Aug. 13, 1929. F. A. HART 1,724,478

TYPEWRITING MACHINE

Filed May 2, 1928 5 Sheets-Sheet 1

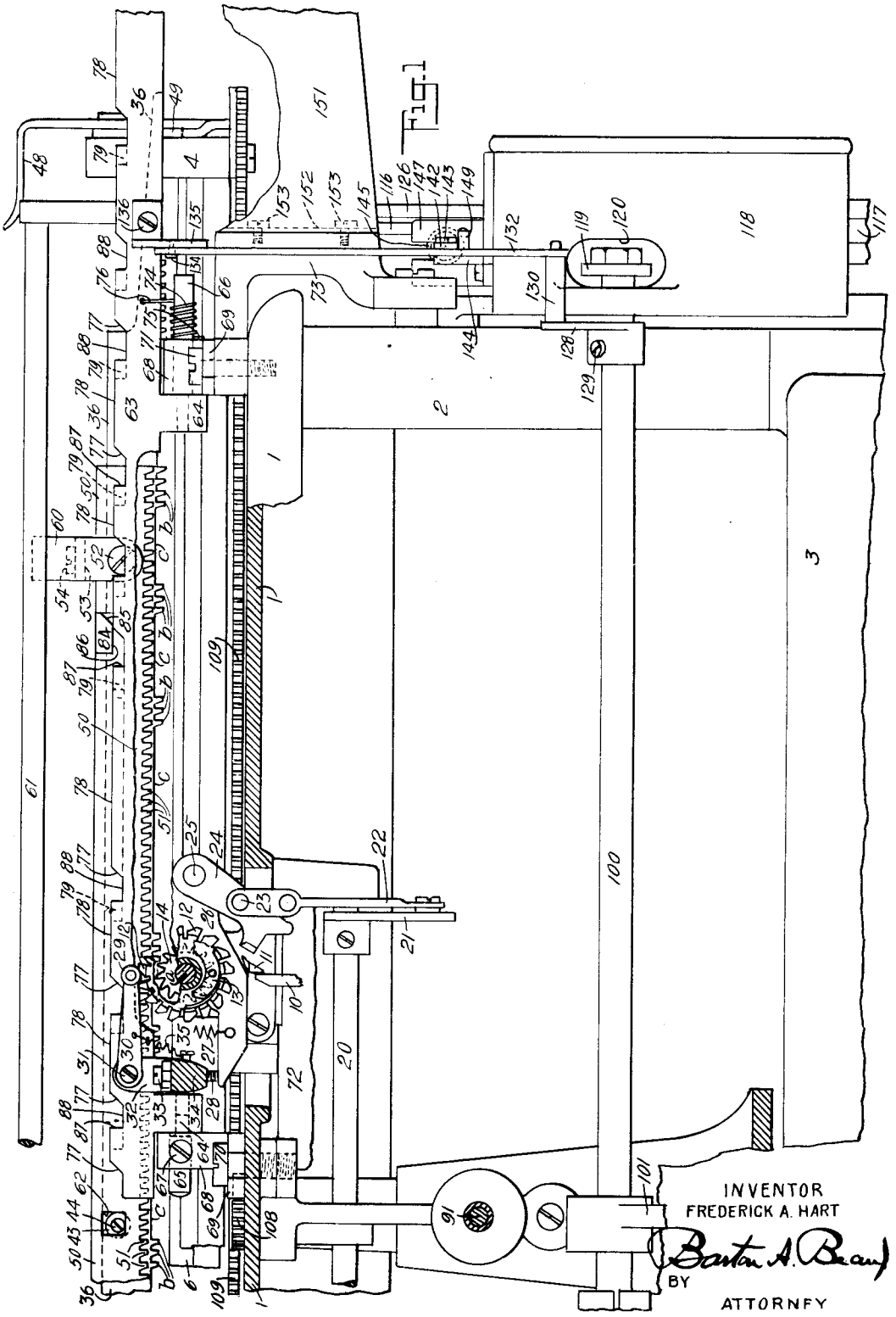


Fig. 1

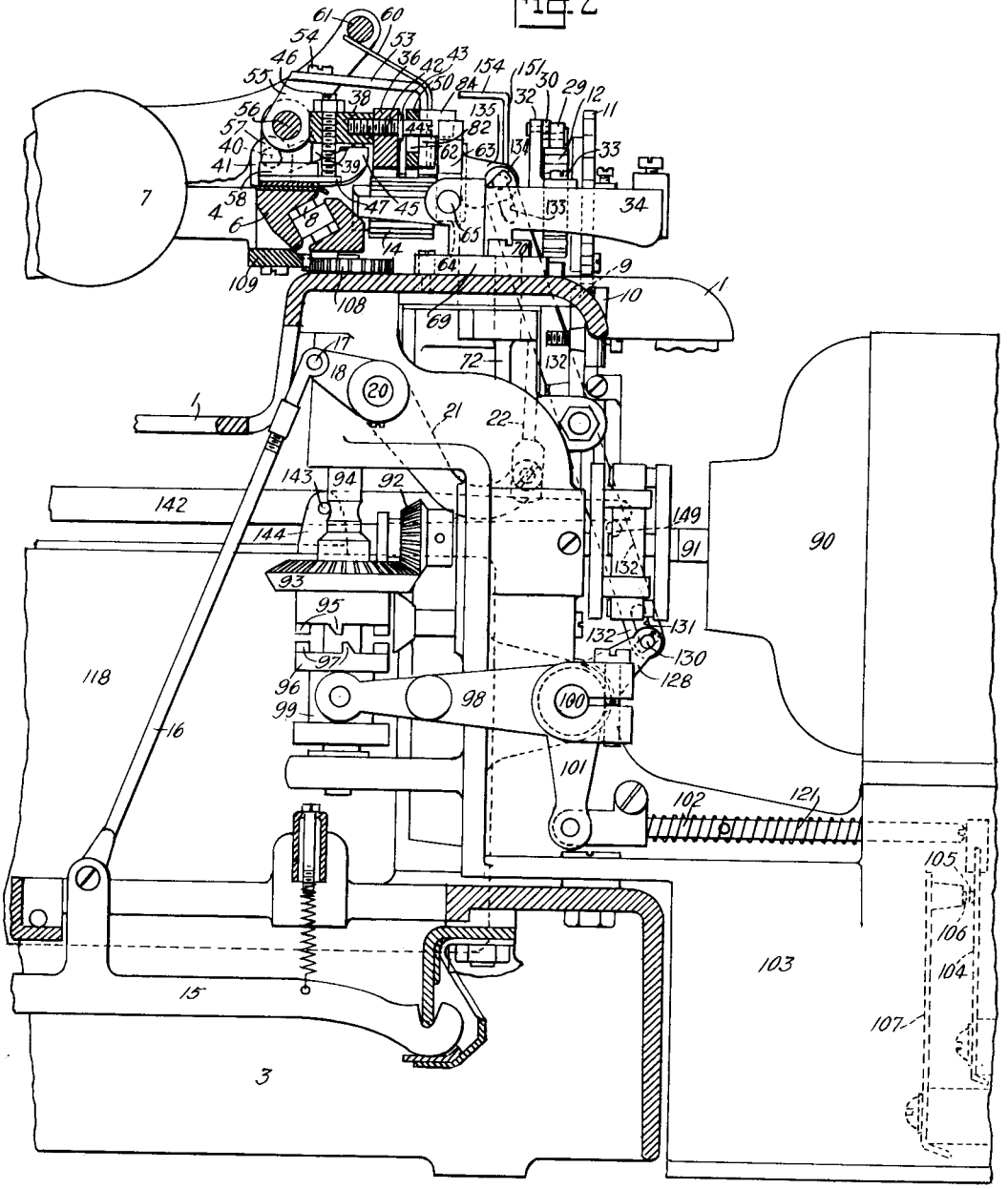
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TYPEWRITING MACHINE

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Fig. 2



WITNESSES

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TYPEWRITING MACHINE

Filed May 2, 1928 5 Sheets-Sheet 3

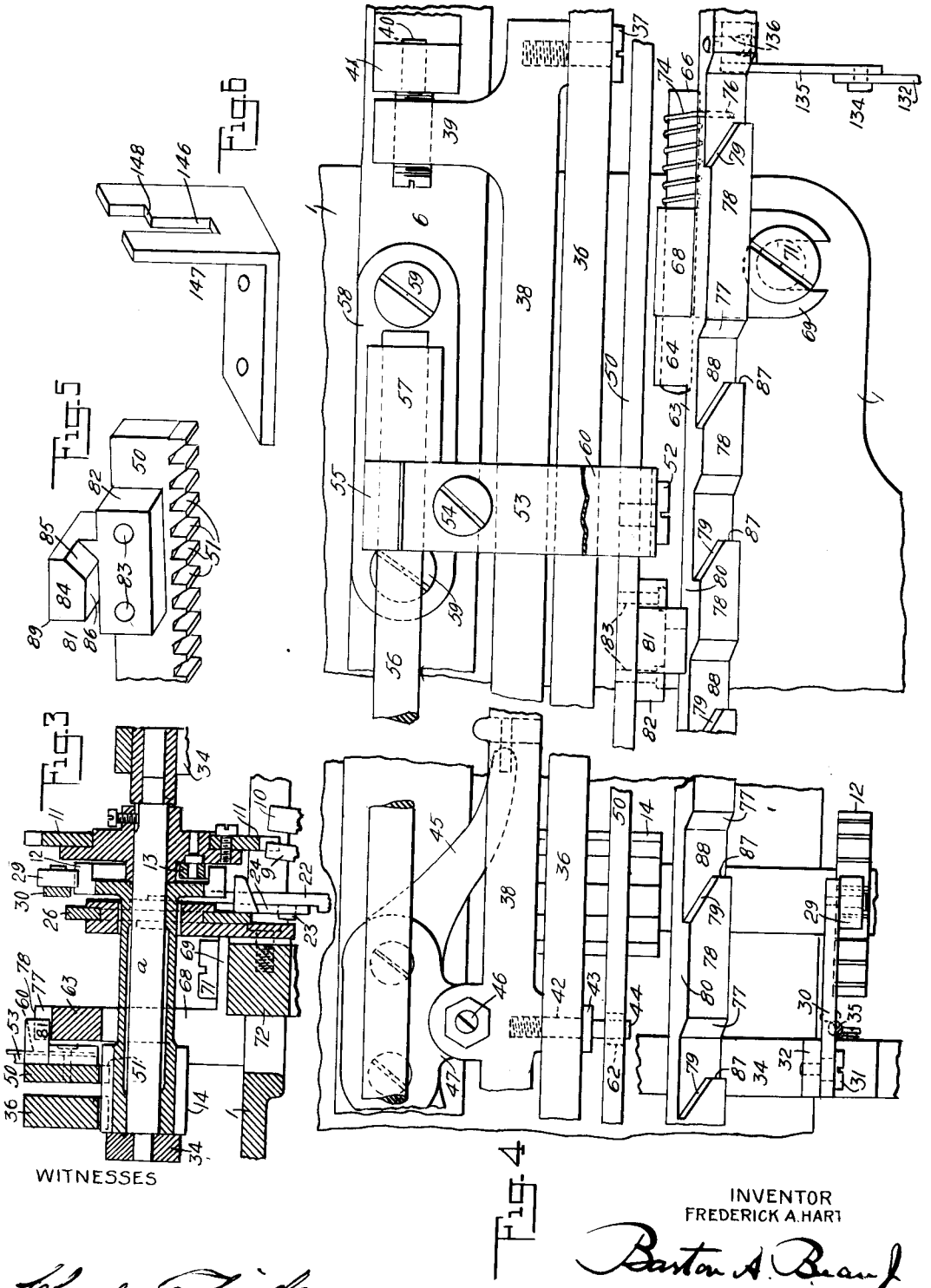


Fig. 6

Fig. 5

Fig. 3

Fig. 4

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Aug. 13, 1929. F. A. HART 1,724,478

TYPEWRITING MACHINE

Filed May 2, 1928 5 Sheets-Sheet 4

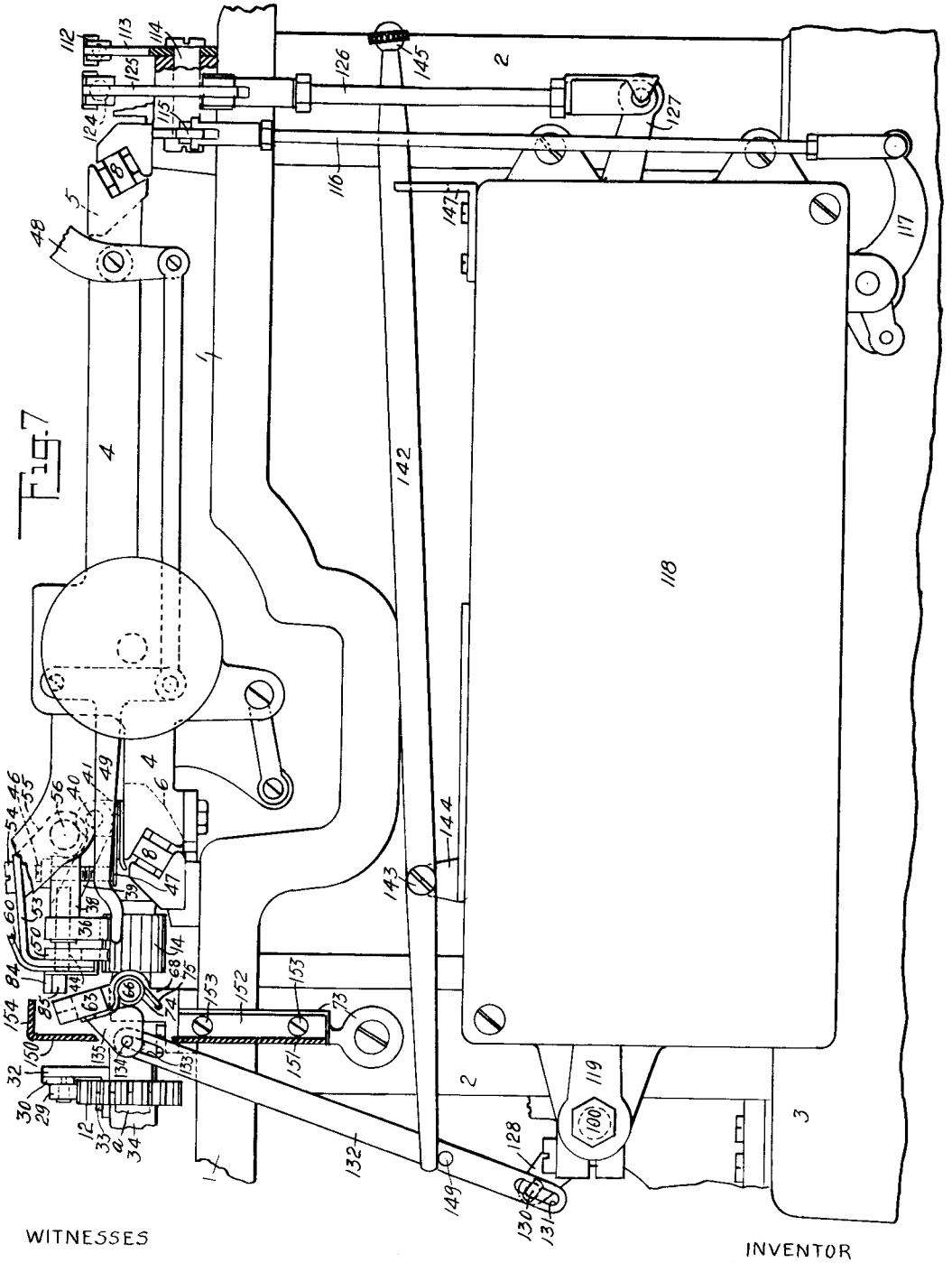


Fig. 7

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TYPEWRITING MACHINE

Filed May 2, 1928 5 Sheets-Sheet 5

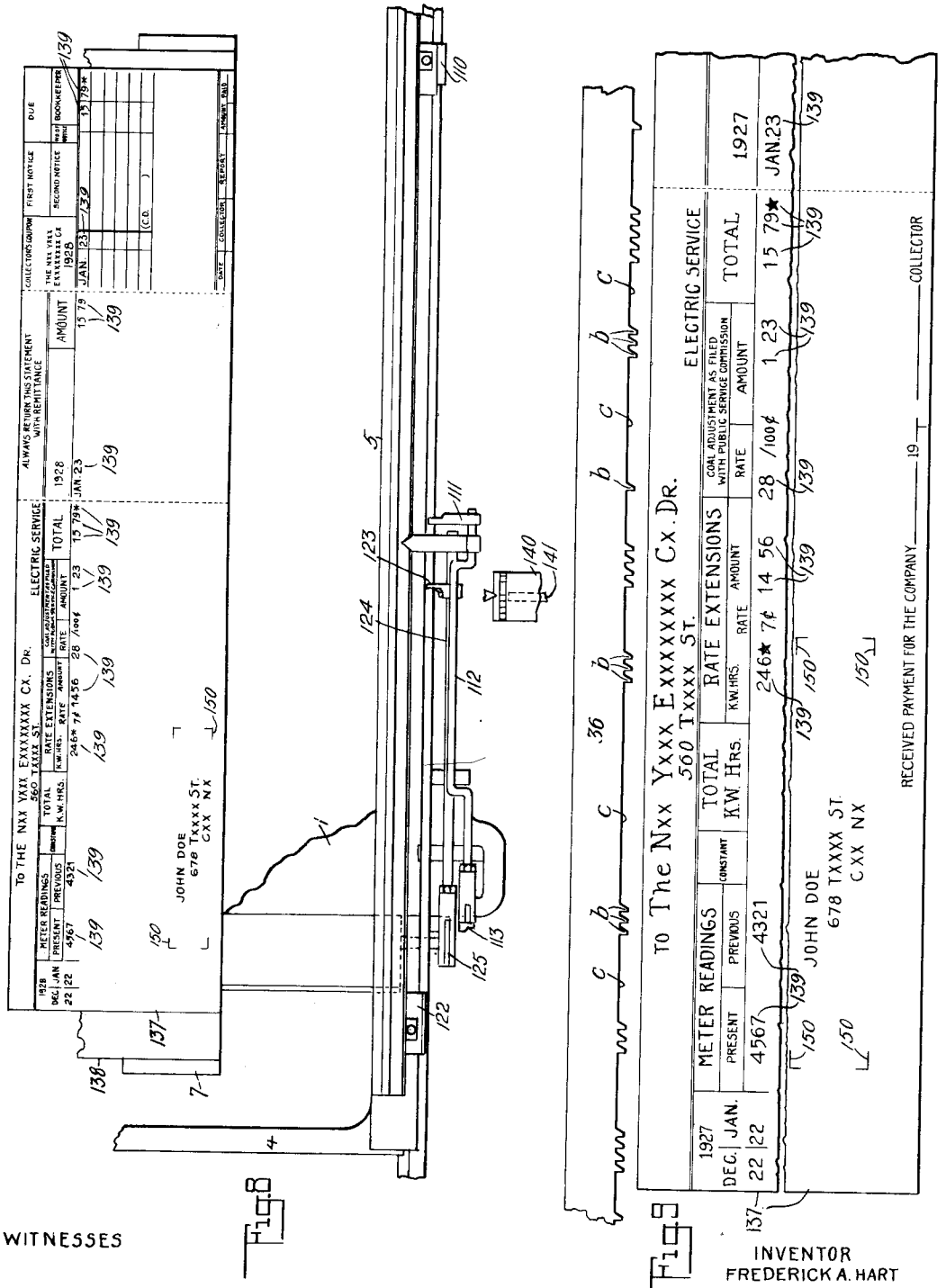


Fig 8

Fig 9

WITNESSES

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UNITED STATES PATENT OFFICE.

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TYPEWRITING MACHINE.

Application filed May 2, 1928. Serial No. 274,631.

My invention relates to typewriting or like machines and more particularly to machines including tabulating mechanism for automatically jufping the carriage from one columnar field to another, such, for example, as is disclosed in my application Sr. No. 242,423, filed December 24, 1927, on which the present invention is an improvement.

One of the main objects of the present invention is to extend the range of utility of a machine, such as is disclosed in my said prior application, by the provision of means operable at will to render and maintain the automatic tabulator ineffective in order that the machine may be rendered effective, in special circumstances, to write in positions on the bill sheet which ordinarily would be skipped by the operation of the automatic tabulator.

A further object of my invention is to attain the above mentioned ends without detracting from the capability of the machine to function in the usual manner under ordinary conditions of use.

To the above and other ends which will hereinafter appear, my present invention consists in the features of construction, arrangements of parts and combinations of devices set forth in the following description and particularly pointed out in the appended claims.

In the accompanying drawings wherein like reference characters designate corresponding parts in the different views:—

Fig. 1 is a fragmentary, rear elevation, with parts in section, of a typewriting machine equipped with the devices of my invention.

Fig. 2 is a fragmentary, vertical, fore and aft sectional view of the same, showing some of the parts at the rear of the machine.

Fig. 3 is an enlarged, detail, fore and aft vertical sectional view of a portion of the escapement and back-spacing mechanism and some of the associated parts.

Fig. 4 is a fragmentary, enlarged, detail, top plan view showing the cam bar, the auxiliary feed rack, and some of the associated parts.

Fig. 5 is an enlarged, detail, perspective view of the contact device on the auxiliary feed rack, which coacts with the cam bar.

Fig. 6 is an enlarged, detail, perspective view of the retaining device or bracket for the hand actuated lever by which the automatic tabulator is rendered effective or ineffective, as desired,

Fig. 7 is a left-hand side view of the machine with parts omitted, and showing more particularly the hand controlled means by which the automatic tabulator is rendered at will effective or ineffective, as well as parts for controlling the automatic return of the carriage.

Fig. 8 is a fragmentary, detail, top plan view showing in part a conventional representation of a portion of the carriage, some of the parts for effecting an automatic return of the carriage, and a bill sheet in position on the platen.

Fig. 9 represents a fragmentary part of one form of bill filled in with the aid of the machine together with the corresponding part of the mutilated feed rack properly positioned with relation thereto.

I have shown my invention embodied in the present instance, in a Remington front feed bookkeeping machine equipped with the power driven carriage return mechanism of my Patent No. 1,567,590, dated December 29, 1925. However I have shown only so much of said machine, thus equipped, as is necessary to arrive at an understanding of my invention in its embodiment therein.

More specifically stated, the present invention is embodied in a machine similar in many respects to the machine disclosed in my said application Sr. No. 242,423.

The features of the present invention may be readily included in machines of the character specified without materially modifying the structural features thereof as they now exist. While this is a desirable factor of the present invention, it should be understood, nevertheless, that the invention is not restricted to inclusion in such machines, but may be employed in typewriting machines generally, wherever found available.

The main frame of the machine comprises a top plate 1, corner posts 2 and a base 3. The usual carriage, comprising end bars 4, a front cross bar 5, and a rear cross bar 6, supports a platen 7 and is mounted front and rear in the usual manner on crossed rollers 8 to travel from side to side of the machine over the top plate 1.

The carriage is controlled for step-by-step letter space movement by feed dogs 9 and 10 which coact with an escapement wheel 11

fixedly secured to an escapement wheel shaft *a*. Operative connection between the escapement wheel and a back spacing wheel 12 is effected by a backing pawl 13, so that the escapement wheel and back spacing wheel turn together in the forward movement of the escapement wheel, but the back spacing wheel may be turned in the reverse direction independently of the escapement wheel. The back spacing wheel 12 is fixedly connected with a feed pinion 14 so that a reverse movement of the back spacing wheel by the back spacing devices, to be later described, will effect a step-by-step backward rotation of the feed pinion 14 and cause the carriage to be back spaced, whereas during the advance of the escapement wheel, such wheel, the back spacing wheel and the feed pinion will turn together to afford a step-by-step letter-feed advance of the carriage.

The escapement mechanism and back spacing devices thus far described are of the usual construction except that in the present instance the feed pinion 14 is considerably longer than that ordinarily employed, since it is intended to coact with two feed racks instead of one as is ordinarily the case.

The back spacing mechanism which controls the feed pinion is of the usual construction and includes the following devices:—

A back spacing key lever 15 has its key at the keyboard of the machine and is connected with a pull link 16. The upper end of said link is pivoted at 17 to an arm 18 on one end of a rock shaft 20. The opposite end of said rock shaft carries a second crank arm 21 connected at its end to one end of a push link 22. The other end of said push link is pivoted at 23 to a back spacing pawl 24, which in turn is pivoted at 25 on a pawl carrier 26. This pawl carrier is supported for pivotal movement around the axis of the escapement wheel shaft *a* and is limited in its movement to normal position under the action of its returning spring 27 by an adjustable screw stop 28. A depression of the back spacing key actuates the back spacing pawl 24 through the above described train of connections and turns the back spacing wheel 12 and feed pinion 14 back one letter space independently of the line spacing wheel, and this movement will be transmitted to the carriage in a manner which will hereinafter appear.

I prefer to employ a suitable spring detent to coact with the back-spacing wheel 12 in order always to assure its positioning in, and prevent its accidental displacement from, the position it should assume when at rest, that is to say, with two teeth thereof uppermost substantially as shown in Fig. 1, for purposes which will hereinafter more clearly appear. In the present instance I prefer to mount a detent roller 29 on ball bearings on an arm 30 pivoted at 31 on the arm 32 of a bracket which has its foot-piece secured by a screw 33 to an arm 34 of the escapement bracket. A spring 35, acting on the arm 30, causes the detent roller 29 to bear on and engage between the teeth of the back-spacing wheel and assure its proper positioning.

The means by which the carriage is automatically jumped from one columnar field to the next comprises a mutilated feed rack 36. This rack is made from materially heavier stock than ordinary feed racks in order that the teeth, some of which arrest the carriage in its tabulating movements, may be of sufficient thickness and strength to stand the strain to which they are subjected. Referring more particularly to Figs. 2 and 4, it will be seen that the rack 36 is secured near its ends by screws 37 to a cross bar 38 which is fixed to arms 39 pivoted at 40 to lugs 41 on the rear cross bar of the carriage. This manner of mounting the feed rack 36 is the same as the manner of mounting the ordinary feed rack usually employed in the machine. In addition to the screws 37 I employ a centrally located screw 42 having a circumferential shoulder or flange 43 and a rearward extension or pin 44. This screw is threaded into a tapped opening in the cross bar 38 and further secures the rack 36 to the cross bar 38, whereas, the pin-like extension 44 performs an an additional function, as will presently appear. A leaf spring 45 pulls down on the cross bar 38 and tends to maintain the rack 36 in its lowermost position and in mesh with the feed pinion 14. This feed rack is limited in its downward movement by an adjustable screw stop 46 which coacts at its lower end with a stop 47 on the carriage.

As shown in Fig. 1 the usual carriage releasing mechanism is employed, comprising a release key 48 controlling a lever, a rearwardly extending arm 49 of which underlies one end of the rack bar 36. On the depression of the release key the arm 49 will lift the rack 36 against the force of the spring 45 and disengage the rack from the feed pinion 14. In the operation of the construction as thus far described it will be understood that the carriage will receive a step-by-step letter feed advance at each printing operation as long as any of the teeth *b* of the mutilated rack 36 engage the feed pinion 14, but as soon as an untoothed portion *c* of the rack reaches the feed pinion the carriage will run free until the next approaching tooth *b* of the rack reaches the feed pinion and arrests the carriage. So on, the carriage may thus be successively letter spaced while writing a predetermined number of characters in one columnar field and then automatically tabulated to the next columnar field throughout the entire length of travel of the carriage from right to left, or throughout so much of such travel of the carriage as it may be deemed necessary

or desirable to have the automatic tabulating movement of the carriage occur in. It will be understood of course that in every instance the mutilated rack is cut to accord with the particular work to be performed on the machine, so far as the location, width and number of columns employed are concerned.

Automatic tabulation effected with the aid of mutilated racks have been used long prior to my present invention, but there are certain difficulties presented in the use thereof in certain circumstances which it is the purpose of the present invention to overcome. Thus, for example, the mutilated rack is cut so as to afford the writing of a definite number of, say, numerical characters in each column before automatically jumping the carriage to the next column. It sometimes occurs that it is necessary to write more than the allotted number of characters in some or all of such columns. Ordinarily this cannot be done inasmuch as there are no teeth in the rack to hold the carriage in position for writing such additional characters. I overcome this difficulty in the present construction and provide means by which any desired number of additional characters may be readily added in each column, or in as many columns as it may be found necessary or desirable to add one or more characters over the number provided for by the cutting of the rack teeth on the mutilated rack bar Such mechanism will now be described.

Parallel with and in the rear of the mutilated rack 36 I mount an auxiliary rack section or bar 50 having a full complement of teeth 51 throughout its length, or so much of it as may be intended for use. The teeth 51 are of the same pitch as the teeth *b* on the mutilated rack and each tooth *b* is in fore and aft register with a tooth 51 of the rack 50 when both racks mesh with the feed pinion, as shown in Fig. 2. The rack 50 is mounted on the carriage, preferably as shown, by securing it with the aid of screws 52 (Figs. 2 and 4) to two bracket arms 53, one located near each end of the rack 50 and extending upward and forward therefrom. Each bracket arm 53 is secured by a screw 54 (see Fig. 4) to a block 55 fixed by suitable means on a pivot rod 56. This rod turns in bearings 57 (see Fig. 4) each secured by its foot piece 58 with the aid of two screws 59 to the rear cross bar 6 of the carriage. Each screw 52 also fastens one end of a leaf spring 60 to the companion bracket arm 53. As shown in Fig. 2 these springs extend upward and forward and contact near their free ends with the underside of a cross rod 61 secured to the end plates of the platen frame and which constitutes part of the usual equipment. The force of the springs 60 is exerted, therefore, to force the feed rack 50 down to mesh with the feed pinion 14. The rack 50 is limited in its downward movement by the pin 44 (Fig. 2) which extends through an opening 62 in said rack and contacts with the upper wall of said opening when the parts are in the normal position, as indicated in Fig. 2. It will be understood that the pin and slot connection between the racks 36 and 50 not only limits the movement of the rack 50 to normal position but also causes the rack 50 to be lifted to releasing position with the rack 36 when the latter is released with the aid of the release key 48. But a further result is attained by this connection between the feed racks, in that it enables the rack 50 to be moved at any time into and out of engagement with the feed pinion by the automatically operating controlling means without displacing the rack 36 from normal, effective, position.

I will now describe the above mentioned automatically operating controlling means.

A cam bar 63 is provided with depending lugs 64 apertured to receive the reduced ends of pivot pins 65 and 66, as shown in Fig. 1. Each pivot pin is held by an associated screw 67 in a supporting standard 68, the foot piece 69 of which is apertured to receive a screw 70 or 71 usually provided in the machine for another purpose. Thus, the screw 70 also is employed to secure the escapement bracket 72 in place, whereas the screw 71 also is employed to secure the extension bracket 73 in place. The standards 68 are, therefore, held firmly on the top plate 1 of the machine under the heads of the screws 70 and 71. The cam bar 63 is thus mounted on the top plate of the machine parallel with and in the rear of the rack bar 50, and is adapted to receive a pivotal movement fore and aft of the machine around the axis of the pivot pins 65 and 66. This cam bar is returned to, and normally maintained in, its forward effective position, shown in Fig. 2, by a coiled spring 74 (see Figs. 1 and 4) which surrounds an outward extension on the pivot pin 66 and is anchored at one end, 75, to the associated standard 68, and at the opposite end, 76, is connected to the cam bar 63.

The length of the cam bar, the number, character and location of the cams thereon, &c. are determined by the character of the mutilated rack 36 and the number of columnar fields from which back spacing is to be effected, as will be better appreciated from what follows. As shown in the present instance the upper portion of the cam bar has a series of rack controlling cams each of which may be said to include an inclined face 77 and a dwell 78 on the upper side of the cam bar. The bar also has a second series of cams which may be termed cam-bar controlling cams, and each of which comprises an inclined face 79 and a dwell 80 on the front side of the cam bar. While the extent of inclined faces 77 of the various cams are uniform, or substantially so, the companion dwells 78 vary in length, depending on the extent of the muti-

lation *c* in the feed rack 36 with which each particular cam 77—78 is associated. The same is true of the cam 79, 80.

Referring more particularly to Figs. 1, 3 and 5, it will be seen that a contact device shown in detail in Fig. 5, and designated as a whole by the reference numeral 81, comprises a plate-like base 82 riveted at 83 to the rear side of the feed rack 50. A rearwardly extending block or projection 84 on the base plate overlies the upper edge of the cam bar 63 when the parts are in normal position, as shown in Fig. 2. An inclined cam face 85 on the left-hand end of the block, as the parts are viewed from the front of the machine, is adapted to coact with the inclined faces 77 on the cam bar as the carriage moves from right to left and lifts the feed rack 50 out of engagement with the feed pinion 14. After the feed rack 50 is thus lifted and the carriage is moving, the lower face 86 on the projection 84 rests on and rides along the companion dwell 78 on the cam, and thus holds the rack 50 out of engagement with the feed pinion until the abrupt drop 87 at the end of the cam is reached when the projection 84 will drop into a depression 88 in the cam bar, thus dropping the feed rack 50 into mesh with the feed pinion 14. This operation is repeated at each cam 77—78 so that the feed rack 50 is successively automatically raised and lowered as the carriage moves from right to left, establishing an intermeshing effective connection between the feed rack 50 and the pinion each time the rack is lowered, and breaking such effective connection each time the rack 50 is automatically raised.

The construction and relative arrangement of the parts are such that whenever the carriage has been automatically tabulated or jumped to a columnar field with the aid of the mutilated rack 36, the feed rack 50 will have been automatically dropped into engagement with the feed pinion 14 at about the completion of such tabulating movement. That is to say, this is true of each tabulated position from which it may at any time be found necessary or desirable to back space from the position of arrest one or more spaces, to add one or more characters or digits in advance of the normal position of arrest. This automatic engagement of the rack 50 with the feed pinion enables the reverse movement of the feed pinion, effected with the aid of the back spacing devices, to be transmitted to the carriage through said feed rack 50. It will be understood that a back spacing of the carriage could not be effected at this time through the mutilated rack, due to the fact that a mutilation *c* therein is adjacent to the feed pinion and there would be no teeth in said rack for the pinion to engage with for back spacing.

In order that the feed rack 50 may remain in engagement with the feed pinion during this back spacing movement of the carriage, and not be lifted out of such engagement by the cam bar, one of the cams 79—80 comes into play. Thus, the corner 89 of the projection 84 will coact with the adjacent inclined face 79 at the first part of the return motion of the carriage and cam the bar 63 rearward around its pivots 65 and 66 against the force of the spring 74 (as shown in Fig. 3) until the rear corner of the lower face 86 of the contact device reaches and rides on the companion dwell 80 of said cam. The contact device will continue to ride on the dwell 80 for the full width of the column in which such back spacing is to be effected. The effect of this is to automatically shift the cam bar to and maintain it in an ineffective position, where the cams 77—78 are out of cooperative relation with the faces 85 and 86 on the contact device 81, enabling the feed rack 50 to remain in engagement with the feed pinion during the back spring operation.

Should the carriage be returned or advanced by hand after depressing the carriage release key 48, this latter will lift the contact device 81 with the racks 36 and 50, carrying the contact device out of cooperative relation with the cam bar, so that the rack 50 will not be actuated thereby. Should the operator merely return the carriage without first depressing the carriage release key, then the cam bar 63 will be shifted to and held out of lifting engagement with the rack 50 by the action of the cams 79—80.

The machine in which I have shown my invention embodied includes power mechanism for automatically returning the carriage to the beginning of a line, such as is disclosed in my hereinbefore mentioned patent. In the present instance I have combined with such carriage return mechanism, means for automatically rendering the automatically operating controlling means for raising and lowering the feed rack bar 50 ineffective when said carriage return mechanism is rendered effective. This is to prevent undue wear, strain, and noise, and possible injury to the rack controlling mechanism and parts associated therewith. Such mechanism will now be described, it being understood that I have shown only so much of the carriage return mechanism as is necessary to arrive at an understanding of the features of my present invention in their cooperation therewith.

An electric motor 90 has a shaft 91 operatively connected to a bevel pinion 92 which meshes with a bevel gear 93. This gear turns freely on an upright shaft 94 and is provided with a hub having clutch teeth 95 forming one section of a two-part clutch. The other section 96 of the clutch carries teeth 97 adapted to engage with the teeth 95 and lock the two

sections to turn together. The clutch section 96 is mounted on a squared lower end portion of the shaft 94, so that such section is free to move up and down on the shaft but is fixed to turn therewith. An automatically controlled crank arm 98 extends at its free end into a circumferential groove 99 in clutch member 96 in order to slide said clutch member 96 up or down on the shaft 94 and thus close and open the clutch respectively. The crank arm 98 constitutes one arm of a bell crank lever mounted on a rock shaft 100, the other arm of the bell crank lever being indicated at 101. This latter arm is pivoted to a rod 102 which at its rear end extends into a housing 103 that contains a switch or circuit breaker which controls the circuit through the motor.

Said motor switch includes a spring arm 104 having a contact 105 and against which arm the rear end of the rod 102 bears to normally break the circuit. A second contact 106 is provided on an arm 107 and when the rock shaft 100 is rocked to close the clutch 95, 97, the rod 102 will be drawn forward, releasing the arm 104 and permitting the contact 105 to coact with the contact 106 to complete the circuit and start the motor. Motion is transmitted from the motor through the pinion 92, gear 93 and shaft 94 to a gear 108 fixed to the upper end of the shaft 94. The gear 108 meshes with a rack 109 fixed to the carriage and the carriage is thus returned to begin a new line. At about the time the carriage is returned the rock shaft 100 is automatically given a reverse rocking motion, thereby breaking the circuit and opening the clutch, leaving these parts in the Fig. 1 position.

The usual means are employed for controlling the rocking of the shaft 100, such means comprising, as shown in Figs. 7 and 8, an adjustable line stop or contact 110 on the carriage which, when the carriage is near the end of the line, coacts with a member 111 and shifts it and the parts controlled thereby, including the rod 112 on which the member 111 is mounted. The rod 112 is connected to an upright arm 113 fixed on a short shaft 114 that carries an arm 115 that projects towards the left. This arm 115 transmits downward motion to an upright link 116. Said link in turn actuates an arm 117 extending from below a housing 118 and controlling a latching mechanism contained within said housing. The release of said latching mechanism releases an arm 119 that is carried by the rock shaft 100 and projects through an opening 120 (see Fig. 1) in the rear of the housing. When the arm 119 is released a coiled spring 121 surrounding the rod 102 shifts said rod forward, thereby releasing the circuit controlling arm 104 to complete the circuit, at the same time closing the clutch 95, 97 and thus return the carriage.

As the carriage nears the end of its return movement a margin stop or contact 122 (Fig. 8) coacts with a member 123 carried by a rod 124 connected to an upright arm of a bell crank 125, which in turn is connected to a depending link 126. The lower end of the link 126 is connected to an arm 127 that projects out from the housing 118 and repositions the parts in the housing 118 that control the arm 119. The effect of this is to lower the arm 119, turn the rock shaft 100 clockwise, as viewed in Fig. 7, and lower the arm 98 at the opposite end of the shaft 100. This results in breaking the circuit and releasing the clutch 95, 97.

Now in order to throw the automatically operating rack lifting mechanism out of operation when the carriage return mechanism is rendered effective I provide the following connections:

A crank arm 128 is adjustably fixed on the rock shaft 100 with the aid of a set screw 129. The rear end of this arm carries a comparatively long pin 130 received in a slot 131 in the lower end of an upright link 132. The upper end of this link is slotted in a like manner at 133 to receive a pin 134 that projects laterally from an arm of a sheet metal bracket 135 secured by a screw 136 to the cam bar 63.

It will be understood that with this train of connections between the rock-shaft 100 and the cam bar, a rocking of said shaft in one direction to render the power actuated carriage return mechanism effective will result in the cam bar being shifted rearward around its pivots 65, 66 to an ineffective position where the cams on the bar are out of cooperative relation with the contact device 81. The parts are maintained in this condition until the return of the carriage has been about completed, when as hereinbefore pointed out, the rock shaft is automatically rocked in the opposite direction to disconnect the motor and break the circuit. When this occurs the arm 128 is elevated, and the spring 74 will return the cam bar to effective position, prepared to function during the forward travel of the carriage.

By reason of the pin and slot connection 133, 134 between the shaft 100 and the cam bar 63, the intermediate connections between these parts will not interfere with the automatic shifting of the cam bar out of effective position during the back spacing operation, even though the shaft 100 and parts fixedly connected therewith are in the Fig. 1 position, as they are at this time. Nor will such connections interfere with the automatic shifting of the cam bar to ineffective position should the carriage be returned to the right by hand without depressing the carriage release key 48.

The pin and slot connection 130, 131 at the lower end of the link prevents injury to or a blocking of the parts, and enables them to properly function if the cam bar 63 should

be held in the ineffective position by a cam dwell 80 at or about the time the rock shaft 100 is automatically actuated to raise the arm 128 from its lowered position to the position indicated in Fig. 1. In short, the pin and slot connections 130, 131 and 133, 134 enable the parts to properly coordinate and function under all possible conditions of use thus far described, and also to function under another condition yet to be described.

It will be understood that in the present instance the cutting of the mutilated rack and the cam bar has been made to accord with a bill sheet of the general character shown at 137 in Fig. 8. In each instance such cutting will be made to accord with the particular requirements encountered, it being further understood that the machine is usually employed to do work of a specific unvarying character in each establishment, or type of establishment, such as a public service corporation for making out bills and simultaneously making entries on ledger and register sheets for, say, gas or electricity, or both consumed by the customers. The register sheet which takes an accumulation of all entries and others not entered on the bill sheet, is indicated at 138.

In this bill there are assumed to be, say, sixteen columns some of which accord with the separated single teeth, or separated groups of teeth *b*, in the mutilated rack 36. Each of said teeth or groups of teeth determine how many characters or digits 139 may be written in each column controlled thereby without recourse to the back spacing mechanism. This is what is intended to be represented in Fig. 8, and it may be pointed out that this ordinarily takes care of the entries to be made in such columns. But it occasionally occurs that a higher number, higher than is taken care of by the mutilated rack teeth, is required in a given column or in each of the columns, say, for example, that the writing of a number of five digits or characters is required in each of columns three, four and seven (counting from the left) under the headings of "Present", "Previous", "Rate extension, K. W. S. Hrs.", instead of a number of four digits or characters, as provided for by the teeth of the mutilated rack. As each of these columns is arrived at by an automatic tabulation, the feed rack 50 is automatically dropped into mesh with the feed pinion. The operator may therefore backspace the carriage once which will bring the work sheet in a position where the writing of a number of five digits or characters instead of four may be started in the columnar field at the printing point. The operator proceeds to write the five digit number in this column, and as the digit or character of the lowest order is written the carriage will be automatically tabulated to bring the next columnar field to the printing point, and so on.

The single space separating columns one and two, and separating the dollars and cents in columns eight, ten, and eleven, for example, is attained with the aid of the ordinary space key.

From the foregoing it will be understood that the cam bar may be provided with the cams 77—78 and 79—80 situated at various points along the length thereof, and that the cam surfaces 78—80 may be of various lengths, all to accord with the particular requirements or work to be done, or the bill or other work sheet to be filled in. For example, in a given column, by reason of the character of the entry to be made therein, it may be unnecessary at any time to back space the carriage from the position to which the carriage is automatically jumped with the aid of the mutilated feed rack. If at this point the contact device 81 has reached the cam bar, then there may be provided at such point a dwell 78 on the cam bar which will prevent the auxiliary feed rack 50 from dropping down into mesh with the feed pinion. Therefore, at this point no intermittent backspacing of the carriage can be effected. Of course, this provision may be made at as many columnar positions of the carriage as may be required for the particular work in hand.

It will be understood, however, that no particular harm can result even if the auxiliary rack is dropped into mesh with the feed pinion at every columnar field to which the carriage may be automatically brought with the aid of the mutilated feed rack, even though there is never any necessity for back spacing from certain of the positions thus selected. The advantage of dropping the auxiliary feed rack into mesh with the feed pinion only at the points from which back spacing may be required, is to prevent unnecessary operations of the parts and to prevent the operator from back spacing the carriage in one or more columns in which no back spacing should be effected.

From the foregoing description it will be understood that I have provided means for automatically effecting a tabulating movement of the carriage from one columnar position to the next, together with back spacing means; that the cam bar and rack bar 50 constitute automatically operating controlling means for rendering the back spacing means effective when the carriage is in its tabulated position, and that such controlling means are rendered ineffective or inoperative when the power actuated carriage return mechanism is rendered effective. The means by which the proper denominational position to begin an entry in each column is obtained in the present construction, whether obtained with the aid of the automatic tabulator alone or in conjunction with the back spacing mechanism, is especially important in a combined typewriting and computing machine, such as

the present invention is shown embodied in, for the following reasons in addition to those which are made apparent from what has been hereinbefore pointed out.

While of course it is highly desirable to have the numbers in each column on the bill sheet, ledger sheet, and register sheet appear one above the other, with each digit appearing in its proper denominational position, it is absolutely necessary that the totalizer for each column to be added shall be positioned correctly in each denominational position of the number to be written and computed. This result is attained with assurance with the aid of the present construction. In Fig. 8 I have attempted to illustrate this with the aid of a single diagrammatically represented totalizer 140 connected with the carriage. This totalizer, as shown, has been automatically brought to a position relatively to the master wheel 141 where the wheel of the third order in said totalizer will be actuated when a numeral of that order is written in the tenth column under the heading "Amount".

Should the operator desire to write a number in this column containing four digits, the operator after this column has been automatically brought to the third denominational position, as shown, will back space the carriage once or one letter space. This not only will position the carriage where writing may begin in the tens of dollars position, but the totalizer for this column will have been back spaced with the carriage to a position where the wheel of the fourth order will be actuated at the first printing stroke of a numeral key, and so on.

The results thus far described can be attained with the aid of the machine disclosed in my prior application hereinbefore referred to. But there are at times difficulties presented in the use of such machine which it is the main purpose of the present invention to overcome, as will now be pointed out. For instance, it is occasionally, in special circumstances, necessary to make the machine operative, effective and useful to write in position on the bill sheet which ordinarily would be interfered with by the automatic tabulator. This will be more specifically exemplified by what follows.

Bills of the character illustrated herein are made out under different rates depending on, say, the kilowatt-hours monthly consumption. For example, the first 1000 kilowatt-hours, monthly consumption, would be at the rate of seven cents. The next 400 kilowatt-hours excess over 1000, monthly consumption, would be at the rate of six cents, whereas the next 800 kilowatt-hours over 1400, monthly consumption, would be at the rate of five cents, and so on. In certain localities the seven cent rate only would apply to, say, ninety-nine out of every one hundred customers. Therefore, the machine is arranged to automatically tabulate the carriage to skip from, say, the fourth to the seventh or "Rate extension, K. W. S. Hrs." column in order to at once enter the number of hours in this column under the seven cent rate which is the only rate billed under. However, occasionally it is necessary to bill under the six cent rate, and possibly under the five cent rate as well as under the six and seven cent rate. When such a case is met with, it is necessary to write in the total number of kilowatt-hours under separate indicated rates in the sixth column which ordinarily is skipped by the automatic tabulator. In order to attain this end (considering it merely as one use of the present improvements) I provide a hand-controlled member or lever 142 (Fig. 7), pivoted at 143 on a bracket 144 secured on the upper side of the housing 118.

This lever 142 extends fore and aft of the machine and is provided at its forward end with a finger piece 145 by which the lever may be manipulated. The forward end portion of the lever works in the slot 146 of a sheet metal guide and locking member 147, shown in detail in Fig. 6. One side wall of the slot 146 is cut away near the upper end thereof so as to provide a locking shoulder 148. The lever has a slight inherent spring pressure to the right at its forward end, so that when the forward end of the lever is shifted up past the shoulder 148 said end will spring to the right and overlie the shoulder, thus locking the lever and the parts controlled thereby against return movement. To release the lever thus locked it is merely necessary to force the forward end thereof to the left off the shoulder 148 and depress said end in the guide slot 146.

The rear end of the lever 142 overlies a pin 149 carried by and projecting laterally from the link 132. When the lever is shifted to and locked in the Fig. 7 position, this results in shifting the cam bar against the force of its spring 74 to the ineffective position where it will be maintained out of cooperative relation with the contact device 81. This will result in the auxiliary feed rack 50 remaining in the lowermost position indefinitely, or until such time as the lever 142 is released from its locked position to permit the cam bar to return to effective position. While the cam bar is thus locked in the ineffective position, the auxiliary feed rack 50 will function at any point in the travel of the carriage and the mutilated feed rack 36 will be ineffective to automatically tabulate the carriage whatever be the position of the latter.

It will be understood therefore that the carriage may be positioned and held at any of the points or columnar fields where ordinarily the carriage would receive a jumping operation and could not ordinarily be held. This enables the operator to fill in these col-

umns which are only occasionally used, and when the bill with such columns has been written the lever 142 may be restored to normal and the machine will function in the usual manner automatically tabulating in accordance with the cutting of the cam bar.

I have referred above, merely by way of example, to certain columns which ordinarily may be skipped, but are occasionally filled in by rendering the automatic tabulator ineffective. It should be understood that any desired number of such columnar fields may be skipped ordinarily, and that the position of such columnar fields may vary considerably, depending on the nature of the bill sheets employed.

Another example of the use of the present improvements for cutting out the automatic tabulating movements of the carriage is the following:—

It will be observed by referring to Fig. 9 that the bill sheet has a space enclosed by corner brackets 150 printed thereon. Ordinarily this space is filled in with the aid of an addressograph machine with the name and address of the customer to whom the bill is to be sent. Occasionally, however, it becomes necessary to fill in the name and address on the combined typewriting and computing machine on which the bill is made out. It will be seen, however, that there are several columns with automatic jumps from column to column in the field where the name and address is to appear. Therefore, it becomes necessary to switch the lever 142 to the Fig. 7 position which conditions the machine to write the name and address in the space between the brackets 150 without any interference from the automatic tabulating mechanism.

The present improvements therefore provide a wider range of uses for the machine of my said prior application and do not interfere with the uses which said machine was devised to perform.

In the particular bill disclosed herein the conditions are such that there is ordinarily an automatic tabulation to columns 3, 4, 7, 8, 9, 10, 11, 12, 13, 14, 16 respectively. There is necessity, at times, to back-space as many as two letter spaces in columns 4, 5 and at times to back-space as many as three letter spaces in columns 8, 9, 11, 12, 14 and 16. Of course it will be understood that these and other conditions will vary with the particular character of the bills to be filled in and that, moreover, the construction is such that any desired extent of back spacing may be effected in any column.

It should be understood that the totalizer equipment will be set or used where required, and that in writing within certain columns it is necessary to automatically disconnect the totalizer actuating mechanism. For this last mentioned purpose I prefer to use mechanism similar to that disclosed in my application Sr. No. 205,749, filed July 14, 1927.

I have hereinbefore indicated that the spring-pressed detent roller 29 coacts with the back spacing wheel 12. The purpose of this detent is to assure the proper positioning of the feed pinion 14 with two of its teeth uppermost and to assure the maintenance of said pinion against accidental displacement from such position when both racks 36 and 50 are out of mesh therewith. This is in order that in the automatic tabulating movement the first oncoming tooth of the mutilated rack 36 will properly coact with a tooth of the feed pinion located always in a given position and thus assure an arrest of the carriage in the proper denominational position where the arrest should occur.

In order to prevent interference with the cam bar 63 at that end thereof which projects beyond the left-hand side of the machine in the present instance, I prefer to employ a protecting guard or shield 151. This shield is preferably made from sheet metal and has its foot piece 152 secured by screws 153 to the bracket 73. This shield extends to the left slightly beyond the cam bar 63 and at its upper edge is bent forward at 154 to overlie the cam bar throughout that portion thereof which extends beyond the frame of the machine. The angular bend in the shield gives added strength and rigidity thereto.

By my present invention I have, by simple changes and additions to the machine of my application Sr. No. 242,423, made such machine available for a materially wider range of uses.

Various changes may be made in the constuction and certain features thereof may be employed without others, without departing from my invention as it is defined in the accompanying claims.

What I claim as new and desire to secure by Letters Patent, is:—

1. The combination of a carriage, means which include a mutilated feed rack and an intermeshing feed pinion for enabling the carriage to receive an automatic tabulating movement from one columnar position to another, back spacing means for effecting a step-by-step reverse movement of said feed pinion, an auxiliary feed rack, automatically operating controlling means for holding said auxiliary feed rack out of mesh with said feed pinion during the tabulating movement of the carriage and for bringing the auxiliary feed rack into mesh with the feed pinion at about the completion of the tabulating movement of the carriage, and hand actuated means operable at will for rendering and maintaining said automatically operating controlling means inoperative, there-

by permitting the auxiliary feed rack to remain in mesh with the feed pinion.

2. The combination of a carriage; means which include a mutilated feed rack and an intermeshing feed pinion for enabling the carriage to receive an automatic tabulating movement from one columnar position to another; back spacing means for effecting a step-by-step reverse movement of said feed pinion; an auxiliary feed rack; automatically operating controlling means for holding said auxiliary feed rack out of mesh with said feed pinion during the tabulating movement of the carriage and for bringing the auxiliary feed rack into mesh with the feed pinion at about the completion of the tabulating movement of the carriage, said controlling means comprising a cam and a cooperative engaging member, one carried by the carriage and the other carried by the frame of the machine, whereby said cam and engaging member will bring about an engagement or disengagement between said auxiliary rack and pinion, depending on the position of the carriage in its line of travel; and hand controlled means operable at will for effecting a relative displacement between said cam and engaging member to render one inoperative on the other during the travel of the carriage.

3. The combination of a carriage, a mutilated feed rack having teeth removed therefrom at a plurality of points in the length thereof, a cooperative feed pinion, the construction enabling the carriage to be automatically tabulated to the next columnar position whenever a mutilation in the feed rack reaches said feed pinion, means including back spacing mechanism for effecting a step-by-step back spacing movement of the carriage from any of a plurality of different columnar positions to which the carriage may be automatically tabulated, and hand controlled means operable at will for preventing an automatic tabulating movement of the carriage when a mutilation in the feed rack reaches the feed pinion.

4. The combination of a carriage; a mutilated feed rack having teeth removed therefrom at a plurality of points in the length thereof; a cooperative feed pinion, the construction enabling the carriage to be automatically tabulated to the next columnar position whenever a mutilation in the feed rack reaches said feed pinion; back spacing mechanism for effecting a step-by-step reverse movement of the feed pinion; an auxiliary feed rack; automatically operating controlling means for effecting an engagement between said auxiliary feed rack and feed pinion at each of the tabulated positions of the carriage from which it may be necessary or desirable to back space the carriage, whereby the reverse movement of the feed pinion may be transmitted through said auxiliary rack to the carriage at each of said tabulated positions of the carriage; and hand actuated means operable at will for rendering and maintaining inoperative or ineffective the said automatically operating means.

5. The combination of a carriage; a mutilated feed rack having teeth removed therefrom at a plurality of points in the length thereof; a cooperative feed pinion, the construction enabling the carriage to be automatically tabulated to the next columnar position whenever a mutilation in the feed rack reaches said feed pinion; back spacing mechanism for effecting a step-by-step reverse movement of the feed pinion; an auxiliary feed rack; automatically operating controlling means for effecting an engagement between said auxiliary feed rack and feed pinion at each of the tabulated positions of the carriage from which it may be necessary or desirable to back space the carriage, whereby the reverse movement of the feed pinion may be transmitted through said auxiliary rack to the carriage at each of said tabulated positions of the carriage, said automatically operating means comprising a series of cams on the frame of the machine and a contact device carried by said auxiliary rack and coacting with said cams to determine the points in the travel of the carriage where the auxiliary rack will be maintained out of mesh with the pinion and the points where such engagement may be effected; and hand controlled means operable at will for effecting a relative displacement between said cam and contact device for rendering and maintaining one ineffective on the other.

6. The combination of a carriage, means which include a mutilated feed rack and an intermeshing feed pinion for enabling the carriage to receive an automatic tabulating movement from one columnar position to another, an auxiliary feed rack, automatically operating means for engaging said auxiliary feed rack with and disengaging it from said feed pinion, and hand actuated means operable at will for rendering and maintaining inoperative said automatically operating means.

7. The combination of a carriage, means which include a mutilated feed rack and an intermeshing feed pinion for enabling the carriage to receive an automatic tabulating movement from one columnar position to another, an auxiliary feed rack, automatically operating means for holding the auxiliary feed rack disengaged from the feed pinion during the automatic tabulating movement of the carriage from one columnar position to the next and for re-engaging the auxiliary feed rack with said pinion when the said tabulating movement of the carriage has been completed, and hand controlled means operable at will for rendering said automatically operating means ineffective so that the auxiliary rack may remain in mesh with the feed

pinion indefinitely and automatic tabulation thereby eliminated.

8. The combination of a carriage, means which include a mutilated feed rack and an intermeshing feed pinion for enabling the carriage to receive an automatic tabulating movement from one columnar position to another, an auxiliary feed rack, automatically operating means for holding the auxiliary feed rack disengaged from the feed pinion during the automatic tabulating movement of the carriage from one columnar position to the next and for re-engaging the auxiliary feed rack with said pinion when the said tabulating movement of the carriage has been completed, said automatically operating means comprising a cam member and a contact device cooperative therewith one carried by the frame of the machine and the other by said auxiliary feed rack, and hand actuated means operable at will for rendering and maintaining indefinitely said cam member and contact device ineffective one on the other and thereby prevent an automatic tabulating movement of the carriage.

9. The combination of a carriage, means which include a mutilated feed rack and an intermeshing feed pinion for enabling the carriage to receive an automatic tabulating movement from one columnar position to another, back spacing means for effecting a step-by-step reverse movement of said feed pinion, an auxiliary feed rack, automatically operating controlling means for holding said auxiliary feed rack out of mesh with said feed pinion during the tabulating movement of the carriage and for bringing the auxiliary feed rack into mesh with the feed pinion at about the completion of the tabulating movement of the carriage, automatically operating means for rendering said controlling means ineffective during the back spacing operation, and hand actuated means operable at will for rendering and maintaining indefinitely said controlling means ineffective.

10. The combination of a carriage; means which include a mutilated feed rack and an intermeshing feed pinion for enabling the carriage to receive an automatic tabulating movement from one columnar position to another; back spacing means for effecting a step-by-step reverse movement of said feed pinion; an auxiliary feed rack; automatically operating controlling means for holding said auxiliary feed rack out of mesh with said feed pinion during the tabulating movement of the carriage and for bringing the auxiliary feed rack into mesh with the feed pinion at about the completion of the tabulating movement of the carriage, said controlling means comprising a cam and a cooperative engaging member, one carried by the carriage and the other carried by the frame of the machine, whereby said cam and engaging member will bring about an engagement or disengagement between said auxiliary rack and pinion depending on the position of the carriage in its line of travel; automatically operating means for rendering said cam and engaging member ineffective one on the other during the back spacing operation; and hand controlled means operable at will for rendering and maintaining indefinitely said cam and engaging member ineffective one on the other.

11. The combination of a carriage, a mutilated feed rack having teeth removed therefrom at a plurality of points in the length thereof, a cooperative feed pinion, the construction enabling the carriage to be automatically tabulated to the next columnar position whenever a mutilation in the feed rack reaches said feed pinion, back spacing mechanism for effecting a step-by-step reverse movement of the feed pinion, an auxiliary feed rack, automatically operating controlling means for effecting an engagement between said auxiliary feed rack and feed pinion at each of the tabulated positions of the carriage from which it may be necessary or desirable to back space the carriage, whereby the reverse movement of the feed pinion may be transmitted through said auxiliary rack to the carriage at each of said tabulated positions of the carriage, automatically operating means for rendering said controlling means ineffective during the back spacing of the carriage, and hand controlled means operable at will for rendering and maintaining indefinitely said controlling means ineffective.

12. The combination of a carriage, a mulilated feed rack having teeth removed therefrom at a plurality of points in the length thereof, a cooperative feed pinion, the construction enabling the carriage to be automatically tabulated to the next columnar position whenever a mutilation in the feed rack reaches said feed pinion, back spacing mechanism for effecting a step-by-step reverse movement of the feed pinion, an auxiliary feed rack, automatically operating controlling means for effecting an engagement between said auxiliary feed rack and feed pinion at each of the tabulated positions of the carriage from which it may be necessary or desirable to back space the carriage, whereby the reverse movement of the feed pinion may be transmitted through said auxiliary rack to the carriage at each of said tabulated positions of the carriage, said automatically operating means comprising a series of cams on the frame of the machine and a contact device carried by said auxiliary rack and coacting with said cams to determine the points in the travel of the carriage where the auxiliary rack will be maintained out of mesh with the pinion and the points where such engagement may be effected, automatically operating means for shifting said cams out of coop-

erative relation with said contact device during the back spacing of the carriage, and hand controlled means operable at will for rendering and maintaining indefinitely said controlling means ineffective.

13. The combination of a carriage, power actuated means for returning the carriage to begin a line of writing, automatically operating means for effecting a tabulating movement of the carriage from one columnar position to the next, back spacing means, automatically operating controlling means for rendering said back spacing mechanism effective when the carriage is in its tabulated position, automatically operating means actuated when the power actuated carriage returning means are rendered effective for rendering said controlling means ineffective, and hand controlled means operable at will for rendering and maintaining indefinitely said controlling means ineffective.

14. In a typewriting or like machine in which automatic tabulating is effected, the combination of a carriage, a feed pinion therefor, a mutilated feed rack cooperative with said feed pinion, an auxiliary feed rack having teeth at points corresponding to those where teeth are omitted from said mutilated feed rack, automatically operating controlling means for shifting said auxiliary feed rack into and out of mesh with said feed pinion, and hand controlled means operable at will for rendering and maintaining indefinitely said controlling means ineffective so that the auxiliary rack will remain in mesh with the feed pinion and automatic tabulation will be eliminated.

15. In a typewriting or like machine in which automatic tabulating is effected, the combination of a carriage, a feed pinion therefor, a mutilated feed rack cooperative with said feed pinion, an auxiliary feed rack having teeth at points corresponding to those where teeth are omitted from said mutilated feed rack, a cam for controlling the shifting of said auxiliary feed rack into and out of mesh with said feed pinion, and hand controlled means for locking and maintaining indefinitely said cam in ineffective position where it is out of cooperative relation with said auxilary feed rack, whereby the auxiliary feed rack may remain in mesh with the feed pinion and automatic tabulation with the aid of the mutilated feed rack is eliminated.

16. In a typewriting or like machine in which automatic tabulating is effected, the combination of a carriage, a feed pinion therefor, a mutilated feed rack cooperative with said feed pinion, back-spacing mechanism including a back-spacing wheel operatively connected with said feed pinion, and a spring-pressed detent coacting with said back-spacing wheel for assuring the positioning of the back-spacing wheel and feed pinion in and for preventing an accidental displacement thereof from the proper position they should assume when at rest.

17. In a typewriting or like machine, the combination of a carriage, automatic tabulating mechanism for jumping the carriage from one columnar field to the next including a cam bar which extends at one end beyond one side of the machine, and a guard or shield on the frame of the machine arranged adjacent to said cam bar at the projecting end thereof to prevent accidental interference with or damage to said cam bar.

Signed at Stamford, in the county of Fairfield and State of Connecticut, this 1st day of May, A. D. 1928.

FREDERICK A. HART.