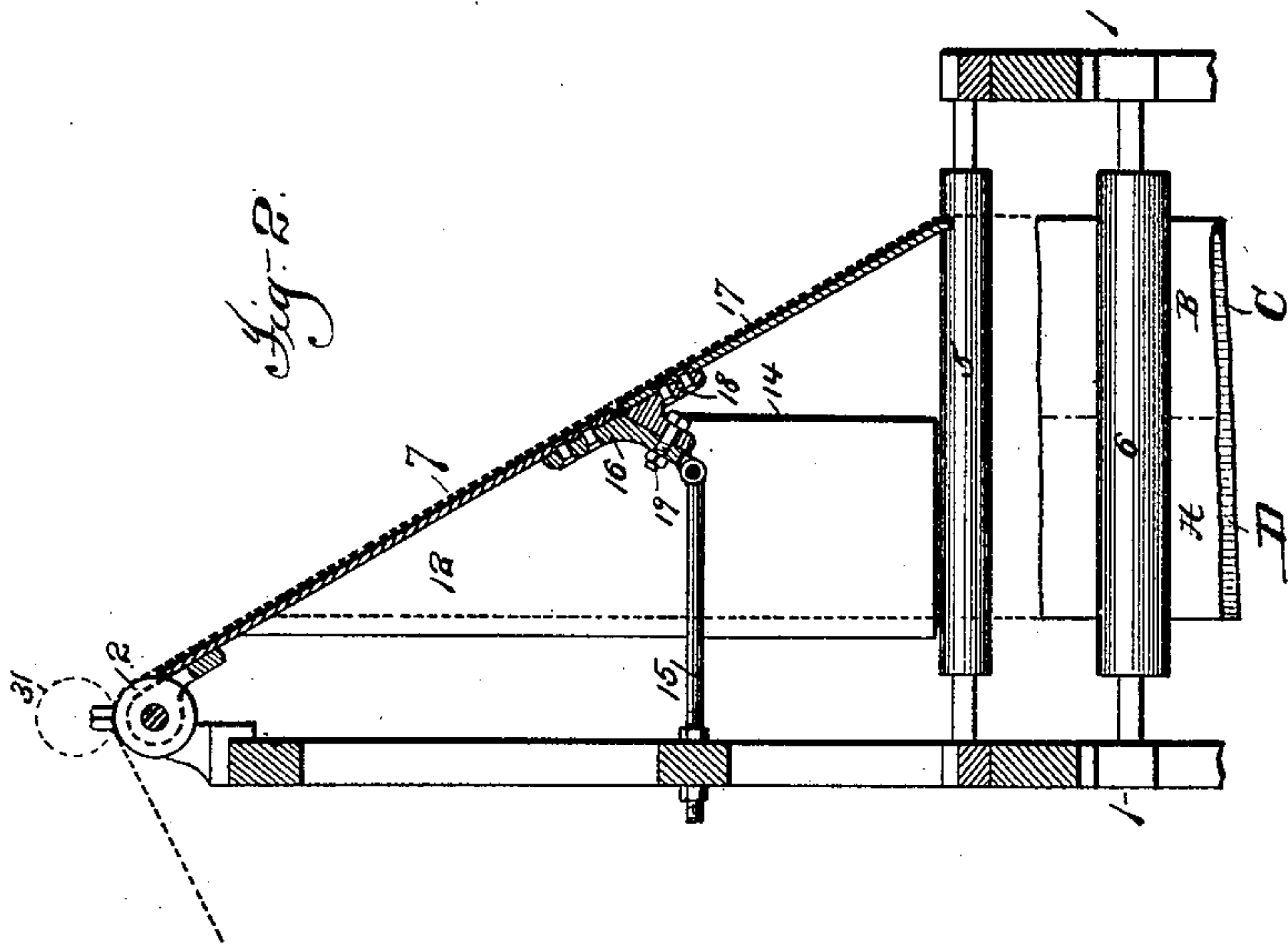



Fig. 6.

Inventor  
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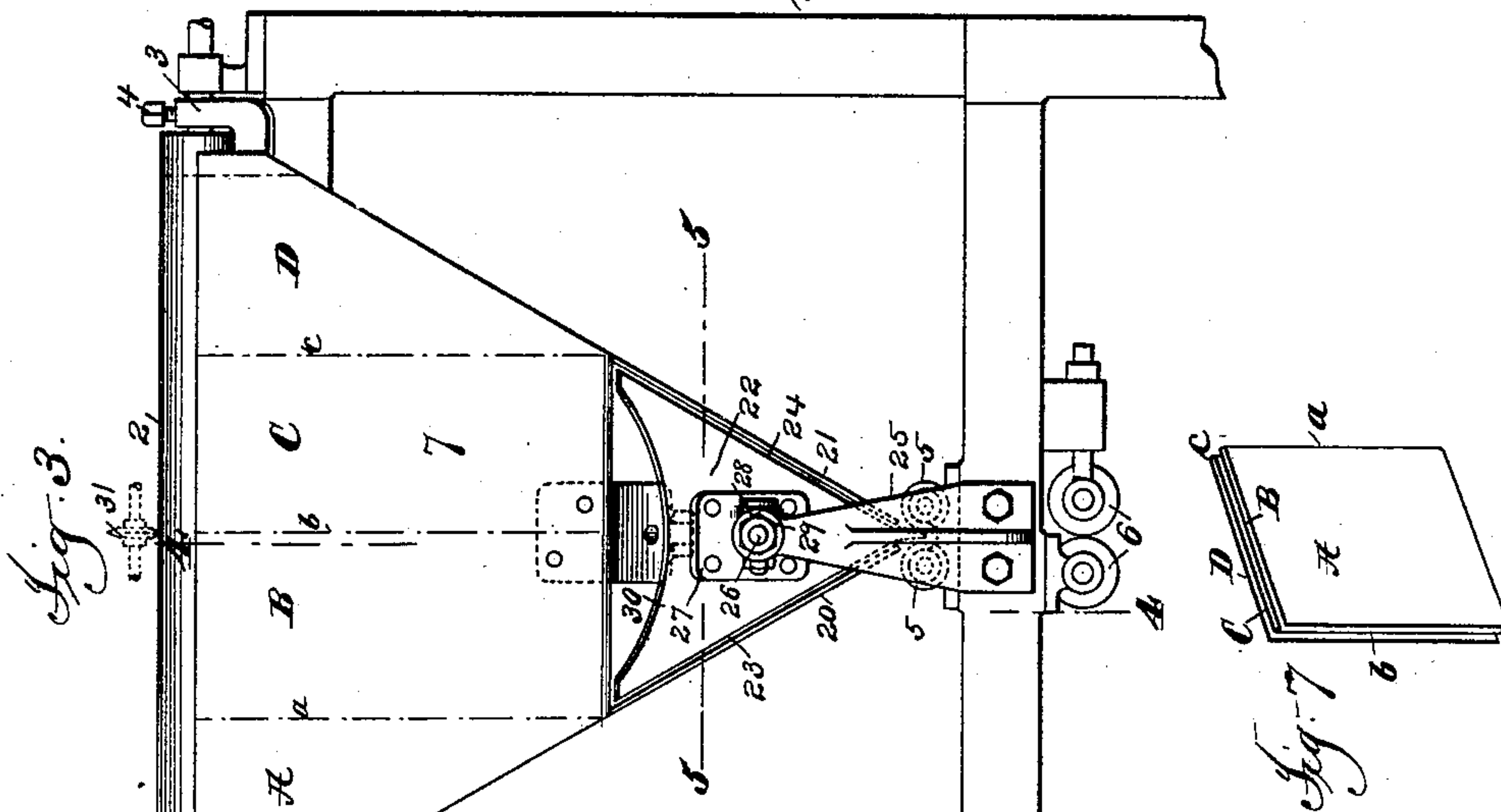
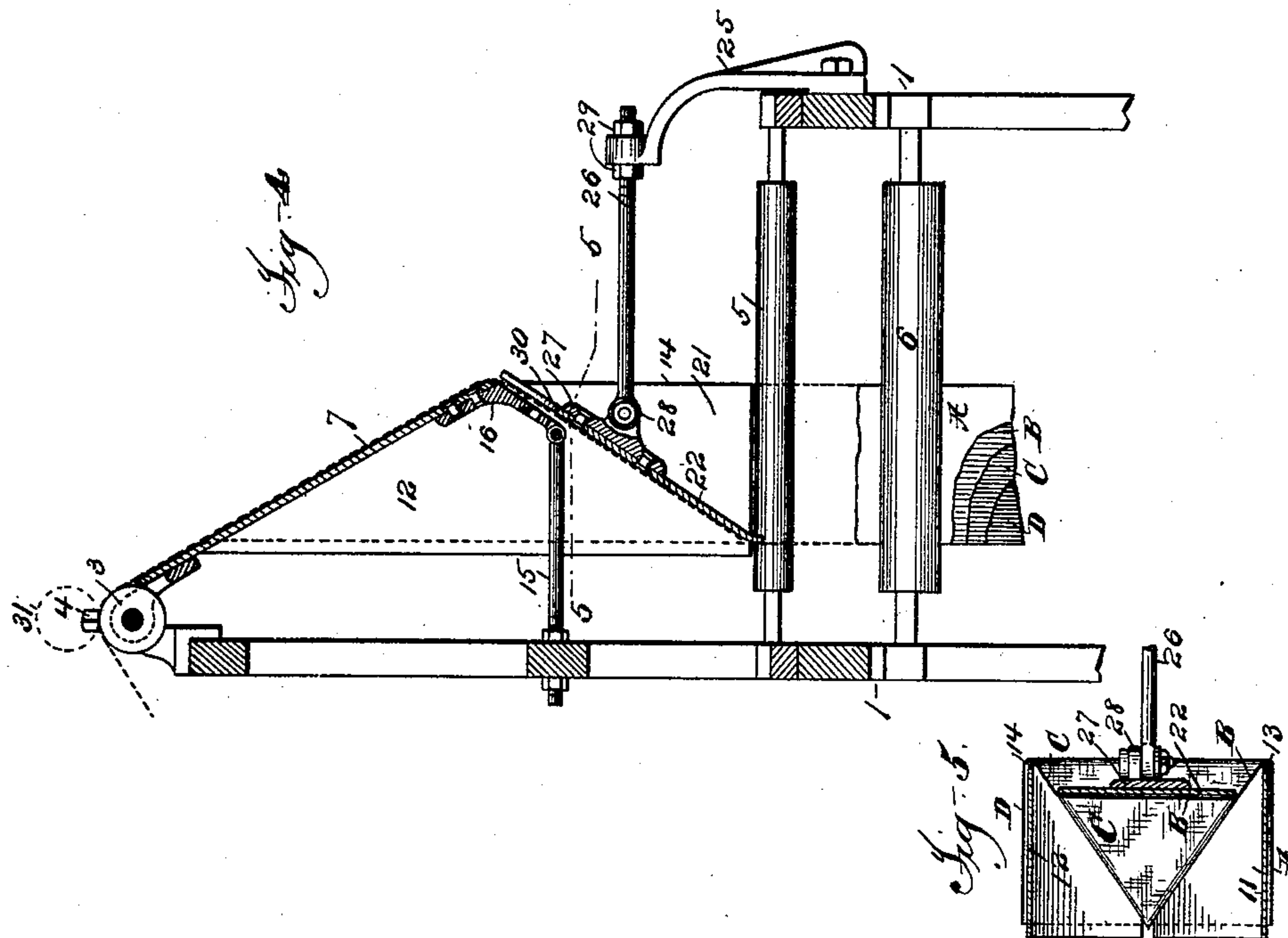
By } Philip P. Phelps & Henry  
Atty

Attest:   
Geo. H. Bots  
J. F. Kehoe.

2 Sheets—Sheet 2.

No. 480,422.

Patented Aug. 9, 1892.



Attest:  
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T. F. Kehoe.

Inventor  
Luther C. Crowell  
By Philip Phelps & Henry  
Attorneys.



# UNITED STATES PATENT OFFICE.

LUTHER C CROWELL, OF BROOKLYN, ASSIGNOR TO ROBERT HOE, STEPHEN D. TUCKER, THEODORE H. MEAD, AND CHARLES W. CARPENTER, OF NEW YORK, N. Y.

## FOLDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 480,422, dated August 9, 1892.

Application filed June 19, 1890. Serial No. 356,002. (No model.)

*To all whom it may concern:*

Be it known that I, LUTHER C. CROWELL, a citizen of the United States, residing at Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Folding-Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

10 This invention relates to that class of folding mechanisms which operate to impart a longitudinal fold to material passing over or through them on the run, and more particularly to such as consist of an internal guide or former having angular guiding-surfaces, in passing over which the material has its sides gradually carried toward each other and finally lapped together, so as to be doubled or folded longitudinally. Longitudinal folders of this class are shown and described in many of my prior Letters Patent, reference being made particularly to Patents Nos. 233,995, 233,996, 233,997, 240,235, 276,672, 281,619, 331,280, and 383,798.

25 The objects of the present invention are to provide an improved folder of this class whereby three longitudinal folds may be imparted to the material, and, further, to provide a construction by which either one or three folds may be imparted, the different products being obtained by a slight and convenient change of parts.

35 With these objects in view my invention consists in the improved folder hereinafter described and claimed and in various constructions and combinations of parts, all of which will be more particularly described in the specification and pointed out in the claims.

40 The improvements embraced in the present invention are especially designed to be used in combination with web-perfecting printing-machines in which the printed web is carried to the delivery mechanism over a longitudinal folder, from which it receives its first longitudinal fold; but it is to be understood that my improvements are equally applicable to all classes of machines in which longitudinal folders of the class referred to are employed.

45 For a full understanding of my invention a detailed description of a folder embodying

the same will now be given, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a front elevation of my improved folder as arranged for imparting a single fold to the material. Fig. 2 is a longitudinal section of the same on the line 2 2 of Fig. 1. Fig. 3 is a front elevation of the folder arranged for imparting three folds to the material. Fig. 4 is a longitudinal section taken on the line 4 4 of Fig. 3. Fig. 5 is a transverse section on line 5 5 of Figs. 3 and 4. Figs. 6 and 7 show products.

Referring to said drawings, it will be understood that the frame 1 is of a construction common in web-printing machines employing longitudinal folders of this class, the web being led to the longitudinal folder over a conducting-roll 2, mounted in the top of the frame, and that the longitudinal folder is carried by arms 3, mounted on the frame or on the shaft of roll 2, as shown, and adjustable thereon by means of set-screws 4, so that the folder may be raised or lowered and adjusted accurately to position. In the frame below the longitudinal folder are the rolls 5, forming the usual fold-laying device and feeding-rolls 6, to which the folded web is led and which form the feeding mechanism by which the web is advanced over the folder.

80 The folder proper consists of a body 7, carrying the converging internal guides 8 9, the body being formed, preferably, of a sheet-metal plate having angular guiding edges or surfaces forming the internal guides, this plate aiding in supporting the web in the center. This body 7 of the folder and the guides 8 do not, however, as usual in this class of construction, extend to the fold-laying device at which the converging guides 8 9 would meet; but the guides are cut transversely at a suitable distance from the point toward which they converge, and a transverse guide 10 preferably extends between their ends, this transverse guide being formed in the folder shown by the rounded cut edge of the plate forming the body. Side guides 13 14 extend downward at an angle to the guides 8 9 to the rolls 5 on each side of the body, these side guides converging toward rolls 5 on the same



angle as the guides 8 9 and forming internal guides for the material when the folder is arranged for three folds. These guides 13 14 may be constructed and supported in any suitable manner, but will, preferably, as shown, be formed by the edges of side plates 11 12, which are carried by the body, and when the body and side plates are made of a sheet metal, as shown, they may be constructed in one piece, the edges of the body being bent to form side plates.

The body 7 is supported above by its arms 3, as previously described, and at its lower end by the adjustable rod or support 15, which is pivotally connected to the block 16, to which the body is secured by rivets, as shown, or in any other suitable manner, the pivotal connection between the rod 15 and block 16 permitting the adjustment of the arms 3 and the body 7, as previously described.

The parts thus far described form the permanent fixed parts of the folder. To complete the folder so as to impart a single fold to the sheet, as in the ordinary folder of this class, a nose-piece 17, carrying guides 20 21, is used, this nose-piece 17 preferably consisting of a plate the edges of which form the guides, and is secured to a block 18, which may be attached to block 16 by bolt 19, thus securing the two parts together, so that the guides 20 21 form continuation of the internal guides 8 9 on opposite sides of the folder by which the material is folded during its passage over the same to the rolls 5, this construction being exactly similar to that of the common type of folder, as will be seen from an inspection of Figs. 1 and 2.

To complete the folder from the body 7 and side guides 13 14 so as to impart three longitudinal folds to the material, the following construction is used: A nose-piece 22, carrying angular converging guides 23 24, the angle of divergence of which is the same as that of guides 8 and 9 and which form external guides for the material, is employed. This nose-piece 22, as shown in Figs. 3, 4, and 5, is preferably formed from a sheet-metal plate, the edges of which form the guides, and the nose-piece is so mounted that the guides 23 24 are not in the same plane as guides 8 9, but are inclined rearward from the end of the body between the side guides 13 14 and converge to the fold-laying device at a point on the rear edge of the folded web, the side guides converging to a point on the front edge of the same, the web being viewed from a position on the side opposite the folder or looking to the left in Fig. 4. The nose-piece is supported upon a bracket 25 at the front of the frame by an adjustable rod or support 26, to which the nose-piece is adjustably connected by means of the block 27 and a bolt 28, the distance of the nose-piece from the body to permit the freer passage of the material between them being adjusted by means of the movement of the support 26 in bracket 25, and the angle of the nose-piece by

its swinging connection with the support-nuts 29 and bolt 28 locking the nose-piece firmly in its adjusted position. The nose-piece when formed of a plate will preferably be cut away next the body 7, as shown at 30 in Fig. 3, to permit the freer passage of the material between the transverse guide 10 and the nose-piece, and its edges at the sides will preferably be rounded, as shown in Fig. 4, for the same purpose.

The operation of the folder will now be described. For convenience of description the material or web may be assumed to be divided, as shown, into four parts or sections A B C D by imaginary lines *a b c*, which finally become lines of fold. For imparting a single fold to the sheet a folder of the ordinary form will be constructed by securing the nose-piece 17 in place by means of bolt 19, the web then passing over the folder to the fold-laying device and feeding mechanism, folded once upon the central line *b*, the resulting product being shown in Fig. 6. For changing the folder so as to impart three folds to the material and produce a four-ply sheet the nose-piece 17 will be removed and the nose-piece 22 secured in position upon the bracket 25 and adjusted, as shown in Figs. 3 and 4, by means of the bolt 28 and nuts 29, the guides 23 24 being placed close to the body 7, but so as to allow the free passage of the material between them and the internal and side guides and the transverse guide 10. The material as it is fed over the body 7 by the feeding mechanism will have its outer sections A D turned inward by means of the internal guides 8 9, and as any portion passes the transverse guide 10 it will be carried downward between it and the nose-piece 22 inside the guides 23 24 and outside the side guides 13 14. The meeting-points of the transverse guide 10, the converging internal guides 8 9, the internal guides 13 14, and the external guides 23 24 are on the lines *a c*, and as the material passes downward outside the guides 13 14 and inside the guides 23 24 the central fold will be formed by the latter and folds will be formed on the lines *a c* by the internal guides 13 14, the sections A D lying upon the outside of the side plates and the sections B C on the inside of the same on opposite sides of the folder, as shown clearly in Fig. 5. As the web reaches the rolls 5 the central-fold line *b* will be brought in line with the edges of the sections A D by the meeting of the guides 23 24 and the fold will be completed by the rolls 5, the result being the product shown in Fig. 7, consisting of a web having three folds—a central fold and two side folds midway between the central fold and the edge of the web. From this description it is clear that there are three pairs of guides in the three-fold folder—the two pairs of internal guides 8 9 and 13 14 and one pair of external guides 23 24. These guides, as shown, consist of the edges of plates, upon which they are respectively formed; but it is



evident that the central part of each plate might be omitted and all the guides consist simply of bars, this construction being well known in the art as an equivalent of that shown. The terms "internal" and "external" guides therefore cover simply those portions of the plates which serve as guides to the material.

If it be desired to slit the sheet on the line *b* during the production of either a two-ply or four-ply sheet, a slitter 31 will be provided, as shown in dotted lines in the drawings, mounted, as usual, above the conducting-roll and folder. A two-ply sheet consisting of two separate plies or a four-ply sheet consisting of two separate sheets, each having one longitudinal fold, may thus be produced. It will be understood, also, that a pasting mechanism of any suitable construction may be provided for the purpose of laying a line of paste on any desired line of the sheet, either longitudinally or transversely, and that other features of construction used with longitudinal folders are equally applicable to the folder constituting the present invention.

It will be seen that by my construction I provide a simple and efficient folder for producing a four-ply product and that the change of a single part is all that is necessary to transform this folder to the ordinary form in which a single fold is imparted, or vice versa.

While I have shown the web as led to the side and external guides over converging internal guides 8 9, and this is preferable, especially with the paper usually employed in web-printing, in order to support the web and partially form the side folders, these converging guides are not absolutely necessary for the three-fold folder; but the web, especially if of considerable strength, may be led directly from the feeding-rolls or other feeding mechanism to the side and external guides, or may be supported only centrally, leaving the edges to be turned inward by the action of those guides.

If it be desired to form the side folds on other lines, so that the plies are not of equal width, the position of these folds may readily be changed by varying the construction of the folder so that the points from which the guides converge are on other lines than midway between the central and side lines of the web.

It will be understood that while I have shown the fold-laying device as consisting of the rolls 5 any other form of fold-laying device may be employed, some of such other forms being set forth in my patents above referred to, and likewise the feeding mechanism may be varied and any other suitable means for advancing the material over and beyond the folder employed.

While it is preferable that the transverse guide 10 be used to support the web while it is being led inside the nose-piece 27, it will be understood that this is not necessary, but that the web may be unsupported except by

the guides 8 9. It will be understood, also, that while I have shown the guides 8 9 as formed upon a sheet-metal body this is not necessary; but, as is common in this class of construction, the body 7 may consist only of bars forming the guides 8 9, and similarly the only absolutely-essential parts of the nose-pieces 17 22 are evidently the guides and means for securing them to their supports, and the construction of these parts may be varied, as desired, while the features essential for producing the different folds are retained.

What I claim is—

1. A three-fold longitudinal folder consisting of a pair of internal side guides converging from points on each side of the central-fold line of the unfolded web to the front edge of the folded web, and a pair of external guides converging from the same points to the rear edge of the folded web, substantially as described.

2. A three-fold longitudinal folder consisting of a pair of internal guides converging toward the central-fold line of the web, but terminating at points on each side of the central-fold line, a pair of internal side guides placed at an angle to the first pair and converging from said points to the front edge of the folded web, and a pair of external guides converging from the same points to the rear edge of the folded web, substantially as described.

3. The combination, with a fold-laying device, of a three-fold longitudinal folder consisting of a pair of internal side guides converging from points on each side of the central-fold line of the unfolded web to the fold-laying device at the front edge of the folded web and a pair of external guides converging from the same points to the fold-laying device at the rear edge of the folded web, substantially as described.

4. The combination, with a fold-laying device and feeding mechanism, of a three-fold longitudinal folder consisting of a pair of internal side guides converging from points on each side of the central-fold line of the unfolded web to the fold-laying device at the front edge of the folded web and a pair of external guides converging from the same points to the fold-laying device at the rear edge of the folded web, substantially as described.

5. In a longitudinal folder, the combination, with internal side guides 13 14, of external guides 23 24, extending between said guides, said internal and external guides converging from a point on each side between the central-fold line and side lines of the unfolded web, the internal lines converging to the front edge and the external guides to the rear edge of the folded web, substantially as described.

6. In a longitudinal folder, the combination, with internal side guides 13 14, of external guides 23 24 between said guides, said internal and external guides converging from a



point on each side between the central-fold line and side lines of the unfolded web, the internal guides converging to the front edge and the external guides to the rear edge of the folded web, and internal converging guides 8 9, over which the web is led to the side and external guides, substantially as described.

7. In a longitudinal folder, the combination of the internal converging guides 8 9, transverse guide 10, the internal converging side guides 13 14, and the external converging guides 23 24, inclined rearward between the side guides, substantially as described.

8. In a longitudinal folder, the combination of internal converging side guides 13 14 and the external converging guides 23 24, inclined rearward between the side guides, and means for adjustably supporting said external guides, substantially as described.

9. In a longitudinal folder, the combination, with the fixed body 7 and fixed side guides

13 14, of interchangeable nose-pieces 17 22, whereby the folder may be capacitated to impart either one or a plurality of folds to the material, substantially as described.

10. The combination, with the fixed body 7 and side guides 13 14, of the removable nose-piece 22, carrying external guides 23 24, substantially as described.

11. The combination, with longitudinally-adjustable supporting-rod 26, of the nose-piece 22, having an adjustable swinging connection with rod 26, and the side guides 13 14, substantially as described.

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

LUTHER C. CROWELL.

Witnesses:

T. H. PALMER,  
T. F. KEHOE.