

(No Model.)

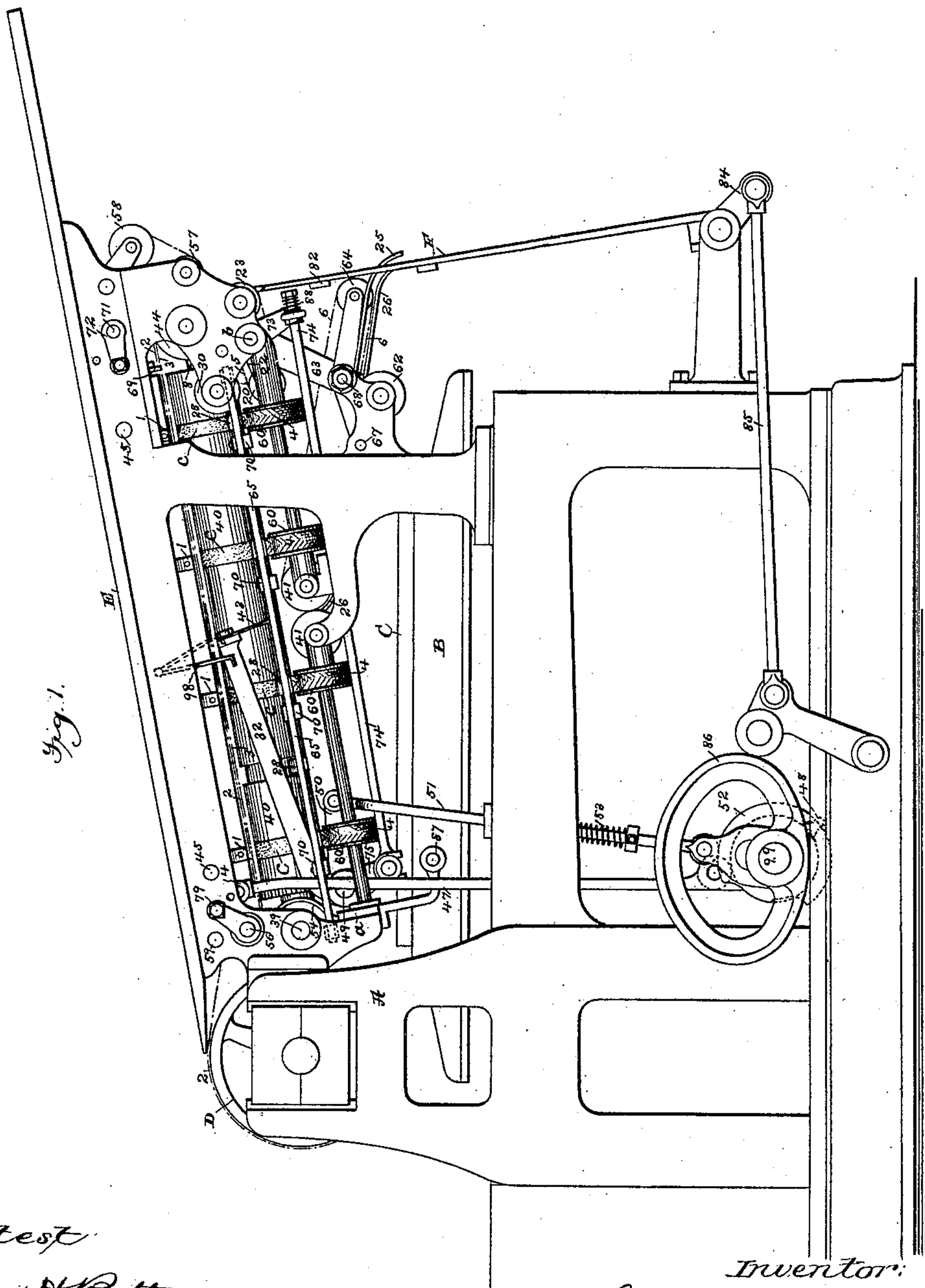
5 Sheets—Sheet 1.

L. C. CROWELL.

COMBINED PRINTING PRESS AND FOLDING MECHANISM.

No. 486,558.

Patented Nov. 22, 1892.



Attest  
Geo. H. Bolls.  
Geo. H. Graham

Inventor:  
Luther C. Crowell,  
by Munroe Philipp,  
Attys:

(No Model.)

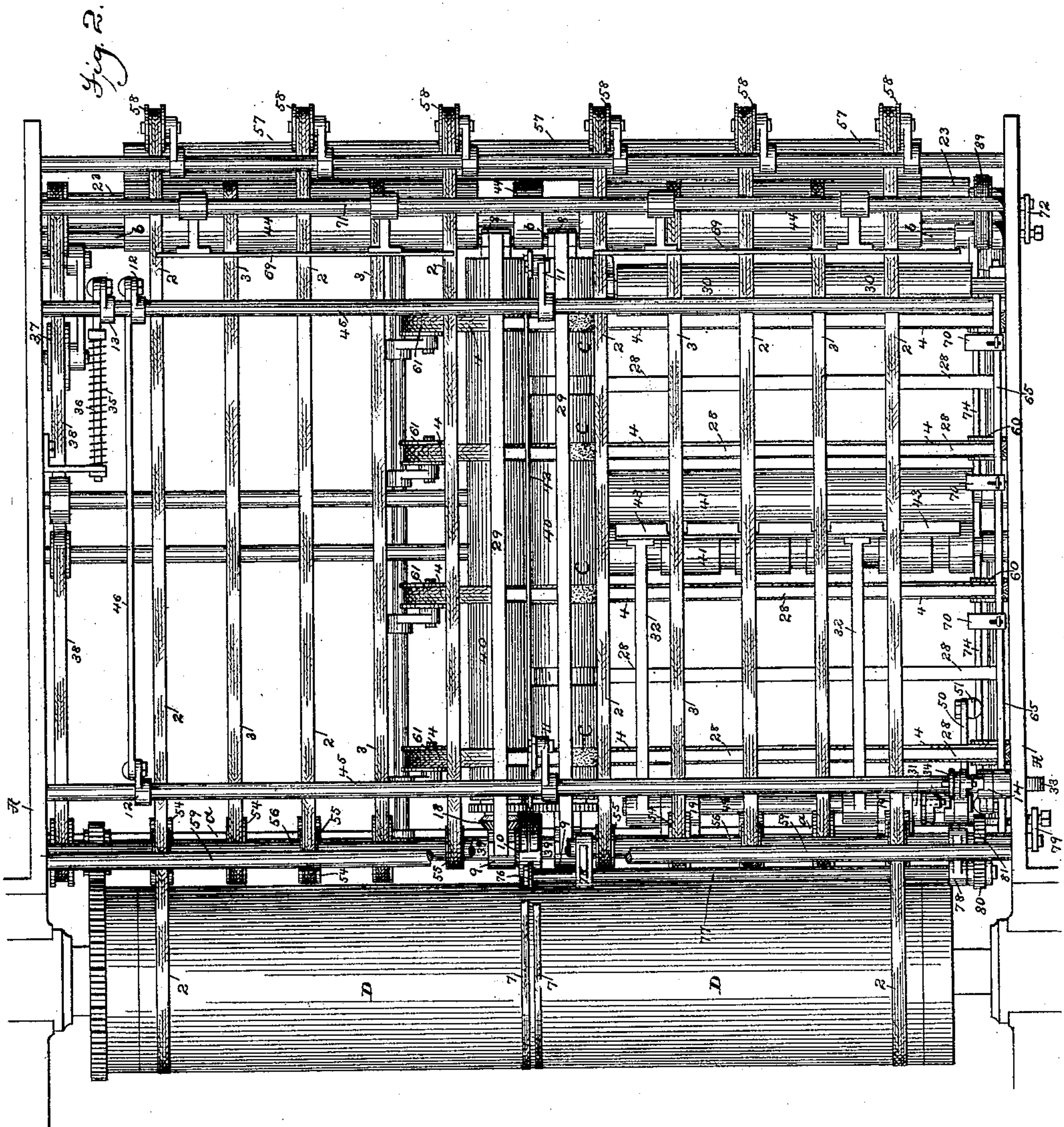
5 Sheets—Sheet 2.

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No. 486,558.

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*Attest:*  
*Geo. H. Bott*  
*Geo. H. Graham*

*Inventor:*  
*Luther C. Crowell*  
*Munroe & Philipp*  
*Attys.*



(No Model.)

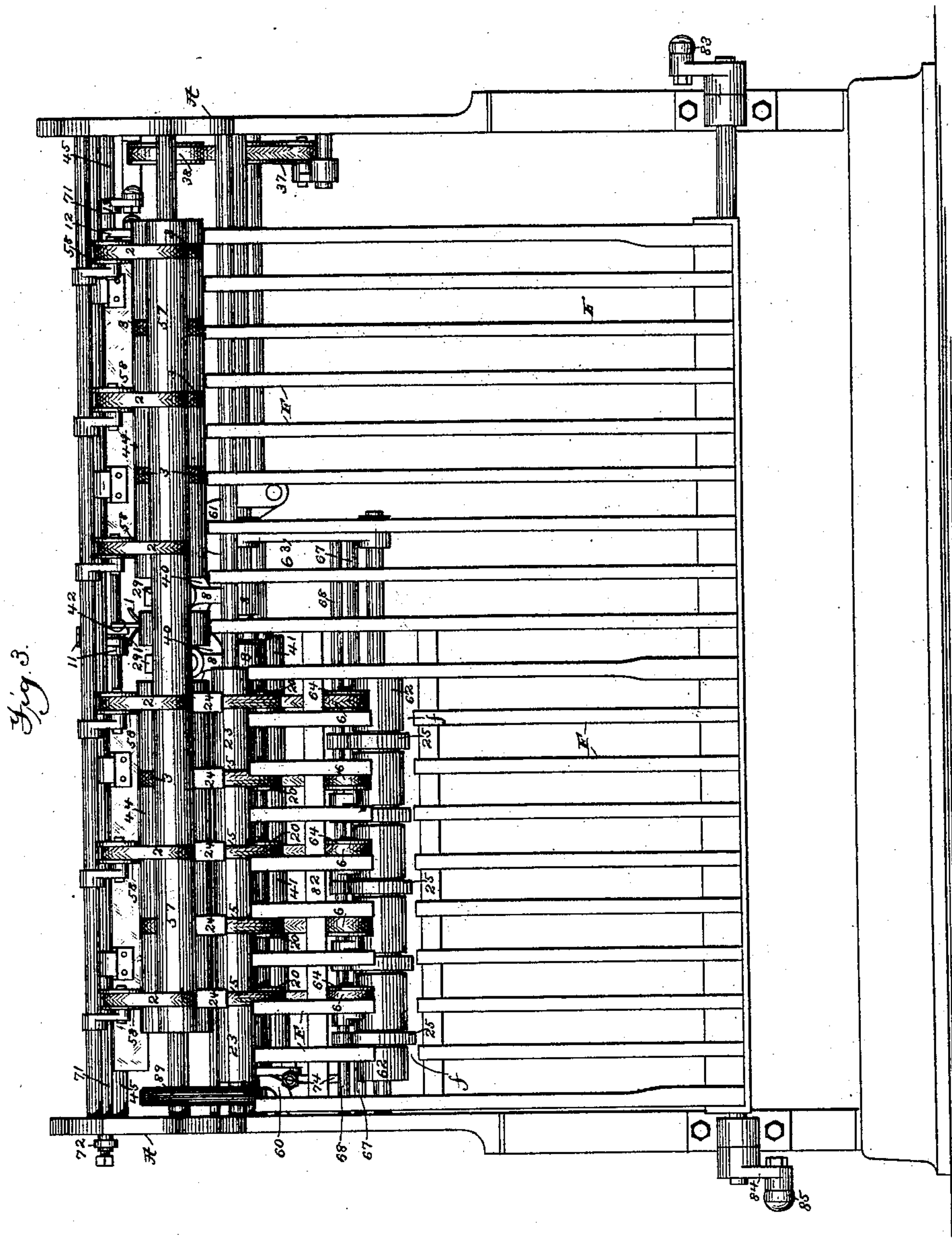
5 Sheets—Sheet 3.

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No. 486,558.

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*Attest:*

*Geo. W. Botts.*

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(No Model.)

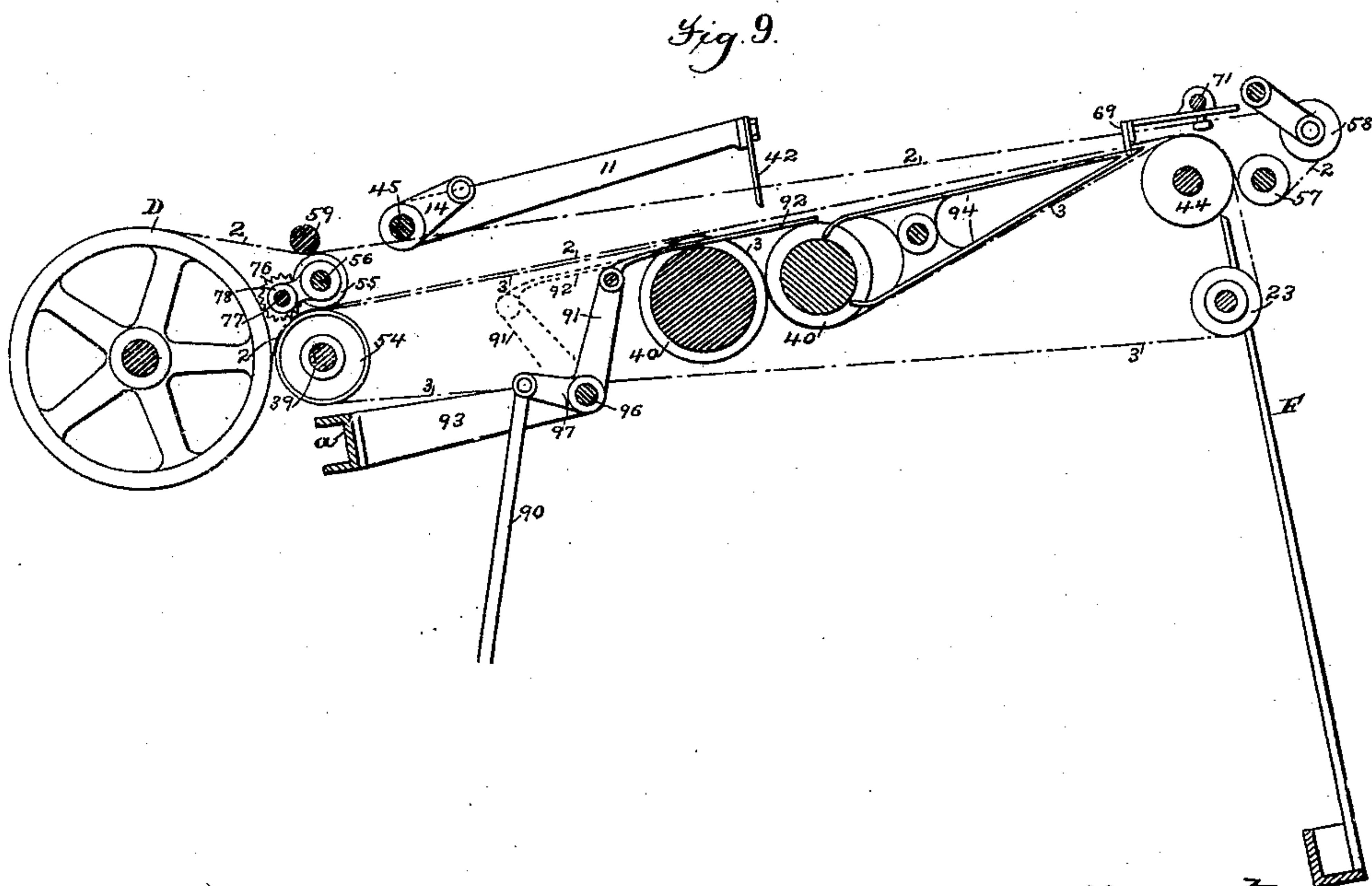
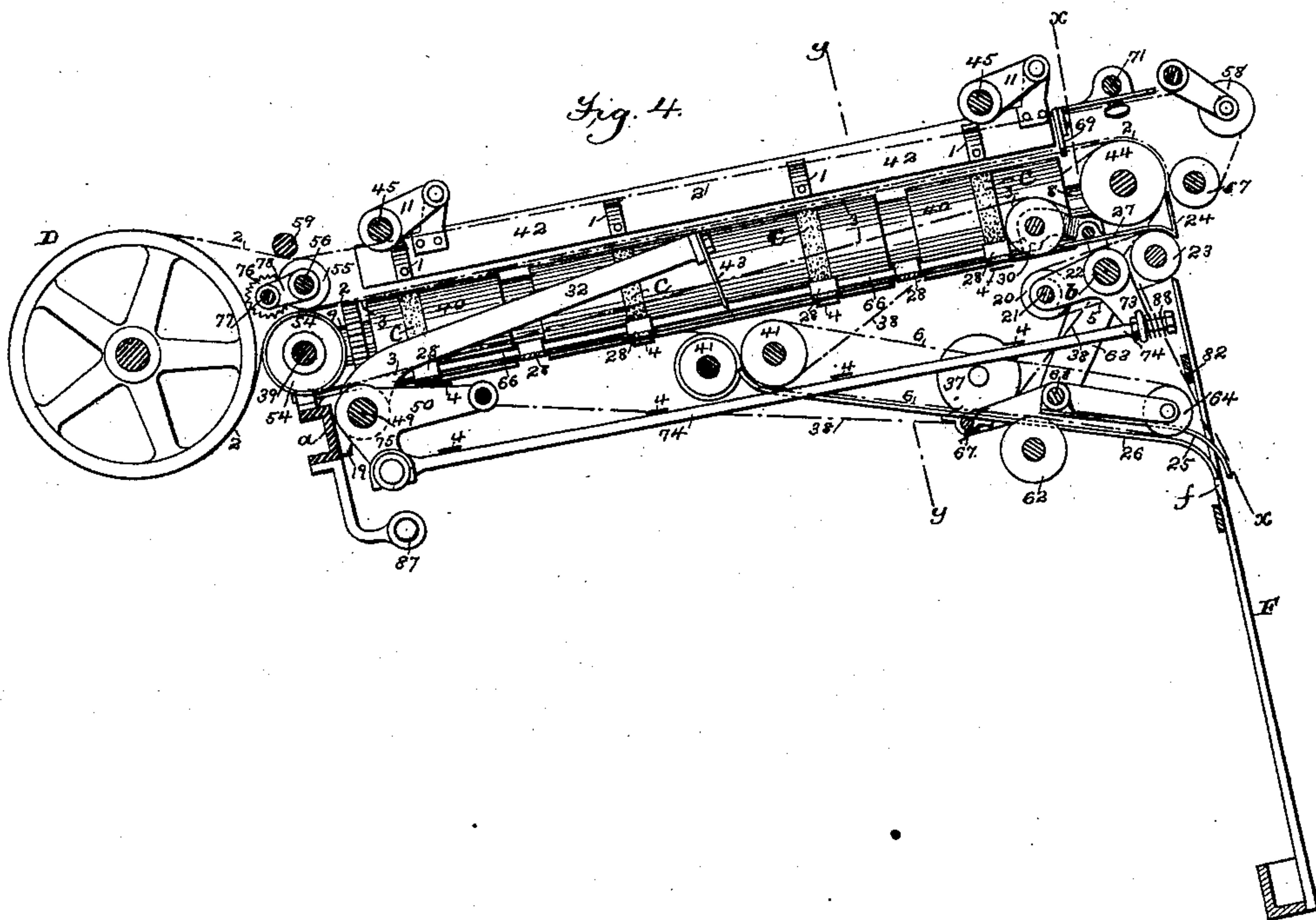
5 Sheets—Sheet 4.

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No. 486,558.

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Attest:

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Atty:

(No Model.)

5 Sheets—Sheet 5.

L. C. CROWELL.

COMBINED PRINTING PRESS AND FOLDING MECHANISM.

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Fig. 5.

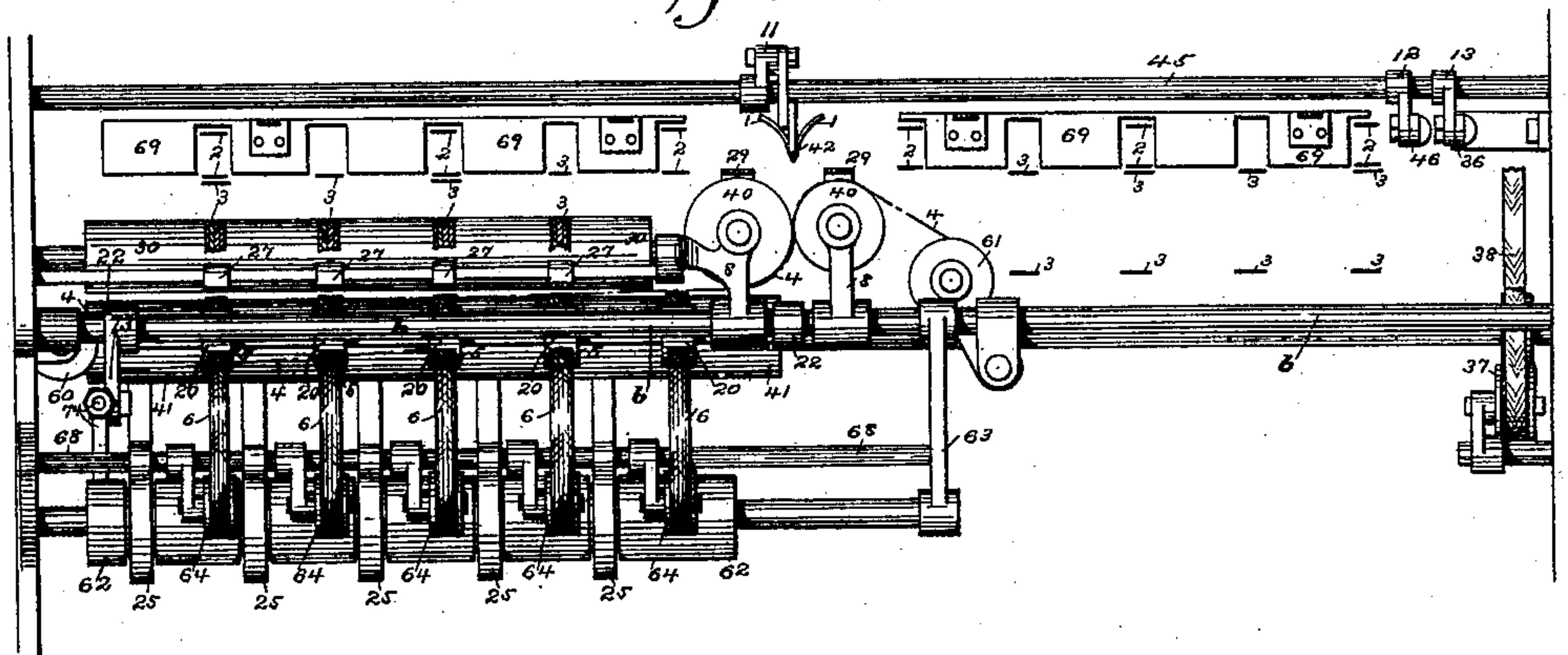


Fig. 6.

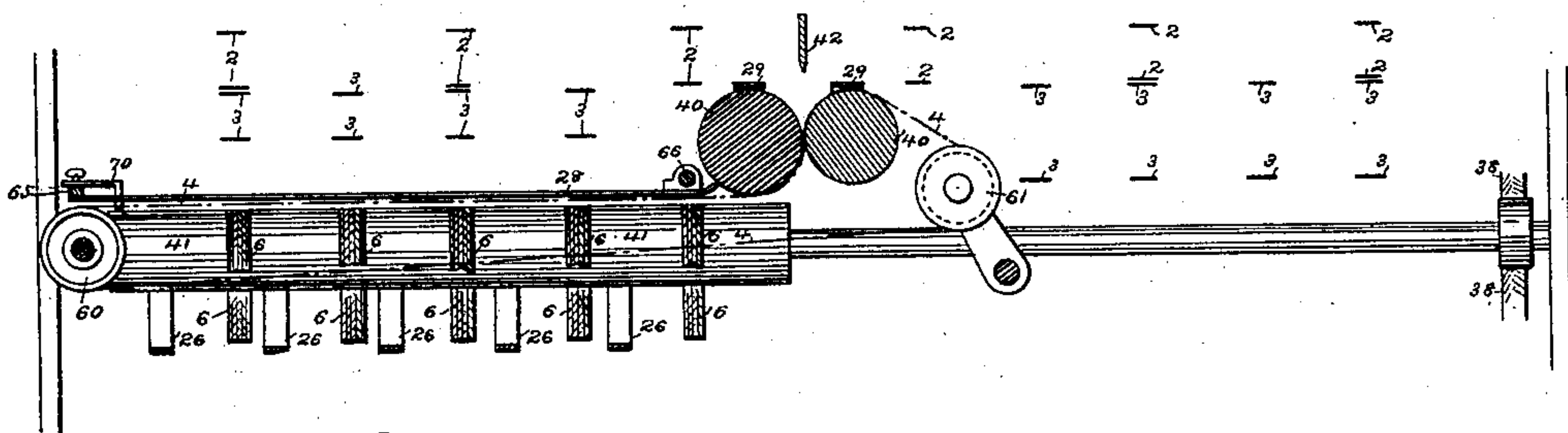


Fig. 8.

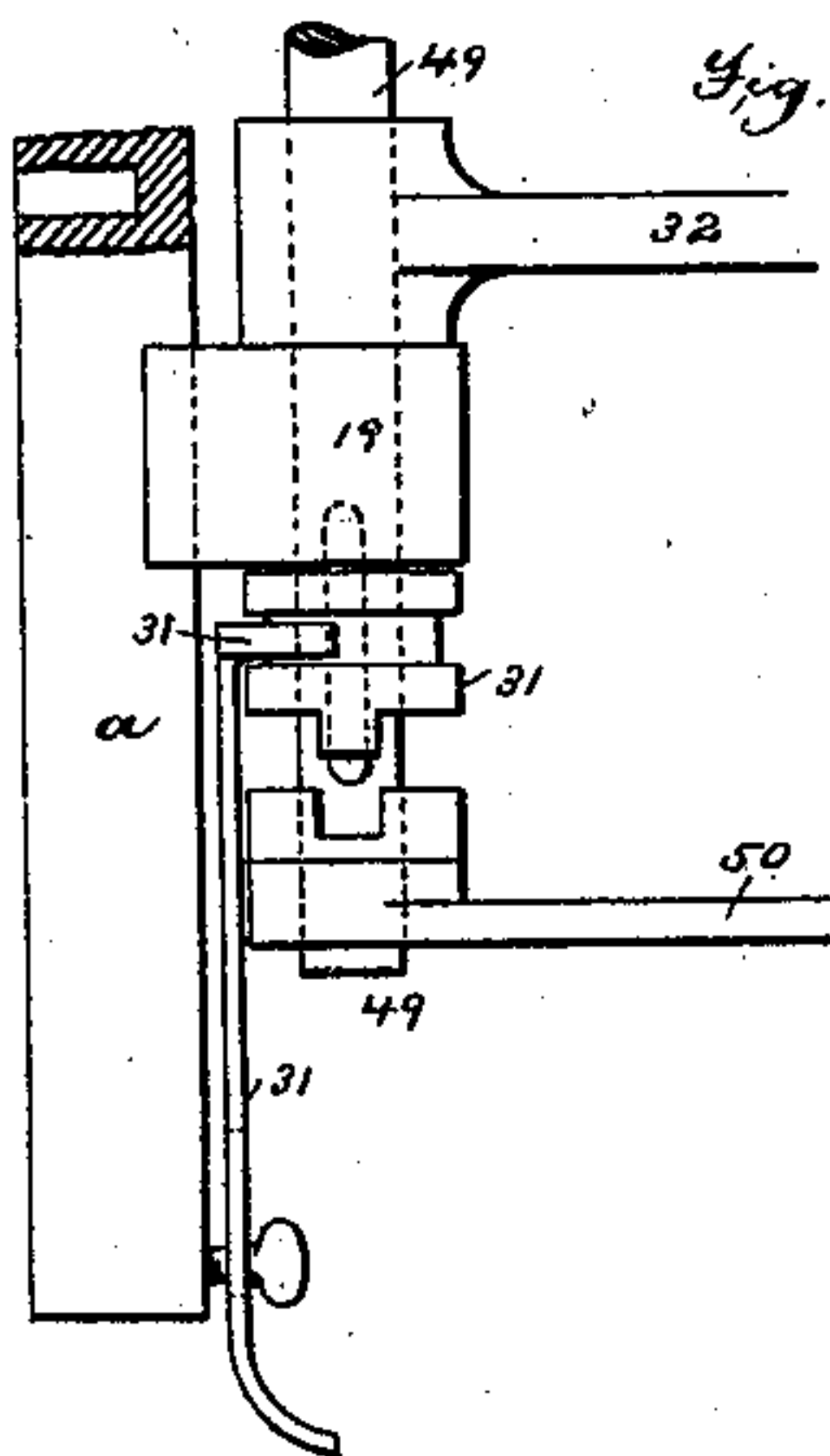
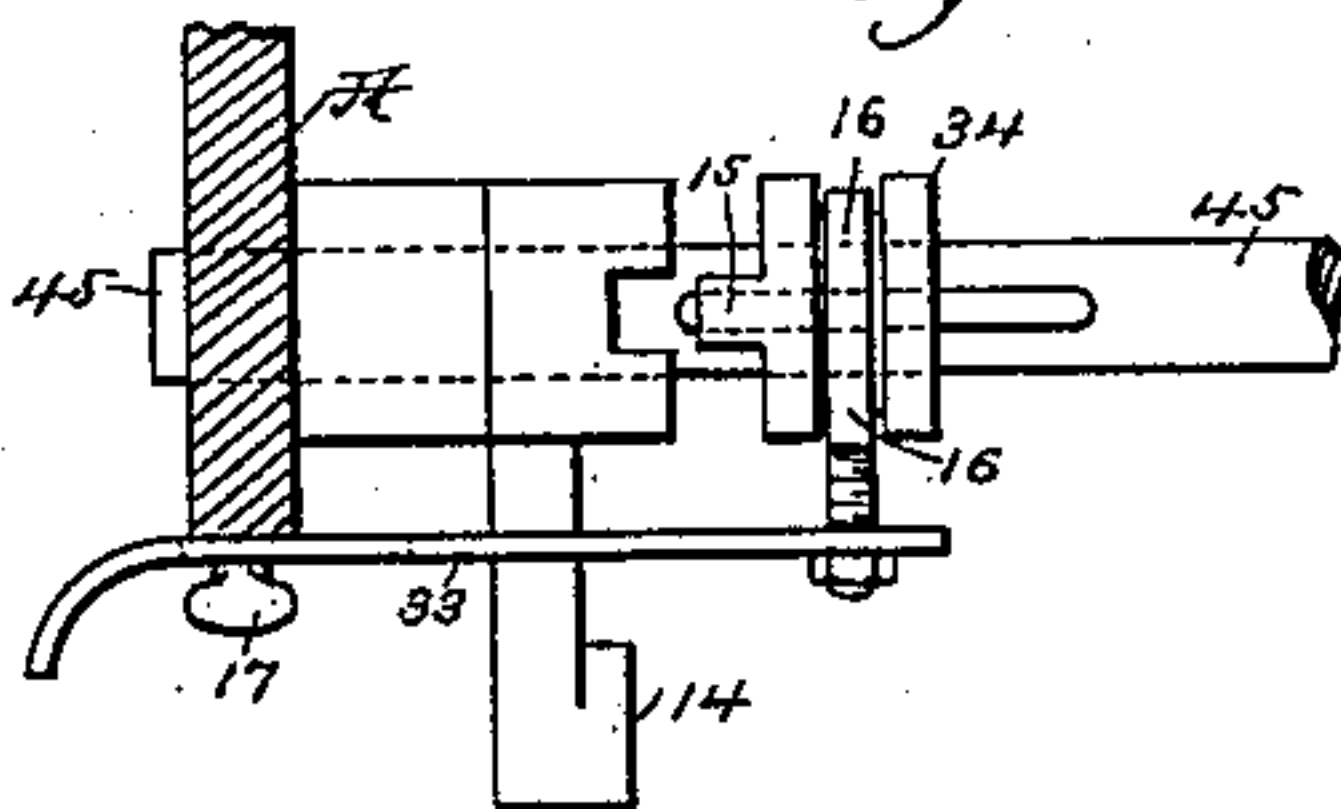


Fig. 7.



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7 Munson & Phillips,

Attest:



# UNITED STATES PATENT OFFICE.

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

## COMBINED PRINTING-PRESS AND FOLDING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 486,558, dated November 22, 1892.

Application filed July 6, 1886. Serial No. 207,209. (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 a Combined Printing-Press and Folding Mechanism, fully described and represented in the following specification and the accompanying drawings, forming a part 10 of the same.

This invention relates to that class of printing-presses employing a reciprocating type-bed in combination with one or more impression-cylinders and generally known as "cylinder-presses."

The general object of the invention is to provide a combined cylinder-press and folding-machine so constructed and organized that the space above the path of movement of the bed at the delivery end of the machine may be utilized for the folding mechanism and this mechanism brought closely adjacent to the cylinder from which the printed sheet is delivered. In cylinder-presses of the common form employing the usual feed board or table I am thus enabled to place the entire folding mechanism in the space under the feed board or table, so that the combined press and folder occupies no more space than 30 that occupied by the press alone.

A further object of the invention is to provide such a combined press and folding mechanism which shall be capacitated to deliver the sheets either in an unfolded condition or folded to different dimensions, as once folded or twice folded, and, further, to provide such a construction in which the sheets, unfolded or thus folded to different dimensions, may be delivered in all cases by the same fly or 40 other piling mechanism.

A further object of the invention is to provide a folding mechanism so constructed and organized that it can be combined with cylinder-presses already in existence without the necessity of making material alterations in 45 their organization.

As a full understanding of the invention can be best imparted by a detailed description of the construction and organization of 50 the mechanism embodying the same, all fur-

ther preliminary description will be omitted and a full description given, after which some of the principal advantages gained by the organization will be explained, and its novel features particularly pointed out and claimed. 55

It will be understood that my invention is applicable generally to printing-presses of the class above referred to, employing a reciprocating type-bed and one or more impression-cylinders, of which class there are many 60 sub-classes; but for the purpose of illustration my invention will be shown in connection with a single-cylinder press of common form, employing a single impression-cylinder, to which the sheets are fed twice from a feed-board for perfecting, with which construction 65 special advantages are obtained.

In the accompanying drawings, Figure 1 is a side elevation of a mechanism embodying the present invention, so much of the press 70 being shown as is necessary to illustrate the manner in which the folder is combined therewith. Fig. 2 is a plan view of the same, the feed-board being removed and certain parts being broken away to expose underlying parts. 75 Fig. 3 is an end elevation of the same, looking from the right of Figs. 1 and 2. Fig. 4 is a longitudinal sectional elevation of the same, taken just inside the framework. Fig. 5 is a vertical cross-section taken upon the line  $xx$  80 of Fig. 4. Fig. 6 is a similar view taken upon the line  $yy$  of the same figure. Figs. 7 and 8 are detail views illustrating the construction of the clutches for throwing the folding-blades and other devices into and out of operation, which determine whether the sheets 85 shall be delivered in an unfolded condition or with one fold or with two folds; and Fig. 9 is a view similar to Fig. 4, illustrating a modified form of the folding mechanism, which will be 90 hereinafter referred to.

Referring to said drawings, it is to be understood that A represents a portion of the framework, B the reciprocating bed, C the form, D the impression-cylinder, E the feed 95 board or table, and F the fly-frame, of an ordinary cylinder printing-press. The bed B is provided with any of the ordinary connections (not shown) by which it is reciprocated in the usual manner, and the cylinder D is 100



also driven in any of the common ways, so as to rotate in unison with the bed at the time the impression is taken. The cylinder is also provided with the usual sheet-grippers (not shown) for holding the sheets to the cylinder during the printing operation. The feed-board E is arranged in the usual or substantially the usual position above and at one side of the impression-cylinder, and the fly-frame F is arranged beneath the outer end of the feed-board, as is also usual.

The folding mechanism is located directly beneath the feed-board and between the impression-cylinder and the fly and is so arranged that when the sheets are to be folded they may be operated upon by the folding mechanism as they pass from the impression-cylinder to the fly without departing substantially from their usual path of travel.

Referring now particularly to Figs. 1 to 6, it is to be understood that, as therein illustrated, the folding mechanism proper consists of two pairs of folding-rolls 40 41 and two vibrating folding-blades 42 43, which operate to fold the sheets into the bite of the rolls in the usual manner. The rolls 40 are arranged at right angles to the impression-cylinder D and midway of its length. They are supported at their inner ends in brackets 9, (see Fig. 2,) rising from a beam *a*, which extends transversely between the side frames A, and at their outer ends in brackets 8, (see Fig. 5,) rising from a rod *b*, which also extends transversely between the side frames. These folding-rolls are geared together in the usual manner and receive motion from a bevel-gear 18 upon the shaft of one of the rolls, (see Fig. 2,) which engages with a similar gear 10 upon the transverse shaft 39, which carries the usual delivery pulleys or rolls 54 and is geared to the impression-cylinder. The folding-rolls 41 are arranged parallel with the impression-cylinder and below and at right angles to the rolls 40 about midway of their length (see Figs. 2 and 6) and extend from the rolls 40 outward to one side of the machine. These rolls are mounted upon shafts, which extend transversely between the side frames and are also driven directly from the shaft 39 of the delivery-pulleys by a belt 38, which passes around a pulley upon said shaft, thence between pulleys upon the shafts of the rolls 41, (see Figs. 2 and 4,) thence around a pulley upon the shaft of the usual tape pulleys or roll 44, which will be hereinafter more particularly referred to, and returns beneath a stretching-pulley 37.

The folding-blade 42 is connected to arms 11, extending from a pair of transverse rock-shafts 45, which shafts are also provided with arms 12, which are connected by a horizontal rod 46. One of the shafts 45 is also provided with an arm 13, which is connected to a rod 36, having a spring 35, the tendency of which is to rock the shafts 45, so as to hold the blade 42 in its raised position. The other of the shafts 45 is provided with an arm 14,

to which is pivoted a vertical rod 47, which is bifurcated at its lower end and straddles the main shaft 99 and is provided with a stud or bowl, which is acted on by a cam 48 on the main shaft in such manner as to depress the blade 42 at the proper time to fold each sheet into the bite of the rolls 40. The arm 14 is mounted loosely on the shaft 45, but is arranged to be rigidly connected thereto by means of a sleeve 34, (see Fig. 7,) which is splined to the shaft so as to slide freely thereon, and is provided with a tongue 15, which enters a corresponding recess in the hub of the arm 14. The clutch thus formed is provided with an operating-handle 33, which extends outward at the side of the machine and is provided with a fork 16, which rests in a circumferential groove formed in the sleeve 34. From this arrangement it results that by pulling and pushing upon the handle 33 the sleeve 34 can be moved along the shaft 45, so as to lock and release the arm 14 to and from the shaft, and thus throw the folding-blade 42 into and out of operation. When the arm 14 is not locked to the shaft 45, the blade 42 will be held in its raised position by the spring 35. The operating-handle 33 is provided with a set-screw 17, by which it can be secured so as to hold the sleeve 34 in either position to which it is moved.

The folding-blade 43 is secured to arms 32, extending from a transverse rock-shaft 49, which is supported in brackets 19, extending from the beam *a*. The shaft 49 is provided with an arm 50, to which is pivoted a vertical rod 51, the lower end of which is bifurcated and straddles the main shaft 99 and is provided with a stud or bowl, which is acted on by a cam 52 in such manner as to hold the blade 43 in its raised position, except at such times as the blade is required to be depressed to fold the sheets into the bite of the rolls 41. The downward movement of the blade 43 to accomplish the folding is effected by means of a spring 53, which is arranged to act upon the rod 51 in such manner as to rock the shaft 49 and depress the blade 43 when by the movement of the cam 52 it is permitted to do so. The arm 50 is mounted loosely upon the shaft 49, but is arranged to be rigidly connected to the shaft by means of a sleeve 31, (see Fig. 8,) which is constructed and arranged the same as the sleeve 34 upon the shaft 45, already described, and is provided with an operating-handle 31, similar to the handle 33. When the arm 50 is not clutched to the shaft 49, the blade 43 will be held in its raised position by any suitable means, as by a hook 98, depending from the feed-board. The folding mechanism thus organized is provided with five sets or series of sheet-conveying tapes 2 3 4 5 6, which operate to take the sheets from the impression-cylinder and convey them either directly to the fly in an unfolded condition or to the folding-rolls 40, and thence to the fly after being once folded, or to the folding-rolls 40, thence to the folding-rolls 41, and



thence to the fly after being twice folded. These tapes are arranged as follows: The series 2 3 correspond to and are arranged in substantially the same manner as the ordinary conveying-tapes with which this class of cylinder printing-machines is usually provided to convey the sheets from the impression-cylinder to the fly. The series 2 pass between the delivery-pulleys 54 and the usual series of co-operating pulleys 55, which are mounted loosely upon a shaft 56, located above the shaft of the delivery-pulleys, thence forward above the folding-rolls 40 and over the tape-roll 44, before referred to, which is located above the upper end of the fly, and thence around a roll 57, and upward around stretching-pulleys 58. From the pulleys 58 all of these tapes except the two marginal ones return directly around the pulleys 55. The two marginal tapes of the series pass beneath a rod 59 and thence around the impression-cylinder D near its ends, returning over the pulleys 54. The series of tapes 3 pass around the delivery-pulleys 54 and thence forward, with the tapes 2, around the roll 44. From the roll 44 the tapes upon one side of the folding-rolls 40 return directly to the pulleys 54 in the usual manner, while those upon the other side of the rolls return over a roll 30, the shaft of which is supported at its outer end in the side frame A and at its inner end in a branch (see Fig. 5) of one of the brackets 8. The series of tapes 4 pass over one of the folding-rolls 40 (see Fig. 6) and downward between the rolls, thence beneath the other of the rolls and outward to the side of the machine, and thence around a series of pulleys 60 and inward, returning around stretching-pulleys 61. The series of tapes 5 pass around a series of pulleys 20, mounted loosely on a shaft 21, which is located directly beneath the roll 30 and is mounted rigidly in the end of arms 22, extending from the rod b, and return around a roll 23. The series of tapes 6 pass around the outer one of the folding-rolls 41, thence downward at an incline above a roll 62, one end of which is supported in the side frame A, while its other end is supported in an arm 63, depending from the rod b, and returning around pulleys 64, which are supported on arms extending from a shaft 68, located above the roll 62 and supported in the same manner as said roll. It is to be remarked that the pulleys 64, instead of being supported on separate arms, may be supported on a shaft suitably arranged for that purpose. In addition to the various tapes already referred to there are also provided the usual narrow tape or tapes 7, which pass around the middle of the impression-cylinder at the point where the blank space usually occurs between the printed pages of the sheet, thence above the central one of the pulleys 54, and around the corresponding one of the pulleys 55.

Directly above the folding-rolls 40 is located a pair of stationary guides 29, which are supported upon the brackets 89 and serve

to support the sheets at their centers as they pass forward above the folding-rolls.

Located above the tapes 4 and arranged to co-operate therewith is a series of stationary guides 28, (see Fig. 6,) which extend from the folding-rolls 40 outward to the side of the machine and are supported upon rods 65 66. Located above the tapes 5 and arranged to co-operate therewith is a series of stationary guides 27, (see Fig. 4,) which extend from the roll 30 forward and turn downward over the roll 23. These guides are provided at their outer ends with upward extensions 24, which bridge the space between the rolls 44 23. Located between and beneath the tapes 6 and arranged to co-operate therewith is a series of stationary guides 26, (see Fig. 4,) which is supported upon a rod 67 and extend from the folding-rolls 41 forward and downward to a point beyond the pulleys 64. Located above the guides 26 and arranged to co-operate therewith is a second series of stationary guides 25, which is supported upon the rod 68 and extend from a point above the roll 62 forward and downward and terminate with the guides 26. The folding mechanism is also provided with two sets of adjustable stops 69 70 for arresting the sheets at the proper points for the folding operation. The set 69 are arranged at or near the forward ends of the folding-rolls 40 and are mounted upon a transverse rock-shaft 71, which is provided with an arm 72, by which it can be rocked so as to raise the stops when desired. The set 70 are arranged at or near the outer ends of the folding-rolls 41 and are mounted upon the rod 65, which supports the guides 28.

The hub of one of the arms 22, in which the shaft 21, carrying the pulleys 20, is mounted, is provided with an arm 73, the end of which is provided with a swiveled eyebolt, through which extends the end of a rod 74, having a head at its end, between which and the eyebolt is located a spring 88. The opposite end of the rod 74 is provided with a yoke, which embraces a stud on the end of an arm 75, extending from the hub of the arm 50, which operates the folding-blade 43.

The folding mechanism, as shown in the present case, is provided with a slit 76, by which the sheets may, when desired, be divided at their centers, or on the line of the first fold. This slit is arranged over the central one of the pulleys 54 and between the tapes 7 and is mounted upon the end of a shaft 77, supported in arms 78, which are rigidly fixed to the shaft 56. The shaft 56 is provided with an arm 79, by which it may be rocked so as to raise the slit and render it inoperative when desired. The shaft 77, upon which the slit is mounted, is provided with a gear 80, which when the slit is in its operative position engages with a gear 81 upon the shaft 39, and thus gives a positive movement to the slit.

The folding-blade 42 is provided upon its opposite sides with a number of light spring-



fingers 1, which are curved to conform to the curvature of the folding-rolls 40, as shown. The purpose of these fingers will be made clear when the operation of the apparatus is explained. The roll 23 is driven by means of a belt 89, which passes around pulleys upon the shafts of the rolls 44 23.

The fly F is of substantially the usual construction, except that those of its fingers which are in front of the folding-rolls 41 and the pulleys 64 are cut away, (see Figs. 3 and 4,) so as to provide an opening *f*, through which the ends of the guides 25 26 project. The portions of the fly-fingers which are above the opening *f* are supported upon a cross-bar 82, which is secured to some of the uncut fingers. The fly F is operated to pile the sheets by means of the usual spring (not shown) which acts upon the arm 83 of the fly-shaft and is returned to and held in its raised position by means of the usual arm 84, connecting-rod 85, and cam 86.

The operation of the mechanism thus organized is as follows: The sheets fed from the feed-board E will be taken by the grippers of the impression-cylinder D and presented to the form C to be printed in the usual manner. After being printed the sheets will be directed off the cylinder by the marginal tapes 2 and the tapes 7 and into the control of the tapes 2 3. If it is desired to deliver the sheets in an unfolded condition—as, for example, when they are passed through the press the first time and are only printed on one side—the shaft 71 will be rocked to and secured in such position as to raise the stops 69 out of the path of the sheets, the sleeve 34 will be moved so as to disconnect the arm 14 from the shaft 45, and thus render the folding-blade 42 idle. The sleeve 31 will be shifted so as to disconnect the arm 50 from the shaft 49, and thus render the folding-blade 43 idle, and the blade will be secured in its raised position. The yoke of the rod 74 will be disconnected from the arm 75 and hooked onto a stationary stud 87, provided for that purpose, so as to hold the pulleys 20 in the position shown, and if it is not desired to divide the sheets longitudinally the shaft 56 will be rocked so as to raise the slit 76 out of operative position and disconnect the gear 80 from the gear 81. The sheets will then, as they are directed off the cylinder, be carried forward by the tapes 2 3 above the guides 29 until they arrive at the roll 44, after which they will be directed downward and will emerge from between the rolls 44 57 and pass downward in front of the guides 24 and the fly and be piled in a flat or unfolded condition, having taken exactly the path of travel which the sheets usually take in a printing-machine of this class in passing from the impression-cylinder to the fly.

If it should be desired instead of delivering the sheets in an unfolded condition to deliver them with one fold, the stops 69 will be lowered to the position shown, the sleeve 34

will be shifted so as to connect the arm 14 to the shaft 45, and thus render the folding-blade 42 operative, and the yoke of the rod 74 will be connected to the arm 75, as shown. The sheets will then, as they are directed off the impression-cylinder, be carried forward by the tapes 2 3 and above the guides 29 until they arrive at the stops 69. The parts will be so timed that as each sheet arrives at the stops 69 the blade 42 will be quickly depressed, so as to double the sheet into the bite of the rolls 40, thus folding it longitudinally upon its central line. After being thus folded the sheet will be carried outward between the tapes 4 and the guides 28 until its folded edge arrives at the stops 70 at the side of the machine. It will be observed that the stops 69 are so positioned that the leading edge of the sheet, or what after the first fold becomes one of its sides, will, as the sheet is carried outward between the tapes 4 and guides 28, project beneath the roll 30 and above the pulleys 20. The parts will be so timed that as the sheet arrives at the stops 70, as just explained, the cam 52 will arrive in position to permit the spring 53 to rock the arm 50 and, through the arm 75, rod 74, and arm 73, rock the arms 22, so as to carry the pulleys 20 upward into biting contact with the roll 30. The side of the sheet, or what now again becomes its leading end, and which, as explained, projects between the roll 30 and pulleys 20, will thus be taken by the roll 30 and the tapes 5 and carried forward beneath the guides 27 and over the roll 23, where it will be directed downward by the curved ends of the guides in front of the fly and be delivered in its once-folded condition.

If it should be desired, instead of delivering the sheets with one fold, to deliver them with two folds, the adjustments will be the same as last described, except that the sleeve 31 will be shifted so as to connect the arm 50 to the shaft 49, so as to render the folding-blade 43 operative, and the yoke of the rod 74 will be disconnected from the arm 75 and hooked onto the stud 87. The sheets then, as they arrive at the stops 70, instead of passing into the control of the roll 30 and tapes 5, will be doubled into the bite of the folding-rolls 41 by the blade 43, thus receiving a second fold at right angles to the one imparted by the blade 42 and rolls 40. As the twice-folded sheets emerge from the folding-rolls 41 they will be carried forward above the guides 26 and roll 62 by the tapes 6 and projected forward and downward between the guides 25 26 and through the opening *f* in front of the fly and be piled in a twice-folded condition.

It is sometimes desirable that the sheets, particularly when they are printed for an eight-page paper, should be divided along the line between the heads of the printed pages, which is the line upon which the first fold is usually made. If in any case it should be desired to do this, the shaft 56 will be rocked so as to lower the slit to the position shown,



which will bring it into position to divide the sheets as they pass the pulleys 54. When the slit-ter is in this position, the gear 80 will en-  
 5 gage with the gear 81, so as to properly drive the slit-ter. The divided sheets can then be delivered in an unfolded condition, the same as already described, or the two halves of each divided sheet may be associated by directing their adjacent edges simultaneously into the  
 10 bite of the folding-rolls 40. For this purpose the folding-blade 42 is provided with the spring-fingers 1, before referred to. If the two halves of the sheet are to be associated in this manner, the stops will be lowered  
 15 to the position shown and the folding-blade 42 will be put into operation. The blade 42 as it descends will pass between the halves of the sheet but the spring-fingers 1 will press the adjacent edges of the two halves of the sheet  
 20 against the folding-rolls, so that they will be drawn into the bite of the rolls and be associated in passing between the rolls. To make it more certain that the halves of the sheets will be drawn into the bite of the  
 25 rollers when their edges are pressed against the rolls by the fingers, the rolls are provided with rubber rings *c*, which serve to give the rolls a better hold upon the paper. By this operation the sheets are in effect folded longi-  
 30 tudinally, the same as first described, but in addition to being folded they are cut or divided on the fold-line. After passing between the folding-rolls 40 the sheets may be delivered without further folding or be folded be-  
 35 tween the rolls 41, and thus delivered, the same as already described.

The organization which has been described embodies the invention in its most complete and desirable form; but in some cases it may  
 40 not be desired to give the machine so great a range of capacity as has been described. If this should be desired, it can be done and yet retain many of the important features of the invention. For example, if it should not  
 45 be desired to capacitate the machine to impart two folds to the sheet the folding-rolls 41, blade 43, tapes 6, and guides 25 26, and the opening *f* in the fly may be omitted. In such case the sheets may be delivered in an un-  
 50 folded condition or with one fold, in the same manner as already described; or the pulleys 20 and the connections for operating them may be omitted, and in such case the sheets may be delivered either in an unfolded con-  
 55 dition or with two folds, in the same manner as already described.

It is usually preferable in a machine of this character that the first fold, when the sheets are to be folded, should be made longitudi-  
 60 nally of the sheet—that is to say, in the direction of its travel as it leaves the impres- sion-cylinder. For this reason the folding- rolls 40 and blade 42 in the construction al- ready described are arranged at right angles  
 65 to the impression-cylinder. This, however, is not necessary and may not always be desir- able, as in some cases it may be preferable to

have the first fold made transversely of the sheet. When it is desired that the first fold should be a transverse one, the folding-rolls 70 40 will be arranged parallel with instead of at right angles to the impression-cylinder. In Fig. 9 an organization of this character is illustrated, which is capacitated to deliver the sheets either in an unfolded condition or with 75 one fold, the single fold being a transverse instead of a longitudinal one. In this organi- zation the folding-rolls 40 are arranged paral- lel with the impression-cylinder and are driven in any suitable manner, but preferably by a 80 belt arranged similar to the belt 38. The blade 42 is mounted upon arms 11, extending from a rock-shaft 45, extending transversely between the side frames. The shaft 45 is pro- vided with an arm 14, which is connected to 85 the shaft by a clutch and is operated in the same manner as already described. The blade 42 is in this case cut away or recessed, so as to permit the passage of the tapes 2. The tapes 2 are arranged the same as already 90 described. The tapes 3, instead of passing from the pulleys 54 directly to the roll 44, pass downward between the folding-rolls 40, and thence to the roll 44, and then return around the roll or pulleys 23. The tapes 4 5 6 are 95 dispensed with and the space between the outer one of the rolls 40 and the roll 44 is bridged by guides 94, which co-operate with the tapes 2 and 3. The inner one of the rolls 40 is provided with a number of circumfer- 100 ential grooves, in which rest horizontally-mov- ing guides 92, which are connected to a trans- verse rod, which is supported in arms 91, ex- tending from a rock-shaft 96, which is mount- ed in brackets 93, projecting from the beam 105 *a*. The shaft 96 is also provided with an arm 97, to which is pivoted a rod 90, the other end of which is acted on by a cam on the main shaft in such manner as to rock the shaft 96 and move the guides inward from the posi- 110 tion shown by full lines to the position shown by dotted lines at regular intervals. The movement of the guides 92 in the reverse di- rection and the upward movement of the blade 42 are effected by means of suitably-ar- 115 ranged springs. (Not shown.) The arm 97 is mounted loosely upon the shaft 96, but is ar- ranged to be secured to the shaft by means of a clutch similar to those hereinbefore described. The operation of the mechanism when thus 120 organized is as follows: When the sheets are to be delivered in an unfolded condition, the arms 14 97 will be disconnected from the shafts 45 96, so as to allow the blade 42 to re- main in its raised position and the guides 92 125 in their forward position, and the stops 69 will be raised out of the path of the sheets. The sheets will then, as they pass forward be- tween the tapes 2 3, be directed past the rolls 40 by the guides 92, and will pass forward be- 130 tween the tapes 2 and guides 94 and be pro- jected downward from the rolls 40 57 in front of the fly and be piled in an un- folded condition. When it is desired to im-



part one fold to the sheets, the stops 69 will be lowered to the position shown and the arms 14 97 will be connected to the shafts 45 96. The parts will be so timed that as or just before the leading end of each sheet arrives at the stops 69 the guides 92 will be moved inward from the position shown by full lines to the position shown by dotted lines, and will be held in that position until the sheet has passed between the folding-rolls. As the leading end of each sheet arrives at the stops 69 the blade 42 will be vibrated quickly downward, so as to fold the sheet between the rolls 40. After passing between the rolls 40 the sheets will be carried forward and upward between the tapes 3 and guides 94, and will then be projected downward from between the rolls 44 57 in front of the fly and be piled in a once-folded condition. The mechanism thus organized may readily be capacitated to impart two folds as well as one by providing it with a second pair of folding-rolls and a second folding-blade similar to the rolls and blade 41 43 and arranged at right angles to the rolls and blade 40 42, and with a roll and set of vibrating pulleys similar to the roll and pulleys 30 20, which will act to take the sheets and forward them to the fly after they have received their second fold.

By means of the organization herein shown and described a combined cylinder-press and folding mechanism of the class shown is provided which occupies no more room than that occupied by the press alone, in which the folding mechanism is located entirely beneath the feed-board of the press, so as to be covered and protected, and by which the sheets can be delivered either in an unfolded or folded condition to the same fly, which fly is located in the usual position, and without substantial departure from the path of travel which they ordinarily take in those machines which are not provided with a folding mechanism in passing from the impression-cylinder to the fly. It will be understood, however, that my invention is applicable also to other classes of cylinder-presses not employing a feed-board, and that, while it is preferable that my special folding mechanism delivering folded sheets at the same point as unfolded be used for convenience and economy of floor-space, and such a construction forms a part of my invention, this feature is not absolutely essential, and my invention is not to be limited thereto. It will be understood, also, that my invention is not to be limited to a construction capacitated to deliver the sheets folded or unfolded, as it may be embodied in a construction delivering only folded sheets. It will be observed that the folding mechanism shown is so arranged that it may be combined with an ordinary cylinder-press without the necessity of making any substantial change in the general construction of the latter, thereby making it practicable to combine this folding mechanism with presses already in existence at a comparatively-small outlay, and this

construction forms a part of my invention, although it will be understood that this feature is not essential to my invention, broadly considered. It will also be observed that the folding mechanism may be so combined with the printing mechanism that the principal parts of the delivery apparatus found in the ordinary cylinder-press remain practically unchanged and can be readily utilized. For example, the cylinder from which the printed sheet is delivered and the fly remain in the same position with relation to each other and the delivery-pulleys 54, their co-operating pulleys 55, the tape-roll 44, and the tapes 2 3 are the same or substantially the same as in an ordinary machine and perform the same functions.

Although the various series of tapes is shown as passing around pulleys in some cases and rolls in other cases, it is to be understood that this is not material, as rolls may be used in place of the pulleys or pulleys in place of the rolls.

What I claim is—

1. The combination, with a printing-press having a reciprocating type-bed coacting with an impression-cylinder, of mechanism for conveying the sheets from the cylinder and a folding mechanism located adjacent to the cylinder and above the path of the bed and arranged to fold the sheets from said conveying mechanism, substantially as described.

2. The combination, with a printing-press having a reciprocating type-bed coacting with an impression-cylinder, of a folding mechanism located adjacent to the cylinder and above the path of the bed and constructed to be rendered inoperative and means for delivering the sheets unfolded, substantially as described.

3. The combination, with a printing-press having a reciprocating type-bed coacting with an impression-cylinder, of a fly located at the end of the press and a folding mechanism located adjacent to the cylinder and above the path of the bed and arranged to deliver the folded sheets to the fly, substantially as described.

4. The combination, with a printing-press having a reciprocating type-bed coacting with an impression-cylinder, of a fly, tapes for conveying sheets from the cylinder to the fly in an unfolded condition, and a folding mechanism constructed to be rendered inoperative and arranged to fold the sheets from said tapes, substantially as described.

5. The combination, with a printing-press having a reciprocating type-bed coacting with an impression-cylinder, of a fly, tapes for conveying sheets from the cylinder to the fly in an unfolded condition, and a folding mechanism constructed to be rendered inoperative and arranged to fold the sheets from said tapes and deliver them to the fly in a folded condition, substantially as described.

6. The combination, with a cylinder printing-press and its feed-board, of a folding mech-



anism located adjacent to the cylinder and beneath the feed-board, substantially as described.

5 7. The combination, with a cylinder printing-press, its feed-board, and tapes for conveying the sheets from the cylinder outward beneath the feed-board, of a folding mechanism located adjacent to the cylinder and beneath the feed-board and arranged to fold the  
10 sheets from said tapes, substantially as described.

15 8. The combination, with a cylinder printing-press, its feed-board, fly, and tapes for conveying the sheets from the cylinder outward beneath the feed-board, of a folding mechanism located between the cylinder and fly and beneath the feed-board and arranged to fold the sheets from said tapes and deliver them to the fly, substantially as described.

20 9. The combination, with a cylinder printing-press, its feed-board, fly, and tapes for conveying the sheets from the cylinder to the fly in an unfolded condition, of a folding mechanism located between the cylinder and fly  
25 and beneath the feed-board and arranged to fold the sheets from said tapes and deliver them to the fly in a folded condition, substantially as described.

30 10. The combination, with a printing-press having a reciprocating type-bed coacting with an impression-cylinder, of a fly located at the end of the press, tapes for conveying the sheets from the cylinder to the fly in an unfolded condition, and folding-rolls 40 and  
35 blade 42, arranged to fold the sheets from said tapes and constructed to be rendered inoperative, substantially as described.

40 11. The combination, with a printing-press having a reciprocating type-bed coacting with an impression-cylinder, of a fly located at the end of the press, delivery-pulleys 54, roll 44, and tapes for conveying the sheets from the cylinder in an unfolded condition, folding-rolls 40, located between the pulleys 54 and  
45 roll 44, and folding-blade 42, arranged to fold the sheets from said tapes into the bite of said rolls and constructed to be rendered inoperative, substantially as described.

50 12. The combination, with the impression-cylinder and bed, the delivery-pulleys 54, and tapes for conveying the sheets from the delivery-pulleys to the folding-rolls, of a folding-blade 42 and the folding-rolls 40, located adjacent to the cylinder and above the path  
55 of the bed and driven directly from the shaft of said pulleys, substantially as described.

60 13. The combination, with the impression-cylinder and bed, the delivery-pulleys 54, and tapes for conveying the sheets from the delivery-pulleys to the folding-rolls, of the folding-rolls 40, located adjacent to the cylinder and above the path of the bed, and the folding-blade 42, operated directly from the main press-shaft 99, substantially as described.

65 14. The combination, with the impression-cylinder and tapes for conveying the sheets

away from the cylinder, of the folding-rolls 40 and blade 42, arranged to fold the sheets from said tapes, the tapes 4, roll 30, and vibrating pulleys 20, all substantially as described. 70

15. The combination, with a cylinder printing-press, its fly, and tapes for conveying the sheets from the cylinder to the fly in an unfolded condition, of the folding-rolls 40 and  
75 blade 42, arranged to fold the sheets from said tapes, the tapes 4, roll 30, and the vibrating pulleys 20, substantially as described.

16. The combination, with a cylinder printing-press, its fly, and tapes for conveying the  
80 sheets from the cylinder, of the rolls 40 and blade 42, arranged to fold the sheets and deliver them to the fly once folded, and the rolls 41 and blade 43, arranged to act upon the sheets as they are delivered from the rolls  
85 40 and deliver them to the fly twice folded, substantially as described.

17. The combination, with a cylinder printing-press, its fly, and tapes for conveying the sheets from the cylinder to the fly in an unfolded condition, of the rolls 40 and blade 42,  
90 arranged to fold the sheets and deliver them to the fly once folded, and the rolls 41 and blade 43, arranged to act upon the sheets as they are delivered from the rolls 40 and deliver them to the fly twice folded, substantially as described. 95

18. The combination, with the impression-cylinder and bed and the delivery-pulleys 54, of the folding-rolls 40 41, located adjacent to  
100 the cylinder and above the path of the bed and driven directly from the shaft of said pulleys, substantially as described.

19. The combination, with the impression-cylinder and bed and the folding-rolls 40 41, located adjacent to the cylinder and above  
105 the path of the bed, of the folding-blades 42 43, operated from the main press-shaft 99, substantially as described.

20. The combination, with the slit 76, of the folding-rolls 40 and the folding-blade 42, provided with the spring-fingers 1, which are curved to conform to the rolls and are arranged to press the sheets against the rolls as the blade is vibrated downward, substantially  
115 as described.

21. The combination, with the folding-rolls 41 and blade 43, of the fly provided with the opening *f* and means for delivering the sheets folded between said rolls through said opening, substantially as described. 120

22. The combination, with the folding-rolls 40 and blade 42, of the tapes 4, roll 30, and vibrating pulleys 20, substantially as described.

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

LUTHER C. CROWELL.

Witnesses:

J. A. HOVEY,

JAS. J. KENNEDY.