(No Model.)

4 Sheets—Sheet 1.

L. C. CROWELL.

METHOD OF AND APPARATUS FOR SHEET DELIVERY.

No. 269,186. Patented Dec. 19, 1882.

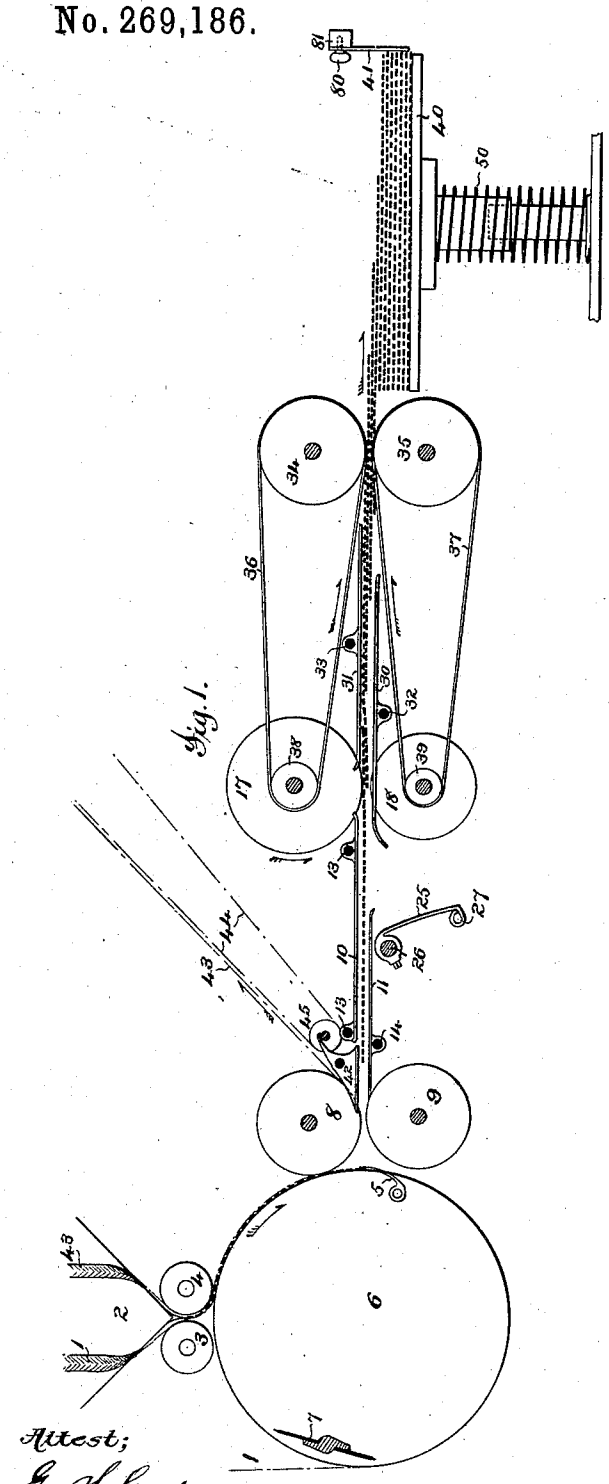


Fig. 1.

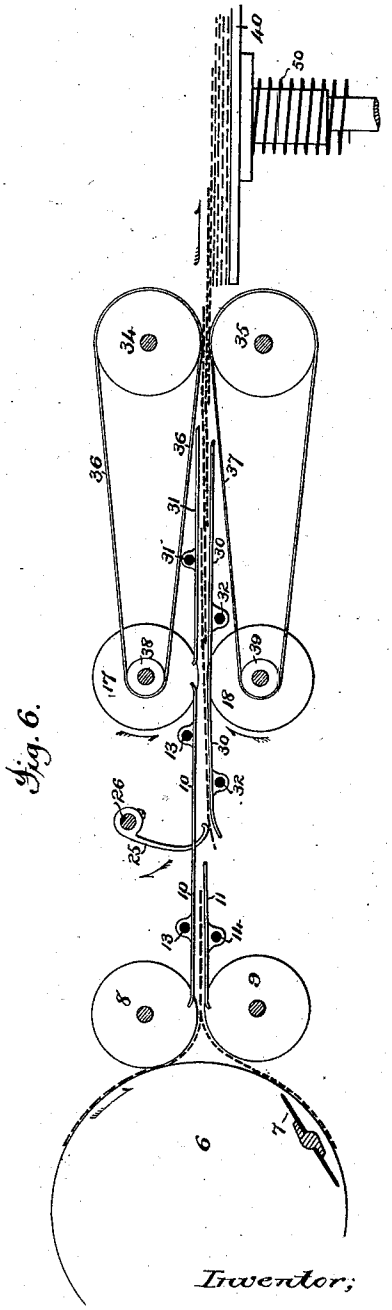


Fig. 6.

Attest;

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by Munson & Philipp

Attys.

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

(No Model.) 4 Sheets—Sheet 2.

L. C. CROWELL.

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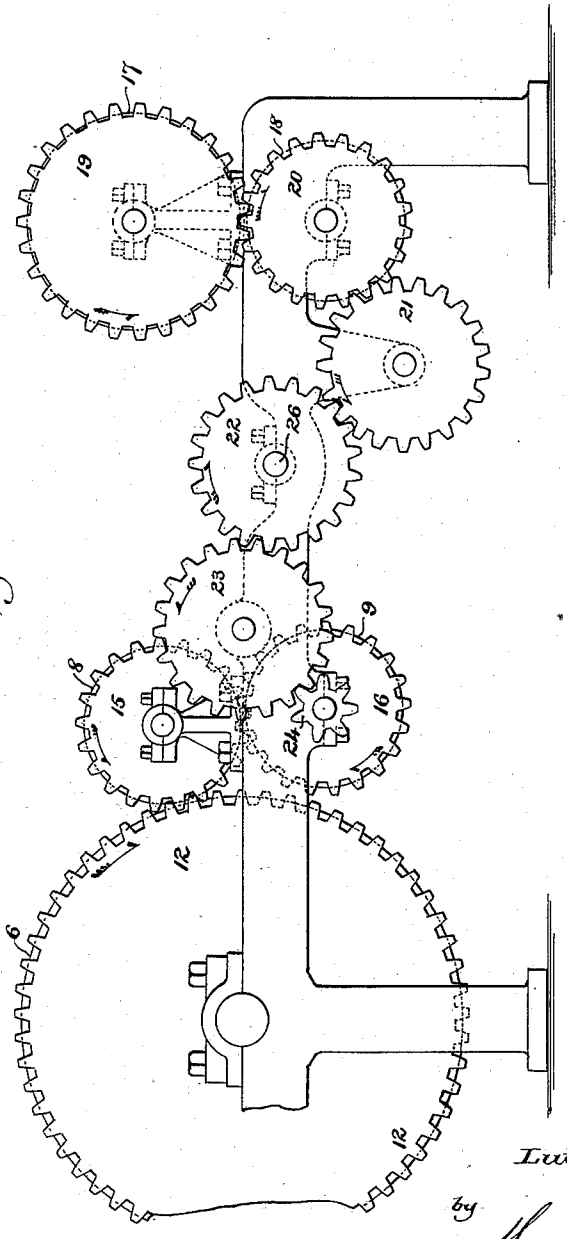


Fig. 2.

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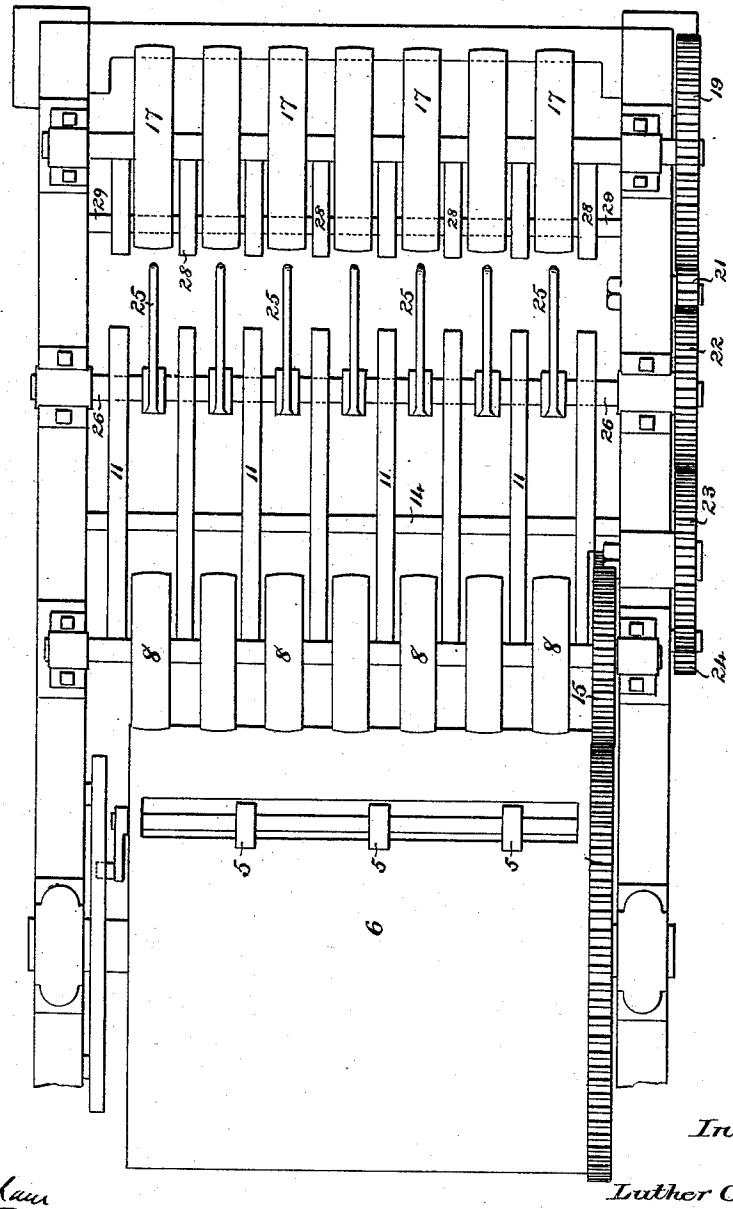
(No Model.) 4 Sheets—Sheet 3.

L. C. CROWELL.

METHOD OF AND APPARATUS FOR SHEET DELIVERY.

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Fig. 3.



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(No Model.) 4 Sheets—Sheet 4.

L. C. CROWELL.

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Fig. 4.

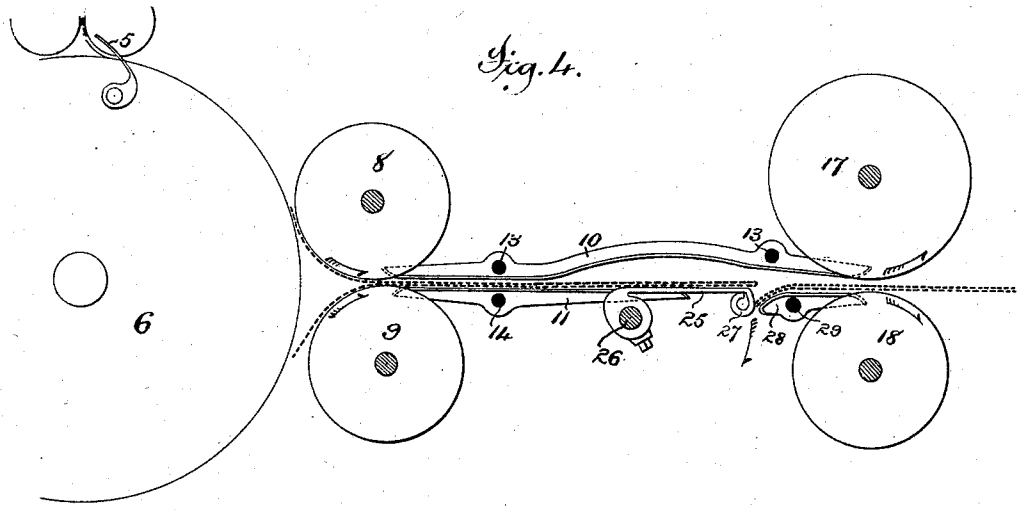
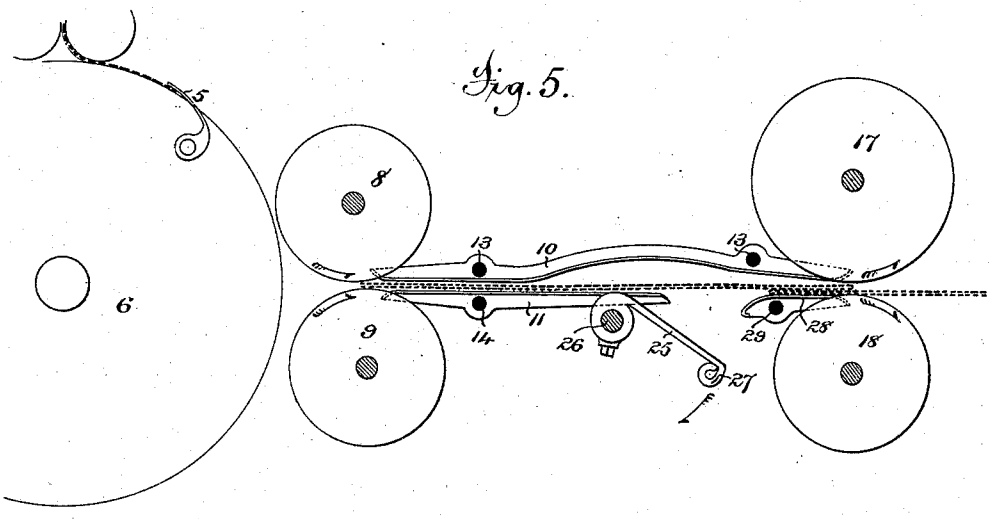


Fig. 5.



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UNITED STATES PATENT OFFICE.

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

METHOD OF AND APPARATUS FOR SHEET-DELIVERY.

SPECIFICATION forming part of Letters Patent No. 269,186, dated December 19, 1882.

Application filed December 19, 1881. (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 Method of and Apparatus for Sheet-Delivery, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

In the printing of newspapers by means of the improved rotary web-perfecting mechanism of the present day great difficulty is experienced, owing to the rapidity with which the printed sheets are produced, in securing their delivery from the machine without injury and in an orderly manner. When by the use of folding mechanism the sheets are reduced to a size or form suitable for mailing this difficulty is to a great extent obviated; but such folding mechanism is expensive, cumbersome, and more or less difficult to manage, besides which it is often more desirable—as, for instance, for transportation in bulk or for street and counter sale—that the sheets should be delivered with a less number of folds, and as the number of folds decreases the difficulty of delivery increases. By the present invention it is designed to effect the orderly and safe delivery of the printed sheets, after they have received one or two folds, by a mechanism compact, simple, and inexpensive, and withal capacitated to receive and dispose of the sheets with as great rapidity as it is possible for them to be produced.

To that end the invention consists of an improved method of effecting the delivery of the printed sheets, and also of certain means by which this method is carried into operation, said means consisting broadly of a conveying mechanism by which as the sheets are led away from the delivery-rolls of the folding mechanism they are caused to overlap each other, which overlapping is made to increase as the sheets advance, until they are brought to rest one above another upon the receiving-table.

It also consists in certain details of construction and combination of parts, all of which will be fully hereinafter explained, and pointed out in the claims.

In said drawings, Figure 1 is a longitudinal vertical section of a mechanism embodying this invention in one of its forms, the gearing and frame-work being removed for the sake of clearness of illustration. Fig. 2 is a side elevation, showing the devices by which the parts are driven. Fig. 3 is a plan view of that portion of the machine shown in Fig. 2. Figs. 4 and 5 are diagrammatic longitudinal vertical sections of Figs. 2 and 3, showing the parts in different positions. Fig. 6 is a diagrammatic section, showing a modification, to be hereinafter referred to.

The web of paper, having been operated upon by the ordinary perfecting printing devices, is severed into short lengths or sheets, which are carried by the tapes 1 43 over the folder 2. The speed of said tapes may be so accelerated that the sheets are separated from each other a sufficient distance (about one-fourth their length in the machine shown) to allow the grippers carried by the folding-cylinder 6 to operate freely. The tape 1 passes between rolls 3 4, around cylinder 6, and back to its starting-point, while the tape 43 passes between rolls 3 4, along cylinder 6, and thence around roll 8, and a roll or pulley (not shown) to its starting-point. These tapes conduct the sheets over the folder 2 of the construction shown in United States Patent No. 233,997, or of any other approved form, by which they are folded longitudinally and delivered between the rolls 3 4 to the grippers 5 of the sheet-carrying cylinder 6.

The grippers 5 are of the usual construction, and are operated by any of the well-known devices, so as to seize and release the sheet at the proper times. The cylinder 6 is also provided with the rotating folding-blade, which may be either double or single, and which is also of the common construction, and is so operated by the usual devices that its edge, or one of its edges, is brought into operative position at each revolution of the cylinder and the sheets taken by the grippers, folded by it between the rolls 8 9, from which it is projected between the upper and lower guides, 10 11, supported upon rods 13 14, extending transversely of the machine.

The carrying-cylinder 6, which is driven by connection with any suitable moving part of

the printing mechanism, has secured to its shaft the gear 12, which engages with gear 15 upon the shaft of roll 8, which latter engages with gear 16 upon the shaft of roll 9, these three gears being of such relative sizes that the three carriers are driven at the same surface speed.

As has been already stated, the sheets as they pass from the folder 2 are shown as separated by spaces equal to about one-fourth their length, and the transverse fold between the rolls 8 9 reduces them to one-half their original length, from which it follows that as the folded sheets emerge from the rolls 8 9 they will, if their speed is not checked, be separated by spaces equal to one and one-half times their folded length.

Located at a distance a trifle less than the length of the transversely-folded sheet from the rolls 8 9 are the feeding-rolls 17 18. The sheet will be advanced by the rolls 8 9 into the bite of the rolls 17 18, and will be fed onward by the latter after being freed from the former. The shafts of rolls 17 18 are provided with engaging gears 19 20, and are driven through the intermediates 21 22 23 from the pinion 24 upon the end of the shaft of roll 9, which pinion is of such size that the surface speed of rolls 17 18 will be but one-third that of rolls 8 9. The result of this is that the sheet is advanced by the rolls 8 9 with a speed equal to that of their surfaces until it reaches and enters the bite of rolls 17 18, at which time it ceases to be acted upon by the former rolls and begins to be advanced by the latter, but at only one-third its previous speed. From this it will be seen that if the second sheet enters and is folded between rolls 8 9, as soon as the first passes from them it will be advanced its entire length and reach rolls 17 18 while two-thirds of the first sheet still projects to the rear of said rolls, and the sheets will overlap two-thirds of their lengths; but, as has already been explained, the fold-line (which after folding becomes its leading end) of the second sheet is separated from the rear end of the first sheet while they are upon the cylinder 6 and folder 2 by a space equal to one and one-half times the length of the sheet after folding, so that after the first sheet leaves rolls 8 9 the second must travel this distance before entering between these rolls. This allows about one-half the length of the first sheet to pass between rolls 17 18 before the second sheet enters between rolls 8 9. The whole of the second sheet must then pass between rolls 8 9 before reaching rolls 17 18, and while it is doing this the first sheet will advance one-third its length between rolls 17 18, so that when the second sheet enters between rolls 17 18 and both begin to travel together they will overlap only one-sixth their lengths.

To insure that the leading end of the second sheet shall pass above the rear end of the first in overlapping, and to prevent the fouling of the sheets, the rotating guide and knocker 25 is provided. This device consists of a series of fingers secured to the shaft 26 of gear 22, and so arranged as to pass in their rotations through the spaces between the guides 10 11. The gear 22 is made of such size that the knocker-shaft makes one revolution to the passage of each sheet. Therefore this shaft is so geared as to revolve in unison with the shaft of cylinder 6, and the shaft 26 is so positioned and timed in its rotations, and the rotating guides or knocker-fingers are of such a length that as they pass upward between the guides 10 11 they will be in the rear of the sheet, and that as they pass downward upon the opposite side of shaft 26 their sides 27 will overlap and strike upon and depress the rear end of the sheet. While the rear of the sheet is thus depressed the leading end of the following sheet passes along the backs of the fingers of the knocker and is guided above the depressed end of the first sheet, so that the ends overlap.

The positions of the parts at the time the overlapping takes place is shown in Fig. 4, in which the upper guide, 10, is shown as being slightly curved, Fig. 5 showing the position of the parts when the overlapped ends have advanced to the bite of the rolls 17 18 and the rear sheet is about to be released from rolls 8 9.

In order to permit the depression of the rear end of the sheet, the under guides 11 terminate a short distance in advance of the shaft 26 of the knocker, leaving the sheet unsupported for a short distance. The sheet may be supported for a short distance in the rear of rolls 17 18 by short guides 28, supported upon the transverse rod 29, as in Figs. 4 and 5, or the under guides 30, to be hereinafter described, may extend to the rear of roll 18 and perform this function. The sheets, having been overlapped, as described, are by the rolls 17 18 fed forward between guides 30 31, supported upon transverse rods 32 33.

Located at a distance a trifle less than the length of a sheet in advance of the rolls 17 18 are the rolls 34 35, into the bite of which the sheets are delivered just as they pass from rolls 17 18. The rolls 34 35 are driven by belts 36 37 from pulleys 38 39 upon the shaft of rolls 17 18, said pulleys being of such a size that the rolls 34 35 have only one-third the surface speed of the rolls 17 18. The result of this is that after the first sheet passes from between rolls 17 18 its speed is again reduced two-thirds, and the second sheet, which continues to be acted upon by rolls 17 18, rapidly advances along the top of the first, so that when the second arrives at the bite of the rolls 34 35 the two will overlap about thirteen-eighteenths. As the first sheet emerges from rolls 34 35 it is projected onto the receiving-table 40, and is brought to rest against the stop 41, the second and succeeding sheets being in like manner projected along the upper surface of the preceding sheets and against the stop.

The piling-table 40 is supported by a spring, 50, arranged, as shown in Fig. 1, so that as the pile of papers increases its weight will gradually press the table downward, so that the top

of the pile will always be about level with the bite of the rolls 34 35.

Instead of being supported by a spring, so as to be lowered by the weight of the pile of papers, the table may be lowered by an automatically-operated pawl-and-ratchet mechanism. Such mechanisms, being in common use for lowering and raising piling and feeding tables, are well known, and need no specific description. The construction shown in Fig. 6 is in all respects similar to that shown in Fig. 1, except that the knocker 25 is placed above instead of below the guides 10 11.

As heretofore stated, the present mechanism is designed and adapted to deliver the printed sheets in a form suitable for carriers or for street or counter sale. When, however, it is desirable to have a machine capacitated to deliver the product of the printing mechanism in either this form or in form suitable for mailing, a switch, 42, may be placed just in advance of rolls 8 9, which can be operated to divert the sheets from between guides 10 11 and direct them into the bite of tapes 43 44, passing around rolls 8 and 45, respectively, by which they will be conducted to a mechanism such as is described in United States Letters Patent No. 244,559, or to any other approved form of folding or folding and wrapping mechanism. When the sheets are directed between tapes 43 44 the pinion 24 should be removed or disconnected from its shaft, so that the mechanism driven by it will be idle.

It is to be remarked that it is not essential that the rolls 34 35 should be driven by the belts 36 37, as shown. They may be driven by a train of gearing connecting them with gear 19 or 20. It will also in most cases be found desirable to so arrange the roll 34 that it will be pressed against roll 35 by springs or other analogous devices, so that it will be slightly yielding, to accommodate itself to the varying thickness of the overlapped papers passing beneath it.

The rolls 8 9, 17 18, and 34 35 may consist of series of pulleys, as shown, or they may be substantially continuous rolls.

Instead of the grippers, as shown, the cylinder 6 may be provided with pins for holding the leading end of the sheet, and this cylinder may be arranged to act as a gathering-cylinder, so that two or more sheets may be associated and then folded between rolls 8 9, in which case the folding-blade will be caused to come into operative position only upon each second or third revolution, according to the number of sheets gathered or associated. When pins are used instead of grippers this cylinder may also be provided with a severing-blade, in which case the web will not be cut into sheets before passing onto the folder 2, but will be severed just in advance of the pins. If in any case the operation is so modified that the relative space between the sheets as they enter the bite of rolls 8 9 is changed, the speed of rolls 17 18 must be correspondingly changed so as to bring the rear ends of the sheets in proper relation to the knocker and to the following sheet.

Instead of the rotating guide and knocker, as 25, arranged, as shown, to depress the rear of the leading sheet, it may be arranged as a vibrating guide and knocker, and operated so as to move upward and raise the leading end of the rear sheet, and thus cause it to be advanced above and overlap the rear end of the first sheet, the upward vibration of the guide being so timed as not to disturb the rear end of the preceding sheet.

The belts 36 37 may serve as guides, in which case the guides 30 31 may be dispensed with.

The stop 41 may be provided with one or more slotted holes, through which set-screws, as 80, may pass for the purpose of an adjustable attachment to the frame 81, so that as the table 40 descends with its accumulation of papers the lowermost ones may be drawn out from under the lower edge of said stop without interfering with the continuity of the accumulating sheets above. The printed web of paper as it issues from the printing mechanism may pass directly to cutting and folding cylinders and receive the first fold transversely between the rolls 8 9; or it may receive two parallel transverse folds by mechanism such as that shown in Letters Patent No. 233,993 before entering the rolls, as 8 9, in which case the position of the shafts of the rotating guide or knocker-fingers with relation to the shafts of rolls 8 9 and 17 18 should be adjusted and timed to correspond to the conditions relative to the speed and size of the sheet, as has been herein set forth.

It is also evident that the shaft supporting the rotary knocker-fingers may be provided with two or more series of knocker-fingers and said shaft have an intermittently-rotative motion, which shall cause a set of knocker-fingers to act upon the rear end of the preceding sheet and serve as a guide to direct the forward end of the following sheet so that it shall overlap the preceding sheet, substantially as herein described, without departing from my invention.

What I claim is—

1. The herein-described method of delivering and piling sheets of material, which consists in overlapping the ends of the sheets, and then, as they are moved forward, retarding or checking the advance sheet or sheets so that the distance overlapped increases, substantially as described.

2. The combination, with a plurality of sheet-feeding mechanisms running at different speeds, so as to retard the sheet as it advances, of means for removing the rear end of the advance sheet from the path of the succeeding sheet to permit the ends to overlap, all substantially as described.

3. The combination, with three sheet-feeding mechanisms running at different speeds, of means for removing the rear end of the ad-

vance sheet from the path of the succeeding sheet to permit the ends to overlap, all substantially as described.

4. The combination, with sheet-feeding mechanism by which the speed of the sheet as it advances is gradually decreased, of means for causing the ends of the successive sheets to overlap, all substantially as described.

5. The combination, with sheet-feeding mechanism by which the speed of the sheet as it advances is gradually decreased and means for causing the ends of the successive sheets to overlap, of sheet-folding mechanism, all substantially as described.

6. The combination of the two pairs of feed-rolls, as 8 9 and 17 18, running at different speeds, with the rotating guide and knocker, as 25, located between them, substantially as described.

7. The combination of the two pairs of feed-rolls, as 8 9 and 17 18, running at different speeds, the rotating guide and knocker, as 25, and transverse folding mechanism, substantially as described.

8. The combination of the three pairs of feed-rolls, as 8 9, 17 18, and 34 35, running at different speeds, the rotating guide and knocker, as 25, and transverse folding mechanism, substantially as described.

9. The combination, with sheet-conveying mechanism in which the ends of the sheets are caused to overlap each other, of the automatically-lowered piling-table, as 40, having stop, as 41, all substantially as described.

10. The herein-described sheet-delivery apparatus, consisting essentially of the three pairs of feed-rolls, as 8 9, 17 18, and 34 35, driven at different speeds, the rotating guide and knocker, as 25, and the automatically-lowered piling-table, as 40, having stop, as 41, 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,
M. B. PHILIPP.