

(No Model.)

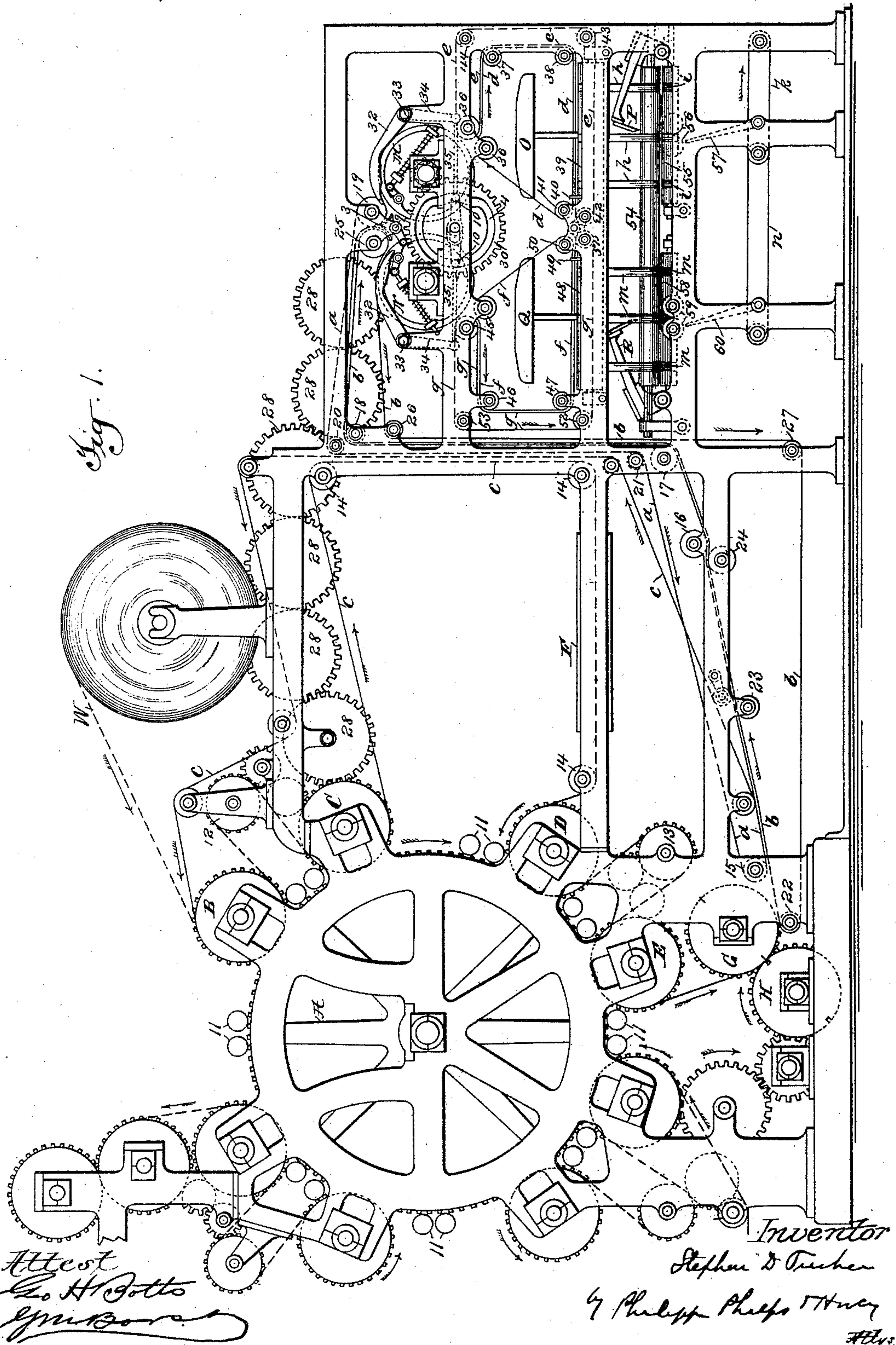
4 Sheets—Sheet 1.

S. D. TUCKER.

DELIVERY MECHANISM FOR WEB PRINTING MACHINES.

No. 441,811.

Patented Dec. 2, 1890.



(No Model.)

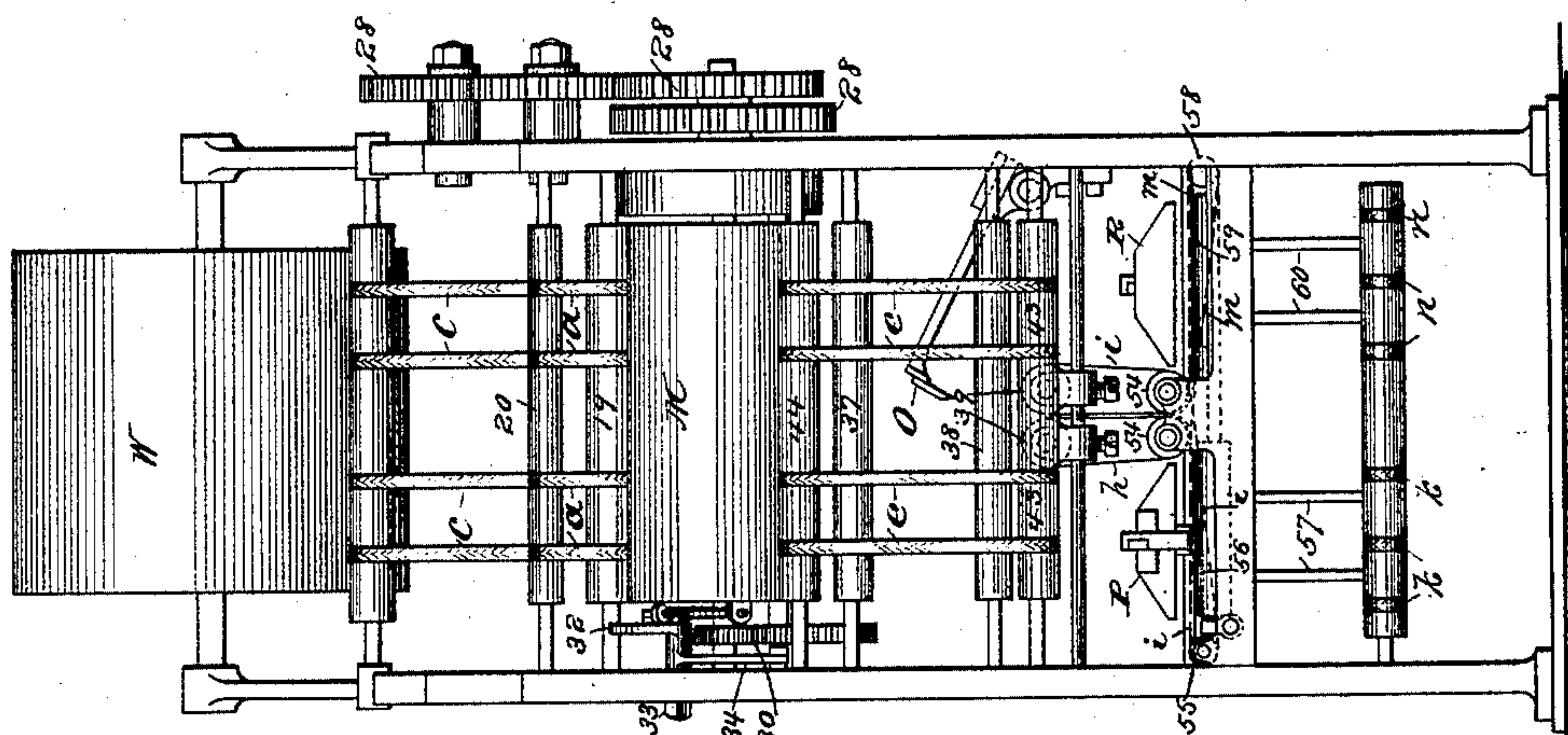
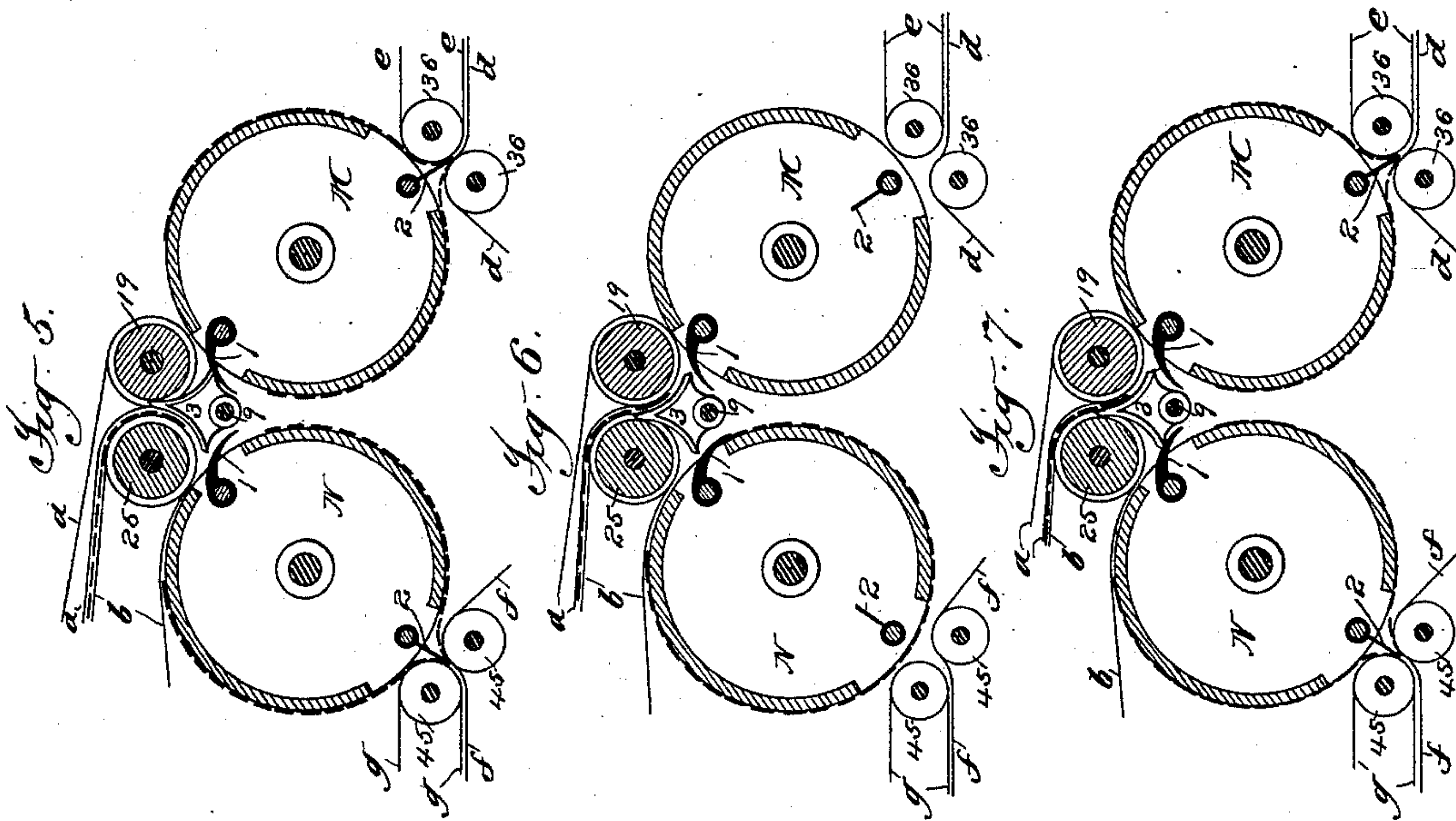
4 Sheets—Sheet 2.

S. D. TUCKER.

DELIVERY MECHANISM FOR WEB PRINTING MACHINES.

No. 441,811.

Patented Dec. 2, 1890.



Attest:
G. H. Bolls
J. M. Bolls

Fig. 8.

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by Philip Phelps & Son
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(No Model.)

4 Sheets—Sheet 3.

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DELIVERY MECHANISM FOR WEB PRINTING MACHINES.

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Fig. 3.

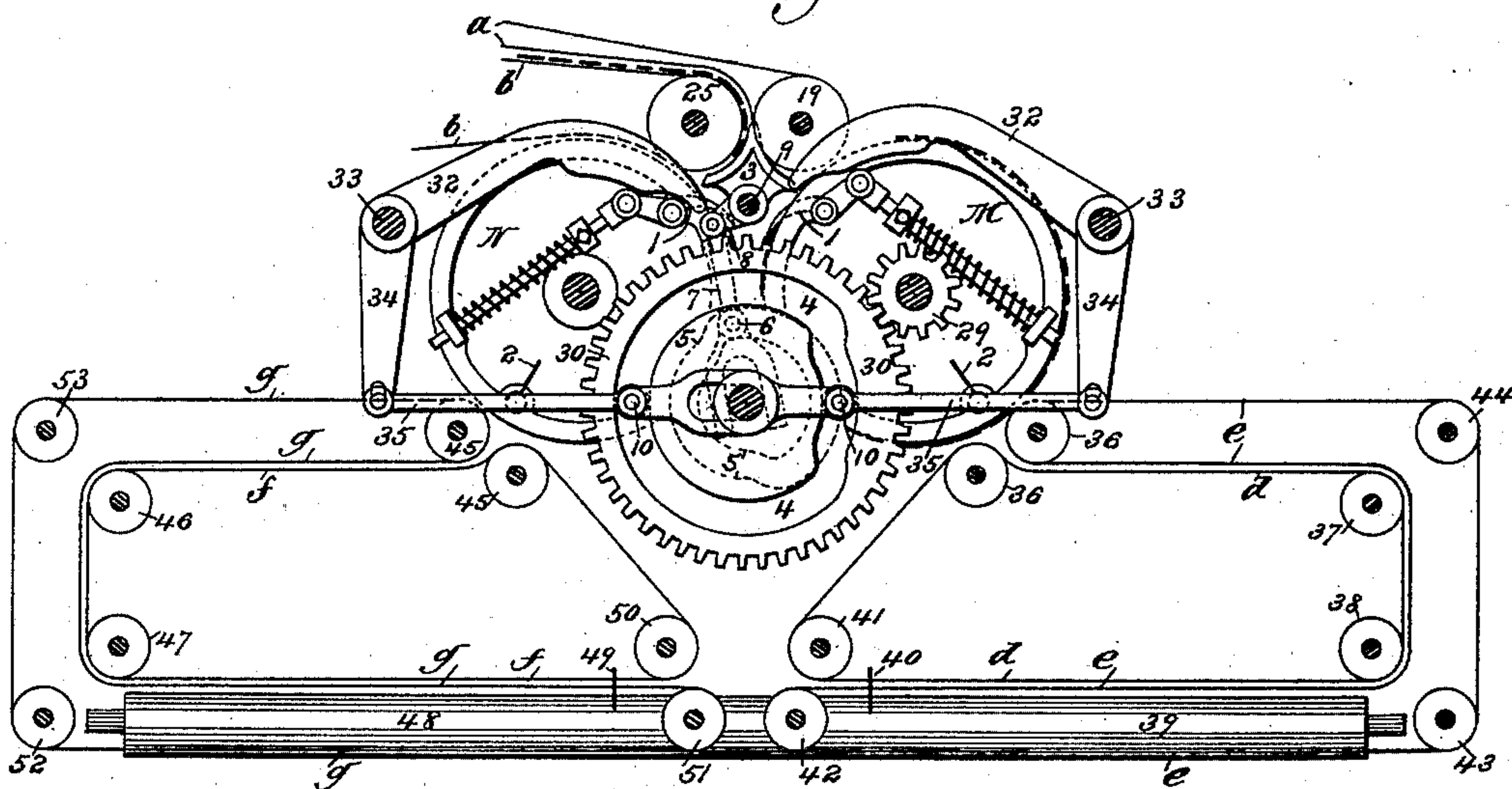
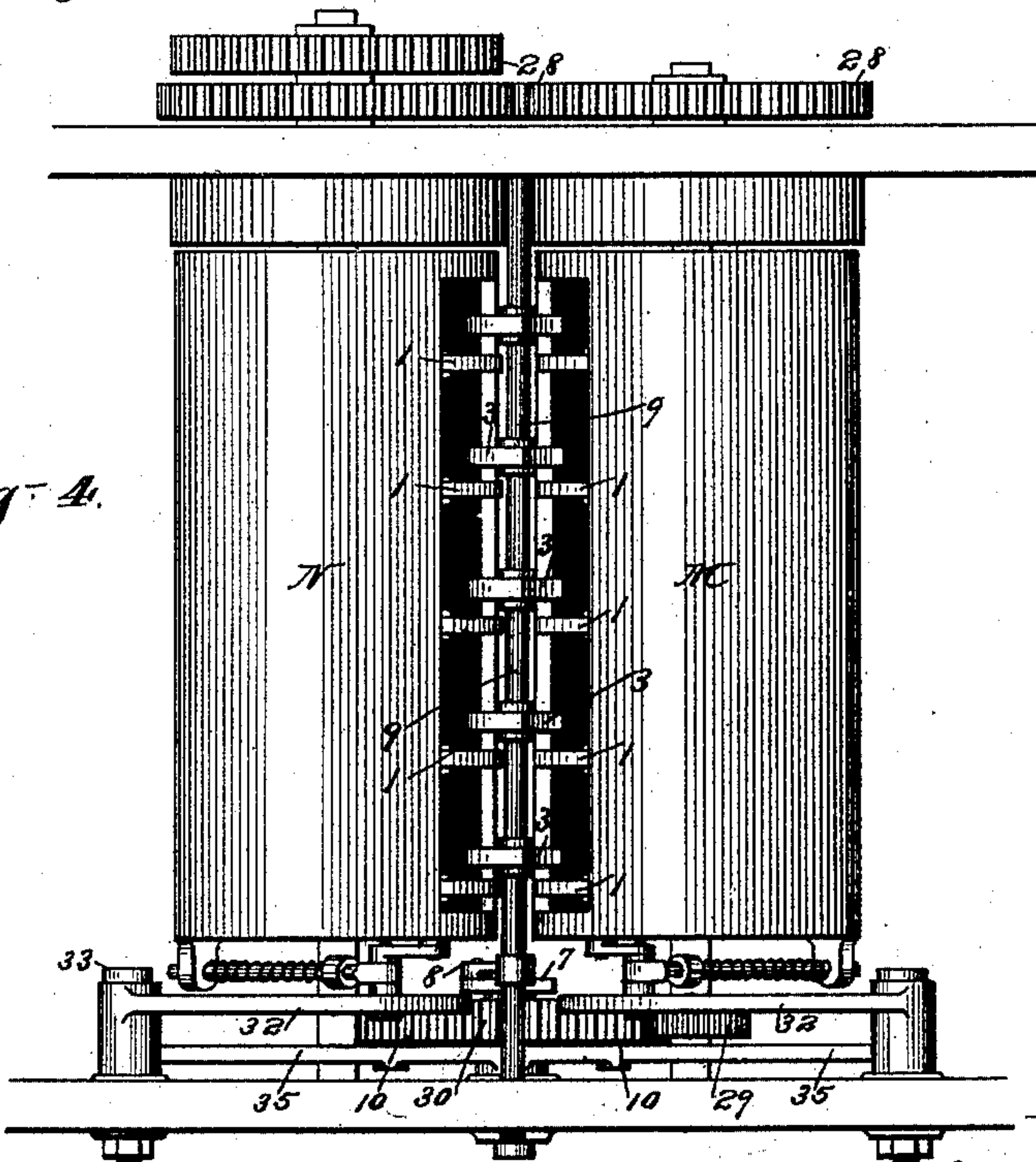


Fig. 4.



Attest:

Geo. H. Potts
Ym. Bore

Inventor

Stephen D. Tucker

By Phelps Phelps & Henry
Attys

(No Model.)

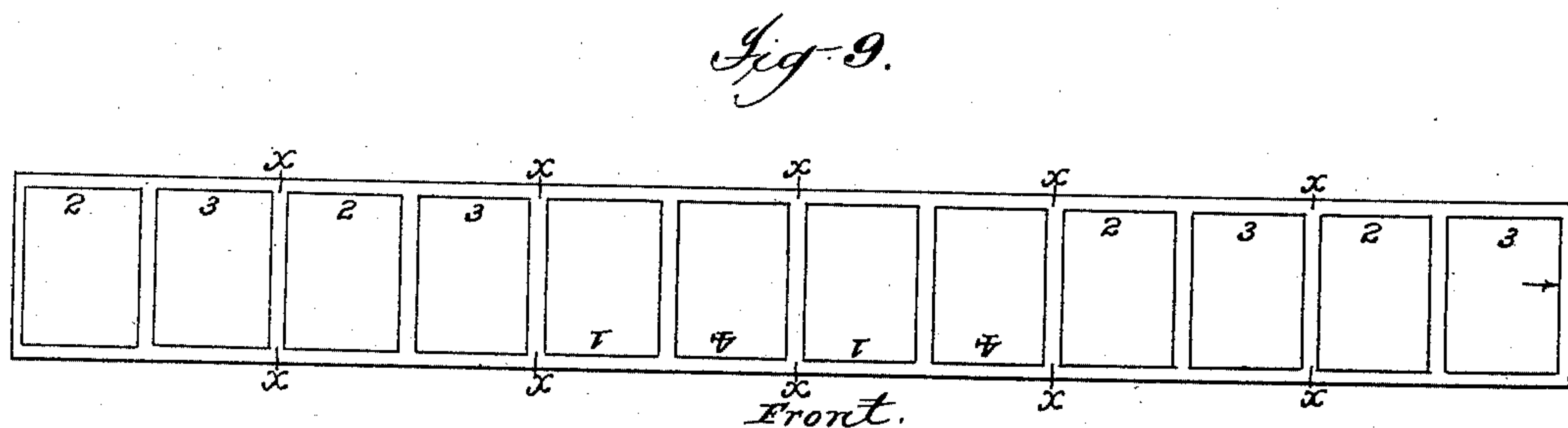
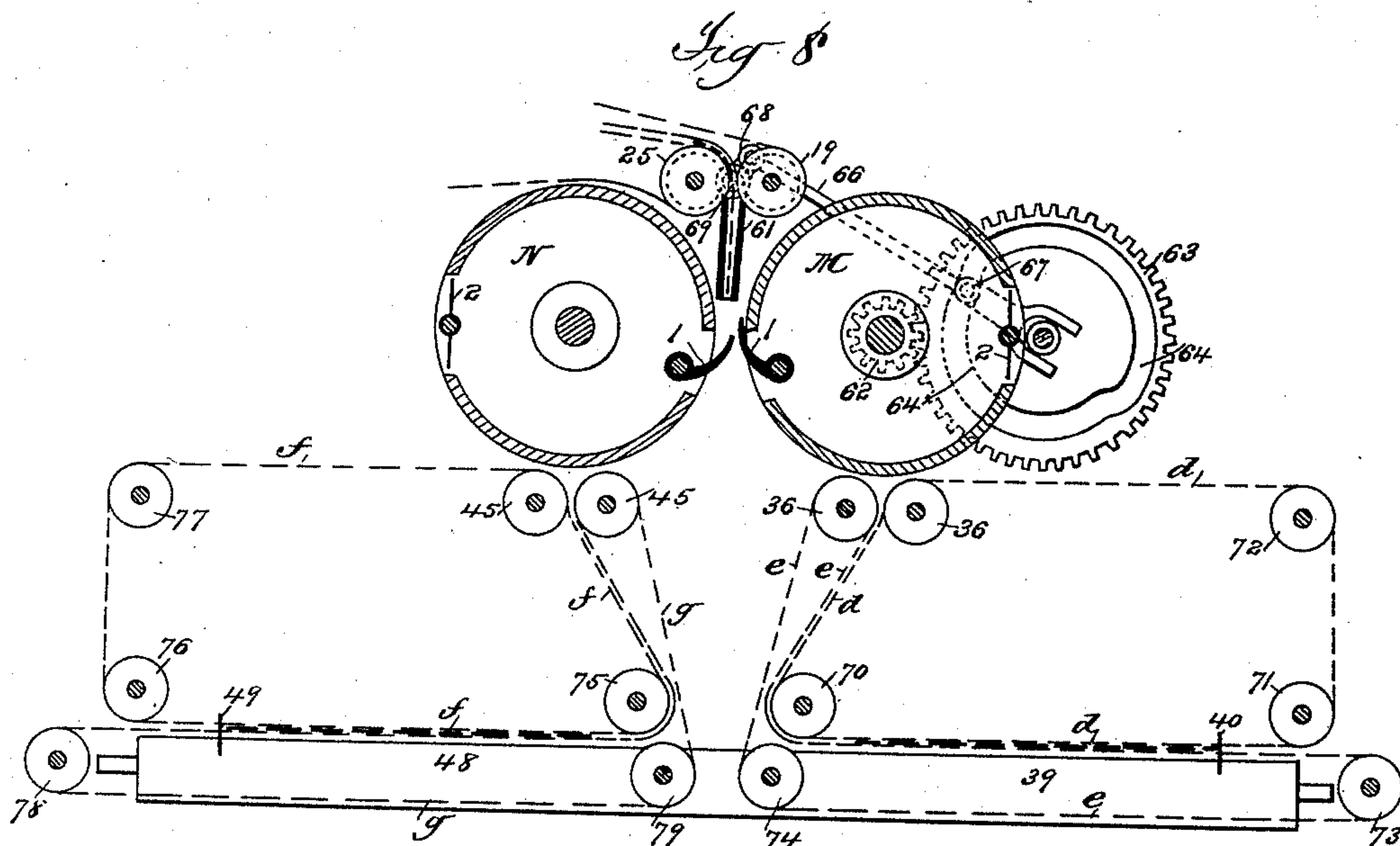
4 Sheets—Sheet 4.

S. D. TUCKER.

DELIVERY MECHANISM FOR WEB PRINTING MACHINES.

No. 441,811.

Patented Dec. 2, 1890.



Attest:
G. H. Rott
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Inventor:
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UNITED STATES PATENT OFFICE.

STEPHEN D. TUCKER, OF NEW YORK, N. Y.

DELIVERY MECHANISM FOR WEB-PRINTING MACHINES.

SPECIFICATION forming part of Letters Patent No. 441,811, dated December 2, 1890.

Original application filed February 26, 1883, Serial No. 86,264. Divided and this application filed July 2, 1890. Serial No. 357,555. (No model.) Patented in England October 3, 1881, No. 4,285.

To all whom it may concern:

Be it known that I, STEPHEN D. TUCKER, a citizen of the United States, residing at New York city, in the county and State of New York, have invented certain new and useful Improvements in Delivery Mechanism for Web-Printing Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same, (the said improvements being embraced in British Letters Patent to William Conquest, No. 4,285, dated October 3, 1881.)

In order to produce newspapers at the speed required by most of the large establishments of the present day, it is necessary to use rotary mechanism and to print upon the paper while in the web, and it is also often desirable for various reasons, but particularly to save the expense and delay incident to stereotyping, to print directly from the type instead of from stereotype-plates.

For the sake of economy in construction and to secure compactness in the machine, it has also been found desirable in this class of machines to place the forms for printing both sides of the web upon a single type or form cylinder and to provide the same with a plurality of impression-cylinders, so that by printing the first side of a web, turning it over, and presenting its opposite side to the form-cylinder both of its sides may be successively printed from the same forms of type. In such case, of course, both sides of the web will contain the same printed matter; but the travel of the web between the printing of its opposite sides is so distanced that the inside pages of the sheet upon the side of the web will fall opposite the outside pages of the sheet upon the opposite side of the web, and vice versa. When printing is done directly from the type on a cylinder, it is necessary to make the cylinder of a comparatively large size, as in practice it is found impossible to successfully secure ordinary parallel type onto a cylinder as small as those commonly employed in web-printing machines which print from stereotype-plates. When a cylinder of sufficient size to successfully carry the forms in type is used, it will be found so large that the forms for printing

both sides of an ordinary newspaper will occupy very much less than its whole circumference. This last fact makes necessary, in order that the web may receive continuous printing, the use of register-rolls and an increased number of impression-cylinders, so that the forms may be enabled to make two or more duplicate and succeeding impressions upon each side of the web at each revolution of the form-cylinder. In machines of this kind the columns of type must run lengthwise of the cylinder, and in order to properly print a web on both its sides the heads of one-half the forms must point in one direction and the heads of the remaining half in the opposite direction. When the web is cut into sheets, it is desirable to deliver by themselves all sheets whose heads lie in the same direction. If they are to be delivered open, two sheet-fliers are used. If they are to be folded, two folding mechanisms are provided, which fold their respective sheets in the proper directions.

The present invention relates to a folding delivery apparatus adapted to operate in conjunction with a printing mechanism of this character, the invention consisting in the various features of construction and combinations of parts, which will be hereinafter fully explained, and particularly pointed out in the claims.

For a full understanding of my invention a detailed description of a machine embodying the same will now be given, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 shows in side elevation a printing mechanism of the character specified provided with a delivery apparatus arranged to print and fold an ordinary folio or four-page newspaper. Fig. 2 is an end elevation of the same. Fig. 3 is an end elevation on an enlarged scale of the folding-cylinders shown in Fig. 1. Fig. 4 is a plan view of the same. Figs. 5, 6, and 7 are diagrammatic sections of the same cylinders, showing the parts in different positions. Fig. 8 is a similar view showing a modification, and Fig. 9 shows the order in which the impressions occur.

By reference to Fig. 1 it will be seen that

the printing apparatus is adapted to operate upon two webs simultaneously; but the mechanism will be described in connection with its operation upon only one web, it being understood that the operation of the printing mechanism on the other side of the cylinder is the same as that described and that a delivery mechanism of the same or any other desired form may be combined therewith at the other end of the machine.

The printing mechanism shown in the present case is substantially the same as that shown in Letters Patent No. 367,123, granted to me July 26, 1887, and consists of a form-cylinder A, which is of the usual construction and of a size sufficient to permit ordinary type to be securely fastened to its periphery. This cylinder is mounted in bearings in an appropriate frame, and is provided with means for carrying four forms of type, which, for convenience, it will be assumed are of a size suitable for printing the four pages of an ordinary folio or four-page newspaper. These forms are arranged in pairs located diametrically opposite each other upon the cylinders, each pair occupying one-fourth of its circumference, the columns of matter lying, as is necessary in machines of this class, parallel with the axis of the cylinder, and the forms being so arranged that those for printing pages 3 2 and 4 1 will as the cylinder revolves follow each other in the order named around the cylinder.

The spaces upon the cylinder between the groups of forms are occupied by ink-distributing tables or surfaces, which are supplied with ink from a fountain in the usual manner, the ink being taken from the tables and supplied to the forms by the ordinary inking mechanism represented by the rolls 11, as in the manner of the well-known Hoe type-revolving press.

Inasmuch as the forms cover only one-half the circumference of the type-cylinder, it becomes necessary, as hereinbefore set forth, in order to print the whole surface of the web, that each form should act twice upon each side of the web at each revolution of the cylinder. To accomplish this four impression-cylinders B C D E and two register-rolls 12 13 are provided. The web is led from its roll around the first impression-cylinder B, thence outward around the register-roll 12, and thence inward around the second impression-cylinder C. The register-roll 12 is placed at such a distance from the impression-cylinders B C that the advance edge of the impression on the web given by the first pair of forms against cylinder B will arrive upon cylinder C just in time to exactly join with the rear edge of the impression given by the same pair of forms against that cylinder. From this it results that this pair of forms makes two impressions upon the web in succession, the second impression being just in advance of the first. Following the rear edge of the impres-

sion made by this pair of forms against cylinder B will be a blank space equal to the space upon the form-cylinder between the groups of forms. At the end of this space the second pair of forms will make an impression upon the web against cylinder B, and passing to cylinder C will make a second impression just in advance of the first, which second impression will just join the impression given by the first pair of forms upon cylinder B, and thus fill the blank space referred to. This operation being repeated at each revolution of the form-cylinder, one side of the web will be wholly covered, the pages occurring twice in succession, as 3 2 3 2 4 1 4 1, as shown in Fig. 9. After passing the impression-cylinder C, the web, now printed upon one side, is conducted around guide-rolls 14 and a web-turner F, which operates to reverse the web, so that its unprinted side is presented to the forms as it passes around impression-cylinders D E. After passing cylinder D, the web passes outward around register-roll 13, and thence inward around cylinder E. The operation of the form-cylinder, in connection with impression-cylinders D E, to print the side of the web now presented is exactly the same as that already described in connection with cylinders B C for printing the first side of the web, and therefore needs no further description. The distance traveled by the web between cylinders C and E will be so regulated by the position of the rolls 14, one or more of which may be adjustable, that the impression made by the forms upon the opposite sides of the web will be in exact register; but pages 3 2 will be backed by forms 4 1, and vice versa.

In putting the forms onto the cylinder A the heads of the forms 3 2 are placed to the left of the machine as it is represented in Fig. 1 and the heads of forms 4 1 are placed to the right. When the web has been printed on one side and turned over and the pages 3 2 have been backed by the forms 4 1, and vice versa, as has been explained, it will be apparent that the heads of the pages in register on opposite sides of the web will point in the same direction, and also that two succeeding sheets will have their heads to the front and two to the rear alternately, as shown on the printed web, Fig. 9. The printed web on leaving the last impression-cylinder E passes between the cutting-cylinders G H, by which it is partially severed into sheets on the lines *x x*, Fig. 9, and then enters between two series of accelerated tapes *a b*. The tapes *a* pass around pulleys 15, under pulleys 16 17, over pulleys 18, under pulleys 19, over pulleys 20, and under pulleys 21 to pulleys 15. The tapes *b* pass around pulleys 22, over pulleys 23 24, under pulleys 16 17, over pulleys 18, under pulleys 25, over pulleys 26, and under pulleys 27 to pulleys 22. As the leading edges of the sheets arrive at the nipping-pulleys 16 24, they are parted from the web and

working-spaces gained between them in the usual manner as they are conveyed by the tapes to the folding-cylinders M N.

The printing mechanism above described may also be provided with tapes *c*, arranged as shown and described in my patent, No. 367,123, before referred to, for conducting the leading end of the web through the machine.

In folding newspapers it is requisite, however small the paper may be folded up, that the title or heading on the first page should always be left in sight. Now, it is obvious from an inspection of the printed web, Fig. 9, which represents the web as it issues from the printing-machine above described, that to accomplish this it is necessary that the two succeeding sheets having pages 3 2 uppermost must be folded through their center margins in one direction and the next two sheets having pages 4 1 uppermost must be folded in the opposite direction to bring page 1 on the outside. In the construction shown in the present case I accomplish this by providing two folding mechanisms arranged to fold sheets in opposite directions, and combine therewith a switch or sheet-director, which operates to direct sheets alternately to these folding mechanisms, so that two sheets will be taken by one folding mechanism and folded in one direction, and then two sheets by the second folding mechanism and folded in the opposite direction.

The folding mechanism may be of any suitable form, but preferably consists of two folding-cylinders M N, which are mounted in a frame-work and geared together to run in unison and receive motion from the impression-cylinder C or some other suitable part of the printing mechanism through the train of intermediate gears 28. These folding-cylinders are each furnished with a set of grippers 1, closed by a spring in the usual manner, and also with a rotating folding-blade 2, of the construction shown and described in Letters Patent No. 171,196.

The folding devices may be so arranged as to operate at any desired interval; but the folding-cylinders will preferably be so arranged as to fold their two successive sheets at equal intervals by folding them at their alternate revolutions, thus reducing the operations of all the folding devices one-half and permitting them to operate at a correspondingly reduced speed. This may be effected, as shown, by removing one of the blades of the rotating folder, so that the remaining blade will only be in an operative position at each second revolution of its cylinder, the folder being constructed and operated as described in my United States Letters Patent No. 214,066, or the folder may be arranged in any other suitable manner for folding at alternate revolutions. The gripper-cams will be so brought into and out of action as to cause the grippers to co-operate with the folding-blades, as explained hereinafter. The folding-cylinders

M N are placed at a slight distance apart and revolve from each other at the top, the sheets, as they issue from between the rollers 19 25, being directed to their respective cylinders by a vibrating switch or sheet-director 3. This switch and the grippers 2 are operated as follows: The cylinder M has on its shaft a pinion 29, which drives a cam-wheel 30, of four times its size, this wheel being provided with cam-grooves 4 5 upon its opposite sides for operating the gripper-cams and switch, respectively. The gripper-cams 32 are mounted upon rock-shafts 33, from which extend arms 34, the ends of which are connected to rods 35, provided with studs 10, which rest in opposite sides of the groove 4 of the cam-wheel 30, so that the wheel, as it revolves, will rock the gripper-cams in and out of action alternately, in accordance with the movement of the folding-blades. The groove 5 in the rear side of the wheel embraces a stud 6, projecting from the forked rod 7, the upper end of which is jointed to an arm 8 on the shaft 9 of the switch. The shape of the groove 5 is such that it will cause the switch 3 to direct two sheets in succession to each cylinder. The cylinder M folds between two folding-rolls 36, around which pass two series of tapes *d e*, these tapes passing from the folding-rolls 36 around the rolls 37 38 and inward over the folding-rolls 39 to the stop 40, whence they diverge, the tapes *d* returning around roll 41 directly to folding-rolls 36, and the tapes *e* around rolls 42 43 44 to the same. The folding-cylinder N folds between a pair of folding-rolls 45, from which extend two series of tapes *f g*. These tapes *f g* pass from rolls 45 around rolls 46 47 inward over roll 48 to the stop 49, whence they diverge, the tapes *f* returning around roll 50 to the folding-rolls 45, and the tapes *g* returning around rolls 51 52 53 to the same. The folding-rolls 39 48 are shown herein as formed of one continuous roll, the two ends of which form the respective folding-rolls, the rolls 42 51 being cut midway of their lengths to permit the rolls 39 48 to pass transversely to them. It will be understood, however, that the rolls 39 48 may be independent rolls, if preferred, in which case the rolls 42 51 may be continuous. The sheets from cylinder M are folded between the folding-rolls 39 by a vibrating folding-blade O of a common construction, whence they pass into the control of tapes *h i*, by which they are carried downward from rolls 39 between rolls 54, extending centrally of the machine directly below rolls 39. The tapes *h* are a series of short up-and-down tapes extending only between the rolls 39 and 54. The tapes *i*, however, extend around one of the rolls 54 and outward to the front side of the machine over roll 55, carrying the sheet over another pair of folding-rolls 56, between which the sheet is folded by a vibrating folding-blade P and is laid by a vibrating fly 57 upon a series of slowly-moving delivery-tapes *k*. The

sheets from cylinder N are folded between
 the folding-rolls 48 by a vibrating folding-
 blade Q, similar to blade O, and pass thence
 into the control of two series of tapes arranged
 5 similarly to the tapes *h i*, except that the
 tapes *m* extend outward to the rear side in-
 stead of to the front side of the machine,
 passing over the roll 58 and carrying the sheet
 over a pair of folding-rolls 59, between which
 10 the sheet is folded by a vibrating folding-
 blade R and laid by a fly 60 upon a series of
 slowly-moving tapes *n* at the rear side of the
 machine, the sheets from cylinders M N thus
 being delivered on the same level at the same
 15 end of the machine, but upon opposite sides
 of the machine.

With the mechanism as thus described, let
 it be supposed that the first sheet as it issues
 from between rolls 19 25 has pages 3 2 on its
 20 upper side with their heads to the rear, as de-
 scribed in connection with the printing mech-
 anism. This sheet is directed by the switch
 3 to the cylinder N, as shown in Fig. 3, so that
 pages 3 2 are next the cylinder and pages 1
 25 4 on the outside. As the gripper-cam 4 and
 rotating folding-blade are in operative posi-
 tion during the first revolution of the cylin-
 der, the sheet will be taken and folded be-
 tween the rolls 45, as shown in Fig. 5, from
 30 whence it will be taken by the tapes *f g* and
 conveyed outward and then downward and
 inward over the folding-rolls 48 to the stop
 49, whence it will be folded by vibrating blade
 Q between the folding-rolls 48. As this first
 35 sheet has the pages 3 2 next to the cylinder
 N with their heads toward the rear of the
 machine, as described, the sheet will be folded
 between rolls 45 with pages 4 1 on the out-
 side, and the sheet will be carried over the
 40 folding-rolls 48 with page 1 facing downward,
 so that the sheet is folded between rolls
 48 with page 1 on the outside. The sheet
 then passes under the control of tapes *m* over
 the folding-rolls 59, between which the sheet
 45 will be folded by folding-blade R, thus leav-
 ing the title or heading exposed across both
 its sides. The sheet is then laid by fly 60 on
 tapes *n* and delivered at the end of the ma-
 chine on the rear side. The second sheet
 50 will also be directed to and taken by the cylin-
 der N at its second revolution; but as the
 single blade 2 of the cylinder is now turned
 inward the sheet will now be folded, and as
 the cam-groove 4 has in the meantime rocked
 55 the gripper-cam 32 out of operative position
 the gripper 1 is not raised and the sheet is
 not released, but carried around again, as
 shown in Fig. 6. The cam-groove 5 will now
 have rocked the arm 8 so as to move the
 60 switch 3 to its opposite position, so that the
 third sheet with pages 4 1 on its upper side
 and with their heads to the front will be di-
 rected to the cylinder M, and as the gripper-
 cam 4 and folding-blade of this cylinder will
 65 be in operative position, as will also the grip-
 per-cam and folding-blade of the cylinder N,

both cylinders will during their third revolu-
 tion fold their sheets simultaneously through
 their respective folding-rolls 36 45, as shown
 in Fig. 7. The sheet folded from cylinder N, 70
 having pages 3 2 next the cylinder, will be de-
 livered as previously described in connec-
 tion with the first sheet taken by the cylinder.
 The sheet taken by cylinder M, having pages 4
 1 on its upper side, will pass around the cylin- 75
 der with the pages 4 1 upon the outside of the
 cylinder and will be folded between the rolls
 36 and into the control of the tapes *d e*, with
 pages 4 1 on the outside, and will pass to fold-
 ing-rolls 39 with page 1 downward. As de- 80
 scribed in connection with cylinder N, there-
 fore, this third sheet will also be folded with
 page 1 upon the outside and delivered by
 tapes *k* at the end, but on the front side of
 the machine. The fourth sheet will also be 85
 directed to and taken by the cylinder M; but
 at the fourth revolution the single blade will
 not be in position to fold the sheet, nor will
 the gripper-cam 32 be in position to release
 it, (see Fig. 3;) so it will be carried around to 90
 the fifth revolution. By this time the switch
 3 will have been moved and the gripper-cams
 rocked into position, so that the fifth sheet
 will be taken by the cylinder N, and this
 sheet will be folded through the rolls 45 si- 95
 multaneously with the folding of the fourth
 sheet on cylinder M through rolls 36. The
 sixth sheet will also be taken by cylinder M,
 but will not be folded at this revolution, but
 will be carried around and folded at the sev- 100
 enth revolution of the cylinder simultane-
 ously with the seventh sheet, which will have
 been taken by the cylinder M, and so the op-
 eration will continue to be repeated.

In the organization shown in Fig. 8 the 105
 sheets are folded at equal intervals, as al-
 ready described, and the devices, though
 somewhat changed in form, perform pre-
 cisely the same functions as in the previous
 arrangement. The folding-cylinders M N re- 110
 volve toward each other at the top, and the
 sheets are directed to their respective cylin-
 ders by a vibrating guide or sheet-director
 61, formed of two plates, between which the
 sheets pass. The cylinder M has on its shaft 115
 a pinion 62, which drives a wheel 63 of four
 times its size, and this cam-wheel has a cam-
 groove 64 formed in its side and so shaped
 that by means of the forked rod 66, the stud
 67 of which rests in the cam-groove, and the 120
 rock-arm 68, fixed to the shaft 69 of the sheet-
 guide 61, the guide is caused to oscillate and
 deliver two sheets in succession to each cylin-
 der. The grippers may be operated by
 either revolving or stationary cams so shaped 125
 as to cause the grippers to properly co-oper-
 ate with the rotating folding-blades 2, which
 in this construction are double-edged, as
 shown, and are caused to operate only at al-
 ternate revolutions of their cylinders in the 130
 manner shown and described in United States
 Letters Patent No. 191,494. The course of

the tapes *d e* and *f g* in this construction is changed so as to carry the sheets from cylinders M N outward over folding-rolls 39 48, instead of inward, as in the construction shown in Figs. 1 to 7. The tapes *d e* pass from the rolls 36 around roll 70 outward to the stop 40 and then diverge, the tapes *d* returning over rolls 71 72 and the tapes *e* over rolls 73 74 to the folding-rolls, the course of the tapes *f g* being substantially the same, passing from rolls 45 over roll 75, thence outward over the folding-rolls 48 to the stop 49 and diverging, the tapes *f* returning over rolls 76 77 and the tapes *g* over rolls 78 79. The delivery mechanism beyond the folding-rolls 39 48 is the same as that shown and described in connection with Figs. 1 to 7. On account of the direction in which the cylinders revolve, the sheets having pages 3 2 on their right-hand side as they issue from the rolls 19 25 must be taken by the cylinder M in order that pages 4 1 may be folded on the outside, and those having pages 4 1 on their right-hand side must be taken by cylinder N, reversing the order of taking sheets from that shown and described in connection with Figs. 1 to 7; but otherwise the order and manner of taking and folding the sheets and the operation of the cylinders and vibrating sheet-director are exactly the same as previously described.

The form-cylinder in printing mechanisms of the class hereinbefore described is not always made of such size that the forms cover only one-half of its circumference. If the paper to be printed is of small size, the forms may cover only one-third or one-fourth of the cylinder, in which case the number of impression-cylinders, and consequently the number of successive impressions made by each form at each revolution of the form-cylinder, will be proportionately increased. In such case the sheet-directors and folding-cylinders M N will be so operated that instead of each cylinder taking two sheets in succession they will take three, four, or more successive sheets, according to the number of impression-cylinders. So also in some cases, when the forms are numerous or of large size, they may cover the entire surface of the form-cylinder, in which case only a single impression-cylinder will be used for each side of the web, and in such case the folding-cylinders will take alternate sheets instead of alternate pairs or series of sheets, so that in all cases the sheets having their columns headed in the same direction and having the same matter upon their upper or outer surfaces will be taken by the same cylinder and folded with the proper pages upon the outside.

While the printing and folding mechanism has been described only in connection with the production of an ordinary folio or four-page newspaper, it will be understood that, as fully set forth in my patent, No. 367,123,

above referred to, the printing mechanism is capacitated for a variety of products, and the folding mechanism may readily be arranged so as to properly deliver the other products of the printing mechanism.

While I have shown and described only a single form of folding mechanism and two forms of means by which the sheets may be delivered alternately to the folding mechanisms, it will be understood that any other folding mechanisms arranged to fold in opposite directions may be used and that the mechanism for directing the sheets to the cylinders may be varied widely by one skilled in the art without departing from my invention.

This application is a division of my application No. 86,264, filed February 26, 1883.

What I claim is—

1. The combination, with a single type or form cylinder and a plurality of impression-cylinders and register-rolls arranged to print both sides of a web from the same forms, of web-severing mechanism, two folding mechanisms arranged to fold sheets in opposite directions, and means for directing sheets alternately to said folding mechanisms, substantially as described.

2. The combination, with a single type or form cylinder and a plurality of impression-cylinders and register-rolls arranged to print both sides of a web from the same forms, of web-severing mechanism, two folding mechanisms arranged to fold the sheets in opposite directions, and means for directing series of sheets alternately to said folding mechanisms, substantially as described.

3. The combination, with two folding mechanisms arranged to fold sheets in opposite directions, of a vibratory sheet-director from which the folding mechanisms receive sheets directly, and means for causing said director to alternate between said mechanisms, substantially as described.

4. The combination, with two folding mechanisms arranged to fold sheets in opposite directions, of a vibratory sheet-director from which the folding mechanisms receive sheets directly, and means for causing said director to present a plurality of sheets to said folding mechanisms alternately, substantially as described.

5. The combination, with two folding-cylinders, of a vibratory sheet-director and means for causing said director to alternate between said cylinders, substantially as described.

6. The combination, with two folding-cylinders, of a vibratory sheet-director and means for causing said director to present a plurality of sheets to said cylinders alternately, substantially as described.

7. The combination, with two folding-cylinders, of a vibratory sheet-director, means for causing said director to alternate between said cylinders, and means for operating the

sheet-controlling devices of said cylinders to fold a sheet from both cylinders simultaneously, substantially as described.

5 8. The combination, with two folding-cylinders, of a vibratory sheet-director, means for causing said director to present a plurality of sheets to said cylinders alternately, and means for actuating the sheet-controlling devices of said cylinders to fold a sheet from both cyl-

inders singly and simultaneously, substantially as described.

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

STEPHEN D. TUCKER.

Witnesses:

OTTO L. RAABE,
D. CUNNINGHAM.