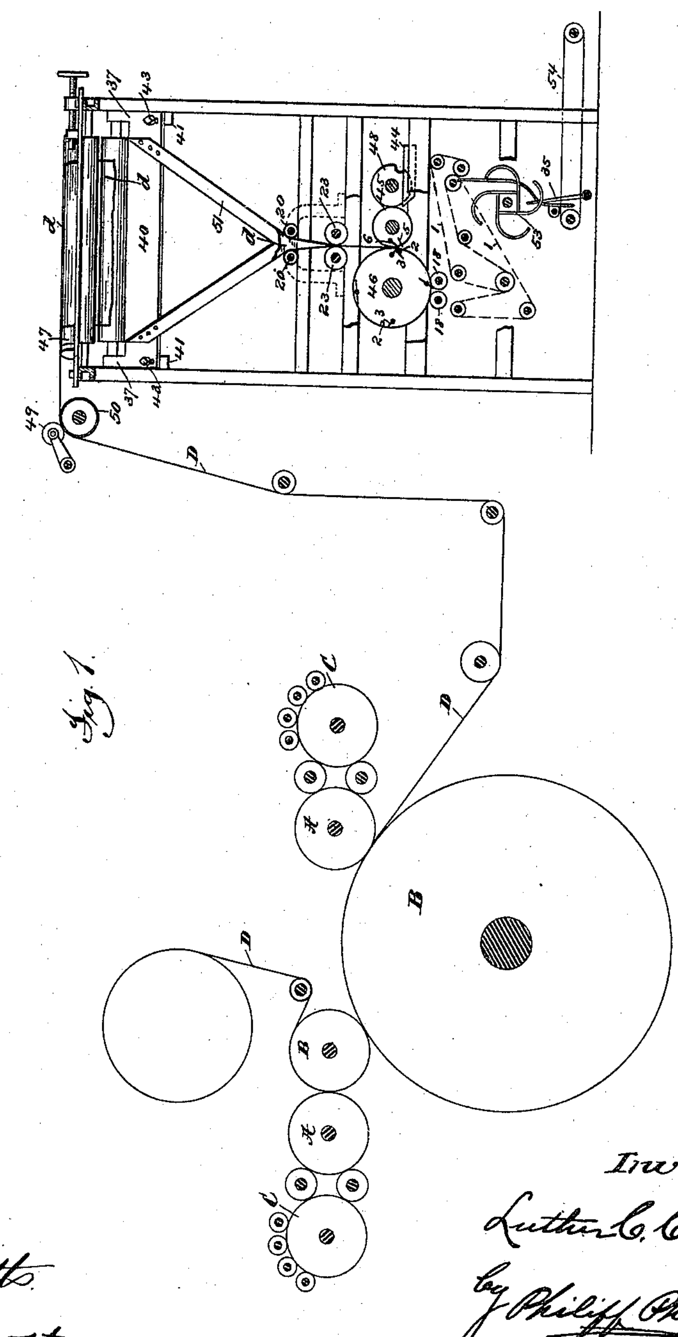
(No Model.)

6 Sheets—Sheet 1.

L. C. CROWELL.

DELIVERY MECHANISM FOR PRINTING MACHINES.

No. 383,800. Patented May 29, 1888.



Attest

Geo. H. Botts.

G. M. Borst.

Inventor:

Luther C. Crowell,

by Philipp, Phelps & Sawyer

Attys.

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 6 Sheets—Sheet 2.

L. C. CROWELL.

DELIVERY MECHANISM FOR PRINTING MACHINES.

No. 383,800. Patented May 29, 1888.

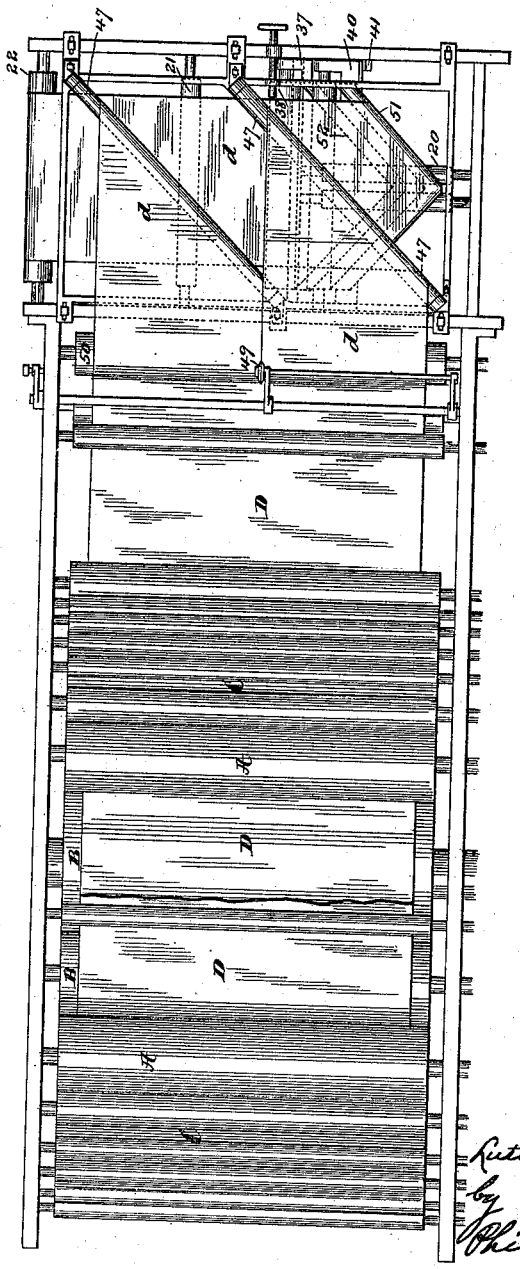


Fig. 2.

Attest:
Geo. H. Botts.
G. M. Bond.

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by Philipp Phelps & Hovey
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(No Model.) 6 Sheets—Sheet 3.

L. C. CROWELL.

DELIVERY MECHANISM FOR PRINTING MACHINES.

No. 383,800. Patented May 29, 1888.

Fig. 2.

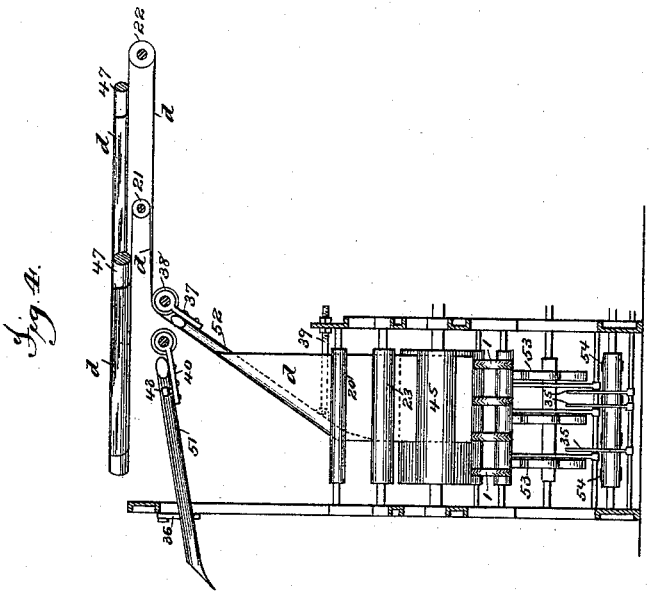
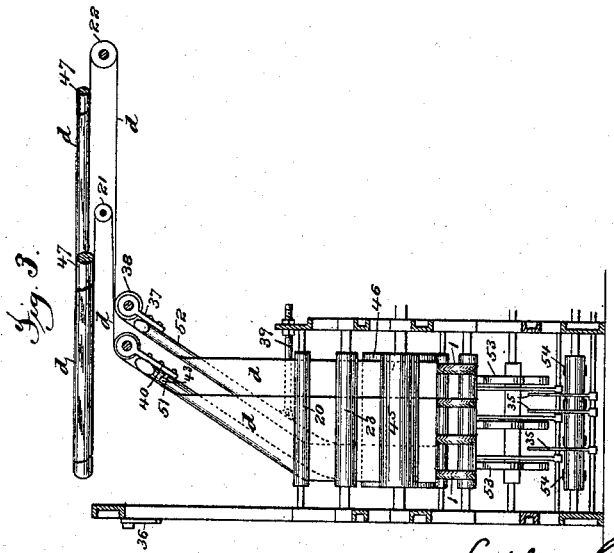


Fig. 3.



Attest:
Geo. H. Bolte.
H. M. Borst.

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by J. Philipp Philipp & Honey.
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(No Model.) 6 Sheets—Sheet 4.

L. C. CROWELL.

DELIVERY MECHANISM FOR PRINTING MACHINES.

No. 383,800. Patented May 29, 1888.

Fig 5.

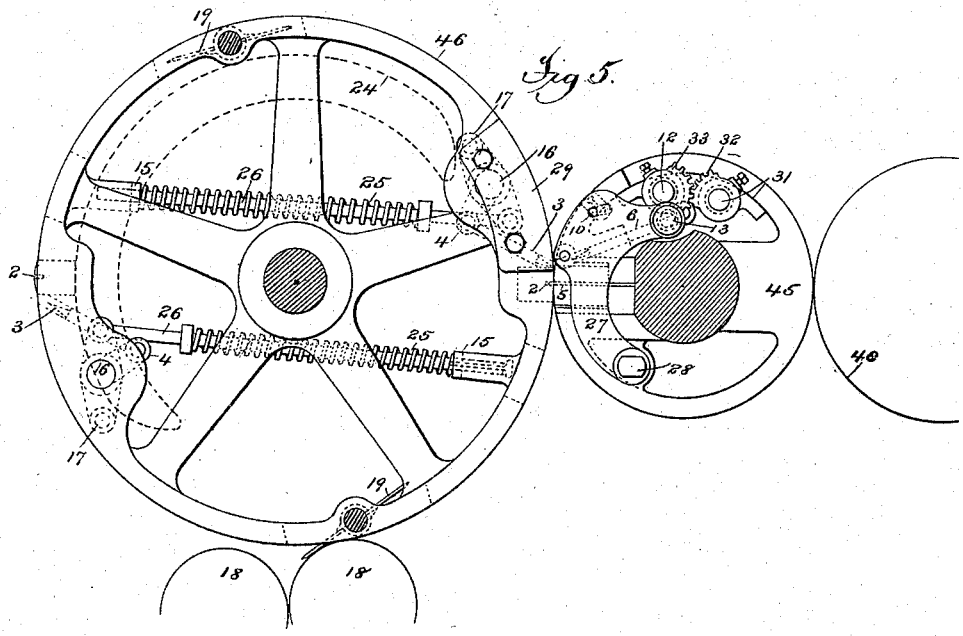
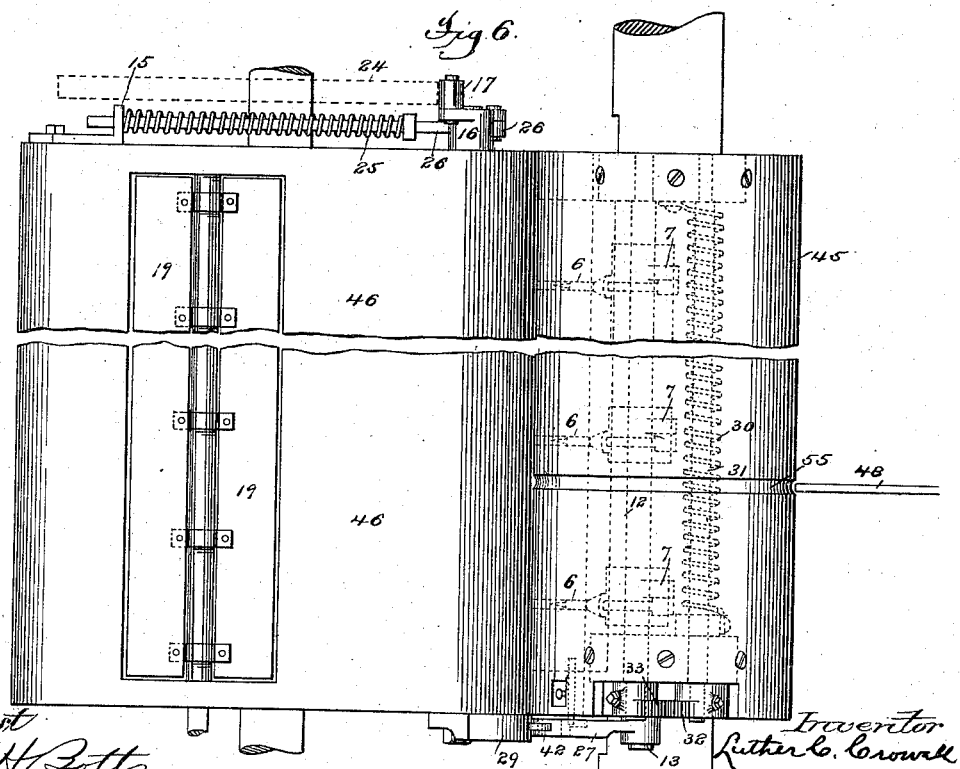


Fig 6.



Attest
Geo. H. Bott.
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Attys

(No Model.) 6 Sheets—Sheet 5.

L. C. CROWELL.

DELIVERY MECHANISM FOR PRINTING MACHINES.

No. 383,800. Patented May 29, 1888.

Fig. 7.

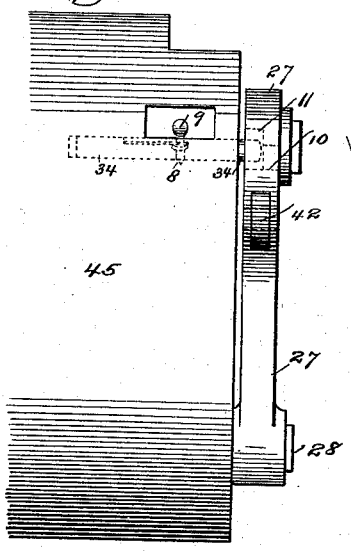


Fig. 8.

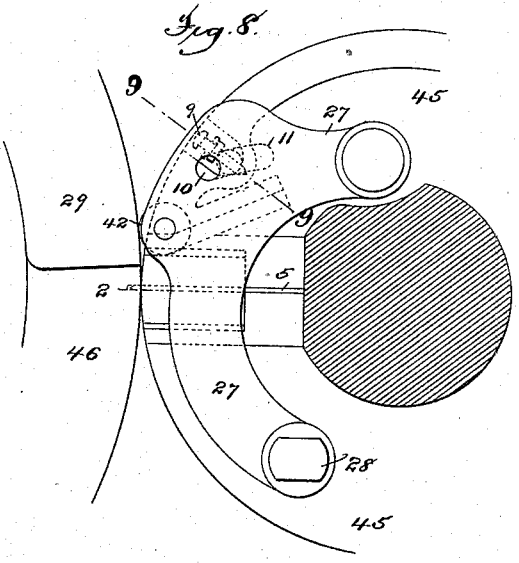


Fig. 9.

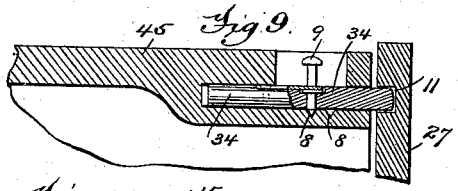


Fig. 10.

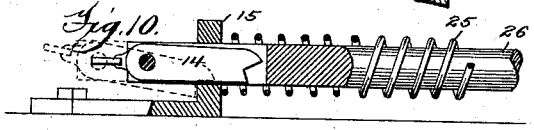
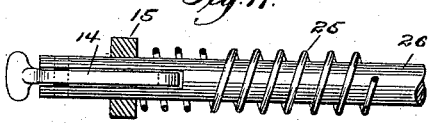


Fig. 11.



Attest:
Geo. H. Botts.
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(No Model.) 6 Sheets—Sheet 6.

L. C. CROWELL.

DELIVERY MECHANISM FOR PRINTING MACHINES.

No. 383,800. Patented May 29, 1888.

Fig. 20.

Fig. 12.

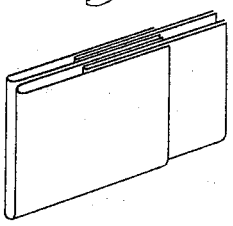


Fig. 13.

Fig. 14.

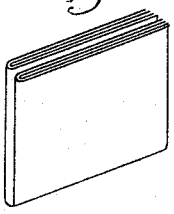


Fig. 15.

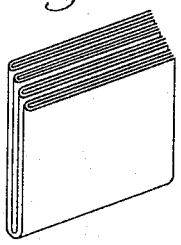


Fig. 16.

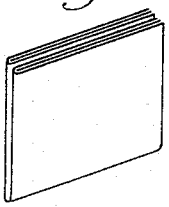


Fig. 17.

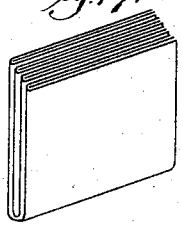


Fig. 18.

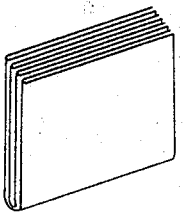
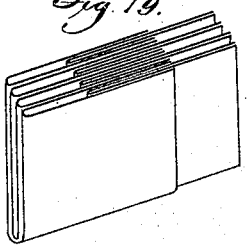


Fig. 19.



Attest:
Geo. H. Botts.
G. M. Borst.

Inventor:
Luther C. Crowell
by Philipp, Philipp & Hoory.
Attys.

UNITED STATES PATENT OFFICE.

LUTHER C. CROWELL, OF BROOKLYN, ASSIGNOR TO ROBERT HOE, PETER S. HOE, STEPHEN D. TUCKER, THEODORE H. MEAD, AND CHARLES W. CARPENTER, ALL OF NEW YORK, N. Y.

DELIVERY MECHANISM FOR PRINTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 383,800, dated May 29, 1888.

Application filed November 10, 1887. Serial No. 254,765. (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 Delivery Mechanism for Printing-Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to a delivery mechanism which is especially designed to be used in connection with a web-printing mechanism which prints upon a plurality of webs, or upon a wide web which is split longitudinally into a plurality of webs after being printed, it being the object of the invention to produce a simplified form of delivery apparatus by which the plurality of webs thus printed can be delivered in products of various sizes or volumes—as, for example, in products composed of one, two, or four sheets.

To this end the invention consists, principally, in a novel arrangement of a plurality of longitudinal folders with relation to the other parts of the mechanism, whereby the full capacity of the printing mechanism can be utilized in producing single-sheet products without duplicating the entire delivery mechanism.

The invention also embraces certain novel features in relation to the cutting, transverse folding, and sheet-associating mechanism.

As a full understanding of the invention can best be given by an illustration and a detailed description of an organized delivery mechanism embodying the same, all preliminary description will be omitted and a full description given, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional elevation of a delivery mechanism embodying the invention, showing also a diagram of the principal parts of the printing mechanism. In this, as also in the other views of the drawings, the gearing and also many of the minor details of the delivery mechanism are omitted, as such parts can readily be supplied by any ordinary skillful mechanic, and if shown would only tend to create confusion in the drawings. Fig. 2 is a plan view of the same. Fig. 3 is a sectional elevation looking from the right of Figs. 1 and 2. Fig. 4 is a similar view showing the parts in a different position. Fig. 5 is an enlarged end view of the cutting, folding, and associating cylinders. Fig. 6 is a plan view of the same. Figs. 7, 8, 9, 10, and 11 illustrate details, which will be hereinafter referred to, Fig. 9 being a section on the line 9 of Fig. 8; and Figs. 12 to 20 are views showing the different-sized products.

Referring to said drawings, it is to be understood that the printing mechanism therein shown is of substantially the ordinary form, consisting of form-cylinders A, impression-cylinders B, and inking mechanisms represented by the rolls and cylinders C, all of which are arranged in the usual manner, and are of sufficient length to capacitate the machine to operate upon a double-width web. The web D is led from a roll, and after passing between the first form and impression cylinders to be printed on one side is led between the second form and impression cylinders to be printed upon its other side, and passes thence over a roll, 50, where it is operated upon by a slitter, 49, and split into two longitudinal sections or narrow webs, *d*, which narrow webs are then led to the delivery mechanism.

The delivery mechanism as herein illustrated consists of a web-associating mechanism of the ordinary form, consisting of two web-turners, 47, two longitudinal folders, 51 52, a transverse cutting, folding, and associating mechanism composed of two cylinders, 45 46, and a sheet-piling mechanism composed of a rotary S-shaped fly, 59, and a series of slowly-moving tapes or belts, 54. The web-turners 47, composing the web-associating mechanism, are arranged obliquely across the paths of the webs *d*, so that as the two webs are led around their respective turners they are brought one directly beneath the other. The web-turners are adjustable, so that they can be shifted to accommodate webs which vary in width. After being thus superimposed, the two webs are led around rolls 21 22, and pass thence over rolls 38, located at the bases of the longitudinal folders 51 52, and over the folders. The roll 21 is adjustable, so as to vary the travel of one of the webs to secure the proper register. These longitudinal folders as herein shown are of substantially the form and con-

struction illustrated and described in the United States Letters Patent No. 331,280, heretofore granted to me. They may, however, be of any other suitable form. These folders are arranged one a short distance in advance of the other and in line, so that the same external turners, 20, co-operate with both folders, and so that both webs pass between the same fold-laying rolls, 23, partially inset one within the other. The purpose of this will be made clear when the operation of the apparatus is explained. The rear folder, 52, is supported in substantially the usual manner, its base being supported by arms 37, loosely mounted on bushings of the shaft of the roll 38 at the base of the folder and its point by an adjustable rod, 39, extending from the frame of the machine. The forward folder, 51, is supported only at its base, and in order to give it the necessary rigidity the arms 37, which extend from bushings of the shaft of the roll 38 at its base, are connected by a wide bar, 40, which rests upon cleats 41, and to which the base of the folder is secured. This permits the folder 51 to be swung up to a substantially horizontal position when desired. For the purpose of adjustment the bar 40 is provided with adjusting-screws, 43, which bear upon the cleats 41.

From the fold-laying rolls 23 the two longitudinally-folded and partially-inset webs pass to the transverse cutting, folding, and associating cylinders 45 46. The cylinder 46 is of a circumference equal to the length of two of the sheets to be produced, and is provided at opposite points with two cutting-grooves, 2, and at the proper points between these grooves with a pair of rotary folding-blades, 19, which latter operate in the usual manner to fold the sheets from the cylinder into the bite of a pair of folding-rolls, 18. The cylinder 46 is provided with two sets of sheet-holding pins, 3, which are located just in the rear of the cutting-grooves 2. These pins pass through openings in the periphery of the cylinder and are pivoted upon the ends of arms 4, extending from rock-shafts 16, journaled in the head of the cylinder and provided with arms 17, having studs or bowls, which engage with a stationary cam, 24, in such manner as to retract the pins within the periphery of cylinder at the proper times. The pins are normally held in their protruded position by means of springs 25, which act upon rods 26, which are pivoted to arms extending from the rock-shafts 16 and pass through guides 15 upon the cylinder-head. In order to hold one set of the pins permanently in their retracted position, which will sometimes be necessary, as will be hereinafter explained, the rod 26 of that set of pins is provided at its end with a latch, 14, (see Figs. 10 and 11,) which is pivoted in a slot in the end of the rod, and is so formed that when the spring 25 is compressed slightly beyond the position to which it is compressed by the cam 24 the latch will drop and engage with the guide 15, as shown by dotted lines in Fig. 10, and thus hold the pins permanently in their retracted position. When, however, the pins are retracted by the action of the cam 24, the shoulder of the latch 14 is not quite withdrawn from the guide 15, and consequently the latch does not engage with the guide.

The cylinder 45 is preferably of a circumference slightly less than one-half the circumference of the cylinder 46 and is provided with a cutting-blade, 5, which is arranged to co-operate with the grooves 2 in such manner as to sever a sheet from each web at each revolution of the cylinder 45, or at each half-revolution of the cylinder 46. This cutting-blade is of an ordinary form, and requires no specific description. The cylinder 45 is provided with one set of impaling-pins, 6, which are located just in the rear of the blade 5. The pins 6, like the pins 3, pass through openings in the periphery of the cylinder, and are pivoted to arms 7, extending from a rock-shaft, 12, which is journaled in the cylinder-heads, and is provided with an arm, 13, to which is pivoted a cam-lever, 27, the opposite end of which is fulcrumed upon the head of the cylinder, as shown at 28, the pivoted connection with the arm 13 being such as to allow a slight amount of play. The cylinder 46 is provided upon one end with a cam projection, 29, which is so arranged that at each alternate revolution of the cylinder 45 it will engage with the projection of the cam-lever 27, and thereby rock the shaft 12, so as to retract the pins 6 within the periphery of the cylinder. The parts are so positioned that this retraction of the pins 6 will take place at or immediately after the time when the cutting-blade 5 co-operates with one of the grooves 2 to sever the sheets from the webs. To reduce the wear of the cam projection 29 and the cam-lever 27, the latter may be provided with an anti-friction rod, 42. The pins 6 are normally held in their protruded position by means of a spring, 30, arranged to act upon a shaft, 31, having a segment, 32, which engages with a corresponding segment, 33, upon the shaft 12. To limit the extent to which the pins 6 will be protruded by the spring 30, the cam-lever 27 is provided upon its inner face with a recess, 11, into which projects a sliding bolt, 34, which rests in a recess in the head of the cylinder 45. (See Figs. 7, 8, and 9.) The recess 11 is of such length as to arrest the lever 27 at the proper point to prevent the pins from being protruded too far.

It will sometimes be necessary, as will be hereinafter explained, to maintain the pins 6 permanently in their retracted position. To enable this to be done, the cam-lever 27 is provided at the outer end of the recess 11 with an opening, 10, through which the bolt 34 can be passed, so as to lock and hold the lever in its innermost position. The bolt 34 is provided with a spring-pressed locking-pin, 9, which engages with recesses 8, so as to hold the bolt 34 in either position to which it is moved.

The delivery mechanism thus organized is capacitated by slightly different adjustment to deliver the full capacity of the printing mech-

anism either in the form of one, two, or four sheet products folded once longitudinally and once transversely, or three-fourths the full capacity of the printing mechanism in products consisting of one full and one half sheet or two full and two half sheets folded to the same dimensions.

The operation of the mechanism in delivering these different products is as follows: If it is desired to utilize the full capacity of the printing mechanism in producing four-page papers—that is to say, papers consisting of one full sheet—the folders 51 52 will both be used, the pins 6 will be rendered inoperative by being retracted, and both sets of the pins 3 will be rendered operative. A full-width web will be used, which, after being printed, will be split, and the two narrow webs thus formed will be led around the turners 47 and to the longitudinal folders, one web passing over each folder, as indicated in Figs. 2 and 3. The distance which the folder 51 is placed in advance of the folder 52 is such that the sides of the web passing over the folder 51 will overlap the sides of the web passing over the other folder, as indicated at Fig. 3, so that as the two webs pass between the fold-laying rolls 23 they will be partially, but not wholly, inset one within the other, as indicated at Fig. 20. In this condition the two webs will pass into the bite of the cylinders 45 46, where the leading ends of the web will be taken by one of the sets of pins 3 and carried around upon the cylinder 46 until the folding-blade 19 arrives in the proper position to fold the sheets between the rolls 18, when the pins will be retracted and the blade operated to fold the sheets between the rolls, and immediately after this the blade 5, co-operating with the groove 2, will sever the sheets, leaving the freshly-severed ends of the web impaled upon the other set of pins 3, and the operation will be repeated. After passing the rolls 18 the sheets emerge in the condition shown in Fig. 12, and will then pass into the control of the tapes 1 and be conveyed to the fly 53, and by it piled upon the slowly-moving tapes 54, in the usual manner. The delivery may also be provided with a counting mechanism, 35, similar to that described in my prior Letters Patent, No. 331,282, which will operate to divide the sheets into lots of any desired number. From this it will be seen that the two single-sheet or four-page products are delivered partially, but not wholly, inset one within the other. If the two sheets or products were fully inset, then the operation of separating them, which of course is necessary, would be slow and difficult; but the sheets not being fully inset it becomes possible to separate them readily and with great rapidity by simply grasping the folded edges of one sheet and the free edges of another and drawing them apart. To do this packs of twenty or more sheets may be taken at the same time. This peculiar manner, however, of delivering the sheets, when single-sheet products are being produced, greatly simplifies the delivery mechanism, as by this means the transverse cutting, folding, and associating mechanism, by being very slightly increased in length, is enabled to operate upon both webs, and thus an extra mechanism of this character is avoided.

If it is desired to utilize the full capacity of the printing-machine in producing two-sheet or eight-page products, the operation may be exactly the same, except that the two webs *d* will be associated and pass over one of the longitudinal folders, as shown in Fig. 4. The two associated webs may be led over either of the longitudinal folders. As here shown, they are led over the rear one of the folders, and in such case the front folder will preferably be so supported, as in the case shown, as to be capable of being swung up to the horizontal position indicated in Fig. 4, in which position it may be fastened by a hook, 36, or other suitable means. When producing this product, the two webs will be fully inset as they pass between the fold-laying rolls 23, as shown in Fig. 13, and the product will be delivered in the form shown in Fig. 14.

When it is desired to utilize the full capacity of the printing-machine in producing products consisting of four sheets or sixteen-page papers, the adjustment and operation will be the same as in producing the two-sheet product just described, except that the pins 6 of the cylinder 45 will be rendered operative, and the set of pins upon the cylinder 46, opposite to the cam projection 29, will be rendered inoperative. As the leading ends of the associated and longitudinally-folded webs arrive at the bite of the cylinders 45 46, they will in this case be taken by the pins 6 and carried around the cylinder 45 until that cylinder has completed a revolution, when the webs will be severed by the blade 5, and at the same time the pins 6 will be retracted. Just before this takes place the pins 3 of the cylinder 46 will take the webs, and also the forward ends of the two sheets, upon the cylinder 45 and carry the forward ends of both of the webs and sheets forward upon the cylinder 46, so that the sheet will become associated with the leading ends of the webs. When the cylinder 46 has made a half-revolution from this point, the blade 5 will again sever the webs, the pins 6 taking the freshly-severed ends, and the blade 19 will be operated to fold them transversely between the rolls 18, the same as before. The product thus produced will consist of two pairs of longitudinally-folded sheets associated and folded transversely together, as indicated in Fig. 15.

To produce products consisting of one full sheet and one half sheet the adjustment and operation will be the same as in producing products consisting of two full sheets, except that the web D will be of three-fourths width, so that one of the webs *d* will be of half-width. The webs *d* will then be associated and folded as indicated in Fig. 16.

To produce products of two full sheets and

two half-sheets, such as shown in Fig. 17, the adjustment and operation will be the same as in the case of the four-sheet product, except that the web D will be of three-fourths width. Products consisting of two full sheets may also be produced by using a web, D, of half-width and operating the cylinders 45 46, the same as in producing the four-sheet product, as shown in Fig. 18, or by using a web, D, of full width, leading one of the webs *d* over each longitudinal folder and operating the cylinders 45 46 in the same manner, as shown in Fig. 19.

Still other variations in the size and form of the products produced and delivered may be obtained by increasing the circumferential capacity of the printing-cylinders and by arranging the mechanism for operating the pins and folding-blades of the cylinders 45 46 so that said cylinders will operate to associate three or more sheets or pairs of sheets. This can readily be done by any ordinarily skillful mechanic if any such range of capacity should be desired in any particular case. Still greater capacity and range in the size of the products may be obtained by using a supplement web in addition to the main web, and such supplement web can be supplied from any supplement-printing mechanism located at the side of the delivery or in any other convenient position. In such case the supplement web will be led into the delivery, so as to be associated with the webs *d*. When a supplement web of half the width of the main web is used, a three-sheet product can be produced by adjusting and operating the delivery mechanism the same as in producing the two-sheet products already described; or a six-sheet product can be produced by adjusting and operating the mechanism the same as in producing the four-sheet product already described.

The cutting, folding, and associating cylinders 45 46 may, if preferred, be arranged at right angles to instead of parallel with the printing-cylinders, and in such case the web-turners 47 will be arranged to act upon only one of the webs *d*, so as to transfer it laterally to bring it over or under the other web. This arrangement of the web-turners is well known in the art, and need not therefore be particularly described.

In producing products shown in Figs. 15, 17, and 18 it may be desired that the sheets or pairs of sheets which are associated after being folded longitudinally should be pasted together along the line of the longitudinal folds. This, if desired, can readily be done by providing a suitable pasting-disk, 48, which runs in a fountain, 44, and is arranged to apply a line of paste to one of the sheets adjacent to the longitudinal fold-line as it is carried around upon the cylinder 45, so that when the two sheets or pairs of sheets are associated upon the cylinder 46 they will be united by this line of paste. The disk 48 is driven in any suitable manner, and is provided with a notch to prevent it from engaging with the cutting-blade 5. The cylinder is also provided with a circumferential groove, 55, to prevent the disk from coming into contact with the cylinder when no sheet is present and thus smearing the cylinder with paste; or the disk 48 may be arranged to move to and from the cylinder.

What I claim is—

1. The combination, in a delivery mechanism, of a plurality of longitudinal folders set one in advance of and partially above another, so as to deliver their folded products inset, substantially as described.

2. The combination, with a transverse cutting mechanism, of a plurality of longitudinal folders arranged one partially beneath another, so as to deliver their folded webs to said cutting mechanism inset, substantially as described.

3. The combination, with a transverse folding mechanism, of a plurality of longitudinal folders arranged one partially beneath another, so as to deliver their folded products to said transverse folding mechanism inset, substantially as described.

4. The combination, with a transverse cutting and folding mechanism, of a plurality of longitudinal folders arranged one partially beneath another, so as to deliver the folded webs to said cutting and folding mechanism inset, substantially as described.

5. The combination, with a transverse cutting mechanism, of a plurality of longitudinal folders arranged one partially beneath another, so as to deliver their folded webs to said cutting mechanism inset, and a web-associating mechanism arranged to associate and deliver the webs to one of said folders, substantially as described.

6. The combination, with the pins 3 and rock-shaft 16, of the rod 26 and spring 25, for protruding the pins, the guide 15, and the latch 14, for holding the pins in their retracted position, substantially as described.

7. The combination, with the pins 6, rock-shaft 12, and segment 33, of the shaft 31, segment 32, and spring 30, for protruding the pins, substantially as described.

8. The combination, with the pins 6 and shaft 12, of the cam-lever 27 and the sliding bolt 34, for holding the pins in their retracted position, substantially as described.

9. The combination, with the pins 6 and shaft 12, of the cam-lever 27, having the recess 11 and opening 10, and the sliding bolt 34, for limiting the movement of the pins and for holding them in their retracted position, substantially as described.

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

LUTHER C. CROWELL.

Witnesses:

GEORGE H. BOTTS,

J. J. KENNEDY.