

No. 628,176.

Patented July 4, 1899.

D. E. FELT.
TABULATING MACHINE.

(Application filed May 31, 1898.)

No Model.)

6 Sheets—Sheet 1.

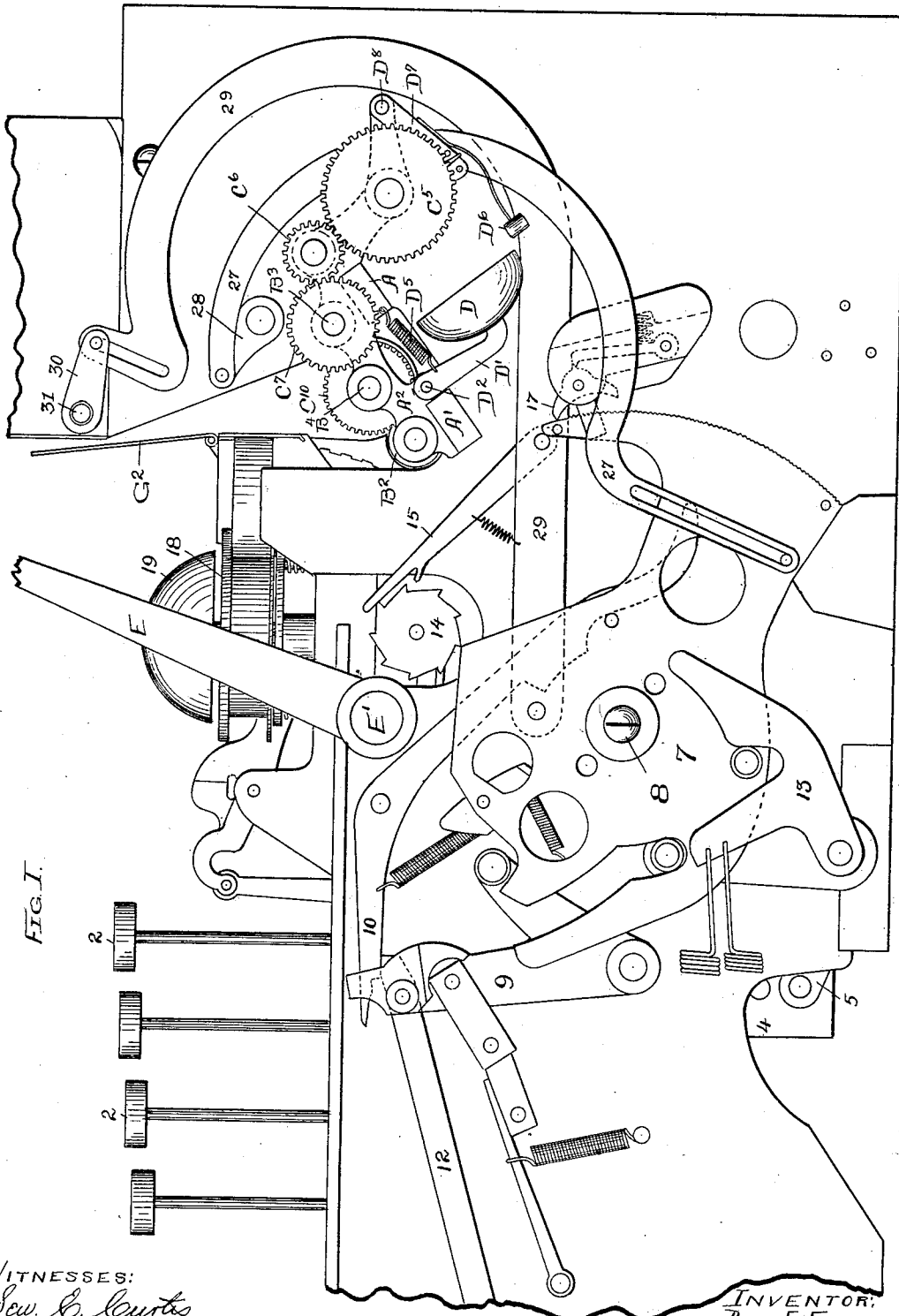


FIG. 1.

WITNESSES:
Geo. C. Curtis
A. W. Munday

INVENTOR:
DORR E. FELT
BY *Munday, Swarts & Adcock.*
HIS ATTORNEYS.

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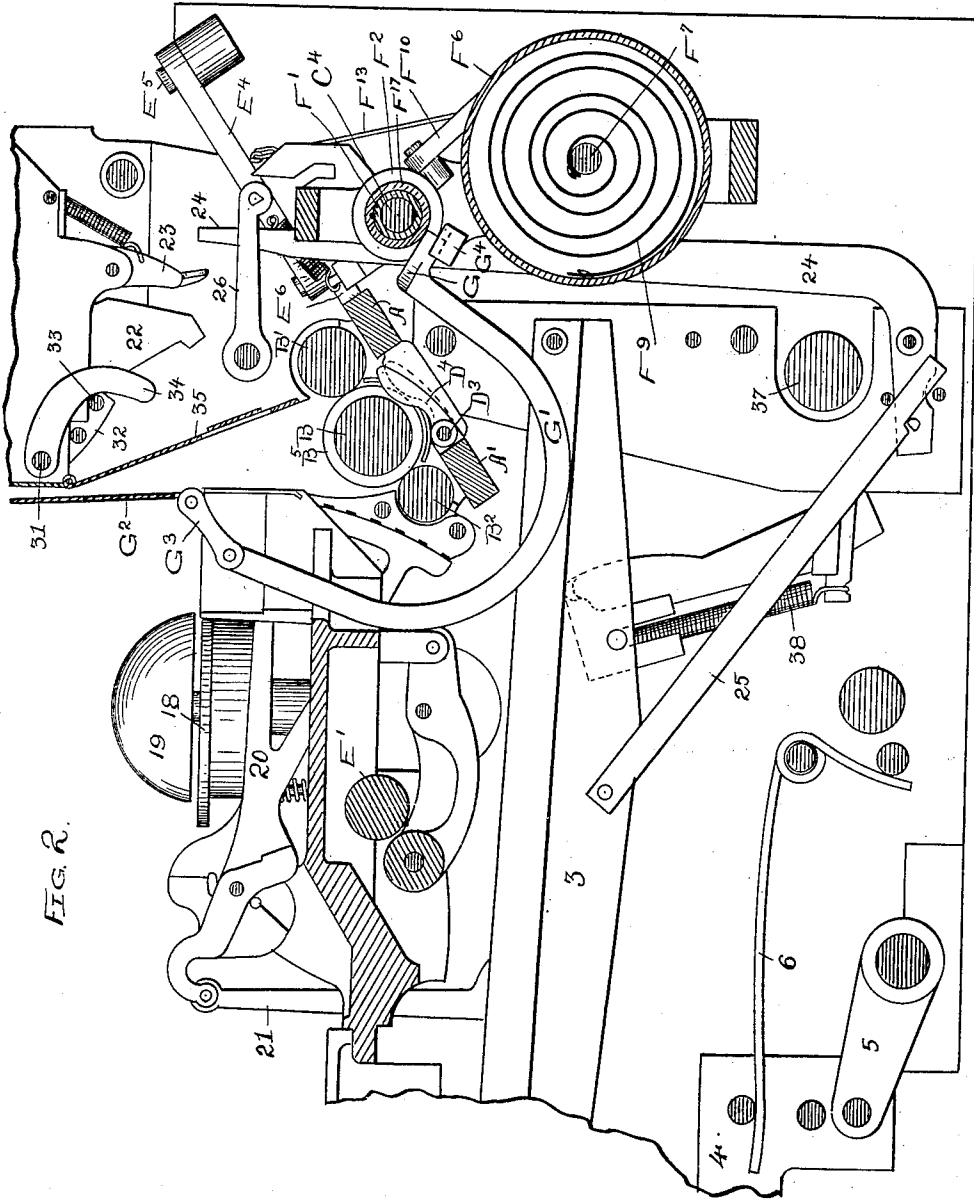


FIG. 2.

WITNESSES:

Sew. C. Curtis
H. M. Munday

INVENTOR:
DORR E. FELT

BY *Munday, Curtis & Adcock,*
HIS ATTORNEYS.

No. 628,176.

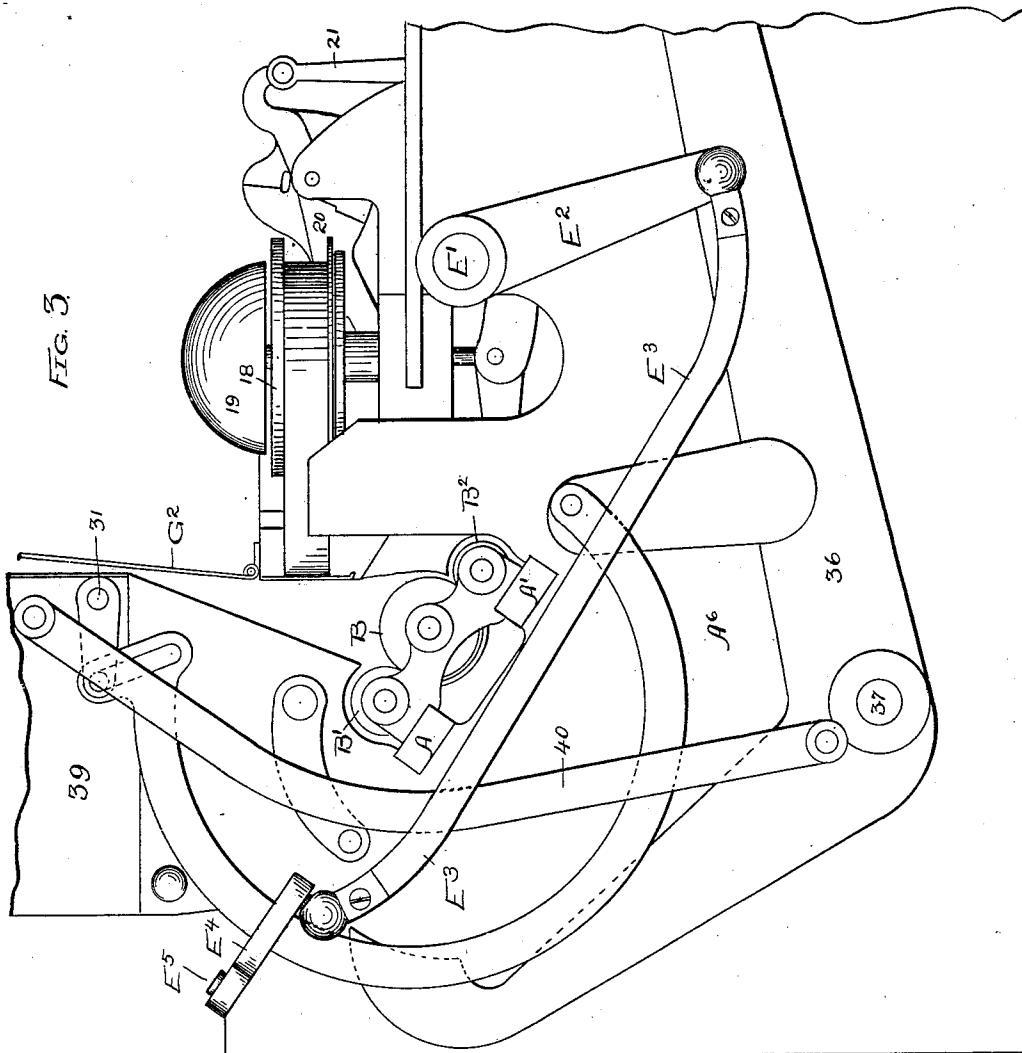
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6 Sheets—Sheet 3.



WITNESSES:
Sew. C. Curtis
A. W. Munday

INVENTOR:
DORR E. FELT
BY *Munday, Davis & Aldcock,*
HIS ATTORNEYS.

D. E. FELT.
TABULATING MACHINE.

(Application filed May 31, 1898.)

(No Model.)

6 Sheets—Sheet 4.

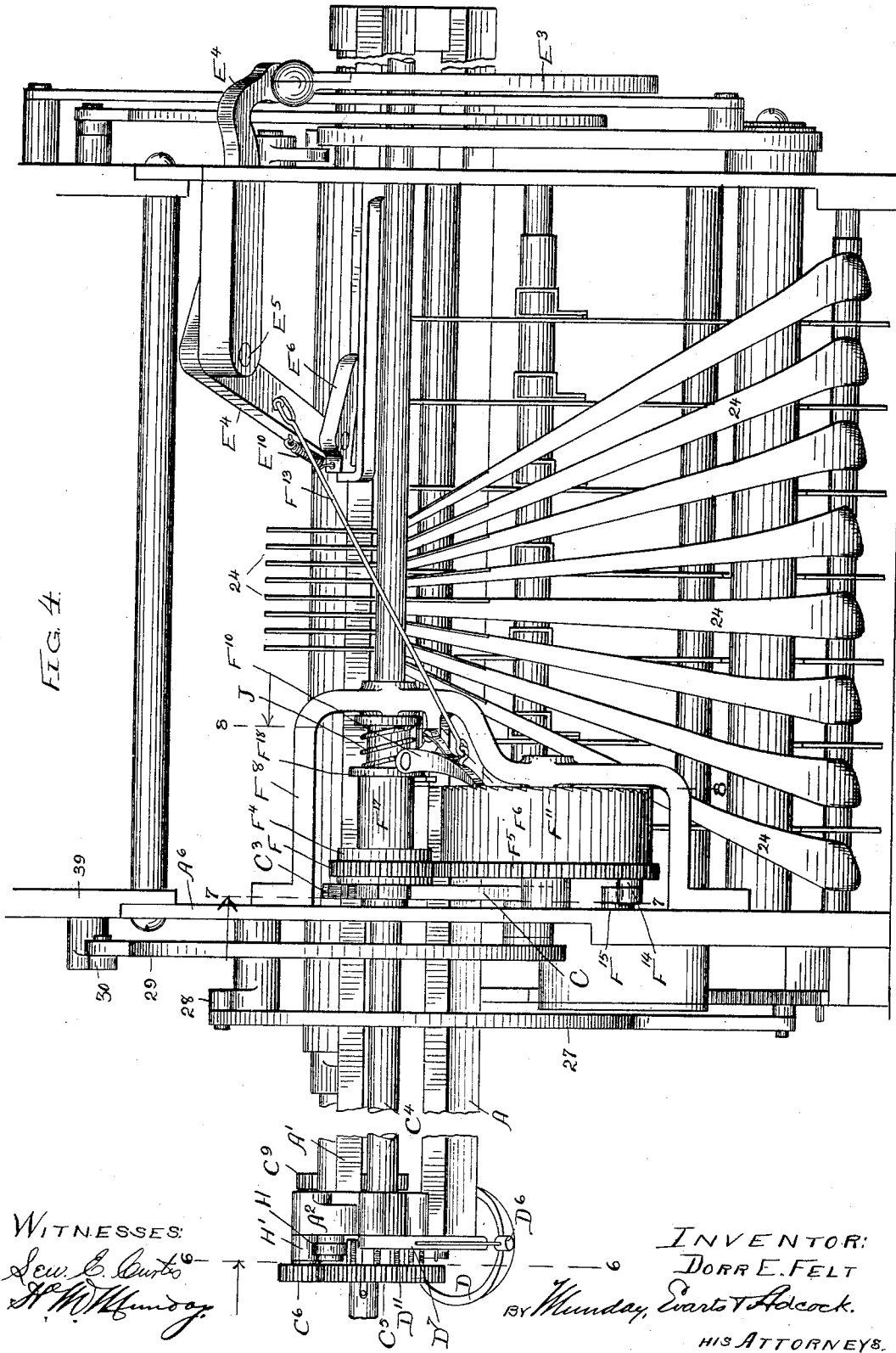


FIG. 4

WITNESSES:
Lew. C. Curtis
H. W. Munday

INVENTOR:
 DORR E. FELT
 BY *Monday, Evans & Adcock.*
 HIS ATTORNEYS.

D. E. FELT.
TABULATING MACHINE.

(Application filed May 31, 1898.)

(No Model.)

6 Sheets—Sheet 5.

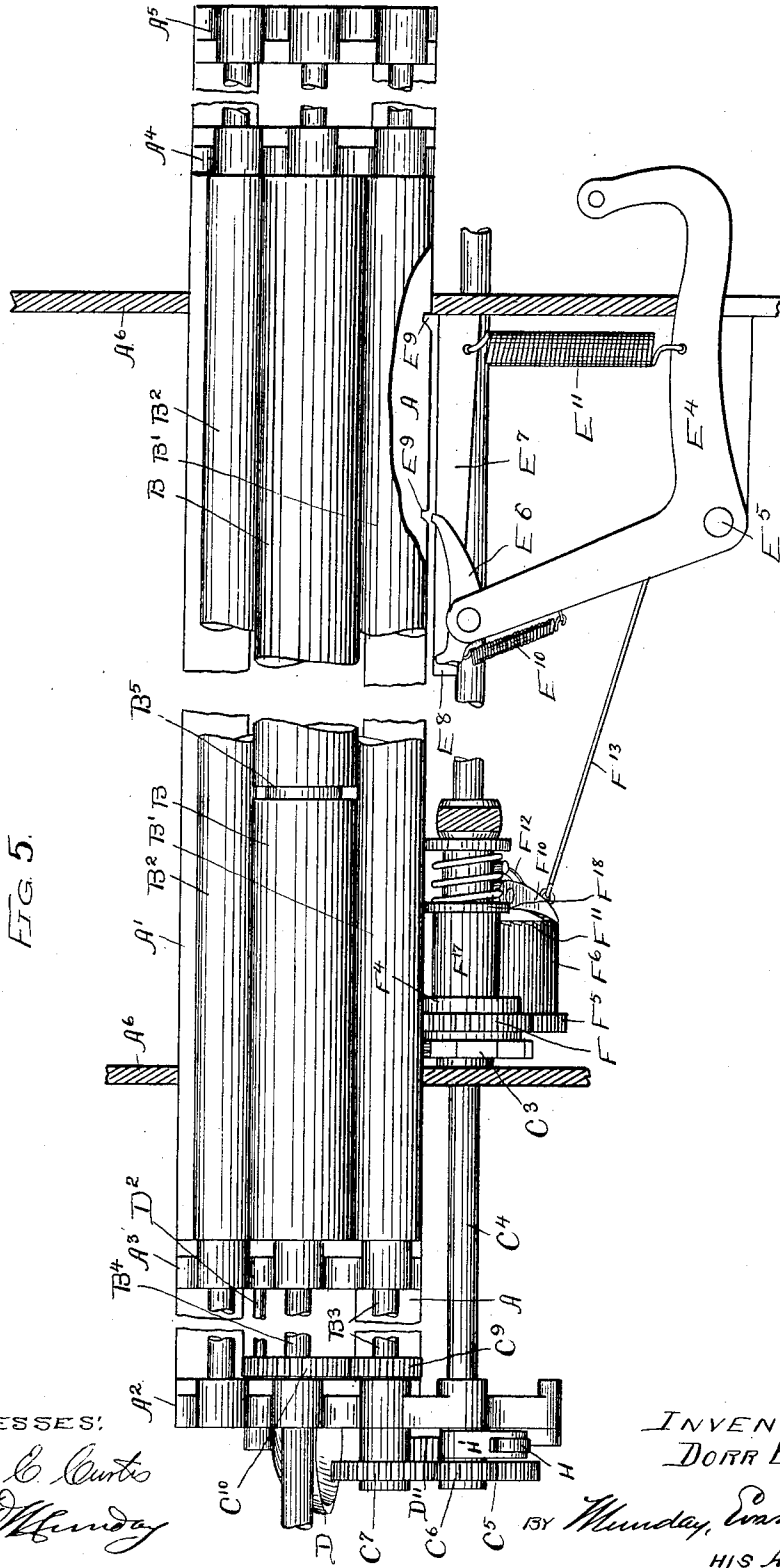


FIG. 5.

WITNESSES:
Sew. C. Curtis
A. M. Munday

INVENTOR:
 DORR E. FELT
 BY *Munday, Swarts & Leck*
 HIS ATTORNEYS.

D. E. FELT.
TABULATING MACHINE.

(Application filed May 31, 1898.)

(No Model.)

6 Sheets—Sheet 6.

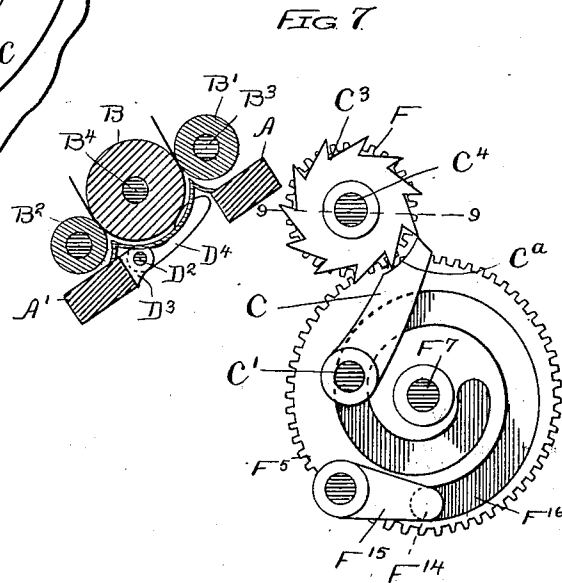
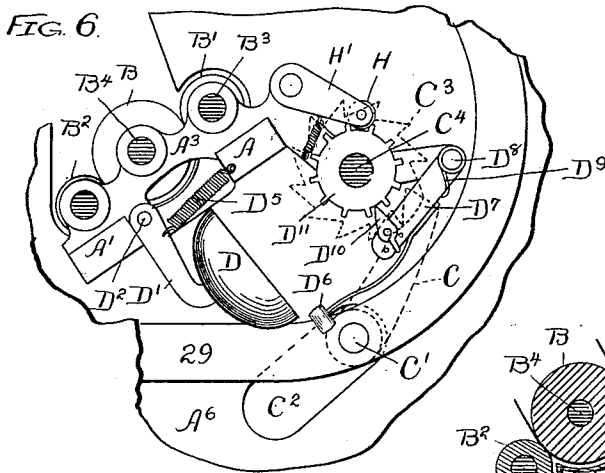


FIG. 8.

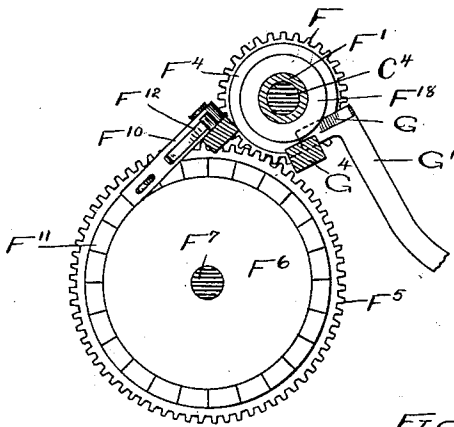


FIG. 9.

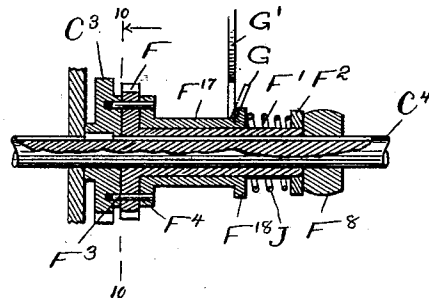
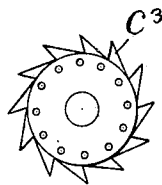


FIG. 10.



WITNESSES:

Sew. L. Curtis
J. W. Munday

INVENTOR:
DORR E. FELT

By Munday, Smart & Adcock.

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 H⁹ 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 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 printing 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 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 heads A², A³, A⁴, and A⁵, and movably supported in stationary uprights A⁶. In this carriage are three rolls B, B', and B² for operating the paper, two of which are driven and the other moves by friction. The paper is entered between the rolls B and B', and is carried around the center roll B and thence up between rolls B and B² to the point of delivery.

The rolls B and B' are actuated in the line-spacing operations as follows: Attached to the lever 29 is a pawl C, the pivot C' uniting which to the lever passes through the slot C² in the adjacent upright A⁶. When lever 29 is actuated by the main cam, this pawl carries the ratchet-wheel C³ through one tooth-space, and thereby gives motion to its carrying-shaft C⁴, which extends from end to end of the paper-carriage and may be supported in the heads thereof. The ratchet-wheel is 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 also carries a gear C⁵, which meshes with an idler C⁶, and this idler actuates a gear C⁷ upon the end of the shaft B³ of paper-roll B'. Shaft B³ carries also a second gear C⁹, which meshes with a gear C¹⁰ upon the shaft B⁴ of paper-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 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 C⁸ being adapted to cooperate with the following tooth of the ratchet in effecting such release at the end of each actuation 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 C⁴.

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 D², passing through the heads at one end of the paper-carriage and supported at its inner end in a bracket D³. At the inner end the shaft D² carries another arm D⁴, which is placed opposite and adapted to enter a groove B⁵ in the center paper-roll B. The paper upon which the tabulating is being done is adapted to keep the arm D⁴ 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 D⁵, attached to arm D'. (Seen at Fig. 6.) This rocks the shaft D² slightly and moves the bell from the position given at Fig. 6 into the field of action of the hammer D⁶, which is attached to a vibrating arm D⁷, pivoted at D⁸, pressed upon by the spring D⁹, and lifted at each actuation of the ratchet-wheel shaft by the pivoted dog D¹⁰, actuated by the toothed wheel D¹¹ upon said shaft. The bell is thus 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 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 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 E², which is connected by a rod E³ to an elbow-lever E⁴, stationarily pivoted at E⁵ and carrying a pawl E⁶. A stationary bracket E⁷, projecting from one of the uprights A⁶, is provided with a stop E⁸, against which the pawl is pressed when the parts are in their normal position, as in Fig. 5, and this stop acts to keep the farther end of the pawl from entering the notches E⁹, of which a series are cut in one edge of one of the longitudinal members of the paper-carriage frame. The spring E¹⁰ 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 stop E⁸. When this engagement takes place, the lever E⁴ will carry the paper-carriage to the right and until the upright to which bracket E⁷ is attached is reached by the pawl and acts as a stop to further movement. The operator now releases the hand-lever, and the retracting-spring E¹¹ 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 between these shifting operations the carriage may be moved freely in either lateral direction by hand, as the pawl E⁶ 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 C⁴ and adjacent to the ratchet-wheel C³ is a gear F, having its hub elongated at one side, as at F', such hub carrying a removable collar F² at its farther end. The gear F is compelled to rotate with the ratchet-wheel by means of the pins F³, secured in the disk F⁴ 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 F⁵, carrying a barrel F⁶ and supported upon a short stationary shaft F⁷, one end of which may be given a bearing in the upright A⁶ and the other end be supported in the bracket F⁸, attached at its ends to the upright. Within said barrel is a spring F⁹, which is wound up by the rotation of gear F⁵, and the power thus stored is preserved by the pawl F¹⁰ engaging the ratchet-teeth F¹¹ on the edge of the barrel, such pawl having a spring F¹² for keeping it in engagement. The pawl F¹⁰ is connected by a rod F¹³ with lever E⁴, 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 F⁹ free to operate the drum and through the gears F and F⁵ to rotate shaft C⁴, 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 F¹⁴, supported upon the hinged arm F¹³, and the spiral groove F¹⁶ in the side face of gear F⁵, 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 F¹⁰ when it is desired to turn the rolls backward, as is frequently necessary, and also to avoid all danger of the spring F⁹ operating when putting in or taking out the paper, I make the disk F⁴ 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 F¹⁷, surrounding the hub F' and movable along the same and provided with a projecting rim F¹⁸. The movement just mentioned of the sleeve is caused by the engagement with rim F¹⁸ of the cam end G of lever G', connected to the hinged paper-guide G² by the crank G³. (See Figs. 2 and 9.) The guide G² 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 F¹⁸ and slides the sleeve along the hub

sufficiently to draw the pins F³ 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 F¹¹. The cam G may be let into a stationary bar G⁴, 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 D¹¹ 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 C³, a spring J is coiled around the hub F' between the collar F² and the end F¹⁸ of the sleeve F¹⁷. The bracket F⁸ not only supports the shaft F⁷, but is preferably made to encircle shaft C⁴, thereby stiffening said shaft and also assisting in keeping the gear F and ratchet-wheel C³ 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-
by the paper-feeding devices may be reversed and caused to return the paper longitudinally
15 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 E⁹, a hand-lever E operable at will,
the shaft E¹, crank E², connecting-bar E³, elbow-lever E⁴, pawl E⁶, stop E⁷, and spring E¹⁰,
35 substantially as specified.

7. The combination with the notched and movable paper-carriage, of a spring-actuated
40 pawl normally disengaged from the carriage, 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
50 normally free to be moved by hand, and mechanism for shifting said carriage in forming the column-spaces, said mechanism automatically engaging and releasing the carriage,
55 substantially as specified.

10. The combination in a tabulating-machine, of a movable paper-carriage normally
60 free to be moved by hand, and mechanism 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
80 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, 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
110 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
120 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, 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,
130 and mechanism for returning the sheet 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^3 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.