

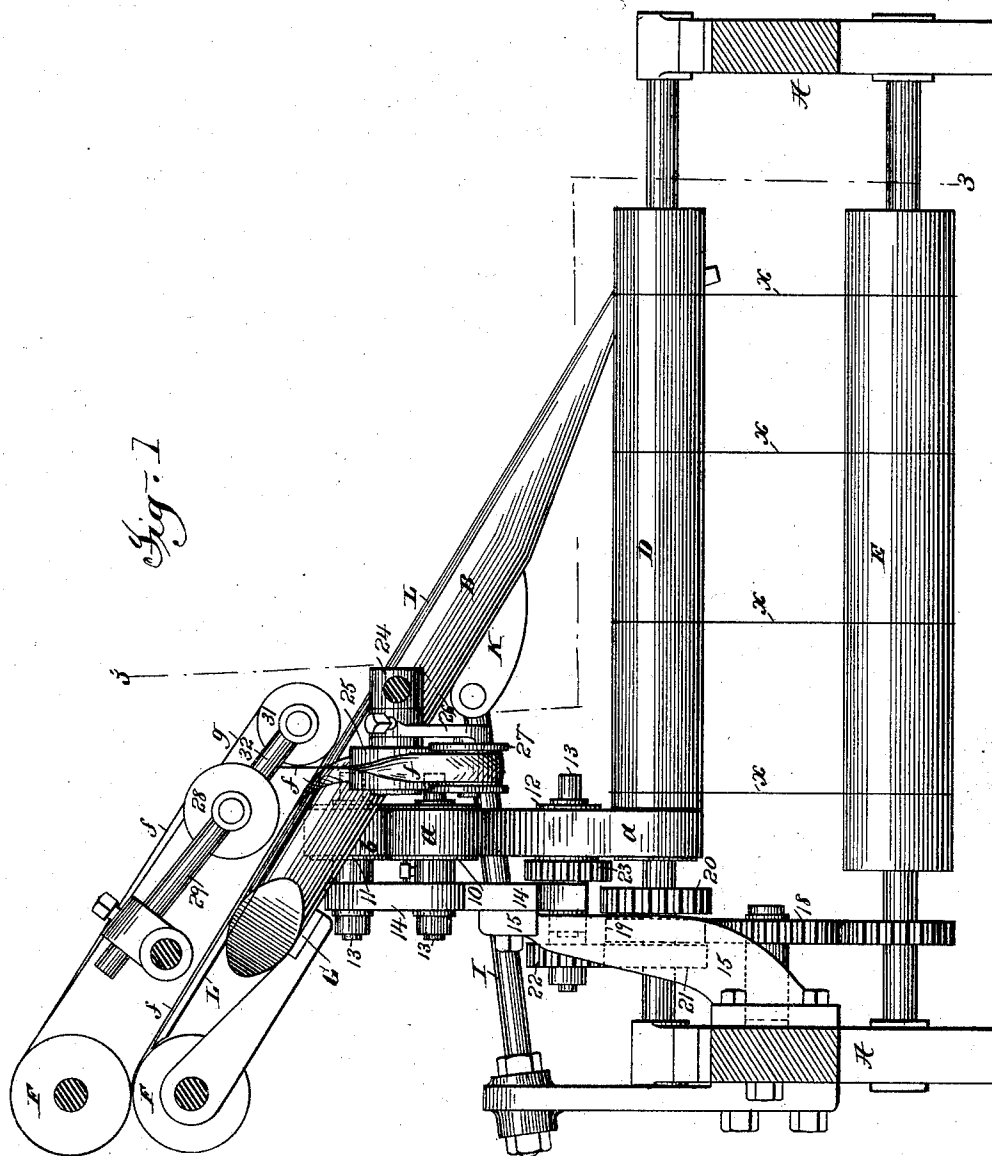
(No Model.)

5 Sheets—Sheet 1.

L. C. CROWELL.
FOLDING MECHANISM.

No. 505,817.

Patented Oct. 3, 1893.



Attest:
Geo. H. Dotts.
T. F. Kehoe.

Inventor:
Luther C. Crowell
by
Philip Munn Phelps
Attys

(No Model.)

5 Sheets—Sheet 2.

L. C. CROWELL.
FOLDING MECHANISM.

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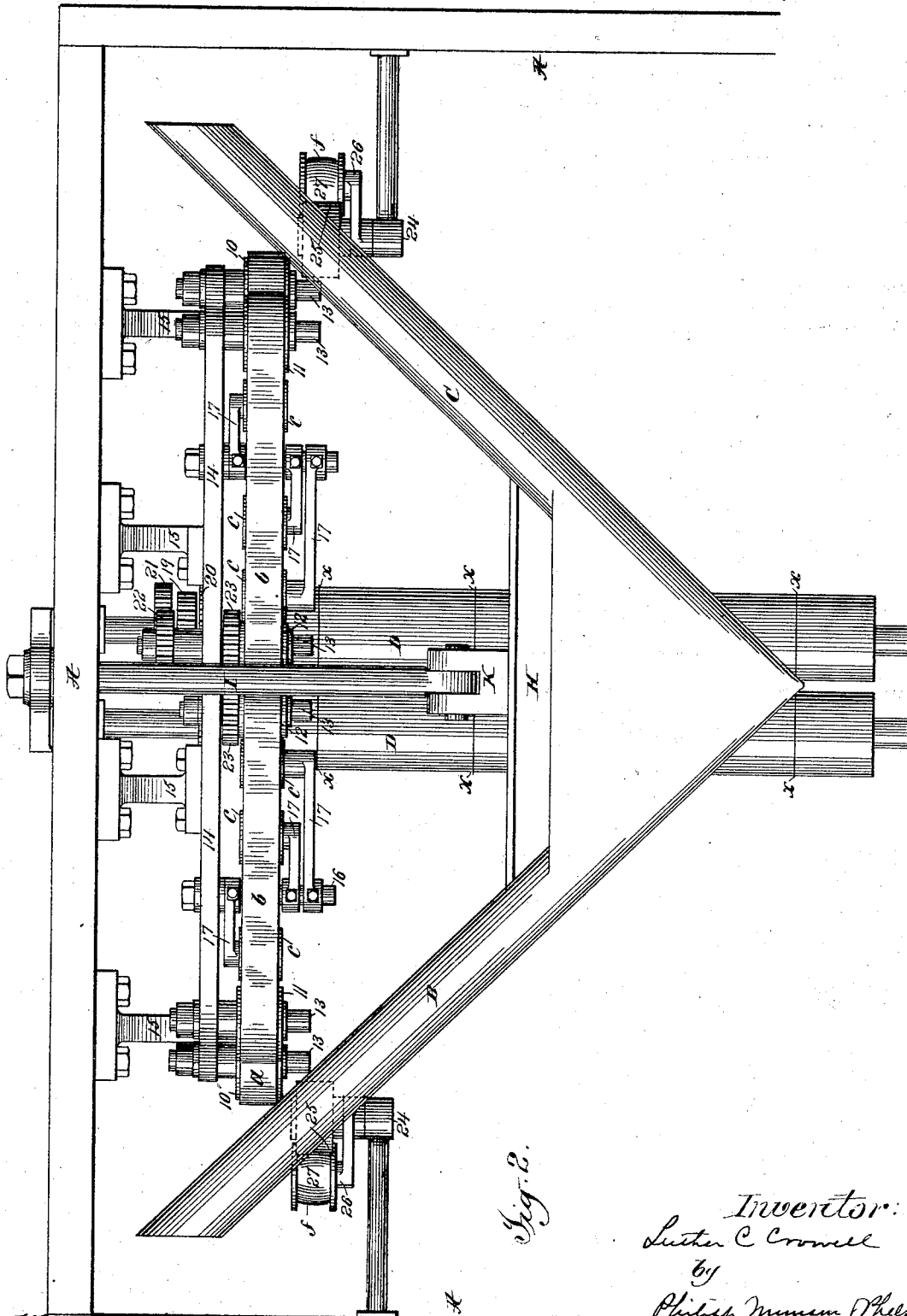


Fig. 2.

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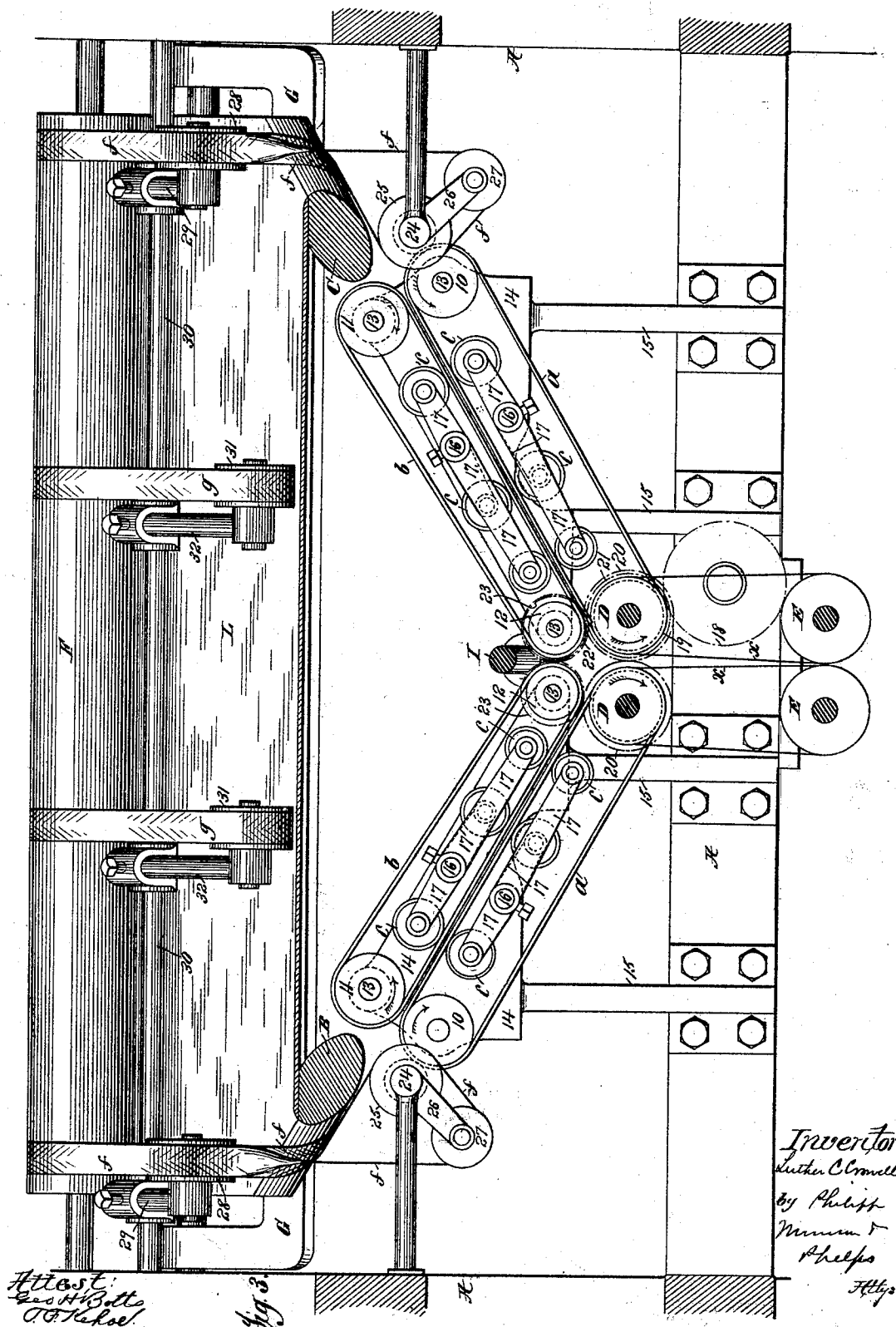
(No Model.)

5 Sheets—Sheet 3.

L. C. CROWELL.
FOLDING MECHANISM.

No. 505,817

Patented Oct. 3, 1893.



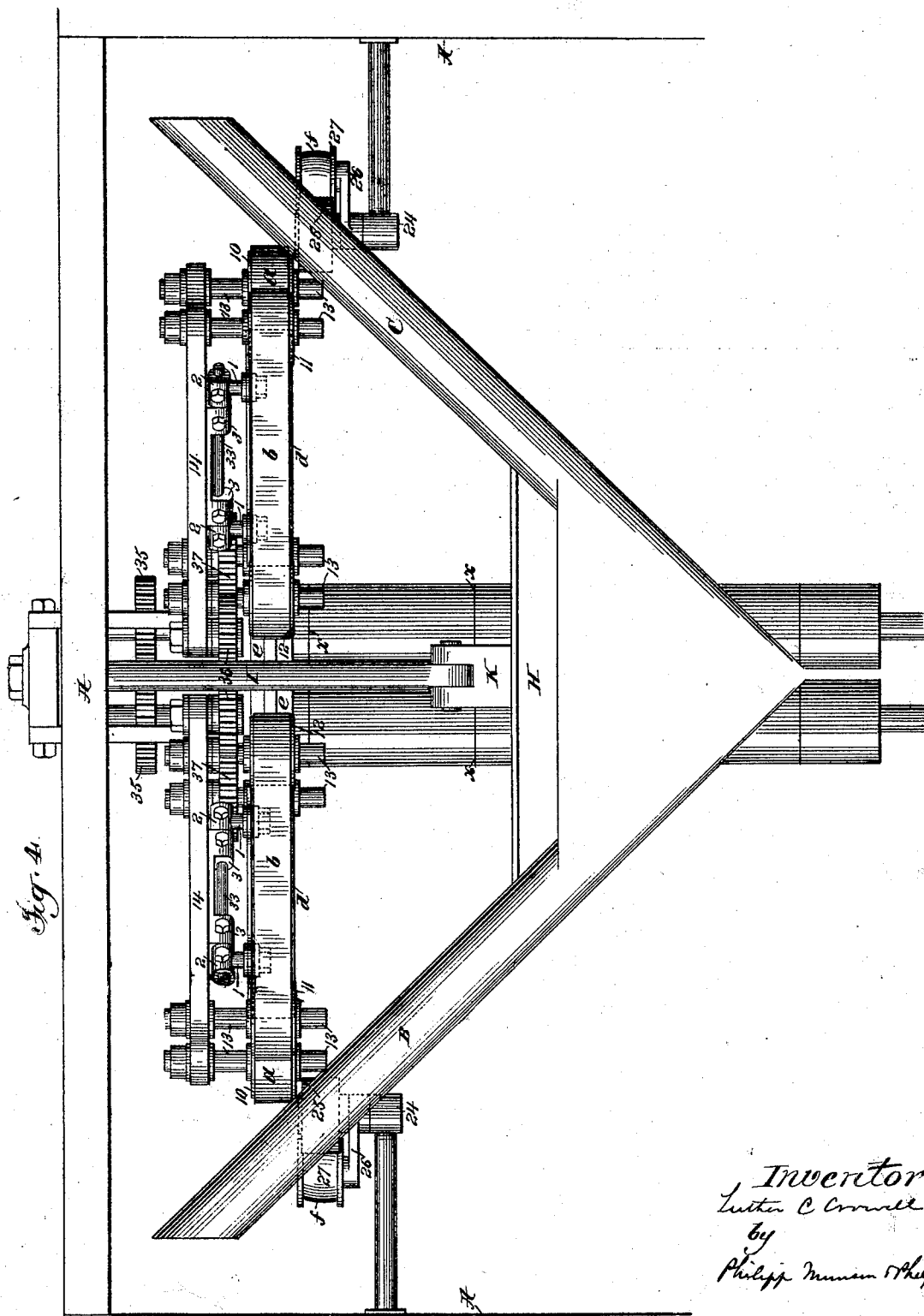
(No Model.)

5 Sheets—Sheet 4.

L. C. CROWELL.
FOLDING MECHANISM

No. 505,817.

Patented Oct. 3, 1893.



Inventor
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by
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Atty's

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Geo. H. Botto
C. A. Kehoe

UNITED STATES PATENT OFFICE.

LUTHER C. CROWELL, OF BROOKLYN, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO ROBERT HOE, THEODORE H. MEAD, AND CHARLES W. CARPENTER, OF NEW YORK, N. Y.

FOLDING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 505,817, dated October 3, 1893.

Application filed November 28, 1892. Serial No. 453,297. (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 Mechanisms, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

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 are provided with a pair of converging internal folding guides or formers, in passing over which the material has its sides carried toward each other so as to be doubled or folded longitudinally. Longitudinal folders of this class have been shown and described in many of my prior Letters Patent. In such longitudinal folders adapted to fold sheets, tapes have been used on the sides of the folder for advancing the sheets, several series of tapes being employed, and either internal or external tapes or series of external tapes coacting with internal plates. Such tape folders are shown in my Patents Nos. 276,672, 281,619, and 331,280. Such constructions, however, have not been entirely satisfactory in operation, as it is difficult to secure and maintain by such tapes the proper tension at all points of the sheet to insure proper feed and accurate folding; the construction requires careful attention to secure the best results, and there is danger of offsetting, as it is found in practice that several series of tapes engaging different parts of the sheet are required.

The special object of the invention is to provide an improved longitudinal folder by which the sheet may be fed positively and with certainty and the requisite tension at all points of the sheet be secured and maintained at high rates of speed, and further to provide a construction by which the sheet may be advanced and its folding secured by tapes on the sides of the folder engaging only the margin of the sheet. I attain these objects in accordance with the present invention by combining with internal and exter-

nal tapes converging from the internal guides at the opposite sides of the folder and arranged to seize the opposite sides of the sheet and bring them together to form the longitudinal fold, pressing devices by which the tapes are held pressed together to secure a positive grip upon the sheet. I prefer to use as the pressing devices series of rolls frictionally driven by engagement with the tapes and preferably made adjustable so as to secure the proper pressure between the tapes at all points, but I may use pressure plates or other suitable devices for securing the required pressure between the tapes. It is much preferable to use both internal and external rolls or plates pressing the tapes together from opposite sides, and such a construction in itself forms a part of my invention, but such devices may be used on only one side of the tapes with good results.

My invention therefore consists broadly in the combination with the converging internal guides of a longitudinal folder, of feeding tapes on the sides of the folder held pressed together by suitable devices so as to secure the required grip for advancing the sheet from the guides with certainty, and in various constructions and combinations of parts, all of which will be fully described in the following specification and pointed out in the claims.

For a full understanding of my invention, a detailed description of a folder embodying the same in its preferred form, and a modification thereof, will now be given in connection with the accompanying drawings forming a part of this specification, in which—

Figure 1 is a side elevation of the folder in the preferred form. Fig. 2 is a plan view with the top plate removed. Fig. 3 is a vertical section on the line 3 of Fig. 1. Fig. 4 is a plan view similar to Fig. 2, showing a modification, and Fig. 5 is a section of the same similar to Fig. 3.

Referring now particularly to Figs. 1 to 3, it will be understood that frame A may be of any suitable construction common in web printing and other machines employing longitudinal folders of this class.

B, C are the internal guides over which the

sides of the sheet are bent to form the fold, these internal guides B, C being shown as consisting of bars converging to the apex between a pair of rolls D forming the fold laying device or external guides, from which the folded sheet passes to a pair of feeding rolls E, the sheets being held and guided between the rolls D, E by cords or tapes *x*. The sheet is advanced to the folder by a pair of feeding rolls F mounted at the top of the folder. The internal guides B, C are supported at their upper ends by a bar G extending across the folder and mounted on the shaft of the lower feed roll F, and at their lower ends by a cross bar H carried by a vertically adjustable arm K on a bar I extending rearward under the folder and mounted in a bracket on the frame A, so as to be adjustable longitudinally, thus securing the proper positioning of the guides B, C. The folder may be left open at the top, only the internal guides B, C being used, but a top plate L extending between the internal guides is preferably used to aid in supporting the sheet.

The construction thus far described is that of longitudinal folders now in common use in web printing and other machines, but it will be understood that my invention may be applied to other similar constructions.

Referring now to the parts in which my invention is embodied—on each side of the folder are two sets of tapes *a*, *b* arranged respectively inside and outside of the path of the sheet as it passes over the folder, these tapes being mounted so that their engaging surfaces run in the proper plane to advance the sheet from the folder, the angle of this plane to the guides being accurately adjusted to keep the sheet taut and to secure the proper tension at every point. These tapes *a*, *b* are preferably mounted to engage the margin of the sheet close to the edge, so as to hold the corners of the sheet down; but it will be understood that this position may be varied somewhat. The external tapes *a* are carried by belt pulleys 10 at their upper ends next the internal guides B, C and by fold laying rolls D at their lower ends, and the internal tapes *b* are carried by belt pulleys 11, 12 at their upper and lower ends respectively, the belt pulleys 10, 11 being placed directly opposite each other and the belt pulleys 12 opposite to the rolls D, so as to secure a positive grip between the tapes at the points at which the sheet is taken and delivered, and to hold the leading end of the sheet as nearly as possible up to the point where it is delivered between the rolls D. The belt pulleys 10, 11, 12 are shown as mounted on short shafts 13 carried by a plate 14 extending across the rear of the folder and carried by brackets 15 on frame A, but it will be understood that any other suitable construction for mounting these rolls may be used.

In the plate 14 on each side of the folder and within each set of the belts *a*, *b* is mounted a stud 16, these studs carrying arms 17

mounted loosely thereon so as to be adjustable circumferentially of the studs, and secured in position by means of set screws. Each of these arms 17 carries a roller *c*, these rollers being placed on opposite sides of the portion of the belts *a*, *b* by which the sheet is engaged, so that these rollers form pressing devices by which the belts are pressed together, so as to secure a positive grip upon the sheets, thus insuring their proper feed and accurate folding. By the adjustment of the arms 17 upon the studs 16, it will be seen that these rollers *c* may be accurately positioned so as to secure just the required tension.

The tapes *a*, *b* and fold laying rolls D may be driven by any suitable means, but are shown as geared as follows:—The rolls E are geared together and driven as usual, and the rolls D are driven from one of the rolls E through an intermediate 18 and a gear 19 on the shaft of one of the rolls, and gears 20 by which the rolls D are geared together, the tapes thus being driven. The roll D carrying gear 19, carries also a third gear 21, which meshes with a gear 22 on the shaft of belt pulley 12, these gears 21, 22 being so timed by relative size as to secure the movement of the belt pulley 12 and belts *b* at exactly the same rate of speed as the rolls D and belts *a* and the belt pulleys 12 are geared together by gears 23 so as to secure the same movement of the other series of belts *b*.

Any suitable feeding devices may be used for securing the proper advance of the leading end of the sheet over the guides B, C, to the tapes *a*, *b*. I prefer, however, to use the construction shown, which I have found forms a simple and efficient means for this purpose coacting well with the tapes *a*, *b*. In this construction a stud 24 is mounted on each side of the folder just below the upper ends of the internal guides B, C, and these studs carry belt pulleys 25 and arms 26 adjustable on the studs, the arm 26 carrying belt turning pulleys 27, so that by the adjustment of these arms, the marginal tapes *f* running over the edges of the internal guides B, C may be adjusted to run as desired. These marginal tapes are led from the upper feeding roll F over the upper ends of the internal guides B, C, then around the guides and downward around the belt pulleys 25, 27, returning over adjustable tension pulleys 28, mounted in arms 29 on bar 30 supported in the frame at the top of the folder. Between the marginal tapes *f*, two or more tapes *g*, two being shown in the present case, are led from the upper feed roll F over the plate L on the top of the folder to points about opposite the upper ends of the guides B, C and returned over adjustable tension pulleys 31 on arms 32 on bar 30, as in the case of the tapes *f*. It will be understood, however, that the marginal tapes *f* may be depended upon to advance the sheets, and the tapes *g* be omitted, but the latter are preferably used.

While it is preferable that the internal and external rollers *c* should be placed opposite each other, as shown, as a more positive grip by the tapes is secured, it will be understood
 5 that these rollers may be staggered, if desired, that is, placed in different positions longitudinally of the belts so as not to be exactly opposite each other. While it is preferable to use rolls as the pressing devices
 10 other devices may be used for this purpose. Thus a series of external or internal rollers coacting with a continuous plate or a series of plates may be used, or external and internal plates arranged to press the tapes together.
 15

In Figs. 4 and 5 I have shown a construction in which plates are used for pressing the tapes together. In this construction the tapes are pressed together by plates *d* placed in the same position as the rolls *c*, in the construction previously described. These plates *d* may be supported in any suitable manner so as to secure the proper pressure upon the tapes, but are preferably mounted so that they may
 25 be adjusted to and from each other, and in the drawings I have shown a simple construction for this purpose in which the plates *d* are carried by studs 1 mounted in sleeves 2 adjustable circumferentially on a bar 33, the sleeves 2 being secured in position on said bar by set screws. The bar 33 is carried by and adjustable in ears 3 on the plate 14. By this construction, the plates may be readily adjusted so as to secure their proper position
 35 and the required pressure between them by adjusting the sleeves 2 on the bar 33, only a very slight adjustment being required. The plates are preferably made slightly convex longitudinally so as to secure the proper tension between the belts at all points, it being found in practice that this construction is preferable. As the belts *a* do not extend to the fold laying rolls *D*, and the leading end of the sheet is not gripped after it has passed
 45 the lower belt pulley 12, and before it is gripped by the fold laying rolls *D*, it is preferable to use a guide *e* placed between the pulleys 12 and rolls *D* and operating to guide the leading end of the sheet to the latter.
 50 It will be understood, however that in place of this guide, other devices, such as rolls coacting with the fold laying rolls *D*, may be used if preferred.

The parts may be driven by any suitable means, but are shown as driven from the rolls *E* as follows:—The fold laying rolls *D* are driven from one of the rolls *E* through an intermediate 34 and gears 35 on the shafts of the rolls gearing them together, and the belt
 60 pulleys 12 are driven from the other roll *E* through a series of intermediates 36 and gears 37 on the shafts of the belt pulleys, the belt pulleys 12 on opposite sides of the folder being geared directly together, and the parts
 65 are so timed that exactly the same speed is obtained on both sides of the folder. The operation of this construction is substantially

the same as that previously described, and no further description is necessary.

For securing the best results, it is necessary that the pressing devices be placed both internal and external of the tapes, as shown, so as to press the tapes together from opposite sides, this construction securing a more positive grip upon the sheet, but the rolls or plate on one side of the tapes may be omitted and good results secured, and such a construction is within my invention, broadly considered.

It will be understood that my invention is not to be limited to the exact form or arrangement of the devices shown, as these have been selected only as embodying my invention in its preferred form, and it will be understood that modifications may be made therein without departing from my invention.

While the construction has been described as applied to folding sheets, it will be understood that it is applicable also to associating two or more sheets or webs led over the opposite sides of the folder, my improved construction being admirably adapted for this use. It will be understood, also, that a slitter, and other devices in use with the present longitudinal folders, are equally applicable to folders embodying my invention.

What I claim is—

1. In a longitudinal folder, the combination with converging internal guides, of endless tapes on the opposite sides of the folder converging from the internal guides, pressing devices intermediate of the tape pulleys for pressing said tapes together, and means for advancing the sheet over the internal guides to the tapes, substantially as described.

2. In a longitudinal folder, the combination with converging internal guides, of endless tapes on the opposite sides of the folder converging from the internal guides, adjustable pressing devices intermediate of the tape pulleys for pressing said tapes together, and means for advancing the sheet over the internal guides to the tapes, substantially as described.

3. In a longitudinal folder, the combination with converging internal guides and a fold laying device, of endless tapes on the opposite sides of the folder converging from the internal guides to the fold laying device, pressing devices intermediate of the tape pulleys for pressing said tapes together, and means for advancing the sheet over the internal guides to the tapes, substantially as described.

4. In a longitudinal folder, the combination with converging internal guides, of endless tapes on the opposite sides of the folder converging from the internal guides, internal and external pressing devices intermediate of the tape pulleys for pressing said tapes together, and means for advancing the sheet over the internal guides to the tapes, substantially as described.

5. In a longitudinal folder, the combination

- with converging internal guides and a fold laying device, of endless tapes on the opposite sides of the folder converging from the internal guides to the fold laying device, internal and external pressing devices intermediate of the tape pulleys for pressing said tapes together, and means for advancing the sheet over the internal guides to the tapes, substantially as described.
6. In a longitudinal folder, the combination with converging internal guides, of endless tapes on the opposite sides of the folder converging from the internal guides, pressure rollers arranged intermediate of the tape pulleys for pressing said tapes together, and means for advancing the sheet over the internal guides to the tapes, substantially as described.
7. In a longitudinal folder, the combination with converging internal guides, of endless tapes on the opposite sides of the folder converging from the internal guides, internal and external pressure rollers arranged intermediate of the tape pulleys for pressing said tapes together, and means for advancing the sheet over the internal guides to the tapes, substantially as described.
8. In a longitudinal folder, the combination with converging internal guides, of endless tapes on the opposite sides of the folder converging from the internal guides, internal and external pressure rollers arranged intermediate of the tape pulleys and opposite each other for pressing said tapes together, and means for advancing the sheet over the internal guides to the tapes, substantially as described.
9. The combination with converging internal guides B, C and fold laying rolls D, of internal and external tapes *a, b* converging from the guides B, C to the rolls D, internal and external pressure rollers *c* pressing said

tapes together between the belt pulleys, and means for advancing the sheet over the internal guides to the tapes, substantially as described.

10. The combination with the converging internal guides B, C and fold laying rolls D, of external tapes *a* carried by said fold laying rolls D and converging thereto from the internal guides, internal tapes *b* co-acting with said tapes *a* and converging from the internal guides to pulleys 12 adjacent to rolls D, pressing devices *c* pressing said tapes together between their pulleys, and means for advancing the sheet over the internal guides to the tapes, substantially as described.

11. The combination with the converging internal guides B, C and fold laying rolls D, of external tapes *a* carried by said fold laying rolls D and converging thereto from the internal guides, internal tapes *b* co-acting with said tapes *a* and converging from the internal guides to pulleys 12 adjacent to rolls D, internal and external pressure rollers *c* pressing said tapes together between their pulleys, and means for advancing the sheet over the internal guides to the tapes, substantially as described.

12. The combination with converging internal guides B, C, and fold laying rolls D, of internal and external tapes *a, b* converging from the guides B, C to the rolls D, studs 16 within said tapes, and internal and external pressure rollers *c* carried by arms 17 adjustable on said studs, substantially as described.

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

LUTHER C. CROWELL.

Witnesses:

THOS. F. KEHOE,
C. J. SAWYER.