Aug. 22, 1933. S. L. WALSOE 1,923,766

TYPEWRITING MACHINE

Filed Oct. 3, 1930 7 Sheets-Sheet 1

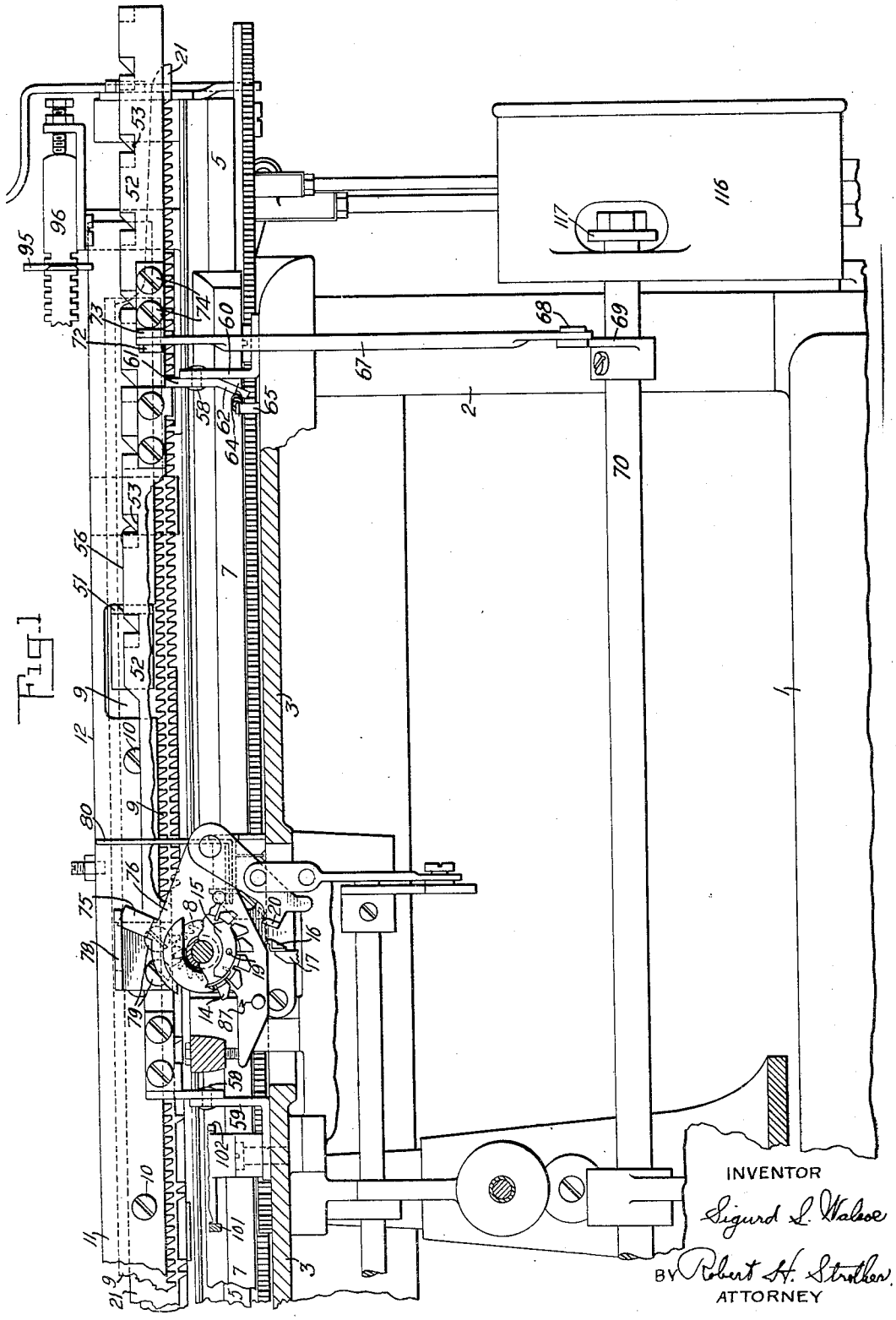


Fig. 1

INVENTOR
Sigurd L. Walsoe
BY Robert H. Strother
ATTORNEY

Aug. 22, 1933. S. L. WALSOE 1,923,766

TYPEWRITING MACHINE

Filed Oct. 3, 1930 7 Sheets-Sheet 2

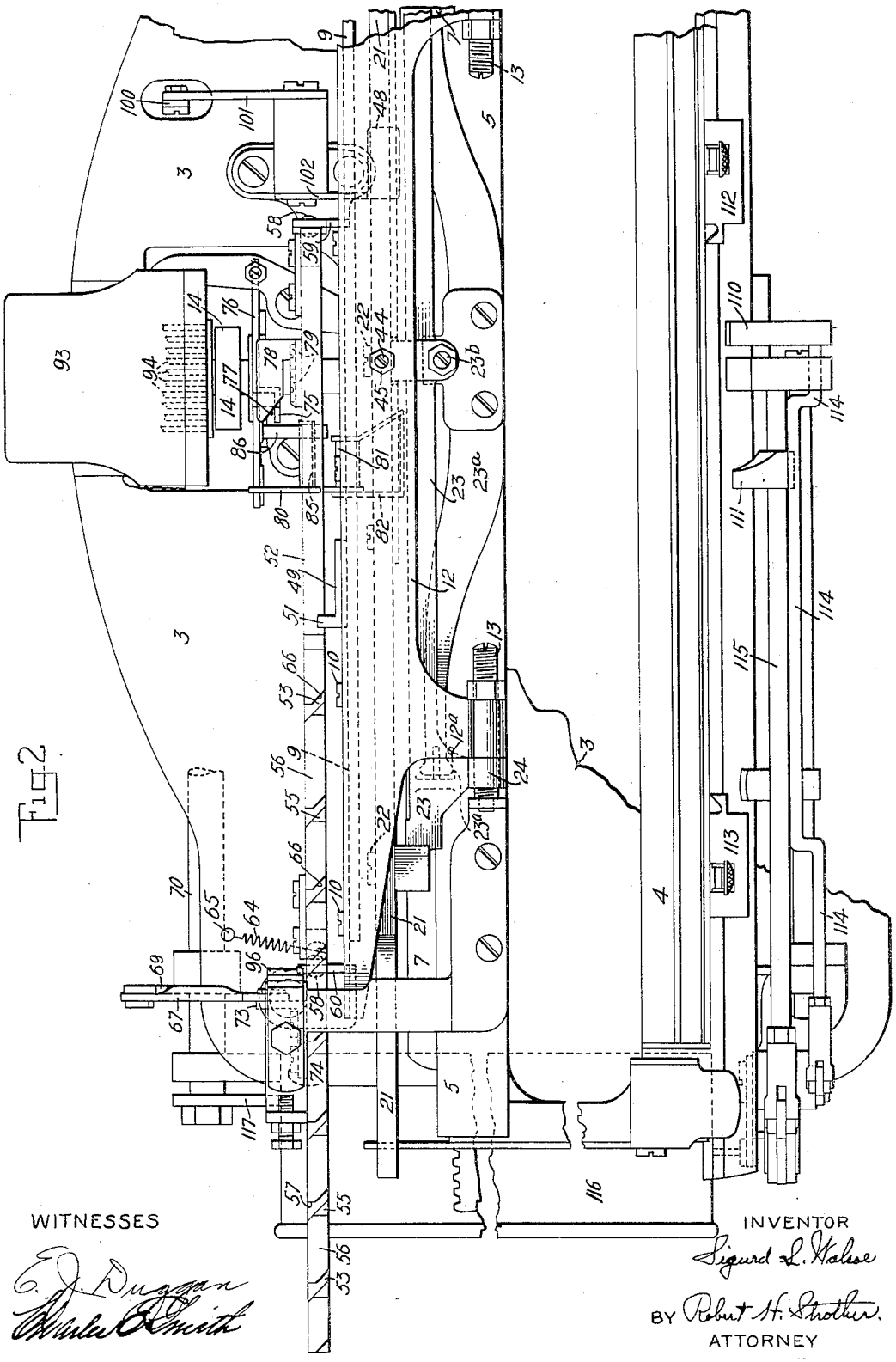


Fig 2

WITNESSES

E. J. Duggan

Walter A. Smith

INVENTOR

Sigurd L. Walsoe

BY Robert H. Strother

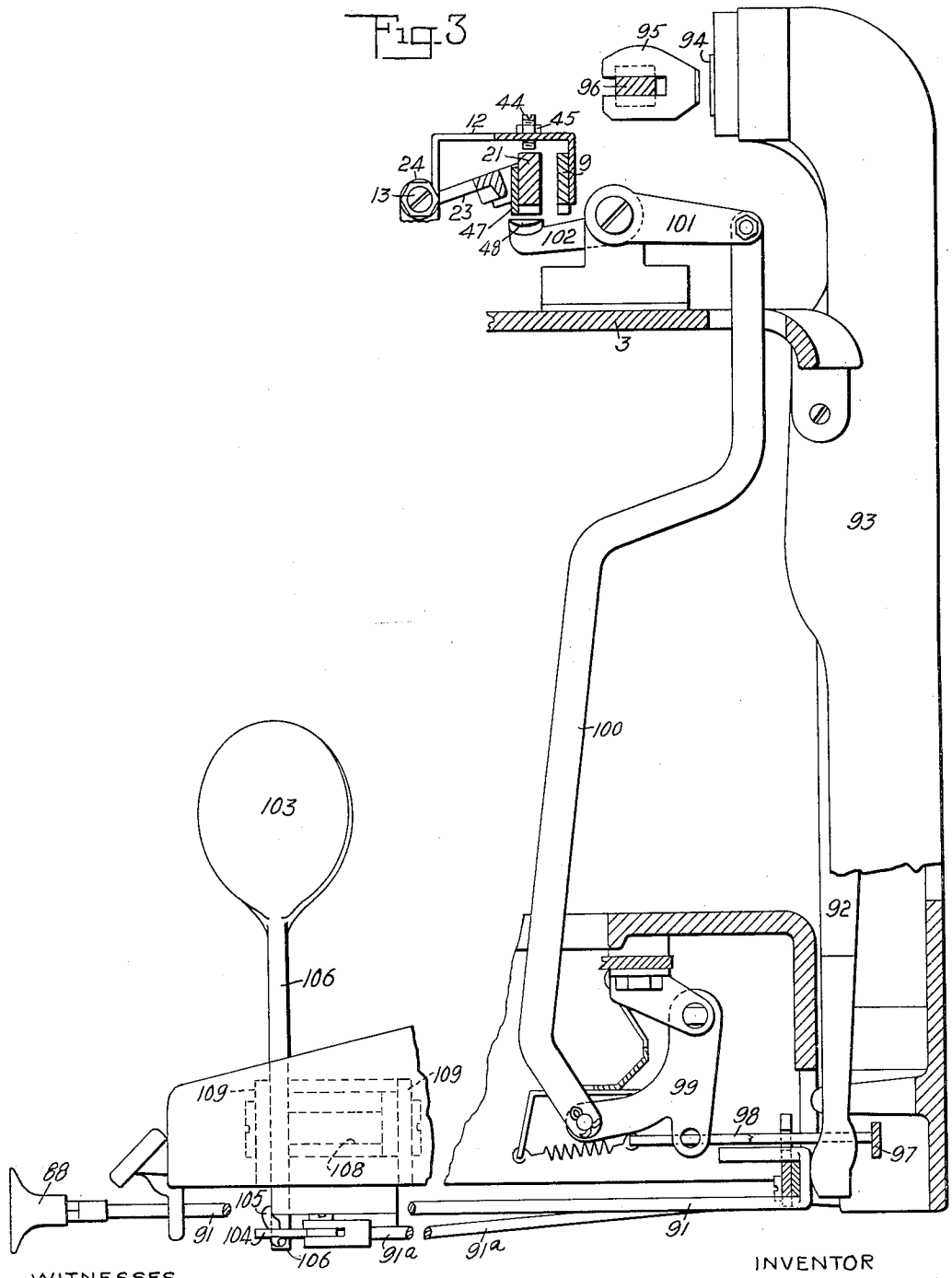
ATTORNEY

Aug. 22, 1933. S. L. WALSOE 1,923,766

TYPEWRITING MACHINE

Filed Oct. 3, 1930 7 Sheets-Sheet 3

Fig. 3



WITNESSES

E. J. Duggan

Wilda E. Smith

INVENTOR

Sigurd L. Walsoe

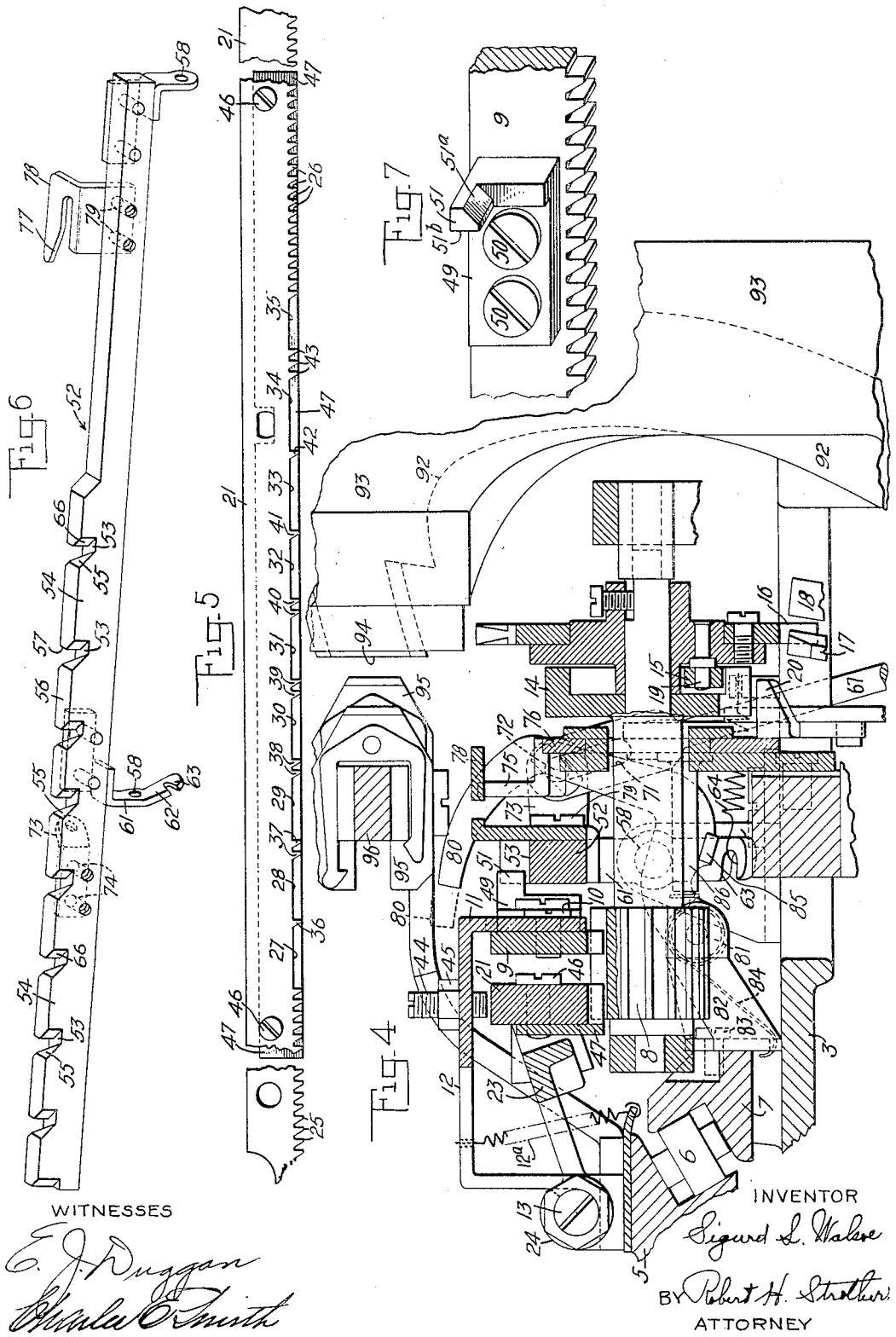
BY Robert H. Strother

ATTORNEY

Aug. 22, 1933. S. L. WALSOE 1,923,766

TYPEWRITING MACHINE

Filed Oct. 3, 1930 7 Sheets-Sheet 4



WITNESSES

E. J. Duggan

Stanley Smith

INVENTOR

Sigurd L. Walsoe

BY Robert H. Strother

ATTORNEY

Aug. 22, 1933. S. L. WALSOE 1,923,766

TYPEWRITING MACHINE

Filed Oct. 3, 1930 7 Sheets-Sheet 5

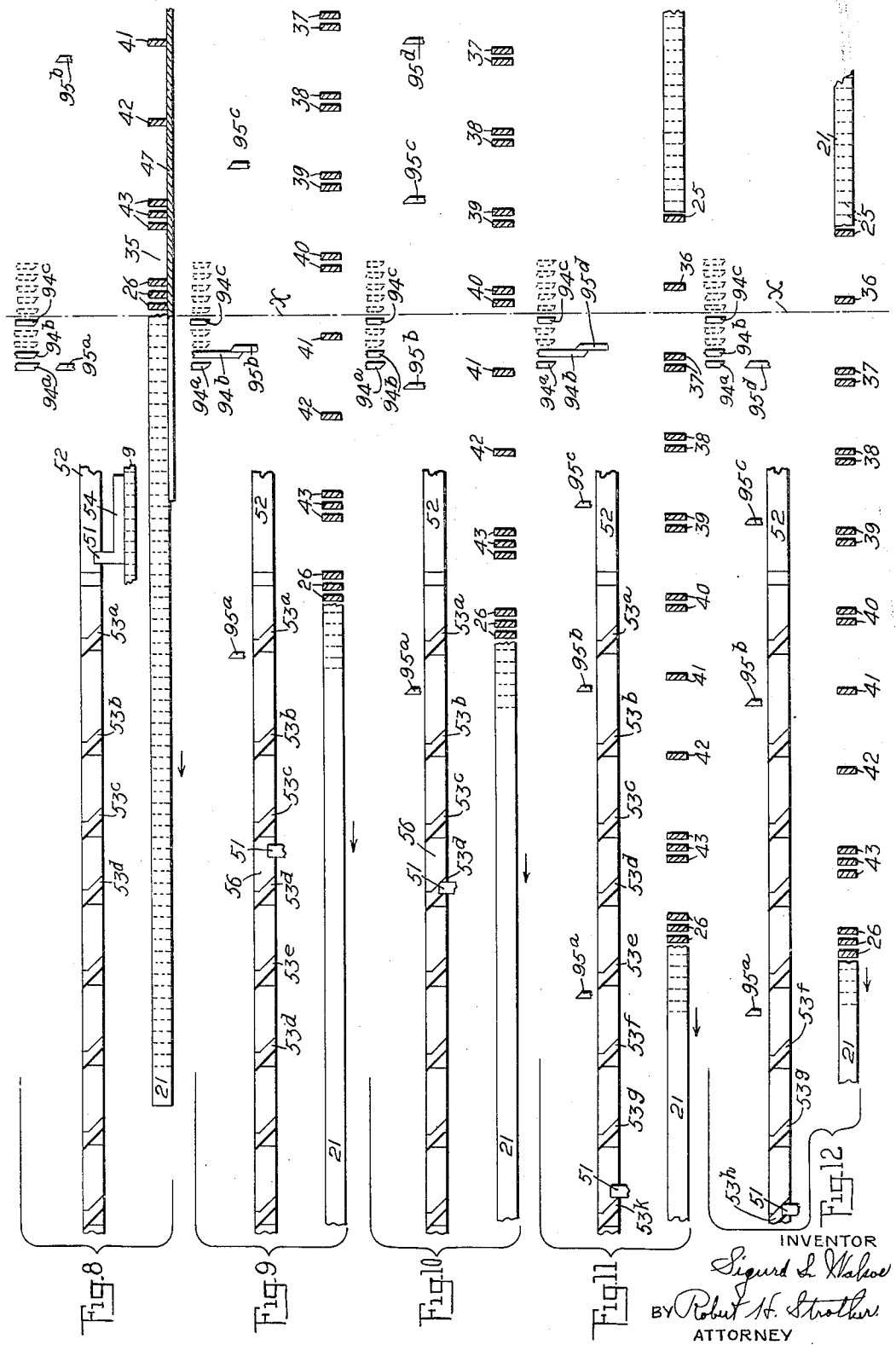


Fig. 8

Fig. 9

Fig. 10

Fig. 11

Fig. 12

INVENTOR
Sigurd L. Walsoe
BY Robert H. Strother
ATTORNEY

Aug. 22, 1933. S. L. WALSOE 1,923,766

TYPEWRITING MACHINE

Filed Oct. 3, 1930 7 Sheets-Sheet 6

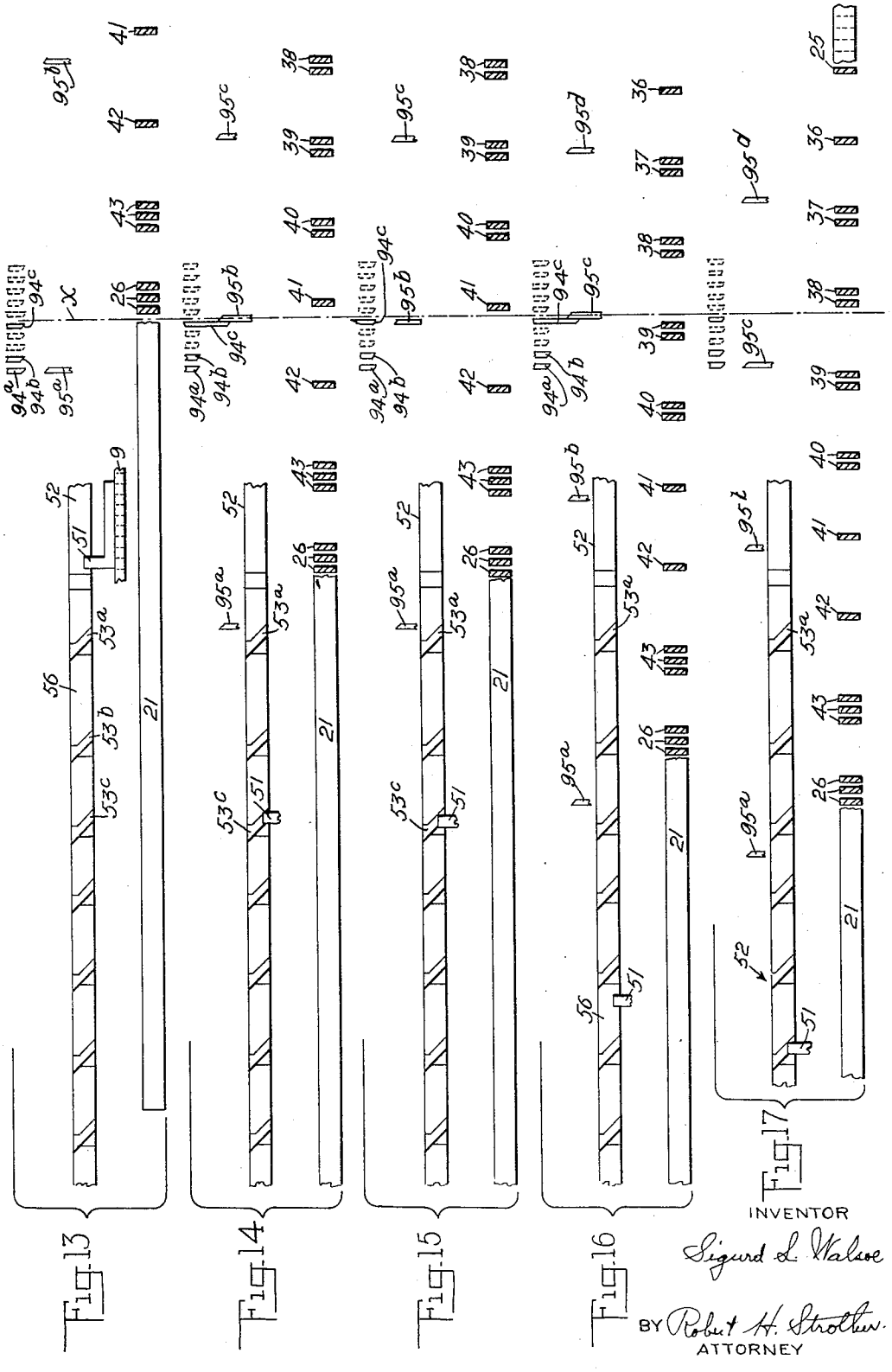


Fig. 13

Fig. 14

Fig. 15

Fig. 16

Fig. 17

INVENTOR

Sigurd L. Walsoe

BY Robert H. Strother.

ATTORNEY

Aug. 22, 1933. S. L. WALSOE 1,923,766

TYPEWRITING MACHINE

Filed Oct. 3, 1930 7 Sheets-Sheet 7

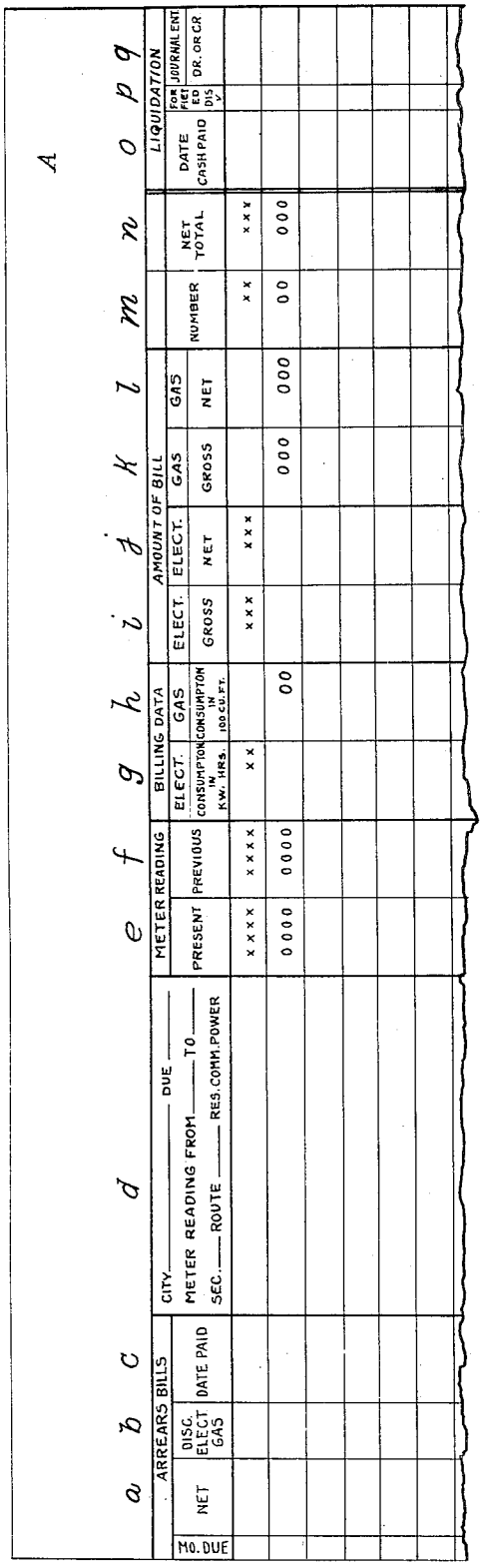


Fig. 18

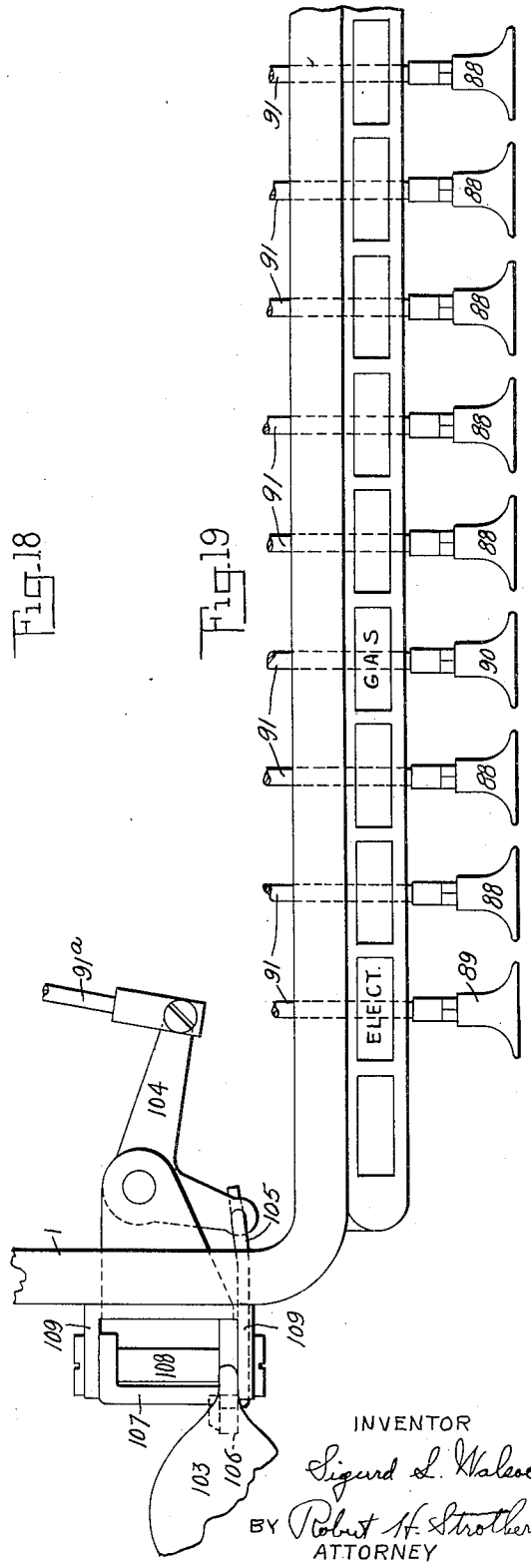


Fig. 19

INVENTOR
Sigurd L. Walsoe
BY Robert H. Strother,
ATTORNEY

Patented Aug. 22, 1933

1,923,766

UNITED STATES PATENT OFFICE

1,923,766

TYPEWRITING MACHINE

Sigurd L. Walsoe, Springdale, Conn., assignor to Remington Typewriter Company, Ilion, N. Y., a Corporation of New York

Application October 3, 1930. Serial No. 486,177

21 Claims. (Cl. 197—177)

My invention relates to typewriting and like machines, and more particularly to tabulating mechanism therefor.

The main object of my present invention, generally stated, is to provide means whereby one or more predetermined variations in the columnar positions of arrest of the carriage, not provided for by the automatic tabulator operating under normal conditions, may be attained without modifying the set-up of the machine in switching from one set of columnar positions of arrest to another.

To the above and other ends which will hereinafter appear my 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—

Fig. 1 is a fragmentary, rear elevation, with parts broken away and in section, of a combined typewriting and computing machine embodying my invention.

Fig. 2 is a fragmentary, top plan view of the same with parts broken away.

Fig. 3 is a detail side elevation, with parts in section, of the key controlled tabulating mechanism and some of the associated parts.

Fig. 4 is an enlarged, detail, vertical, fore and aft sectional view of the tabulating mechanisms, the carriage feed mechanism and some of the associated parts.

Fig. 5 is a detail, rear view of the mutilated feed rack.

Fig. 6 is a detail, perspective view of the cam or controlling bar as viewed from the front of the machine.

Fig. 7 is a detail, fragmentary, perspective view of the feed rack and the lifting abutment or cam carried thereby and which coacts with the cam bar, said feed rack and abutment being seen as viewed from the rear of the machine.

Figs. 8–12 inclusive are diagrammatic working views of parts of the structure which show successive tabulating steps for filling in bill forms that require entries relating alone to electricity.

Figs. 13–17 inclusive are like diagrammatic working views which show successive tabulating steps for filling in bill forms that require entries relating alone to gas.

Fig. 18 is a fragmentary, face view of a bill form that may be filled in on the machine for either gas and electricity, gas alone, or electricity alone, as may be desired, with the aid of the machine of my invention and without modifying the set-up disclosed in the drawings.

Fig. 19 is a full-sized, fragmentary, top plan view of the tabulator keys and associated parts.

I have embodied my invention in the present instance in a No. 23 Remington accounting machine equipped with the usual front feed billing mechanism, motor driven carriage return mechanism, etc., but have not shown some of the last mentioned features or the computing mechanism, and have illustrated only so much of said machine as is necessary to arrive at an understanding of my invention in its embodiment therein. It should be understood, however, that the devices of my invention are not restricted to use in such machine, but may be employed in typewriting and like machines generally, wherever found available.

The present invention is in the nature of an improvement on the machine disclosed in the patent to Frederick A. Hart, No. 1,710,685, dated April 30, 1929.

In said prior machine means are provided for automatically tabulating to successive columns of a bill form for filling in items on a combined gas and electric bill, for example. This same result may be performed on the machine of my present invention. However, it often occurs that the consumer uses only gas, or only electricity, and the same blank bill form is used in any of the three events mentioned, although only certain of the columns used in a combined electric light and gas bill are filled in when gas only is consumed and certain other columns of the combined bill are filled in when electricity only is consumed.

It is one of the main purposes of my present invention to provide means whereby the machine may be readily employed for tabulating and filling in at will the bill forms for any of the three conditions mentioned above without changing the set-up of the tabulator stops or other features of the machine, and in any one of the three instances mentioned different columnar positions of arrest will be automatically attained, at least in part, as will be hereinafter more fully explained.

In carrying out my invention in the present instance I provide a construction in which an actuation of one key will effect a tabulating operation and also result in bringing about, with the aid of automatic tabulating operations, a selection of one set of columns, and an actuation of another key will effect a tabulating operation and will also result in bringing about, with the aid of auto-

matic tabulating operations, a selection of another and different set of columns without changing the set-up of the tabulating mechanism, and without interfering with the use of the automatic tabulator under ordinary conditions in bringing about the selection of a third set of columns which include those of the first two sets.

Expressed from another point of view, the machine of my invention includes automatic tabulating mechanism whereby a predetermined set of columnar positions of arrest of the carriage may be automatically attained, and also includes key-controlled means by an actuation of each of the keys of which certain predetermined automatic tabulations may be eliminated and a skipping effected of certain columnar fields attained with the aid of the automatic tabulating means, thereby enabling the operator to tabulate to various predetermined columnar fields as determined by an automatic tabulating operation alone or by an operation of one or another of said keys in conjunction with the automatic tabulating mechanism. The foregoing described selection of one or another set of columnar fields is attained without changing the set-up of the machine and merely results, in the present instance, from the use of either of said keys or the non-use of either of them.

In order to carry out these results I embody the novel features of my present invention in a machine such as is disclosed in said Hart patent without modifying, or materially modifying, the existing structures thereof.

The frame of the machine comprises a base 1, corner post 2 and top plate 3. The carriage which supports a cylindrical platen (not shown) is mounted in the usual manner to travel from side-to-side of the machine over the top plate, being impelled in the direction of its feed by the usual spring drum, not shown. The carriage comprises a truck having front and rear cross bars 4 and 5, respectively, united by end bars. The cross bar 5 is grooved to receive crossed bearing rollers 6 that likewise are received and travel in a grooved guide rail secured to the top plate of the machine. The front cross bar 4 of the carriage is supported and guided in a like manner.

The step-by-step letter-feed movements of the carriage in the direction of its feed are controlled by carriage escapement mechanism which comprises a feed pinion 8 that is adapted to mesh with a feed rack 9 carried with the carriage and having a full complement of teeth throughout the effective length thereof. From an inspection of Figs. 2 and 4, it will be seen that the feed rack is connected by screws 10 to depending rear portion 11 of a frame 12 that in cross section has a substantially inverted U-shape. The forward arms of this frame are pivoted to the rear cross bar of the carriage on pivot screws 13 in order that the feed rack may have a pivotal movement into and out of mesh with the teeth of the feed pinion 8, being returned to and normally held in meshing engagement by a returning spring 12^a as shown in Fig. 4.

The feed pinion is operatively connected through the usual backing ratchet wheel 14 and pawl 15 (see Figs. 1 and 4) with an escapement wheel 16. This connection causes the escapement wheel and feed pinion to turn together in the step-by-step letter-feed advance of the carriage to the left under control of feed dogs 17 and 18, and enables the feed pinion 8 to turn independently of the escapement wheel in the return movement of the carriage to the right. The pawl 15 is pivoted at 19 on the escapement wheel, whereas the backing ratchet 14 also constitutes a back spacing wheel with peripheral teeth with which the usual key-controlled back spacing pawl 20 coacts for back spacing the carriage.

In addition to the feed rack 9, the carriage carries a second or mutilated tabulating rack 21, shown in detail in Fig. 5. This rack is secured by screws 22 to a second frame 23, pivoted by forwardly projecting lugs 24 to the rear cross bar 5 of the carriage on the pivot screws 13. A flat spring 23^a normally holds the frame depressed to a position limited by the usual stop 23^b, shown in Fig. 2. The teeth of this mutilated rack are adapted to mesh with the feed pinion 8, the latter being prolonged for this purpose.

From a consideration of Fig. 5 it will be seen that the mutilated tabulating rack 21 in the present instance has uninterrupted groups of teeth at opposite end portions thereof, as indicated at 25 and 26, whereas at various intervals intermediate these groups are cut-outs or mutilations 27, 28, 29, 30, 31, 32, 33, 34 and 35, leaving in the specific instance shown, one, two or three teeth, as indicated at 36, 37, 38, 39, 40, 41, 42 and 43, between adjacent mutilations. This is in order that when, during the feed of the carriage, a mutilation in the rack 21 reaches the feed pinion 8, the carriage may automatically receive a tabulating movement to the next columnar position, for at this time the feed rack 9 is out of engagement with the feed pinion as will presently more clearly appear. When the next on-coming tooth of the multilated rack reaches the feed pinion, the carriage will be arrested in position to make an entry in the column determined by the particular tooth in question. This, in accordance with the present showing, enables the operator to write two, three or four characters before the carriage jumps to bring the next-columnar field to the printing point.

From an inspection of Fig. 4 it will be seen that the frame 12 of the feed rack carries a stop or set screw 44 that is threaded therethrough and has a lock nut 45 for securing it in its adjusted position. The lower end of this screw extends to a point above the tabulating rack 21 so that when the latter is lifted and disengaged from the feed pinion 8, the feed rack 9 will likewise be disengaged from said pinion, although the feed rack may be lifted independently of the tabulating rack and the mutilated rack may be lowered independently of the feed rack.

Secured by screws 46 on the front side of the mutilated rack is a bar or plate 47. The lower edge of this plate extends to and terminates at the lower ends of the teeth of the mutilated rack and forward of the feed pinion 8. This is in order that the rack-lifting shoe 48 (see Fig. 3), when elevated, will come into contact with the lower edge of the plate 47 and lift the mutilated rack without entering the mutilations or cut-outs 28, 29 etc., in said rack.

It will be understood that after each automatic tabulating movement, the feed pinion 8 is contained within one of the cut-outs or mutilations 27, 28 etc., in the rack 21, with one of the teeth 36, 37, etc., bearing against the pinion and holding the carriage against further advancing movement. Ordinarily at this time a reverse or back spacing movement of the feed pinion 8 would merely result in turning said pinion in the cut-out in the rack 21 without effecting any backward movement of the carriage.

In order that back spacing of the carriage may

be effected from any tabulated position controlled by the mutilated rack, the same means that are disclosed in said Hart patent for this purpose are employed herein, and will now be briefly described.

As shown in Figs. 2, 4 and 7, a contact device or block 49 is secured by screws 50 to the rear side of the feed rack 9. This block has a rearwardly extending projection 51 that overlies and normally bears on a cam or controlling bar, designated as a whole by the reference numeral 52 and shown in detail in Fig. 6. This bar has a series of depressions 53 in the upper side thereof, one such depression being provided for each tabulated position of the carriage automatically attained with the aid of the mutilated rack 21. Intermediate each adjacent pair of depressions 53 is a cam member or projection 54 having a right-hand inclined face 55, an elongated dwell 56 at the top of the projection and an abrupt vertical face 57 at the left-hand side of the projection. It will be understood that the cam bar is mounted on the top plate of the machine and that the projection 51 traveling with the carriage rides along the top of said cam bar until it reaches a depression 53 and drops therein. This is at the instant that the carriage is arrested, after a tabulating movement, by one of the teeth of the mutilated rack. The effect of the projection 51 thus dropping into a depression 53 is to lower the feed rack 9 into mesh with the feed pinion 8, so that if the latter be back spaced at this time the carriage will likewise be back spaced. Such back spacing is sometimes required when, for instance, the entry in any column requires starting at any higher denominational position than is ordinarily required. Should a lower denominational position be required than that ordinarily provided for by the mutilated rack, then an operation of the usual space key will advance the carriage, say, one space from its position of arrest by the tabulator rack, although this is seldom required. In the use of the back spacer let us assume, for example, that the tabulator rack is so cut that in making an entry on the bill from A shown in Fig. 18, in the column under the caption "Elect. gross", the entry will start in the hundreds or third position, whereas the amount of the entry, occurring only occasionally, requires beginning the entiry in the fourth or thousands position. A single actuation of the back spacing key will properly space the carriage to receive the entry. And this is true of each column where such condition exists.

The carriage having been arrested by the automatic tabulating mechanism in the manner described, the operator proceeds to make the requisite entry in the column at the printing point and as soon as the entry is started the cam face 51a on the projection 51 will ride up on the adjacent cam face 55 on the cam bar 52, thus lifting the feed rack 9 and disengaging it from the feed pinion. This disengagement will be maintained by the projection 51 riding along the companion dwell 56 until the next automatic tabulated position has been reached, when the projection 51 will drop into the next depression 53 and again establish a meshing engagement of the feed rack 9 with the feed pinion as previously pointed out.

The cam bar 52 is pivoted at 58 on brackets 59 and 60 (see Fig. 1) secured to the top plate 3 of the machine. This enables a cam bar to receive a swinging movement fore and aft of the machine under conditions which will hereinafter appear. One of the bracket arms 61 secured to the cam bar, and by which it is pivotally mounted, is prolonged to provide an arm 62 that extends below its pivot 58 and terminates in a hook-like end 63 to which one end of a contractile returning spring 64 is connected, the other end of said spring being anchored on a pin 65 on the top plate. The force of the spring 64 is exerted to return the cam bar to normal position shown in Fig. 4, and to normally hold the bar in such position.

The right-hand wall of each depression 53 in the cam bar has at the forward position thereof an inclined cam face 66 with which the edge 51b (see Fig. 7) of the projection 51 is adapted to coact in a movement of the carriage to the right, and thus cam the bar 52 rearward out of the path of the projection 51 in the event that said bar is not moved by other means to be hereinafter described.

As in the construction disclosed in said Hart patent I employ link 67 (see Fig. 1) pivoted at its lower end, as at 68, to a crank arm 69 adjustably secured to a rock shaft 70 of the usual power actuated carriage return mechanism. The upper end of the link 67 is slotted at 71 (see Fig. 4) to receive a pin 72 carried by an arm of a bracket 73 secured by screws 74 to the rear side of the cam bar 52. This link 67 limits the forward movement of the cam bar under the force of its spring 64.

When an operation of the parts is initiated to effect a return of the carriage by the power actuated means, the shaft 70 is rocked, thereby pulling down the link 67 and moving the cam bar 52 rearward against the force of its spring 64 and out of cooperative relation with the projection 51. This renders the cam bar 52 ineffective to successively raise and lower the feed rack 9, as said bar does automatically during the forward movement of the carriage.

It has been found in practice that occasionally during a very rapid and vigorous actuation of the back spacing key, the edge 51b of the projection 51 in operating on the adjacent cam face 66 during a back spacing operation, lifts the projection 51 instead of merely camming the bar 52 to ineffective position. The result would be that no back spacing would occur, and if the operator failed to note this, an entry would be made in the wrong denominational position.

To overcome the above mentioned difficulty I have provided special means controlled by the back spacing device and acting directly on the cam bar 52 to move it into ineffective position, without relying on the cam faces 66 to attain this result.

Such means is best shown in Figs 1, 2, 4 and 6, and includes an actuating finger or projection 75 extending upward and off-set forward from a pivoted arm 76 to which the back spacing pawl 20 is pivoted. This finger 75, during each back spacing operation, coacts with a cam 77 on a bracket 78 secured by screws 79 to the rear side of the cam bar 52 above the pivots 58 thereof. The effect of this construction is to cam the bar 52 rearward out of cooperative relation with projection 51 by the direct operation of the back spacing mechanism on the cam bar 52, and there is an avoidance of any chance of lifting the feed rack out of mesh with the feed pinion during the back spacing operation. It will be understood that the cam bar 52 will be held out of effective position during each entire back spac-

ing operation, and will not be returned to effective position until the back spacing mechanism has been returned to normal position.

If at this time the projection 51 should be out of register with one of the depressions 53 in the cam bar no harm will result, since the forward solid portion of the cam bar intermediate two adjacent depressions 53 will bear against the rear end of the projection 51 and the cam bar will be held out of operative position until such time as a depression 53 registers with said projection.

In order to prevent the feed rack 9 from being accidentally forced upward during the back spacing operation, there is provided a locking arm 80 which is automatically moved upward from its normal full-line position, shown in Fig. 4, to a locking position where it will overlie the frame 12 of the feed rack 9 and prevent the latter and the mutilated rack 21 as well from being forced up out of mesh with its feed pinion during the back spacing operation. This result is attained by the following means. The arm 80 is formed with a hub 81 by which the arm is pivoted between the arms of a yoke-like bracket 82 secured by screws 83 to the rear fixed carriage rail 7. A spring 84 is coiled around the hub 81 and exerts its force to carry the free end of the arm 80 to the dotted line position shown in Fig. 4, where it overlies the frame 12 and prevents an upward pivotal movement thereof, thereby preventing a disengagement of the rack 9 and the rack 21 as well. In order to release the locking arm 80 there is carried thereby an off-set finger 85 which underlies a forwardly projecting pin 86 carried by the back-spacing pawl-carrying arm 76. When said arm is elevated during the back spacing operation, the pin 86 will move upward, thereby releasing the arm 80 and enabling it to be moved by its spring to locking position. When the back spacing key is released, the arm 76 will be returned to normal position by its spring 87 (Fig. 1) that is heavy enough to overcome the force of the spring 84 and return the clocking arm 80 to the normal position, shown in full lines in Fig. 4. This frees the racks 9 and 21 and maintains them free to be elevated out of cooperative relation with the feed pinion except when a back spacing operation is being actually effected, in order that at other times the said racks may be lifted by the releasing shoe 48, for example, as hereinbefore pointed out.

An important factor of the present invention resides in the provision of means, about to be described, when combined with features hereinbefore referred to, and which are operative to bring about a discontinuance in part of the operation of the automatic tabulating mechanism at one part or another of the travel of the carriage depending on the use of the machine for filling in bill forms for electricity alone, or gas alone, and depending on the actuation of a so-called electric key, or a so-called gas key.

Referring more particularly to Figs. 3 and 19 it will be observed that a tabulator is disclosed comprising a series of keys 88. In the indicating strip over one of these keys, shown at 89, I have placed the designation "Elect.", to indicate that this key is to be used when the tabulator is to be employed to fill in bill forms that are to contain items that relate to electricity and not to gas. Another of these keys, shown at 90, has the designation "Gas" on the indicating strips, to indicate that this key is to be employed in the event that the machine is to be used to fill in items in the bill forms that relate to gas and not to electricity.

Each of the keys 88, 89 and 90 is connected in the usual manner to a push rod 91, coacting at its rear end with a companion stop lever 92 pivoted intermediate its ends in a tabulator frame 93 and terminating at its upper end in a forwardly projecting stop 94. When one of said keys is pressed rearward, the corresponding stop 94 is projected forward into the path of a series of column stops 95 removably secured to, and adjustable to different positions along, a column stop bar 96 carried by the carriage. This same actuation of one of the tabulator keys carries a companion lever 92 against and actuates a universal bar 97 of the carriage releasing mechanism. This actuation of the universal bar 97 transmits motion through a sliding frame member or link 98 to an angular lever 99. Said lever is connected through a link 100 to a rearwardly extending arm 101 connected to the rack-lifting arm 102 that carries the shoe 48 at the forward end thereof. This operation results in lifting both racks 9 and 21, as hereinbefore described, and freeing the carriage from the control of the feed rack 9, the tabulating rack 21 and the escapement mechanism, allowing the carriage to run free in the direction of its feed until the first of the oncoming column stops 95 reaches the projected stop 94. After the carriage is thus arrested, the operator releases the actuated tabulator key and the racks 9 and 21 return to normal position prepared to function in the manner previously described to automatically effect a tabulating operation of the carriage after an entry has been completed in a column determined by the mutilated rack 21.

In the present instance I have selected what ordinarily corresponds to the units tabulator key for the "Elect," key 89, and have selected the key 90 which ordinarily is used for the thousands key as the "Gas" key. In addition I connect a palm tabulator key 103 to the push rod 91a that corresponds to that ordinarily employed for the decimal stop except that it is connected to the palm tabulator key 103 instead of to one of the ordinary push keys 88. This connection from the palm tabulator key to this push rod 91a is made through a bell crank lever 104 actuated through a push link 105 from the depending end of a lever 106 of which the key 103 forms part. Said lever 106 has a yoke-like part 107 that is formed integral therewith, and this yoke is received between and pivoted at 108 to the arms of a bracket 109 secured to the base 1 of the machine.

It will be understood that in setting up the machine in the first instance the column stops 95 must be set in a definite relation with reference to the automatic control by the rack 21 and the mutilations therein, as well as in definite relation to the particular stops 94 controlled by the keys 89 and 90 in cooperation with said column stops, as will hereinafter more clearly appear.

The operation of the machine, as it is brought about in the present instance by the particular cutting of the mutilated rack 21 and the corresponding cutting in cam bar 52, for use in filling in the bill form A shown in Fig. 18 under the varying conditions hereinbefore referred to, may be best understood by referring to the diagrams shown in Figs. 8 to 17 inclusive.

Figs. 8–12, inclusive, show different successive steps of parts of the structure when it is used for filling in items in the bill form that relate to electricity. This will be described first after

pointing out that the columns *a*, *b*, *c* and *d* in every instance may be brought to position to receive the entry of items with the aid of the palm tabulator key 103 and an appropriate setting of related column stops 95. This is true whether the bill form is to be filled in for gas and electricity, gas alone, or electricity alone. The same is true of columns *o*, *p* and *q* although it should be understood that the mutilated feed rack may, if desired, be specially cut to take care of these columns automatically, or some at least of them. It will be understood, moreover, that in filling in items in a bill form for both gas and electricity all of the columns *e* to *n*, inclusive, will be brought successively and automatically into position to receive the items in the main under control of the mutilated rack 21, and that an operation of the "Gas" key 90 and "Elect," key 89 is unnecessary.

Referring now to Figs. 8–12, inclusive, and to the control of the machine for filling in items relating to electricity, it will be seen that Fig. 8 shows the parts as they appear after having filled in items in column *d*, and after an actuation of the palm tabulator key 103 has been effected. The operation of the key 103 after filling in column *d* was effective to project the stop 94 controlled by said key into the path of the oncoming column stop 95^a, the column stops being progressively indicated in Figs. 8–17, inclusive, by the addition of exponents *a*, *b*, *c*, etc., to the reference numeral 95 in order that they may be clearly distinguished in their progressive steps. In a like manner the depressions 53 in the cam bar 52 have progressive alphabetical exponents *a*, *b*, *c*, etc., added to their reference numeral 53 in these views in order to clearly distinguish them, and the particular denominational stops 94 controlled by the palm tabulator key 103, by the electric key 89 and the gas key 90 are designated in these views by the reference characters 94^a, 94^b, 94^c, respectively, in order that they may be readily distinguished one from another. The dot and dash line *x* in these views indicates the center line of the feed pinion and approximately the position where the teeth of the mutilated rack are brought into contact with the feed pinion to arrest the carriage in its tabulating movements under control of said rack.

It will be seen, therefore, that an actuation of the palm tabulator key 103 after filling in the column *d* will leave the parts in the position shown in Fig. 8 ready to start writing the highest of the four digits indicated by *x*-marks in the column *e*. At this time the third from the last of the teeth 26 of the mutilated rack engages the feed pinion. This permits the writing of four digits in column *e*, and after the fourth or last digit is written the space 35 in the rack 21 reaches the feed pinion, permitting the carriage to automatically jump the required distance to start writing the highest of the four digits *x* in column *f*. A like automatic tabulating movement of the carriage is effected to bring the column *g* into position for writing the highest digit *x* after writing the last digit in column *f*. The entry of the two digits is made in column *g* and the carriage automatically jumps after writing the last digit to bring the gas column *h* to printing position. However, inasmuch as no entries are to be made for gas, the electric key 89 is pushed in, causing the mutilated and feed racks 21 and 9 respectively to be elevated to ineffective position where they do not operate to control the carriage, at the same time projecting the stop 94^b into the path of the column stop 95^b, thereby effecting an arrest of the carriage in this manner, as indicated in Fig. 9. When pressure on the actuated key 89 is released, the stop 94^b will be withdrawn and a further movement of the carriage will be effected, bringing the parts to the Fig. 10 position with the left-hand tooth 40 arrested by a feed pinion 8, it being understood that the release of the key 89 enables the mutilated rack to be lowered to effective position. The result of this operation of the electric key 89 was to bring about a jump of the carriage to clear the gas column *h* and effect an arrest of the carriage in position to bring writing in column *i*. Successive automatic jumps will occur from columns *i* to *j* and from columns *j* to *k* after writing the last digit in each of the two first mentioned columns. When the gas column *k* is reached, this and the next succeeding gas column *l* are to be skipped to bring the "Number" column *m* into position to receive an entry. To bring about this result the electric key 89 is pushed in, releasing the carriage from the control of the automatic tabulator rack 21 and arresting the carriage by the column stop 95^d, as shown in Fig. 11. When pressure on the key 89 is released, the stop 94^b is withdrawn from projected position, freeing the carriage from control thereof and again bringing the carriage under control of the now lowered mutilated rack 21. This results in a further advance of the carriage from the Fig. 11 to the Fig. 12 position where it is arrested by the tooth 36 of the rack 21 reaching the feed pinion, as indicated in Fig. 12. The act of making the two digit entry in this column automatically brings the "Net total" column *n* into position to receive a three digit entry. After this entry is completed the remaining columns may be filled in in any suitable manner.

From what has been pointed out above it will be understood that when a skipping of a gas column is produced by an actuation of the electric key 89, or a tabulating operation is effected by an actuation of the key 103, the projection 51 will be elevated out of cooperative relation with the cam bar 52 so that the latter is ineffective to function at this time and will remain ineffective until the actuated key 89 or 103 has been returned to normal position and the control of the carriage by the mutilated feed rack has been reestablished.

It also will be understood that it is immaterial whether or not the projection 51 is in register with a depression 53^a or 53^b, etc., in the cam bar when the carriage is arrested by either of the stops 94^a or 94^b, since at this time the said projection 51 is out of cooperative relation with the cam bar. If at the time in question the projection 51 is in register with a depression 53^a, 53^b, etc., said projection will enter such depression when the racks 9 and 21 are lowered to bring the carriage into control thereof. If the projection 51 is out of register with such a depression when the carriage is arrested by either of the stops 94^a or 94^b, as indicated in Figs. 9 and 11, then when the racks are lowered and the projected stop 94^a or 94^b is withdrawn, the carriage will continue to travel further to the left until arrested by the next on-coming tooth of the mutilated rack (36 in the instance disclosed in Fig. 11) collided with the feed pinion. During such movement of the carriage, the projection 51 will ride along on top of the coacting dwell 56 of the cam bar. When the on-coming tooth of the mutilated rack has thus been arrested, the projection 51 will be in register with a depression

53[a] or 53[b], etc., and the feed rack 9 will be lowered into mesh with the feed pinion prepared to bring about a back spacing of the carriage should the back spacing mechanism be actuated.

It is thought from the foregoing explanation given in connection with Figs. 8–12, inclusive, that an understanding of Figs. 13–17 will be readily arrived at. These last mentioned views show some of the same steps in the operation of the parts as those disclosed in the first mentioned figures, except that in Figs. 13–17 the control is by the gas key 90, instead of the electric key 89, the operation of the key 90 being effective to skip the columns where entries are required relating exclusively to electricity, and entries, as indicated by the "oo" in the second line of the bill form, are made in those columns which relate to gas. In other words, in one case (Figs. 8 to 12) all the columns except *h*, *k* and *l* may be filled in, whereas in the other case all columns except *g*, *i* and *j* may be filled in. It will be understood, of course, that in practice these two characters of entries, one for gas and the other for electricity, are not made on the same bill form, but on separate bill forms.

Summarizing the operation from a slightly different point of view, it will be understood that when any of the keys 89, 90 and 103 of the key controlled tabulator is actuated, the effect is to take the carriage out of control of the automatically operating tabulator mechanism comprising the mutilated feed rack 21 and place the carriage under control of the key controlled tabulator. When the key projected tabulator stop is withdrawn by the release of its key, the carriage is again restored to control of the automatically operating tabulator, or mutilated rack. In effecting such restoration it may occur in some instances, as shown in Figs. 14 and 15 for example, that the projection 51 will be located at one of the depressions in the cam bar 52, as indicated at 53[c] in these figures, when the projected key controlled tabulator stop is withdrawn. In such event there will be no, or substantially no, movement of the carriage in restoring it to control of the multilated feed rack, since one of the teeth of the lowered rack 21 is at, or substantially at, the feed pinion. At the same time the feed rack is lowered into mesh with the feed pinion, so that the back spacer is operative to function if necessary.

In other instances, however, as indicated in Figs. 9 and 10 the projection 51 will drop on a dwell 56 on the cam bar when the projected tabulator stop is withdrawn. In such event the mutilated rack 21 will be lowered, although the feed rack 9 will be maintained out of cooperative relation with the feed pinion. The carriage at this time being no longer held arrested by the projected key controlled tabulator stop will advance until arrested by the next on-coming tooth of the rack 21. When such arrest is effected, the projection 51 will reach the next depression in the cam bar, indicated in Fig. 10 at 53[d]. When this occurs said projection 51 will drop into such depression, enabling the feed rack 9 to reengage the feed pinion and enabling a back spacing operation to be effected, if desired.

It will be seen that every time the carriage is finally arrested in a tabulated position, whether such position be effected by the mutilated rack alone, by the key controlled tabulator alone, or by the combined use of the key controlled tabulator and the mutilated rack as pointed out above, the feed rack 9 will be reengaged with the feed pinion 8, so that a back spacing of the carriage may be effected from such position, if desired.

I have given a detailed description of one particular bill form which the construction was specificially devised, in the present instance, to be used in connection with. And I have given a detailed description of the operation of the machine in filling in such bill form under the three different conditions referred to. It should be understood, however, that various bill forms may be employed, and the machine in some respects is to be varied accordingly, and according to the special requirements in individual cases. For example, it may require varying cuttings of the rack 21 and cam bar 52 and varying adjustments of the column stops 95 to accord therewith, for different variations in the character of the bill forms to be used, and the varying requirements thereof. However, inasmuch as one organization is apt to send out the same character of bill form even though entries therein may vary as in the present instance, such special cutting, etc., is of no great moment, especially where a number of machines have their racks all cut in the same manner.

So far as the automatically controlled, power actuated, carriage return mechanism is concerned, it will be unnecessary for the purpose of the present invention to describe such mechanism in detail, and it is illustrated only in part as hereinbefore indicated. The computing mechanism likewise has not been illustrated, its disclosure being unnecessary for the purpose of the present invention.

Parts of the carriage return mechanism are shown in Fig. 2, wherein the usual contacts 110, 111 are operated on respectively by the carriage carried "stops" or contacts 112 and 112, respectively, to connect and start the motor at the end of the travel of the carriage from right to left, and for disconnecting and stopping the motor when the carriage arrives at the beginning of a line position in its return movement to the right.

The contacts 110, 111 are connected respectively to rods 114, 115, which, through intermediate devices, control means (not shown) contained within a control box 116 by which an arm 117 on the shaft 70 is controlled to rock said shaft and in turn control the clutch and motor starting and stopping means, not shown.

It will be seen that by the present invention I am enabled to effectively attain the results hereinbefore pointed out, and am enabled to embody the features of my said invention in the machine disclosed in said Hart patent without materially modifying any existing structural features included in said machine.

Various changes may be made in the construction, and some of the features thereof may be included 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, automatically operating tabulating mechanism therefor, a separate key controlled tabulating mechanism, and automatically operating means controlled thereby for rendering said automatically operating tabulating mechanism ineffective during the control of the carriage by said key controlled tabulating mechanism.

2. The combination of a carriage, automatically operating tabulating mechanism therefor, a separate key controlled tabulating mechanism including carriage arresting stops separate and

distinct from the automatically operating tabulating mechanism, and automatically operating means controlled by said key controlled tabulating mechanism for rendering said automatically operating tabulating mechanism ineffective during the control of the carriage by said key controlled tabulating mechanism and for automatically restoring the carriage to control of its automatically operating tabulating mechanism when the carriage is freed from control of the stops of said key controlled tabulating mechanism.

3. The combination of a carriage, automatically operating tabulating mechanism therefor, and means by which one or more predetermined variations in the columnar positions of arrest of the carriage not provided for by the automatic tabulating mechanism may be attained without modifying the set up of the machine, said last mentioned means including one or more key controlled stops operable to arrest the carriage independently of the said automatically operating tabulating mechanism.

4. The combination of a carriage, automatically operating tabulating mechanism therefor including a mutilated rack, tabulating mechanism including a key controlled stop for arresting the carriage, and means controlled by an actuation of the key of said key controlled stop for rendering the mutilated rack ineffective.

5. The combination of a carriage, automatically operating tabulating mechanism therefor including a mutilated rack, tabulating mechanism including a key controlled stop for arresting the carriage, and means for rendering the mutilated rack ineffective when said stop is projected by its key to arrest the carriage and for restoring the carriage to control of the mutilated rack when the stop is withdrawn from effective position.

6. The combination of a carriage, a feed rack therefor, a feed pinion cooperative with said feed rack, a mutilated tabulating rack cooperative with said feed pinion, automatically operating controlling means for maintaining said feed rack out of mesh with said feed pinion during the tabulating movements of the carriage under control of said mutilated rack and for re-establishing meshing engagement with the feed pinion when each tabulating movement of the carriage under control of the mutilated rack has been completed, a separate tabulator mechanism including a key controlled stop for arresting the carriage, and means controlled by an actuation of the key of said key controlled stop for rendering the mutilated rack ineffective and for disengaging said feed rack from the feed pinion, thereby taking the carriage out of control of the mutilated rack and placing it under control of the tabulator mechanism which includes the key controlled stop.

7. The combination of a carriage, a feed rack therefor, a feed pinion cooperative with said feed rack, a mutilated tabulating rack cooperative with said feed pinion, automatically operating controlling means for maintaining said feed rack out of mesh with the feed pinion during the tabulating movements of the carriage under control of said mutilated rack and for reestablishing meshing engagement with the feed pinion when each tabulating movement of the carriage under control of the mutilated rack has been completed, a separate tabulator mechanism including a key controlled stop for arresting the carriage, and means controlled by an actuation of the key of said key controlled stop for disengaging the feed rack from the feed pinion and throwing it out of control of its automatically operating controlling means and for rendering said mutilated rack ineffective.

8. The combination of a carriage, a feed rack therefor, a feed pinion cooperative with said feed rack, a mutilated tabulating rack cooperative with said feed pinion, automatically operating controlling means for maintaining said feed rack out of mesh with said feed pinion during the tabulating movements of the carriage under control of said mutilated rack and for reestablishing meshing engagement with the feed pinion when each tabulating movement of the carriage under control of the mutilated rack has been completed, a separate tabulator mechanism including a key controlled stop for arresting the carriage, and means controlled by an actuation of the key of said key controlled stop for disengaging the feed rack from the feed pinion and throwing it out of control of its automatically operating controlling means and for rendering said mutilated rack ineffective when said stop is projected to effective position and for rendering the mutilated rack effective and restoring the feed rack to control of its controlling means when said stop is withdrawn to ineffective position.

9. The combination of a carriage, automatically operating tabulating mechanism therefor, a separate key controlled tabulating mechanism, automatically operating means controlled thereby for rendering said automatically operating tabulating mechanism ineffective during the control of the carriage by said key controlled tabulating mechanism, and back spacing means for back spacing the carriage from any tabulated position whether such tabulated position be attained with the aid of the automatically operating tabulating mechanism or the key controlled tabulating mechanism.

10. The combination of a carriage, automatically operating tabulating mechanism therefor including a mutilated rack, key controlled tabulating mechanism including a key controlled stop, back spacing means, and automatically operating means for rendering said back spacing means effective at each tabulated position of arrest of the carriage whether such position be attained with the aid of the automatically operating tabulating mechanism or the key controlled tabulating mechanism.

11. The combination of a carriage, automatically operating tabulating mechanism therefor, key controlled tabulating mechanism, back spacing means, and automatically operating means for rendering said back spacing means effective at each tabulated position of arrest of the carriage whether such position be attained with the aid of the automatically operating tabulating mechanism alone, by the key controlled tabulating mechanism alone or by the conjoint operations of the automatically and key controlled tabulating mechanisms.

12. The combination of a carriage, a mutilated rack carried thereby, a feed pinion with which said rack cooperates, column stops carried by the carriage, a key controlled tabulator stop cooperative with said column stops, and means controlled by a projection of said key controlled tabulator stop into cooperative relation with said column stops for moving said mutilated rack out of cooperative relation with the feed pinion.

13. The combination of a carriage, a mutilated rack carried thereby, arresting means with which

said mutilated rack coacts, a plurality of individually adjustable and detachable column stops carried by the carriage, a key controlled tabulator stop cooperative with said column stops, and means controlled by an actuation of the key of said key controlled stop for moving said mutilated rack out of cooperative relation with its coacting arresting means.

14. The combination of a carriage, a mutilated tabulator rack and a feed rack carried thereby, a feed pinion with which both of said racks coact, a cam bar for automatically controlling the movement of said feed rack into and out of mesh with said feed pinion, a column stop carried by and adjustable on the carriage, a key controlled tabulator stop cooperative with said column stop, and means controlled by the projecting of said key controlled stop to effective position for moving both of said racks out of cooperative relation with the feed pinion and for moving the feed rack out of cooperative relation with said cam bar.

15. The combination of a carriage, automatically operating tabulating means including a mutilated tabulator rack for automatically affording tabulating movements of the carriage to different columnar positions, and key controlled tabulator stop mechanism operable at will for skipping certain of the columnar positions ordinarily attained automatically with the aid of said mutilated rack and including means controlled by an actuation of said key controlled tabulator mechanism for rendering said mutilated rack ineffective to arrest the carriage while it is under control of the key controlled tabulator mechanism.

16. The combination of a carriage, automatically operating tabulating means including a mutilated tabulator rack for automatically affording tabulating movements of the carriage to different columnar positions, key controlled tabulator stop mechanism operable at will for skipping certain of the columnar positions ordinarily attained automatically with the aid of said mutilated rack and including means controlled by an actuation of said key controlled tabulator mechanism for rendering said mutilated rack ineffective to arrest the carriage while it is under control of the key controlled tabulator mechanism, back spacing means, and automatically operating means for rendering said back spacing means effective at each tabulated position of the carriage whether such position be attained by the mutilated feed rack alone or with the aid of the key controlled tabulator mechanism.

17. The combination of a carriage, a mutilated tabulator rack and a feed rack carried thereby, a feed pinion with which both of said racks coact, a cam bar, means on the feed rack which coact with said cam bar to lift the feed rack out of mesh with the feed pinion during the tabulating movements of the carriage determined by said mutilated rack and for restoring the feed rack into mesh with the feed pinion when a tabulated position of arrest by the mutilated rack has been reached, back spacing means for effecting the back spacing movements of the feed pinion and the carriage controlled thereby, a column stop carried by the carriage, a cooperative key projected tabulator stop, means controlled by an actuation of the key of said key projected stop for moving the mutilated rack out of cooperative relation with the feed pinion, and intermediate operative connections between said mutilated rack and the feed rack for disengaging the latter from the feed pinion and maintaining it out of cooperative relation with said cam bar when the mutilated rack is moved out of cooperative relation with the feed pinion.

18. The combination of a carriage, a mutilated tabulator rack and a feed rack carried thereby, a feed pinion with which both of said racks coact, a cam bar, means on the feed rack which coact with said cam bar to lift the feed rack out of mesh with the feed pinion during the tabulating movements of the carriage determined by said mutilated rack and for restoring the feed rack into mesh with the feed pinion when a tabulated position of arrest by the mutilated rack has been reached, back spacing means for effecting a back spacing movement of the feed pinion and the carriage controlled thereby, and automatically operating locking means actuated at each back spacing operation for locking both of said racks against movement from effective position.

19. The combination of a carriage, automatically operating tabulating mechanism therefor including a mutilated rack, a feed rack for the carriage, automatically operating controlling means for rendering said feed rack ineffective during the tabulating movements of the carriage under control of said mutilated rack and for rendering said feed rack effective at the end of each of said tabulating movements, back spacing means, and means controlled directly thereby and operating directly on said controlling means for rendering them ineffective during the back spacing operation.

20. The combination of a carriage, automatically operating tabulating mechanism therefor including a mutilated rack, a feed rack for the carriage, automatically operating controlling means for rendering said feed rack ineffective during the tabulating movements of the carriage under control of said mutilated rack and for rendering said feed rack effective at the end of each of such tabulating movements, said controlling means comprising a cam bar for controlling the movements of said feed rack into and out of operative position, back spacing means, and means controlled directly thereby and operating directly on said cam bar for shifting it to inoperative position during the back spacing operation and for affording a movement of the cam bar to operative position when the back spacing means return to normal position.

21. The combination of a carriage, automatically operating tabulating mechanism therefor, and key controlled tabulating mechanism including means for taking the carriage out of control of said automatically operating tabulating mechanism and placing it under control of said key controlled tabular mechanism on the depression of a key of the latter and for reestablishing the control of the carriage to the automatically operating tabulating mechanism when the actuated tabulator key is restored to normal position.

SIGURD L. WALSOE.