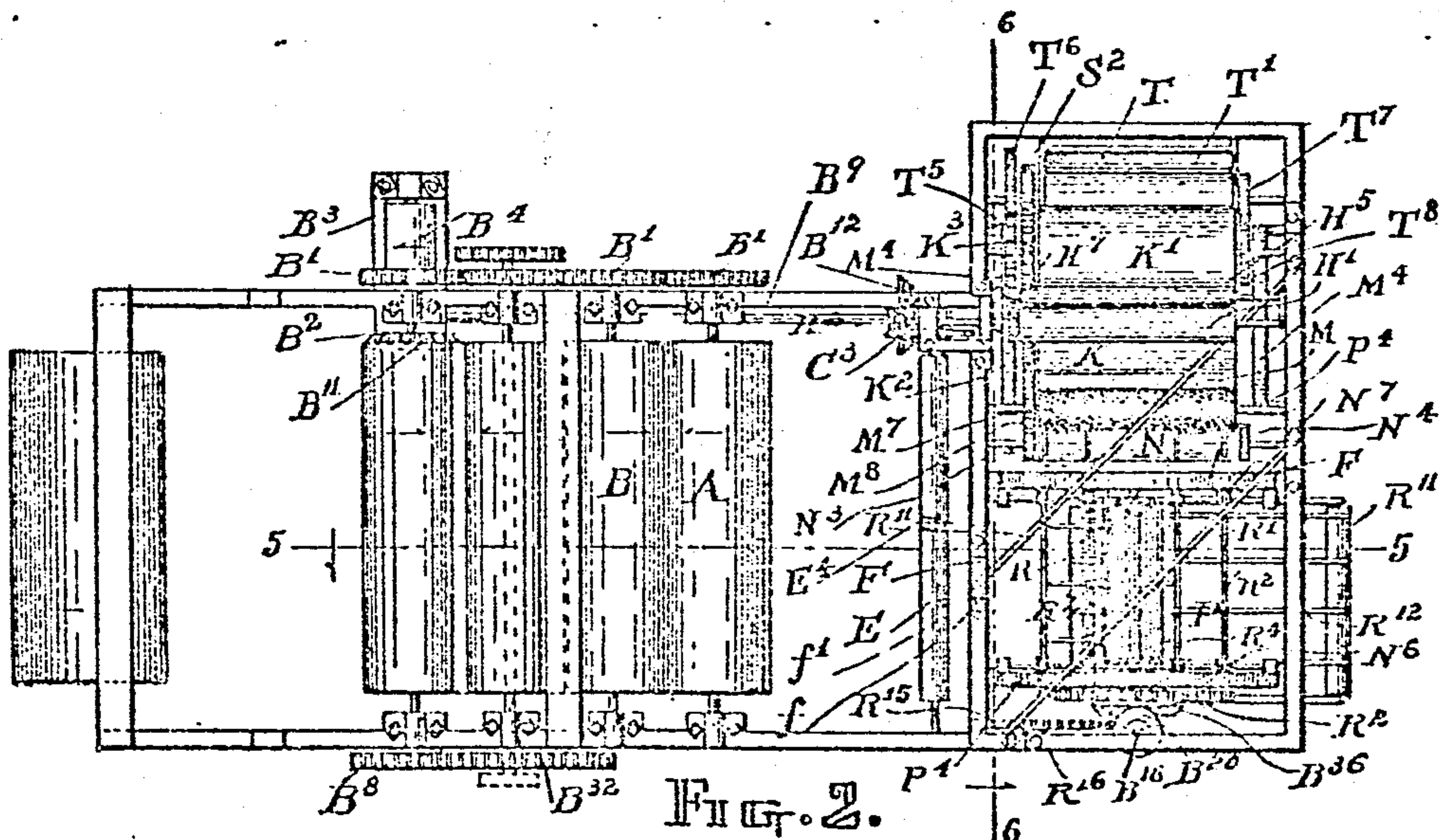
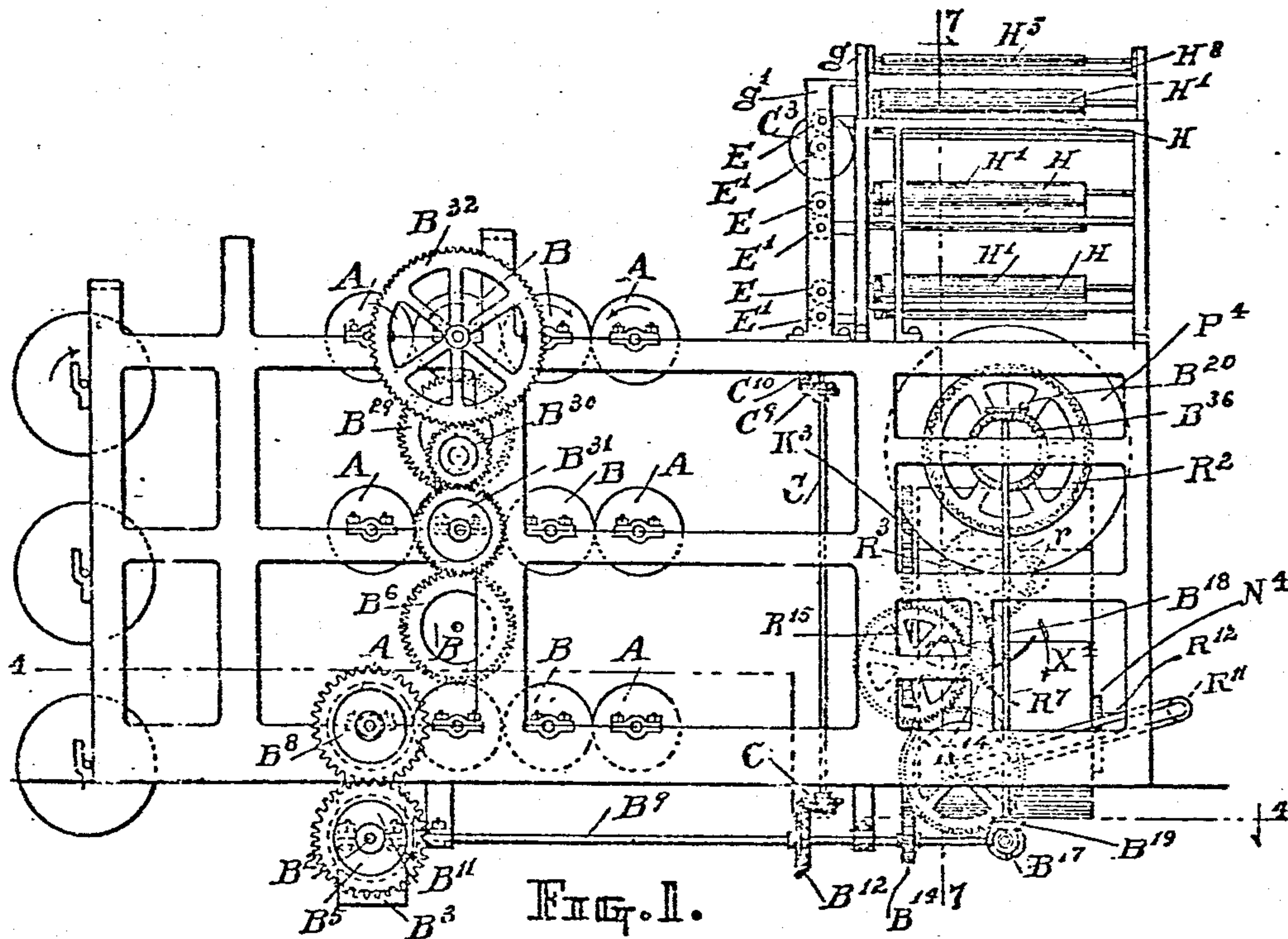


J. A. BOYCE.  
APPARATUS FOR PRINTING AND FOLDING NEWSPAPERS.  
APPLICATION FILED MAY 9, 1904.

900,259.

Patented Oct. 6, 1908.

11 SHEETS—SHEET 1.



Witnesses.  
Emma Schuyler  
Oliver C. DuBois.

Inventor.  
JOHN A. BOYCE.  
By Atty N. C. DuBois.



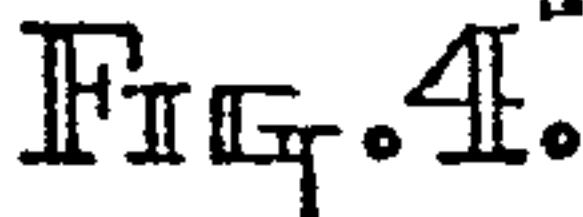
17

# APPARATUS FOR PRINTING AND FOLDING NEWSPAPERS.

Patented Oct. 6, 1908.

11 SHEETS--SHEET 2.

900,259.



Emma Sharp  
Chloroc. E. Dubois.

JOHN ABOYCE.

By Atty N. DuBois.



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APPARATUS FOR PRINTING AND FOLDING NEWSPAPERS.

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900,259.

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11 SHEETS—SHEET 3.

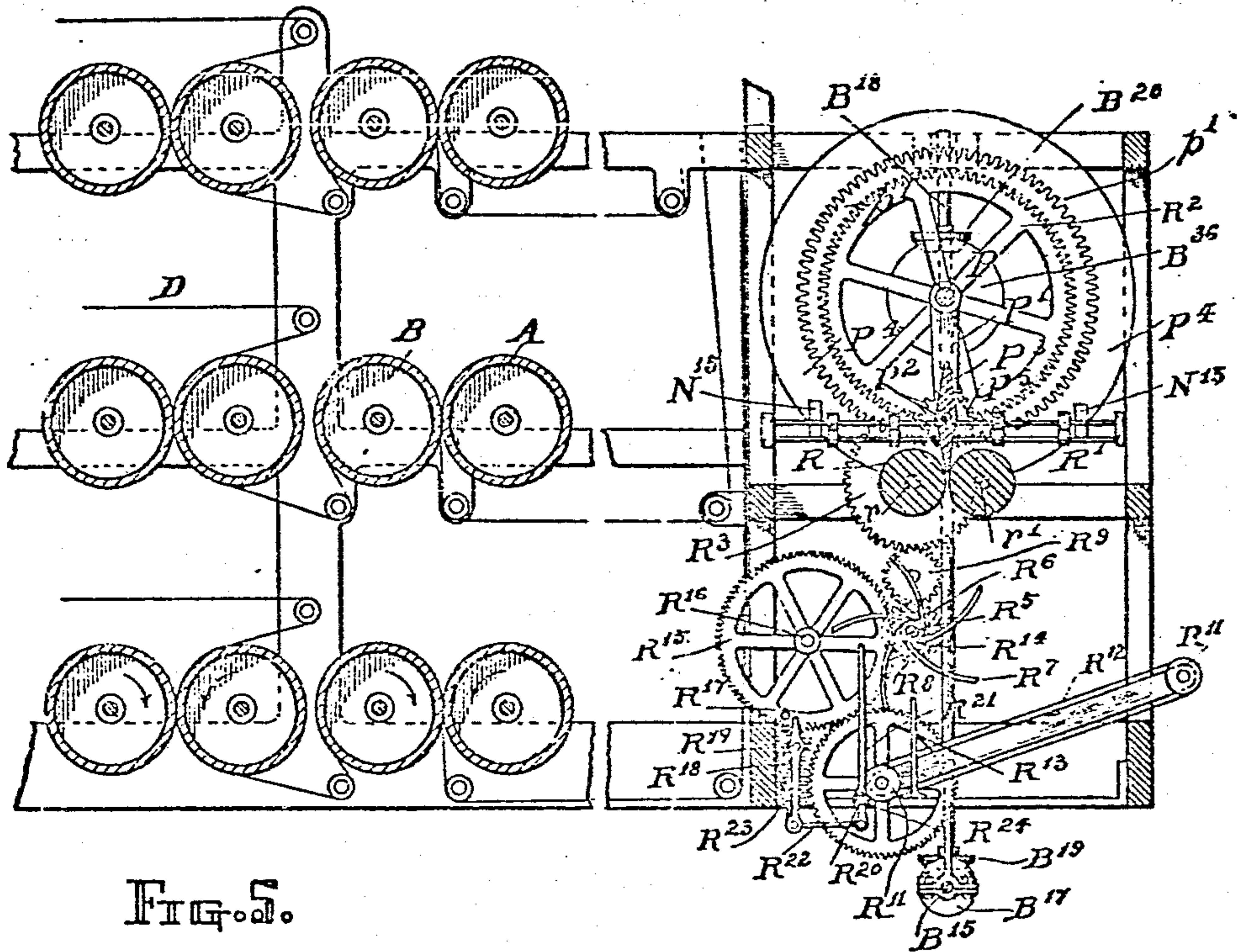


FIG. 5.

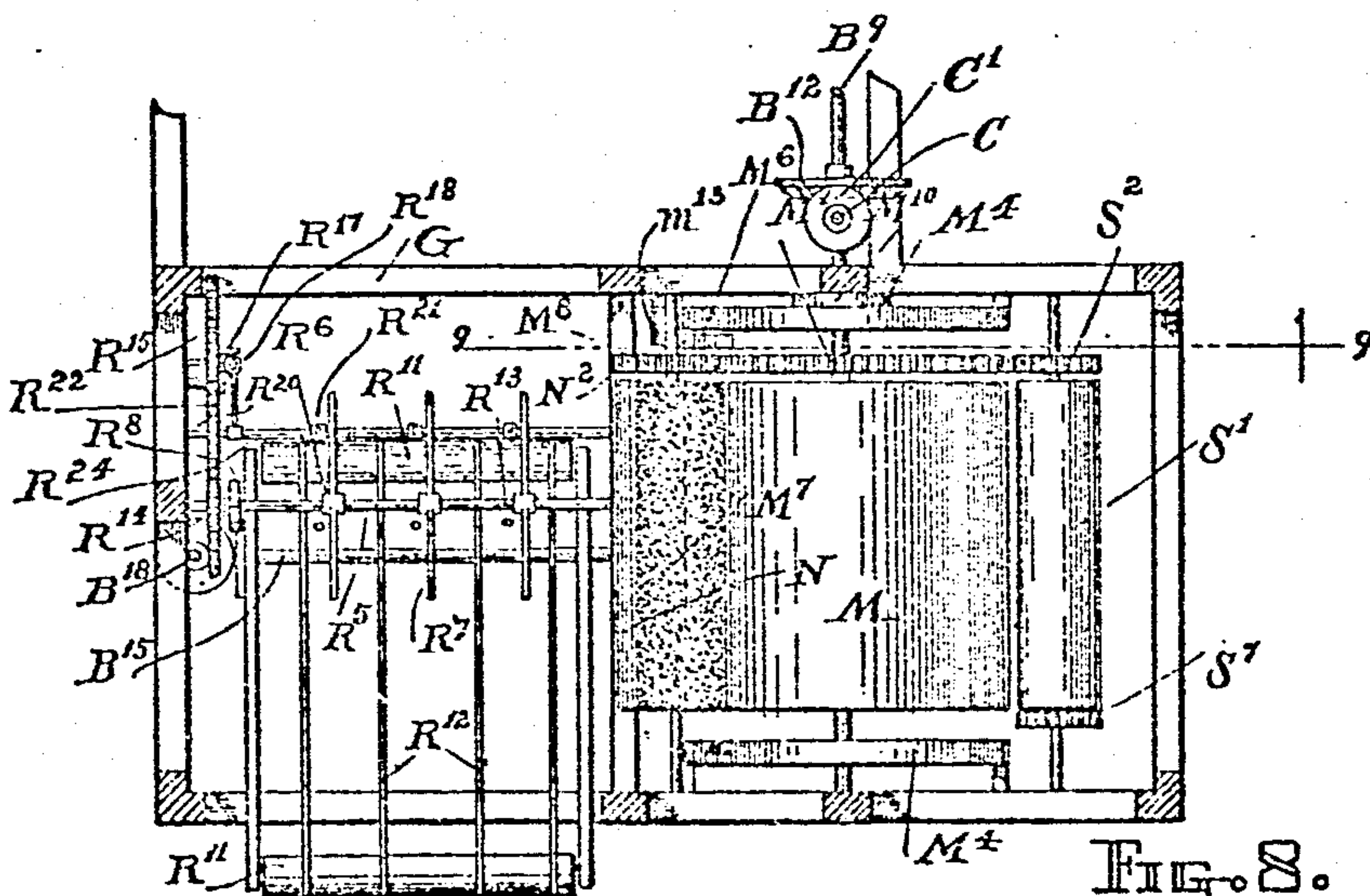


FIG. 8.

Witnesses.

Emma Sharp  
Artema C. DuBois.

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By Atty N. DuBois.



J. A. BOYCE.

APPARATUS FOR PRINTING AND FOLDING NEWSPAPERS.

APPLICATION FILED MAY 9, 1904.

900,259.

Patented Oct. 6, 1908.

11 SHEETS—SHEET 4.

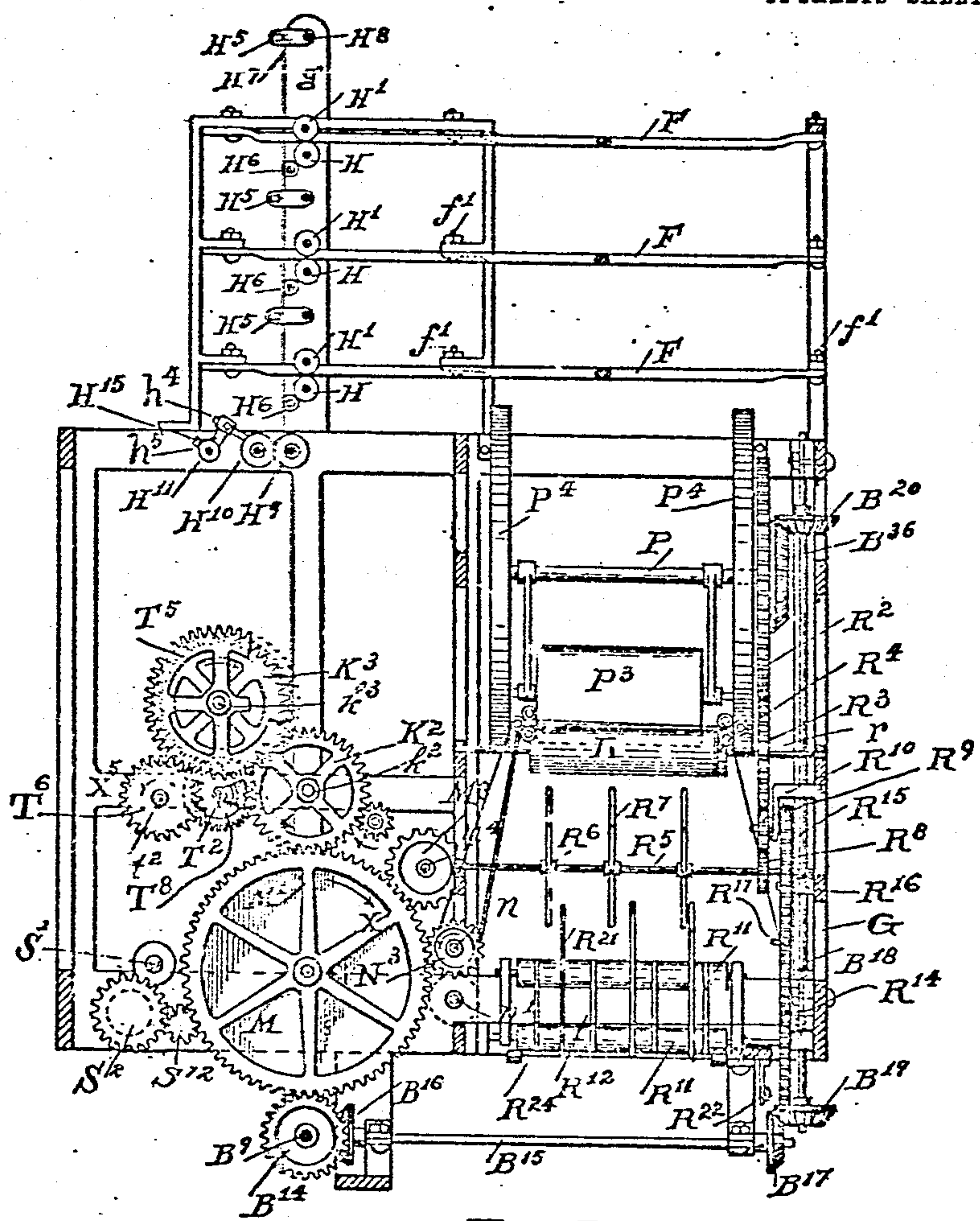


FIG. 6.

Witnesses.  
Emma Sharp  
Orelina E. DuBois.

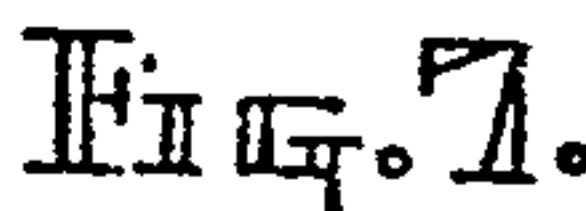
Inventor.  
JOHN A. BOYCE.  
By Atty C. V. DuBois.

APPARATUS FOR PRINTING AND FOLDING NEWSPAPERS.

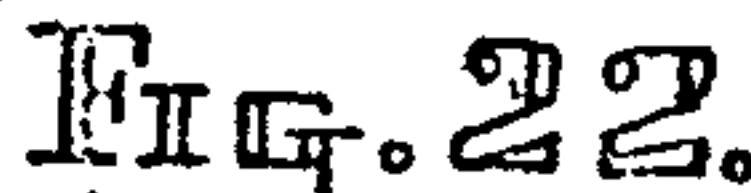
Patented Oct. 6, 1908.

11 SHEETS--SHEET 5.

900,259.



Emma L. Sharp  
Cortland, C. Du Bois.



JOHN A. BOYCE.  
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OR FOLDING.

DRAFTSMAN

J. A. BOYCE.

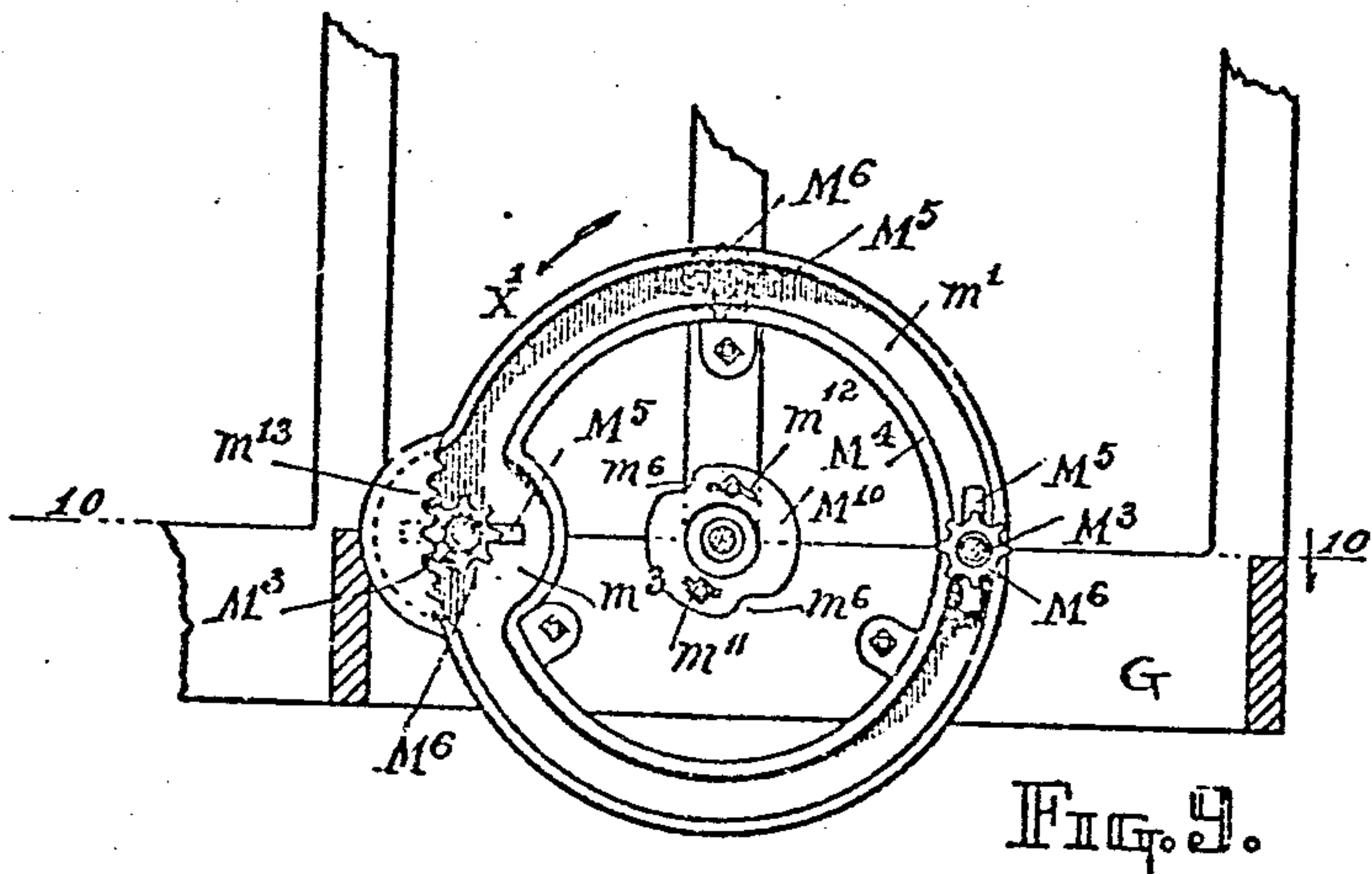
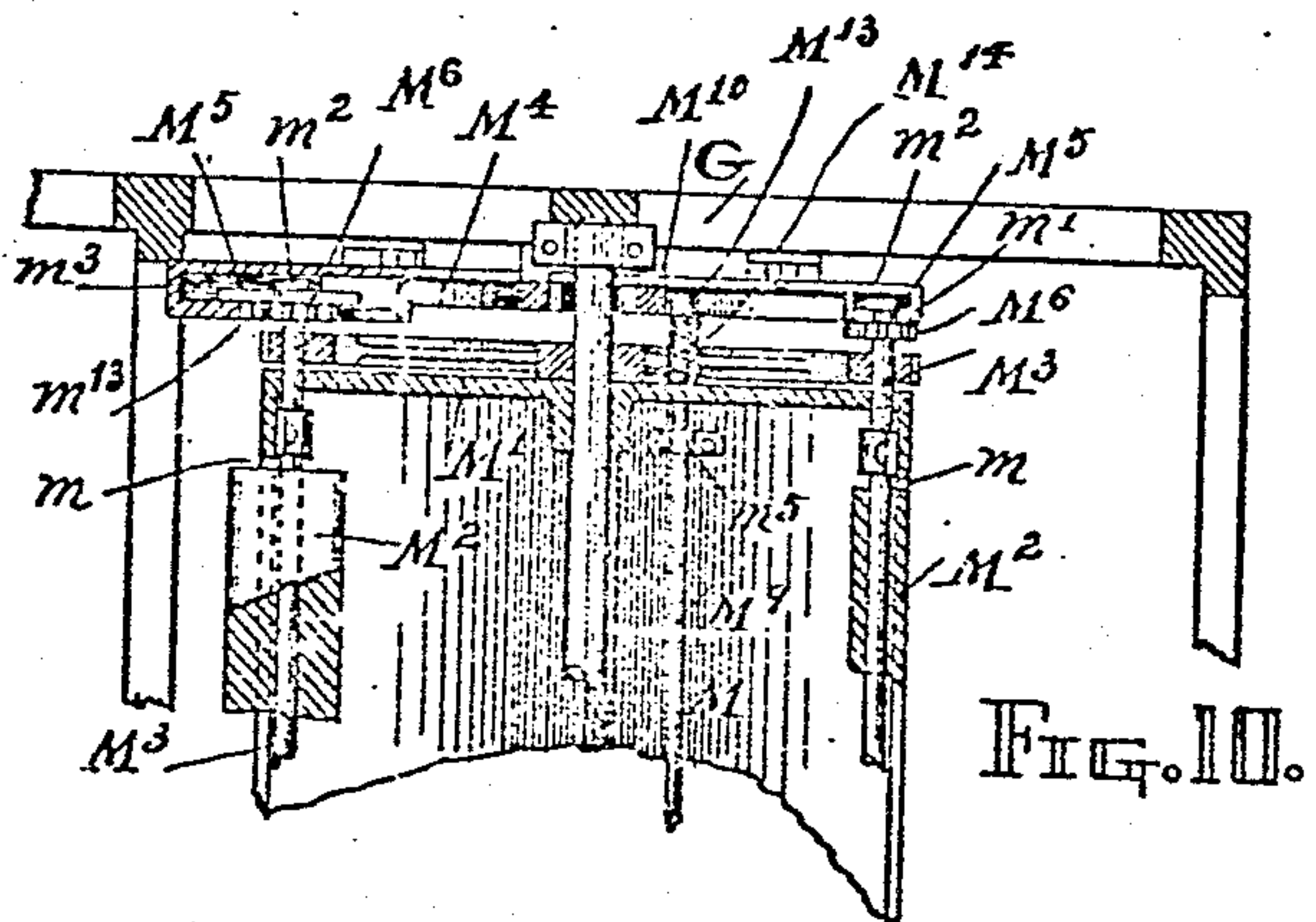
APPARATUS FOR PRINTING AND FOLDING NEWSPAPERS.

APPLICATION FILED MAY 9, 1904.

900,259.

Patented Oct. 6, 1908.

11 SHEETS—SHEET 6.



Witnesses.  
Emma Sharp.  
Ardena E. DuBois.

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APPARATUS FOR PRINTING AND FOLDING NEWSPAPERS.

APPLICATION FILED MAY 9, 1904.

900,259.

Patented Oct. 6, 1908.

11 SHEETS—SHEET 7.

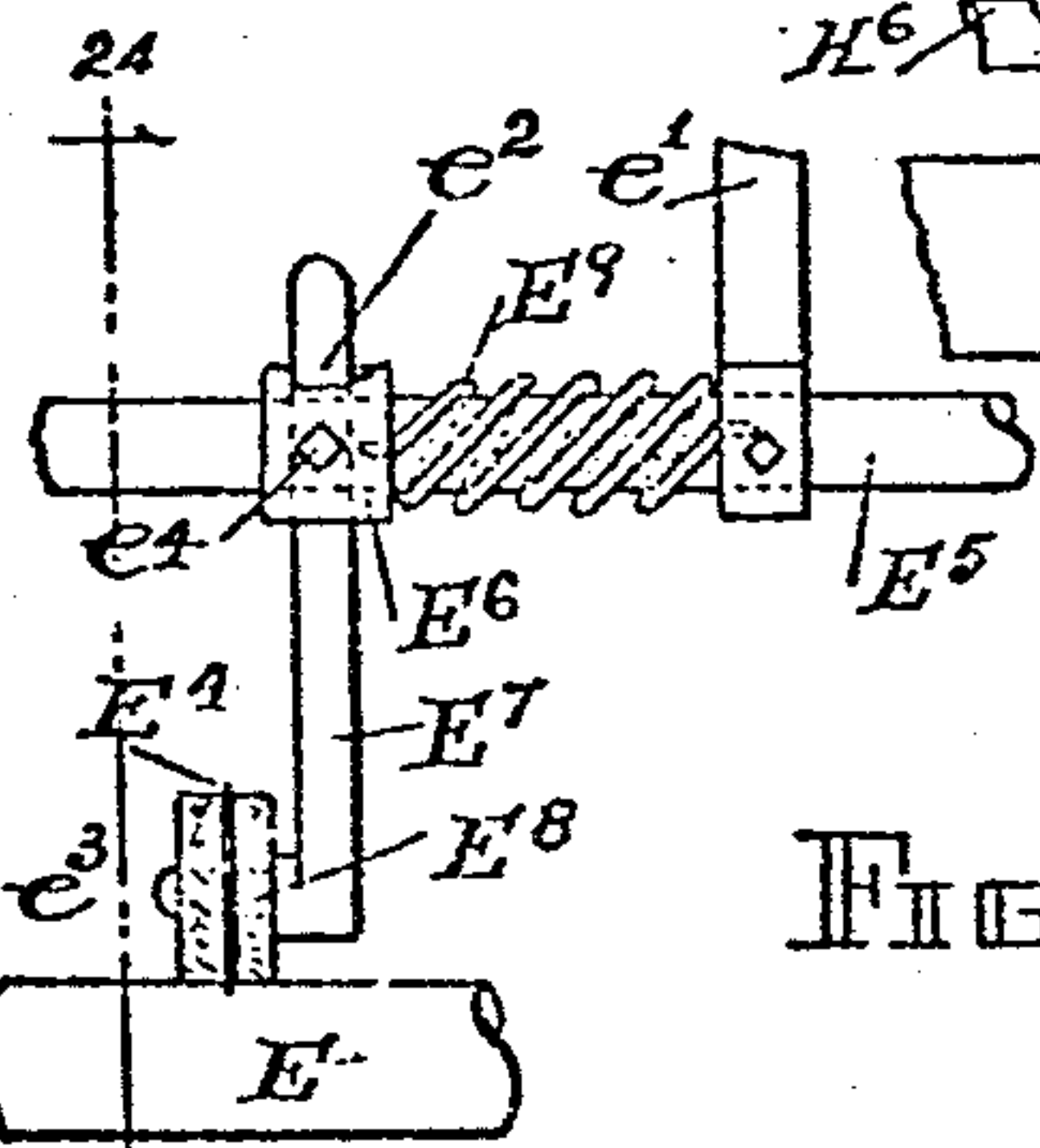
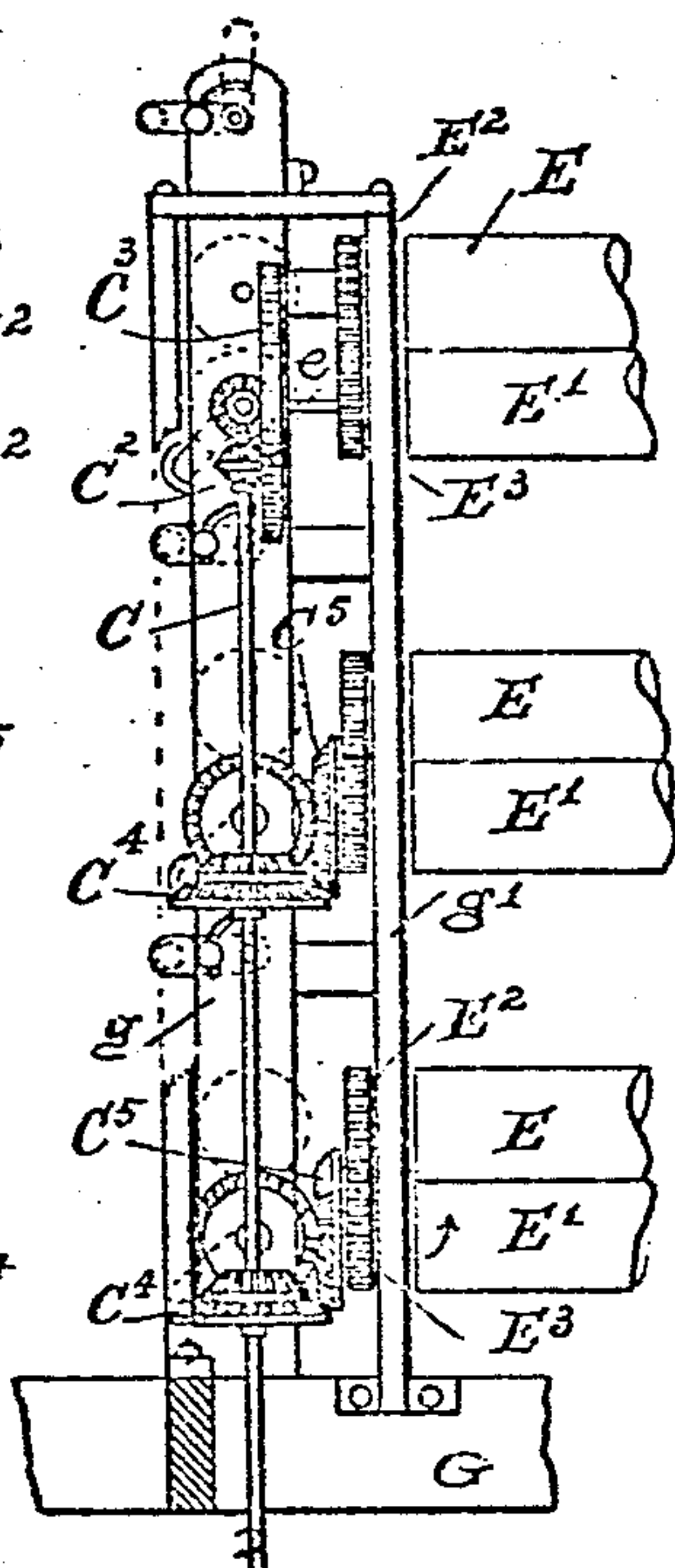
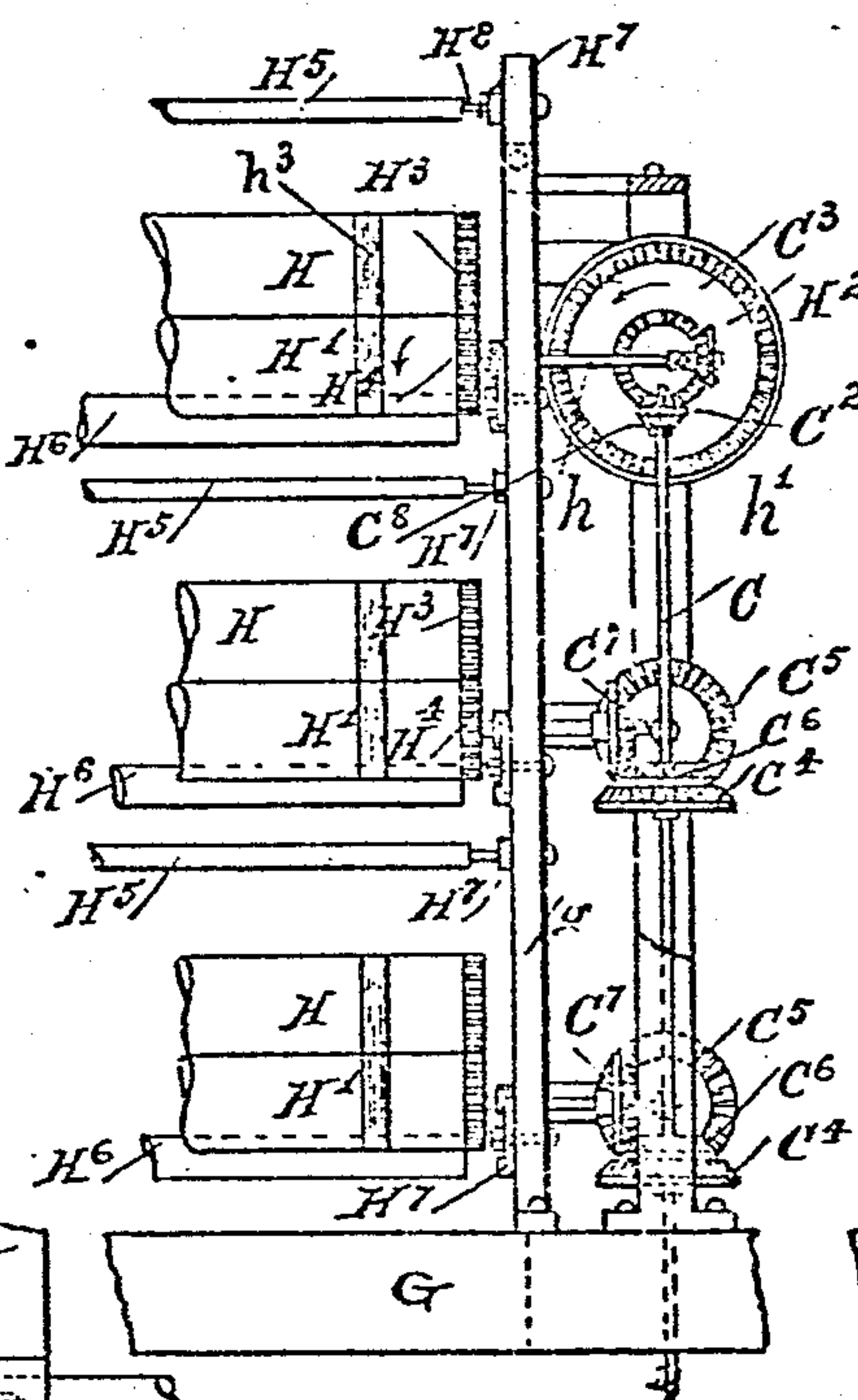
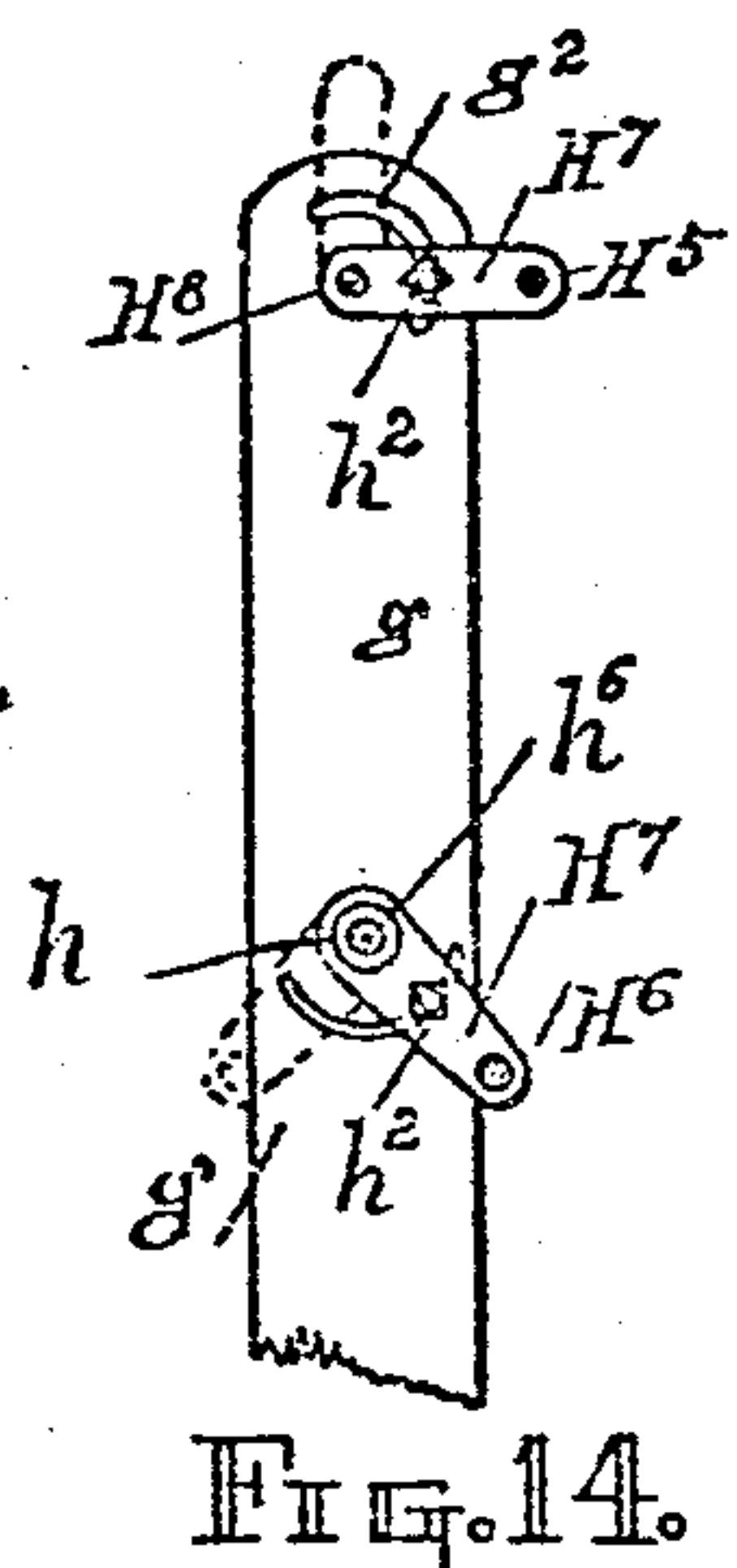


FIG. 11.

FIG. 12.

FIG. 23.

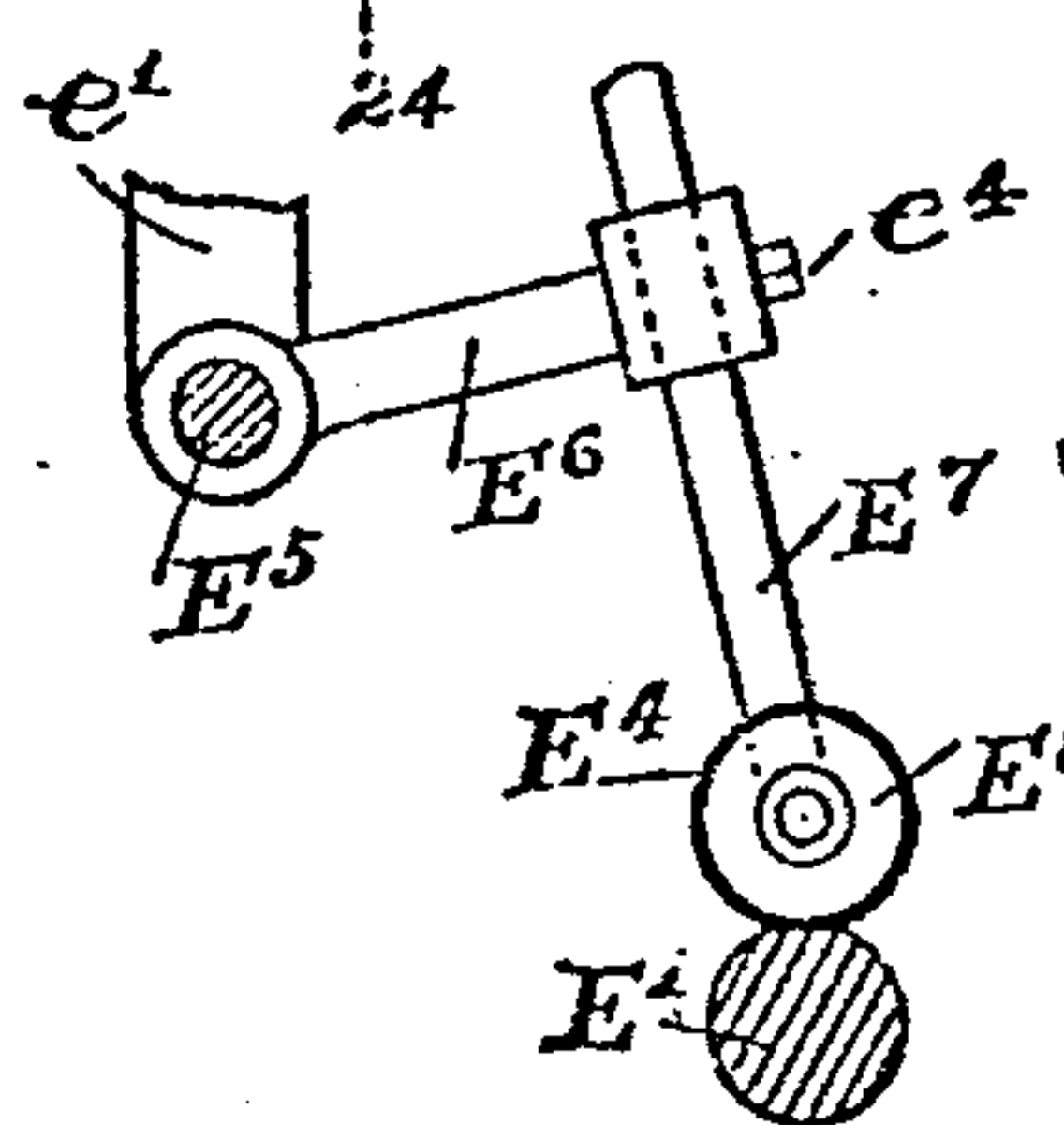


FIG. 24.

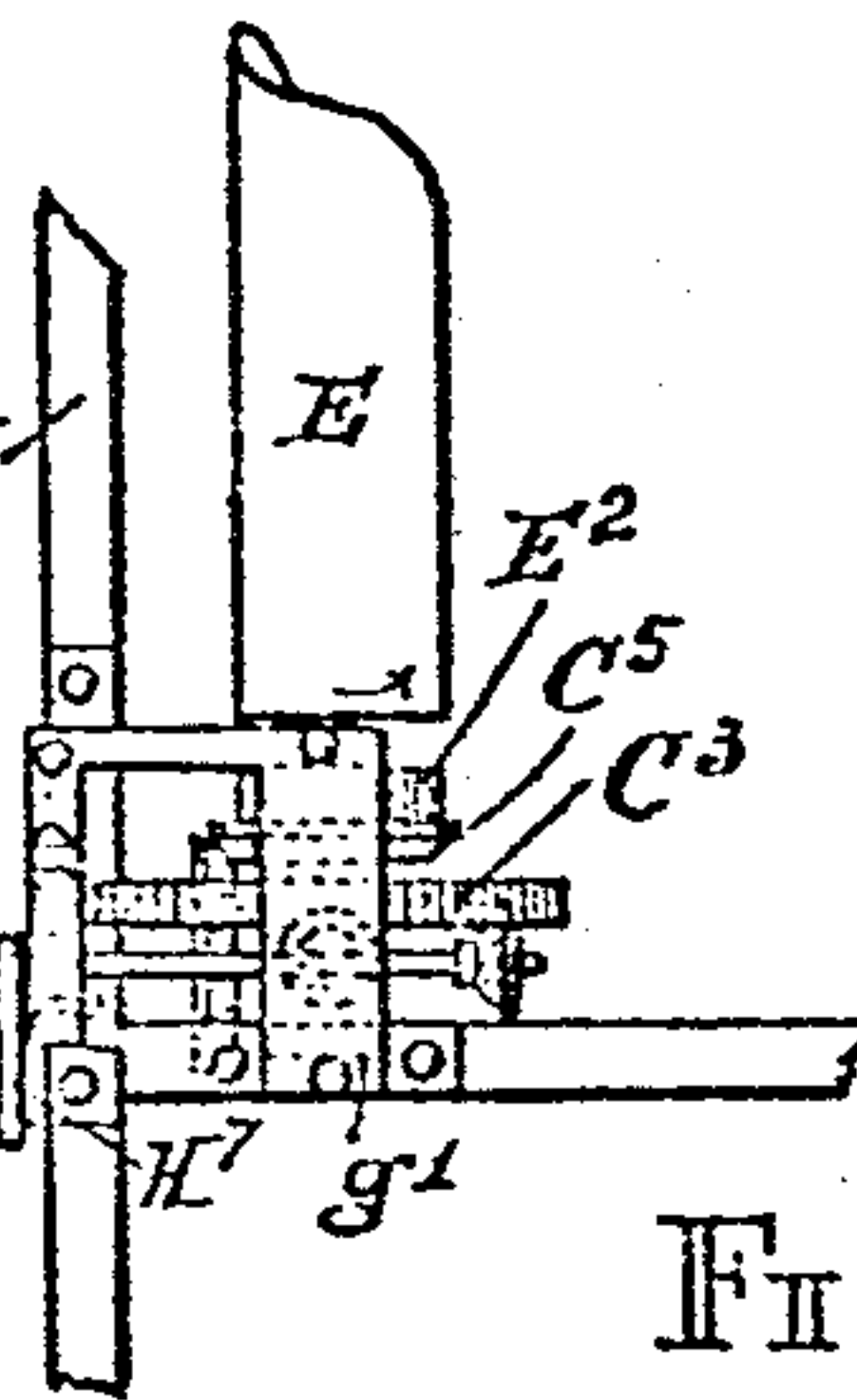


FIG. 13.

Witnesses.

Emma Sharp.  
Orlena L. DuBois.

Inventor.

JOHN A. BOYCE.  
By Atty N. DuBois.



270. SHEET-MATERIAL ASSOCIATING  
OR FOLDING.

DRAFTSMAN

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APPARATUS FOR PRINTING AND FOLDING NEWSPAPERS.

APPLICATION FILED MAY 9, 1904.

900,259.

Patented Oct. 6, 1908.

11 SHEETS—SHEET 8.

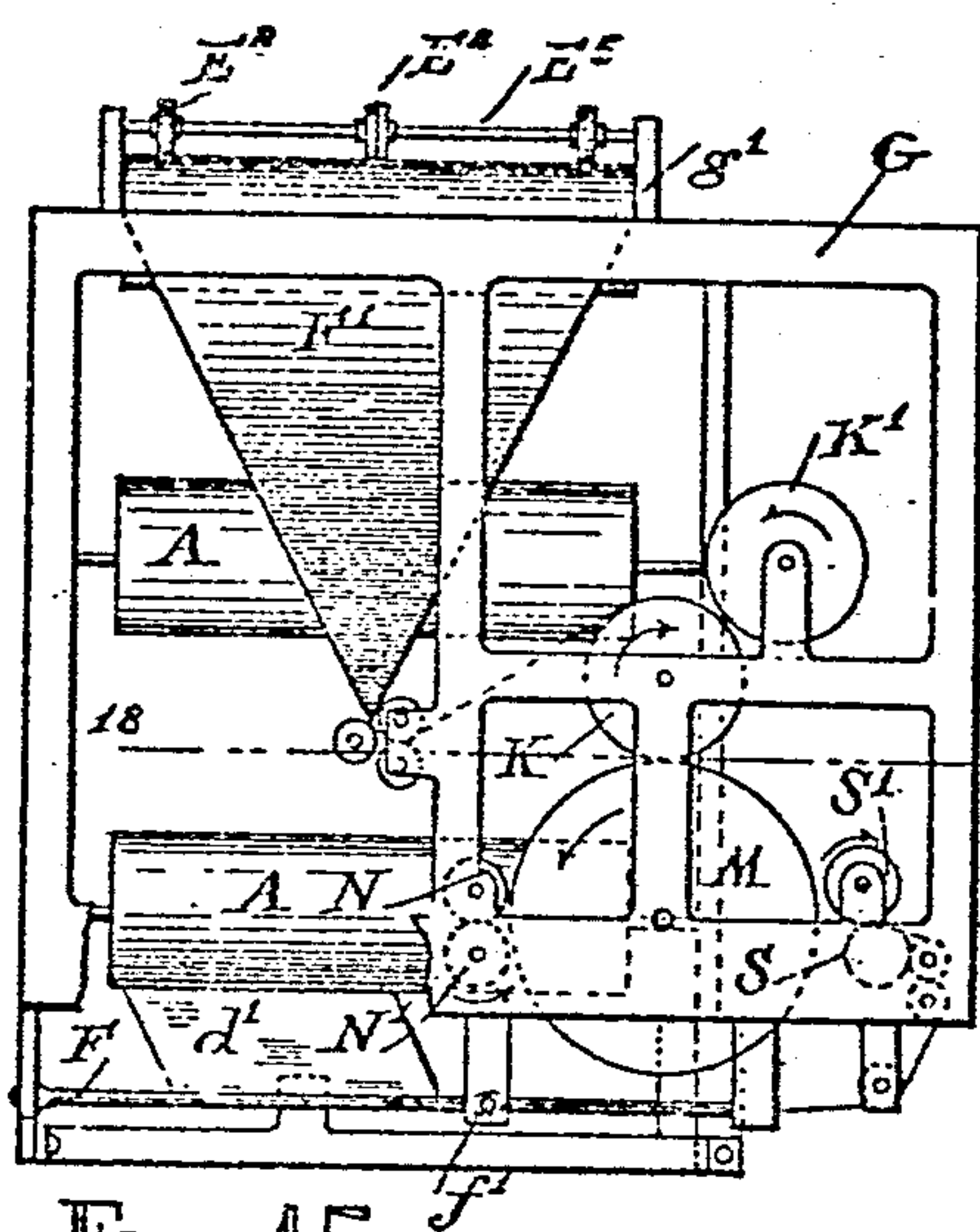


FIG. 15.

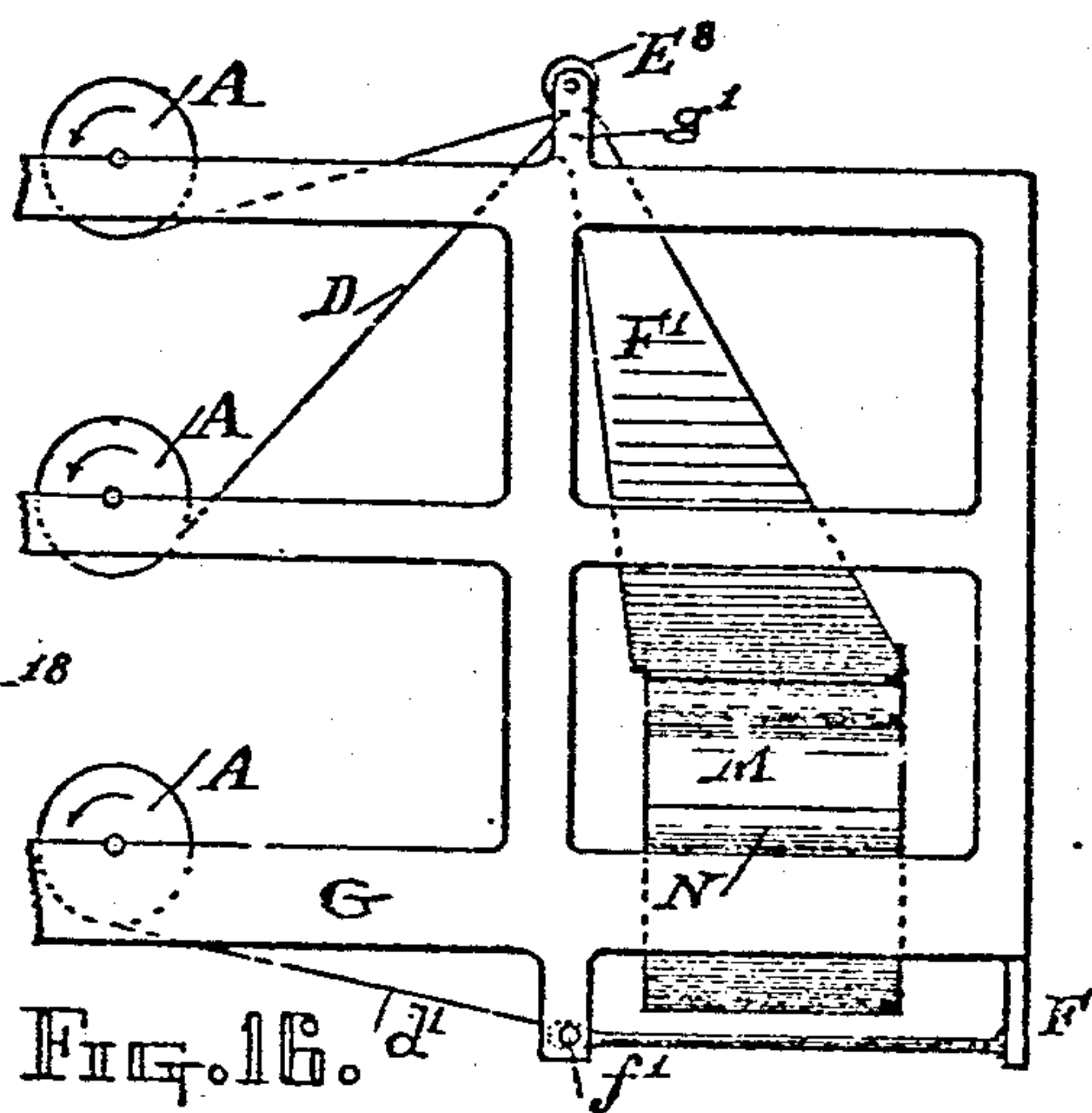


FIG. 16.

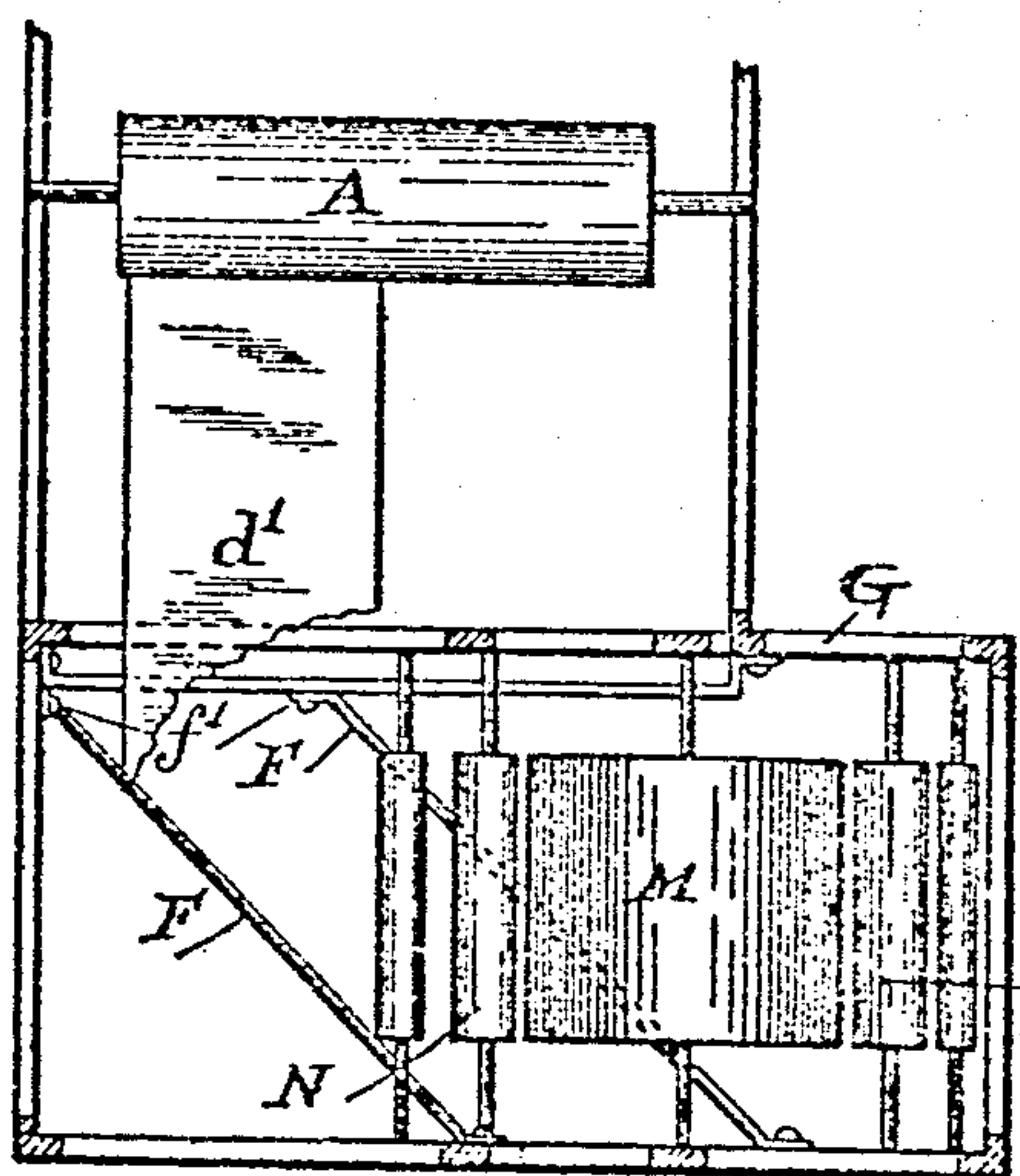


FIG. 18.

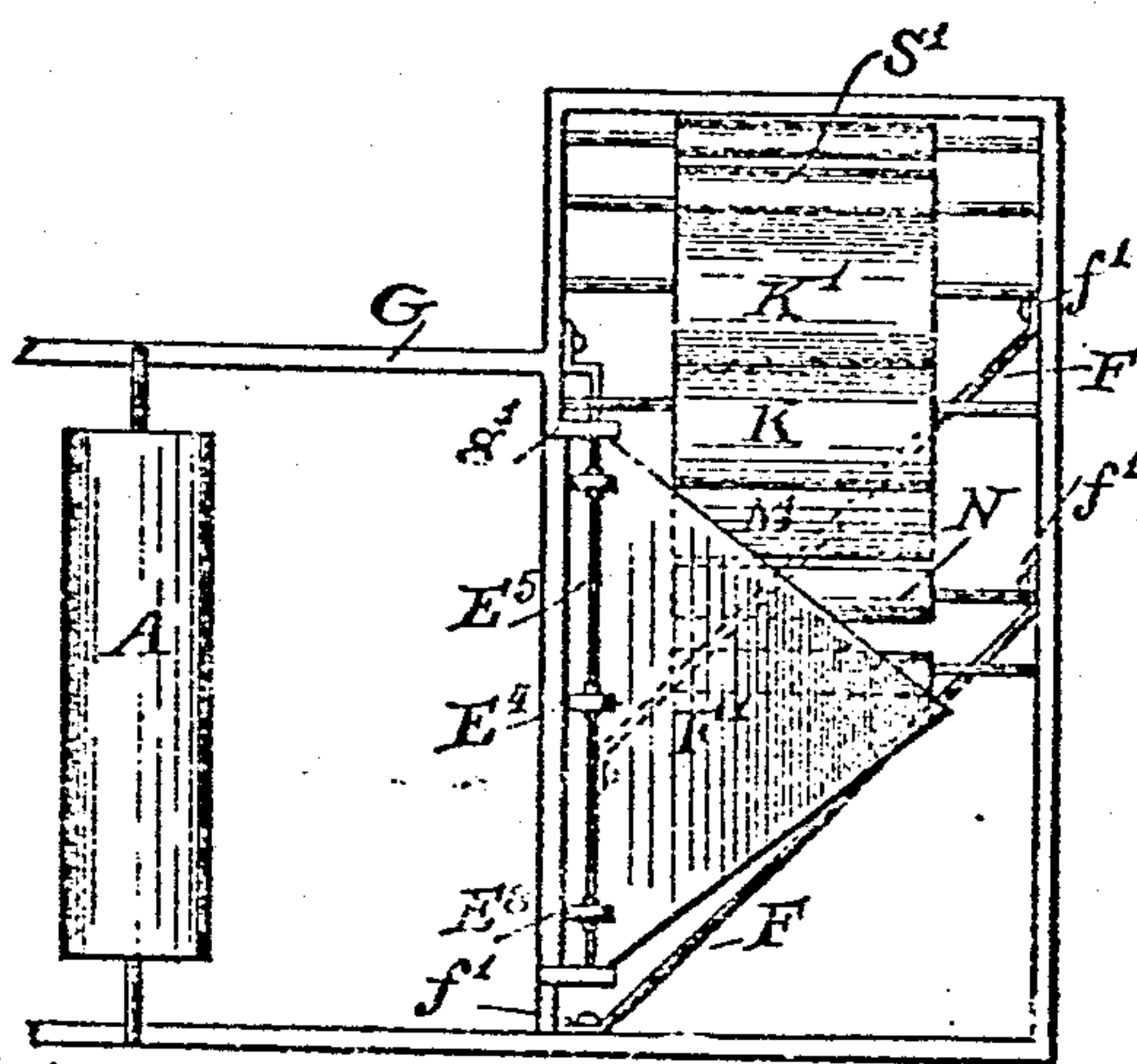


FIG. 17.

Witnesses.  
Emma Sharp  
Orlena E. DuBois.

Inventor.  
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By Atty N. DuBois.



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APPARATUS FOR PRINTING AND FOLDING NEWSPAPERS.

APPLICATION FILED MAY 9, 1904.

900,259.

Patented Oct. 6, 1908.

11 SHEETS—SHEET 9.

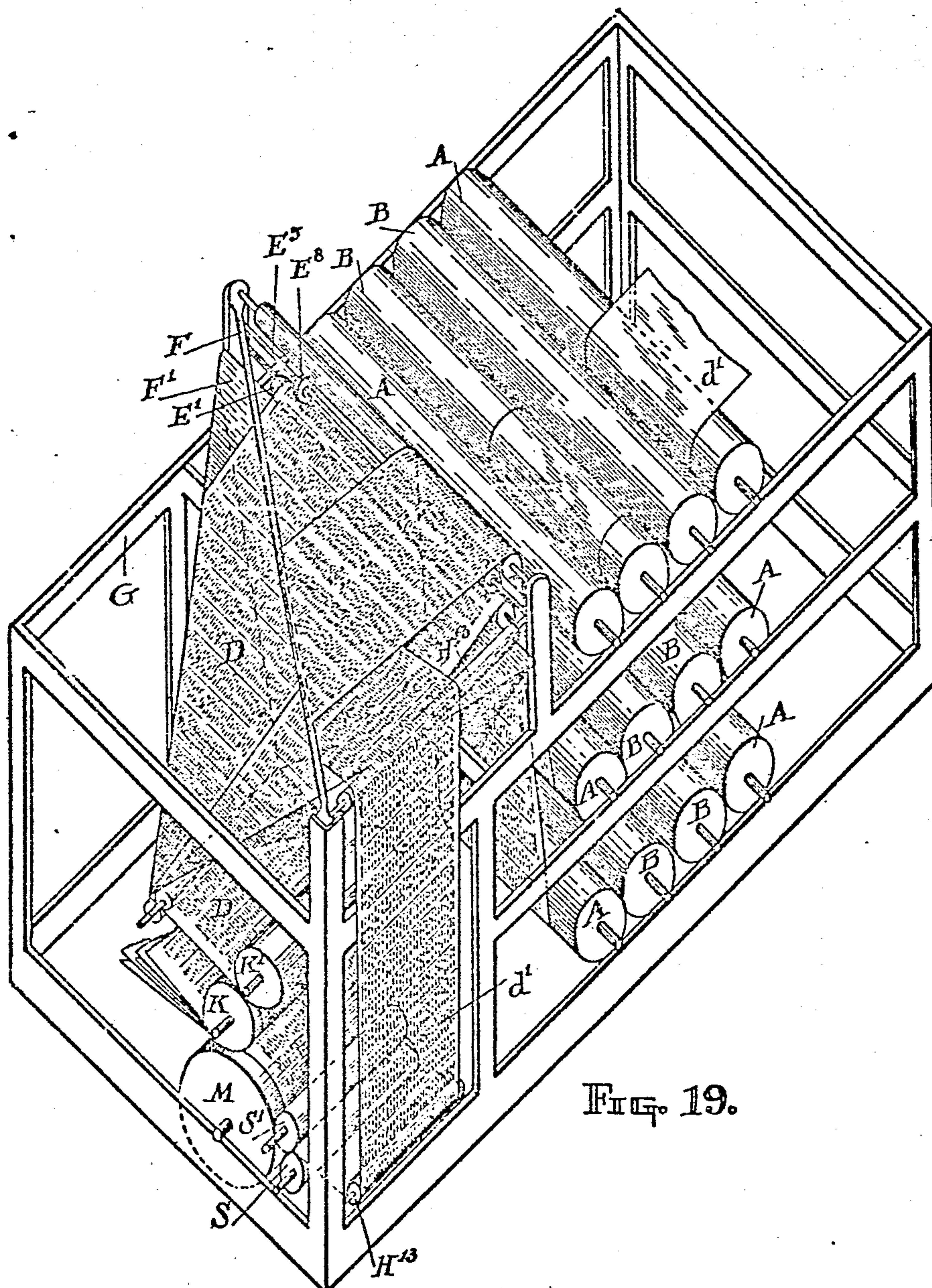


FIG. 19.

Witnesses.

Emma Sharp.  
Charles E. DuBois

Inventor

JOHN A. BOYCE  
By Atty N. DuBois.



270. SHEET-MATERIAL ASSOCIATING  
OR FOLDING.

J. A. BOYCE.

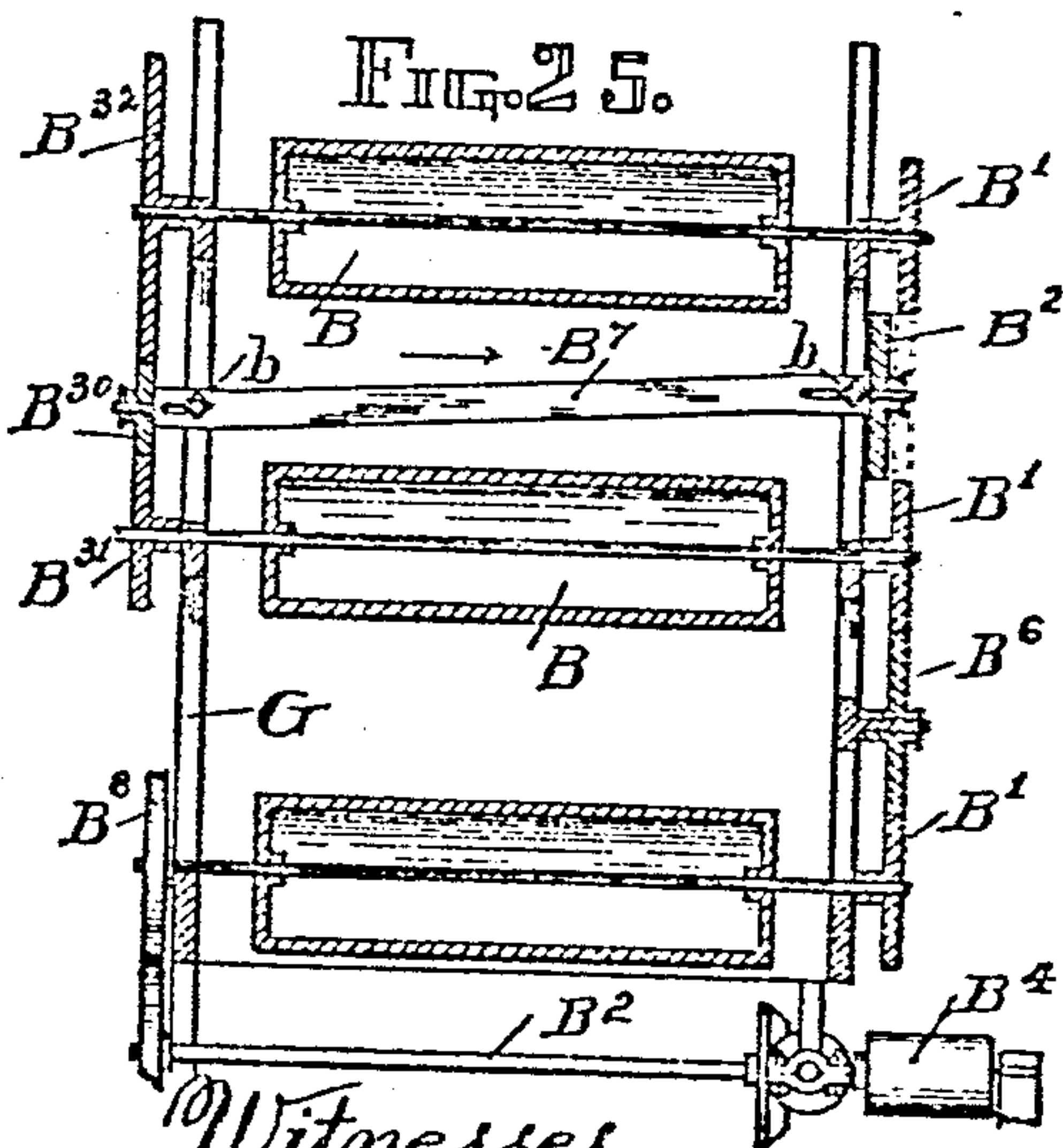
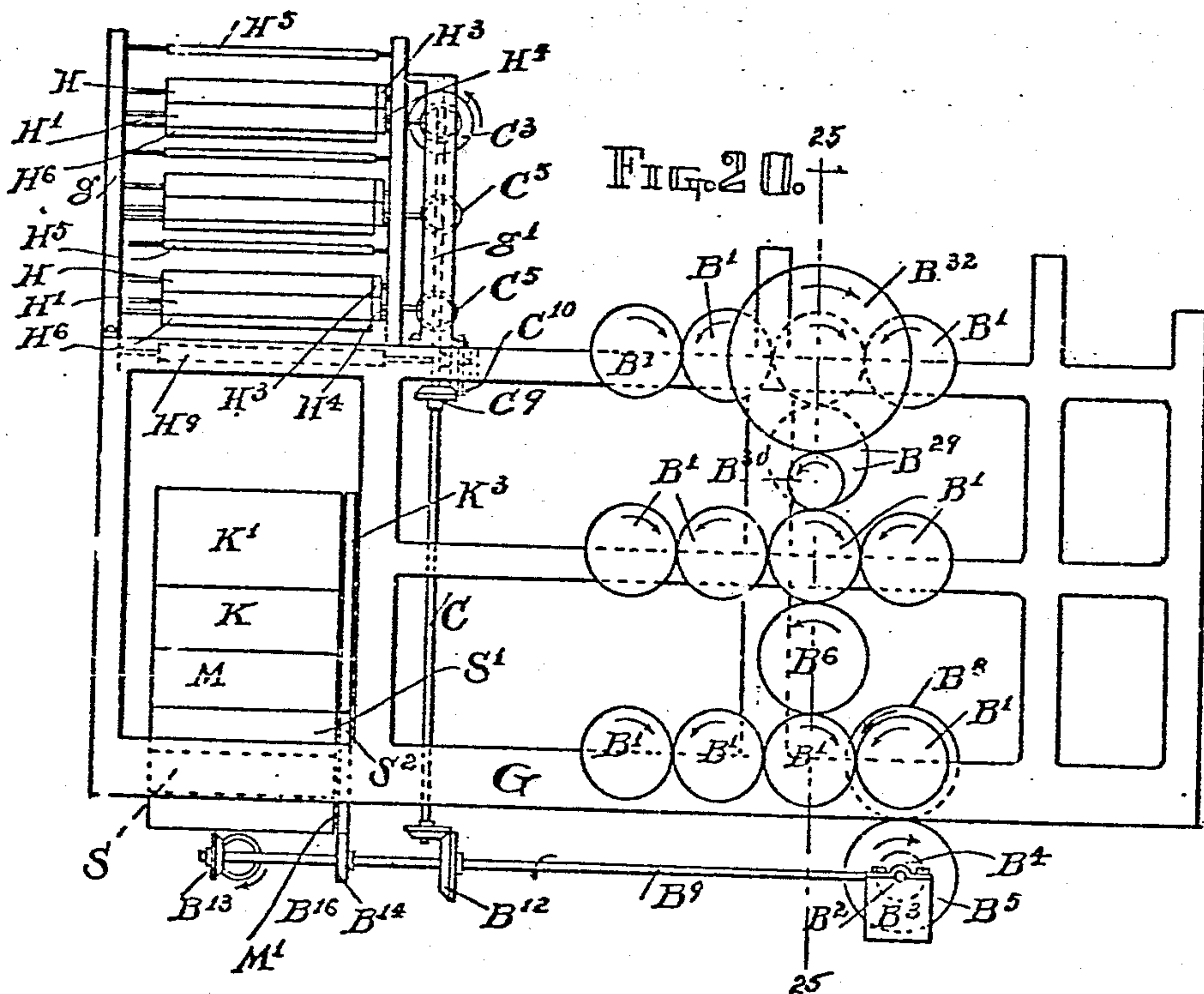
APPARATUS FOR PRINTING AND FOLDING NEWSPAPERS.

APPLICATION FILED MAY 9, 1904.

900,259.

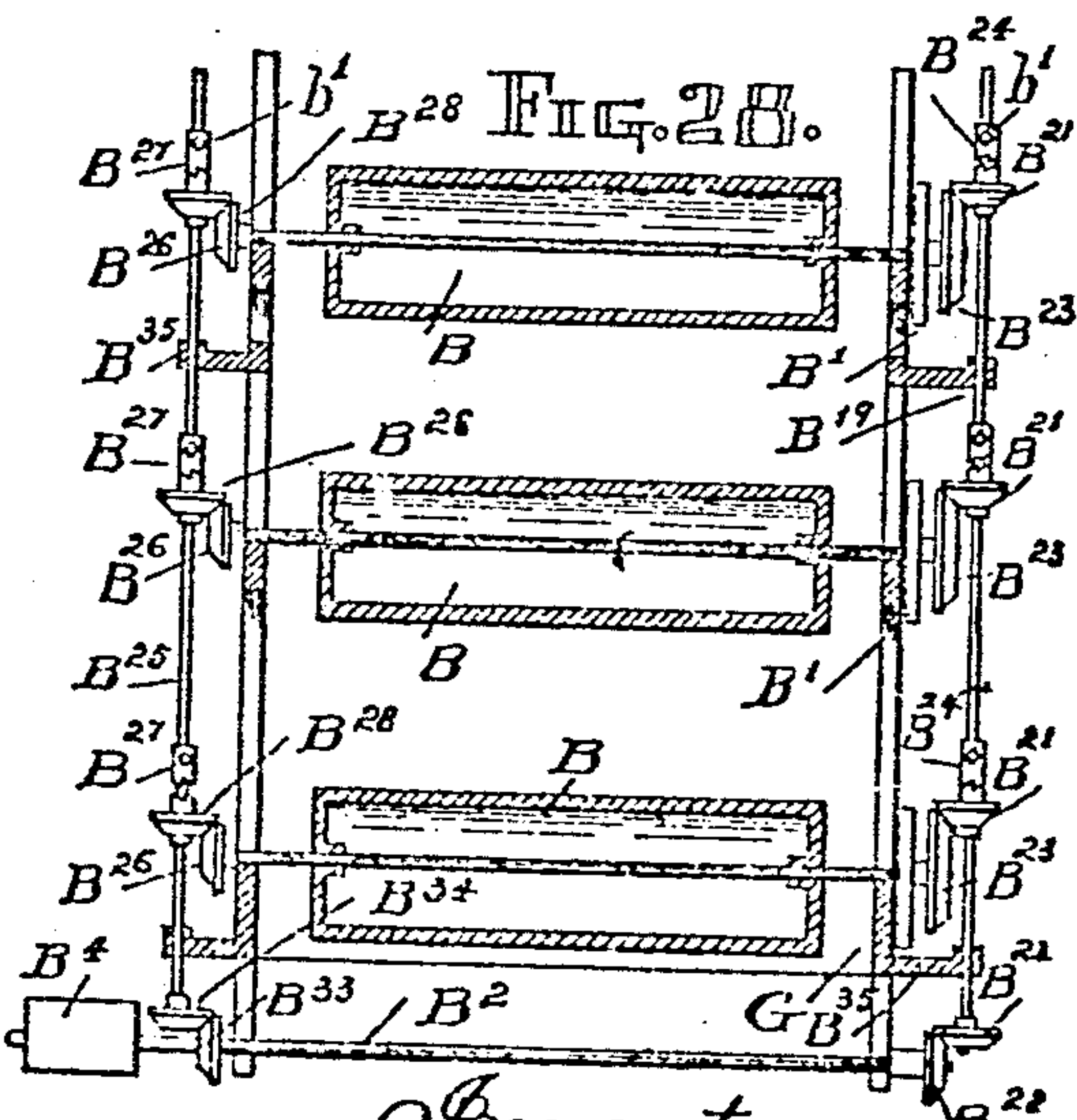
Patented Oct. 6, 1908.

11 SHEETS—SHEET 10.



Witnesses.

Amos Sharp  
Orlando C. DuBois.



Inventor.

JOHN A. BOYCE.

By Atty N. DuBois.



SHEET-MATERIAL ASSOCIATING  
OR FOLDING.

J. A. BOYCE.

APPARATUS FOR PRINTING AND FOLDING NEWSPAPERS.

APPLICATION FILED MAY 9, 1904.

900,259.

Patented Oct. 6, 1908.

11 SHEETS—SHEET 11.

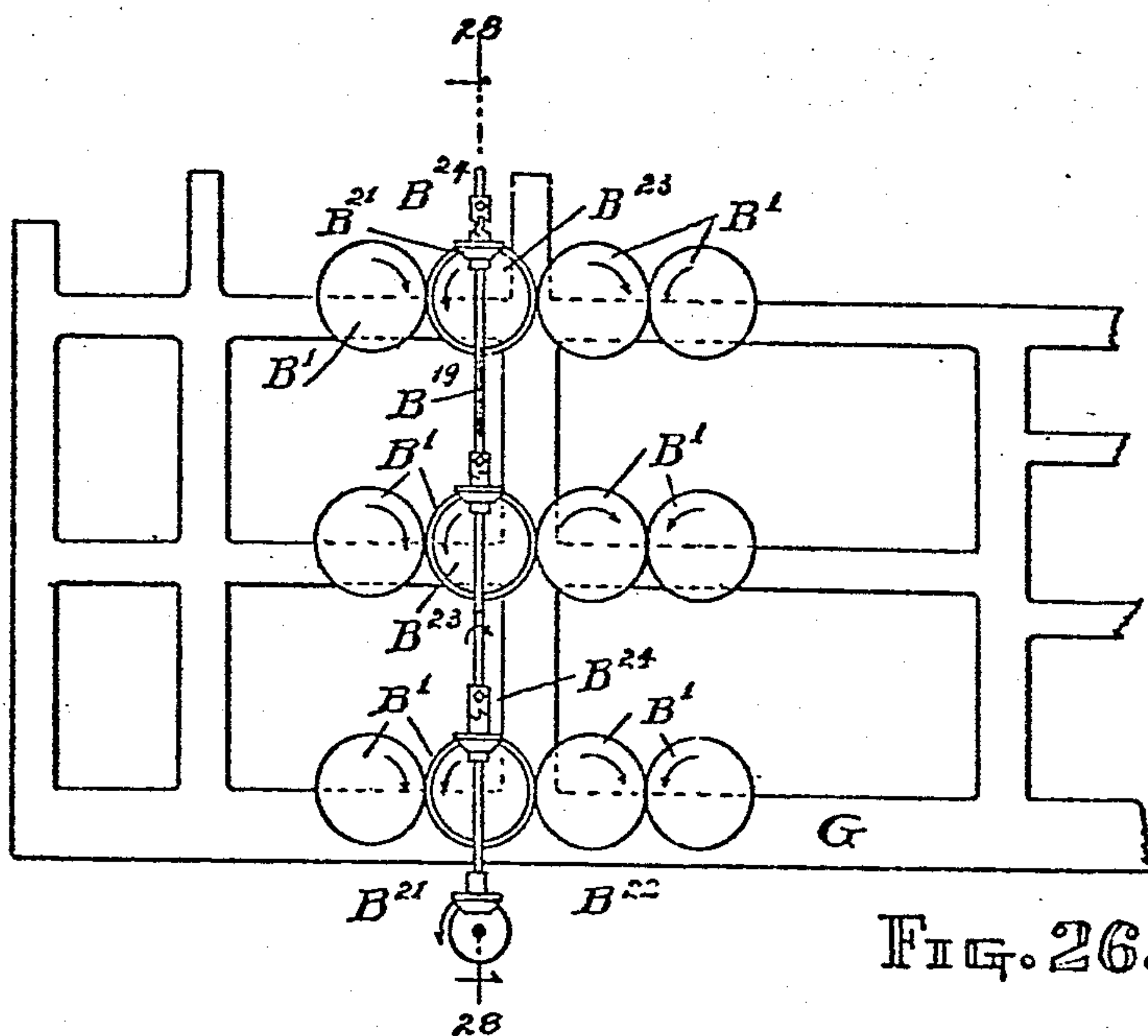


FIG. 26.

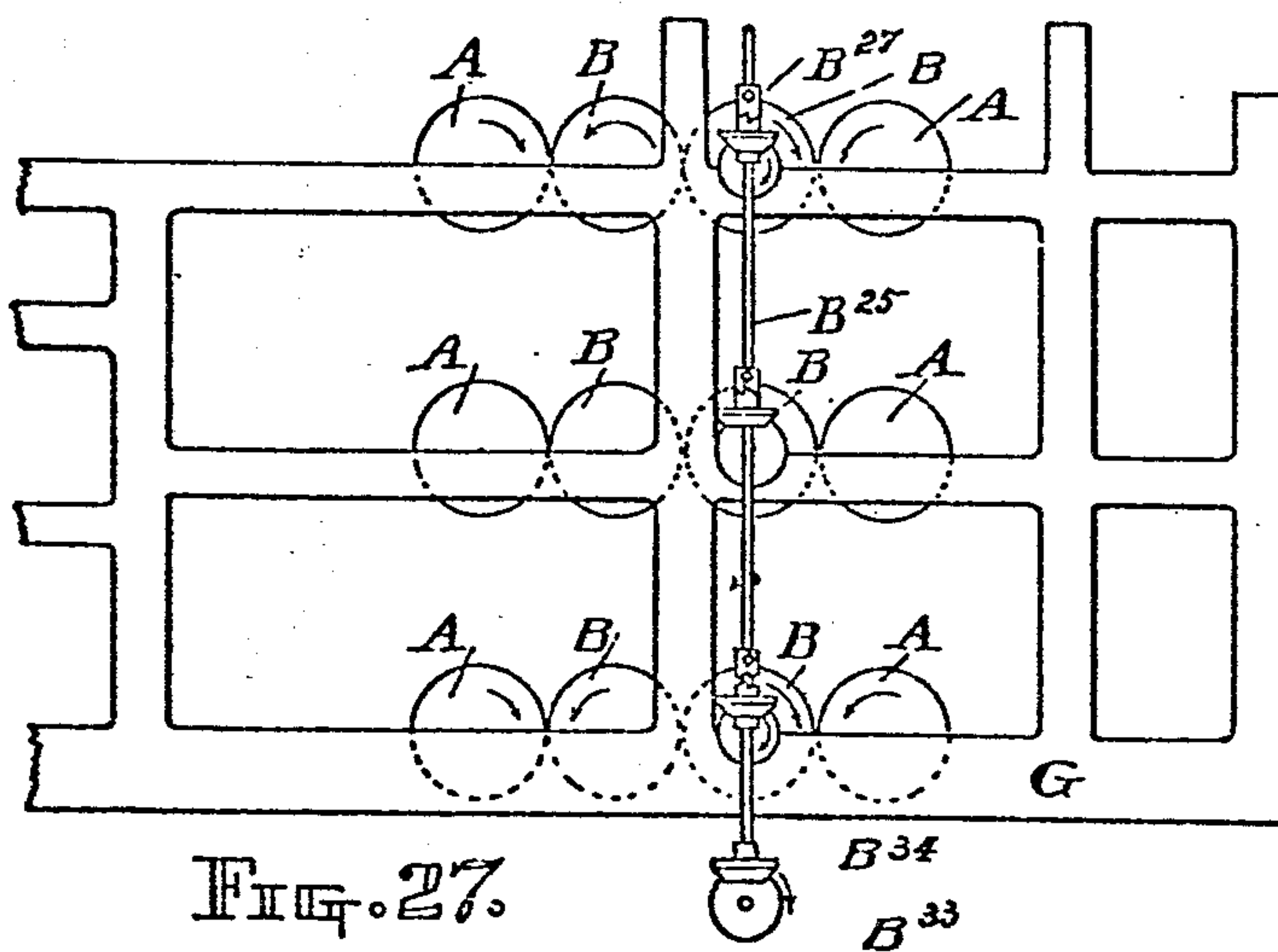


FIG. 27.

Witnesses:  
Emma J. Sharp  
Orlina E. DuBois.

Inventor  
JOHN A. BOYCE.  
By Atty N. DuBois.



# UNITED STATES PATENT OFFICE.

JOHN A. BOYCE, OF SPRINGFIELD, ILLINOIS.

APPARATUS FOR PRINTING AND FOLDING NEWSPAPERS.

No. 900,259.

Specification of Letters Patent.

Patented Oct. 6, 1908.

Application filed May 9, 1904. Serial No. 207,079.

*To all whom it may concern:*

Be it known that I, JOHN A. BOYCE, a citizen of the Dominion of Canada, residing at Springfield, in the county of Sangamon and State of Illinois, have invented a certain new and useful Apparatus for Printing and Folding Newspapers, of which the following is such a full, clear, and exact description as will enable others skilled in the art to which it appertains to make and use my said invention.

My invention primarily relates to folding machines such as are used in connection with printing presses, to fold printed newspapers or similar publications.

The general purpose of my invention is to produce an apparatus having continuously rotating and positively quick acting folder devices, in operative connection with a printing press having plate cylinders carrying stereotype plates having columns lying lengthwise of the cylinder; said apparatus being adapted also to associate the pages of a news-paper or similar publication in book form preliminary to and without any interruption or retardation of the operation of folding, said apparatus being also adapted to deliver an insert or supplement sheet to a folding device, without circuitous travel of the sheet and without retarding the operation of the folder device.

With these general purposes in view the more specific purposes of my invention are; to provide simple and effective means for accomplishing the following results, in substantially the order stated viz; To slit the paper web longitudinally after it comes from the printing press and before its delivery to the first folder device, so as to divide the web into two strips of equal width, the width of each strip being approximately equal to the length of one page of the plates carried on the plate cylinders; also to simultaneously slit two or more webs, and associate the half webs as hereinafter described. To super-pose one of said web-strips above the other and guide and simultaneously convey said strips traveling always in parallel into position to be operated upon by the main cutter cylinders. To cut a single strip, or to simultaneously cut a number of strips, into sheets of equal length, each sheet containing four pages of the forms mounted on the plate cylinders, two pages being on each side of the sheet. To simultaneously convey the cut sheets to and part way around the first

folder cylinder, into position for the folder blade to crease the sheets midway between the pages thereof. To provide means for expediting the travel of the supplement sheet coincidentally with its delivery to the first folder cylinder. To simultaneously crease all of said cut sheets except the insert sheet midway between the pages thereof and move the creased parts of the sheets radially outward from the folder cylinder into position to be caught by the first set of folder-rollers. To pass the creased sheets simultaneously between the first set of folder rollers to complete the first fold. To convey the sheets thus folded into position to be acted upon by a creasing device in connection with the second folder-device. To form by means of said creasing device a second crease midway of the sheets and transverse to the first fold. To pass the sheets thus creased, between the second set of folder rollers, thereby completing the second or transverse fold. To count and convey the folded papers to and deposit them in a suitable receptacle. To so conduct and time the several operations of associating the pages and folding the paper that when folded it will invariably be in book form, and if a supplement sheet is used, said supplement will be on the inside, and will pass through the first set of folder rollers with the sheet between the folds of which it is situated. To convey one strip or half web to a second or supplementary cutting device. To cut said half web into supplement sheets of suitable length. To convey the supplement sheets to the first folder cylinder in such order and time that the supplement sheet will lie next to the face of the cylinder and when folded will lie between the sheets occupying the cylinder simultaneously with it, without circuitous travel of the sheets and without retarding the operation of the folding device; all of these operations being accomplished by using only one plate on the full-speed plate cylinders for each printed page of the paper, exclusive of the supplement page or pages. Duplicate plates are used only in producing the supplement page.

Briefly stated my invention involves the production of a page for each plate used on the plate cylinders, (exclusive of the supplement sheet) without reference to the number of decks in the printing apparatus.

It also involves the use of two sets of cutter cylinders adjacent to and in operative

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relation to a single folder cylinder. This is a prime feature of my invention.

In addition to the foregoing my invention embraces details of construction shown in the drawings and hereinafter more fully explained.

I show in the drawings and will hereinafter describe four slightly different forms of an apparatus embodying my invention but all exhibiting one prime feature thereof viz: an apparatus adapted to receive a web printed on plate cylinders having columns lying lengthwise of the cylinders, adapted to associate the pages in book form in transit between the plate cylinders and the first folder cylinder and adapted to convey a supplement sheet to second or auxiliary cutter cylinders adjacent to the first folder cylinder, below the formers, angle bars, or other associating devices, and deliver it to the first folder cylinder in proper position to fold in book form with the other pages of the paper.

Referring to the drawings in which similar reference letters and characters designate the same parts in the several views, Figure 1.— is a side elevation of a complete machine embodying double angle bars. Fig. 2.— is a top plan of the same machine. Fig. 3.— is an elevation of the right-hand end of the same machine. Fig. 4.— is a horizontal longitudinal section on the zigzag line 4. 4. of Fig. 1. Fig. 5.— is an enlarged partial vertical longitudinal section on the line 5. 5. of Fig. 2. Fig. 6.— is an enlarged vertical transverse section on the line 6. 6. of Fig. 2. Fig. 7.— is an enlarged vertical transverse section on the line 7. 7. of Fig. 1. Fig. 8.— is an enlarged partial horizontal section on the line 8. 8. of Fig. 3. Fig. 9.— is an enlarged partial vertical section on the line 9. 9. of Fig. 8. Fig. 10.— is a horizontal section on the line 10. 10. of Fig. 9. Fig. 11.— is an enlarged partial elevation of the web-adjusting rolls and operating gear wheels, of a machine employing double angle bars. Fig. 12.— is an enlarged partial elevation of the slitting rolls and their operating gear wheels, and shows their relation to the adjusting rolls. Fig. 13.— is a top plan of the mechanism shown in Figs. 11, and 12. Fig. 14.— is an enlarged elevation of a set of roll-adjusting devices. Figs. 15, 16, and 17.— are respectively a partial end elevation, a side elevation, and a top plan of a machine embodying a former in operative relation to the folder mechanism. In these views the folder cylinder is shown at right angles to the plate cylinders, the supplement sheet being supplied from the lower deck of the printing press. Fig. 18.— is a horizontal section on the line 18. 18. of Fig. 15. Fig. 19.— is a partial isometric projection of the machine embodying a former in operative relation to the folder mechanism, situated at right angles to the plate cylinders and showing the supplement sheet as being

taken from the upper deck of the press. Fig. 20.— is a diagram showing in elevation in proper relation to the folder mechanism a system of gear wheels adapted to operate the upper deck of the press at half speed or at full speed. In this view spur wheels are indicated by pitch-circles only, and bevel gear wheels, cylinders, rollers etc., are shown in outline only. Fig. 21 is a longitudinal section through the folder cylinder on the line 21. 21. of Fig. 7. Fig. 22.— is an enlarged detached partial perspective view of one of the pins of the folder cylinder and the arm operating same. Fig. 23.— is an enlarged detached partial side elevation of a modified form of the slitter device. Fig. 24.— is a vertical transverse section on the line 24. 24. of Fig. 23. Fig. 25.— is a vertical transverse section through the press frame, one tier of the blanket cylinders, and the gear wheels, on the line 25. 25. of Fig. 20. Figs. 26 and 27.— are diagrams showing in outline in side elevation a modified form of means for operating either the upper deck or the lower deck at full speed, or half speed. Fig. 28.— is a vertical transverse section through the press frame and one tier of the blanket cylinders, on the lines 28. 28. of Fig. 26. and shows in end elevation the train of gear wheels operating the plate cylinders and the blanket cylinders.

The structure and operation of the mechanism of the printing press are such as are commonly employed in rotary printing presses known as perfecting presses and need not be particularly described, except the means for changing the speed of the plate cylinders.

In the drawings I have shown a three-deck press having three sets of plate cylinders A and three sets of cooperating blanket-cylinders B; in operative relation to each other.

My folder devices are equally effective when used with presses having a greater or a less number of decks, as will hereinafter more fully appear.

In a two-plate-wide printing press adapted for use with my folder devices the circumference of the cylinders A and B must be such that the stereotype plates being arranged on the plate cylinder A so that the columns of the plates lie lengthwise of the cylinder, each cylinder will accommodate four plates in two tiers extending around the cylinder.

The plate cylinders are always two plates in circumference and may be one or more plates wide. The full speed plate cylinders are equipped with original plates only, no duplicate plates being used on them. The half-speed supplement plate-cylinders may be equipped with both original plates and duplicate plates.

The cylinders A and B are rotated in proper time by gearing substantially as shown, and the plates on the plate cylinders



are inked by suitable inking devices which do not form a part of my invention and therefore are not shown. The paper webs D passing between the printing cylinders A and B are taken from rolls suitably supported on the main frame of the printing press. Circular  
5 slitter knives E<sup>1</sup> on the rollers E, or the shafts E<sup>2</sup> as the case may be, (Figs. 2, 15, and 23) cut against rollers E<sup>1</sup>, on which the webs  
10 travel and divide each web into longitudinal strips *d* and *d*<sup>1</sup>. Angle bars F, are adjustably mounted on the frame G.

The angle bars are in pairs, one pair for each deck of the press and are set at an angle  
15 of forty-five degrees relative to the median line of the paper webs and are so situated that the member *d* of the paper web will pass around one angle bar of a set, and the member *d*<sup>1</sup> of the same web will pass around the  
20 other angle bar of the same set, so as to cause the member *d*<sup>1</sup>, to overlie the member *d*, and so as to simultaneously change the direction of travel of all the web members and cause them to travel in a direction at right angles  
25 to their first line of travel.

Near each end of the angle bars is a slot *f*. (Fig. 2.) Bolts *f*<sup>1</sup>, pass through the slots *f*, and connect the angle bars with the main frame. The angle bars may be adjusted by  
30 loosening the nuts on the bolts *f*<sup>1</sup>, setting the angle bars at the desired inclination and then tightening the nuts.

Instead of using angle bars for changing the direction of and overlapping the web  
35 members and associating the pages in book form, formers F<sup>1</sup>, such as are shown in Fig. 15 may be used without departing from my invention. A practical advantage of this construction is that a low former may be used  
40 with its nose parallel and near to the female cutter cylinder K so that the web goes directly to and hugs the cutter cylinder.

Tape rollers or equivalent devices may be used to lead the web from the nose of the  
45 former to the cutter cylinders substantially as shown in Fig. 15. In this type of the apparatus a single adjusting device for each deck may be used for adjusting the webs before going over the former, for accurate cutting of the sheets instead of using a set of adjusting rollers for each half web as shown in Fig. 7. These angle bars, or formers, or  
50 equivalent associating devices serve as a means for associating the pages and arranging them in book form before reaching the first folder cylinder; the pages lying next to the folder cylinder coming on the inside of the book form as hereinafter more fully explained.

The associating devices above mentioned consist of means substantially as described, for arranging the paper webs or web members one above the other and presenting them to the first folder device in position for  
60 the first folder device to simultaneously fold

them parallel to the columns. If a former is used three different arrangements of angle bars may be used according to the position of the former and the first folder cylinder relative to the plate cylinders, and according to the deck of the press which carries the half web from which the supplement sheets are taken. When the upper edge of the former is at right angles to the plate cylinders and the first folder cylinder is parallel to the plate cylinders; one long angle bar for each deck, may be used to change the direction of travel of the full width webs before they pass over the former. In this case the half-web for the supplement sheet runs in a straight line directly to the second cutter cylinders. When the upper edge of the former is parallel to the plate cylinders and the first folder cylinder is at right angles thereto and the supplement sheet is taken from the lower deck; full width webs pass over the former and angle bars are used only to change the direction of travel of the half web from which the supplement sheets are taken, as shown in Figs. 16 and 18. When  
70 the upper edge of the former is parallel to the plate cylinders and the supplement sheets are taken from a half web from the upper deck; the full width webs pass over the former and a single angle bar is used to change the direction of travel of the half web from which the supplement sheet is taken. This method of associating in book form is of prime importance because it may be rapidly and effectively executed.

The main frame G is preferably L shaped as shown. The plate cylinders A and blanket cylinders B, turn in suitable bearings on the frame G. Intermeshing gear wheels B<sup>1</sup>, secured on the shafts of the cylinders operate the cylinders A and B, in pairs, one plate cylinder and one blanket cylinder turning towards each other. The main drive shaft B<sup>2</sup>, is mounted on a stationary block B<sup>3</sup>. A pulley B<sup>4</sup>, on the shaft B<sup>2</sup>, is driven by a belt from an engine or other suitable motor. A spur wheel B<sup>5</sup> (Figs. 1, and 20.) on the shaft B<sup>2</sup> meshes with a similar spur wheel B<sup>6</sup> on the shaft of one of the plate cylinders of the lower deck and drives the train of wheels operating the plate cylinders and blanket cylinders.

In producing a supplement sheet it is necessary to run one deck of the press at half speed while the other decks are operated at full speed. In a multiple deck apparatus embodying my invention any suitable means may be employed to operate one deck at a constant full speed and one or more cooperating decks at full speed or half speed as may be desired.

In Figs. 1 and 20 are illustrated means for operating the lower deck and the middle deck at full speed and the upper deck at half speed to cooperate with the half speed slitter

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device and the half speed web-adjusting rollers shown in Figs. 11 and 12. The spur wheel B<sup>8</sup> on the shaft of one of the plate cylinders meshes with and is driven by the spur wheel B<sup>5</sup>. Intermeshing spur-wheels B<sup>1</sup>, on the shafts of the plate cylinders and the blanket cylinders turn the cylinders in pairs in unison. An intermediate spur wheel B<sup>6</sup>, is driven by the spur wheel B<sup>1</sup>, on the shaft of one of the lower blanket cylinders and meshes with and drives at the same speed the corresponding wheel B<sup>1</sup>, on the shaft of one of the blanket cylinders of the middle deck. A bar B<sup>7</sup>, (Fig. 25) is supported on stud bolts b on the frame G. By loosening the nuts of the bolts b the bar B<sup>7</sup>, may be slid to the right or the left and then secured in position by tightening the nuts. Spur wheels B<sup>29</sup> and B<sup>30</sup> turn on spindles at the ends of the bar B<sup>7</sup>. The pinion B<sup>30</sup> is shown as meshing with the wheels B<sup>31</sup>, and B<sup>32</sup>. The wheel B<sup>31</sup>, is secured on the shaft of the blanket cylinder and is half the diameter of the wheel B<sup>32</sup> which is secured on the shaft of the upper blanket cylinder and consequently drives the cylinders of the upper deck at half the speed of the cylinders of the middle and lower decks. To cause the cylinders of the upper deck to travel at the same speed as the cylinders of the other decks it is only necessary to slide the bar B<sup>7</sup> to the right and thereby disengage the pinion B<sup>30</sup> and cause the wheel B<sup>29</sup> to intermesh with the wheels B<sup>1</sup>, of the upper and middle decks.

I will now describe equivalent means for operating either the upper deck or the lower deck at half speed, shown in Figs. 26, 27, and 28. Vertical shafts B<sup>19</sup> and B<sup>25</sup> turn in suitable bearings in brackets B<sup>35</sup> on the main frame. Bevel cog pinions B<sup>21</sup>, and B<sup>28</sup> are loose on the shaft B<sup>19</sup> and B<sup>25</sup> respectively. Clutch members B<sup>24</sup> and B<sup>27</sup> slide on feathers on the shafts B<sup>19</sup> and B<sup>25</sup> and engage with corresponding clutch members on the hubs of the pinions B<sup>21</sup> and B<sup>28</sup> respectively. Set screws b<sup>1</sup> secure the clutch members B<sup>24</sup> and B<sup>27</sup> on the shafts when engaged with or disengaged from the clutch members on the hubs of the pinions. A series of bevel cog wheels B<sup>23</sup> respectively secured on the shafts of one tier of the blanket cylinders mesh with and are driven by the pinions B<sup>21</sup>. Intermeshing spur wheels B<sup>1</sup> secured on the shafts of the plate cylinders and blanket cylinders, turn the cylinders in pairs in unison. Bevel cog pinions B<sup>20</sup> respectively secured on the shafts of a tier of the blanket cylinders mesh with and are driven by the cog pinions B<sup>23</sup>. Bevel cog pinions B<sup>22</sup> and B<sup>23</sup> secured on the shaft B<sup>2</sup> respectively mesh with and drive similar pinions B<sup>31</sup> and B<sup>32</sup> secured on the shafts B<sup>19</sup> and B<sup>25</sup>.

To operate all of the decks at full speed the shaft B<sup>2</sup> is driven with all of the clutch members B<sup>27</sup> in engagement with the pinions

B<sup>23</sup>, and all of the clutch members B<sup>24</sup> disengaged. To operate the upper deck at half speed and the other two decks at full speed the upper clutch member B<sup>27</sup> and the lower and middle clutch members B<sup>21</sup> will be disengaged and the middle and lower clutch members B<sup>27</sup> and the upper clutch member B<sup>21</sup> will be engaged. To operate the lower deck at half speed, the clutch members B<sup>27</sup> of the middle and upper decks and the clutch member B<sup>21</sup> of the lower deck will be engaged, and the clutch members B<sup>21</sup>, of the upper and middle decks and the clutch member B<sup>27</sup> of the lower deck will be disengaged; by disengaging all of the clutches B<sup>21</sup>, and B<sup>27</sup>, the shaft B<sup>2</sup> may be turned without turning any of the cylinders.

A horizontal shaft B<sup>9</sup> (Fig. 4.) turns in suitable bearings on the main frame. A pinion B<sup>10</sup> secured on the shaft B<sup>9</sup> meshes with a cog wheel B<sup>11</sup>, on the main shaft B<sup>2</sup>. Bevel cog wheels B<sup>12</sup>, and B<sup>13</sup>, and a spur wheel B<sup>14</sup>, are secured on the shaft B<sup>9</sup>.

In the drawings (Figs. 11 to 14 inclusive) I have illustrated and will now describe means for operating the upper set of slitter rolls and the upper set of web-propelling rolls at half speed while the other slitting rolls and web-propelling rolls are operated at full speed. A vertical shaft C, (Figs. 1 and 11) turns in suitable bearings on the main frame and has at its lower end a bevel cog pinion C<sup>1</sup>, (Fig. 1) which meshes with the bevel cog wheel B<sup>12</sup>. The shaft C has at its upper end a double bevel cog pinion C<sup>2</sup>, which meshes with either of two sets of teeth on a double cog wheel C<sup>3</sup>, which is secured on the shaft e, of one of the upper slitter rollers E<sup>1</sup>. The cog wheel C<sup>2</sup>, is slidable on the shaft C and is adjustable thereon by a set screw C<sup>8</sup>. When the cog pinion C<sup>2</sup> is in mesh with the inner set of teeth of the wheel C<sup>3</sup>, it turns at a predetermined speed corresponding to the speed of the plate cylinders and when the pinion C<sup>2</sup> is in mesh with the outer set of teeth the wheel C<sup>3</sup>, turns in the same direction at half-speed. A cog pinion H<sup>2</sup> is secured on the shaft h of the upper propelling roller H<sup>1</sup>, and meshes with the inner set of teeth of the double cog wheel C<sup>3</sup>. Bevel cog wheels C<sup>4</sup> secured on the shaft C mesh with and drive bevel cog wheels C<sup>5</sup> on the shafts of the middle and lower rollers E<sup>1</sup>. Cog wheels C<sup>6</sup> on the shaft C, mesh with and drive bevel cog pinions C<sup>7</sup> secured on the shaft h<sup>1</sup>, of the middle and lower propelling rollers H<sup>1</sup>. It will be seen then that when the pinion C<sup>2</sup> meshes with the outer set of teeth of the wheel C<sup>3</sup> the slitter roller E<sup>1</sup>, of the top pair of rollers and the propelling roller H<sup>1</sup>, of the top pair of rollers, turn at half the speed of the lower and intermediate pairs of slitter rollers and propelling rollers and are thereby adapted to take care of the webs from the upper deck of the press when the plate cylinders of the lower



and middle deck are running at full speed and the plate cylinders of the upper deck are running at half speed. Intermeshing spur wheels  $E^2$  and  $E^3$  on the shafts of the rollers  $E$  and  $E^1$ , cause them to turn in unison towards each other and similar spur wheels  $H^2$  and  $H^3$  on the shafts of the propelling rollers  $H$  and  $H^1$ , cause them to turn in unison toward each other. In practice instead of using two solid rollers  $E$  and  $E^1$ , geared as shown in Fig. 12, to turn in unison, the upper roller  $E$  may be dispensed with and the slitter device shown in Figs. 23 and 24 may be substituted therefor without departing from my invention. In the alternative form of the slitter device a horizontal shaft  $E^5$  parallel to the roller  $E^1$ , is mounted to oscillate in suitably placed stationary bearings  $e^1$ . Arms  $E^6$  are adjustably connected with the shaft  $E^5$  by set screws and have sockets  $e^2$  in which the standards  $E^7$  are slidable. Rubber faced wheels  $E^8$  turn on studs  $e^3$  on the standards  $E^7$  and run in contact with the pipe rollers  $E^1$ . Set screws  $e^4$  serve to secure the standards  $E^7$  in any desired position in the socket  $e^2$ . Springs  $E^9$  surround the shaft  $E^5$  and one end of each spring is secured to one of the arms  $E^6$  and its other end is secured to one of the lugs  $e^4$ , in such manner that the springs will serve to keep the periphery of the wheels  $E^8$  in constant and uniform contact with the rollers  $E^1$ . A number (preferably five) sets of arms  $E^7$  and wheels  $E^8$ , are connected with the shafts  $E^5$  as described and the central wheel  $E^8$ , has a circular blade  $E^4$  which cuts on the surface of the roller  $E^1$ , and slits the web  $D$  longitudinally as it passes over the roller  $E^1$ . By loosening the set screws  $e^5$  the arms  $E^6$  may be respectively turned on the shaft  $E^5$  so as to increase or diminish the tension of the springs  $E^9$  and thereby correspondingly increase or diminish the pressure of the wheel  $E^8$  on the web as occasion may demand.

In case double angle bars are used to cause the web members to overlap so as to collect the papers in book form it is necessary to provide means to equalize the run of the web members so as to compensate for the greater distance to be traveled by the web member carried on the angle bar remote from the adjusting rolls and thereby cause the collected pages to register properly in their passage through the folder devices. To adjust the web members to compensate for the difference in length due to passing them around the angle bars  $F$ , I provide pipe rollers  $H^2$  and  $H^3$  mounted to turn between arms  $H^2$ . The upper set of arms are secured on a suitably supported shaft  $H^2$ . (Fig. 14.) The other sets of arms turn on hubs  $h^6$  surrounding the shafts  $h$ . The web-propelling rollers  $H$  and  $H^1$ , which turn in bearings on the standards  $g$ , on the frame  $G$ , support the web strips  $d$  and  $d^1$ , as they come from the angle

bars, and propel the web strips into position to be received and carried onward by the pinch rollers  $H^9$  and  $H^{10}$ . (Fig. 7.). Each of the propelling rollers  $H$  and  $H^1$ , has a number (preferably 3) of circumferential narrow bands  $h^3$ , of felt or other yielding material which take firm hold on the web members and prevent them from slipping or tearing. Arms  $H^7$ , secured on the shafts  $H^2$ , carry at their outer ends pipe rollers  $H^5$ . Bolts  $h^2$  pass through the arms  $H^7$ , and through segmental slots  $g^2$ , in the standards  $g$ , and connect the arms with the standards so that the arms may be turned to occupy different positions and may be secured in any desired position within the scope of their turning, and permit adjustment of the arms  $H^7$ , so as to equalize the web members  $d$ , and  $d^1$ , and cause accurate registry of the pages thereof. The left hand web members  $d$  from all the decks respectively pass around the left hand angle bars  $F$ , between the rollers  $H$ , and  $H^1$ , and over the pipe rollers  $H^5$ ; and the right hand web members  $d^1$ , pass around the right hand angle bars  $F$ , between the rollers  $H$ , and  $H^1$ , and over the pipe rollers  $H^5$ . The web members being arranged as described, the arms  $H^7$  are then adjusted to cause exact registry of the pages of the web members, which are then all simultaneously propelled onward between the pinch roller  $H^9$  and the wheels  $H^{10}$ . (Fig. 7.) A number (preferably three) of rubber faced wheels  $H^{10}$ , turn on stems  $H^{14}$  which are adjustable in sockets in the arms  $H^{15}$  by means of set screws  $h^4$ . The arms  $H^{15}$  are secured on the shaft  $H^{11}$ , which is parallel to the roller  $H^9$ , by set screws  $h^5$ . The mechanism described permits accurate adjustment of the wheels  $H^{10}$  relative to the roller  $H^9$ , to increase or diminish the bight of the wheels on the face of the roller. A bevel cog pinion  $C^9$  (Fig. 20.) on the shaft  $C$  meshes with an intermediate pinion  $C^{10}$  which in turn meshes with and drives a pinion (not shown) on the shaft of the roller  $H^9$  and thereby drives the roller to propel the web members onward at exactly the same speed that they travel around the propelling rollers  $H$ ,  $H^1$ . A pipe roller  $H^{13}$  is mounted to turn in bearings on the lugs  $g^3$ , on the frame  $G$ , and guide the web members into position to be caught by the tapes  $k^4$ , which assist in conveying them upward around the lower main-cutter cylinder  $K$ .

The slitter devices, the web-propelling devices and the web-adjusting devices are all substantially as shown, wherever used in the different forms of the apparatus, except such slight modifications as may be necessary to adapt them to the different positions of the folder units relative to the plate cylinders. These slight modifications will readily occur to any one skilled in the art and therefore are not shown nor particularly described.

In the form of the apparatus shown in Fig. 130



17, the same train of gears shown in the other views and herein described may be used to operate the first folder unit consisting of the main cutter cylinders, the first folder cylinder, the supplement cutter cylinders and the first folder rollers; this train of gears being driven by any suitable gears (not shown.) connected with and driven by the press gear. The form of the connecting gear is immaterial, it being essential only that the first folder unit shall cooperate with the plate cylinders substantially as set forth. The position of the first folder unit relative to the plate cylinders is likewise immaterial, that is to say, the first folder unit may be in line with the plate cylinders, or it may be at right angles to the plate cylinders as shown in the different views, without departing from my invention. Likewise in this form of the apparatus the same second folder unit herein described may be used and the same train of gear for driving the second folder unit may be used, but a different connecting gear between the press and the second folder unit may be used without departing from my invention.

The main cutter device for cutting the webs into sheets two-pages in length consists of two rotative cylinders K and K<sup>1</sup>, one of which has a longitudinal blade that cuts against a strip of wood or other material which will not injure the cutter blade. The circumference of the cylinders K and K<sup>1</sup> is the same as the circumference of the plate cylinders and they revolve at the same speed, thereby delivering the sheets to the first folder cylinders at exactly the same speed that they come from the plate cylinders. Fixed pins (not shown) on the cylinder K prevent the sheets from slipping on the cylinder. The cutting cylinder K<sup>1</sup>, carries a longitudinal blade k which cuts against cutting wood k<sup>1</sup>, on the roller K. The edge of the blade k travels in a circumference exactly equal to the circumference of the cylinder K, so that the blade makes one cut and no more, for each revolution of the cylinder K. A spur wheel K<sup>2</sup> (Fig. 6.) secured on the shaft k<sup>2</sup> of the cutter cylinder K, meshes with and is driven by the cog wheel M<sup>1</sup>, on the shaft of the folder cylinder and in turn meshes with and drives a similar cog pinion K<sup>3</sup>, secured on the shaft k<sup>3</sup>, of the cutter cylinder K<sup>1</sup>. A series of tape rollers K<sup>4</sup>, (Fig. 7.) are mounted to turn in suitable bearings on the main frame and carry endless tapes k<sup>4</sup>, which run in contact with the periphery of the cutter cylinder K. One of the rollers K<sup>4</sup> is preferably mounted on adjustable arms k<sup>5</sup>, for the purpose of tightening or loosening the tapes as occasion may demand. The web members coming from the pipe roller H<sup>3</sup>, pass around the lower tape roller K<sup>4</sup>, and upward around the cylinder K. The tapes k<sup>4</sup>, bear on the web members and facilitate their passage around the cylinder. The web mem-

bers then pass between the cylinders K, and K<sup>1</sup>, and are cut into sheets by the blade k, cutting against the cutting-wood k<sup>1</sup>. Guide strips K<sup>4</sup> or equivalent leader devices adjacent to and conforming to the periphery of the cylinder K, lead the cut sheets downward and prevent them from falling away from the cylinder.

A leader device preferably consisting of a circular brush M<sup>7</sup>, of about the same length as the cylinder M, is secured on the shaft m<sup>4</sup>, which turns in suitable bearings on the main frame and the brush runs in slight contact with the periphery of the cylinder and serves to keep the sheets in contact with the cylinder and guide them downward towards the pair of first folder rollers N. and N<sup>1</sup>, which make the first fold parallel to the columns. A cog pinion M<sup>8</sup>, (Fig. 8.) secured on the shaft m<sup>4</sup> of the brush M<sup>7</sup>, meshes with and is driven by the cog wheel M<sup>1</sup>, on the shaft of the folder cylinder and turns the brush M<sup>7</sup> towards the cylinder M. The pinion M<sup>8</sup>, may be omitted and the brush M<sup>7</sup> may be driven by frictional contact with the cylinder M, without departing from my invention. A cog pinion N<sup>3</sup>, (Fig. 6.) secured on the shaft n, of the roller N, meshes with and is driven by the wheel M<sup>1</sup>. Intermeshing cog wheels N<sup>4</sup>, (Fig. 3.) on the shafts n, and n<sup>1</sup>, turn the rollers N, and N<sup>1</sup>, in unison towards each other. The folder roller N, and pipe rolls N<sup>5</sup>, N<sup>6</sup>, and N<sup>7</sup>, (Fig. 7.) suitably supported on the frame G, carry endless tapes n<sup>2</sup>, which run around and are driven by the roller N<sup>1</sup>. The folder roller N and pipe rollers N<sup>7</sup>, N<sup>8</sup>, and N<sup>10</sup>, carry endless tapes n<sup>3</sup> which run under and are driven by the roller N. Guide rollers N<sup>12</sup>, cause the tapes to run close over each other along the second folder rollers so as not to interfere with the operation of the rotating folder blade P<sup>3</sup>. The tapes n<sup>2</sup>, travel in the direction indicated by the arrow x<sup>2</sup>, (Fig. 7) and the tapes n<sup>3</sup>, travel in the direction indicated by the arrow x<sup>3</sup>. The tapes n<sup>2</sup>, and n<sup>3</sup>, travel in unison and carry the papers, after receiving the first fold, up from the first pair of folder rollers until they are stopped by a stationary stop N<sup>15</sup>, in position to be operated upon by the second folder device. The sheets after being cut off by the blade k, are carried around the folder cylinder M, until the middle of the sheet reaches a position directly opposite to the folder rollers N, and N<sup>1</sup>. At this instant one of the blades M<sup>2</sup> acts to crease the sheet and force it outward into position to be seized by the folder rollers, folded and carried upward between the tapes n<sup>2</sup>, and n<sup>3</sup>, as already described. Strippers K<sup>5</sup> of the usual well known form strip the sheets from the cylinder K and guide them down on to the first folder cylinder. The circumference of the cylinder K is equal to the length of two pages of the plate-forms including margins, hence



the blade cuts off from each strip or each web, a sheet in length equal to the width of two plates plus margins for each revolution of the cylinder K.

5 By reference to the drawings it will be seen that the arrangement of the webs in the apparatus is such that when all of the decks are operated at full speed with their full complement of plates the web from one deck is always delivered in direct contact with the surface of the first folder cylinder and the other webs overlies it so that in making the first fold the pages cut from the first named web are always folded on the inside.

10 In case a supplement sheet is to be folded in the paper one of the decks of the press will be operated at half speed and with half a complement of plates, to deliver the supplement sheet to the cutter cylinders S and S', to be cut and conveyed next to the first folder cylinder as already described. This feature is of great practical advantage, because it expedites the process of assembling the sheets, by reason of the direct travel of the sheets. There is no circuitous travel. As soon as the sheets are cut off they are in position to be immediately carried onward on the folder cylinder.

15 In my apparatus the run of the paper webs through the press and through the folding machine is a rapid continuous or straight run as, distinguished from an intermittent or retarded run. All the webs and all of the web members travel at a uniform full speed around the first folder cylinder so that there is no interruption or delay in the operation by reason of part of the web members or sheets being retarded in their movement in order to permit slower-traveling web members or sheets to catch up during the process of collecting, or by reason of some of the sheets having to travel a greater distance than other sheets travel. The first folder cylinder M, which makes the first fold parallel to the columns, has two folder blades M<sup>2</sup> each of which is alternately used so that two folds are made for each revolution of the folder cylinder and there is no retardation of the operation of the folding by reason of dis-  
use of one of the folder blades.

20 The three-deck press and the folder devices illustrated in the drawings are capable of producing and folding a paper of four, six, eight, ten, twelve, fourteen, sixteen, eighteen, twenty or twenty-four pages as will be hereinafter more fully explained.

25 In a three-deck machine using double angle bars as shown there are three sets of plate cylinders A, three corresponding sets of slitter rollers E and E', and three corresponding sets of propelling rollers H and H'. The circumference of the cylinder M, is twice the circumference of the plate cylinder A. The folder cylinder M is mounted to turn in bearings on the frame G, and is actuated by suit-

able gear-wheels substantially as shown, and the folder cylinder makes one half revolution for each revolution of the plate cylinder. The circumference of the folder cylinder M is also twice the circumference of the cylinder K, hence the sheets cut on the cylinder K by the blade k, and equal in length to the circumference of the cylinder K will extend half way round the cylinder M and will contain two pages, the length of each page being equal to one quarter of the circumference of the cylinder M.

The first folder cylinder is always operated at full speed irrespective of the number of decks of the printing press with which the folder apparatus is used.

The folder cylinder M, is driven by a spur pinion B<sup>14</sup>, (Figs. 4. and 6.) on the shaft B<sup>2</sup>, which meshes with a cog wheel M<sup>1</sup>, secured on the shaft of the folder cylinder and turns the cylinder in the direction indicated by the arrow x in Fig. 6 and the arrow x<sup>1</sup> in Fig. 9. The cylinder M, is hollow and is pierced by two diametrically opposite longitudinal slots m (Fig. 10.) through which the folder blades M<sup>2</sup>, are alternately projected, once during each complete revolution of the cylinder, so as to strike the sheet or sheets traveling on the cylinder midway of said sheets and crease same in the middle and push them radially outward from the cylinder into position to be caught by the first pair of folder rollers N. and N'. There are two folder blades M<sup>2</sup> (Figs. 8, 9, and 10.) which are exactly alike and are mounted on shafts M<sup>3</sup> which turn in suitable bearings on the inside of the cylinder and extend longitudinally through and beyond the ends of the cylinder. Secured on the frame G, are two circular channel plates M<sup>4</sup>, respectively adjacent to the ends of the cylinder. The plates M<sup>4</sup> are concentric with the cylinder and have circular channels m<sup>1</sup>. Rollers m<sup>2</sup> turn on the ends of the shafts M<sup>3</sup> and travel in the channels m<sup>1</sup>.

Adjacent to the folder rollers N and N', the plate M<sup>4</sup> has an approximately circular recess m<sup>3</sup>, adapted to permit turning of the guide blocks M<sup>5</sup> in the recesses. The outer wall of the recess m<sup>3</sup> extends laterally from the plate M<sup>4</sup> toward the cylinder M and has an integral toothed segment m<sup>12</sup>. Cog pinions M<sup>6</sup>, secured on the shafts M<sup>3</sup> between the plates M<sup>4</sup> and the ends of the cylinder M, mesh with the toothed segments m<sup>12</sup> in such manner that each time that the cylinder M makes one half revolution the pinions M<sup>6</sup>, engaging in the teeth of the segments m<sup>12</sup> cause the shafts M<sup>3</sup> to successively make exactly a half revolution. This half revolution of the shafts M<sup>3</sup> causes the edges of the blades M<sup>2</sup> to project through the slits m, at the precise instant that the central line of the sheets traveling on the cylinder M reaches the plane of tangency between the folder rollers N and N', and also causes immediate retraction of



the blades. This instantaneous outward thrust of the folder blade creases the sheets on the cylinder and forces them into position to be engaged and carried away by the folder rollers.

Periodic outward thrusts of the blades  $M^2$  are made while the cylinder is revolving, it is therefore necessary to immediately retract the folder blades to prevent them from striking against the rollers  $N$  and  $N^1$ .

The edges of the blades  $M^2$  project through the slots  $m$ , only at the instant of creasing the sheets as described. At all other times the outer surfaces of the blades lie flush with the outer surface of the cylinder so as to close the slots and prevent injury to the paper traveling on the cylinder.

The curvature of the surfaces of the blades  $M^2$ , is approximately the same as the curvature of the outer surface of the cylinder  $M$ . Guide blocks  $M^5$ , approximately rectangular in form, with rounded corners, travel around in the channels  $m^1$ , and prevent rocking or turning of the shafts  $M^3$ , except during the instant that the blocks  $M^5$ , are in the recesses  $m^3$ . During this instant the blocks make a half revolution in the recess  $m^3$  and immediately again enter the channels  $m^1$ , in which they continue to travel until they again reach the recesses  $m^3$ , when the blocks make another half revolution; and so on as long as the operation is continued. A changed position of the pinions  $M^6$  and the guide blocks  $M^5$ , is indicated by dotted lines in Fig. 9. The folder blades  $M^2$  each in succession make a half revolution co-incidentally with the half revolution of the corresponding guide blocks  $M^5$ . Pins  $M^{12}$  on the folder cylinder take hold of the sheet at the instant that the pins on the cylinder  $K$  release it. Shafts  $M^9$  (Figs. 21 and 22 26.) extend through the cylinder  $M$ , diametrically opposite to each other and are mounted to oscillate on lugs  $m^5$ , in the cylinder. A circular cam plate  $M^{10}$ , is secured on the main frame coaxial with and adjacent to one end of the cylinder  $M$ . Two diametrically opposite depressions  $m^6$ , (Fig. 9.) in the periphery of the cam plate  $M^{10}$ , cause oscillation of the shafts  $M^9$  as herein- after described. Arms  $M^{11}$ , are secured on the shaft  $M^9$ , by splines  $m^7$ . Pins  $M^{12}$  sharpened and slightly curved at their outer end screw into the arms  $M^{11}$ , and are secured thereon by jam nuts  $m^8$ . The sharpened ends of the pins project through slots  $m^9$  in the wall of the cylinder. Arms  $M^{13}$ , are secured on the projecting ends of the shafts  $M^9$  and have at their lower ends little rollers  $m^{10}$  which travel on the circumference of the cam plate  $M^{10}$ . Springs  $M^{14}$ , surround the shafts  $M^9$  between the arms  $M^{13}$  and the end of the cylinder. One end of each of the springs  $M^{14}$  is connected with the end of the cylinder and the other end is connected with the arm  $M^{13}$  and the springs operate to hold the little rollers

$m^{10}$  in uniform contact with the periphery of the cam plate  $M^{10}$ . In practice the sharpened ends of the pins  $M^{12}$  project very slightly beyond the circumference of the cylinder  $M$  through slots  $m^9$  and serve to hold the sheets on the cylinder until the pins are retracted by the oscillation of the arms  $M^{13}$  traveling on the cam plate  $M^{10}$ .

The retractive pins  $M^{12}$  hold the sheet during the time that it travels from the cutter cylinder  $K$  around the cylinder  $M$  until the middle of the sheet reaches a position contiguous to the rollers  $N$  and  $N^1$ . At this instant the blades  $M^2$  act on the sheet to crease it and force it outward into position to be seized by the rollers  $N$  and  $N^1$ , and simultaneously the little rollers  $m^{10}$  run into the depressions  $m^6$  of the cam plate, and cause the arms  $M^{13}$  to oscillate the shafts  $M^9$  so as to retract one set of the pins and release one sheet and project the other set of pins so as to engage the next succeeding sheet. This operation is repeated periodically as often as it is necessary for the folder blades  $M^2$  to crease a sheet. The bolts  $m^{11}$ , which connect the plates  $M^{10}$  with the frame  $G$  pass through segmental slots  $m^{12}$ . By loosening the nuts of the bolts  $m^{11}$ , and turning the plate  $m^{10}$  on the bolts the position of the plate may be accurately adjusted so as to assure oscillation of the shafts  $M^9$  at the precise instant required. At the instant that the creased sheets enter between the rollers  $N$  and  $N^1$  the pins holding the sheet on the cylinder  $M$  are retracted so as to permit the removal of the sheet from the cylinder  $M$  without tearing the sheet. At this stage of the operation the second folder device comes into action. This device consists of a rapidly rotating folder blade carried on a shaft turning at proper speed to bring the folder blade into engagement with the sheet carried between leader devices such as tapes  $n^2$  and  $n^3$ , at the precise instant to make the cross fold of the sheet, and not at any other time. A horizontal shaft  $P$  (Figs. 3, 5 and 7.) turns in bearings on the frame  $G$ . Radial arms  $P^1$ , are secured on the shaft  $P$ . A shaft  $P^2$  turns in bearings  $p$  on the arms  $P^1$ .

The length of the arms  $P^1$ , and the speed of rotation of the shaft  $P$  are such that once during each revolution of the shaft  $P$  the folder blade  $P^3$  will be brought into operative relation to the second pair of folder rollers  $R$ , and  $R^1$ , as clearly shown in Fig. 5, and the arms make exactly one revolution during the time that the sheet carried between the tapes  $n^2$  and  $n^3$  is traversing the distance between the line of contact of the rollers  $N$  and  $N^1$ , and the stop  $N^{15}$ . The folder blade  $P^3$  is a metal blade secured on and turning with the shaft  $P^2$ . Circular plates  $P^4$  having internal cog teeth  $p^1$ , are secured in a vertical position on the frame  $G$  and axial with the shaft  $P$ . Pinions  $P^5$  secured on the shaft  $P^2$  mesh



with teeth  $p^1$  of the plate  $P^4$ . As the shaft  $P$  revolves the pinions  $P^5$  running around the toothed plates  $P^4$  cause the blade  $P^3$  to revolve rapidly. Each rotation of the shaft  $P$  brings the rapidly rotating blade  $P^3$  into position to strike the sheet lying under the blade and crease it and force it quickly downward into position to be caught and folded by the second set of folder rollers  $R$  and  $R^1$ . A horizontal shaft  $B^{15}$  (Figs. 4 and 6.) turns in bearings on the main frame. Bevel cog wheels  $B^{16}$ , and  $B^{17}$  are secured on the shaft  $B^{15}$ . A vertical shaft  $B^{18}$  turns in suitable bearings on the main frame. Bevel cog pinions  $B^{19}$  and  $B^{20}$  are secured on the shaft  $B^{18}$ . The cog pinion  $B^{19}$  meshes with and is driven by the cog wheel  $B^{13}$  and the cog wheel  $B^{19}$  meshes with and is driven by the cog wheel  $B^{17}$ . The cog wheel  $B^{20}$  meshes with the bevel cog pinion  $B^{36}$  secured on the shaft  $P$  and turns the shaft so as to operate the folder blade  $P^3$  as already described. Parallel horizontal second folder rollers  $R$  and  $R^1$ , (Figs. 5 and 7.) mounted in bearings on the main frame, turn toward each other at the proper speed to fold the papers as fast as they are creased by the rotating folder blade  $P^3$  and make the second fold transverse to the columns. A spur pinion  $R^3$  secured on the shaft  $r$ , of the roller  $R$  meshes with and is driven by a spur wheel  $R^2$  secured on the shaft  $P$ . Intermeshing spur wheels  $R^4$  (Fig. 3.) secured on the shafts  $r$  and  $r^1$ , of the rollers  $R$  and  $R^1$ , respectively, cause the rollers to turn in unison towards each other. A horizontal shaft  $R^5$  below and parallel to the rollers  $R$  and  $R^1$  turns in suitable bearings on the frame  $G$ . A series of hubs  $R^6$  are secured on the shaft  $R^5$ . Five radiating curved arms  $R^7$  are secured on each of the hubs  $R^6$ . A spur pinion  $R^8$  (Fig. 6.) secured on the shaft  $R^5$  meshes with a similar pinion  $R^9$  which turns on a stud on a bracket  $R^{10}$  which is suitably connected with the main frame. The spur wheel  $R^3$  on the roller shaft  $r$ , meshes with the pinion  $R^9$  and drives same so as to rotate the shaft  $R^5$  in the direction indicated by the arrow  $x^1$  in Fig. 1. at the proper speed to take away the folded papers as they come from the rollers  $R$ . and  $R^1$ .

Below and to the rear of the shaft  $R^5$  are two parallel horizontal tape rollers  $R^{11}$  turning in suitable bearings on the main frame and carrying a series of endless tapes  $R^{12}$ . Adjacent to the left hand roller  $R^{11}$  are a series of vertical rods  $R^{13}$ . The arms  $R^7$  turn between the rods  $R^{13}$  and the rods prevent the papers from being pulled off the tapes while the arms are being withdrawn from under the papers. The folded papers passing downward between the rollers  $R$  and  $R^1$  fall on the arms  $R^7$  by which they are carried around until the folded edges of the papers encounter the rods  $R^{13}$ , thereby stopping the papers and permitting the arms to

turn away from the papers, which are then deposited on the tapes  $R^{12}$ . The tapes  $R^{12}$  travel very slowly so that a number of papers may accumulate in a pile on the tapes before the papers run off of the tapes.

In practice it is desirable to count the papers in lots of say fifty papers each. This is accomplished by projecting the edge of every fiftieth paper somewhat beyond the other papers in the pile. Each revolution of the shaft  $R^5$  causes the deposit of five papers on the pile. In order to project each fiftieth paper as described I provide a slipper coming into action at each tenth revolution of the shaft  $R^5$ . A cog pinion  $R^{14}$  fixed on the shaft  $R^5$  meshes with a cog wheel  $R^{15}$  which turns on a stationary stud  $R^{16}$ . The circumference of the wheel  $R^{15}$  is ten times the circumference of the pinion  $R^{14}$ , hence ten revolutions of the pinion cause one revolution of the wheel. A pin  $R^{17}$  projects laterally from the face of the wheel  $R^{15}$ . A lever  $R^{18}$  oscillates on a stationary pivot  $R^{19}$  and the free end of the lever extends across the path of the pin  $R^{17}$ . A pipe  $R^{24}$  turns on a stationary horizontal shaft  $R^{20}$ . Arms  $R^{21}$  are secured on the pipe  $R^{24}$ . A spring  $R^{23}$  mounted on a stationary support acts against the arm  $R^{18}$ , the spring is compressed by rearward movement of the lower end of the arm and reacts to push the arm forward. A rod  $R^{22}$ , connects the lever  $R^{18}$  with one of the arms  $R^{21}$ . At each revolution of the wheel  $R^{15}$  the pin  $R^{17}$ , engages with the free end of the lever  $R^{18}$ , causing it to move the upper end of the arms  $R^{21}$  to the right by means of the connecting rod  $R^{22}$ . As soon as the pin passes the end of the lever  $R^{18}$  the spring  $R^{23}$  reacts to restore the arms  $R^{21}$  to their initial position. The arms  $R^{21}$  act between and do not interfere with the movement of the curved arms  $R^7$ . During each revolution of the shaft  $R^5$  five papers carried by the arms  $R^7$  are deposited on the tapes  $R^{12}$ . On the completion of each tenth revolution of the shaft  $R^5$  the pin  $R^{17}$  strikes the lever  $R^{18}$  and causes the arms  $R^{21}$  to move to the right so as to strike the edge of each fiftieth paper and project that paper beyond the other papers piled on the tapes  $R^{12}$ . It will be seen then that each lot of fifty papers is separated by one paper which projects beyond the others in the pile and facilitates counting of the papers in lots of fifty.

The means for cutting the supplement sheets hereinafter designated as the supplement cutter cylinders consists of a pair of cutter cylinders  $S$  and  $S^1$ , (Fig. 7.) which turn in suitable bearings on the frame  $G$ . The circumference of these cylinders is one-half of the circumference of the cylinders  $K$  and  $K^1$ . The cylinders  $S$  and  $S^1$  have half the peripheral speed of the cylinders  $K$  and  $K^1$ . The cylinders  $S$  and  $S^1$ , being half the diameter of the cylinders  $K$  and  $K^1$ , the half web from which the supplement sheets are formed



travels at half speed between the cylinders S and S<sup>1</sup>, until the supplement sheets are cut off. Immediately upon the cutting off of the supplement sheets the tapes S<sup>4</sup> lead them into contact with the periphery of the cylinder M and there-after the supplement sheets travel at the full peripheral speed of the cylinder M as hereinafter more fully explained. A spur pinion S<sup>2</sup> (Fig. 6) secured on the shaft of the cylinder S, meshes with and is driven by an intermediate spur-wheel S<sup>12</sup> which meshes with and is driven by the spur-wheel M<sup>1</sup>. Intermeshing spur wheels S<sup>7</sup> (Fig. 8.) secured on the shafts of the cylinders S and S<sup>1</sup>, turn the cylinders in unison towards each other. The cylinder S (Fig. 7.) has a longitudinal blade S<sup>3</sup>, which cuts on cutting wood S<sup>10</sup>, embedded in the cylinder S<sup>1</sup>. In the form of the machine employing double angle bars the web member from which the supplement sheets are cut is carried from the upper deck of the press over the splitter roller E<sup>1</sup> of the upper deck, over the pipe roller H<sup>5</sup> and around the pipe rollers H<sup>16</sup>, H<sup>17</sup>, and H<sup>18</sup>, to the cutter cylinder S<sup>1</sup>.

Fixed pins (not shown) on the cylinder S<sup>1</sup>, prevent the paper from slipping on the cylinder. At each revolution of the cylinders the blade S<sup>3</sup> cuts off a supplement sheet containing on each side a single printed page of the form of the plates on the cooperating half speed plate cylinders. These supplement sheets pass around the first folder cylinder concurrently with the two-page sheets between the pages of which they are to be inserted.

Strippers S<sup>6</sup> strip the sheets successively from the cylinder S<sup>1</sup> and guide them up between the tapes S<sup>4</sup> and the face of the cylinder M. The tapes S<sup>4</sup> which run on the tape wheels S<sup>5</sup> lead the cut sheets from the cylinder S<sup>1</sup>, to the folder cylinder M by which they are carried around next to the face of the cylinder M and in position to be folded between the sheets delivered to the cylinder M from the first cylinder K. The circumference of the second cutter cylinders S and S<sup>1</sup>, being one half the circumference of the plate cylinders it is necessary to operate at half speed the plate cylinders cooperating with the second cutter cylinders.

In order that the supplement sheet may be printed on both sides and delivered in due time to the second cutter cylinders, only a half complement of plates is used on the cooperating plate cylinders. In this case duplicate plates of one page of the supplement sheet extend around half of one plate cylinder and duplicate plates of the other page extend around half of the other cooperating plate cylinder on the same deck. The plate cylinders, the plates and the means for connecting the plates with the cylinders for the purpose stated may be of any usual or suitable construction and not being essential

devices of my invention are not shown or claimed. This is the only use of duplicate plates with this apparatus. In every other case original plates only are used and a printed page is produced for every plate on the plate cylinders.

In using the folder apparatus with a multiple deck printing machine to produce a paper including a supplement sheet it is necessary to operate only one deck of the press at half speed and it is immaterial which deck is so operated.

Figs. 1 to 13 inclusive illustrate an apparatus employing angle bars and adapted to operate the upper deck at half speed in cooperation with the second cutter cylinders S and S<sup>1</sup>. Figs. 15 to 18, inclusive illustrate a modified form of the apparatus employing a former instead of angle bars for associating the pages and adapted to cooperate with plate cylinders on the lower deck run at half speed, and Fig. 19 illustrates a modification of the apparatus employing a former and adapted to run the plate cylinders on the upper deck at half speed in cooperation with second cutter cylinders, first cutter cylinders, and a folder cylinder. In this case the half web from which the supplement sheets are cut is taken from the upper deck and carried around a single angle bar F as shown to bring the web into proper position for cutting the supplement sheets. In every case the supplement web is only one page in width.

Previous to the cutting of the supplement sheet it travels at one half the circumferential speed of the first folder cylinder. Coincidentally with the cutting of the supplement sheet it is caught by the tapes S<sup>4</sup> and guided into contact with the surface of the folder cylinder M and immediately begins and thereafter continues to travel at the circumferential speed of the folder cylinder. The second cutter cylinders being close to the folder cylinder this change of speed is attained without employing complicated mechanism, or causing the sheet to travel an unnecessary distance or retard the operation of the folder cylinder.

It is sometimes desirable to paste the supplement sheet between the pages of the paper in which it is folded, so as to prevent accidental displacement of the supplement. This result is accomplished by a pasting device (Fig. 7.) which I will now describe.

A suitable box T supported on the frame G contains properly prepared paste. A roller T<sup>1</sup>, turns in the paste box. A shaft T<sup>2</sup> turns in suitable bearings and carries a longitudinal wiper T<sup>3</sup> having its edge faced with rubber t, or other yielding material. The rubber t, turns in contact with the surface of the paste roller T<sup>1</sup>. The paster device being close to the cutter cylinder on which the double sheet is traveling the paste cannot dry before the supplement sheet is attached. By using dif-



ferent widths of rubber strips on the face of the wiper paste-strips of different widths may be applied to the sheets. A springy blade  $T^4$  is mounted on the box  $T$  and closes an opening therein and its free end is contiguous to the surface of the roller  $T^1$ . The blade  $T^4$  is adjustable by means of screws  $t^1$ , so as to move the edge of the blade upward or away from the surface of the roller and thereby control the supply of the paste to the roller. A spur wheel  $T^5$  (Fig. 6.) secured on the shaft  $k^3$ , of the cutting cylinder  $K^1$ , meshes with and drives a spur pinion  $T^6$  secured on the shaft  $t^2$ , of the paste roller  $T^1$ , and turns the paste roller in the direction indicated by the arrow  $X^5$  in Fig. 6. A spur wheel  $T^7$ , (Fig. 2.) secured on the shaft  $t^2$  of the paste roller meshes with and drives a similar spur wheel  $T^8$  (Fig. 6) secured on the wiper shaft  $T^2$  and causes the wiper to make one revolution for each complete revolution of the cylinder  $K$ ; so that at the instant the central margin of the sheet reaches the proper position on the cylinder  $K$  the rubber  $t$ , carrying paste received from the roller  $T^1$ , will quickly dab the sheet and leave a narrow strip of paste along the margin of the sheet. A cushion  $k^6$ , (Fig. 7) of rubber or other yielding material is embedded in the circumference of the cylinder  $K$  and is so situated that when the sheets are on the cylinder and immediately before the cutting of the sheets the cushion will underlie the margin between the pages of the sheets and the wiper in applying the paste to the paper will strike the paper while in contact with the cushion. The cushion prevents tearing the paper by too hard a blow by the wiper in applying the paste. The supplement sheet and the double sheet then pass between the cylinder  $K$  and the cylinder  $M$  and the paste on the margin of the double sheet causes the supplement sheet to stick to the sheet coming around the cylinder  $K$  and both are then carried by the cylinder  $M$  into position to be creased and folded as hereinbefore described.

In printing and folding a ten page paper on the type of the machine employing angle bars (and illustrated in Figs. 1, to 13 and Fig. 19.) the plate cylinders on the upper deck and the plate cylinders on one of the other decks are used. For this purpose the two plate cylinders on the middle deck of the press are supplied with their full complement of eight plates each, and a paper web of full width, equal to the length of the plate cylinder is employed. On the upper deck the paper web is half-width and two plates are used on half the length of the plate cylinders, instead of four plates on the full length of the plate cylinders. The plates on the first plate cylinder of the upper deck contain the matter to be printed on one side of the supplement sheet, and the plates on the other plate cylinder contain the matter to be printed on the other side of the supplement sheet. The mid-

dle deck being provided with full sets of plates and webs of full width and running at full speed and the upper deck being provided with cylinders having plates occupying only half the length of the cylinders and employing a half width web and running at half speed, eight complete pages will be printed on the plate cylinders of the middle deck and two pages on the cylinders of the upper deck. Duplicate plates for the supplement sheet, two of a kind are used on the plate cylinders of the upper deck.

When printing a ten page paper the plate cylinders of the upper deck are run at half-speed in order to print one fourth of the number of pages that are printed by the plates of the cylinders of the middle or co-operating deck.

To produce papers of different numbers of pages folded in book form the apparatus employs the number of decks specified, using the number of plates stated, viz; eight pages, one deck with full complement of plates, at full speed; ten pages, one deck with full complement of plates at full speed, and one deck with half a complement of plates and at half speed; twelve pages, one deck with full complement of plates, at full speed and one deck with half a complement of plates at full speed; fourteen pages, one deck with full complement of plates, at full speed, one deck with half a complement of plates at full speed, and one deck with half a complement of plates at half speed; sixteen pages, two decks with full complement of plates, at full speed; eighteen pages, two decks with full complement of plates at full speed, and one deck with half a complement of plates at half speed; twenty pages, two decks with full complement of plates, at full speed, and one deck with half a complement of plates at full speed; twenty-four pages, three decks with full complement of plates at full speed.

In the form of the apparatus shown in Fig. 7, the supplement sheet is taken from a half-web running on the upper deck of the press; this half web passes around one angle bar  $F$  between the upper set of propelling rollers  $II$ , and  $II^1$ , over the upper adjusting rollers  $II^2$ , thence downward around the rollers  $II^6$ ,  $II^7$  and  $II^8$  to the supplement cutter cylinders  $S$  and  $S^1$ . After slitting the web from the middle deck as already described the web members will be carried around the middle angle bars  $F$ , and after being overlapped will be conveyed to the folder cylinder as has already been described in detail. The sheets from the middle deck and the upper deck are delivered to the cylinder  $M$ , in such order that the supplement sheet lies next to the face of the cylinder. The sheets in this position are carried around the cylinder  $M$ , and thence between the folder rollers  $N$  and  $N^1$ , as already described.

By arranging the plates length-wise of the



plate cylinders, operating in connection with angle bars and straight line rotary folder devices as described I gain the great practical advantage of speed in the associating of the pages and folding them in book form.

I am aware that the plate cylinders having plates of which the columns lie length-wise of the cylinder have long been used, I therefore do not claim that feature broadly.

My machine involves a new and useful adaptation of angle bars, formers or equivalent devices for associating the pages in conjunction with plate cylinders for use with rapid rotary folder devices for folding them in book form.

The surface speed, of the main plate cylinders, the main impression cylinders, the main cutter cylinders, the folder cylinder and the folder rollers is always the same and the main web, or the cut sheets, as the case may be, travel throughout at the initial surface speed of the main web.

In producing a paper with a supplement sheet the plate cylinders and impression cylinders of one deck will be operated at half speed and the supplement sheets will be cut from a web one-plate wide carried on that deck.

It is a characteristic of my invention that no matter what the means for associating the web members or sheets as the case may be, said associated members or sheets of the main webs always travel in parallel, without divergence, without reversal of travel and without duplication of travel and that the sheets cut from the supplement web come into line with and are folded in book form with sheets cut from the main web or webs without any retardation of the latter. The width of the supplement web is equal to the length of one page plus margins and the sheets cut from it are always in length equal to the width of one page plus margins. The sheets cut from the main or full speed web or webs are always in length equal to the width of two pages plus margins and in width are equal to, the length of one page plus margins.

The use of original plates only on every full speed plate cylinder of every deck of a multiple deck apparatus, results in a page for a plate product printed in the form of successive signatures each having as many pages as there are plates on each full-speed printing couple of the decks respectively. This arrangement admits of the immediate association of the plural members of the webs carried on the respective decks to produce a series of folios from each deck associable with similar folios produced from the webs of the other decks; it also admits of the advantageous operation of a single deck or the joint operation of two or more decks, and no matter whether only one full-speed deck is in cooperation with the half speed

supplement deck, or plural full speed decks are in cooperation with the half speed deck a one-plate wide half-speed supplement web may be used because the one-page long supplement sheet is never inserted until after the two-page-long main sheets are associated and about the time that they are cut off. The insert sheet is always in line with the associated main sheets and there is therefore no necessity for collecting the sheets; and the product is always in book form. None of the apparatuses known prior to my invention admit of the invariable use of a one plate wide supplement web.

A great practical advantage of my apparatus is that the final delivery of the folded product is always commensurate to the capacity of the printing units and is not effected by the number of pages of the product, the number of decks employed in its production or by the production and insertion of a supplement.

I am the first to devise an apparatus so organized that the full speed plate cylinders are always two plates in circumference and the plates thereon are all original plates having columns lengthwise of said plate cylinders, and the half-speed plate cylinders are always two plates in circumference and carry both original plates and duplicate plates having columns lengthwise of said cylinders, said full speed plate cylinders and half speed cylinders cooperating with a single folder cylinder in width equal to the length of one plate plus margins and in circumference equal to the width of four plates plus margins; all the members of a single full speed web being in line and associated before being acted upon by said folder cylinder, and in case a multiple deck press is used, all of the associated members of the several webs being consolidated or brought together in book form before being acted upon by said folder cylinder.

The operation of the apparatus is obvious, from the foregoing description and need not be recited in detail.

Having fully described my invention what I claim as new and desire to secure by Letters Patent is:

1. A folder unit consisting of a rotative first folder cylinder and rotative main cutter cylinders, rotative supplement cutter cylinders and rotative folder rollers all contiguous and parallel to said first folder cylinder; in combination with plate cylinders rotative at full speed; plate cylinders rotative at half speed; means for leading to the main cutter cylinders the web or webs from the plate cylinders rotating at full speed; means for leading to the supplement cutter cylinders a web from the plate cylinders rotating at half speed; a paster device cooperating with one of said main cutter cylinders; and means for delivering to the main folder rollers the com-



bined sheets cut by the first cutter cylinders and the supplement cutter cylinders; as set forth.

2. In an apparatus of the class described, the combination of a main frame, a rotative main folder cylinder, rotative first cutter cylinders and rotative supplement cutter cylinders mounted on the main frame, a stationary paste box contiguous to said main cutter cylinders, a paste roller turning in said paste box; and a rotative wiper periodically contacting with said paste roller and with one of said main cutter cylinders; as set forth.

3. In an apparatus of the class described, the combination of rotative main cutter cylinders, a cushion on one of said main cutter cylinders, a stationary paste box, a paste roller turning in said paste box, and a rotative wiper having yielding surfaces periodically contacting with said paste roller and with the cushion on the main cutter cylinder, as set forth.

4. In an apparatus of the class described, the combination of a two-page cutter device; a one-page cutter device, a guide device and a stripper device cooperating with said two-page cutter device; a folder cylinder cooperating with said cutter devices, a leader device between said cutter devices, folder rollers cooperating with said folder cylinder, and a leader device between said folder rollers and said two-page cutter device; as set forth.

5. In an apparatus of the class described, the combination of a rotating folder cylinder; projectile blades and retractive pins on said cylinder, rotative main cutter cylinders, a paster device periodically contacting with one of said main cutter cylinders, supplement cutter cylinders, leader devices contiguous to said folder cylinder and folder rollers contiguous to said folder cylinder; all cooperating to interpose and paste the supplement sheet and fold it with the concurrent sheet, as set forth.

6. In an apparatus of the class described, the combination of a main frame, a main drive shaft and a cooperating counter shaft mounted on said frame, a folder cylinder, a spur wheel connected with said folder cylinder, a spur pinion on said counter shaft meshing with said spur wheel, parallel main cutter cylinders, intermeshing spur wheels respectively connected with said main cutter cylinders, a spur wheel connected with one of said main cutter cylinders and meshing with the spur wheel connected with the first folder cylinder, a rotative paste roller, a spur wheel connected with said paste roller and meshing with a spur wheel on the shaft of one of said cutter cylinders, a rotative wiper, a spur wheel connected with said wiper and meshing with a spur wheel on the shaft of one of the main cutter cylinders, rotative supplement cutter cylinders, intermeshing spur

wheels connected with said supplement cutter cylinders respectively, a spur pinion connected with one of said supplement cutter cylinders and driven by a spur wheel connected with the first folder cylinder, parallel rotative folder rollers, intermeshing spur wheels connected with said folder rollers respectively, and a pinion connected with one of said folder rollers and meshing with the spur wheel connected with the first folder cylinder; all cooperating to turn the folder cylinder, the first cutter cylinders, the paste roller, the supplement cutter cylinders and folder rollers in proper direction and in due time, as set forth.

7. In an apparatus of the class described, the combination of a main frame, a rotative counter shaft, a rotative first-folder cylinder, a spur wheel connected with said first-folder cylinder; rotative main cutter cylinders, supplement cutter cylinders and folder rollers geared to cooperate with said first-folder cylinder; a spur pinion on said counter shaft meshing with the spur wheel on said first folder cylinder, a revoluble vertical shaft, a bevel cog wheel secured on said vertical shaft contiguous to said counter shaft, a bevel cog wheel on said counter-shaft meshing with and driving said bevel cog wheel on said vertical shaft, parallel rotative web-propelling rollers in pairs, intermeshing spur wheels connected with said web-propelling rollers, parallel rotative slitter devices in pairs, spur wheels respectively connected with one roller of each slitter device, a double cog wheel having an inner gear and an outer gear and connected with one of said slitter rollers, a double bevel cog pinion slidable on and turning with said vertical shaft and adjustable to mesh with either set of cog teeth on said double cog wheel, a bevel cog pinion connected with one of said web-propelling rollers and meshing with the inner gear of said double cog wheel, bevel cog wheels secured on said vertical shaft and meshing with similar bevel cog wheels respectively connected with one web-propelling roller of one or more pairs, and bevel cog wheels secured on said vertical shaft and respectively meshing with similar cog wheels connected with said slitter devices; all cooperating to drive one set of slitter devices and one set of web-propelling rollers at changeable speed and the other set or sets of slitter devices and web propelling rollers at constant speed; in cooperation with said first folder cylinder, main cutter cylinders, supplement cutter cylinders and folder rollers, as set forth.

8. A web adjusting device consisting of slotted vertical standards, arms mounted to turn on said standards, connecting devices passing through the slots in said standards and through said arms, and rollers mounted to turn between said arms; in combination



with web-propelling devices and folder devices in operative relation to said web propelling devices, as set forth.

9. In an apparatus of the class described, the combination of a main frame, a main drive shaft turning thereon, plate cylinders and blanket cylinders operatively connected with said main drive shaft, a first counter shaft driven by said main shaft, a second counter shaft driven by said first counter shaft, a vertical third shaft driven by said counter shaft, a rotatable second-folder shaft, arms and a bevel cog wheel secured on said second-folder shaft, a bevel cog wheel secured on said third shaft and meshing with the bevel cog wheel on said second-folder shaft, circular toothed plates co-axial with said second-folder shaft, a rotary folder blade mounted on said arms, a pinion connected with said folder blade and meshing with the teeth of said circular plates, parallel rotary second-folder rollers, intermeshing spur wheels connected with said rollers, a spur wheel secured on said second-folder shaft, a spur pinion connected with one of said second folder rollers and driven by the spur wheel on the second-folder shaft; a rotative first folder cylinder, rotative main cutter cylinders, rotative supplement cutter cylinders, rotative first folder rollers and means for leading papers from said first folder rollers to said second folder rollers, as set forth.

10. In an apparatus of the class described, the combination of multiple sets of plate cylinders carrying plates with columns lengthwise of said cylinders, means for rotating one set of said plate cylinders at half speed, means for rotating one or more sets of said plate cylinders at full speed, means for slitting the webs from the full speed plate cylinders, means for changing the direction of and overlapping the web-members of the slitted webs, multiple sets of web-propelling devices, means for operating at full speed the other set or sets of the web-propelling devices, means for adjusting the web members longitudinally relative to each other, a first folder cylinder turning at full speed, first cutter cylinders coöperating with said first folder cylinder, means for leading the overlapped web members to said first cutter cylinders, supplement cutter cylinders coöperating with said first folder cylinder, means for leading the web from said half speed plate cylinders to said supplement cutter cylinders, means for leading the sheets from first cutter cylinders to said first folder cylinder, means for applying adhesive material to the sheets in transit between the first cutter cylinders and the first folder cylinder, means for leading sheets from the supplement cutter cylinders around the first folder cylinder, means for folding together the sheets from the first cutter cylinders and the supplement cutter

cylinders, means for leading said combined sheets to a second folder device, means for folding said combined sheets transverse to the first fold, means for depositing the papers thus folded on a conveyer device, means for counting the folded papers in lots, and means for conveying away the folded papers, as set forth.

11. A multiple deck apparatus for printing and folding papers, comprising full-speed printing couples invariably two-plates in circumference and plural plates wide, the plate cylinders of said printing couples invariably having full complements of plates with columns lengthwise of the plate cylinders and all of the plates being original plates, a co-operating folder cylinder invariably one-plate-wide irrespective of the width of the main printing couples and irrespective of the number of decks of printing couples in use and adapted to carry two-page-long sheets with columns lengthwise of the folder cylinder and provided with means for creasing and projecting said sheets twice during each revolution of the folder cylinder, means for dividing webs into members in width equal to the length of one page plus margins, before cutting them into sheets, means for associating all of the web members of all of the webs, main cutter devices operating independently of the folder cylinder and adapted to cut the associated web members into sheets in length equal to the width of two pages plus margins, all of said sheets being carried upon and around one of said cutter devices and thereby delivered upon the folder cylinder, and means for folding together the associated sheets carried upon the folder cylinder, the run of the webs, the web members, and cut sheets, being a continuous straight-run always in parallel from start to finish.

12. An apparatus for printing and folding papers, comprising plural sets of full speed plate cylinders and coöperating impression cylinders two plates in circumference and plural plates wide, said plate cylinders having plates with columns lengthwise of the plate cylinders and all of said plates being invariably original plates; a coöperating folder cylinder one plate wide, adapted to carry sheets with columns lengthwise of said cylinder and provided with means for creasing and projecting said sheets twice during each revolution of said folder cylinder; means for dividing webs into members in width equal to the length of one plate plus margins; means for associating all the members of a single web during the continuous straight run of all of the members of said web traveling always in unison; means for bringing together in book form the associated web members; cutter cylinders the same diameter as and turning in unison with the plate cylinders and adapted to cut the associated web members into sheets in length equal to the



width two page plus margins, said associated sheets being on one of said cutter cylinders; and means for folding together said associated sheets.

5 13. An apparatus for printing and folding papers comprising full speed plate cylinders and cooperating impression cylinders 2 plates in circumference and plural plates wide, said plate cylinders having plates with columns  
10 lengthwise of the cylinders and all of the plates being invariably original plates; a cooperating folder cylinder one-plate wide adapted to carry sheets with columns length-  
15 wise of said cylinder and provided with means for creasing and projecting said sheets twice during each revolution of said folder cylinder; means for dividing webs into mem-  
20 bers in width equal to the length of one plate plus margins; means for associating all the web members of a single web during the continuous straight run of all of said web mem-  
25 bers; cutter cylinders operating independently of the folder cylinders to cut the associated web members into sheets in length equal to the width of two pages plus margins, the associated cut sheets being carried on one of said cutter cylinders; means for applying  
30 paste to the outer sheet of the associated sheets on the cutter cylinder on the margin between the pages thereof; means for printing a supplement web invariably one plate wide; means for cutting said supplement web into sheets one page long; means for placing said one-page-long sheet on the quarter of the  
35 folder cylinder adjacent to the main cutter cylinders in position to, adhere to the pasted part of the sheet on the cutter cylinder; and means for folding together the supplement sheet and the associated sheets from the cut-  
40 ter cylinders to invariably produce two complete papers always in book form with a supplement sheet, for each revolution of the folder cylinder.

45 14. An apparatus for printing and folding papers, comprising multiple sets of plate cylinders and cooperating impression cylinders two plates in circumference and plural plates wide, said plate cylinders having plates with columns lengthwise of the cylinders and all  
50 of the plates being original plates; a cooperating folder cylinder 1 plate wide adapted to carry sheets with columns lengthwise of said cylinder and provided with means for creasing and projecting said sheets invariably  
55 twice during each revolution of said folder cylinder; means for dividing webs into members in width equal to the length of one plate plus margins; means for associating all the web members of a single web; means for  
60 bringing together in book form the associated members of the several webs; cutter cylinders for cutting the associated web members into sheets in length equal to the width of two pages plus margins during the  
65 continuous straight run of said web members,

said associated sheets being carried on one of said cutter cylinders and means for folding together all of the associated sheets on the cutter cylinder to invariably produce two papers in book form for each revolution of  
70 the folder cylinder.

15. A multiple-deck apparatus for printing and folding papers comprising plural sets of full-speed plate cylinders and cooperating impression cylinders two plates in circum-  
75 ference and plural plates wide, said plate cylinders having plates with columns lengthwise of the cylinders and all of the plates being original plates; a cooperating set of half-speed plate cylinders and impression  
80 cylinders two plates in circumference, said half-speed plate cylinders having both original plates and duplicate plates with columns lengthwise of said plate cylinders; a cooperating folder cylinder adapted to carry sheets  
85 with columns lengthwise of said folder cylinder and provided with means for creasing and projecting said sheets twice during each revolution of said cylinder; means for dividing webs into members in width equal to the  
90 length of one plate plus margins; means for associating all the web members of a single web; means for bringing together in book form the associated members of the several webs; cutter cylinders for cutting the associ-  
95 ated web members into sheets in length equal to the width of two pages plus margins, said associated sheets being carried on one of said cutter cylinders; means for applying paste to the outer sheet of the sheets car-  
100 ried on the cutter cylinder; means for cutting a supplement web into sheets one-page long; means for placing said one-page long supplement-sheets on the folder cylinder in position to adhere to the pasted sheet on the cutter  
105 cylinder; and means for folding together the supplement sheet and the associated sheets from the cutter cylinders.

16. An apparatus for printing and folding papers comprising plural sets of full speed  
110 plate cylinders and cooperating impression cylinders two plates in circumference and plural plates wide, said plate cylinders having plates with columns lengthwise thereof and all of said plates being original plates; a  
115 cooperating folder cylinder one plate wide adapted to carry two-page sheets with columns lengthwise of said cylinder and provided with means for creasing and projecting said sheets invariably twice during each revo-  
120 lution of said folder cylinder; means for dividing the webs from the plate cylinders into members in width equal to the length of one plate plus margins during the continuous straight run of all of said web members;  
125 means for associating all of the web members from all of the plate cylinders; main cutter cylinders situated between the plate cylinders and the folder cylinder and adapted to cut the associated web members into two-  
130



page sheets independently of the folder cylinder; half-speed supplement plate cylinders two plates in circumference and having original plates and duplicate plates with columns lengthwise of said supplement cylinders; supplement cutter-cylinders between the folder cylinder and the plate cylinders and adapted to cut the supplement web into sheets one-page long means for delivering the cut sheet in a continuous straight run onto the quarter of the folder cylinder adjacent to the main cutter cylinders; and means for folding together the supplement sheet and the associated sheets from the first cutter cylinder.

17. An apparatus for printing and folding papers comprising plural sets of plate cylinders and cooperating impression cylinders two plates in circumference and plural plates wide, said plate cylinders having plates with columns lengthwise thereof and all of said plates being original plates; a cooperating folder cylinder one plate wide adapted to carry two-page sheets with columns lengthwise of said cylinder and provided with means for creasing and projecting said sheets twice during each revolution of said folder cylinder; means for dividing the webs from the plate cylinders into members in width equal to the length of one plate plus margins; means for associating all of the web members from all of the plate cylinders; main cutter cylinders situated between the plate cylinders and the folder cylinder and operating independently of the folder cylinder to cut the associated web members into two-page sheets; supplement cutter cylinders between the folder cylinders and the plate cylinders and adapted to cut the supplement web into one page sheets; means for applying paste to the outside sheet of the sheets associated on the main cutter cylinders; means for placing the supplement sheet on the folder cylinder in position to adhere to the pasted part of the outside sheet on the main cutter cylinder; and means for folding together the supplement sheet and the associated sheets from the main cutter cylinder and adapted to invariably produce two papers in book form with a supplement sheet for each complete revolution of the folder cylinder.

18. In an apparatus for printing and folding papers the combination of rotative full-speed plate cylinders two-plates in circumference and plural plates wide and having columns lengthwise of said plate cylinders, all of the plates on said cylinders being original plates; cooperating full speed impression cylinders; half-speed plate cylinders two plates in circumference and having both original and duplicate plates with columns lengthwise of said plate cylinders; full speed main cutter cylinders between the folder cylinders and the full speed plate cylinders cutting independently of the folder cylinders and

always cutting off sheets in length equal to the width of two pages plus margins; half-speed cutter cylinders between the folder cylinder and the half-speed plate cylinders cutting off sheets in length equal to the width of one page plus margins and delivering same in a continuous straight run onto the quarter of the folder cylinder adjacent to the main cutter cylinders; a rotative folder cylinder one plate wide and adapted to invariably produce two papers in book form for each and every revolution of the folder cylinder; means for associating on said folder cylinder sheets from said full speed plate cylinders and sheets from said half speed plate cylinders and means for folding together all of said associated sheets in book form.

19. An apparatus for printing and folding papers, comprising multiple sets of plate cylinders two plates in circumference and plural plates wide, carrying full complements of plates with columns lengthwise of said plate cylinders, all of said plates being invariably original plates; impression cylinders cooperating with said plate cylinders; a single folder cylinder one plate wide and adapted to carry two-page sheets with columns lengthwise of said folder cylinder; means for associating all of the two-page sheets from all of said plate cylinders in book form on said single one-plate wide folder cylinder, a cutter device operating independently of the folder cylinder and adapted to cut off a sheet in length equal to the width of two pages plus margins for each revolution of the plate cylinders, and means for folding together all of the associated sheets from all of said plate cylinders; all cooperating to produce a paper always in book form and having an original printed page for every plate on the plate cylinders, two folded papers being invariably produced for each and every revolution of the folder cylinders.

20. In a multiple deck apparatus for printing and folding papers, the combination of multiple sets of rotative cylinders two plates in circumference and two plates wide with columns lengthwise of said plate cylinders; impression cylinders cooperating with said plate cylinders; web adjusting devices adapted for separate adjustment of the webs of the respective decks; slit devices adapted to slit said webs respectively; angle bars adapted to change the direction of travel of said webs respectively; a former adapted to fold longitudinally the webs carried on said angle bars; and a rotative first folder cylinder one plate wide and corresponding rotative main cutter cylinders, rotative supplement cutter cylinders and rotative folder rollers in operative relation to said first folder cylinder.

21. An apparatus for printing and folding papers comprising full-speed plate cylinders two plates in circumference and plural plates



wide and provided always with a full complement of original plates having columns lengthwise of said plate cylinders; half-speed plate cylinders two plates in circumference and plural plates wide and provided with original plates and duplicate plates having columns lengthwise of said half speed plate cylinders; full speed impression cylinders cooperating with said full speed plate cylinders; half-speed impression cylinders cooperating with said half speed plate cylinders; a folder cylinder one plate wide and adapted to carry two-page sheets with columns lengthwise of said folder cylinder and provided with means for creasing and projecting said sheets twice during each revolution of said folder cylinder; means for associating in book form all the web members from all of the full speed plate cylinders; means operating independently of the folder cylinder to cut into sheets in length equal to the width of two pages plus margins all of the web members from the full speed plate cylinders, one cut being made for every revolution of the plate cylinders; means for cutting into sheets in length equal to the width of one page plus margins the web from the half-speed plate cylinders; means for placing said last named sheets next to the outer surface of the folder cylinder upon the quarter thereof adjacent to the main cutter cylinders and a folder device cooperating with said folder cylinder to fold in book-form all of the sheets from all of the plate cylinders, two complete papers being invariably produced for each and every revolution of the folder cylinder.

22. In an apparatus for printing and folding papers, the combination of plate cylinders invariably two-plates in circumference and plural plates wide and provided with plates having columns lengthwise of said plate cylinders, and all of said plates being original plates; impression cylinders cooperating with the plate cylinders, means for slitting the webs carried on said plate cylinders to form web-members in width equal to the length of one page plus margins; means for associating invariably in book form all of the web-members running invariably in unison and in parallel; main cutter devices adapted to cut off sheets in length equal to the width of two pages plus margins; and a main folder device invariably one plate wide regardless of the width of the plate cylinders and adapted to invariably fold in book form the entire printed product of said plate cylinders and invariably produce one complete paper in book form for each revolution of the main printing couples and main cutter device irrespective of the width of the printing couples.

23. In an apparatus for printing and folding papers the combination of main plate cylinders plural plates wide, two plates in circumference and equipped with a full complement

of plates having columns lengthwise of the plate cylinders, all of said plates being invariably original plates; impression cylinders cooperating with the main plate cylinders; associating devices adapted to associate in book form, the entire printed product of the main plate cylinders, during the continuous straight run, in parallel, of all of the main web-members; a main folder cylinder invariably one-plate wide, regardless of the width of the plate cylinders; a main cutter device one-plate wide and making one cut for every revolution of the main printing couples and the main cutter device, and adapted to cut into sheets in length equal to the width of two pages plus margins, the entire printed product of the main printing couples; and one-plate-wide folder mechanism adapted to invariably fold in book form, the entire product of the main printing couples and deliver a complete paper for every revolution of the main printing couples and the main cutter device.

24. A folder unit comprising a rotative folder cylinder; main cutter cylinders adapted to cut full speed web into two-page sheets independently of said folder cylinder; supplement cutter cylinders adapted to cut half speed web into one-page sheets independently of said folder cylinder said supplement cutter cylinders being in position to deliver the supplement sheets in a straight run directly onto the quarter of the folder cylinder contiguous to and approaching the main cutter cylinders; and folder rollers cooperating with said folder cylinder to fold together the sheets cut by said main-cutter cylinders and supplement-cutter cylinders.

25. A folder unit comprising a revoluble main folder cylinder, folder rollers cooperating with the folder cylinder, and revoluble male and female cutter cylinders cutting independently of the folder cylinder; in combination with means for supplying to the cutter cylinders sheets printed in pages, and a paster device adapted to apply paste along the central margin between the pages of a sheet traveling on one of the main cutter cylinders, at each revolution of said cutter cylinders.

26. In an apparatus for printing and folding papers, the combination of full-speed plate cylinders two-plates in circumference and provided with plates with columns lengthwise of said plate cylinders, all of said plates being original plates, half-speed plate cylinders two-plates in circumference and provided with original and duplicate plates with columns lengthwise of said half-speed plate cylinders, impression cylinders cooperating with said full-speed and half-speed plate cylinders respectively, a folder-unit comprising a folder cylinder, main cutter cylinders cutting independently of the folder cylinder, supplement cutter cylinders in line



with the folder cylinder and the half-speed supplement web and adapted to deliver cut sheets in a straight-run directly onto the quarter of the folder cylinder adjacent to and approaching the main cutter cylinders, folder rollers, and means for slitting the full-speed webs and means for associating the full-speed web members intermediate of said plate cylinders and said folder-unit.

27. In an apparatus for printing and folding papers the combination of rotative full-speed plate cylinders two-plates in circumference and having full complements of original plates with columns lengthwise of said cylinders; rotative half-speed plate cylinders two-plates in circumference and having both original plates and duplicate plates with columns lengthwise of the plate cylinders; rotative impression cylinders cooperating with said plate cylinders respectively; a folder unit as described in operative relation to said plate-cylinders and associating devices and web-slitting devices between said plate-cylinders and said folder unit and a paster device contiguous to and cooperating with said folder unit and adapted to apply paste along the central margin between the pages of the sheet traveling on one of the main cutter cylinders.

28. In an apparatus for printing and folding papers, the combination of multiple sets of full-speed rotative plate cylinders two plates in circumference and having full complements of original plates with columns lengthwise of said plate cylinders; cooperating impression cylinders; a folder unit consisting of a folder cylinder and a pair of main cutter cylinders as described in operative relation to said plate cylinders; half speed rotative plate cylinders two plates in circumference and having both original plates and duplicate plates with columns lengthwise of said plate cylinders; means for leading a half web in a continuous straight run from the half-speed plate cylinders directly to the folder unit and delivering same directly onto the quarter of the folder cylinder adjacent to and approaching the main cutter cylinders; a slitter device and an associating device intermediate of said folder unit and said full speed plate cylinders and a paster device in operative relation to said folder unit and adapted to apply paste along the central margin between the pages of a sheet traveling on one of the main cutter cylinders.

29. In an apparatus for printing and folding papers the combination of rotative main cutter cylinders a cushion on one of said main cutter cylinders situated to underlie the margin between the pages of successive sheets traveling on said cutter cylinders; a stationary paste box with a roller turning in said paste box and a rotative wiper having a yielding surface contacting with said paste roller and with the cushion on the cutter cylinder once for each revolution of the cutter cylinder.

30. In an apparatus for printing and folding papers the combination of a pair of rotative main cutter cylinders cutting independently of the folder cylinder and adapted to cut off a sheet in length equal to the width of two plates plus margins for each revolution of the plate cylinders, a rotative folder cylinder receiving sheets cut by said main cutter cylinders and adapted to invariably produce two complete papers always in book form for each revolution of said folder cylinder; guide strips contiguous to one of said main cutter cylinders and the folder-cylinder; strippers contiguous to said folder cylinder and folder rollers cooperating with said folder cylinder.

31. In an apparatus for printing and folding papers the combination of cutter cylinders adapted to cut associated web members into sheets two pages in length, with a paster device adapted to apply paste along the margin between the pages of the outer sheet of the sheets associated on one of the cutter cylinders during the time that said sheets are upon said cutter cylinders.

32. An apparatus comprising full-speed printing units two plates in circumference and plural plates wide and equipped with full complements of exclusively original plates with columns lengthwise of the plate cylinders; an associating device associating in book form the entire product of said printing units, said associating device being so constructed and arranged that all the web members comprised in the printed product travel always in parallel and have a continuous straight run; and cooperating one-plate-wide rotary folder mechanism adapted to invariably fold in book form the entire product of said printing units, said folder mechanism being so situated relative to said printing units that the printed product has a continuous straight run through said folder mechanism and the final delivery of the product is invariably commensurate to the capacity of the full-speed printing couples and is always the same independently of the number of pages of the product and independently of the number of decks of printing units employed in its production.

33. An apparatus comprising full-speed printing units two plates in circumference and plural plates wide and equipped with full complements exclusively original plates with columns lengthwise of the plate cylinders; cooperating half-speed printing units two plates in circumference and equipped with both original plates and duplicate plates in pairs with columns lengthwise of the plate cylinders, each pair of plates upon a single supplement plate cylinder being different from every other pair of plates upon the same supplement plate cylinder; an associating device associating in



book form the entire product of said printing units, said associating device being so constructed and arranged that all web-members of the printed product travel always in parallel and have a continuous straight run; and cooperating rotary folder mechanism invariably one-plate wide and adapted to fold in book form the entire product of said printing couples, said folder mechanism being so situated relative to the printing units that the entire product of all of said printing units has a continuous straight run through said folder mechanism and the final delivery of the product is invariably commensurate to the capacity of the full-speed printing couples and is always the same independently of the number of pages of the product, independently of the number of decks of printing couples in use and independently of the production and insertion of a supplement sheet.

34. A folder unit and its gear comprising a revoluble folder cylinder, a cog wheel connected to and turning with said cylinder; revoluble main cutter cylinders; intermeshing cog wheels turning with said main cutter cylinders, one of said cog wheels meshing with and being driven by the cog wheel connected with the folder cylinder; revoluble supplement cutter cylinders; and intermeshing cog wheels turning with said supplement cutter cylinders and one of said cog wheels meshing with and being driven by an intermediate cog wheel meshing with a cog wheel connected with the folder cylinder; in combination with revoluble printing couples having plate cylinders two, plates in circumference and plural plates wide and equipped with original plates exclusively, having columns lengthwise of said plate cylinders; and means for revolving said folder cylinder in unison with said printing couples.

35. In an apparatus for printing and folding papers the combination of full-speed printing couples having plate cylinders two plates in circumference and plural plates wide and equipped with full complements of exclusively original plates; means for supplying web to said printing couples; means for dividing said web into members in width equal to the length of one page plus margins; an associating device associating in line all the members of said web; and so arranged that all of the web members carried thereon invariably travel in parallel; a main cutter device cutting said associated web members into main sheets in length equal to the width of two pages plus margins, one cut being made for each revolution of the printing couples; half speed printing couples printing on a half-speed web in width equal to the length of one page plus margins, matter in pages with columns transverse to said web; a supplement cutter device in line with the half-speed printing couples and between the

folder cylinder and the half-speed printing couples and adapted to cut said half speed web into insert sheets in length equal to, the width of one plate plus margins and situated to deliver the supplement sheets directly onto the quarter of the folder cylinder adjacent to and approaching the main cutter device; means for associating said insert sheet in line with and in time with said main sheets; and means for folding together invariably in book form said main sheets and insert sheet.

36. In an apparatus for printing and folding papers, the combination of revoluble printing couples two plates in circumference and plural plates wide and equipped with exclusively original plates with columns lengthwise of the plate cylinders, a revoluble folder cylinder in width equal to the length of one plate plus margins regardless of the width of the main printing couples and adapted to carry sheets in length equal to the width of two pages plus margins with columns lengthwise of the folder cylinder and provided with means for creasing and projecting said sheets twice during each revolution of the folder cylinder, main cutter devices operating independently of the folder cylinder to cut web-members into sheets in length equal to the width of two pages plus margins and adapted to carry upon and around one of said cutter devices all the associated sheets cut from a single web, and folder devices cooperating with the folder cylinder to fold together in book form all of the associated sheets carried on the cutter device and the folder cylinder.

37. An apparatus for printing and folding papers, comprising plural sets of full-speed plate cylinders and cooperating impression cylinders plural plates wide and invariably two plates in circumference, said plate cylinders being equipped with exclusively original plates with columns lengthwise of the plate cylinder; a cooperating folder cylinder in width equal to the length of one plate plus margins and adapted to carry two-page sheets with columns lengthwise of said folder cylinder and provided with means for creasing and projecting said sheets twice during each revolution of the folder cylinder; means for dividing webs into members in width equal to the length of one plate plus margins; means for associating all the members of a single web before cutting them into sheets during the continuous straight-run of all the members of the same web traveling always in unison; main cutter devices adapted to cut independently of the folder cylinder and adapted to carry all the pages cut from all the members of plural webs in book form upon and around one of said cutter devices; and folder rollers adapted to fold together in book form all of the associated and consolidated sheets carried on the main cutter device and the folder cylinder.



38. In an apparatus for printing and folding papers, the combination of a revoluble folder cylinder in width equal to the length of one plate plus margins under all conditions of operation and adapted to crease and project two two-page papers for each revolution of the folder cylinder, folder rollers cooperating with the folder cylinder, a multiple-deck printing mechanism comprising revoluble printing couples invariably two plates in circumference and plural plates wide and equipped with exclusively original plates with columns lengthwise of the plate cylinders; means for slitting all the webs into members in width equal to the length of one page plus margins; means for consolidating in a single continuously moving pile all of the web-members of all the webs from all the decks; and means for cutting the web-members into sheets in length equal to the width of two pages plus margins and delivering same in a continuous straight-run upon the folder cylinder.

39. In an apparatus for printing and folding papers, the combination of a revoluble folder cylinder in width equal to the length of one plate plus margins, under all conditions of operation and adapted to crease and project two two-page papers for each revolution of the folder cylinder; a multiple-deck printing mechanism comprising revoluble full-speed printing couples invariably two-plates in circumference and plural plates wide and equipped with exclusively original plates with columns lengthwise of the plate cylinders, and revoluble half-speed supplement printing couples equipped with original and duplicate plates in pairs with columns lengthwise of the plate cylinders, only one pair of a kind being on one plate cylinder; means for slitting all of the full-speed webs into members in width equal to the length of one page plus margins; means for associating all of the members of all of the full-speed webs in a single continuously moving pile; means for cutting the associated full-speed web-members into sheets in length equal to the width of two pages plus margins and delivering same upon the folder cylinder; means for cutting the supplement web into sheets in length equal to the width of one page plus margins and delivering said sheets upon the folder cylinder in time with the two-page-long sheets carried thereon; and a folder device cooperating with said folder cylinder to fold together the main sheets and the supplement sheet.

40. The combination of a revoluble folder cylinder adapted to carry, crease, and project main sheets in length equal to the width of two pages plus margins with columns lengthwise of the folder cylinder, a main cutter device comprising male and female cutter cylinders, adjacent to the folder cylinder and adapted to cut off main sheets in length equal

to the width of two pages plus margins, a supplement cutter device so situated relative to the folder cylinder and the main cutter device and so constructed and arranged that it will cut from a moving supplement web a supplement sheet each and every time that the leading edge of a supplement sheet reaches a position contiguous to the margin between the pages of the main sheet carried on the folder cylinder, means for supplying printed webs to the main cutter device and the supplement cutter device, and a folder device adapted to fold together the main sheets and the supplement sheet.

41. The combination of a revoluble folder cylinder in width equal to the length of one plate plus margins and adapted to carry, crease, and project, sheets in length equal to the width of two pages plus margins, with columns lengthwise of the folder cylinder, a main cutter device adjacent to the folder cylinder and adapted to cut off sheets in length equal to the width of two pages plus margins, a supplement cutter device in such relation to the folder cylinder and the main cutter device and so constructed and arranged that it will cut from a moving web a supplement sheet in length equal to the width of one page plus margins, every time that the leading edge of a supplement sheet reaches a position contiguous to the margin between the pages of the main sheets carried on the folder cylinder, means for supplying to the main cutter device associated web-members with printed matter in signatures in length equal to the width of two pages plus margins, with columns transverse to the web-members, means for supplying to the supplement cutter device one-page-wide web with printed matter in successive single pages with columns transverse to the web, and means for folding together the associated main sheets and the supplement sheet.

42. The combination of revoluble main printing couples invariably two plates in circumference and equipped with exclusively original plates with columns lengthwise of the plate cylinders, revoluble supplement printing couples invariably two plates in circumference and equipped with plates in pairs with columns lengthwise of the plate cylinders, each pair of plates upon a single supplement plate cylinder being different from every other pair of plates upon the same supplement plate cylinder, a main cutter device comprising cooperating male and female cutter cylinders adapted to cut off a main sheet in length equal to the width of two pages plus margins for each revolution of the main printing couples, a revoluble folder cylinder adjacent to the main cutter device, a supplement cutter device in such relation to the main cutter device and so constructed and arranged that it will cut from a moving supplement web a sheet in



length equal to the width of one page plus margins each and every time that the leading edge of a supplement sheet reaches a position contiguous to the margin between the pages of the main sheets carried on the folder cylinder, means for leading web from the supplement printing couples to the supplement cutter device and means for folding together in book form the main sheets and the one-page supplement sheet.

43. The combination of revoluble main printing couples, plural plates wide, invariably two plates in circumference and equipped with exclusively original plates with columns lengthwise of the plate cylinders, means for dividing plural-plate-wide webs running upon the printing couples, into web-members in width equal to the length of one page plus margins, means for associating in a continuously moving pile all the members of a single web, a main cutter device comprising cooperating male and female cutter cylinders adapted to cut the associated web-members into sheets in length equal to the width of two pages plus margins for each and every revolution of the printing couples, a folder cylinder adjacent to the main cutter device and adapted to carry, crease, and project the associated sheets once for each and every revolution of the printing couples, and a folder device adapted to fold together all of the associated sheets carried on the folder cylinder.

44. The combination of revoluble main printing couples plural plates wide, invariably two plates in circumference and equipped with exclusively original plates with columns lengthwise of the plate cylinders, half-speed printing couples invariably two plates in circumference and equipped with plates in pairs with columns lengthwise of the plate cylinders, each pair of plates upon a single supplement cylinder being different from every other pair of plates upon the same supplement plate cylinder; means for dividing plural-page-wide webs running upon the printing couples into web-members in width equal to the length of one page plus margins, means for associating in a single continuously moving pile, all of the members of all of the webs from the main printing couples, a main cutter device comprising male and female cutter cylinders adapted to cut the associated web-members into sheets in length equal to the width of two pages plus margins once for each and every revolution of the main printing couples, a folder cylinder adjacent to the main cutter device and adapted to carry, crease, and project the associated sheets once for each and every revolution of the main printing couples, a supplement cutter device in such relation to the main cutter device and so constructed and arranged that it will cut from the moving supplement web running on supplement printing couples, a sheet in

length equal to the width of one page plus margins, each and every time that the leading edge of a supplement sheet reaches a position contiguous to the margin between the pages of the main sheets carried on the folder cylinder, and means for folding together the main sheets and the one-page supplement sheet for each and every revolution of the main printing couples.

45. The combination of revoluble main printing couples plural plates wide, invariably two plates in circumference and equipped with exclusively original plates with columns lengthwise of the plate cylinders, half-speed printing couples invariably two plates in circumference and equipped with plates in pairs with columns lengthwise of the plate cylinders, each pair of plates upon a single supplement cylinder being different from every other pair of plates upon the same supplement plate cylinder; means for dividing plural-plate-wide webs running upon the printing couples into web members in width equal to the length of one page plus margins, means for associating in a single continuously moving pile, all of the members of all of the webs from the main printing couples, a main cutter device comprising cooperating male and female cutter cylinders adapted to cut the associated web-members into sheets in length equal to the width of two pages plus margins, once for each and every revolution of the main printing couples, a folder cylinder adjacent to the main cutter device and adapted to carry, crease, and project the associated sheets once for each and every revolution of the main printing couples, a supplement cutter device in such relation to the main cutter device and so constructed and arranged that it will cut from the moving supplement web running on the supplement printing couples, a sheet in length equal to the width of one page plus margins each and every time that the leading edge of a supplement sheet reaches a position contiguous to the margin between the pages of the two-page sheets carried on the folder cylinder, a paster device adapted to apply paste along the margin between the pages of the main sheet running next to the folder cylinder, and means for folding together the main sheets and the supplement sheet, to produce a paper in book form with a pasted supplement sheet between the inside pages of the paper for each and every revolution of the main printing couples.

46. The combination of a rotative one-plate-wide folder cylinder, rotative main printing couples plural plates wide, two plates in circumference and equipped with exclusively original plates with columns lengthwise of the plate cylinders, supplement printing couples two plates in circumference and equipped with plates in pairs with columns lengthwise of the plate cylinders



ders, each pair of plates upon a single supplement cylinder being different from every other pair of plates upon the same supplement plate cylinder; a main cutter device 5 adjacent to the folder cylinder and adapted to cut sheets in length equal to the width of two pages plus margins once for each revolution of the main printing couples, means for associating and leading in a continuous 10 straight-run to the main cutter device, all of the members of plural webs running on the main printing couples, a supplement cutter device adjacent to the main folder cylinder and the main cutter device and adapted to 15 cut the supplement web during its continuous straight-run into supplement sheets in line with the sheets cut by the main cutter device, a supplement sheet in length equal to the width of one page plus margins being 20 cut off each and every time that the leading edge of the supplement sheet reaches a position contiguous to the margin between the main sheets carried on the folder cylinder, and a folder device operating upon all of the 25 sheets associated and having a continuous straight-run on the folder cylinder to fold together the main sheets and the supplement sheet and produce by means of exclusively original plates on the main plate cylinders, a 30 paper in book form with supplement for each and every revolution of the main printing couples.

47. The combination of a rotative one-plate-wide folder cylinder, rotative main 35 printing couples plural plates wide, two plates in circumference and equipped with exclusively original plates with columns lengthwise of the plate cylinders, a main cutter device adjacent to the folder cylinder and 40 adapted to cut main sheets in length equal to the width of two pages plus margins once for each revolution of the main printing couples, means for associating and leading in a continuous straight-run to the main cutter device all the one-page-wide members of plural 45 webs running on the main printing couples, and a folder device operating upon all of the associated sheets cut by the main cutter device and having a continuous straight-run 50 upon the folder cylinder to fold in book form all of the associated main sheets along the margin between the pages thereof and produce a page-for-plate paper in book form for each revolution of the printing couples, regardless of the number of decks in use and 55 regardless of the width of the webs operated upon.

48. In an apparatus for printing and folding 60 papers, the combination of main printing couples plural plates wide, plural plates in circumference, equipped with exclusively original plates with columns lengthwise of the plate cylinder and arranged to print a page-for-plate product, a one-plate-wide 65 folder device cooperating with the printing

couples during the continuous straight run always in parallel of all of the members of all of the webs printed on the main printing couples, and a one-plate-wide cutter device 70 having a male and female cutter cylinder adapted to cut off a complete paper in book form for every revolution of the male and female cutter cylinders and main printing couples.

49. In an apparatus for printing and folding 75 ing papers, the combination of printing couples equipped with plates arranged to print upon continuously moving plural-plate-wide main webs, the matter of invariably different pages with columns crosswise 80 of said webs, and arranged in the form of successive signatures in length equal to the width of two pages plus margins and in width equal to the length of one page plus margins; 85 slitter devices adapted to slit said webs into web-members each in width equal to the length of one page plus margins; turners adapted to turn alike all the members of a single web and likewise adapted to turn alike all the members of plural webs, to superpose 90 said web-members one upon the other and associate all the members of a single main web and likewise adapted to associate all the members of plural main-webs, into a single series of continuously moving web-members, 95 in width equal to the length of one page plus margins; means adapted to lead all of said web-members, invariably in parallel, to arrive at a one-plate-wide folder device in line with a half-speed supplement web, irrespective of the width of the main webs, the number of webs in use and the position of said one-plate-wide folder device relative to 100 the printing mechanism; printing couples equipped with plates arranged to print on a single continuously moving half-speed supplement web in width equal to the length of one page plus margins, plural pages of matter with columns crosswise to said half-speed 105 web, half of said matter being invariably produced by original plates and half thereof being invariably produced by duplicate plates; cutter devices adapted to cut the main webs into main sheets in length equal to the width of two pages plus margins, one cut being 110 made and a complete paper in book form exclusive of supplement, being cut off for each and every cycle of the main printing couples; cutter devices adapted to cut said half-speed web into sheets in length equal to the width 115 of one page plus margins and in width equal to the length of one page plus margins; and a folder device adapted to fold the main sheets along the margins between the pages thereof, with the supplement sheets between the inside 120 pages of the main sheets.

50. An apparatus for printing and folding 125 papers, comprising full-speed plate cylinders plural-plates-wide and two plates in circumference and equipped with all original plates 130



with columns lengthwise of the plate cylinders; half-speed plate cylinders one-plate-wide and two plates in circumference and equipped with duplicate sets of plates with  
 5 columns lengthwise of the plate cylinders, a folder cylinder one plate wide and four plates in circumference, means for associating in book form all the members of a single main web before being acted upon by the folder  
 10 cylinder, means for cutting the associated web-members into sheets two pages in length before being acted upon by the folder cylinder, one cut being made for each and every revolution of the full-speed plate cylinders;  
 15 means for cutting the half-speed web into sheets one-page in length, two cuts being made for each and every revolution of the half-speed plate cylinders; means for associating said one-page sheet with the two-page  
 20 sheets on the folder cylinder; and folder rollers co-acting with said folder cylinder to fold together said two-page sheets and one-page sheet; the run of all of the webs and of all of the sheets cut therefrom being a continuous  
 25 straight run, in contra-distinction to the run of a web-member back upon itself, also in contra-distinction to the run of one member of a web crosswise to the other member of the same web.

30 51. In an apparatus for printing and folding papers, the combination of full-speed plate cylinders plural plates wide and two plates in circumference and equipped with all original plates with columns lengthwise of  
 35 the plate cylinders and operating upon plural-plate-wide web; half-speed plate cylinders two plates in circumference and one plate wide and equipped with original plates and duplicate plates and operating on one-plate-  
 40 wide supplement; a former in operative relation to said full-speed plate cylinders and having its nose in line with one edge of the supplement web printed on the half-speed plate cylinders; and main cutter devices,  
 45 supplement-cutter-devices, a folder cylinder and folder rollers coöperating with said former.

50 52. An apparatus for printing and folding papers, comprising main printing couples plural plates wide and two plates in circumference and equipped with exclusively original plates, supplement printing couples two plates in circumference and equipped with plates in pairs, one plate cylinder of the supplement couple having invariably two plates  
 55 of a kind and the complemental supplement plate cylinder of the same couple having two plates of a kind, differing from the plates on

the first named supplement cylinder, a folder cylinder in width equal to the length of one  
 60 plate plus margins, means for cutting the main webs into sheets in length equal to the width of two pages plus margins, means for cutting the supplement web into sheets in  
 65 length equal to the width of one page plus margins, means for associating the members of the main web and the supplement web on the folder cylinder invariably in book form, and means for folding together the main  
 70 sheets and the supplement sheet carried on the folder cylinder, the run of the main webs and the sheets cut therefrom and the run of the supplement web and the sheets cut therefrom being invariably a continuous straight-  
 75 run from start to finish.

53. In an apparatus for printing and folding papers, the combination of full-speed main printing couples equipped with a full complement of exclusively original plates  
 80 and adapted to perfect a plurality of continuously moving main webs, means for associating said main webs before slitting, means for slitting said associated main webs to divide them into longitudinal web-members, means for effecting a quarter turn of  
 85 said web-members and causing them to run laterally relative to the initial line of travel of the main webs from which said web-members are derived, half-speed printing couples adapted to perfect a supplement web in width  
 90 equal to the length of one plate plus margins, means for propelling said supplement web parallel to said main webs, means for turning said supplement web and causing it to travel laterally relative to its initial line of travel  
 95 and in line with the associated web-members of said main webs, means for cutting the associated main web members into two-leaf main sheets in length equal to the width of two pages plus margins, means for cutting  
 100 said supplement web into one-leaf supplement sheets in length equal to the width of one plate plus margins, means for inserting said one-leaf supplement sheets with said two-leaf main sheets, and folder mechanism  
 105 in width equal to the length of one plate plus margins and adapted to fold together said main sheets and said supplement sheets.

In witness whereof I have hereunto subscribed my name at Springfield Illinois, this  
 110 5th day of May 1904.

JOHN A. BOYCE.

Witnesses:

MARGARET McDONALD,  
 ROBERT H. DOOLING.