(Model.)

10 Sheets—Sheet 1.

L. C. CROWELL.

Folding Machine.

No. 233,995. Patented Nov. 2, 1880.

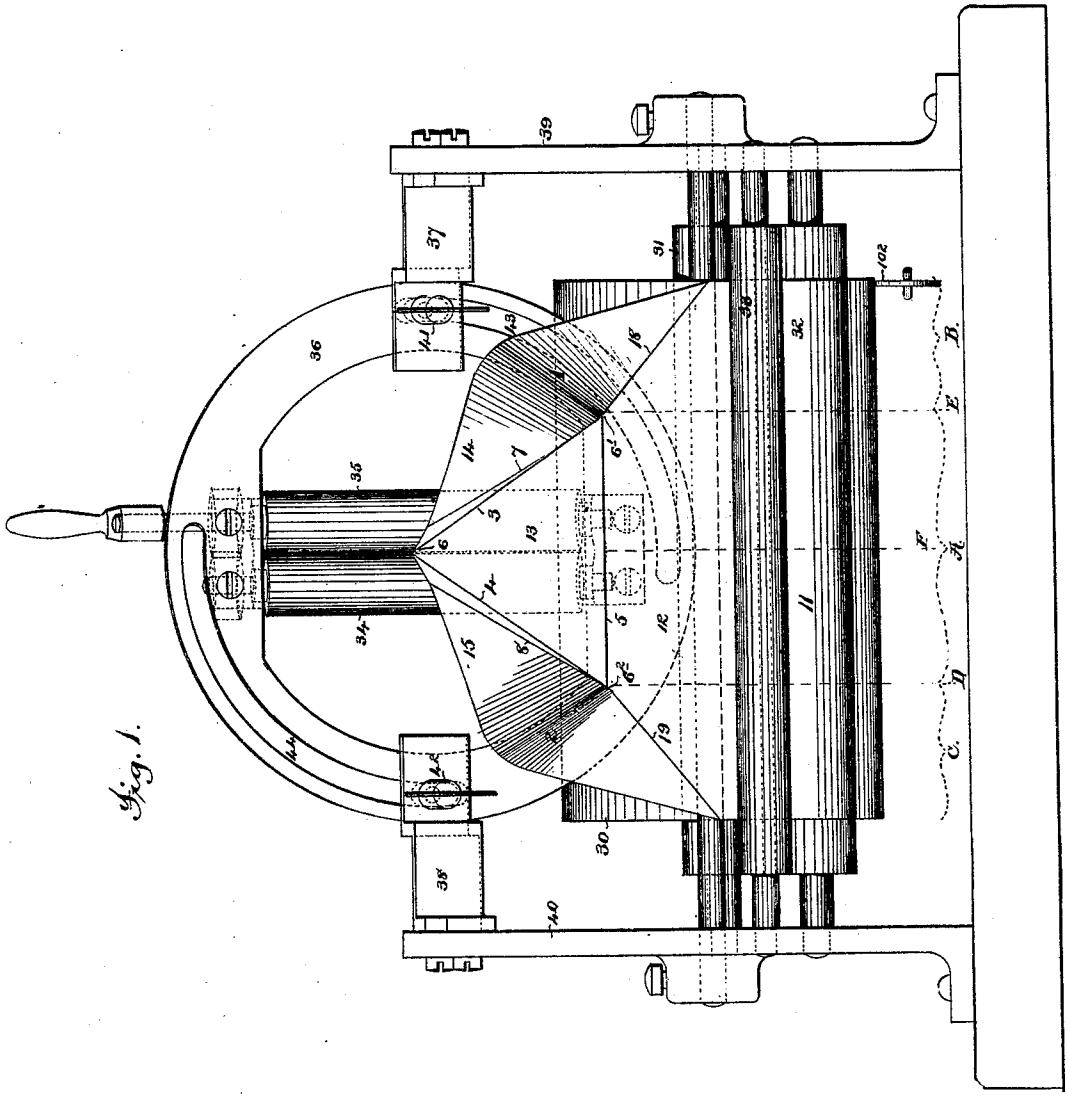


Fig. 1.

Attest;
Geo. H. Graham
Anthony N. Jacobus

Inventor
L. C. Crowell,
by Munson & Philipp
Attys.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

(Model.)

10 Sheets—Sheet 2.

L. C. CROWELL.

Folding Machine.

No. 233,995. Patented Nov. 2, 1880.

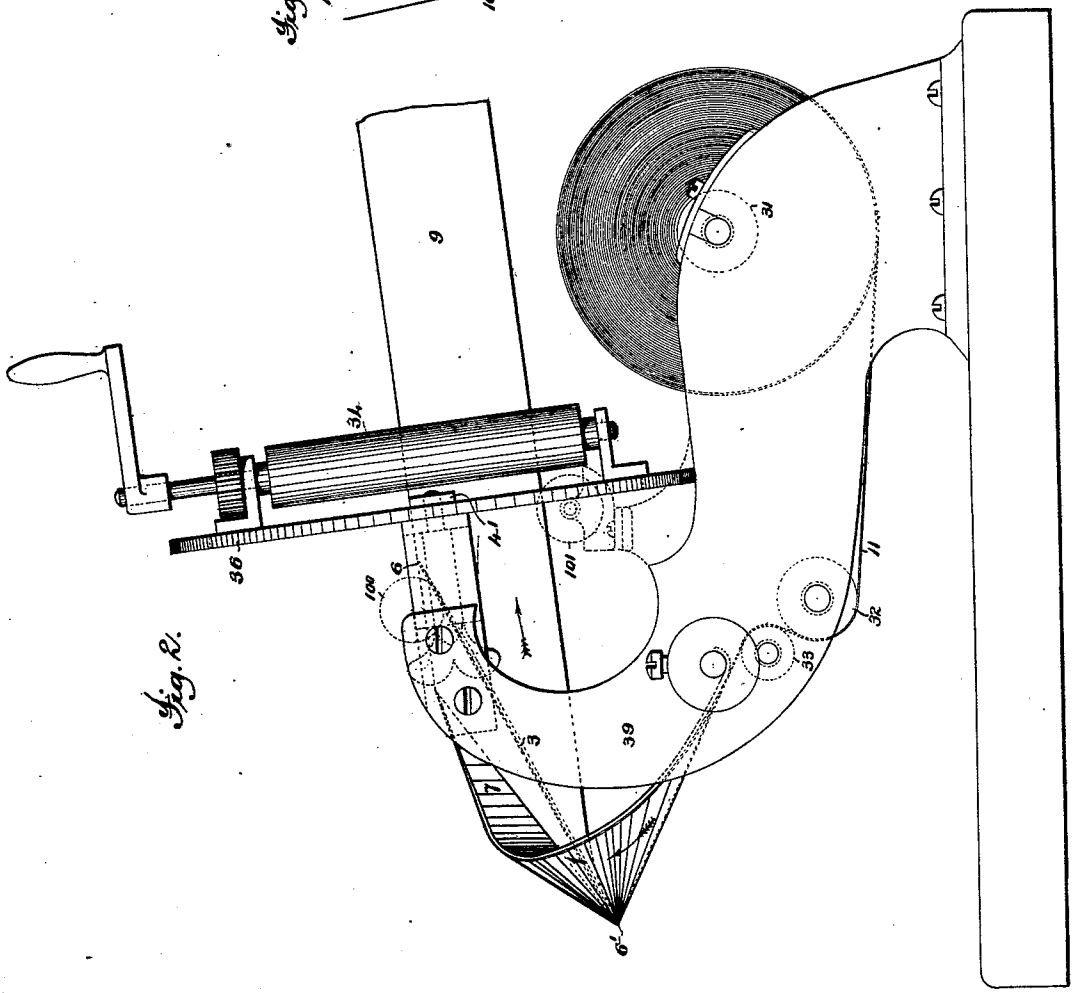
Fig. 6.



Fig. 5.



Fig. 2.



Attest;
Geo. H. Graham
Anthony T. Jasbera

Inventor,
L. C. Crowell,
by Munson & Philipp
Attys.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

(Model.)

10 Sheets—Sheet 3.

L. C. CROWELL.

Folding Machine.

No. 233,995. Patented Nov. 2, 1880.

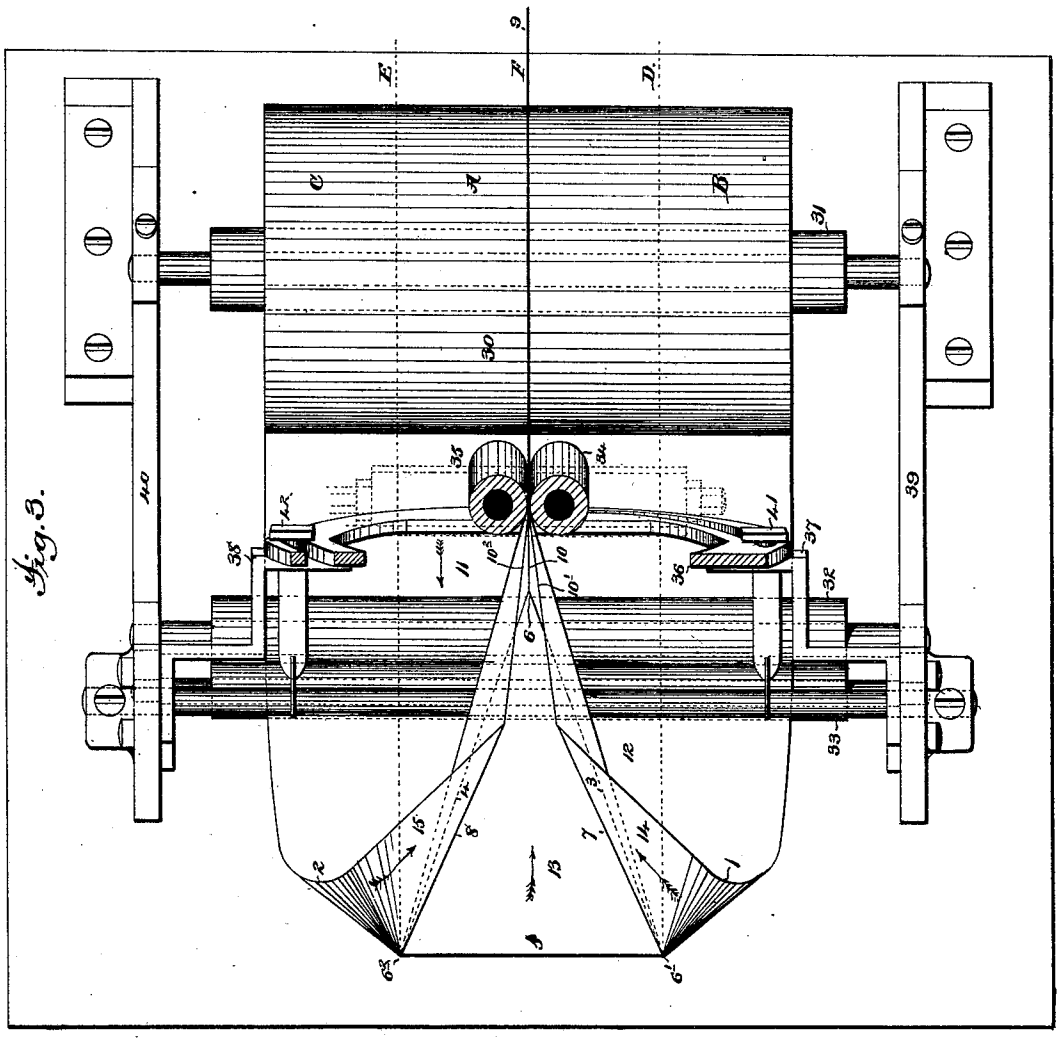


Fig. 3.

Attest,
Geo. H. Graham
Anthony N. Zaebra

Inventor,
L. C. Crowell,
by Munson & Philipp
Attys.

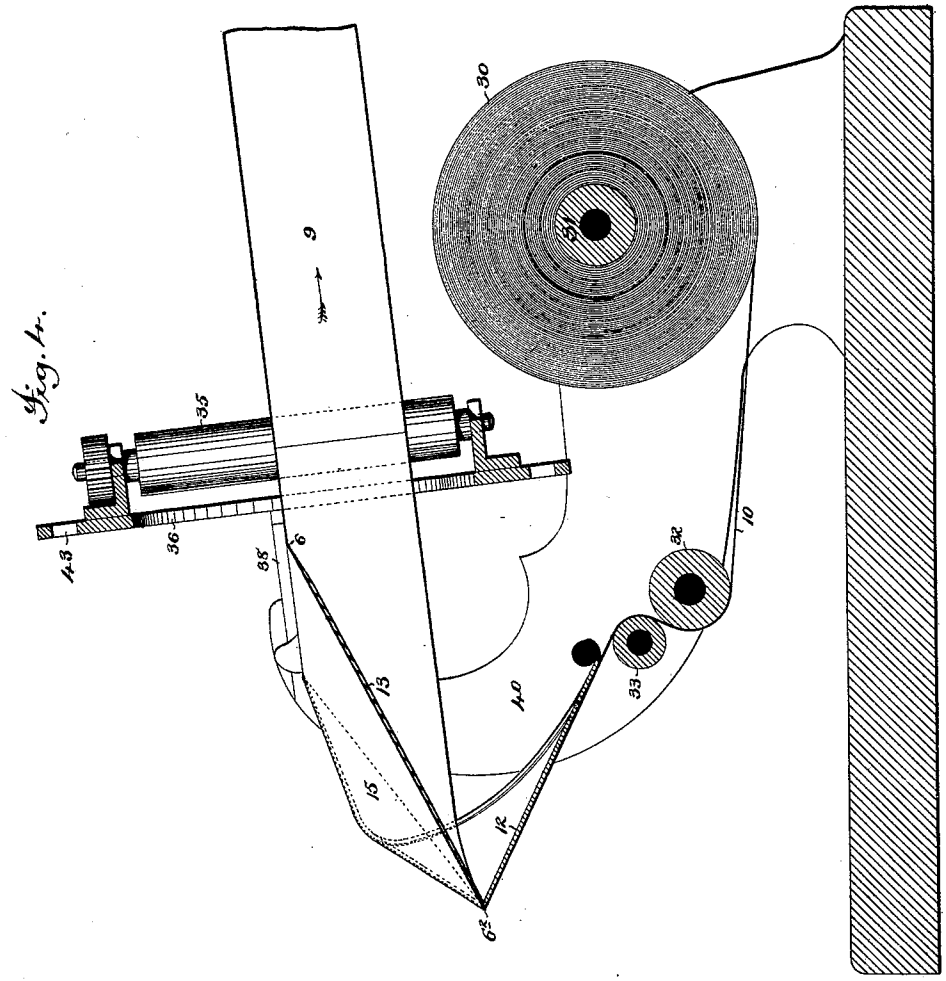
N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

(Model.) 10 Sheets—Sheet 4.

L. C. CROWELL.

Folding Machine.

No. 233,995. Patented Nov. 2, 1880.



Attest,
Geo. H. Graham
Anthony N. Jacobus

Inventor,
L. C. Crowell,
by Munson & Philipp
Attys

N. PETERS, PHOTO LITHOGRAPHER, WASHINGTON, D. C.

(Model.)

10 Sheets—Sheet 5.

L. C. CROWELL.

Folding Machine.

No. 233,995. Patented Nov. 2, 1880.

Fig. 1.

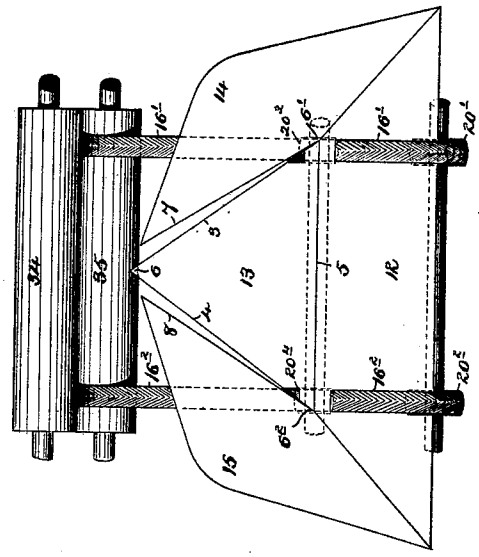


Fig. 8.

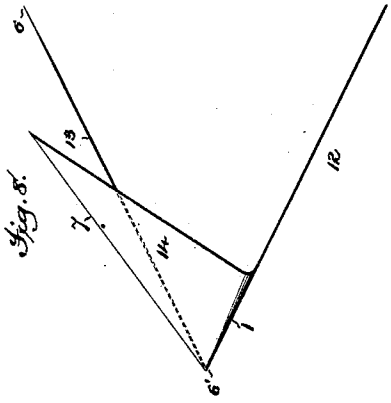
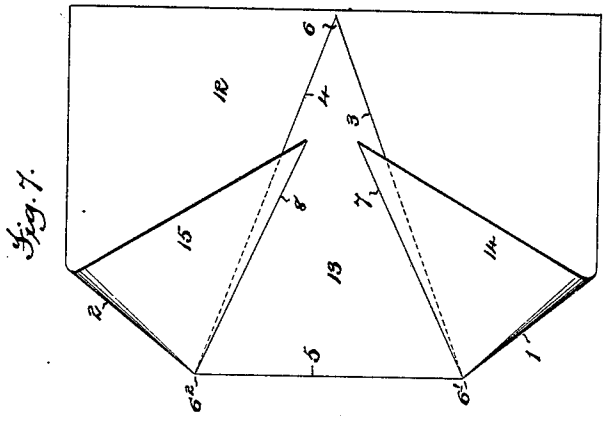


Fig. 7.



Attest:
Geo. H. Graham
Anthony N. Jaberg

Inventor,
L. C. Crowell,
by Munson & Philips
Attys.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

(Model.)

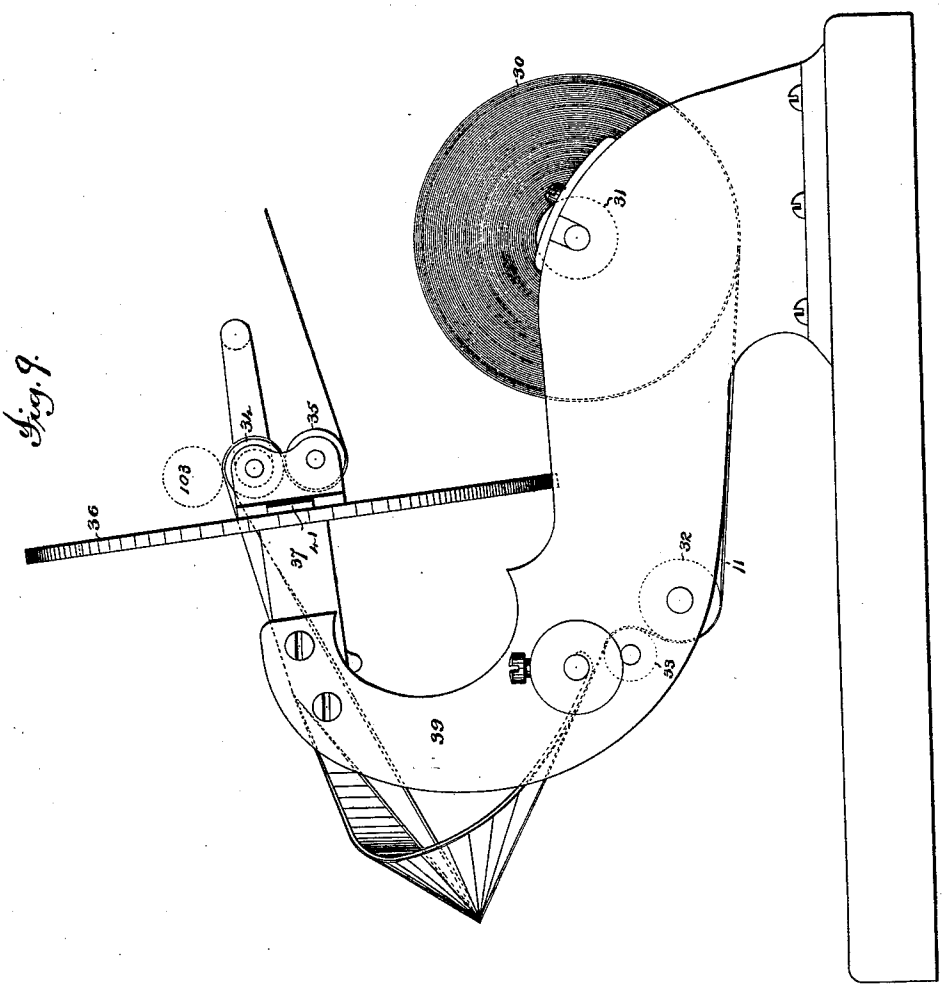
10 Sheets—Sheet 6.

L. C. CROWELL.

Folding Machine.

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Fig. 9.



Attest;
Geo. H. Graham
Anthony N. Jaebera

Inventor,
L. C. Crowell,
by Munson & Philipp
Attys.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

(Model.)

10 Sheets—Sheet 7.

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Folding Machine.

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Fig. 12.

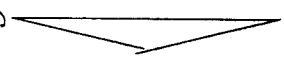


Fig. 11.

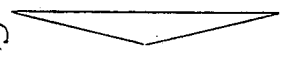
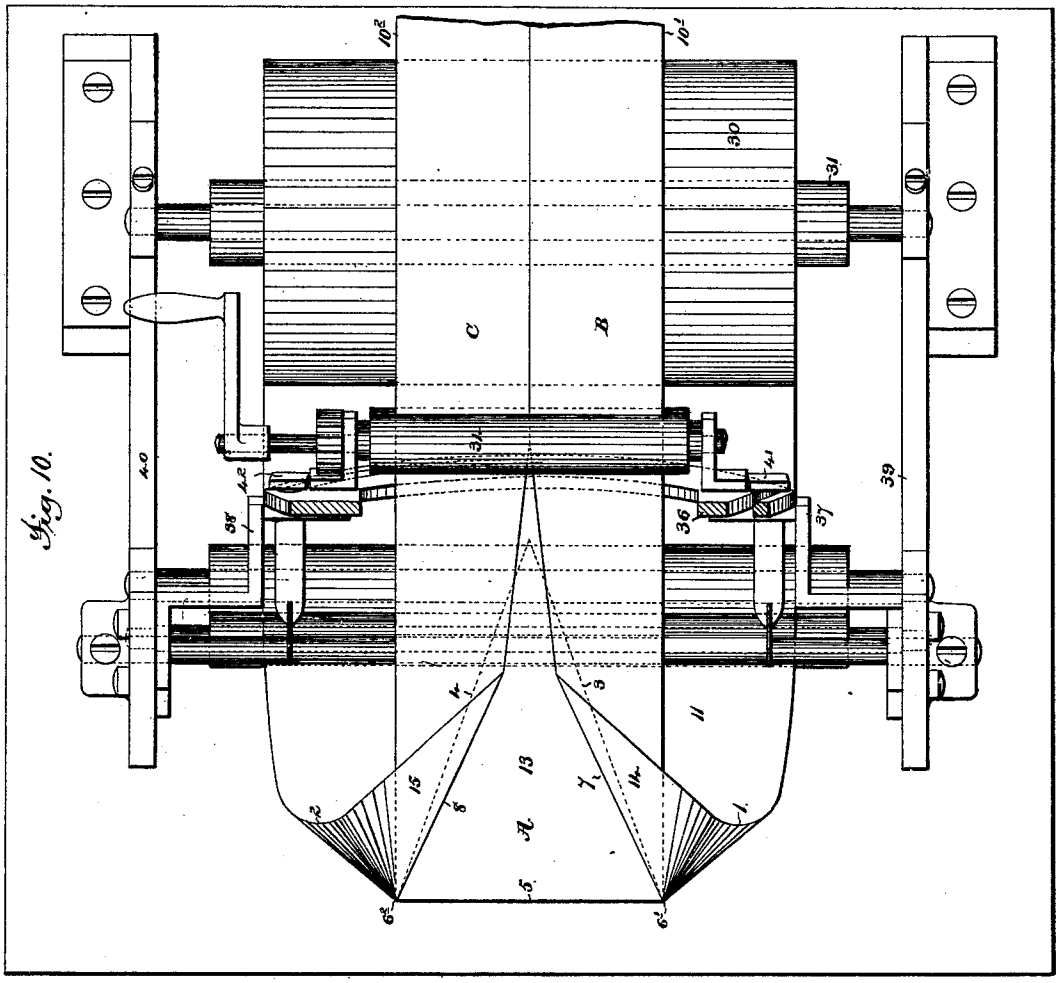


Fig. 10.



Attest;
Geo. H. Graham
Anthony & Jacobs

Inventor,
L. C. Crowell,
by Munson & Philipp
Attys.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

(Model.)

10 Sheets—Sheet 8.

L. C. CROWELL.

Folding Machine.

No. 233,995. Patented Nov. 2, 1880.

Fig. 14.

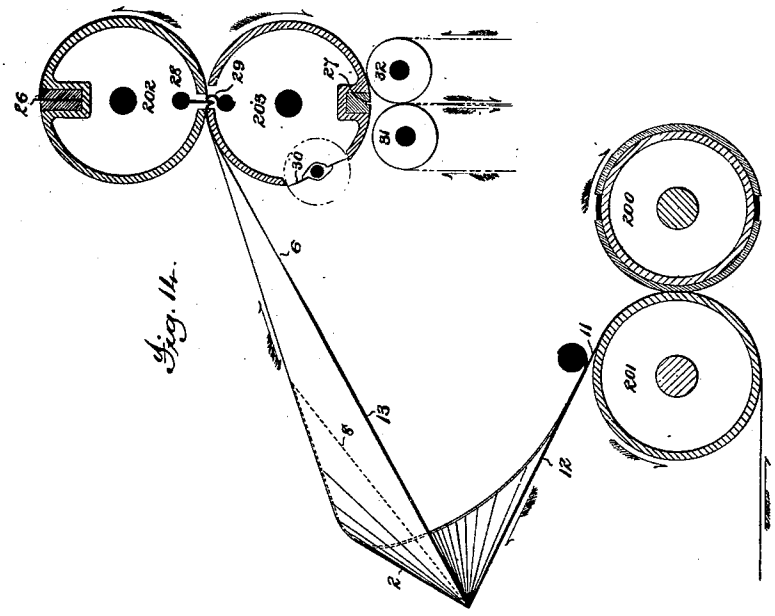
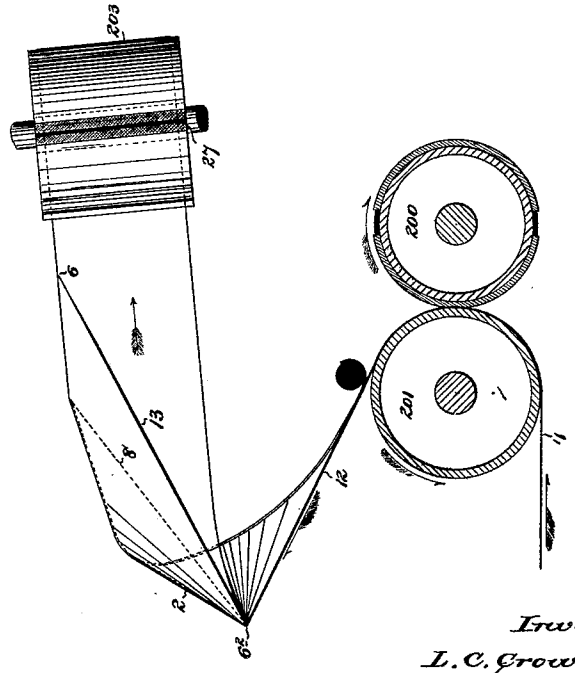


Fig. 13.



Attest,
Geo. C. Graham
Anthony A. Gasbera

Inventor,
L. C. Crowell,
by Munson & Philipp
Attys.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

(Model.) 10 Sheets—Sheet 9.

L. C. CROWELL.

Folding Machine.

No. 233,995. Patented Nov. 2, 1880.

Fig. 16.

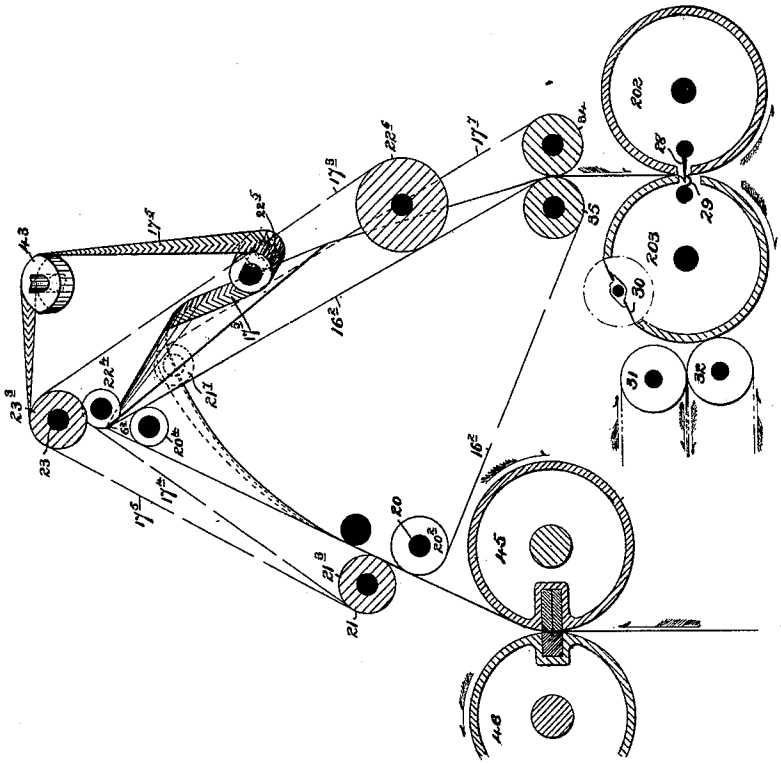
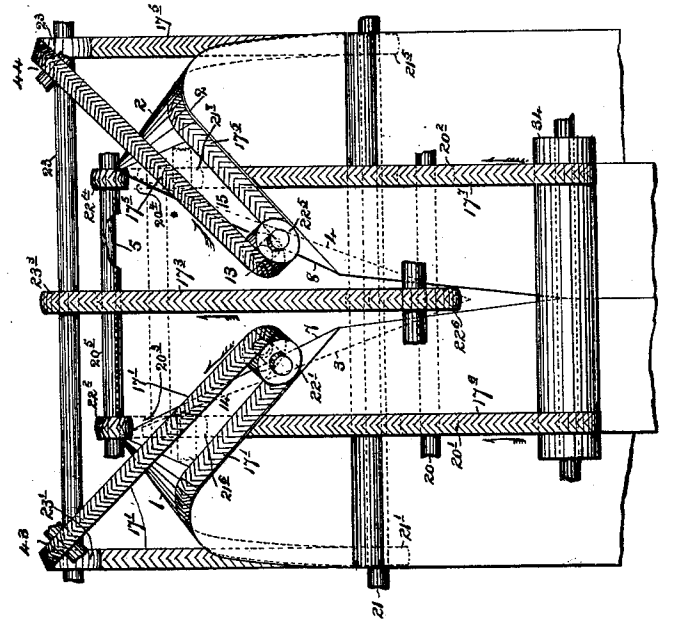


Fig. 15.



Attest;
Geo. H. Graham
Anthony T. Jastrow

Inventor,
L. C. Crowell,
by Munson & Philipp
Attys.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

(Model.)

10 Sheets—Sheet 10.

L. C. CROWELL.

Folding Machine.

No. 233,995. Patented Nov. 2, 1880.

Fig. 18.

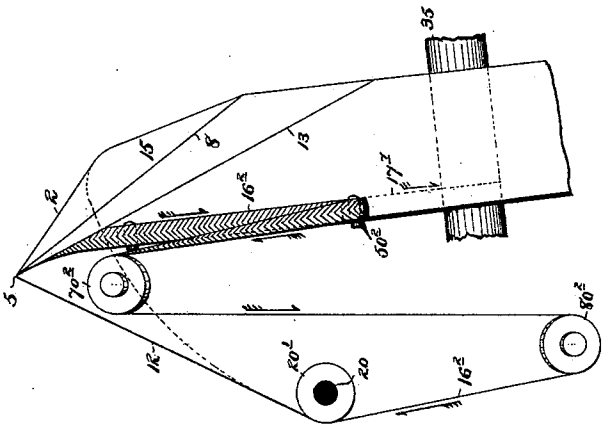
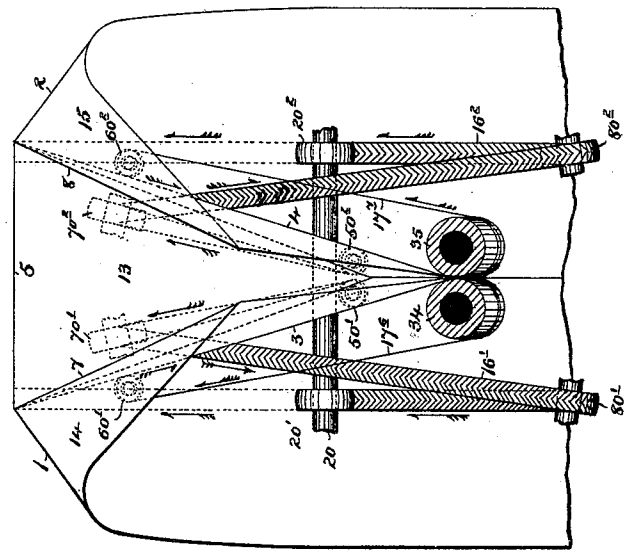


Fig. 19.



Attest,
Geo. H. Graham.
Anthony N. Jacobus

Inventor,
L. C. Crowell,
by Munson & Philipp
Attys.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

LUTHER C. CROWELL, OF BROOKLYN, NEW YORK.

FOLDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 233,995, dated November 2, 1880.

Application filed May 12, 1880. (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 C,) fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

In said drawings, Figure 1 is an end elevation, Fig. 2 a side elevation, Fig. 3 a plan view, and Fig. 4 a longitudinal elevation, of a machine embodying my invention, while Figs. 5 and 6 are sectional views, showing the product folded by such machine. Figs. 7 and 8 show a modified construction of the turners. Fig. 9 is a side elevation, and Fig. 10 a plan view, of a modified form of said machine, while Figs. 11 and 12 are sectional views, showing the product as folded by such modified machine. Figs. 13 and 14 illustrate the combination of this improved folder with a web-printing machine and with a transverse cutting and folding machine. Figs. 15 to 17, inclusive, illustrate a system of taping this improved folder when adjusted to impart two folds to detached sheets, Fig. 16 also illustrating its combination with a transverse-cutting apparatus and a transverse-folding apparatus. Figs. 18 and 19 illustrate the modification of taping necessary when the folder is adjusted to accomplish three folds.

This invention relates to the construction of a folder that is adapted to impart longitudinal folds to a web or sheets of material passing through it, which folds may be three in number, reducing the web to one-quarter its normal width, or two in number, reducing it to one-half its normal width.

The invention consists, principally, in the construction of the folder, but includes various combinations of the same with other devices, and also a system of taping, all of which is too particularly hereinafter set forth to need further preliminary description.

The primary purpose of the folder is to impart the longitudinal folds to a web of paper or to short lengths or sheets of paper as the same is received from the printing devices of a web-printing machine, said folder being adapted to so fold the web or sheets at a speed equal to the highest rate at which the rotary printing devices may be run. It is thus not only capable of disposing of the product of a printing-machine, but so manipulates that product that its dimensions are reduced widthwise to a degree that enables it to be subsequently manipulated by a mechanism comparatively small in its dimensions, which may be adapted to cut the longitudinally-folded web into sections and deliver the same in a flat pile, or to impart transverse folds thereto. It is further adapted to folding the product of cloth-machines or any other fabric-producing machinery where it is desirable to deliver the product folded longitudinally; and it is likewise adapted to the production of tubes for use in the making of bags and similar articles, as will hereinafter appear.

The structure of the machine embodying the present improvements will first be described as represented in Figs. 1 to 4, and then its modifications will be explained.

In describing these improvements the web to be manipulated will be referred to as composed of three sections, (see Figs. 1 and 3,) the middle section, A, being equal to half the width of the web, and two side sections, B C, equal respectively to one-quarter of the width of the web, said side sections being divided from the middle section by imaginary lines D E, which ultimately become lines of folding.

The folder is composed of turners 1, 2, 3, 4, 5, 7, and 8. The turner 5 is of a length equal to the middle section, A, of the web, and the turners 1 2 are disposed in angular positions, so as to support the side sections, B and C, of the web. The inner ends of these turners 5 1 2, would, if continued, meet at the points marked $6'$ 6^2, which are the folding-points; but these points are imaginary ones—that is to say, the said inner ends of the turners 5 1 2 are cut away, so that they do not meet, but leave a free space, within which the sections of the web may crease or double without having any supporting surface or bearing immediately beneath such points to obstruct the creasing or doubling of the fabric.

The turners 3 4 extend forwardly from the ends of the turner 5, (see Fig. 1,) and are disposed so that their forward ends would meet together at the common point 6, as their rear

ends would, if continued, meet the turners 1 2 5 at the points 6′ 6²; but, like said turners, they are cut away at such points as they are also cut away at the point 6, so as not to bear upon the fabric.

The turners 7 8 project forwardly from the turners 1 2, their point of union therewith at 6′ 6² being cut away, and they terminate at points above the turners 3 and 4, with which their lower edges are approximately aligned. These turners are connected together by plates, so as to afford bearing-surfaces between them for the paper, as follows: a back plate, 12, connects the turners 1, 2, and 5; a plate, 13, connects the turners 3, 4, and 5; and plates 14 15 connect the turners 1 7 and 2 8.

The folder constituted by these turners forms an improvement upon the folders forming the subject-matter of applications filed May 5, 1880, and May 6, 1880; and as the turners constitute a double folder by reason of their being arranged to impart at least two folds to the fabric, it may be said that one turner of each folder, as 3 or 4, is merged into one member, as the plate 13.

The web of paper 11 is shown as coming from a roll, 30, wound on a roller, 31, and it passes under a bending-roller, 32, and a guiding-roller, 33, into contact with the surface of the back plate, 12, against which it is stretched smoothly throughout its width. From this back plate its middle section, A, is drawn smoothly over the turner 5, and thence over the plate 13 and turners 3 4. This brings its center over the folding-point 6 and causes the side sections, B C, to be drawn smoothly over the turners 1 2 and plates 14 15, and thence over turners 7 8. This disposition of the web causes the crease or fold formed at the points 6′ 6² to lie below the plane occupied by the turners 3 4, which draws a portion of the middle section, A, down below said turners 3 4 and a portion of the side sections, B C, into a like position, the remaining portions of said side sections being sustained by the plates 14 15. As the central or folding point of the middle section is sustained over the folding-point 6, the web will thus be provided with three folds—namely, a central fold, 10, and side folds, 10′ 10²—and the plies composing the same will lie in a vertical plane that will form a sectional figure approximately like the letter **W**, (see Figs. 5 and 6,) when they are entered into the nip of the drawing-rollers 34 35, between which rollers the four plies of the fabric will be pressed snugly together. These drawing-rollers 34 35, being vertical, are so related to the turners that they govern the course of the paper—that is to say, while the combined turners distend the fabric to its full width, although it is supported in different planes, the vertical rollers deflect the folded side sections, B C, so that a central or third fold formed at the point 6 unites them. When the rollers 34 35 are moved they will draw the web over the turners and impart folds to it upon the three parallel lines D E F, which will reduce the width of the web to one-quarter its original extent and deliver it in a form suitable to be cut up into sheets, which may be delivered in that form or be further folded transversely or otherwise, as desired.

The turners 1 3 must be so disposed with respect to the turner 5 that they will distend the side sections, B C, of the web when its central section is stretched over said turner 5, and the turners 7 8 must be so disposed with respect to said turners 1 3 that they will stretch the side sections centrally, so as to direct the outer edges of the web properly onto the doubled parts of the middle section of the web and to the rollers 34 35; and while the turners 1 2, as shown in these figures, extend from the lines 18 19 (see Fig. 1) on one side and vanish into the plates 14 15 on the other side, it is practical to make the angle of relation between the plates 12 and 13 more acute or more obtuse. In the latter case said lines 18 19 would be more nearly vertical than is shown, and in the former case the said lines would spread laterally and finally merge into the said turners 1 2, which would then stand more obliquely with respect to the turner 5, and nearly in the same plane.

The latter one of these arrangements of the turners is shown in Figs. 7, 8, in which the turners 1 2 lie in nearly the same horizontal plane as does turner 5, and are arranged with respect thereto at a greater angle than in the preceding figures. These figures also show that the turners 7 8 may lie more nearly parallel with the turners 3 and 4 and in about the same horizontal plane. Other changes in the relation of these turners 1 2 7 8 with respect to the turners 3 4 5 may be made; but the preferable arrangement is that shown in Figs. 1 to 4.

When the web is conducted to this folder direct from a printing-machine it may be slit on the line F, or point of its central fold, and a line of paste be applied to and between the side sections near their lines of fold, so that when they are brought together between the rollers 33 34 they will be united by said line of paste, and when severed transversely each section so produced will constitute a pack or pamphlet of four leaves united together at their back edges. This may be readily accomplished by a slitter, 100, properly placed to so divide the web, and a suitable pasting-disk, as 101, properly positioned with respect to the folded edges of the two sections.

In the machine illustrated by Figs. 1 to 4 the vertically-arranged rollers 34 35, which are geared to run in unison, are supposed to be sustained in proper bearings in a suitable framework in which the turners are supported; but as the said turners are capable of imparting two parallel folds as well as three to the web, these rollers are shown as journaled in a circular frame, 36, which frame is secured to brackets 37 38, which project from the side frames,

39 40, which circular frame is capable of being adjusted upon the shafts of the screw-bolts 41 42, being furnished with guide-slots 43 44 for this purpose. Said frame may thus be held in the position shown in Fig. 1 to sustain the rollers 34 35 vertically, or, as shown in Figs. 9 and 10, to sustain such rollers horizontally; but any other means may be adopted to effect this. When but two longitudinal folds are to be produced these rollers are adjusted horizontally and the web is stretched over the turners 1 2 5 7 8 precisely as before; but, instead of the creased or folded side sections being carried down over the turners 3 4 to form a central fold between them, they are stretched directly from the points 6′ 6² over the roller 3 4, and then between the two, as shown. The web might go directly to the nip of the rollers 34 35, if desired, and said rollers are adjusted in the proper plane with respect to the turners. The web therefore does not have a working contact with the turners 3 4, which are then out of action and practically dispensed with. The rollers 34 35 being turned, the web will be drawn over the turners 1 2 5 7 8, and thus have its side sections, B C, laid over the middle section, A, thus assuming the form shown in Fig. 11. A web so folded may have the edge of one side section lapped over the edge of the other side section, as in Fig. 12, and when the machine is supplied with a proper pasting appliance, as the disk 102, (see Fig. 1,) these lapped edges would be secured together and form tubes which might be utilized in the production of bags, paper-files, &c.; but for newspaper purposes the web may be folded so that its edges will simply meet, and when so folded it may be cut transversly and further folded in any direction, as may be desirable, whether or not it is slit centrally by a slitter, 103, Fig. 9, to divide it into two sections, each folded longitudinally.

It may be remarked that in either of the above adjustments of this folder a previously-printed supplement web may be incorporated within the folded product by simply leading the same over the turner 5, whether such supplement web is of a width equal to the whole or any part of the width of the main web. The supplement web thus introduced will be drawn onward by the rollers 34 35 and folded within the main web, and be severed with the severed section.

It will be obvious that the folded web may be led over one of these rollers 34 or 35, as shown in Figs. 1 to 4, at a right angle therefrom, to a pair of carrying-rollers, or be led directly to a cutting or combined cutting and folding machine. This latter expedient will be resorted to where compactness of the machine is desired or where it is preferable to deliver the web at the side of the machine. In such case the roller might be stationary and the web be drawn over it. Thus led out from the roller it might be turned at any angle desired by means of turners arranged as is described in the United States Patent No. 212,880, dated March 4, 1879.

It will now be understood that the web of paper, instead of being supplied from a roll, 30, will, in practice, be received directly from the fabric producing or manipulating machine, as from a web-printing machine, and that one or both the rollers 32 and 33 might be omitted; also, that the folded web might be delivered directly to a rotary folding-machine, which would supplant the rollers 34 35.

In the form of machine Figs. 1 to 4 the folding devices of such folding-machine would stand vertically, as in Fig. 13, while in the machine illustrated in Figs. 9 and 10 said folding device would stand horizontally, as is shown in Fig. 14, from which and the lettering of these illustrations it will be understood that the web is manipulated by the turners in Fig. 13 as it is in Figs. 1 to 4, and in Fig. 14 as it is in Figs. 9 and 10.

The cylinders 200 201 represent the last type and impression cylinders of a web-printing machine, and the cylinders 202 203 represent the carriers of a combined rotating cutting and folding mechanism, which mechanism may be of various constructions, as is now well understood in this art. As shown, the cylinder 202 is provided with a cutting-blade, 26, that co-operates with a slot, 27, in the cylinder 203. A tucking creaser or blade, 28, is carried by the cylinder 202, and co-operates with a vibrating jaw, 29, carried by the cylinder 203, which blade and jaw coact to produce a transverse fold in the fabric. An apparatus thus composed is substantially described in Patent No. 143,674, dated October 14, 1873. The cylinder 203 is further provided with a rotating folding-blade, 30, that co-operates with folding-rollers 31 32, the construction and operation of which devices are fully described in Patent No. 171,196, dated December 14, 1875.

The printed web, emerging from between the cylinders 200 201, will be carried directly through the folders, as before described, and thus be folded longitudinally. This folded web will, by the coaction of the cutters 26 27, be severed into short lengths or sheets, which sheets will be folded transversely by the coaction of the folding devices 28 29, and this once-transversely-folded sheet will be again transversely folded by the action of the rotating folding-blade 30, which will double the folded sheet into the nip of the rollers 31 32, which, with the tapes that run over them, will deliver the same. It is further to be understood that this folder, whether adjusted to produce three folds or two folds, as has been described, may be supplied with tapes to aid in carrying sheets through it, whether such sheets be conveyed singly to it or come in succession from a printing or other sheet-producing machine. A system of taping the said folder when adjusted to produce two folds is shown in Figs. 15, 16, and 17. In such figures the cylinders 45 46 illustrate the cutting-cylinders of a web-print-

ing machine from which a printed web is delivered in sheet form.

This taping is as follows: The series beneath the web consists of two tapes, 16′ and 16^2. The tape 16′ runs from the pulley 20′ on the shaft 20 over the plate 12 and the pulley 20^3 below turner 5, the surface of which pulley is coincident with the surface of plates 12 and 13, (which are removed at that point.) From this pulley the tape passes over the plate 13, around the roller 35, and thence returns to the pulley 20′.

The tape 16^2 runs from the pulley 20^2 on the shaft 20, over the plate 12, to pulley 20^4, thence over the plate 13 to roller 35, over which it returns to pulley 20^2. Of the outer or surface series, one marginal tape, 17′, runs from the pulley 21′ on the shaft 21, over the plate 12 and turner 1, to the pulley 22′, around which it returns, passing over a deflecting-pulley, 43, to pulley 23′ on a shaft, 23, and returns to pulley 21′. The opposite marginal tape, 17^5, passes in like manner from pulley 21^5 on shaft 21, over plate 12 and turner 2, to the pulley 22^5, around which it returns, passing over a deflecting-pulley, 44, to pulley 23^5 on shaft 23, and returns to pulley 21^5. The central surface-tape, 17^3, passes over pulley 21^3 on shaft 21, over the plate 12, to and over the turner 5, over the plate 13 to the pulley 22^6, over which it passes to pulley 23^3 on shaft 23, and returns thence to pulley 21^3.

Two intermediate surface-tapes run longitudinally in the same vertical planes as those occupied by the tapes 16′ 16^2 and 17^6 17^7. They co-operate with the former tapes 16′ 16^2 to form a pathway in carrying the sheet up over the turner 5, said tapes 16′ 16^2 and 17^6 17^7 continuing the pathway so formed from the turner 5 to the rollers 34 35. One set only of these tapes appears in the drawings—viz., that marked 17^4—which tape runs from pulley 21^3, fast on the shaft 21, over plate 12, parallel to and in carrying contact with the inner tape, 16^2, to and over the turner 5, and returns over pulley 22^4, located near the point 6^2, to the pulley 21^3. The companion tape runs from a pulley fixed on the shaft 21 at an appropriate point distant from the pulley 21^3, passes over the plate 12, parallel to and in carrying contact with the inner tape, 16′, thence to and over the turner 5, and returns over the pulley 22^2, (see Fig. 15,) located over the point 6′, to the said pulley on shaft 21.

Other outer or surface tapes, 17^6 and 17^7, arranged to conduct the fabric through the folder by contact with the doubled or folded portion thereof, are located and run as follows: one, 17^6, from the pulley 21^6, and thence to and in carrying-contact with the inner tape, 16′, to roller 34, and returns thence to the pulley 21^6. The other tape, 17^7, passes from the pulley 21^7, parallel to and in carrying contact with the inner tape, 16^2, to roller 34, and returns thence to the pulley 21^7.

From this described taping the modification of the same necessary to conduct sheets through the folder constructed of the turners where the fabric is disposed as is shown in Figs. 1 to 4, inclusive, will be readily apparent. Such modification is, however, illustrated in Figs. 18 and 19.

Thus it will only be necessary to change the run of the under tapes, 16′ 16^2, and the upper tapes, 17^6 17^7, which will then be as follows: The tapes 16′ and 16^2 will be run from their respective pulleys 20′ and 20^2 on shaft 20 over the plate 12 and turner 5, near the points 6′ 6^2, and, bearing over the edges of the turners 3 and 4, will run toward rollers 34 35, lying in the same planes in which the side sections of the web are to move, and then return, respectively, over vertical pulleys 50′ 50^2, journaled beneath the point 6, thence around suitable guiding-pulleys, 70′ 70^2 and 80′ 80^2, to their respective pulleys 20′ 20^2. The tapes 17^6 and 17^7 will run, respectively, from rollers 60′ 60^2, journaled vertically beneath the turners 7 and 8, thence outward in carrying contact with the tapes 16′ 16^2 to the rollers 34 35, and return thence to the pulleys 60′ 60^2. These taped folders are thus adapted to impart longitudinal folds to the sheets, and these sheets may be supplied from any source, as before explained.

In Fig. 16 the cutting-cylinders 45 46 of a web-printing machine are shown as the means of dividing a web into sheets as it passes to this folder. In this illustration these cylinders are supposed to but partially sever the web, so that the faster-running tapes of the folder may, when the partially-severed portion is within their nip, accelerate its movement, detach a sheet, and rapidly advance it. It is apparent, however, that the cylinders 45 46 may entirely sever the web to form sheets, and these sheets be guided by conductors into the nip of the tapes. The longitudinally-folded sheet, emerging from the rollers 34 35, may be delivered to any of the now well-known forms of rotary folding-machines. In this figure a rotary folding-machine adapted to impart two transverse folds to the sheets is shown; but as it is constructed like the rotary folder shown in Fig. 14, no explanation of its parts is necessary here. It may be remarked, however, that by the removal of the rotary blade 30 in both cases one transverse fold only will be imparted to the sheets.

The web or sheets folded by this apparatus may be slit longitudinally while passing to this folder or the turners thereof by placing the slitter 103 near the point 6 over the central plate, 13, which will be properly grooved to secure its edge, or on the roller 33, or between the rollers 32 33, or at any other suitable point. The product of either modification of the apparatus will then be two webs, each folded in their longitudinal center.

The twice-folded web produced by the modified apparatus shown in Figs. 9 and 10, when one of its edges overlaps the other, as in Fig.

12, may have a line of paste applied to the proper one of its edges by a suitable pasting apparatus, so that such surface shall run in contact with it, and as it passes through the folder such edge will be united to the opposite edge as it overlaps the same in passing between the rollers 34 35, whereby said twice-folded web will have its free edges united together and form a tube.

Essential differences exist between this system or method of folding and that commonly practiced where the line or lines of folding are determined by surfaces over which the fabric is turned as follows: Heretofore, in turning a web or sheets of fabric to impart a fold thereto, the fabric is strained at the line of intended fold between a folding-edge on one side and coacting devices on the other, whereby the sections of fabric are forced toward each other over the folding-edge to cause said sections to lap together. In these improvements the turners or surfaces over which the web or sheets are carried are all disposed on one side of the fabric, and are so related to each other that the sections to be lapped together are gradually turned and caused to travel in such different planes as to ultimately come together or be lapped without the aid of any device acting upon the opposite side of the fabric. Such a structure, besides simplifying the mechanisms, enables one surface of the fabric to be coated with paste, printed, or otherwise ornamented, and whether such coating or ornamenting be freshly applied or dry the fabric may undergo the folding operation without damage or injury thereto. It has furthermore been the practice to define the line of fold by means of a folding-edge in contact with the fabric at the line of its intended fold, whereby such fabric is strained, distorted, or broken on the line of folding by such folding-edge.

In these improvements the turners are so disposed with respect to each other that they do not extend to the point where the fabric is folded, said folders, on the contrary, being cut away or set apart, so as to leave the fabric without any bearing-surface at that point. The fabric, though given the proper direction by the support afforded by the turners, nevertheless remains free or unsupported at the folding-point, and may hence bend or double at that point without being strained by any rigid supporting-surface or opposing force on either side of it. The most limp or fragile paper or fabric may therefore be doubled or folded by this improved folder without injury to its surface or liability to tear at the folding point or line. Moreover, it will be observed that in all positions which the web or sheet is made to assume in being folded by this improved folder it is fully distended widthwise, and therefore has no slack portion which will permit it to buckle up or be otherwise distorted from its true course.

The pasting apparatuses might be constructed so as to apply transverse lines of paste to the web at proper points.

It is to be understood, as before explained, that either five of the turners or the seven turners are capable of separate co-operation with the other devices and mechanisms in producing longitudinal folds in the material and otherwise manipulating it, and hence that five of the turners as well as seven of them are embraced in the combinations hereinafter set forth.

What, therefore, is claimed is—

1. A longitudinal folder composed of the turners 1, 2, 3, 4, 5, 7, and 8, angularly disposed with respect to each other, substantially as described.

2. A longitudinal folder composed of the turners 1, 2, 7, 8, and 5, angularly disposed with respect to each other, substantially as described.

3. The combination, with a longitudinal folder composed of turners angularly disposed with respect to each other, as described, of one of the guide or conducting rollers 34 35 and means for drawing the fabric onward, substantially as described.

4. The combination, with a longitudinal folder composed of turners angularly disposed with respect to each other, as described, of the rollers 34 and 35, substantially as shown and described.

5. The combination, with a longitudinal folder composed of turners angularly disposed with respect to each other, as described, of the rollers 34 and 35 and a roller or cylinder operating to direct or lead the fabric while it is distended widthwise onto said turners, all substantially as described.

6. The combination, with a longitudinal folder composed of turners angularly disposed with respect to each other, as described, of one of the guide or conducting rollers 34 35 and a roller or cylinder operating to direct or lead the fabric while it is distended widthwise onto said turners, all substantially as described.

7. The combination, with a longitudinal folder composed of turners angularly disposed with respect to each other, as described, of a roller or cylinder operating to direct or lead the fabric while it is distended widthwise onto said turners, substantially as described.

8. The combination, with a longitudinal folder composed of turners angularly disposed with respect to each other, as described, of a longitudinal slitter, as 100, all substantially as described.

9. The combination, with a longitudinal folder composed of turners angularly disposed with respect to each other, as described, of a pasting apparatus, all substantially as described.

10. The combination, with a longitudinal folder composed of turners angularly disposed with respect to each other, as described, of a longitudinal slitter and a pasting mechanism, all substantially as described.

11. The combination, with a longitudinal folder composed of turners angularly disposed with respect to each other, as described, of a transverse-cutting mechanism, all substantially as described.

12. The combination, with a longitudinal folder composed of turners angularly disposed with respect to each other, as described, of a transverse-cutting mechanism and a transverse-folding mechanism, all substantially as described.

13. The combination, with a longitudinal folder composed of turners angularly arranged with respect to each other, as described, of a printing mechanism, all substantially as described.

14. The combination, with a longitudinal folder composed of turners angularly arranged with respect to each other, as described, of a printing mechanism and a transverse-cutting mechanism, all substantially as described.

15. The combination, with a longitudinal folder composed of turners angularly arranged with respect to each other, as described, of sets of tapes, whereby detached or partially-detached sheets may be carried over said turners and delivered therefrom with longitudinal folds, all substantially as described.

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

LUTHER C. CROWELL.

Witnesses:
H. T. MUNSON,
T. H. PALMER.