

No. 628,176.

Patented July 4, 1899.

D. E. FELT.  
TABULATING MACHINE.

(Application filed May 31, 1898.)

(No Model.)

6 Sheets—Sheet 1.

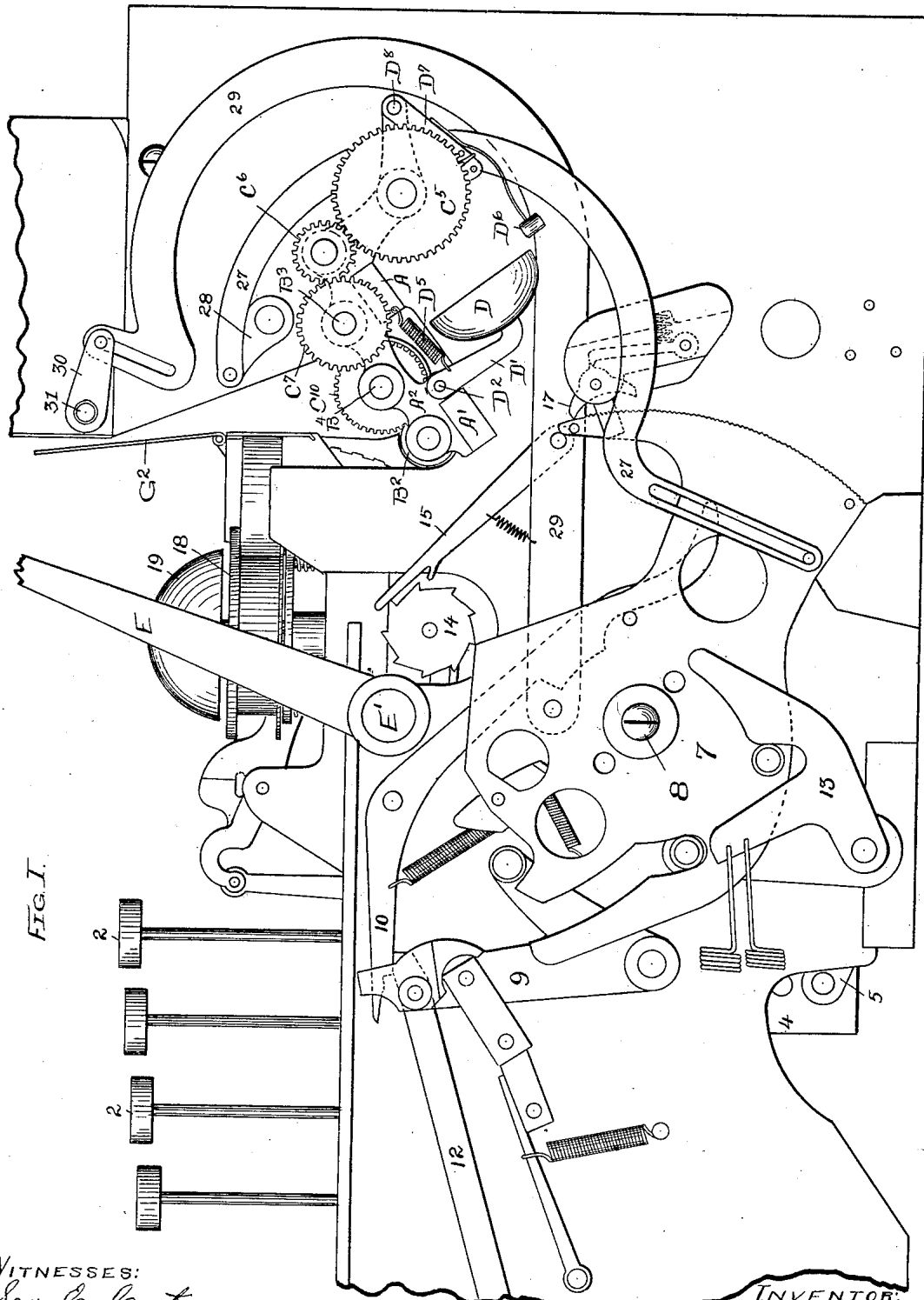


FIG. 1.

WITNESSES:  
*Geo. E. Curtis*  
*W. H. Munday*

INVENTOR:  
DORR E. FELT  
BY *Monday, Swartz & Adams*  
HIS ATTORNEYS.

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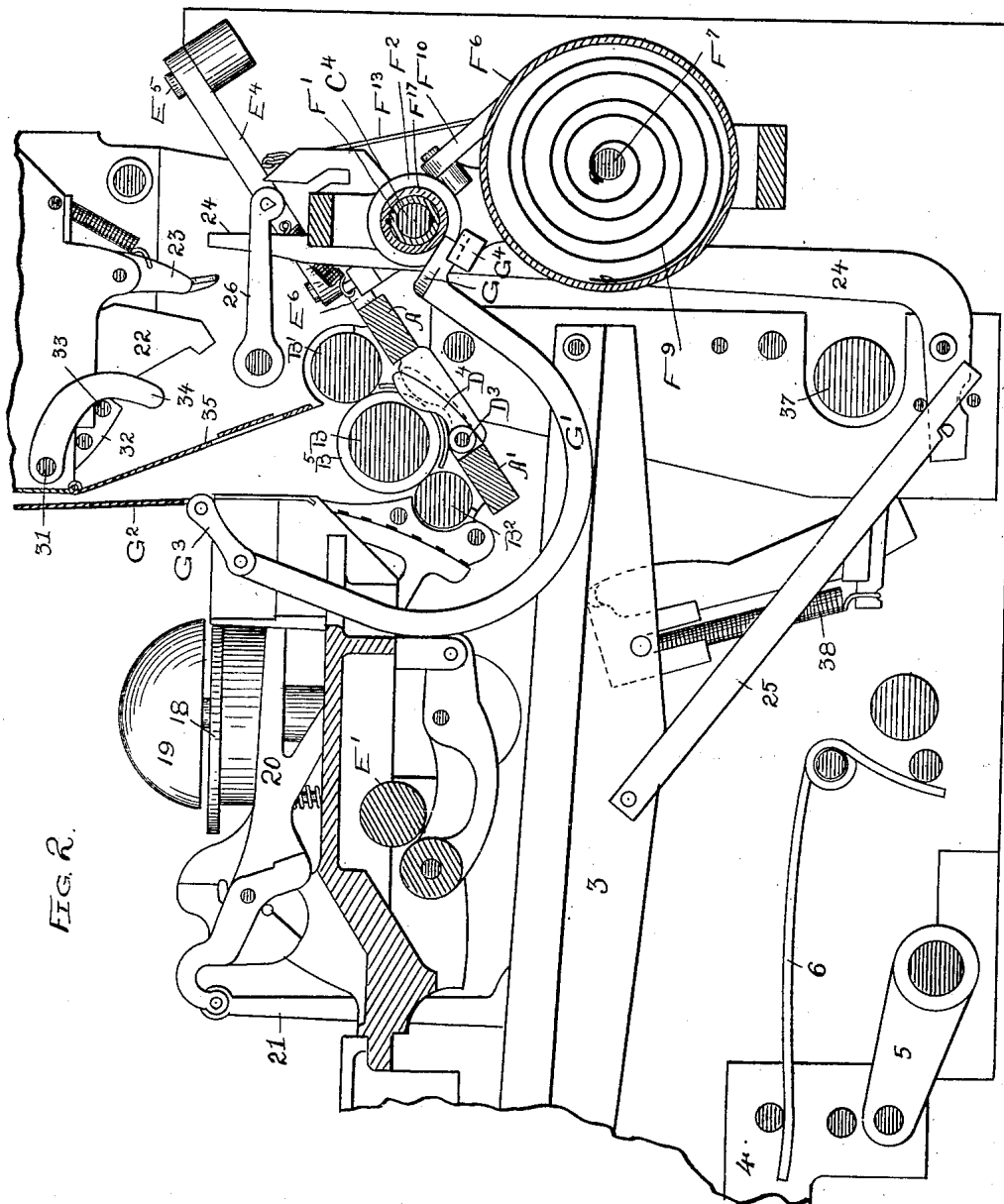


FIG. 2.

WITNESSES:

*Sam. C. Curtis*  
*H. M. Munday*

INVENTOR:  
DORR E. FELT

BY *Munday, Evans & Adcock.*  
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**No. 628,176.**

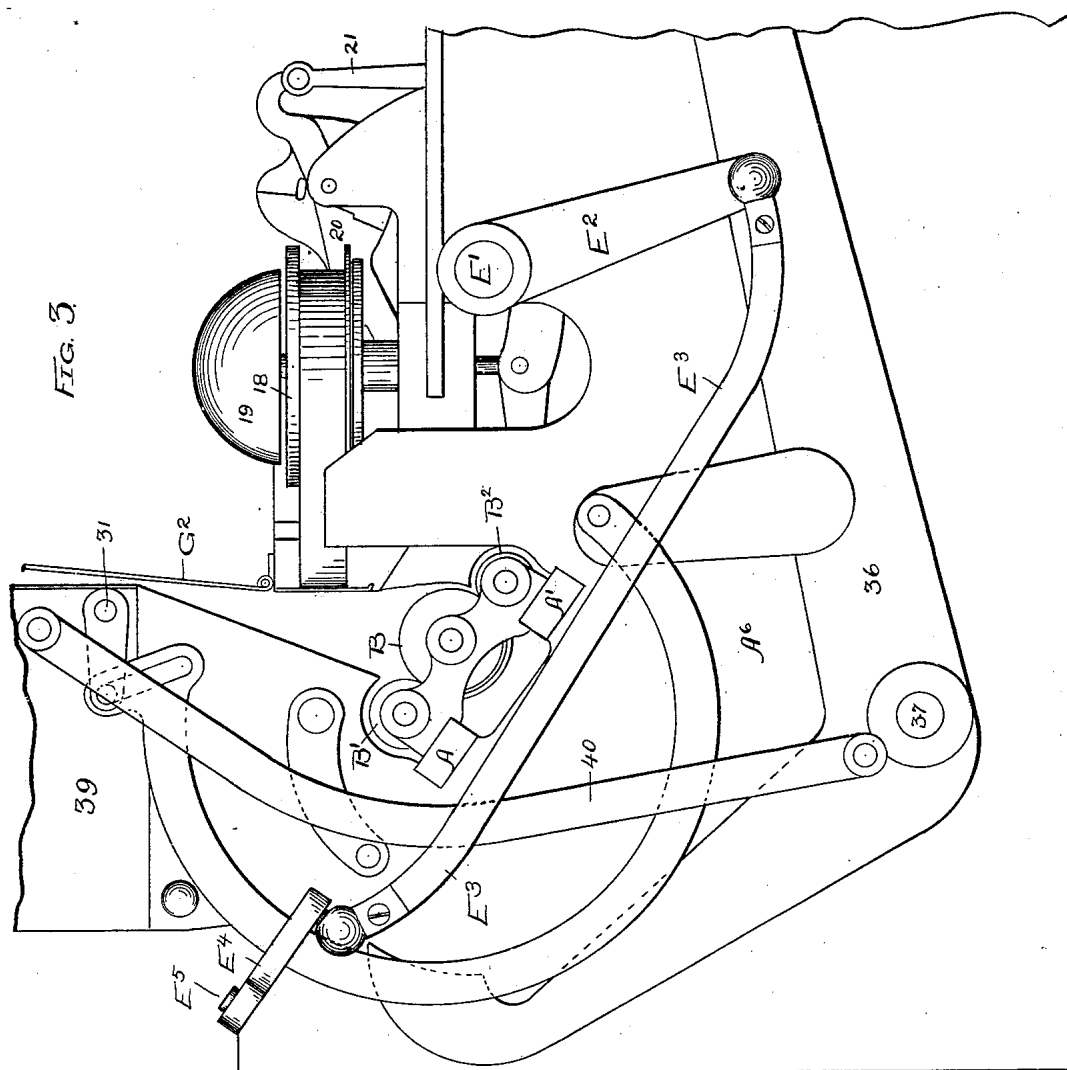
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(No Model.)

**6 Sheets—Sheet 3.**



WITNESSES:

Sew. E. Curtis  
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INVENTOR:

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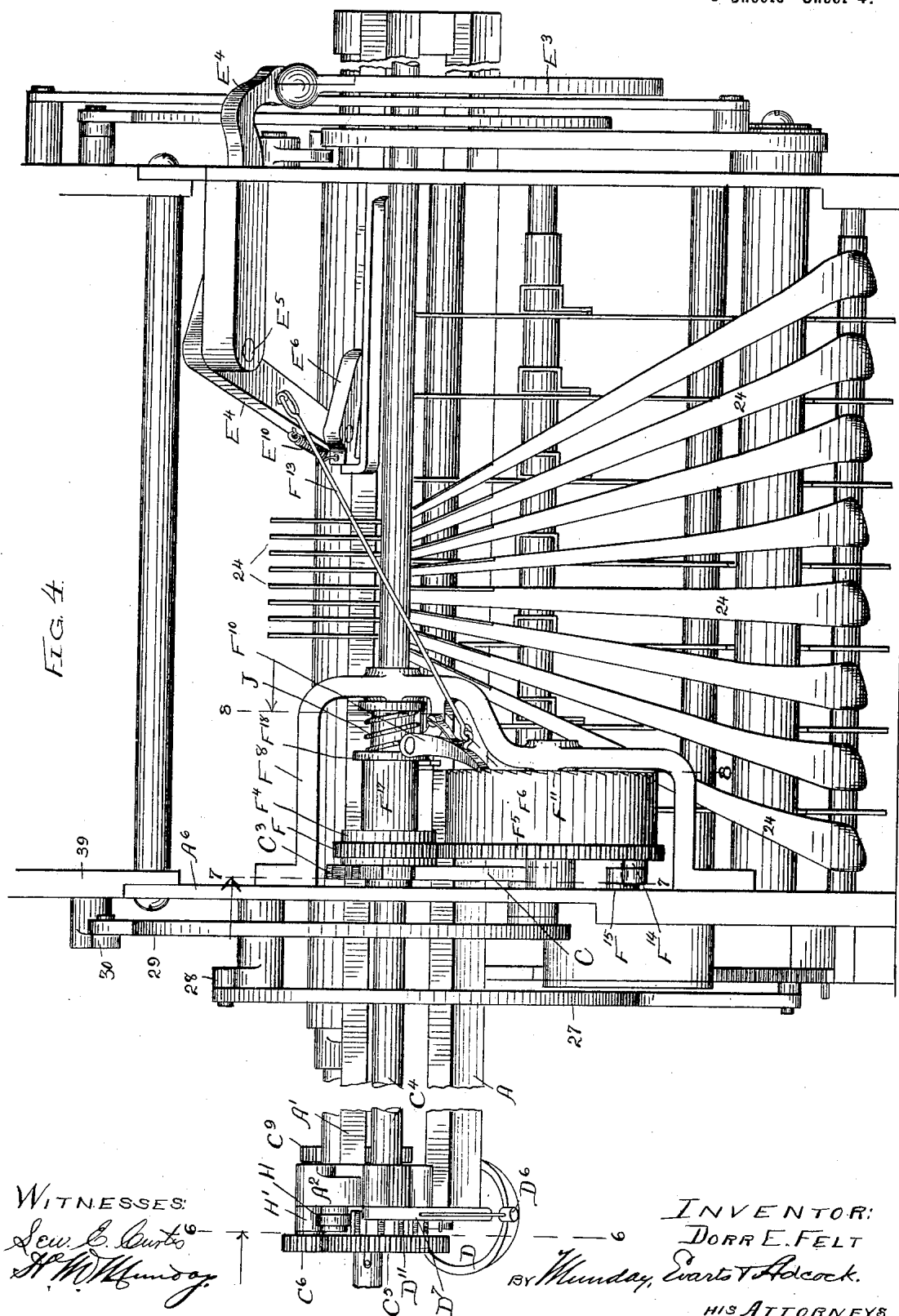
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6 Sheets—Sheet 4.



D. E. FELT.  
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6 Sheets—Sheet 5.

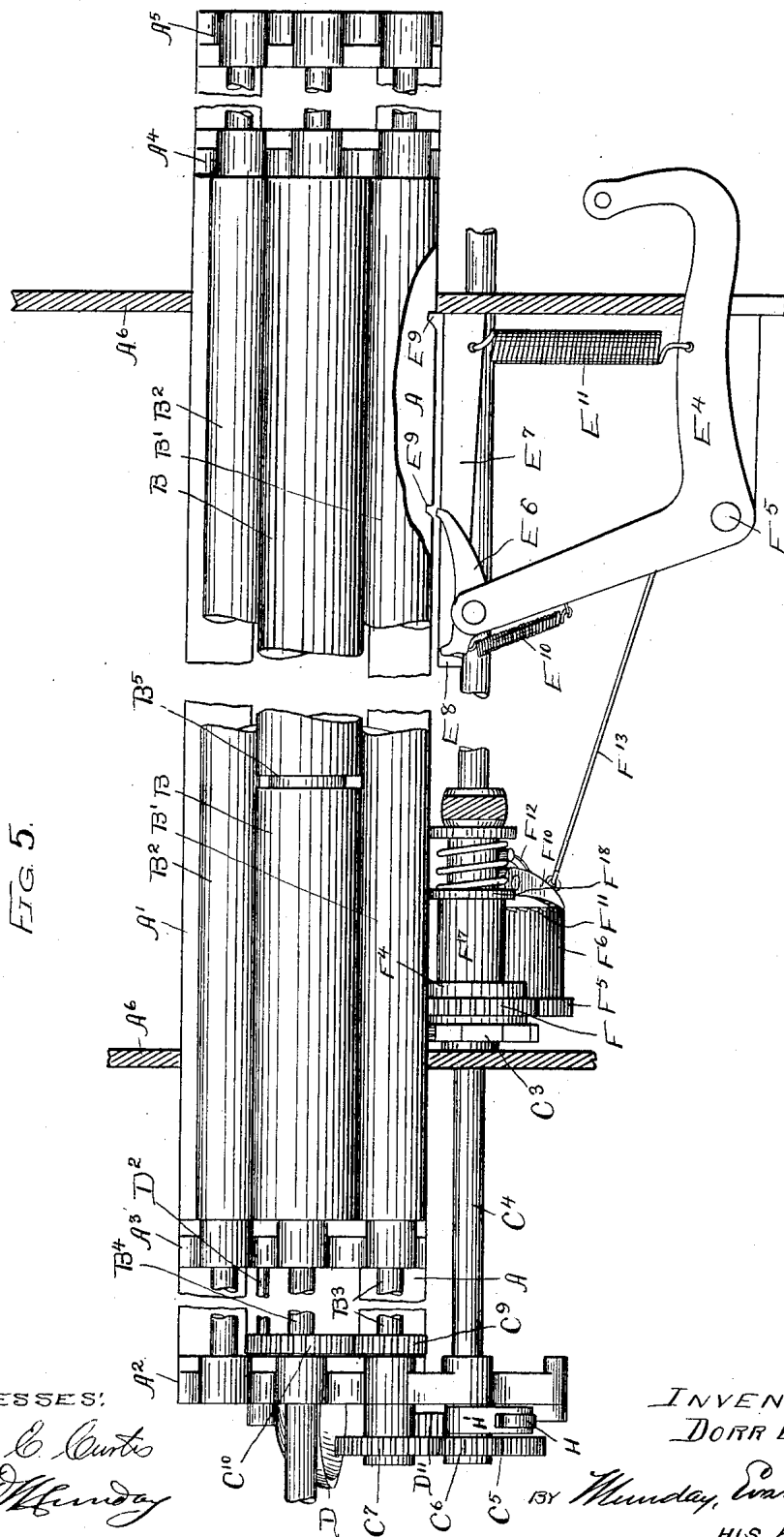


FIG. 5.

WITNESSES:

*Levi C. Curtis*  
*H. M. Munday*

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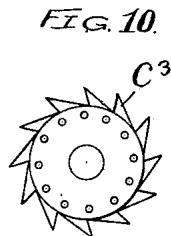
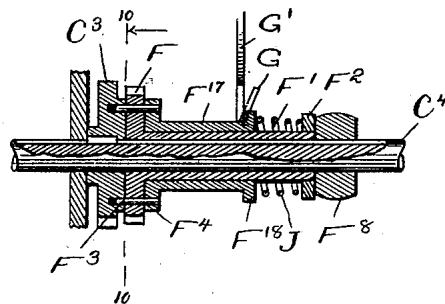
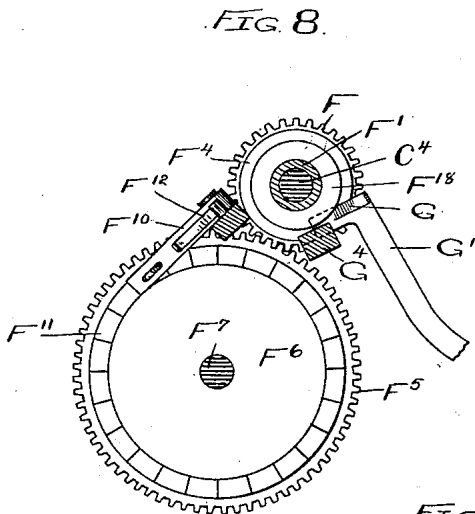
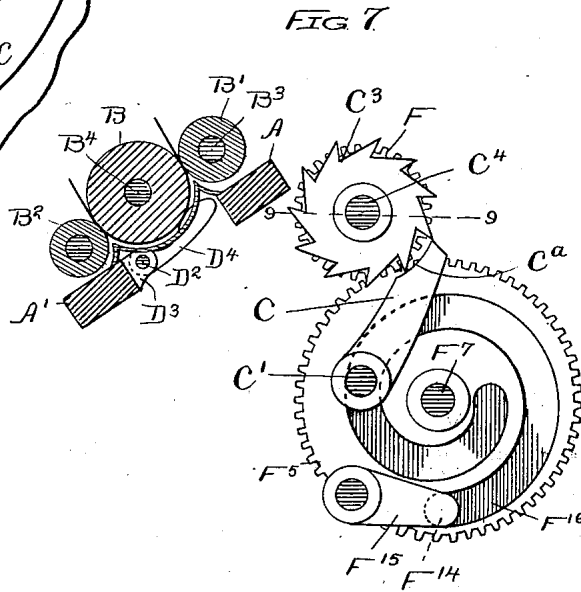
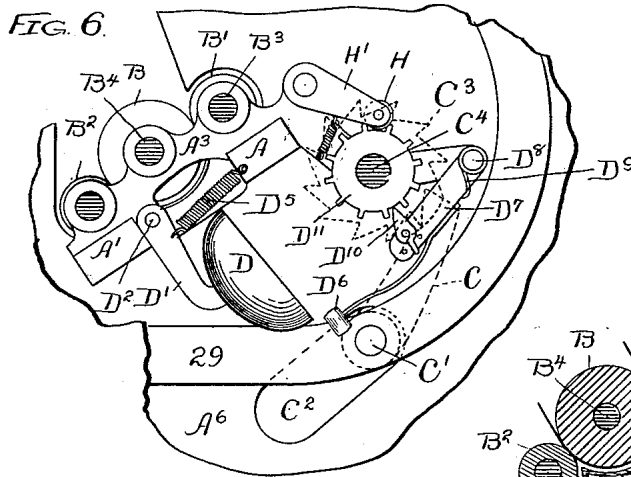
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(Application filed May 31, 1898.)

(No Model.)

**6 Sheets—Sheet 6.**



WITNESSES:  
Sew. C. Curtis  
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INVENTOR:  
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HIS ATTORNEYS.

# UNITED STATES PATENT OFFICE.

DORR E. FELT, OF CHICAGO, ILLINOIS.

## TABULATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 628,176, dated July 4, 1899.

Application filed May 31, 1898. Serial No. 682,119. (No model.)

*To all whom it may concern:*

Be it known that I, DORR E. FELT, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Tabulating-Machines, of which the following is a specification.

This invention relates to the construction of calculating-machines adapted to both add numbers and to print or tabulate the numbers as they are added, together with the sums of the numbers. My endeavor therein has been to adapt such machines to use with paper in sheet or short-length form as distinguished from roll or continuous-length paper; also, to permit the printing upon the paper of a plurality of columns or vertical rows of numbers by providing it with a laterally-shifting paper-carriage and with mechanism adapted also to feed the paper vertically at each printing operation; also, to provide the machine with means whereby the operator may be warned when the bottom of the sheet has been reached, to the end that he may either put in a fresh sheet or shift the one already in, so as to start a fresh column of numbers thereon; also, to provide means which when the operator shifts the paper will also roll the paper back, so as to present the top of the sheet at the printing-center, and thus enable the making of each new column of numbers of the full length permitted by the sheet. These and other features of the invention will be fully understood from the detailed description given below when considered in connection with the accompanying drawings, forming a part thereof, in which—

Figure 1 is a partial side elevation of a calculating-machine embodying my invention and showing the part thereof to which the invention more especially relates. Fig. 2 is a longitudinal vertical section of the parts shown in Fig. 1. Fig. 3 is a partial elevation of the machine, showing the side opposite to that given in Fig. 1. Fig. 4 is a rear elevation. Fig. 5 is a detail vertical cross-section showing the paper carriage and rolls. Figs. 6, 7, and 8 are sections on the lines 6 6, 7 7, and 8 8, respectively, of Fig. 4. Fig. 9 is a section on the line 9 9 of Fig. 7; and Fig. 10 is a side elevation of the ratchet-wheel shown

in section in Fig. 9, looking in the direction of the arrow at line 10 10 of Fig. 9.

The machine embodies the usual numeral-wheels and their operating devices—such, for instance, as those shown in Patent No. 568,021, granted to me September 22, 1896. The wheels are not shown in the drawings; but the setting-keys are indicated at 2 2, the segment-levers for rotating the wheels at 3, the vibrating frame whereby the keys are attached to and enabled to regulate the operation of said levers at 4, the crank supporting said frame at 5, the spring for lifting the vibrating frame at 6, the main cam at 7, wherefrom most of the operating parts of the machine derive power, and the pivot upon which such cam oscillates at 8. I have also shown at 9 an elbow-lever, at 10 a catch-lever, and at 12 a connecting-rod, forming part of mechanism for interlocking the total-printing mechanism and the main cam, so that neither can operate pending an operation by the other; also, at 13 a spring-lever for returning the cam to its normal position, at 14 and 15 the ink-ribbon-feeding ratchet and pawl, at 17 the double-acting pawl for preventing partial strokes by the main cam, at 18 the ink-ribbon spools, at 19 the alarm for notifying the operator that the ribbon should be reversed, at 20 the type-segments joined to the segment-levers by connecting-rods 21, at 22 the hammers for causing the impressions, at 23 the pawls for controlling the hammers, at 24 the levers for releasing said pawls 23, at 25 the levers connecting said levers 24 with the segment-levers, at 26 the swinging frame corresponding to frame H<sup>9</sup> of my said patent, at 27 and 28 the slotted lever and crank for operating said frame 26, and at 29 and 30 the slotted levers and cranks for operating the shafts 31, carrying the arms 32, connected by a cross-bar 33, serving to lift the hammers after each operation, said shaft 31 also carrying an arm 34 for depressing the shield 35, whereby the paper is moved close to the type preparatory to printing. The totalizing-lever is shown at 36, its shaft at 37, and retracting-spring at 38, and the lever for lifting the housing 39 appears at 40.

All the parts above enumerated are either in my patent or in my pending application,

Serial No. 679,461, filed May 2, 1898, and, as will be understood from the patent, they are adapted to enable the operator to preliminarily set the type side by side necessary to  
 5 print any amount coming within the capacity of the machine, whether it embraces one figure or several figures; also, to print from all the figures which are set simultaneously and at one operation; also, to enable the print-  
 10 ing of the total of the amounts or sums added and listed at any time.

The machine is provided with a paper-carriage adapted to be moved laterally whenever it is desired to start the printing of a  
 15 fresh vertical column or row of numbers. This carriage may be made much like the paper-carriage of type-writers; but in the construction preferred by me it consists of two longitudinal bars A A', connected at their ends by  
 20 heads A<sup>2</sup>, A<sup>3</sup>, A<sup>4</sup>, and A<sup>5</sup>, and movably supported in stationary uprights A<sup>6</sup>. In this carriage are three rolls B, B', and B<sup>2</sup> for operating the paper, two of which are driven and the other moves by friction. The paper is  
 25 entered between the rolls B and B', and is carried around the center roll B and thence up between rolls B and B<sup>2</sup> to the point of delivery.

The rolls B and B' are actuated in the line-spacing operations as follows: Attached to the  
 30 lever 29 is a pawl C, the pivot C' uniting which to the lever passes through the slot C<sup>2</sup> in the adjacent upright A<sup>6</sup>. When lever 29 is actuated by the main cam, this pawl carries the ratchet-wheel C<sup>3</sup> through one tooth-  
 35 space, and thereby gives motion to its carrying-shaft C<sup>4</sup>, which extends from end to end of the paper-carriage and may be supported in the heads thereof. The ratchet-wheel is  
 40 stationary as to location and has a spline engagement with the shaft, so that it operates the latter in whatever position it may be, as will be understood from Fig. 9. The shaft  
 45 also carries a gear C<sup>5</sup>, which meshes with an idler C<sup>6</sup>, and this idler actuates a gear C<sup>7</sup> upon the end of the shaft B<sup>3</sup> of paper-roll B'. Shaft B<sup>3</sup> carries also a second gear C<sup>9</sup>, which meshes with a gear C<sup>10</sup> upon the shaft B<sup>4</sup> of paper-  
 50 roll B. This construction automatically imparts at each actuation of the main cam such an amount of rotation to the paper-rolls B and B' as is necessary to move the paper vertically the extent of one line-space; but it  
 55 does not interfere with the operation of the paper-rolls at will in either direction desired, inasmuch as the pawl C is self-releasing, its under surface C<sup>8</sup> being adapted to cooperate with the following tooth of the ratchet in effecting such release at the end of each actua-  
 60 tion of the wheel. The carriage may be made of any width desired, and no change in any of the parts above described will then be needed beyond the mere lengthening of the paper-rolls and the ratchet-wheel shaft C<sup>4</sup>.

65 The alarm or bell, which indicates that the bottom of the sheet has been reached, is shown at D in Figs. 1, 4, 5, and 6 and is sup-

ported by means of an arm D', projecting from a rock-shaft D<sup>2</sup>, passing through the heads at one end of the paper-carriage and supported at its inner end in a bracket D<sup>3</sup>.  
 70 At the inner end the shaft D<sup>2</sup> carries another arm D<sup>4</sup>, which is placed opposite and adapted to enter a groove B<sup>3</sup> in the center paper-roll B. The paper upon which the tabulating is  
 75 being done is adapted to keep the arm D<sup>4</sup> out of the groove so long as it covers the groove; but when the bottom of the sheet is reached, so that the groove is uncovered, the arm is impelled to enter the same by the spring D<sup>5</sup>,  
 80 attached to arm D'. (Seen at Fig. 6.) This rocks the shaft D<sup>2</sup> slightly and moves the bell from the position given at Fig. 6 into the field of action of the hammer D<sup>6</sup>, which is attached to a vibrating arm D<sup>7</sup>, pivoted at D<sup>8</sup>,  
 85 pressed upon by the spring D<sup>9</sup>, and lifted at each actuation of the ratchet-wheel shaft by the pivoted dog D<sup>10</sup>, actuated by the toothed wheel D<sup>11</sup> upon said shaft. The bell is thus  
 90 normally out of reach of the hammer, so that although the latter is moved at each paper-feeding operation the bell does not get within its reach until the lower edge of the paper uncovers the groove in the paper-roll.

For shifting the paper-carriage laterally after  
 95 the completion of a column in order to bring a fresh portion of the paper in front of the printing-center and in readiness for the printing of another column I employ the following devices: A hand-lever E, (shown at  
 100 Fig. 1,) mounted upon one end of the rock-shaft E', is actuated by moving it over toward the keys in said figure. At its other end said shaft carries the crank or arm E<sup>2</sup>, which is connected by a rod E<sup>3</sup> to an elbow-lever  
 105 E<sup>4</sup>, stationarily pivoted at E<sup>5</sup> and carrying a pawl E<sup>6</sup>. A stationary bracket E<sup>7</sup>, projecting from one of the uprights A<sup>6</sup>, is provided with a stop E<sup>8</sup>, against which the pawl is pressed when the parts are in their normal  
 110 position, as in Fig. 5, and this stop acts to keep the farther end of the pawl from entering the notches E<sup>9</sup>, of which a series are cut in one edge of one of the longitudinal members of the paper-carriage frame. The spring  
 115 E<sup>10</sup> tends to force the pawl into the notches and will carry it into one of them as soon as the lever E is actuated, because such actuation results in moving the pawl away from  
 120 stop E<sup>8</sup>. When this engagement takes place, the lever E<sup>4</sup> will carry the paper-carriage to the right and until the upright to which bracket E<sup>7</sup> is attached is reached by the pawl and acts as a stop to further movement. The  
 125 operator now releases the hand-lever, and the retracting-spring E<sup>11</sup> will return the carriage-actuating parts by which the shifting has been accomplished to their starting positions. (Shown at Figs. 1, 3, and 5.) In the intervals  
 130 between these shifting operations the carriage may be moved freely in either lateral direction by hand, as the pawl E<sup>6</sup> is normally out of engagement. At the same time the paper-carriage is thus shifted the paper



is also moved back, so as to bring its top to the printing-center, and this operation is rendered wholly automatic by the employment of means such as the following: Loosely mounted upon the shaft C<sup>4</sup> and adjacent to the ratchet-wheel C<sup>3</sup> is a gear F, having its hub elongated at one side, as at F', such hub carrying a removable collar F<sup>2</sup> at its farther end. The gear F is compelled to rotate with the ratchet-wheel by means of the pins F<sup>3</sup>, secured in the disk F<sup>4</sup> and extending through the gear and into the side face of the ratchet-wheel, the ratchet being recessed to receive such pins, as will be understood from Figs. 9 and 10. Gear F meshes with the gear F<sup>5</sup>, carrying a barrel F<sup>6</sup> and supported upon a short stationary shaft F<sup>7</sup>, one end of which may be given a bearing in the upright A<sup>6</sup> and the other end be supported in the bracket F<sup>8</sup>, attached at its ends to the upright. Within said barrel is a spring F<sup>9</sup>, which is wound up by the rotation of gear F<sup>5</sup>, and the power thus stored is preserved by the pawl F<sup>10</sup> engaging the ratchet-teeth F<sup>11</sup> on the edge of the barrel, such pawl having a spring F<sup>12</sup> for keeping it in engagement. The pawl F<sup>10</sup> is connected by a rod F<sup>13</sup> with lever E<sup>4</sup>, and when said lever is operated the pawl is withdrawn from the barrel, as will be understood from Figs. 4 and 8. This leaves the spring F<sup>9</sup> free to operate the drum and through the gears F and F<sup>5</sup> to rotate shaft C<sup>4</sup>, and thus to actuate the paper-rolls in a direction the reverse of their feeding movements. This operation should be sufficient to carry the paper to its starting position—that is to say, with its top at the printing-center. The extent of the rotation thus received from the spring may be limited in any suitable way—as, for instance, by means of the stop F<sup>14</sup>, supported upon the hinged arm F<sup>15</sup>, and the spiral groove F<sup>16</sup> in the side face of gear F<sup>5</sup>, into which said stop is entered.

To avoid the winding up of the barrel-spring when operating the paper-rolls by hand, which is a necessary operation when starting the paper into the bite of the rolls, and also to avoid all necessity for releasing the pawl F<sup>10</sup> when it is desired to turn the rolls backward, as is frequently necessary, and also to avoid all danger of the spring F<sup>9</sup> operating when putting in or taking out the paper, I make the disk F<sup>4</sup> movable away from the ratchet-wheel, so as to break the engagement between the ratchet and gear F, and for this purpose said disk is mounted upon a sleeve F<sup>17</sup>, surrounding the hub F' and movable along the same and provided with a projecting rim F<sup>18</sup>. The movement just mentioned of the sleeve is caused by the engagement with rim F<sup>18</sup> of the cam end G of lever G', connected to the hinged paper-guide G<sup>2</sup> by the crank G<sup>3</sup>. (See Figs. 2 and 9.) The guide G<sup>2</sup> is located in front of the point at which the paper is put into the machine and the operator pulls its upper edge over toward the keys, and thereby brings the cam G into contact with the rim F<sup>18</sup> and slides the sleeve along the hub

sufficiently to draw the pins F<sup>3</sup> out of the ratchet-wheel. The operator retains the guide in this bent-over position so long as may be necessary, and while so held the disengagement between the ratchet-wheel and gear F will continue, so that he is during that time free to operate the paper-rolls to any extent desired, and during the same time the rewinding-drum will be stationary, the pawl remaining in engagement with its teeth F<sup>11</sup>. The cam G may be let into a stationary bar G<sup>4</sup>, so as to be guided thereby, as seen at Fig. 2.

A dolly-roll H upon the end of a spring-depressed arm H' may be employed in connection with the wheel D<sup>11</sup> to regulate the step-by-step feeding movements of the paper-rolls and to insure the uniformity in the extent of the different impulses.

While I have described the paper as presenting its top at the printing-center when it is moved back by the backward rotation of the feed-rolls, it will be understood that I mean by this that the paper is carried back to the point from which it has been fed in the line-spacing operations. This point ordinarily will be the top of the sheet; but it may be lower down on the sheet, and, in fact, at any intermediate point thereon, and hence I do not wish the claims upon this feature to be limited to means for returning the paper to what is literally its top, especially in view of the fact that the mechanism shown by me will return the paper either to its top or to a lower plane, depending upon the location occupied by the paper at the time the line-spacing operations begin.

In order to keep the gear F normally in engagement with the ratchet-wheel C<sup>3</sup>, a spring J is coiled around the hub F' between the collar F<sup>2</sup> and the end F<sup>18</sup> of the sleeve F<sup>17</sup>. The bracket F<sup>8</sup> not only supports the shaft F<sup>7</sup>, but is preferably made to encircle shaft C<sup>4</sup>, thereby stiffening said shaft and also assisting in keeping the gear F and ratchet-wheel C<sup>3</sup> in close proximity to each other.

It will be obvious to those skilled in the art that many of the features of my invention can be changed without departing from the spirit of the invention, and hence I do not wish to be limited in my claims to the precise construction shown except in cases where the letter of the claims clearly calls for the precise construction.

I claim—

1. The combination with the printing mechanism adapted to print two or more characters side by side, of a laterally-movable paper-carriage, devices for feeding the paper longitudinally mounted in said carriage, and automatic mechanism acting in any position of the carriage to actuate said feeding devices in the line-spacing movements, substantially as specified.

2. The combination with a series of type arranged to print side by side, devices for impressing the paper upon the type, a laterally-movable paper-carriage adapted to position

the paper for the different columns, feed-rolls for moving the paper longitudinally past the type, and means for actuating said rolls, substantially as specified.

5 3. The tabulating-machine wherein are combined a paper-carriage which is laterally movable to allow the spacing of the columns, feeding devices on said carriage operating in  
10 any position of the carriage to feed the paper longitudinally in line-spacing, devices, also operable in any position of the carriage, where-  
15 by the paper-feeding devices may be reversed and caused to return the paper longitudinally to its starting position, and means actuated  
by the lateral movement of the carriage for setting said last-mentioned devices in operation, substantially as specified.

4. The tabulating-machine having in combination a laterally-movable paper-carriage,  
20 means for feeding the paper vertically in any position of the carriage, and mechanism for shifting the carriage laterally the width of a column-space, substantially as specified.

5. The tabulating-machine having in combination a laterally-movable paper-carriage,  
25 means for feeding the paper vertically in any position of the carriage, and mechanism for shifting the carriage laterally the width of a column-space, such mechanism embracing a  
30 hand-lever E, substantially as specified.

6. The combination in a tabulating-machine, of a movable paper-carriage having notches E<sup>9</sup>, a hand-lever E operable at will,  
the shaft E', crank E<sup>2</sup>, connecting-bar E<sup>3</sup>, elbow-lever E<sup>4</sup>, pawl E<sup>6</sup>, stop E<sup>7</sup>, and spring E<sup>10</sup>,  
35 substantially as specified.

7. The combination with the notched and movable paper-carriage, of a spring-actuated pawl normally disengaged from the carriage,  
40 and mechanism for moving said carriage laterally and acting to release said pawl so it may engage in the notches upon the carriage, substantially as specified.

8. The combination in a tabulating-machine, of a laterally-movable paper-carriage,  
45 and mechanism for shifting said carriage to form the column-spacing, said mechanism being normally disengaged from the carriage, substantially as specified.

9. The combination in a tabulating-machine, of a movable paper-carriage which is normally free to be moved by hand, and mechanism for shifting said carriage in forming  
50 the column-spaces, said mechanism automatically engaging and releasing the carriage, substantially as specified.

10. The combination in a tabulating-machine, of a movable paper-carriage normally free to be moved by hand, and mechanism  
60 normally disengaged from the carriage but serving when actuated to engage and move the carriage laterally in column-spacing, substantially as specified.

11. The combination with the laterally-movable paper-carriage and its paper-feeding roll  
65 or rolls, of mechanism for shifting the carriage in spacing the columns, and mechanism

for returning the paper so as to present the top of the sheet at the printing-center, substantially as specified. 70

12. The combination with the laterally-movable paper-carriage and its paper-feeding roll or rolls, of mechanism for shifting the carriage in spacing the columns, and mechanism  
75 for imparting a backward rotation to the paper roll or rolls, so as to return the paper and present its top at the printing-center, substantially as specified.

13. The combination with the laterally-movable paper-carriage and its paper-feeding roll or rolls, of mechanism for shifting the carriage in spacing the columns, and mechanism  
80 for returning the paper so as to present the top of the sheet at the printing-center, said paper-returning mechanism operating simultaneously with said shifting mechanism, substantially as specified. 85

14. The combination with the laterally-movable paper-carriage, and its paper-feeding roll or rolls, of mechanism for shifting the carriage in spacing the column, and mechanism  
90 for returning the paper so as to present the top of the sheet at the printing-center, said returning mechanism being operated by said shifting mechanism, substantially as specified. 95

15. The combination with a laterally-movable paper-carriage, and the paper-feeding rolls supported in said carriage, of a spring for imparting backward rotation to said rolls,  
100 and means for putting said spring under tension, substantially as specified.

16. The combination with the driven paper-feed rolls, of a spring mechanically connected to and put under tension by the feeding operations of the rolls, said spring serving when  
105 released to impart a backward rotation to the rolls and to carry the paper back to its starting position, substantially as specified.

17. The combination with the paper-feed rolls, and the mechanism for actuating them in the line-spacing operations, of a spring mechanically connected to said actuating mechanism and put under tension thereby, a barrel surrounding said spring, a spring-actuated  
115 pawl engaging teeth carried by the barrel, and means for withdrawing the pawl when it is desired to move the paper back to its starting position, substantially as specified.

18. The combination of the laterally-movable paper-carriage, driven paper-feed rolls supported in the carriage, mechanism for moving the carriage laterally, and mechanism for  
120 returning the sheet so as to present its top at the printing-center, substantially as specified. 125

19. The calculating-machine wherein are combined a laterally-movable paper-carriage, driven paper-feed rolls supported in the carriage, mechanism for moving the carriage laterally, and mechanism for returning the sheet  
130 so as to present its top at the printing-center, substantially as specified.

20. The combination of the laterally-movable paper-carriage, driven paper-feed rolls

supported in the carriage, mechanism for moving the carriage laterally, and mechanism for returning the sheet so as to present its top at the printing-center, said mechanism for moving the carriage and said mechanism for returning the sheet operating simultaneously, substantially as specified.

21. The combination of the laterally-movable paper-carriage, driven paper-feed rolls supported in the carriage, mechanism for moving the carriage laterally, and mechanism for returning the sheet so as to present its top at the printing-center, said last-mentioned mechanism being set in operation by said mechanism for moving the carriage, substantially as specified.

22. The combination with the paper-feed rolls and mechanism for returning the paper so as to bring its top to the printing-center, of means for disengaging said mechanism from the rolls while inserting the paper, substantially as specified.

23. The combination with the paper-feed rolls and mechanism for returning the paper so as to bring its top to the printing-center, of a movable guide  $G^2$  and connections between said guide and said spring, mechanism whereby said guide may cause disengagement between the rolls and the mechanism, substantially as specified.

24. The combination with the paper-feed

rolls, of spring mechanism normally in engagement with the rolls so that power will be stored in the mechanism by the ordinary operations of the rolls, and means for disengaging the mechanism when it is desired to operate the rolls independently, substantially as specified.

25. The tabulating-machine provided with means for returning the paper so as again to present its starting-point at the printing-center, substantially as specified.

26. The combination with a laterally-movable paper-carriage and means for feeding the paper longitudinally, of a shaft connected to and driving said feeding means, a gear on said shaft acting to rotate the same, and means for actuating said gear, substantially as specified.

27. The combination with a laterally-movable paper-carriage and means for feeding the paper longitudinally, of a shaft supported in and moving with said carriage and connected to and driving said feeding means, a gear through which said shaft is free to move longitudinally and which serves to rotate the shaft, and means for actuating said gear, substantially as specified.

DORR E. FELT.

Witnesses:

EDW. S. EVARTS,  
H. M. MUNDAY.