

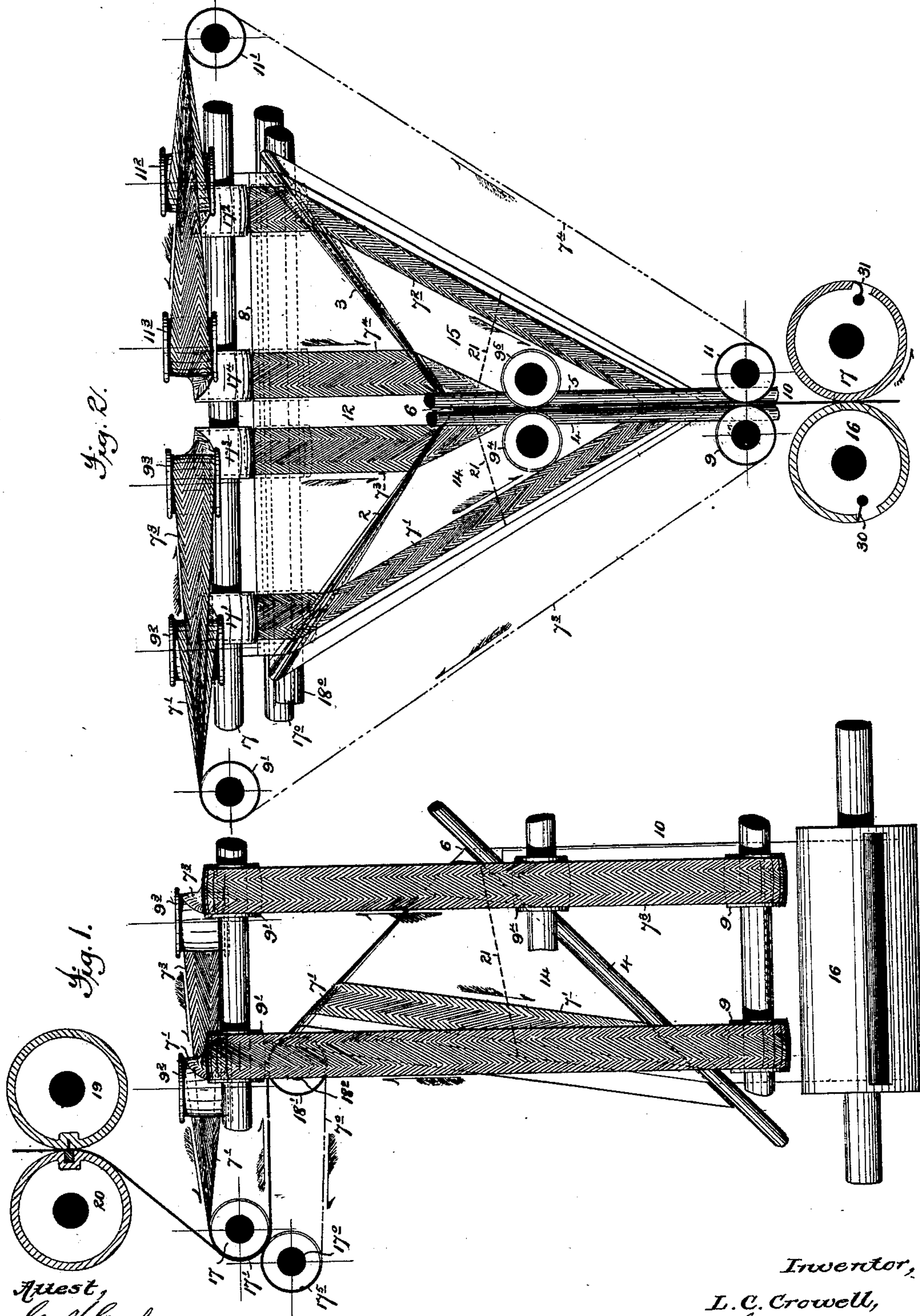
(No Model.)

3 Sheets—Sheet 1.

L. C. CROWELL.
Folding Machine.

No. 233,996.

Patented Nov. 2, 1880.



Attest,
G. M. Graham
T. H. Palmer

Inventor,
L. C. Crowell,
by Hanson & Phillips
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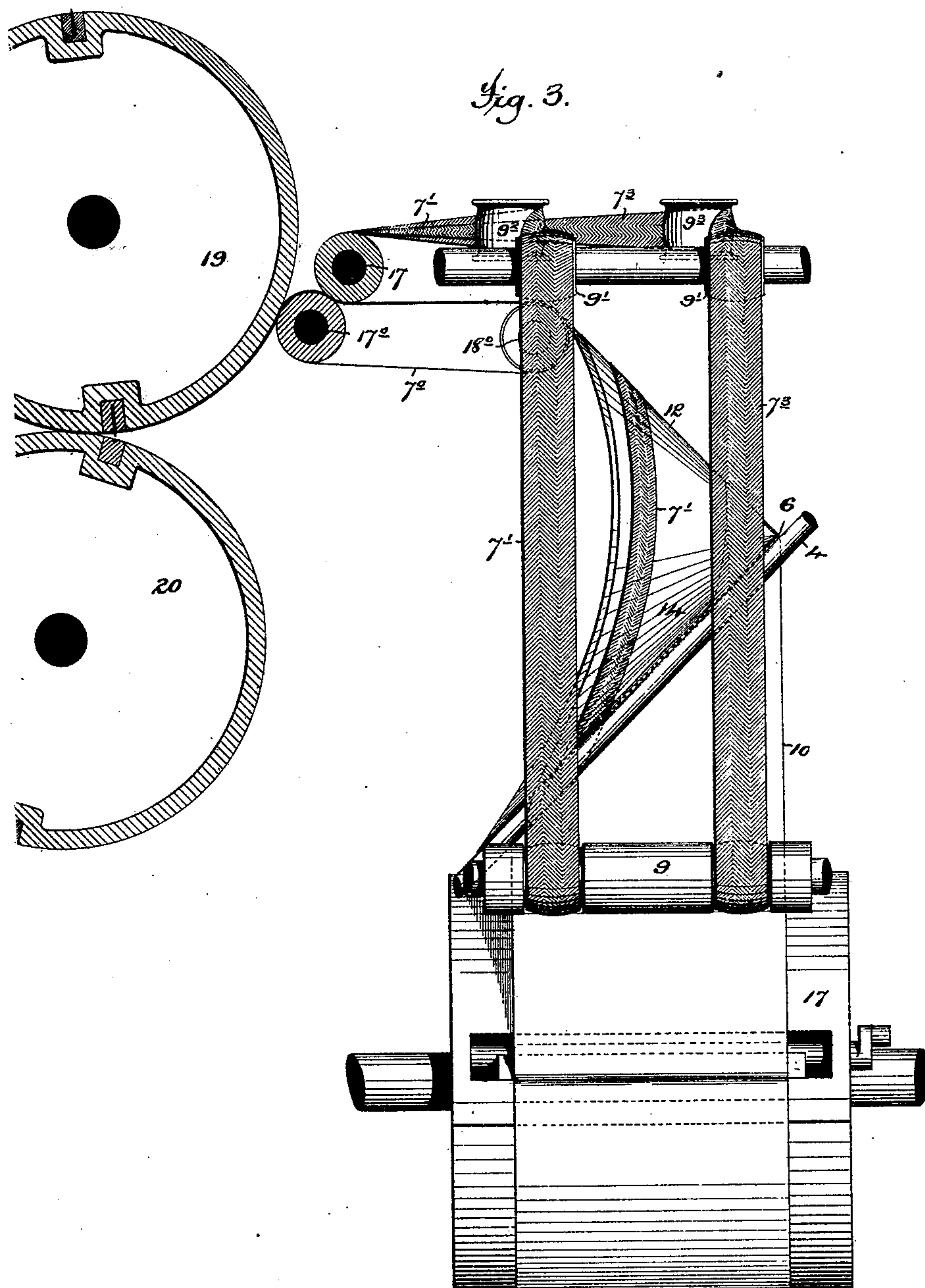
(No Model.)

3 Sheets—Sheet 2.

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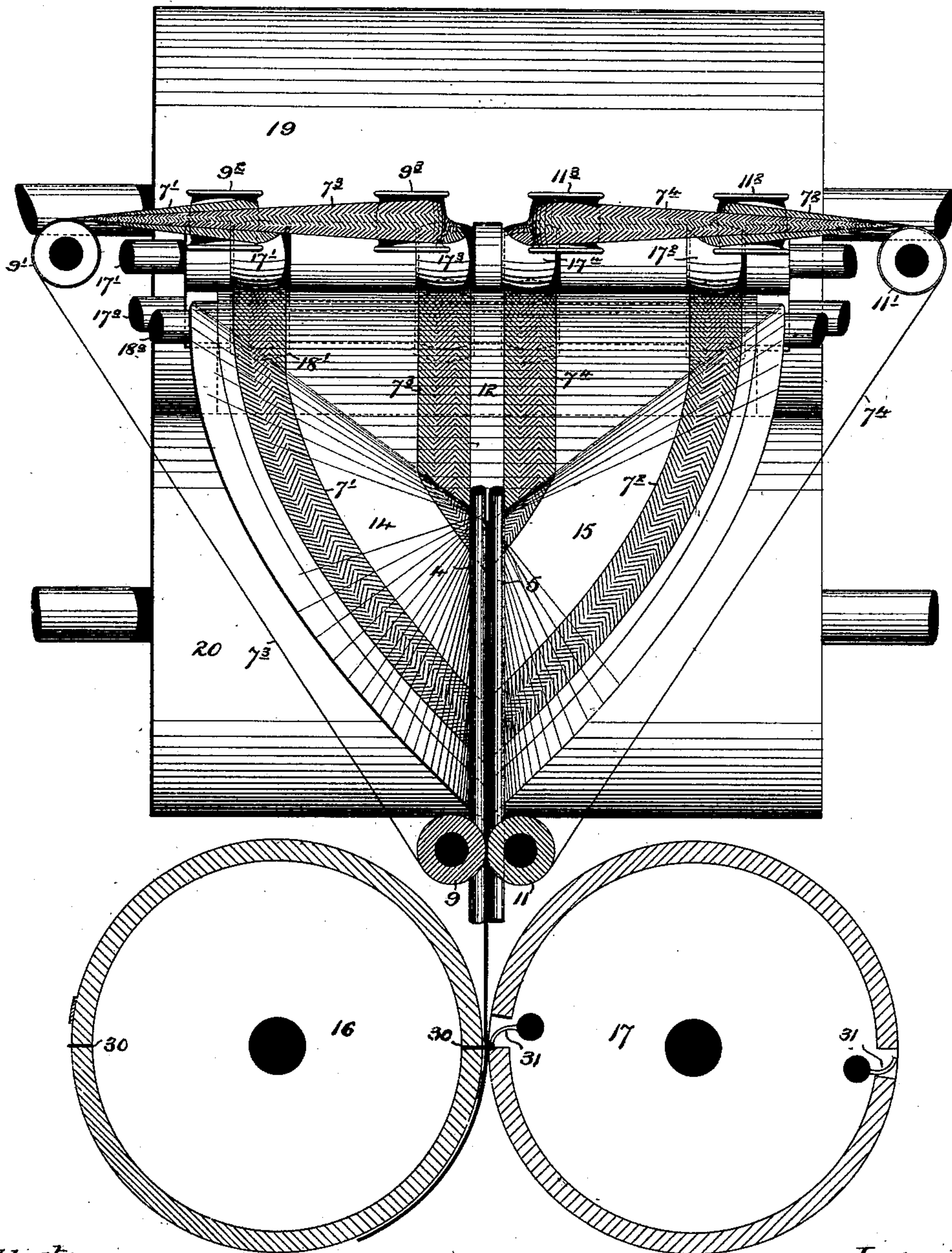
3 Sheets—Sheet 3.

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Fig. 4.



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UNITED STATES PATENT OFFICE.

LUTHER C. CROWELL, OF BROOKLYN, NEW YORK.

FOLDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 233,996, dated November 2, 1880.

Application filed June 29, 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 F,) fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

In said drawings, Figure 1 illustrates a side elevation, and Fig. 2 a plan view, of a machine embodying the present invention. Fig. 3 illustrates a side elevation, the cylinder 16 being removed, and Fig. 4 a plan view of a modified construction of the same.

This invention relates to that class of folding-machines whereby a web or sheet of paper or other fabric passed through the same receives a longitudinal fold, said fabric in such manipulation being distended widthwise and supported lengthwise by guiding-surfaces, over which its side sections are deflected centrally by means of external pressing or guiding turners, such guiding-surfaces and turners constituting internal and external guides, by the conjoint action of which a fabric drawn through them will be doubled upon itself or folded longitudinally, which class of folders are especially adapted for attachment to web-printing machines as the delivery apparatus thereof.

The present invention consists, mainly, in the peculiar arrangement of the internal guide and external turners, whereby the side sections are first brought together at the folding-point—that is to say, the outside edges or margins of said sections are completely lapped together after the fold is wholly formed.

The invention embraces, however, a system of taping the mechanisms, so that said folder may manipulate sheets or short detached portions of a web, and the combination of the folder with a printing mechanism, a cutting mechanism, and with a folding mechanism, and other combinations of devices, all of which is too particularly hereinafter set forth to need further preliminary description.

The construction and operation of the internal guides and external turners will first be described, and then its modifications and combinations with the other devices set forth.

The necessary frame-work for supporting the stationary parts as well as the turning parts and the means for revolving the latter are omitted here, as the same may be of any common construction, as is well understood in this art.

The internal guide consists of a support the general form of which is that of a pyramid, the rear side, 12, of which, at its base-line 8, is equal in length, at least, to that of the width of the material to be manipulated, and its forward sides, 14 15, are each equal in height to at least one-half the width of the web, no matter at what angle they are arranged. The rear side, 12, of the pyramidal internal guide may be inclined at various angles from the base-line, where the fabric is supported widthwise, to the apex 6, which is the point where the fold is formed; but from this point 6 the folded fabric must be drawn outward by a device the straining-line of which is at right angles to the line of fold 10 formed by drawing the fabric over the edges or bends 2 3, formed by the union of the forward sides, 14 15, of the pyramid with its rear side, 12. This variation in the angular position of the rear side, 12, will, however, cause the bends or lines of union 2 3 to stand at a more obtuse angle as the plate is depressed and more acutely as it is raised.

The sides 14 15 should project forward so that their line of union will stand at an angle from a perpendicular line passing through the point 6, corresponding with that at which the rear side, 12, stands with respect to said line, and the external guides, 4 5, which are fixed rods, will be sustained parallel with and slightly in front of the line of union of the forward edges of said sides 14 15. These forward edges may be shortened and the guides 4 5 be placed in a more vertical position, or the same may be lengthened so that the guides 4 5 will be inclined farther forward, which positions of them will be varied to suit the character of the fabric to be manipulated. The greater their length is made the less abrupt will be the inward deflection of the sides of the fabric to complete its lapping, and consequently the danger of rupturing the same will become lessened. This arrangement of folding mechanisms thus enables the bend or fold

to be determined at the point 6, and to be gradually completed as the fabric passes outward therefrom, till the lapping is finally accomplished by the external turners, 4 5.

5 The internal guide may be given the form of a cone, as is shown in Figs. 3 and 4, if desired, and this is accomplished by simply curving the sides 12 14 15 so that the bends uniting them form arcs of the same degree of curva-
10 ture as the said sides have. The angles of inclination of said sides are, however, preserved, but may be relatively varied, as before described, and said guide still provide a means for distending the fabric widthwise as it passes
15 onto the guide, and cause the fold to be formed in the fabric at the apex 6 before its side sections, which are deflected centrally by passing over the sides 14 15, are completely lapped together by passing between the external turn-
20 ers 4 5.

The fabric is led over the rear edge or base, 8, of the side 12, has its side sections laid over the side plates, 14 15, and after being brought together is led between the external turners, 4
25 5, from whence the doubled fabric is entered between a rotating forwarding mechanism the line of seizure of which is at right angles to the folded edge 10 of said fabric. This forwarding mechanism may be the pulleys 9 11,
30 Figs. 1, 2, or their equivalent rollers 9 11, Figs. 3, 4, the folding-cylinders 16 17, Figs. 1, 2, or cutting-cylinders substituted for the latter.

Practically this folder may be used to fold a web of paper by leading the same directly
35 from the printing-cylinders of a printing-machine, as will be described farther on; but when used to fold sheets or short detached portions of a web it will be necessary to provide the folder with sheet-conducting tapes,
40 whereby such sheets may be properly carried through its mechanisms. A system of such taping is illustrated herein and will now be explained: Such taping consists of upper or
45 outer side tapes, of which the endless margin-tapes 7' 7² run from the pulleys 17' 17² on shaft 17 and pass over the rear side, 12, thence follow near the base or margin of the plates 14 15, run between the turners 4 5, and return
50 over the lower pulleys, 9 11, and the lower deflecting-pulleys, 9' 11', and the pulleys 9² 11² to the pulleys 17' 17².

Endless central tapes, 7³ 7⁴, run from the pulleys 17³ 17⁴ on shaft 17 and pass over the rear side, 12, thence enter upon the sides 14
55 15, near the point 6, run between the turners 4 5, and return over the upper pulleys, 9 11, and the upper deflecting-pulleys, 9' 11', and the pulleys 9³ 11³ to the pulleys 17³ 17⁴.

Additional pulleys 9⁴ 9⁵ may be placed just
60 in advance of the point 6, if desired.

Sets of auxiliary tapes 7⁰ run from pulleys 17⁵ on shaft 17⁰ to pulleys 18' on shaft 18⁰, the forward pulleys being placed near the pulleys on the shaft 17, and the shaft 18⁰ of the latter
65 pulleys being placed just below the base 8 of the rear side of the internal guides.

The pulleys 9 11, the pulleys on shafts 17, 17⁰, and 18⁰ might be given the form of rollers, if desired, as is shown in Figs. 3 and 4; hence their tape-receiving portions are marked with
70 characters corresponding with the pulleys to indicate their equivalency therefor. The folder thus equipped with tapes is especially adapted for co-operation with a web-printing machine. To illustrate this combination the cutting-cyl-
75 inders 19 20 of such a machine are shown, and these cylinders may be of a size equal circumferentially to the length of one or that of two sheets, as may be desired, and as is shown in the drawings. The latter form (shown in Fig. 80 3) is preferable, since by making one set of cutting devices removable one pair of cylinders may be made to sever two sizes of sheets. These cutting-cylinders may entirely sever the web, so as to completely detach the sheets, 85 or they may operate to but partially sever the web. In the former case suitable guides to direct the leading edge of the sheets into the tapes will be required between the cutting-cylinders and the pulleys or rollers on the shafts 17 17⁰, 9c as is well understood. In the latter case the web, partially cut on the lines to divide it into sheets, will be held together with a strength sufficient to carry it into the conducting-tapes without the use of such conductors. Such a 95 partially-severed web, emerging from the cutting-cylinders 19 20, will be led between the tapes 7⁰, 7', and 7², and thence through the folder, as before described, the tapes 7' 7² 7³ 7⁴ causing the web to properly travel onward 100 and prevent its weak points or lines of partial severance 21 from being broken in such passage, the series of tapes running at the same surface speed as the cylinders 19 20. This partially-severed web or succession of sheets 105 will be folded longitudinally at the point 6, and have its sides lapped together by the external turners, 4 5, as before described, and the fabric thus doubled on the line 10 will be nipped between the pulleys or rollers 9 11 and directed 110 to the devices carried by the cylinders 16 17, the rollers on pulleys 9 11 thus acting as the means for drawing the web onward, though this function may be wholly performed by the cylinders 16 17, in which case the rollers or 115 pulleys 9 11 will be set apart and act as guides for the tapes simply.

The cylinders 16 17 are rotating carriers supplied with a tucking-blade, 30, and a movable jaw, 31, thus constituting the rotating 120 folding mechanism constructed as is that described in Letters Patent No. 143,674, granted October 14, 1873. These cylinders will be run at a surface speed slightly greater than that of the printing-machine and the tapes, in order that, as the folded web passes between 125 them and is folded transversely by the blade 30, which presses the fabric into the nip of the vibrating jaw 31, which jaw, thus seizing the sheet, carries it around with the cylinder 17 130 in the direction of the arrow, the folded web may thus be so accelerated or drawn forward

as to complete its severance on the line 21 when the same has cleared the external turners, 4 5, or the rollers or pulleys 9 11. The sheet thus transversely folded is delivered from the jaw 31, and properly piled or otherwise disposed of, as is set forth in said patent; or the cylinders 16 17 may be supplied with the web-severing devices shown in the rotating folding mechanism described in Letters Patent No. 10 143,674, granted October 14, 1873, a smooth or unbroken edge being substituted for the serrated knife shown in said Letters Patent, in which case the cylinders 16 17 and the printing-cylinders would travel at the same surface speed, the severing devices acting to sever the sheet from the web along the line of partial severance. The cylinder 19 may also be provided with web-retaining devices (located near the knife carried by said cylinder) and a swinging or rotating folding-blade, in which case the web would be severed by the cutting devices of cylinders 19 20 and the forward end of the web be held and carried around on cylinder 19 by the pins until the folding-blade arrived at the pulleys carried by shaft 17⁰, when the pins would be withdrawn and the folding-blade be turned outward, forcing the overlying paper between the pulleys on shafts 17 17⁰, between which the sheet would be folded and carried thence over the longitudinal folder, the cutting devices severing it from the main web, the forward end of which would be held by the pins and carried past the pulleys on shafts 17 17⁰, the folding-blade returning to its normal position to again perform its function of folding the subsequent sheet, as above described, the folding-blade operating as is shown in Letters Patent No. 186,309. This will be embraced in another application, and is therefore not claimed in this.

The cylinders 16 17, as illustrated in Fig. 4, do not differ materially from those shown in Figs. 1 and 2, except that they are of double size and provided at opposite points with duplicate folding mechanisms, as the lettering indicates, being thus made capable of folding sheets of one-half the circumferential extent, or equal in length to their entire circumference. To accomplish this one of the folding mechanisms must be made capable of being thrown out of action as may be required.

When this folder is to be used to manipulate a web, in which case it need not have the tapes, the cylinders 16 17 will be provided with cutting mechanisms only, and may be constructed as are the cylinders 19 20. In this case the web-printing machine will not require the cutting mechanism, and the web delivered to this folder and folded longitudinally thereby will be cut up into sections or sheets of the desired length by the cutting-cylinders placed

in front of the turners 4 5, which cylinders will then run at a surface speed the same as that of the printing-machine. It will be apparent that the cylinders 16 17 may likewise be supplanted by a combined rotating cutting and folding mechanism, such as is shown in the patent before cited, and that in that case the folded web will not only be cut into sections or sheets, but said sheets will be delivered once folded transversely.

It is to be understood that this folder is capable of use with any means for supplying the web or separated sheets to it.

The internal guide may be divided widthwise or lengthwise, so as to constitute a sectional structure, and still afford a supporting-surface that operates in connection with the external turners to perfectly perform the folding operation. A series of under tapes may also be so arranged as to pass from the pulleys on shaft 17⁰ over the internal guide and in carrying contact with the tapes herein shown and described, said under tapes returning around pulleys located near the external turners, thence over suitable deflecting guides or pulleys to the under side of pulleys on shaft 17⁰.

What is claimed is—

1. A folding mechanism consisting of an internal guide, pyramidal or conical in form, with which is combined external inclined turners, 4 5, substantially as described.
2. The combination, with a folder consisting of the pyramidal or conical internal guide and external inclined turners, 4 5, of the system of taping, substantially as described.
3. The combination, with a folder consisting of the pyramidal or conical internal guide and external inclined turners, 4 5, of a drawing mechanism, as the rollers or pulleys 9 11 or the cylinders 16 17, substantially as described.
4. The combination, with a folder consisting of the pyramidal or conical internal guide and external inclined turners, of cutting-cylinders for transversely severing the material operated upon, substantially as described.
5. The combination, with a folder consisting of the pyramidal or conical internal guide and external inclined turners, 4 5, of the cutting-cylinders 19 20 and folding-cylinders 16 17 and the system of taping, substantially as described.
6. The combination, with a folder consisting of a pyramidal or conical internal guide and external inclined turners, 4 5, of the folding-cylinders and the system of taping, 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,
GEO. H. GRAHAM.