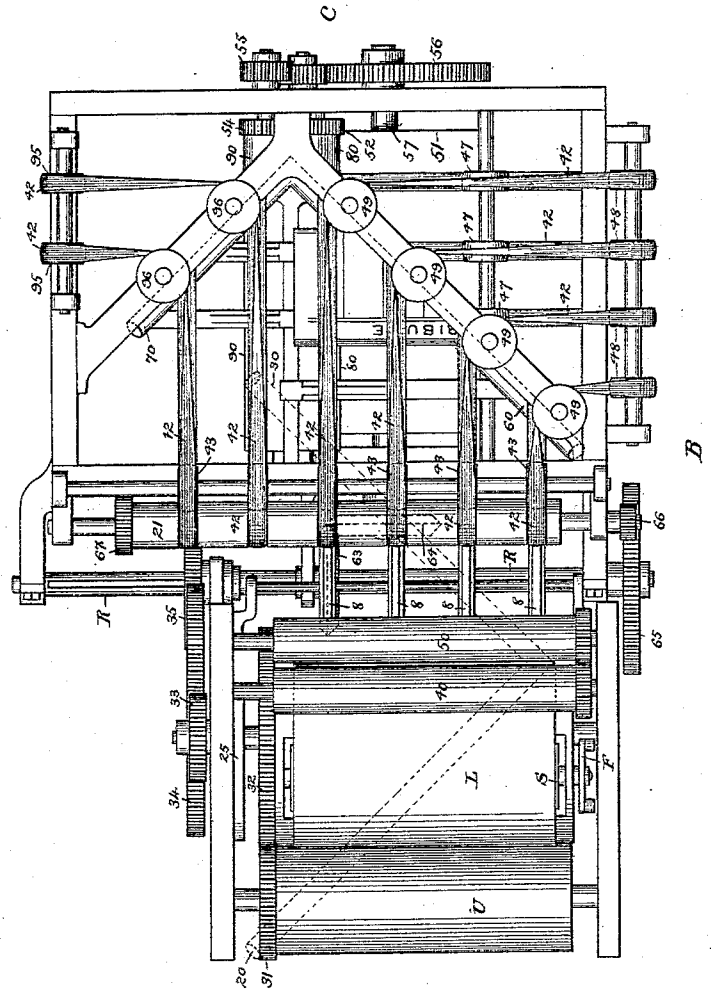
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L. C. CROWELL.

DELIVERY APPARATUS FOR PRINTING MACHINES.

No. 339,530. Patented Apr. 6, 1886.

Fig. 1.



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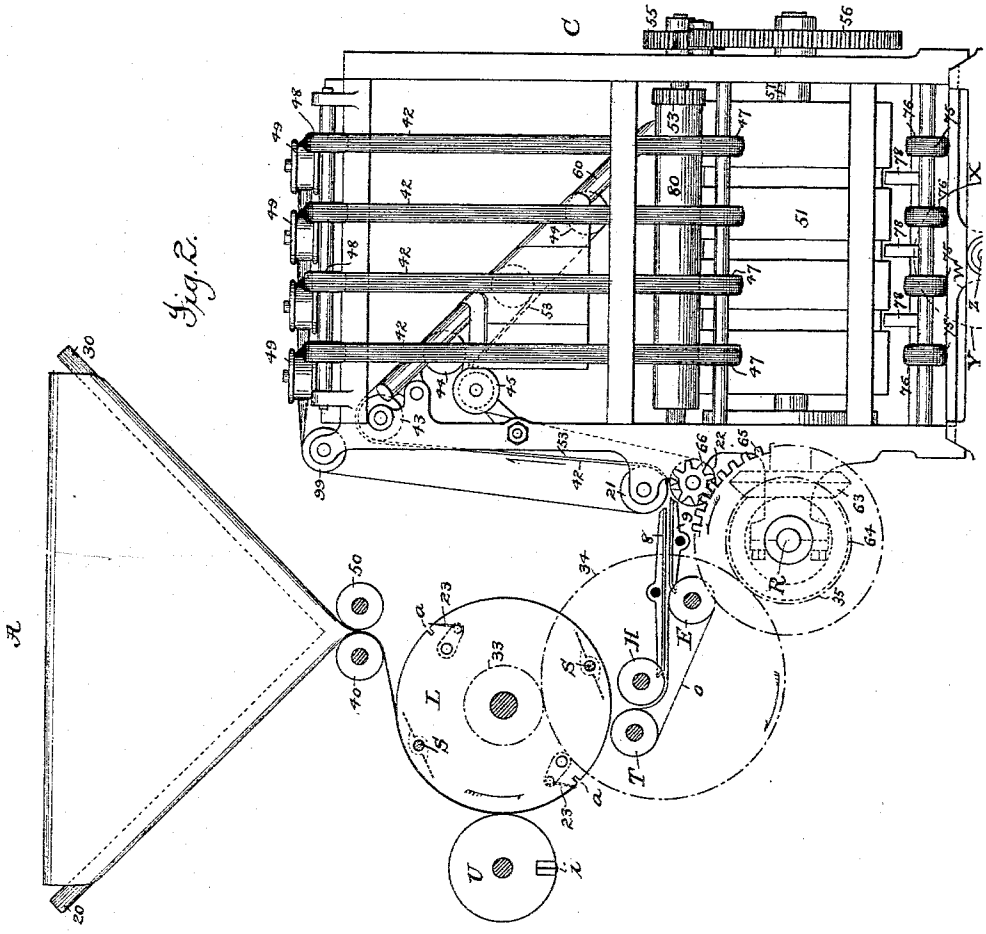
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Fig. 2.



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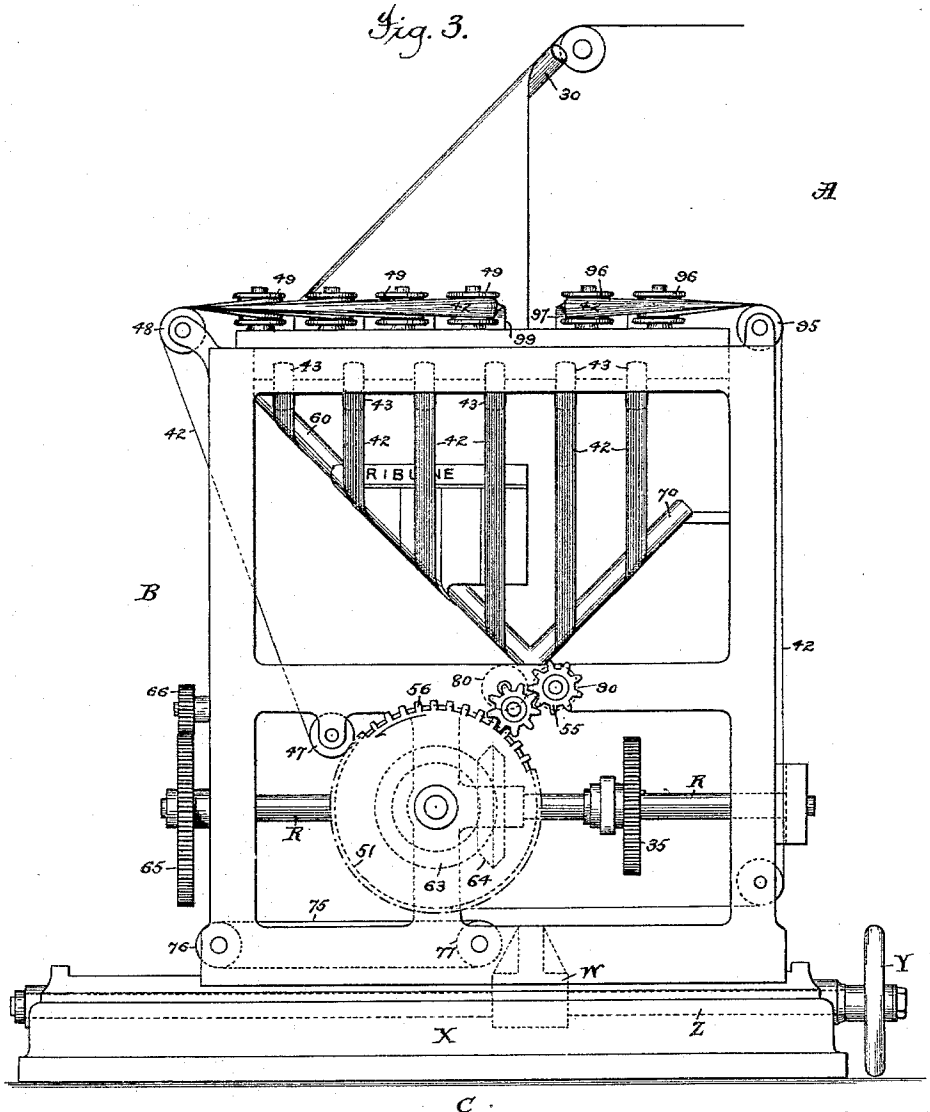
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L. C. CROWELL.

DELIVERY APPARATUS FOR PRINTING MACHINES.

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Fig. 3.



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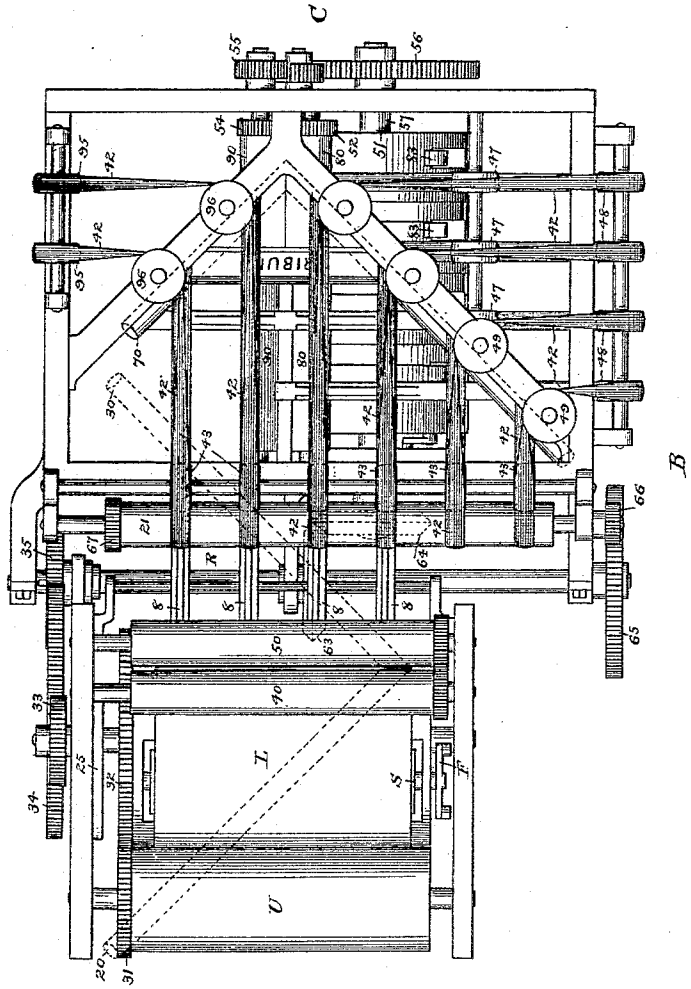
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L. C. CROWELL.

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Fig. 4.



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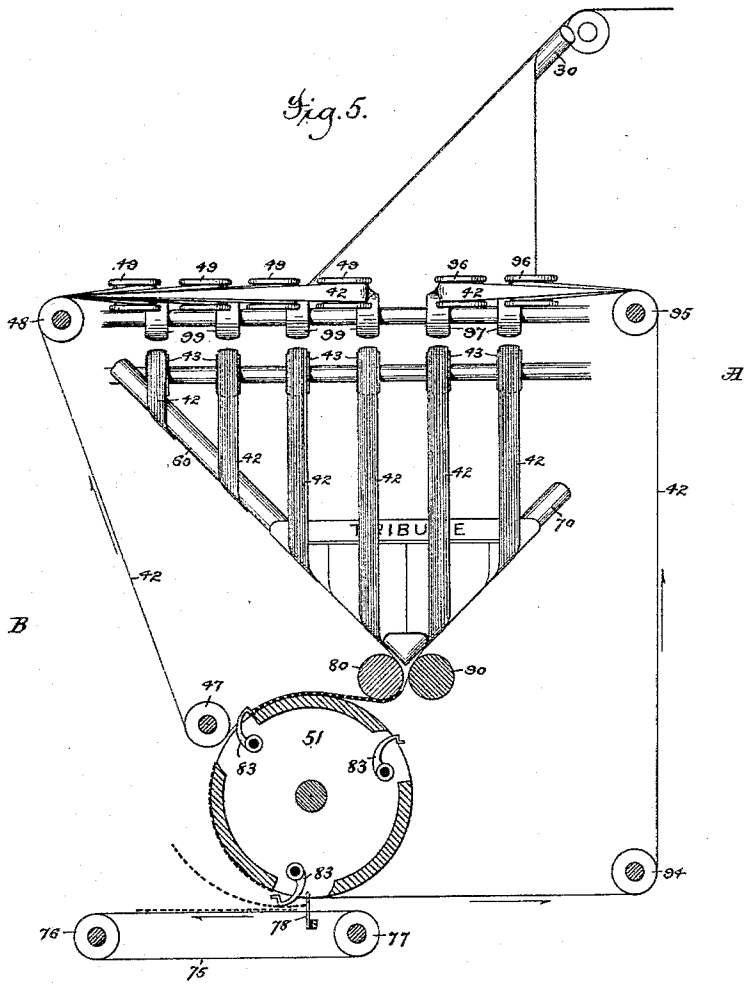
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Fig. 5.



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(No Model.) 7 Sheets—Sheet 6.

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Fig. 6.

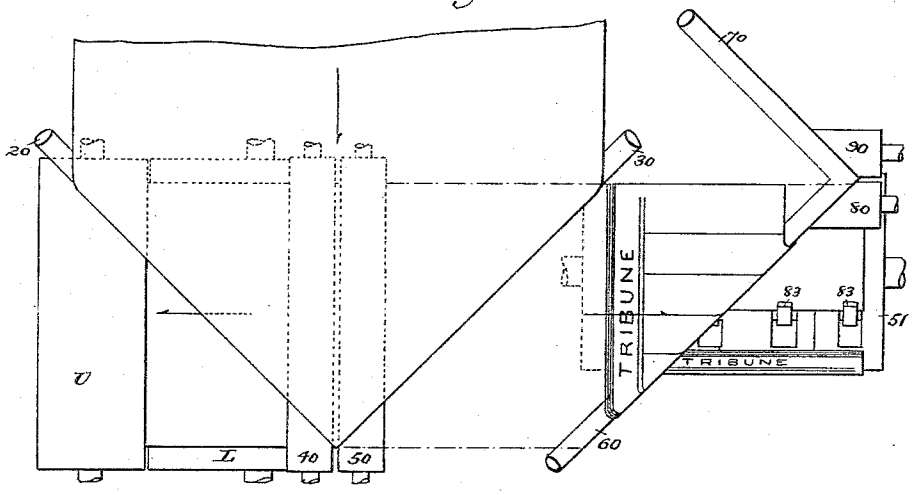


Fig. 8.

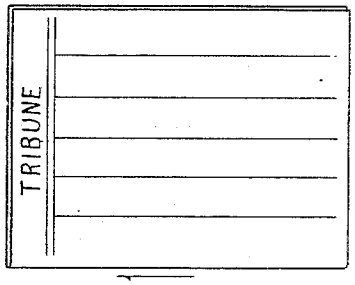


Fig. 9

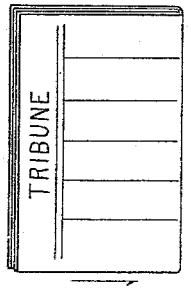
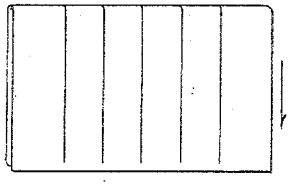


Fig. 10



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(No Model.) 7 Sheets—Sheet 7.

L. C. CROWELL.

DELIVERY APPARATUS FOR PRINTING MACHINES.

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Fig. 7.

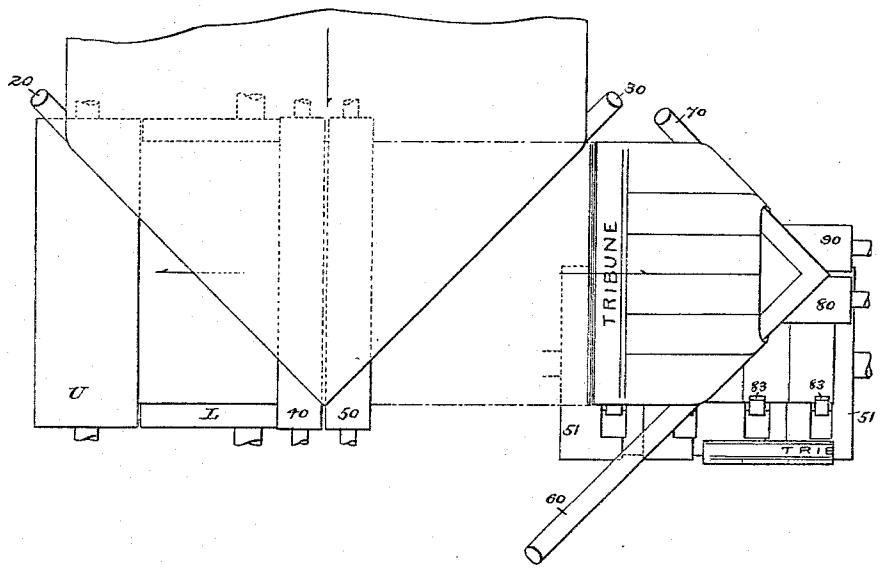


Fig. 11.

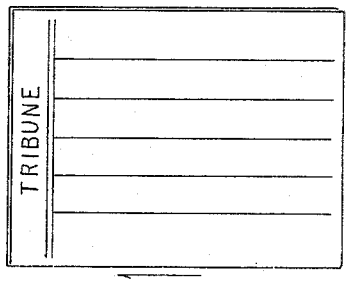


Fig. 12.

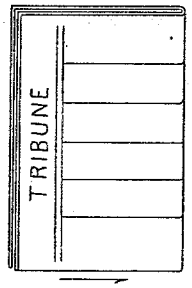
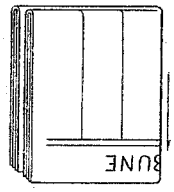


Fig. 13.



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UNITED STATES PATENT OFFICE.

LUTHER C. CROWELL, OF BROOKLYN, ASSIGNOR TO R. HOE & CO., OF NEW YORK, N. Y.

DELIVERY APPARATUS FOR PRINTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 339,530, dated April 6, 1886.

Application filed April 17, 1884. Serial No. 128,238. (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 Delivery Apparatus for Printing-Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

In said drawings, Figure 1 is a plan view of a folding mechanism especially adapted as the delivery apparatus of a printing-machine, the primary longitudinal folder being shown in dotted lines. In this view A indicates the side at which the printing apparatus is located, or at which the paper is introduced into the delivery apparatus. B indicates the sheet-delivery side, and C one of the sides of the apparatus. In this view, and also in Fig. 4, many of the underlying parts are omitted for the sake of avoiding confusion.

Fig. 2 is an elevation of the apparatus as seen from the B or delivery side of the apparatus, part of the frame-work being removed. Fig. 3 is an elevation as viewed from the C side of the apparatus, some of the parts being shown in dotted lines. Fig. 4 is a view similar to Fig. 1, showing the apparatus with the secondary longitudinal folder adjusted into folding position. Fig. 5 is a similar view to that of Fig. 3, but the frame-work is omitted, the rotary fly-cylinder is illustrated in sectional elevation, and the secondary longitudinal folder is adjusted into folding position. Figs. 6 and 7 are diagrammatic plans illustrating two modes of operation. Figs. 8, 9, and 10 illustrate the various conditions of the paper in its passage through the apparatus when adjusted as in Figs. 1, 3, and 6. Figs. 11, 12, and 13 illustrate the various conditions of the paper in its passage through the apparatus when adjusted as in Figs. 4, 5, and 7.

It is the object of this invention to capacitate a single set of delivery apparatus wherein the sheets are folded to so operate, by means of slight adjustment, that the sheets may be delivered folded in more than one form—as twice folded for ready handling in distribution as by carriers, or three or more times folded into proper shape for distribution through the mails.

The principal feature of the invention consists in a longitudinal folder which is so constructed and combined with the other mechanisms that it can be moved or adjusted to different positions with relation to the preceding mechanism, whereby it may be caused to receive the web or sheet in such position that it will be folded centrally or at one side of the center, or in such position that the web or sheet will be simply guided or turned without being folded in passing through the folder, and whereby, also, webs or sheets of different widths may be folded centrally.

The invention also includes the combination of two folding mechanisms arranged to act upon the web or sheet in succession, the second of said mechanisms being a longitudinal folder, and the two being adjustable with relation to each other, whereby the same results can be accomplished.

The invention also embraces various other combinations, all of which will be hereinafter described and pointed out.

That this invention may be readily understood and carried out, the construction and operation of the apparatus involving a practical embodiment of it, as shown in the accompanying drawings, will be explained in detail; and, first, the general construction of the various mechanisms constituting this apparatus will be explained without regard to the adjusting feature of the longitudinal folder.

It is to be observed that the said drawings do not show the printing apparatus or source of supply of the sheets, but are confined to the delivery apparatus. It will, however, be readily understood by reference to Figs. 1, 2, and 3, where the sides of the apparatus are marked A, B, and C, respectively, that any apparatus operating upon a web of paper—as a printing apparatus of any of the well-known forms, which operate to print a web of material upon both of its surfaces and to deliver the same, either wholly or partially cut into sheets or not—may be placed so as to deliver the printed web or sheets at the A side of this apparatus, at which side the primary longitudinal folder extends rearward. This A side is therefore the receiving side of the appa-

ratus, and it may be remarked here that though the B side is shown as the delivery side of said apparatus, the paper may be carried to any other side of the apparatus for final delivery.

The primary longitudinal folder consists of angularly-arranged internal guides, 20 30, and external turners, 40 50, and the secondary longitudinal folder consists of angularly-arranged internal guides, 60 70, the former of which is of sufficient length to receive the full width of the sheet or web as it is presented to the folder, and external turners, 80 90, both of which may be constructed in any of the common ways now practiced, as is illustrated by Letters Patent Nos. 233,994, 233,995, 233,996, 233,997, 240,235, 269,019, 276,672, and in my pending application filed February 8, 1884.

The primary longitudinal folder is not taped, while the secondary is provided with conducting-tapes, adapting it for the manipulation of sheets. The primary may, however, be provided with such tapes, so as to conduct sheets, in which case the printing apparatus will be provided with a cutting or perforating mechanism for the purpose of dividing the printed web into sheets, and means will be provided for accelerating the sheets, so as to provide a working-space between them as they enter into the delivery apparatus, and for collecting two or more sheets, if desired.

Beneath the primary longitudinal folder there is arranged the rotating carrier L of a rotary folding mechanism, a cutting-cylinder, U, folding-rollers T H, a tape-roller, E, and a shaft, R, all of which have parallel axes and are mounted to turn in a suitable frame-work. The cylinder U and the carrier L are geared together by the wheels 31 32, and the shaft of the carrier L is provided with a pinion, 33, that gears with a driving-wheel, 34, that is driven from a pinion, 35, on the shaft R, which latter is the driving-shaft of the delivery apparatus, and may receive its motion by suitable gearing from the printing apparatus, so as to run in unison therewith.

The cutting mechanism consists of slots *a* in the carrier L, and a cutting-blade, *i*, in the cylinder U. This is a simple form of cutting mechanism, but may have substituted for it any of the well known constructions.

The folding-rollers T H will be geared together, as is usual, and one of the gears—that upon the roller T—may receive motion by meshing with the wheel 32, as is common in rotary folders. The positive motion thus derived will be imparted to the tapes *o*, that pass over roller T and the tape roller or pulleys E.

The conductors 8 9, forming in connection with the tapes *o* a conducting-pathway for the sheets from said folding-rollers T H to the carrier-rollers 21 22, are, as is usual, short rods or castings held in place by being fixed upon rods that are secured to the frame-work.

The external turners, 40 50, of the primary longitudinal folder may, when the web is not severed until after it passes them, revolve or not, as may be desired; but where the web is severed before passing over the primary longitudinal folder—that is, where tapes will be employed—said tapes may return around the turners 40 50, and being driven impart a proper surface-speed to said turners.

The carrier L is provided with two double-bladed rotating folders, S, mounted at opposite points near the periphery of said carrier, each being provided with rock-arms, as F, Figs. 1 and 2, which co-operate with cams so as to protrude a blade between the rollers T H in passing the same, as is fully set forth in the Patent No. 171,196. These double rotating folding-blades may have substituted for them single blades, and any other means for producing their protrusion between fold-forming devices, and withdrawal therefrom, of which many varieties are now common in the art of folding-machines—*e. g.*, Patents Nos. 143,674, 197,694, 214,066—or any other rotary folding mechanism may be employed. At points midway between these rotary folding-blades two sets of sheet-holding pins, 23, are provided, their points being located so as to protrude just in the rear of the cutting-slots *a*, said pins being mounted upon rock-shafts that project beyond the end of the cylinder, and receive appropriate motion for protruding or withdrawing them by means of a cam, 25.

The secondary longitudinal folder, composed of the internal guides, 60 70, and co-operating external turners, 80 90, is supported in a frame-work in which is also mounted, beneath said turners 80 90, a delivery-cylinder, 51, the axis of which is at right angles to that of the carrier L. The turners 80 90 are geared together to run in unison by the wheels 52 54, and they are driven in the proper direction by means of the pinion 55, which engages through an intermediate with a wheel, 56, the latter being on a shaft, 57, that receives motion from the main shaft R by means of the bevel-wheels 63 64. This shaft R also carries a wheel, 65, that drives a pinion, 66, that is mounted at one end of the tape pulleys or roller 22, which tape-roller 22 is so geared to its companion 21 at the opposite end as to drive the same in unison with it, toothed wheels being used for this purpose, only one, 67, of which is shown, Figs. 1 and 2. This secondary longitudinal folder is a taped folder adapted for the manipulation of sheets, and for this purpose it is provided with two series of tapes—an under and an upper series. The under series of tapes, all of which are marked 53, start from the pulley 22, pass in contact with roller 21, and thence over pulleys 43 at the base of the secondary longitudinal folder, and thence pass over pulleys, as 44, which are located just behind the internal guides, 60 70, at different points thereof, all these tapes 53 returning over stretching-pulleys 45 to the roller 22. The upper series, all of which are marked 42, start from the roller 21, run over the pulleys 43 at the base of the longitudinal folder, and pass over its

internal guides, 60 70; thence between the external turners, 80 90, (which are shown as rollers,) and thence pass in contact with the delivery-cylinder 51. A portion of said tapes return under pulleys 47, over pulleys 48, around pulleys 49, and over pulleys 99 to the rollers 21, and another portion pass around the delivery-cylinder 51 and return under pulleys 94, over pulleys 95, around pulleys 96, and over pulleys 97 to the said pulley 21.

The sheet-piling mechanism is what is now known as a "rotary fly." It consists of a cylinder, 51, having a suitable number of fingers or arms, as 83, mounted to swing in recesses in the periphery of said cylinder, and propelled or vibrated at the proper intervals of time by means of a cam. (Not shown.) Each set of these fingers or arms operate first to grasp the leading end of a sheet, so as to clamp the same onto the cylinder and carry it onward therewith as the cylinder rotates; then to release the sheet, so that it may descend onto belts 75, that are slowly rotated by pulleys 76 77, and it finally acts to lay the sheets smoothly onto said belts, where their forward movement is suspended by stops 78, which three operations are illustrated in Fig. 5. Any other piling mechanism may, however, be employed, and that shown is not claimed herein.

The secondary longitudinal folder, including its taping and tape-carrying pulleys, together with the delivery-cylinder 51 and its driving mechanisms, are all mounted in the same frame-work, and the latter is arranged to slide upon a bed-plate, X, (see Figs. 1 to 4,) and is thus capable of being bodily moved from the position shown in Figs. 1, 3, and 6 to that shown in Figs. 4 and 7, this movement being accomplished by a screw, Z, which works in a nut, W, and is turned by the hand-wheel Y, or in any other manner. In this adjustment of the secondary folder and its various adjuncts the driven pinion 35 on the shaft R, whereby motion is communicated from the primary driver, will remain meshed with the driving-wheel 34, by reason of the fact that said pinion 35 is secured upon the shaft R by means of a spline that runs in a groove in said shaft, as is well shown in Figs. 1 and 3.

Assuming the apparatus to be adjusted as in Figs. 1 to 3 and 6, its operation will be as follows: The web of material—say printed paper—shown as passing over the primary longitudinal folder in Figs. 2 and 3, will be doubled or folded longitudinally as it passes over the internal guides, 20 30, and between the turners 40 50, and thus folded, as in Figs. 8 and 11, its leading edge will be impaled by the pins 23 on the carrier L, so as to be carried around upon the surface of said carrier. In passing between the cutting devices *a i* this folded web will be severed transversely into sheets; but before such severance the set of pins 23 will impale said web just behind the cutting-line, so as to secure what will become the end of the web when the severance takes place, and thus carry it onward as before. When a section of the web constituting a sheet's length has been carried onward by the carrier L so as to bring its middle portion over the folding-rollers T H, a folding-blade, S, will be moved to protrude from the carrier and press the said middle portion of the sheet into the nip of said rollers, the pins 23 being simultaneously withdrawn to release the leading edge of the sheet. This accomplishes a second or transverse fold in the sheet or one at right angles to its primary fold, as in Figs. 9 and 12. The sheet thus twice folded is carried onward by the nip of the tapes *o* and roller H, and passes between the conductors 8 9 until it is entered into the tapes 42 53 at the rollers 21 22. In consequence of its lengthwise dimensions having been reduced, the speed of travel of the sheet may also be reduced, and for this purpose the relative size of the driver 33 and the driver 35 vary appropriately. The twice-folded sheet is then carried by the tapes 42 53 through the secondary longitudinal folder; but when this folder is adjusted to the position before stated the position of its center with respect to that of the preceding mechanisms is such that the pathway of the sheet will be confined to a movement over the guide 60, which forms one side of the folder, and which is, as will be observed, of sufficient length to receive the whole width of the sheet, as is best seen in Fig. 6. From this it follows that said secondary longitudinal folder in this case acts simply as a carrier or turner, and this for the reason that the pathway of the sheet is such that no part of the sheet goes over the apex or folding-point of said secondary longitudinal folder. The twice-folded sheet will then be led from the external turners, 80 90, and delivered still in its twice-folded condition, as in Fig. 10, in like manner as will be the case when the secondary longitudinal folder operates as a folder, which will presently be explained.

When the secondary longitudinal folder and its adjuncts are adjusted in the positions shown in Figs. 4, 5, and 7, they will be in such position as to cause the center of the twice-folded sheet to pass over the apex or folding-point of the secondary longitudinal folder, as is best shown in Fig. 7. The result will therefore be that when the twice-folded sheet passes over the internal guides, 60 70, and between the external turners, 80 90, it will receive a third fold parallel with its first fold and at right angles to its second fold, as in Fig. 13. The sheets as they leave the secondary longitudinal folder, whether folded thereby, as in Fig 13, or not, as in Fig. 10, have their leading edges seized by the fingers 83, whereby they are clamped onto the cylinder 51, and as this cylinder revolves said fingers will, as they approach the point occupied by the stops 78, be vibrated to release the sheet, which sheet thereupon is free to fall upon the belt 75, and be laid against said stops, as shown in Fig. 5.

By considering Figs. 6 and 7 it will be per-

ceived that the invention will be involved if the rotary transverse folding mechanism be entirely omitted. Thus the web, after being centrally folded in passing the primary longitudinal folder, as in Figs. 8 and 11, may be led directly from the external turners, 40 50, to the secondary longitudinal folder, and the latter may be adjusted, as in Fig. 6, so that it will guide or turn the once-folded web onward to the cylinder 51 without imparting another fold to said web; or the secondary folder may be adjusted, as in Fig. 7, so that the once-folded web in passing through the same will receive a second fold parallel with the first fold. In such an apparatus, however, it will be necessary either to provide the cylinder 51 with cutting mechanism, to divide the web into appropriate sheets, in which case neither longitudinal folder need be taped, or to tape both longitudinal folders and perform the cutting operation in the printing-machine; or, if the primary longitudinal folder be without tapes and the secondary longitudinal folder be taped, then a cutting mechanism would be interposed between them.

The invention will also be involved if the primary folding mechanism be entirely omitted, or if it be of any known type. Thus, assuming the primary longitudinal folder to be omitted and a folding mechanism—as the rotary one shown—to be used for imparting the primary fold, in that case the adjustment of what is here called the "secondary longitudinal folder" will operate to impart a fold to the sheet passed through it, or omit such fold, as may be desired. So, too, there may be introduced between said adjustable folding mechanism (what is called the "secondary longitudinal folder") and whatever piling mechanism is used, one or more folding mechanisms, in which instance, as in all other cases, the function of the adjustable folding mechanism will be to impart a fold or not, according to the requirements and its position of adjustment. The folder interposed between the primary and secondary longitudinal folders may be of any known type. It will also be seen that by adjusting the secondary longitudinal folder to positions intermediate of those shown in Figs. 6 and 7, the web or sheet may be folded at one side of its center line, or a web or sheet of less than full width may be folded centrally.

It is to be remarked that when two longitudinal folders are combined, as shown in the present case, and are arranged to act successively upon the web or sheet, either with or without an interposed transverse folder, the results herein described may be attained by adjusting the first folder longitudinally or forward and back, instead of by adjusting the second folder laterally or sidewise, as herein shown, and such an arrangement is to be considered as, in a broad sense, embraced within the present invention. An organization of such a character will, however, be specifically claimed in a future application.

By these improvements a folding delivery apparatus is capacitated by means of a unitary set of mechanisms to impart a given number of folds to a sheet, or to omit one of said folds by mere adjustment, and without requiring putting into operation what may be termed an "extra set" of sheet folding and piling mechanisms, as has heretofore been required when an apparatus is fitted to produce folded sheets in two or more forms.

What therefore is claimed is—

1. In a delivery apparatus, a longitudinal folder which is made adjustable or capable of being moved to different positions with relation to the preceding mechanisms, so that it can be caused to receive the sheet or web in such position that it will be folded in passing through the folder, or in such position that it will be simply guided or turned over one of the sides or internal guides of the folder without being folded, all substantially as described.

2. In a delivery apparatus, a longitudinal folder having one of its sides or internal guides of sufficient length to receive the full width of the web or sheet presented to the folder, and which is made adjustable or capable of being moved to different positions with relation to the preceding mechanisms, so that it can be caused to receive the sheet or web in such position that it will be folded in passing through the folder, or in such position that it will be simply guided or turned over one of the sides or internal guides of the folder without being folded, all substantially as described.

3. The combination, with a longitudinal folder which is adjustable or capable of being moved to different positions with relation to the preceding mechanisms, of a sheet-piling mechanism which is made adjustable to correspond with or conform to the position of the folder, all substantially as described.

4. The combination of two folding mechanisms arranged to act upon the web or sheet in succession, and the second of which mechanisms is a longitudinal folder, said mechanisms being adjustable with relation to each other, so that the web or sheet may be received by the second mechanism in position to be folded thereby, or in position to be simply guided by it without being folded, all substantially as described.

5. The combination, with a folding mechanism arranged to impart a fold to a web or sheet, of a secondary folding mechanism consisting of a longitudinal folder which is adjustable, so that the web or sheet may be received by it in position to be folded, or in position to be simply guided by it without being folded, all substantially as described.

6. The combination of two longitudinal folders arranged to act upon the web or sheet in succession, said folders being adjustable with relation to each other, so that the web or sheet may be received by the second in position to be folded thereby, or in position to be simply guided by it without being folded, all substantially as described.

7. The combination of two longitudinal folders arranged to act upon the web or sheet in succession, the second of said folders being adjustable, so that the web or sheet may be received by it in position to be folded, or in position to be simply guided by it without being folded, all substantially as described.

8. The combination of two longitudinal folders and an interposed folding mechanism, the three being arranged to operate upon the web or sheet in succession, and said longitudinal folders being adjustable with relation to each other, so that the web or sheet may be received by the second of said folders in position to be folded thereby, or in position to be simply guided by it without being folded, all substantially as described.

9. The combination of two longitudinal folders and an interposed folding mechanism, the three being arranged to operate upon the web or sheet in succession, and the second of said longitudinal folders being adjustable with relation to the other, so that the web or sheet may be received by it in position to be folded, or in position to be simply guided by it without being folded, all substantially as described.

10. The combination, with a stationary folding mechanism, of a folding mechanism mounted in a movable frame-work, whereby the position of the latter mechanism with respect to the former may be adjusted to operate as a guiding or folding mechanism, substantially as described.

11. The combination, with a stationary folding mechanism, of a longitudinal folding mechanism and a sheet-piling mechanism, both mounted in a movable frame, whereby while their corelation is maintained their position with respect to the other folding mechanism may be adjusted so as to guide and deliver or fold and deliver, 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,
J. A. HOVEY.