

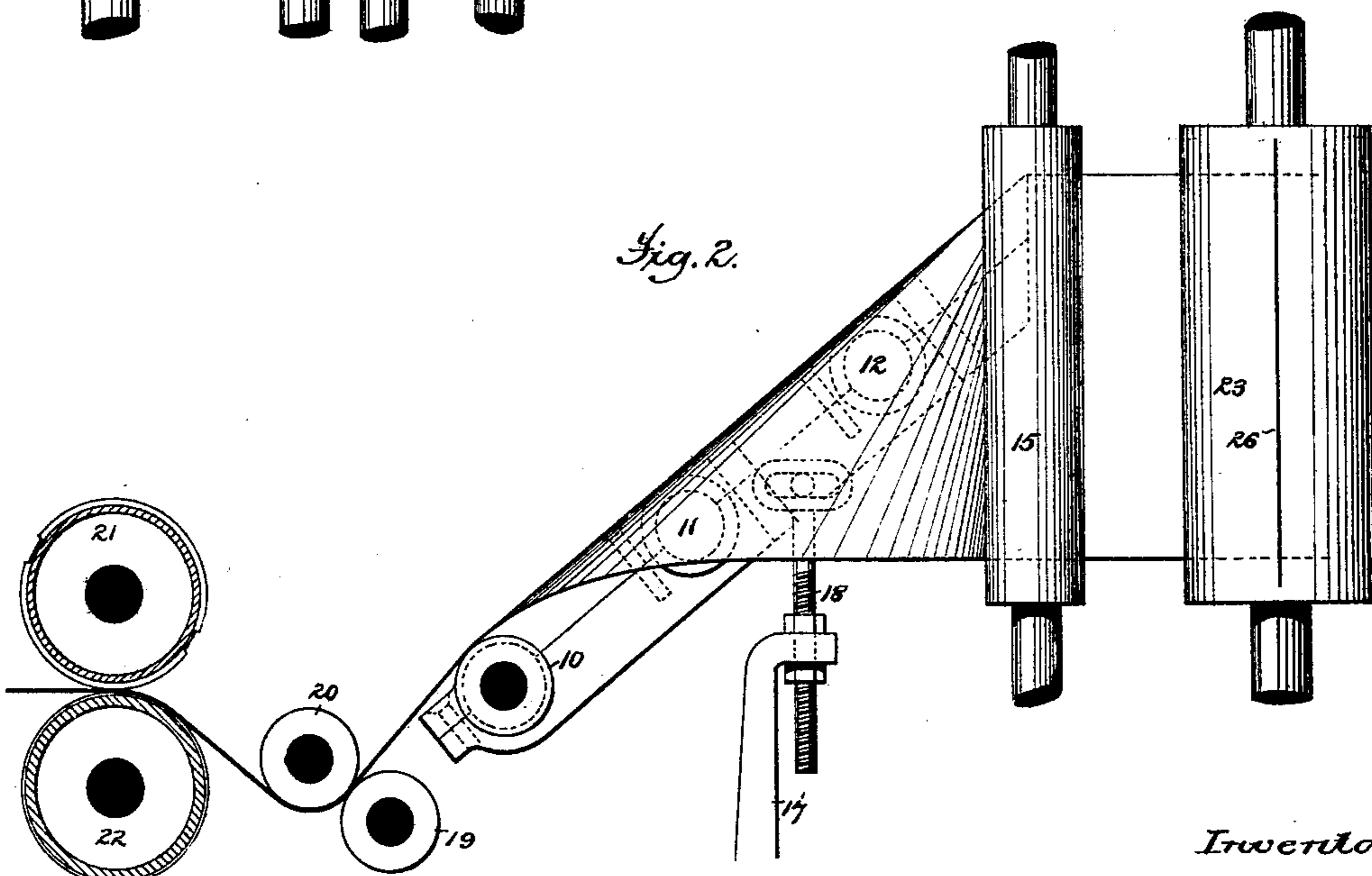
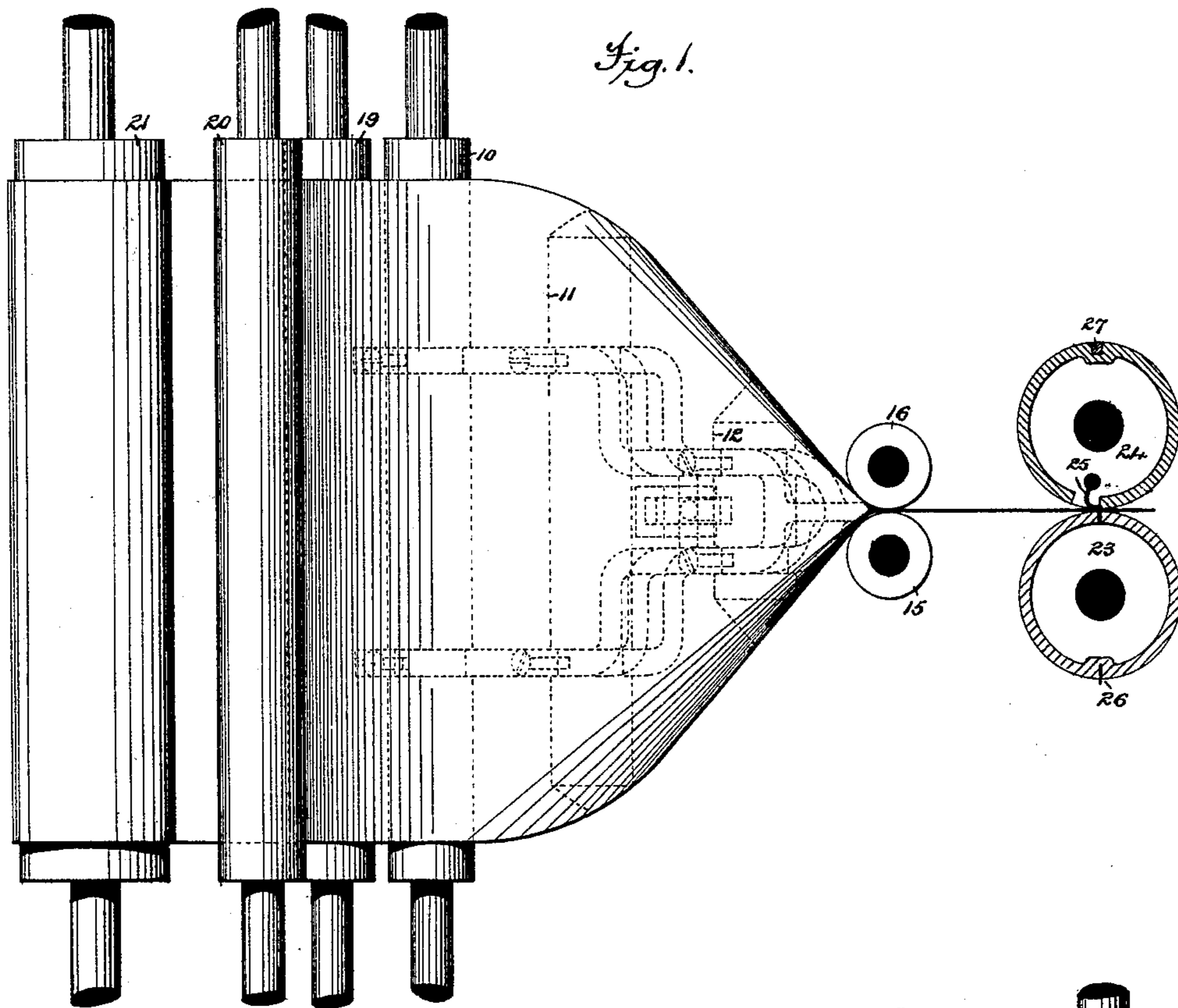
(No Model.)

3 Sheets—Sheet 1.

L. C. CROWELL.  
Folding Machine.

No. 233,997.

Patented Nov. 2, 1880.



Attest;  
*Geo. M. Graham*  
*Anthony J. Barbera*

Inventor,  
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Atty's.

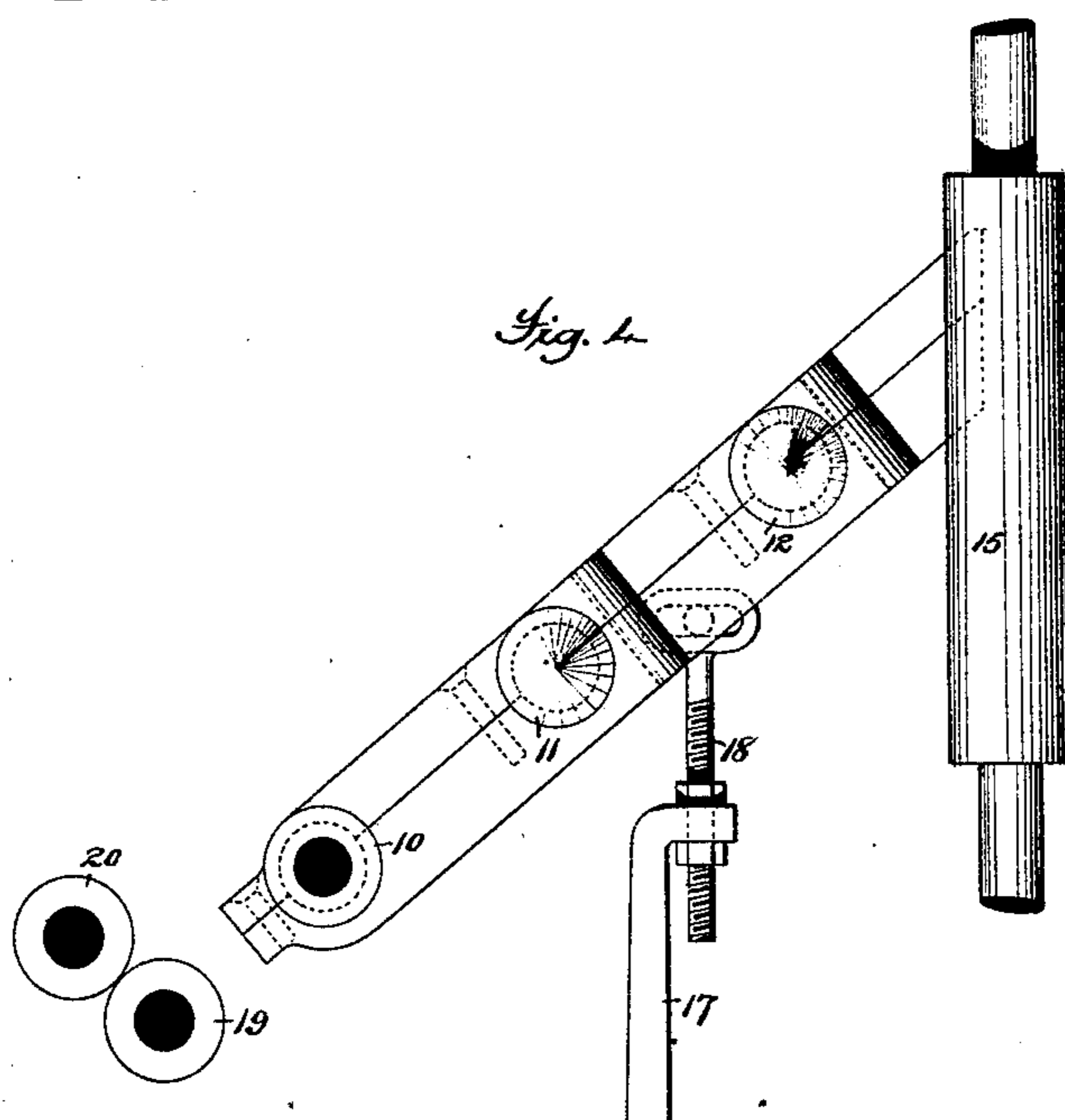
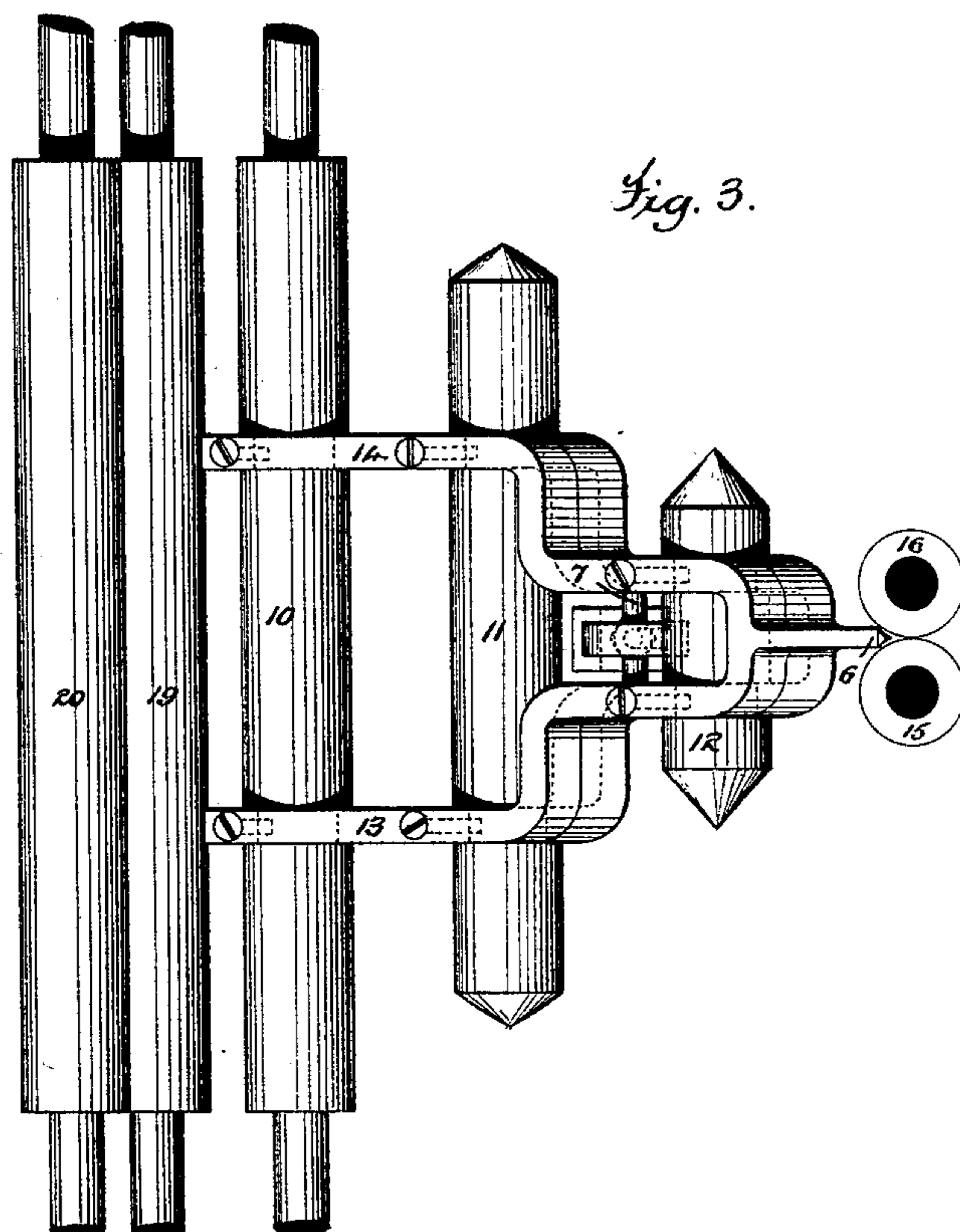
(No Model.)

3 Sheets—Sheet 2.

L. C. CROWELL.  
Folding Machine.

**No. 233,997.**

**Patented Nov. 2, 1880.**



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(No Model.)

3 Sheets—Sheet 3.

L. C. CROWELL.  
Folding Machine.

No. 233,997.

Patented Nov. 2, 1880.

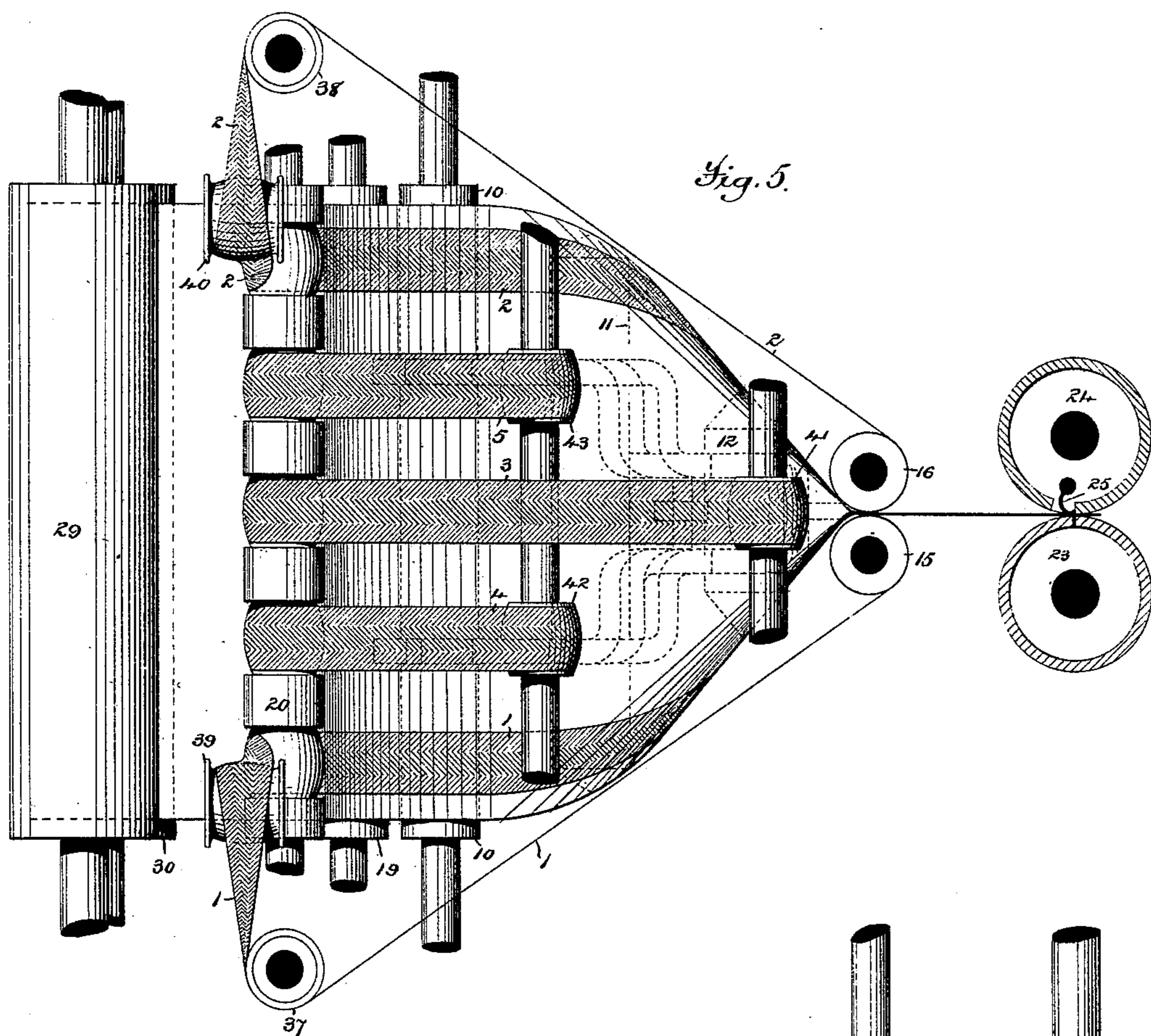


Fig. 5.

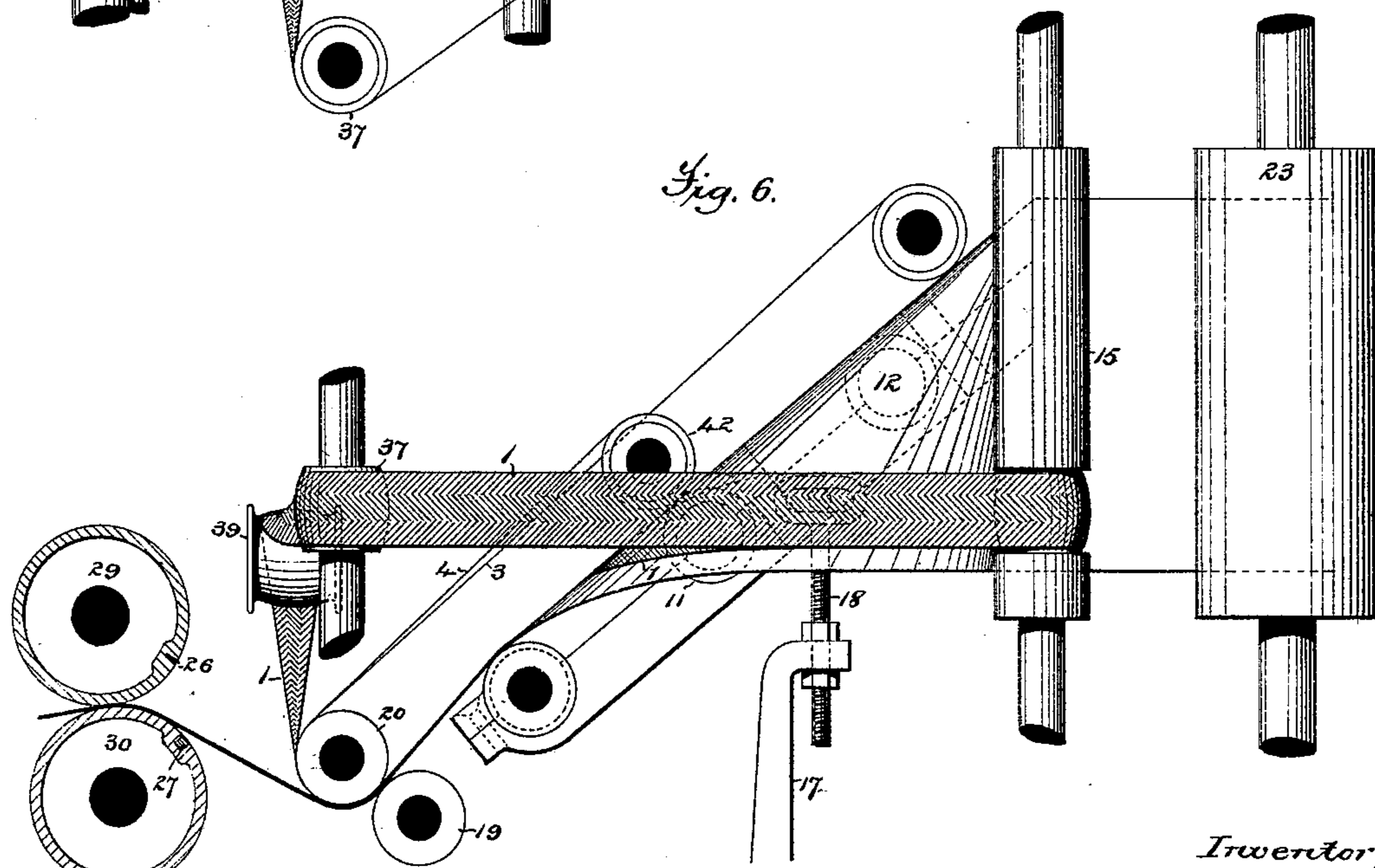


Fig. 6.

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# UNITED STATES PATENT OFFICE.

LUTHER C. CROWELL, OF BROOKLYN, NEW YORK.

## FOLDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 233,997, dated November 2, 1880.

Application filed May 27, 1880. (No model.)

*To all whom it may concern:*

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

In said drawings, Figure 1 represents a plan view, and Fig. 2 a side elevation, of the folding-machine, showing the fabric as introduced through the same. Fig. 3 is a plan view, and Fig. 4 a side elevation, of the folder unobstructed by the presence of the fabric. Fig. 5 is a plan view, and Fig. 6 a side elevation, of the folder, showing one mode of taping the same so as to adapt it to manipulate detached sheets.

This invention relates to that class of longitudinal folding-machines wherein the folding is accomplished by conducting the material between two series of folding-guides, one of which is in contact with the inner surface of the material, and is therefore termed the "internal guide," while the other is placed in contact with the face or outer surface of the material to direct its opposite sections into face-to-face contact, and consequently termed "external guides or turners."

The present invention relates more particularly to the construction of the internal folding-guide and the combination of the same with external guides, as well as with conducting-tapes, with transverse-cutting mechanisms, and with transverse-folding mechanisms, the whole constituting a folding delivery mechanism especially adapted to work in combination with a printing mechanism of that class known as "web-perfecting machines," the printed product of which may be thereby cut into sections or sheets and folded at a high rate of speed.

It is well known that to accomplish the doubling or folding of a web or sheet longitudinally, or in the direction of its travel, by carrying the same between external and internal folding-guides, it is essential that the internal folding-guide should be so placed as to guide that portion which constitutes the bight or crease of the fold in the line of travel

parallel with that of the edge of the folded section.

In the present invention the internal guide is so constructed that the danger of rupturing the edge of a web of thin fragile material—such as the paper used in web-perfecting presses—is avoided by means of a guide, which distends the web or sheet widthwise from the point of its reception upon the guide to the point of folding contact, whereby the pressure of the external guides or turners exerts no strain tending to rupture the edge of the fabric as it leaves the widthwise support afforded by the internal guide; or, if the internal guide is so placed as to provide sufficient slack to the side sections to avoid the breaking tension over its edges, no injurious overstrain will be brought upon that portion of the fabric in contact with the creasing-edge of said guide, all of which will be more particularly hereinafter pointed out.

The structure of this folder will now be explained.

The internal guide is composed of a series of rollers, 10 11 12, which have their bearings in a frame the members 13 14 of which terminate at their forward end in a bearing, 6, which constitutes the point where the longitudinal fold is to be formed. The roller 10 is of a length at least equal to the width of the material to be folded, and the rollers 11 and 12 have conical ends, said internal guide thus composed being pivoted at its rear end by the journals of the roller 10 and rendered adjustable in its angular position with respect to the external guides or turners, 15 16, by a supporting-frame, as 17, by which it may be raised and lowered by means of a cross-bar, 7, that rests in the slot of an elevating screw-threaded rod, 18.

The external guides or turners, 15 16, are properly supported in a frame-work (not shown, but of common construction) so as to stand at right angles to the line of fold to be imparted to the material, and the conical ends of the rollers 11 and 12 are so aligned with the folding-point 6 as to properly bend the material that is distended widthwise by the roller 10 as it passes over them to the control of the external turners, 15 16, and thus deflect its side sections so as to cause the mate-

rial to crease at the point 6, and its side sections folded at that point to be lapped together at said turners 15 16.

This internal guide may, of course, stand at a different angle of elevation with respect to the external turners, 15 16. Thus, if its rear end is raised from the position shown, the rollers 11 12 will have to be shortened so that their conical ends form a more acute angle of union with the point 6, and if said rear end be lowered the rollers 11 12 would have to be lengthened so that the angle of union of their conical ends with the point 6 would be more obtuse. This angle of relation between their conical ends and the point 6 would also vary with the longitudinal extent of this internal guide as said guide is lengthened or shortened; but in all cases slight vertical adjustment should be made to cause the conical ends of these rollers to perfectly take up the slack material caused by deflecting its side sections centrally, to cause the formation of the longitudinal fold.

With the internal guide thus constructed, whether it has two rollers, as 11 12, or more, as may be required by the fragility of the paper, it will perfectly distend the same, so that the body portion will be supported as it passes over the roller 10, and the deflected sides thereof will be likewise supported between the conical ends of said rollers, as 11 12, the point 6, and the external guides or turners, 15 16.

A folder thus composed operates to accurately impart a longitudinal fold to the material without unduly straining it in any part, but, on the contrary, perfectly distending the same without danger of rupture or injury to it, the series of rollers forming the internal guide for the material during its folding, providing surfaces that support it widthwise and along its natural bending-points, so as to cause the strain to be equally distributed throughout the fabric widthwise. Thus the constantly-changing bend forming the fold, which commences at the side edges and runs thence angularly to the line of permanent folding, is definitely determined and formed without distorting the material or unduly straining the same.

In Figs. 1 and 2 a web of paper is illustrated as being longitudinally folded by this apparatus, and, though bending-rollers, as 19 20, are shown as guiding said web onto the internal guide, such rollers may obviously be dispensed with, and said web led directly from the printing and impression cylinders 21 22 of a printing-machine, which cylinders are designed to represent the last printing-cylinders of a perfecting printing-machine, the structure of which is so well known to persons skilled in this art as to need no description here.

The web passing from between the cylinders 21 22 or rollers 19 20 is laid breadthwise over the roller 10, and then carried over the angular sides of the internal guide, as formed by the conical ends of the rollers 11 12

and the point 6, whereby they are brought together and entered between the external guides, 15 16, which guides, as here illustrated, are shown to be rollers that will be properly geared together and driven at a surface speed equal to that of the printing-cylinders 21 22; but here it is to be remarked that these external turning-guides need not rotate, but, on the contrary, they may be fixed surfaces. If, however, they are to operate not only as external guides, but as means for drawing the material through this folder, they will, of course, be driven rollers. The web is shown as passing beyond them to a cutting and folding mechanism, which consists of two rotating carriers, 23 24, the former being supplied with a tucking-blade and the latter with a nipping-jaw, 25, said cylinders also carrying a cutting-blade, 26, and cutting-slot 27.

This combined cutting and folding mechanism is constructed substantially like that described in Patent No. 143,674, granted October 14, 1873, and therefore needs no particular description here. It may be generally said, however, that the web passed between the carriers 23 24 is pressed by the tucking-blade between the nipping-jaws; that the latter seize it at that point and carry it onward with the carrier 24 until the cutting-blade 26 comes into action to divide the web transversely to form a sheet, which sheet, once folded transversely by the movement of the jaws 23, is at the proper time delivered therefrom. Either the cylinders 23 24 or the rotating turners 15 16 may thus be the means of drawing the web through this folder, and it will be obvious that the strain upon the web will be sufficient to cause its sides to be deflected over the edges of the internal guide, the crease to be formed at the point 6, and the sides lapped together in passing to turners 15 16, thus imparting a longitudinal fold to the material, which operation may be carried on at great speed, equivalent to that at which the printing-machine can perform its operations.

The cutting operation, whereby the web is divided into short sections or sheets, may be performed before this longitudinal folder is reached. This may be done by interposing cutting-cylinders, as 29 30, between the printing-cylinders 21 22 and this folder, as in Fig. 6. When this is done it will be apparent that the cutting mechanisms will not be required in the rotating transverse-folding mechanisms constituted by the cylinders 23 24, which transverse-folding mechanism will thus operate to simply fold the sheets previously severed from the web, as shown in Fig. 5. When this longitudinal folder is to operate upon detached sheets, as in Figs. 5 and 6, it will be necessary to supply the folder with means for conducting the sheets through it, and this is done by means of tapes. One system of taping is shown in said figures.

When the web is but partially severed by cylinders 29 30, then, as the rollers 10 11 12

form the inner support, outside tapes only are necessary. These outside tapes consist of margin-tapes 1 2, that run under the roller 20, thence over the roller 10, thence follow the path taken by the margins of the sheets and return around the lower ends of the rollers 15 16, passing over deflecting-pulleys 37 38 and 39 40 to the roller 20.

A central tape, 3, runs from the roller 20 over the roller 10, and returns over a pulley, 41, placed near the point 6, so as to bear upon the bar forming said point or a roller supported thereby.

Intermediate tapes 4 5 run from the roller 20 and return over pulleys 42 43, that bear upon the roller 11. These tapes are sufficient to nip the partially-detached sheets between them and carry the same onward through the folder, so that they will be properly advanced and will be directed between the external guides, 15 16, which, in this arrangement, should be drawing-rollers. These tapes and the rollers 15 16 will run at the same surface speed as the cylinders 21 22, and the rotating carriers 23 24 will run so much faster as is necessary to accelerate the travel of the material and detach the partially-severed sheet from it.

If the cylinders 29 30 completely sever the material, the customary leading-cords will direct the sheet therefrom to the rollers 20 19, around the latter of which underleading-tapes will extend to rollers 10 11 12 to properly support the sheet, or other supporting means will be required.

The transverse-folding machine may be constructed like that shown, or be of any other well-known construction. A stationary bar might supplant the roller 10, and the rollers 11 12 might be fixed on their bearings so as not to revolve. If enough rollers, as 11 12, are used so that a diminutive roller is supplied to support the material very close to the point 6, the extended frame forming a support at that point may be omitted.

Though the material or fabric has been de-

scribed as coming from a printing-machine, it is obvious that it may be received from any source whatever, either in the web or sheet form.

What is claimed is—

1. The combination, with external guides or turners, 15 16, of a sectional internal guide consisting of rollers, as 11 12, having tapered ends, forming angular surfaces, over which the side sections of the material are deflected centrally, by the conjoint action of which internal guide and external turners a longitudinal fold is imparted to the material, substantially as described.

2. The combination of a longitudinal folder composed of a sectional internal guide formed of rollers having tapered ends and external guides or turners, 15 16, with a transverse cutting mechanism, substantially as described.

3. The combination of a longitudinal folder composed of a sectional internal guide formed of rollers having tapered ends and external guides or turners, 15 16, with a rotary printing mechanism, substantially as described.

4. The combination of a longitudinal folder composed of a sectional internal guide formed of rollers having tapered ends and external guides or turners, 15 16, with bending-rollers, as 19 20, substantially as described.

5. The combination of a longitudinal folder composed of a sectional internal guide formed of rollers having tapered ends and external guides or turners, 15 16, with a system of tapping, substantially as described.

6. The combination of a longitudinal folder composed of a sectional internal guide formed of rollers having tapered ends and external guides or turners, 15 16, with the cylinders or carriers 23 24 and their cutting or folding mechanisms, substantially as described.

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

LUTHER C. CROWELL.

Witnesses:

GEO. H. GRAHAM,

T. H. PALMER.