

No. 711,487.

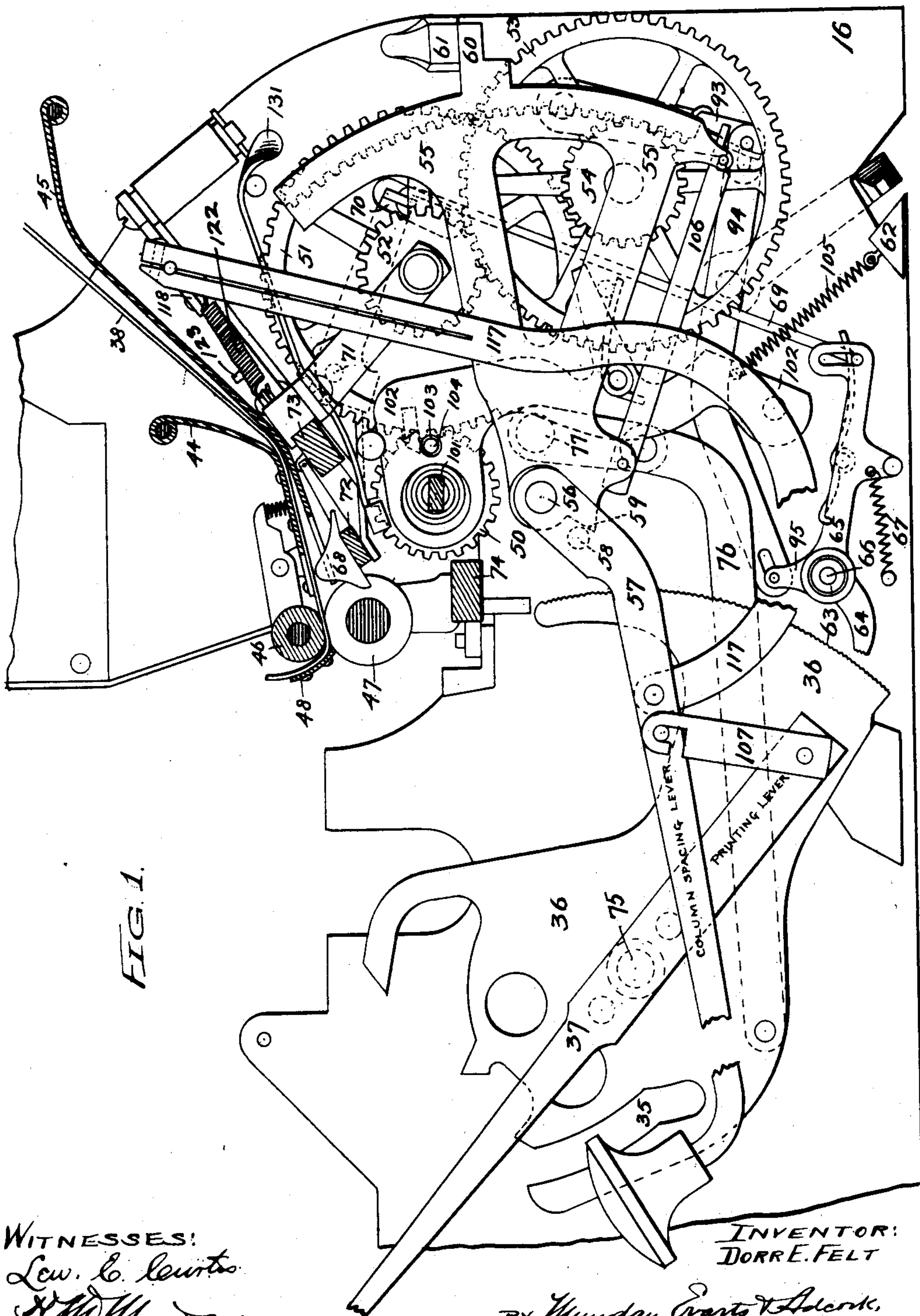
Patented Oct. 21, 1902.

D. E. FELT.  
TABULATING MACHINE.

(Application filed Apr. 29, 1901.)

(No Model.)

4 Sheets—Sheet 1.



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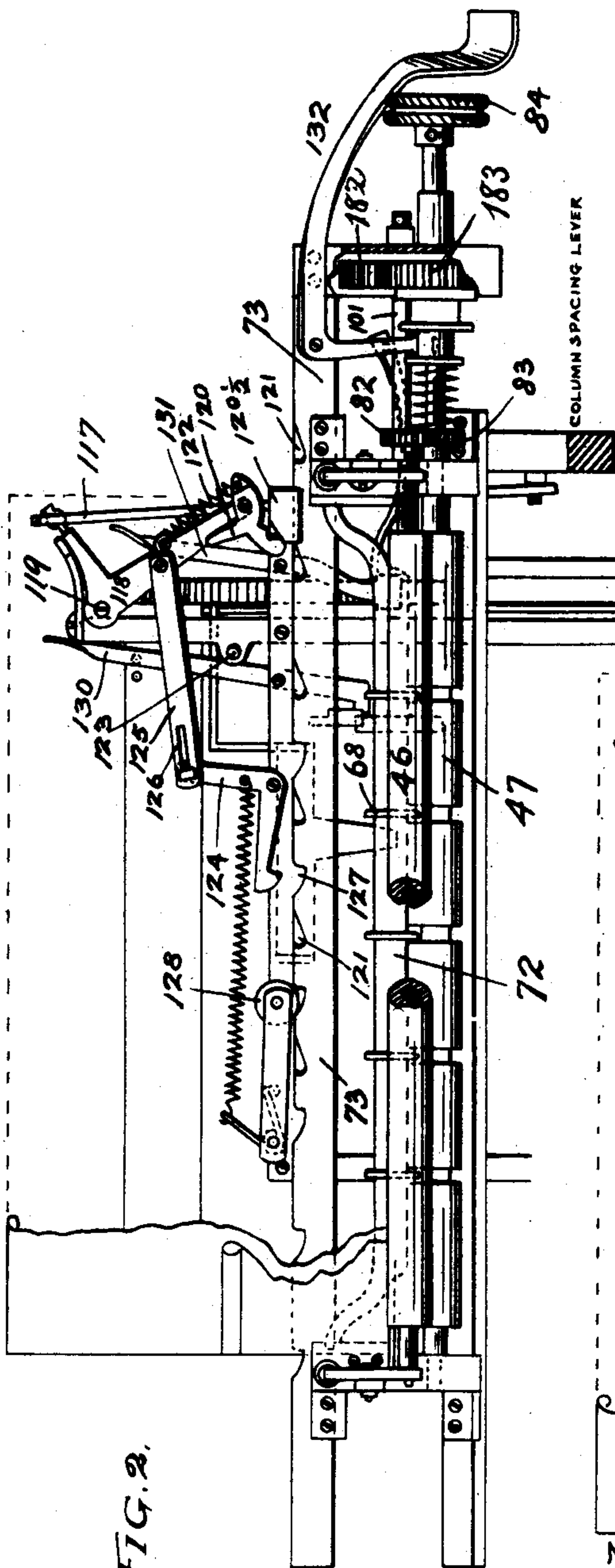


FIG. 2.

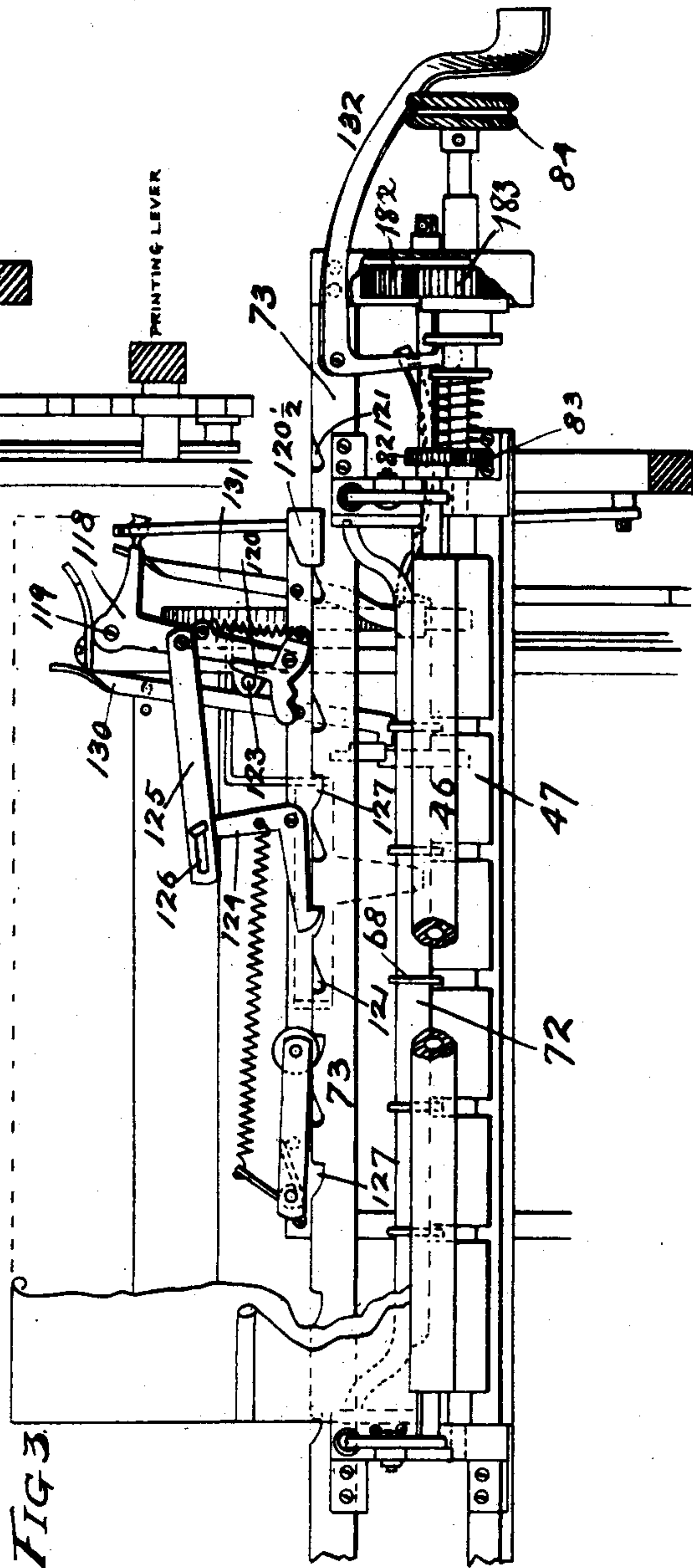


FIG. 3.

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4 Sheets—Sheet 3.

FIG. 5.

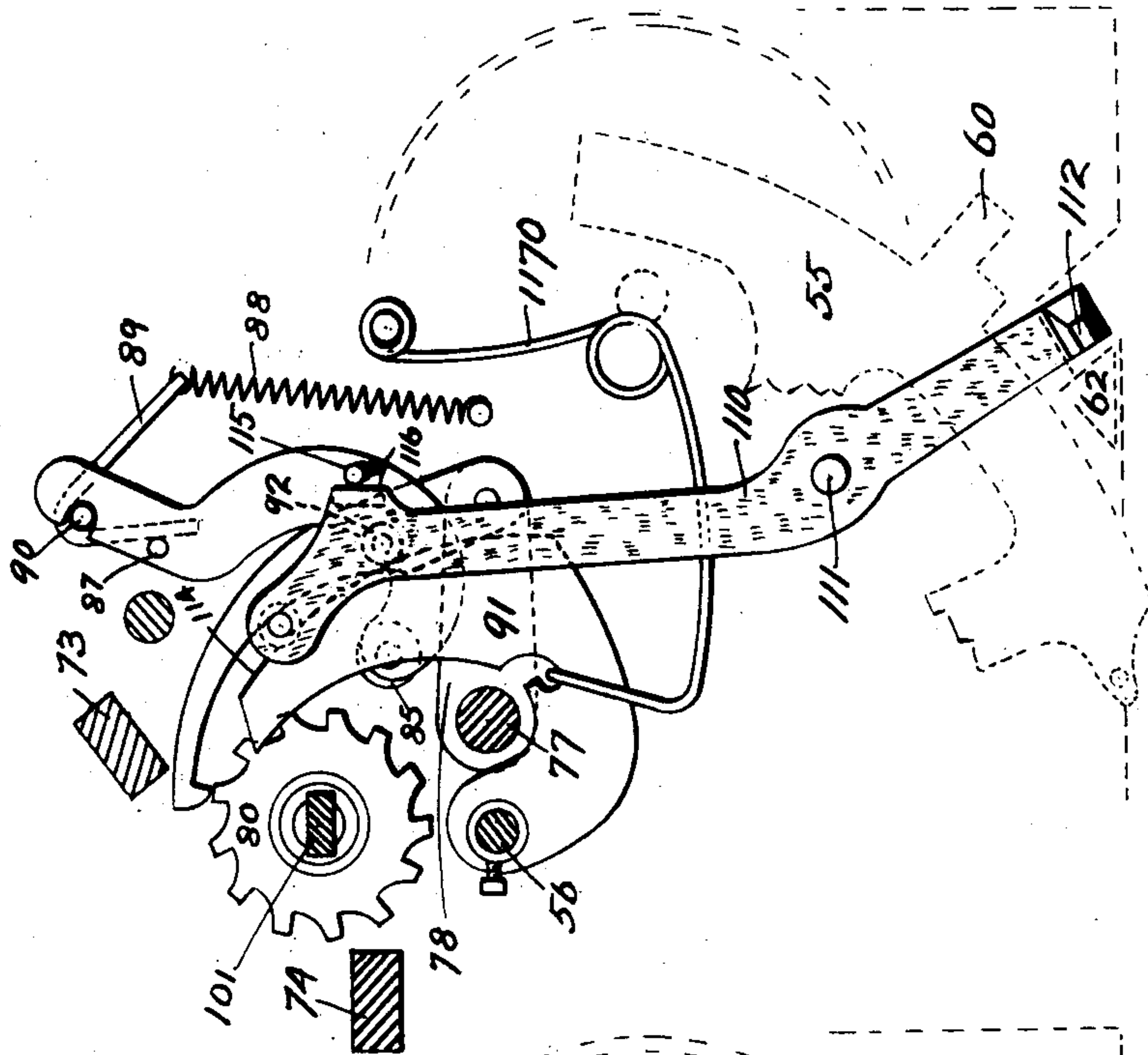
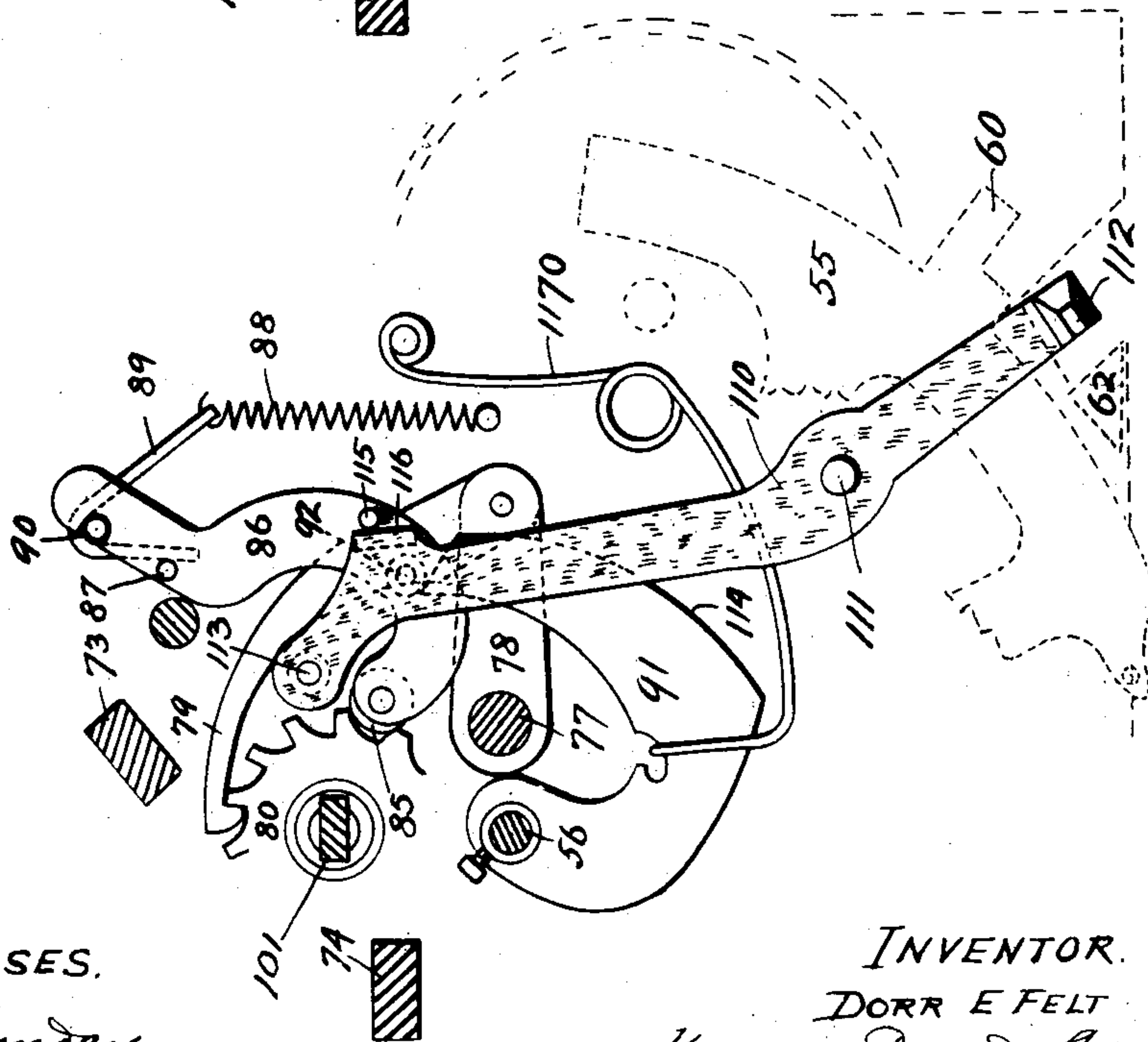


FIG. 4.



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4 Sheets—Sheet 4.

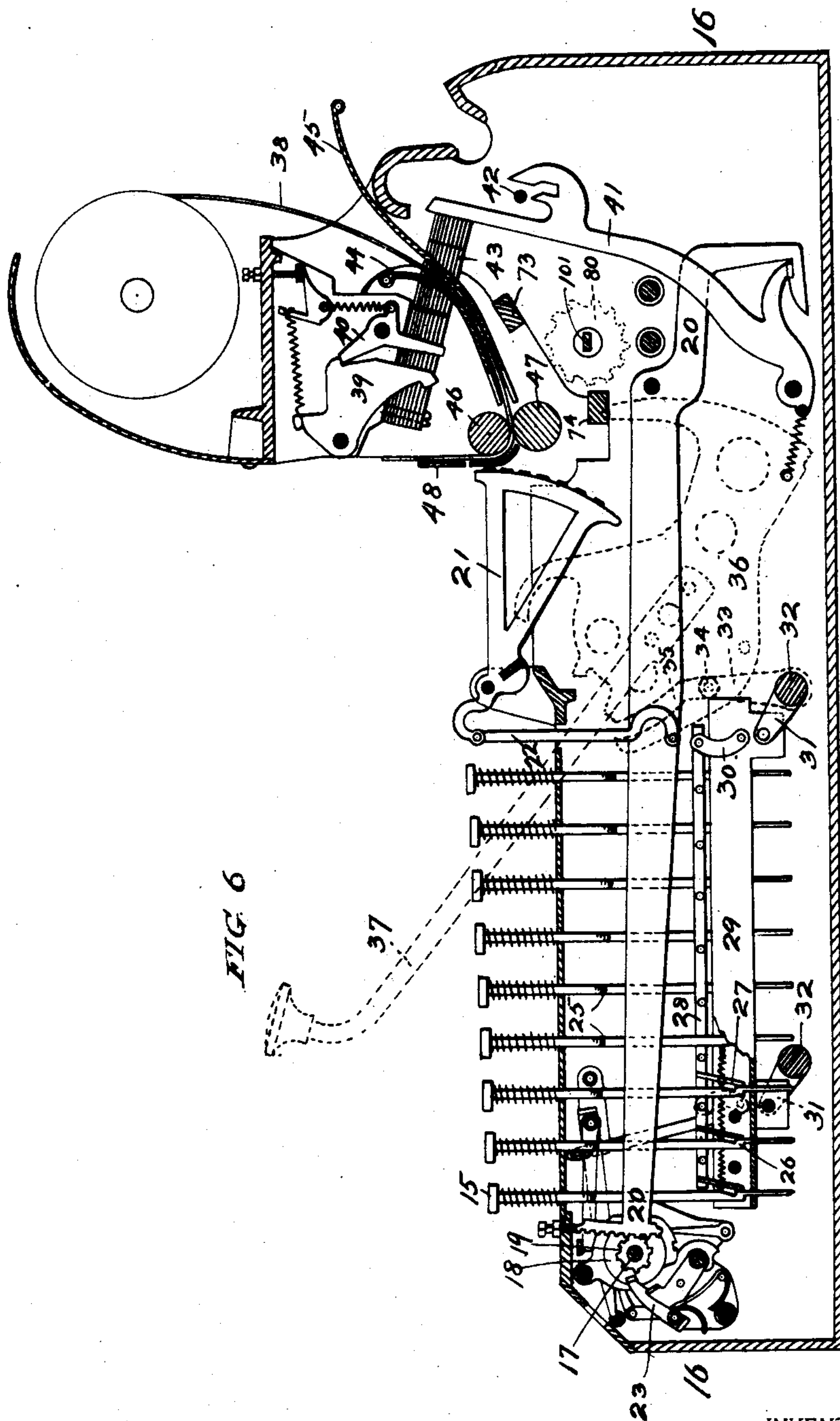


FIG. 6

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# UNITED STATES PATENT OFFICE.

DORR E. FELT, OF CHICAGO, ILLINOIS, ASSIGNOR TO COMPTOGRAPH COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

## TABULATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 711,487, dated October 21, 1902.

Application filed April 29, 1901. Serial No. 57,905. (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.

In some kinds of tabulating-work it is necessary that horizontal lines or rows of numbers or amounts shall be added and the totals noted at the end of the line. This kind of work, which I call "cross-tabulating," because it is done across the sheet rather than vertically of it, cannot conveniently be done by any tabulating-machine now made; and the object of the present invention is to provide such machine with means whereby it will be enabled to do cross tabulating or adding. I have devised the invention with special reference to its embodiment in the tabulating-machine of my Patent No. 644,287; but the invention is not limited to any particular construction of tabulator. The nature of the means by which I accomplish this result and am enabled to do cross-tabulating is fully set forth below and illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section of a tabulating-machine embodying my invention. Figs. 2 and 3 are horizontal sections showing the paper-carriage in different positions. Figs. 4 and 5 are detail vertical sections showing different positions of the parts. Fig. 6 is a longitudinal vertical section showing more especially the printing mechanism.

In said drawings, 15 represents the keys; 16, the surrounding frame; 17, the shaft on which the numeral-wheels 18 are supported; 19, the pinion actuating one of the numeral-wheels; 20, the segmental lever meshing with said pinion and also joined to the type-segment 21 by a link 22 in such a manner as to position such segment when it (the lever) is depressed. The carrying-lever of the numeral-wheel next adjacent to the wheel shown appears at 23. The keys are each provided with an offset or bend 25 on its stem adapted to engage the lever 20, and the offsets are graduated in position so that each key will be able to impart the proper amount of movement to the

lever. The keys are made the medium of depressing the levers 20, and to this end each key-stem has a shoulder 26, adapted to be engaged by a spring-catch 27, carried by a frame 29, when the key is depressed or set by the finger of the operator. The frame 29 is united to a frame 28 by links 30 and has a bodily downward movement imparted to it by cranks 31 on the shafts 32, one of said shafts having a crank 33, the upper end of which carries a pin 34, working in a slot 35 in the main cam 36, operated by the printing and adding hand-lever 37. The downward movement of frames 28 and 29, caused when the hand-lever is operated, carries any key which may have been set downward with the frames, and such key imparts a movement to its segment-lever proportioned to the power of the key, and the segment-lever in turn actuates its corresponding numeral-wheel to a proportionate extent and positions the type-segment to which it is attached with the figure corresponding to the key at the printing-center. It will be understood that there is a series of nine keys for each denomination embraced in the machine and that such keys are duplicates of the ones shown, also that there is a separate numeral-wheel and segment-lever for each denomination, together with the carrying devices for all the wheels except the lowest. The keys are released from the catches by a horizontal movement of frame 28, imparted to it at the conclusion of the printing operation by means not shown, but which may be seen in my Patent No. 568,021, of September 22, 1896. The paper (seen at 38) is impressed upon the type by spring-actuated hammers 39, of which there is one for each denomination, and which are normally held out of action by detents 40, but are released from the detents by the tail-piece 41, actuated in part by the segment-levers 20 and in part by a swinging cross-bar 42 and the hammer-releasing frames 43. The action of the parts 39 to 43 is fully set forth in my Patent No. 644,287, of February 27, 1900. The paper enters the machine between the guides 44 and 45, is fed by rolls 46 and 47, and is guided upward by guide 48. The present machine also embodies mechanism for returning the paper to its starting position after the completion of a vertical column, and



this returning mechanism may be patterned after the designs shown in either of my patents No. 628,176 or No. 644,287. The mechanism shown for this purpose is substantially like that of Patent No. 644,287, and consists of the pinion 50, which corresponds to the pinion C' of the patent and is actuated in the line-spacing movements of the paper-rolls, the train of gears 51, 52, 53, and 54, the segment 55, actuated by gear 54 and supported on shaft 56, the hand-lever 57, mounted on said shaft, and having a stud 58 engaging the shoulder 59 on the hub of segment 55. The segment also carries a projection 60, which encounters stationary stops at both limits of its path, the upper stop being shown at 61 and the lower one at 62.

The locking mechanism is preferably similar to that of my pending application, Serial No. 36,951, filed November 19, 1900, in which the edge 63 of the cam 36 is serrated and is engaged by the serrated end 64 of the lever 65, pivoted at 66 and having a spring 67 urging it into engagement with the cam. This spring is controlled by the means set forth in my said application and consisting of a series of feelers 68, arranged under the path of the paper and pressed upward against the same by power from spring 67. The connections between the feelers and the spring consist of the lever 65, the connecting-wire 69, the lever 70, pivoted at 71 and acting upwardly on the bar 72, supporting the series of feelers. The bar 72 is supported and moves with the laterally-movable paper-carriage, the longitudinal members whereof are shown at 73 and 74 and which also support the paper rolls and guides, as will be understood. The feelers are prevented from moving upward by the paper; but as soon as the bottom of the paper passes them they move upward into the grooves of the paper-roll and allow the spring 67 to throw the lever 65 into engagement with the cam, thereby arresting both the adding and the printing mechanisms of the machine.

I have shown in the drawings a number of features of my tabulating-machine which perhaps have no bearing on the present invention, among which may be mentioned the arm 93, bar 94, actuated by said arm and connected to arm 95 of lever 65, which are employed to cause the locking of cam 36 whenever any predetermined number of lines have been printed, as set forth in my application, Serial No. 53,659, filed March 30, 1901; also the movable plate 102, having an opening 103 for pin 104, the spring 105 attached to said plate, and the cushioning contact 106, attached to segment 55. The construction, purpose, and operation of all these parts are fully set forth in said applications.

When the lever 37 is depressed, it not only causes the printing of the figures corresponding to the keys which may have been set, but also causes the actuation of the feed-rolls, which impart a vertical movement to the paper equal to a line-space. The connec-

tions between the lever 37 and the paper-feed rolls through which this result is obtained may be of any suitable construction and, as illustrated, consist of the cam 36, attached to and moving with the lever and pivoted at 75, the bent lever 76, attached to the cam at one end and to a rock-shaft 77 at the other end, the arm 78 on shaft 77, and a pawl 79, carried by said arm and engaging the ratchet-wheel 80, mounted on and actuating the angular shaft 101, which is geared to the shafts of the feed-rolls 46 and 47 by gears 182 and 183 at Fig. 2. A button is shown at 84 for turning roll 46 by hand. A dolly-roll 85 is supported in a swinging arm 86, supported upon a stationary pin 87, and is normally urged toward ratchet-wheel 80 through the medium of bent lever 89, employing pin 87 as a fulcrum and exerting its power upon the pin 90, inserted in arm 86. The dolly-roll is forced away from the ratchet whenever the paper-reversing lever is actuated by means to be described later on.

The column-spacing mechanism is similar to that of my said application, Serial No. 36,951. It consists of the hand-lever 57, the bent link 117, connecting the hand-lever to the short arm of an elbow-lever 118 by a universal joint. Lever 118 is pivoted stationarily at 119 and carries upon its long arm a pivoted pusher 120, adapted to engage the notches 121 in the bar 73 of the carriage. The pusher is normally held out of engagement by rest 120½, but is urged into engagement as soon as it moves off the rest by spring 122. The notches are spaced to agree with the column-spaces, and at each actuation of lever 57 the pusher is carried off the rest and far enough beyond to shift the carriage a column-space to the left. The stationary stop 123 acts on the vertical arm of the pusher and compels it to release the carriage at the conclusion of the shifting movement. To prevent overthrow of the carriage in the shifting movements, an elbow-shaped latch 124 is employed and connected to elbow-lever 118 by link 125. The link is freely joined to the lever and is slotted at 126 where it joins the latch. The normal position of the latch is shown at Fig. 2, and it is not forced into engagement with bar 73 until the shifting movement is almost complete. It enters notches 127, located between notches 121, and having their abrupt sides facing oppositely to the abrupt sides of notches 121. To hold the carriage stationary between shifting operations, I employ the spring-pressed dolly-roll 128, entering notches 127. The notches 121 are cut only part way through the bar, while notches 127 are cut all the way through, thus preventing the dolly from entering the former, but allowing it full liberty to enter the latter. The dolly does not effect an absolute lock of the carriage, but is easily freed to yield whenever it is desired to shift the carriage in either direction by hand.

The hand-lever 131 (shown at Figs. 2 and



3) corresponds to the interlocking lever of my application Serial No. 36,951, by which the reversing mechanism is thrown into and out of action at will. The hand-lever 130 (shown in the same figures) is for effecting change from single-line to double-line spacing in feeding the paper vertically and corresponds to the lever 90 of said application. The lever 132 releases the clutch connecting the feed-rolls to their operating-gears when it is desired to turn the rolls by hand.

My present improvements are applied to the machine thus far described, and the first feature to be noted is the coupling together of the main or printing levers 37 and the column-spacing and paper-reversing lever 57, so that both will of necessity be operated together. This I do by means of the link 107, Fig. 1, which is preferably pivoted to one of the levers and detachably hooked to the other lever, so that when cross-tabulating is not desired it can be detached from the lever to which it is hooked and allowed to hang idly from the other. By this coupling of the levers together I cause the shifting of the sheet a column-space with the printing of each item, and in order that in the same operation the sheet may not be fed vertically I employ the means described in the next paragraph.

At 110 is a lever pivoted stationarily and shown in its normal position when the levers are not coupled together for cross-tabulating at Fig. 4 and in its normal position for cross-tabulating at Fig. 5. At the upper end the lever carries a laterally-projecting pin 113, setting under the pawl 79. The lever also carries a laterally-projecting roll 92, adapted to be engaged by a cam 91, fast on shaft 56, which is operated by the paper-reversing or column-spacing lever 57, the cam thus causing the lever 110 to move from its position in Fig. 4 to its position at Fig. 5 at each descending movement of lever 57. By this change of position pin 113 is caused to lift pawl 79 from the ratchet-wheel, if then engaged therewith, and to prevent its actuating the ratchet-wheel, and it will continue to act thus as long as it remains in the position of Fig. 5, and consequently, although the pawl may be moved up over the wheel in the same manner as when the line-feeding is desired, yet those movements will by the means described be rendered idle. By the movement described of lever 110 the dolly-roll arm 86 is also carried out of action by the contact of its pin 115 with the lug 116 on the lever, as shown at Fig. 5. The return movements of the dolly-roll arm and lever 110 will be caused by spring 88 as soon as cam 91 is allowed to be returned to its normal position by spring 1170, and this will take place upon the upward stroke of the reversing-lever. It will thus be seen that with the printing and reversing levers coupled together whenever the printing-lever is depressed to print a number or item the reversing-lever, which by the coupling is held normally in its lowest position,

will be forced upward, so that shaft 56 will be rocked in the direction which carries cam 91 from the position of Fig. 5 to that of Fig. 4. When the printing-lever moves upward, the reversing-lever moves down, and consequently both shafts 56 and 77 rock back to the position of Fig. 5. When the items to be tabulated in a single line have all been duly printed, the paper will stand with the end of the line at the printing-center of the machine, so that the sum of the items included in that line will be printed in the same line with them.

In my previous application, Serial No. 36,951, I have shown means for locking the cam 36 by pawl 64 whenever there is no paper in the machine or whenever the segment 55 is in its extreme downward position, this latter locking being effected by the contact-bar 106 coming against the stud on lever 65. The principal object of this feature was to prevent operating of lever 37 or pawl 79 after the lug 60 on the segment is against stop 62, because the ratchet is blocked at such times and the result would be a locking of the machine, which would prevent its operating or being released by ordinary users. The same thing occurs when the pawl 64 is forced into locking position by the operator turning the knob 84 at times when the cam 36 is not in position to be engaged by it. In the present invention I have provided an additional safeguard against this result, and it consists in extending lever 110 downward and providing it with a projection 112, which lies in the path of and will be engaged by the lug 60 when the segment nears the limit of its downward movement. By this arrangement the lever 110 will be forced to the position of Fig. 5 before lug 60 can come against stop 62, so that the pawl will at such times be prevented from entering the ratchet, even if the pawl should be moved. I prefer that contact 106 should act just before the lug 60 acts on the projection 112.

The gears 82 and 83 are mounted on the shafts of the feed-rolls and insure their moving together.

While the mechanism above set forth for causing the cross-feeding without any vertical feeding is the best now known to me, it will be understood that I do not wish to be limited thereto in my claims, except in cases where the construction is expressly called for.

I claim—

1. The combination in a tabulating-machine of devices normally acting to feed the paper vertically in line-spacing, devices for shifting the paper in column-spacing, devices for printing the items to be tabulated, and means for preventing the line-spacing devices from operating, substantially as specified.

2. The tabulating-machine having mechanism for printing the items to be tabulated, means normally acting to impart a vertical or line-spacing movement to the paper, means for imparting column-spacing movements to



the paper, and means for preventing action by the line-spacing means, substantially as specified.

3. The tabulating-machine having in combination a laterally-movable paper-carriage, means normally acting to feed the paper vertically in any position of the carriage, mechanism for shifting the carriage laterally in column-spacing, and means for preventing said feeding means from operating when the carriage is shifted, substantially as specified.

4. The tabulating-machine having printing mechanism, adding mechanism, and paper-controlling mechanism, all operated by the same lever and acting to print a series of numbers or items in a horizontal line, to add the numbers printed, and to print the total in the same line, substantially as specified.

5. The tabulating-machine, embodying printing mechanism, adding mechanism and means for automatically shifting the sheet in column-spacing and all operated by the same lever and adapted to the tabulating and adding of numbers in cross-horizontal lines, substantially as specified.

6. The tabulating-machine adapted to tabulate and add numbers in vertical columns, and embodying means for shifting the paper laterally in column-spacing, and means adapted to be put into use at will for preventing the vertical feed of the paper, whereby the machine may be used to tabulate and add numbers in horizontal lines, substantially as specified.

7. The tabulating-machine having a laterally-movable paper-carriage, and means for moving said carriage a column-space at each operation, and means for feeding the paper vertically in any position of the carriage, means for preventing the paper-feeding means from operating, means for printing the items to be tabulated, and means for coupling the printing means and the column-spacing means together, substantially as specified.

8. The combination with the printing mechanism, the lever for operating such mechanism, the column-spacing mechanism and a lever for operating the same, of means for coupling the levers together so that the operating of one will cause the operating of the other, substantially as specified.

9. The combination in a tabulating-machine of mechanism for simultaneously printing a series of figures side by side, and mechanism coupled to and operating with said printing mechanism and acting to cross-feed the sheet a column-space at each operation of the printing mechanism, substantially as specified.

10. The tabulating-machine having means for printing a plurality of figures simultaneously side by side, adding mechanism for adding the numbers so printed and means for shifting the paper laterally in column-spacing, and means for printing the sum of the added numbers, such printing means and shifting means being coupled together so as

to be operated by a single lever, substantially as specified.

11. The tabulating-machine wherein are combined with the printing-lever and column-spacing lever, a link coupling them together, so that the operating of one causes the operating of the other, substantially as specified.

12. The tabulating-machine wherein are combined with the printing-lever and column-spacing lever, a link coupling them together, so that the operating of one causes the operating of the other, said link being detachably joined to one of the levers, substantially as specified.

13. The combination with the paper-carriage, the feed-rolls for automatically feeding the paper in line-spacing and their actuating pawl and ratchet, and means for shifting the carriage in column-spacing, of lever 110 for displacing said pawl, substantially as specified.

14. The combination with the paper-carriage, the feed-rolls for automatically feeding the paper in line-spacing and their actuating pawl and ratchet, and means for shifting the carriage in column-spacing, of lever 110 actuated by said carriage-shifting means and serving to displace said pawl, substantially as specified.

15. The tabulating-machine wherein are combined a printing-lever for causing the printing of the numbers, and means actuated by power from said lever and serving to shift the paper laterally a column-space at each operation, substantially as specified.

16. The tabulating-machine having a laterally-movable paper-carriage, and a printing-lever, said carriage being shifted by power from the lever at each operation of the lever, substantially as specified.

17. The tabulating-machine having a printing mechanism for printing numbers consisting of a plurality of figures, an operating-lever for causing the operation of said mechanism, and mechanism actuated by power received from said lever and serving at each actuation of the lever to cross-feed the paper without moving it vertically, substantially as specified.

18. The tabulating-machine having type adapted to be set side by side preparatory to printing, keys for selecting the type to be printed, a lever distinct from both types and keys for causing the impressions, and mechanism actuated by power received from said lever and serving to cross-feed the paper without moving it vertically, substantially as specified.

19. The tabulating-machine having mechanism for simultaneously printing a plurality of figures side by side, a hand-lever for causing action by said mechanism, and mechanism for cross-feeding the sheet actuated by power from said hand-lever at every operation of the latter, substantially as specified.

20. The combination with the ratchet and pawl of the paper-line-feeding devices, and



the paper-reversing mechanism, of lever 110, actuated by said reversing mechanism and serving to hold the pawl out of action, substantially as specified.

- 5 21. The combination with the ratchet and pawl of the paper-line-feeding devices, of a pivoted lever 110 serving to hold the pawl

out of action, and paper-reversing mechanism, having a segment 55 bearing a lug operating said lever, substantially as specified.

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