

(No Model.)

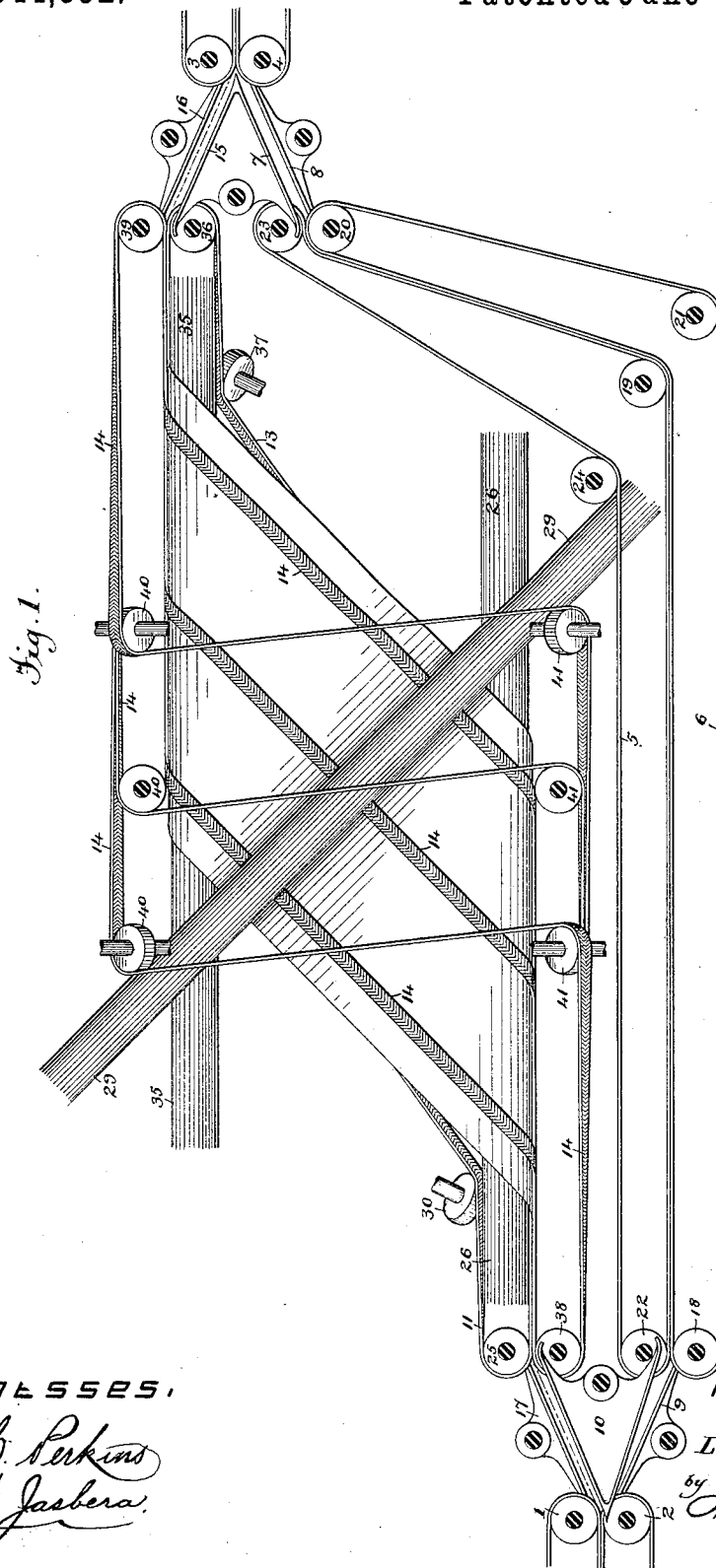
5 Sheets—Sheet 1.

L. C. CROWELL.

# SHEET REVERSING APPARATUS.

No. 344,352.

Patented June 29, 1886.



Witnesses.

C. C. Perkins  
A. N. Jasbera.

*Inventor.*

*L.C. Crowell,*

by Munson & Philo  
Attys.

(No Model.)

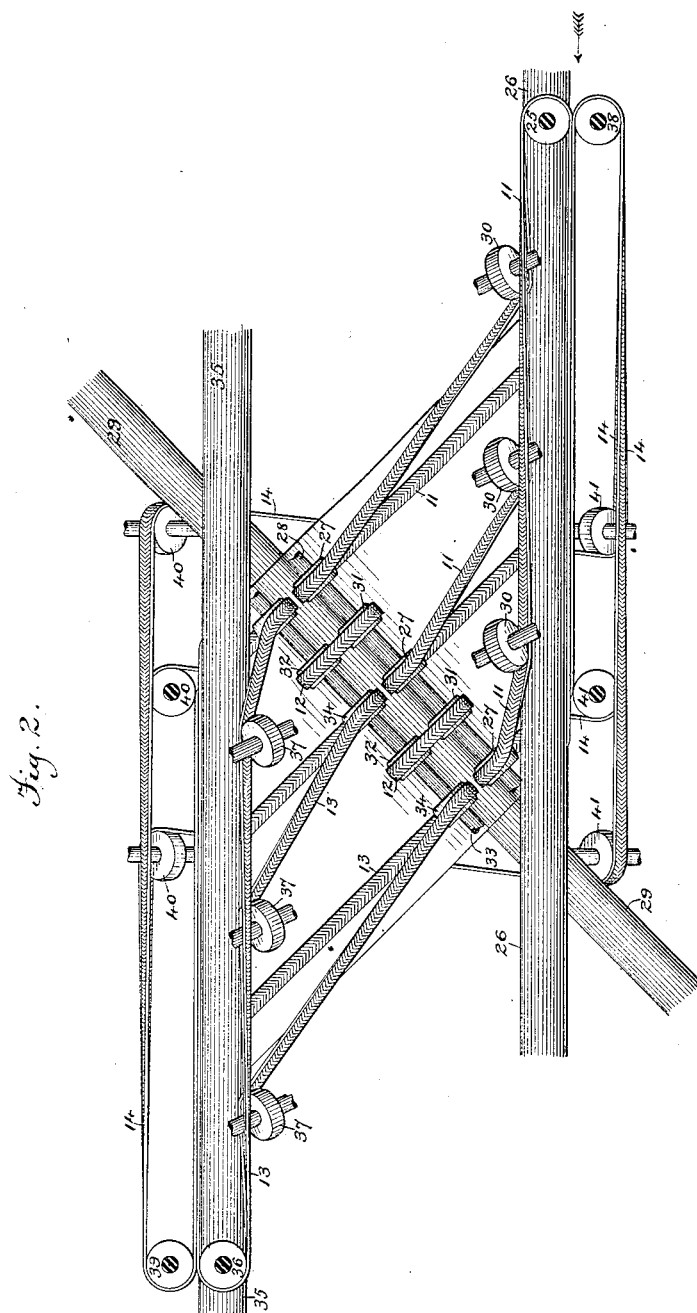
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L. C. CROWELL.

## SHEET REVERSING APPARATUS.

No. 344,352.

Patented June 29, 1886.



Witnesses,

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A. N. Jachera.

*Inventor.*

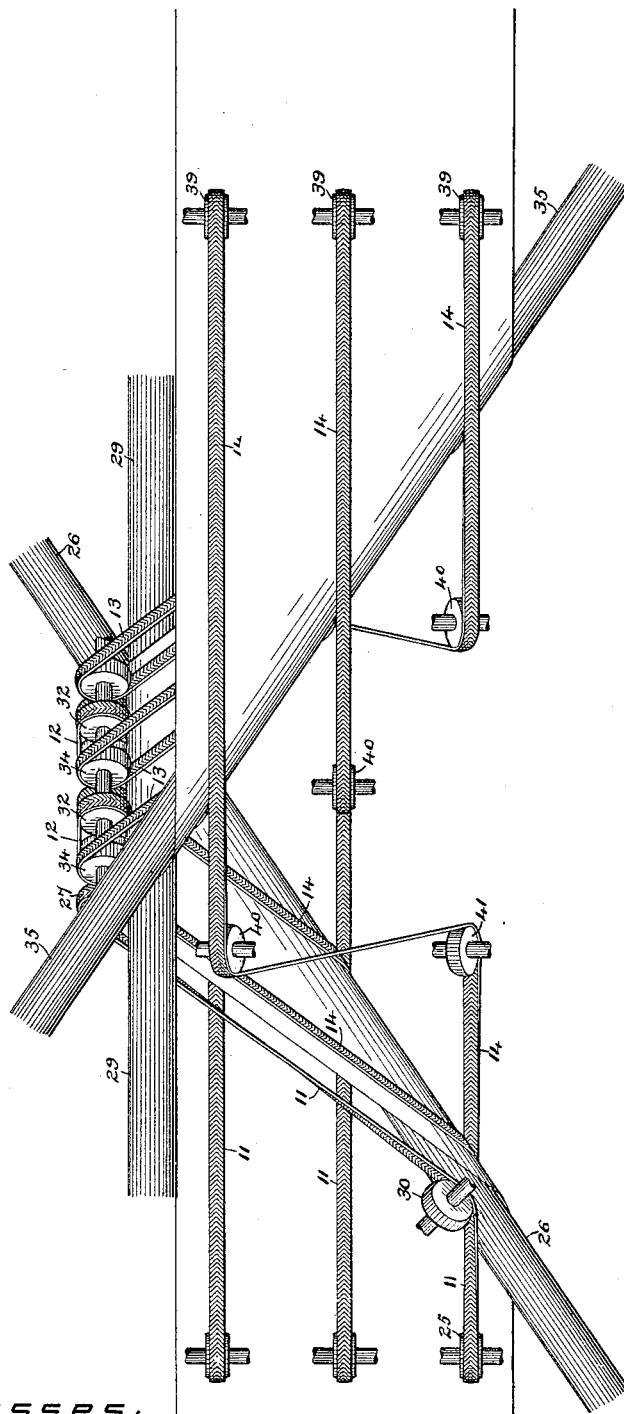
*L. C. Crowell,*  
*by Munson & Philipp*  
*Attys.*

L. C. CROWELL.  
SHEET REVERSING APPARATUS.

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Fig. 3.



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(No Model.)

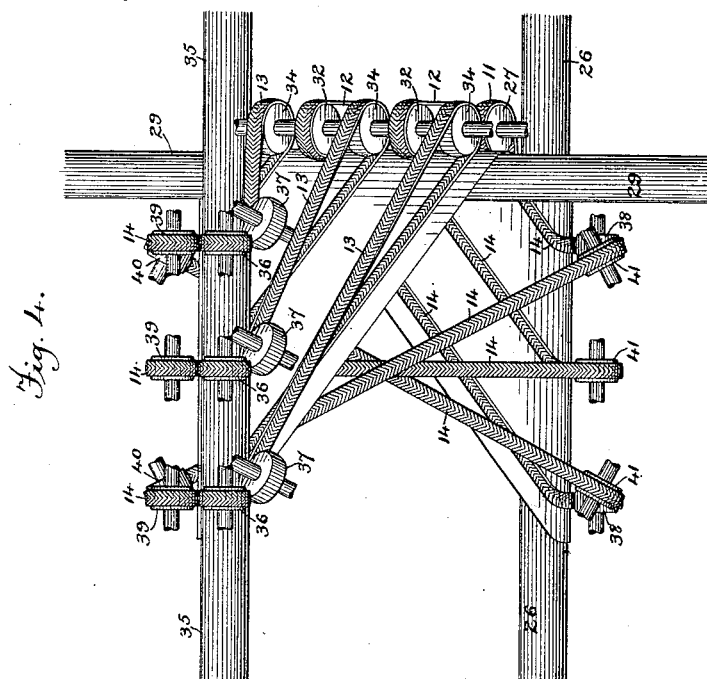
5 Sheets—Sheet 4.

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SHEET REVERSING APPARATUS.

No. 344,352.

Patented June 29, 1886.



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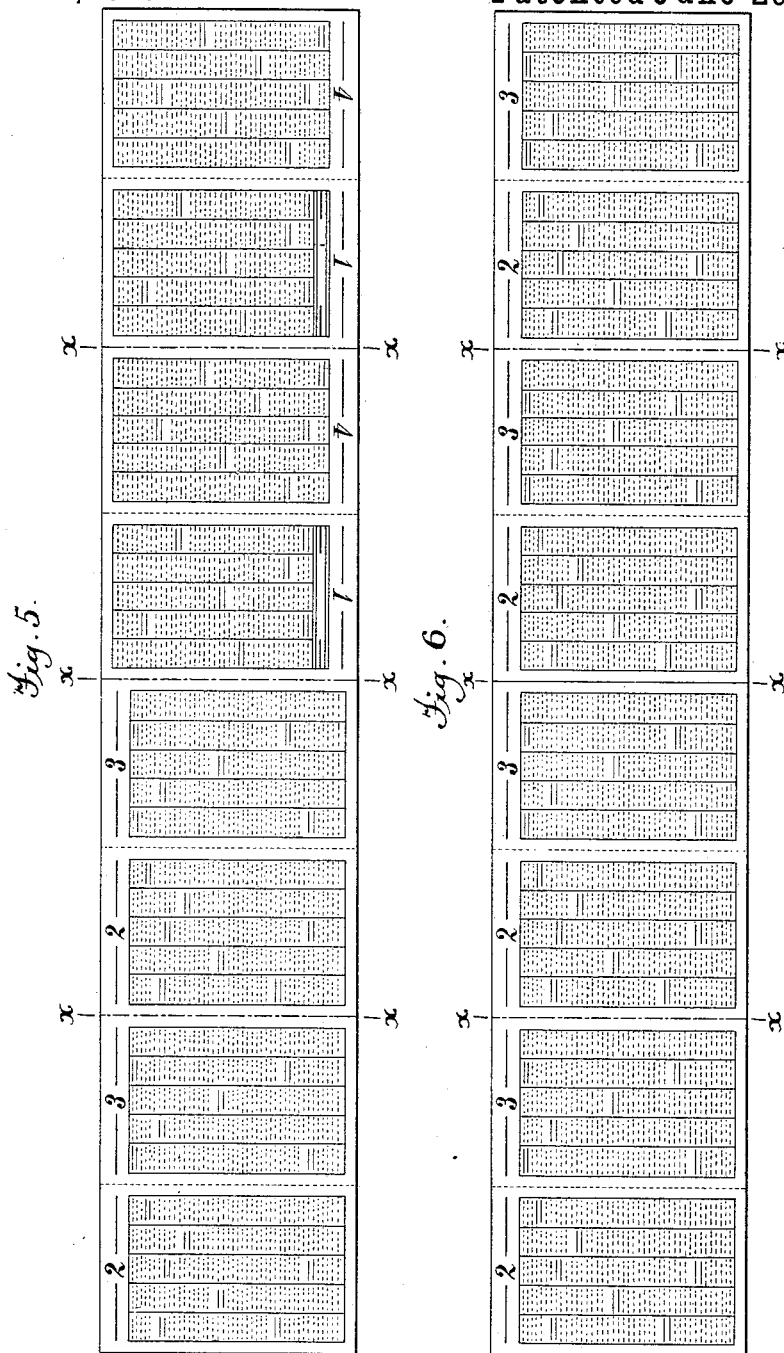
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# UNITED STATES PATENT OFFICE.

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

## SHEET-REVERSING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 344,352, dated June 29, 1886.

Application filed January 20, 1883. Renewed September 2, 1885. Serial No. 176,003. (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 Sheet-Reversing Apparatus, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

10 This invention relates to a delivery apparatus designed especially for use in connection with that class of printing-machines in which the forms for printing both sides of the web are arranged to follow each other in succession around the circumference of a single cylinder, and in which the web, after being printed upon one side, is turned and re-presented to the cylinder, so that both sides of the web receive the same printed

20 pages, but arranged in such order that the outside pages of the sheet upon one side of the web fall opposite the inside pages of the sheet upon the other side of the web, and vice versa.

25 In machines of this class the columns of matter in the forms may lie either longitudinally or circumferentially of the form-cylinder; but in either case, as will readily be seen, only one-half of the sheets severed from the web will have their outside pages uppermost.

30 When the forms for printing both sides of the sheet occupy the whole circumference of the form-cylinder, the alternate sheets will have their outside pages uppermost; but, when the forms occupy less than the whole circumference of the cylinder, which is usually the case when the cylinder is made of sufficient size to carry the forms in type, and additional impression-cylinders are employed, so that each

40 form acts two or more times upon the web at each revolution of the form-cylinders, instead of the alternate sheets bearing different printed matter upon their upper surfaces it is the alternate series of two or more sheets that are

45 so printed. This lack of uniformity in the position of the sheets issuing from the machine makes it necessary, if the sheets are to be flown, to provide two flies acting in opposite directions and means for directing the

50 alternate sheets or series of sheets to said flies,

so that all those having the same printed pages upon their upper surfaces will be delivered to the same fly, or if the sheets are to be folded, to provide two folding mechanisms arranged to fold the alternate sheets or series of sheets in opposite directions. For the sake of economy and compactness in the construction of the machine it is of course desirable to dispense with this extra delivery apparatus and send all of the sheets to a single mechanism, and it is the object of the present invention to provide means by which this can be accomplished.

To this end the invention consists in means arranged, as hereinafter described, by which the alternate sheets or series of sheets severed from the web are reversed, so that all pass to the fly or folding mechanism headed in the same direction and with the same printed pages uppermost.

In the accompanying drawings, Figures 1 and 2 are opposite side elevations of the reversing apparatus. Fig. 3 is a plan view and Fig. 4 a front elevation of the same. Fig. 5 is a diagram showing the order and position of the printed pages upon a web perfected as described; and Fig. 6 is a like view showing the order and position of the printed pages after one-half the sheets have been reversed.

Referring to Figs. 1 and 2, let it be supposed that the web, perfected in the manner illustrated in Fig. 5, has been severed upon the lines *xx* and the sheets separated from each other in their line of travel to provide working-spaces by any approved device for that purpose—as, for instance, the well-known accelerated tapes and pulleys—before they arrive at the bite of pulleys 1 2.

Leading from the pulleys 1 2 to the pulleys 3 4 are two pathways, preferably of equal or substantially equal lengths, the lower of which is formed by the series of tapes 5 6, guides 7 8 9, and the switch 10, the upper being formed by the series of tapes 11 12 13 14, guides 15 16 17, and switch 10. One of these pathways (the lower one, as shown) is so arranged that the sheets passing through it will not be turned or reversed, while the other pathway is provided with a sheet turning or reversing apparatus, consisting, as shown in the present case,

of ordinary turning-bars by which the sheets passing through it are turned over or reversed.

The series of tapes 6 pass around pulleys 18, beneath pulleys 19, around pulleys 20, and return around pulleys 21; while the series 5 pass around pulleys 22, beneath pulleys 19, around pulleys 23, returning around pulleys 24. The series of tapes 11 pass around pulleys 25, beneath an angularly-arranged turning-bar 26, around pulleys 27, mounted upon a shaft, 28, arranged parallel and in close proximity to a second angularly-arranged turning-bar, 29, and return around pulleys 30. The series of tapes 12 pass around pulleys 31, also mounted upon shaft 28, and pulleys 32, mounted upon a shaft, 33, also parallel with and in close proximity to the turning-bar 29. The series of tapes 13 pass around pulleys 34, also upon the shaft 33, over a third angularly-arranged turning-bar, 35, around pulleys 36, returning above pulleys 37. The series of tapes 14 pass around pulleys 38, beneath the bar 26, around the bar 29, above the bar 35, around pulleys 39, returning around pulleys 40 41.

The shafts of the driving-pulleys for the various sets of tapes just enumerated will be connected with each other and with the printing mechanism or other source of power by gearing suitably proportioned to give them the required speed, and the switch 10 will be provided with the usual devices for causing it to oscillate at the proper times.

As the first sheet passes from between the pulleys 1 2 the switch 10 will be operated so as to direct it into the upper pathway, where it will pass forward between the switch and guides 17 into the bite of the tapes 11 14, and will be conveyed by them upward around the bar 26, thence outward to the bar 29, around which it will be conveyed by the tapes 12 14, thence inward and upward around the bar 35, after which it will pass between guides 15 16 into the bite of pulleys 3 4. By following the sheet through the path just described it will be seen that it has been reversed, so that the side bearing pages 4 1, which were uppermost and next the tapes 11 as it entered the path, as shown in Fig. 5, is now, as it leaves the path, underneath and next the tapes 13, as shown in Fig. 6. The second sheet will follow the same course and be in like manner reversed, so as to pass between pulleys 3 4 with its pages 3 2 uppermost. As the third sheet passes from between pulleys 1 2, the switch 10 will have been operated so as to guide this sheet into the lower pathway, where it will pass forward between tapes 5 6 and enter the bite of pulleys 3 4 immediately in the rear of the second sheet, which, as just described, has been reversed, and the fourth sheet will follow the same course, so that all will pass in succession to the fly or to a sub-

sequent folding mechanism in the order shown in Fig. 6. As the fifth sheet passes from between pulleys 1 2, the switch will have been again operated so as to direct this sheet into the upper pathway, where it will be reversed, as just described, and so the operation will be repeated. When the alternate sheets have their outside pages uppermost, the switch will direct the first sheet into the upper pathway, the second into the lower pathway, the third into the upper pathway, and so on, the result being that alternate sheets are reversed and all thus caused to be presented with like pages uppermost to whatever mechanisms are to further operate upon them.

Although it is preferable that the two pathways should be of the same length, in order that the speed of the sheets passing through them may not be changed or varied, yet this is not essential. One of the pathways may be slightly longer than the other, in which case its tapes will be driven at a correspondingly increased speed, so that the sheets will be presented in proper succession to the pulleys 3 4.

If in any case it should be desired to associate two succeeding sheets or sets of sheets, it may be accomplished by simply increasing the length of one of the pathways, so that the two sheets will arrive simultaneously at the exit.

The angular relation of the bars 26 29 35 may be considerably varied from that shown without departing from the invention. They may, for instance, be arranged in either of the ways shown in United States Letters Patent No. 212,444, although, for convenience of tapping, the present arrangement is to be preferred.

What I claim is—

1. The combination, with two pathways leading from a common entrance to a common exit, and means for directing sheets alternately into said pathways, of a turning or reversing apparatus located in one of said pathways, whereby the sheets passing through said pathway are turned over or reversed, all substantially as described.

2. The combination, with moving tapes forming two pathways leading from a common entrance to a common exit, of a switch arranged to control the entrance to said pathways, and turning-bars, as 26 29 35, arranged in one of said pathways and operating to reverse the sheets passing through said pathway without changing the direction of their travel, all substantially as described.

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

LUTHER C. CROWELL.

Witnesses:

J. A. HOVEY,  
T. H. PALMER.