

Aug. 16, 1932.

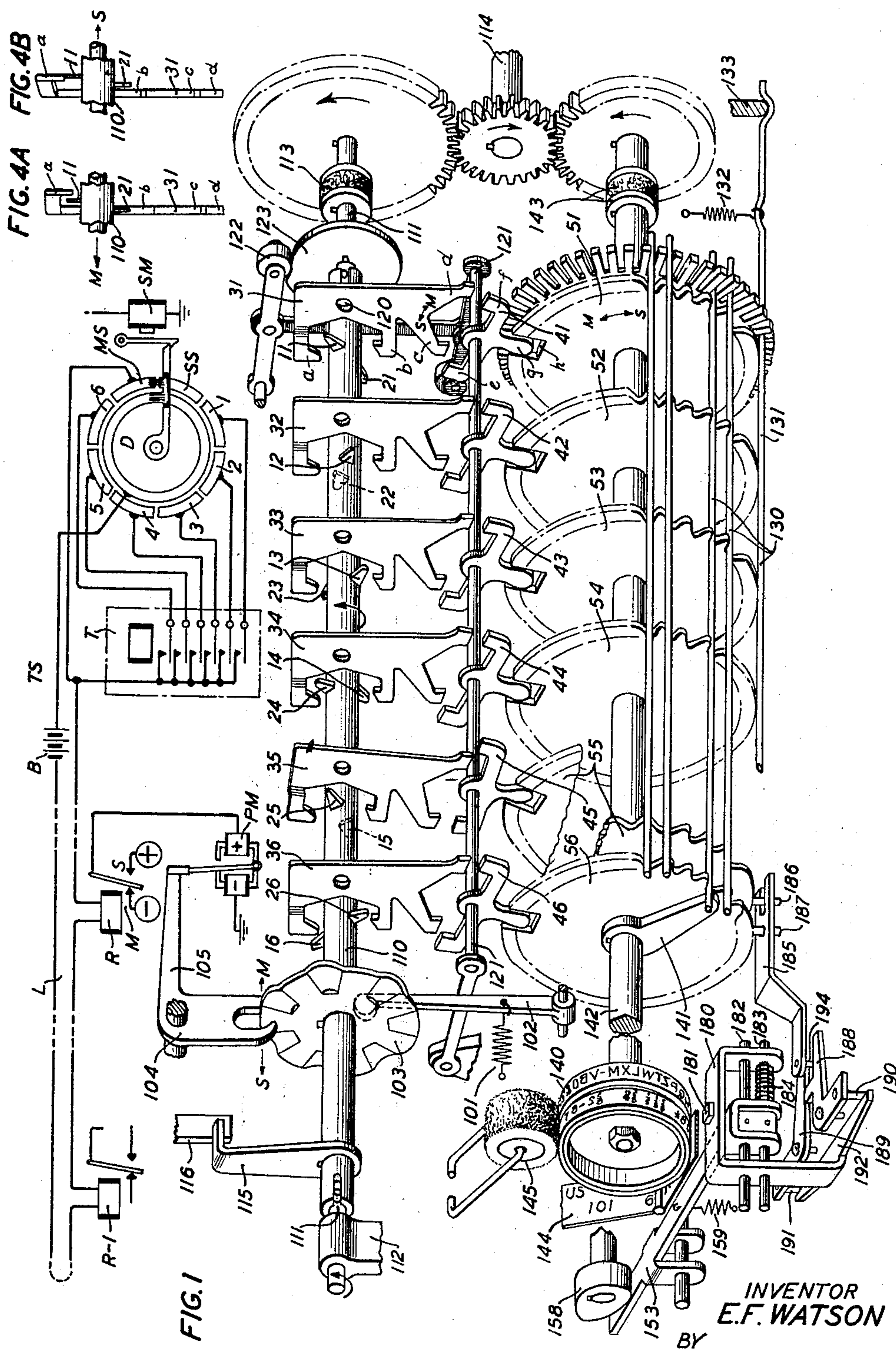
E. F. WATSON

1,871,933

TELEGRAPH PRINTER

Filed Sept. 1, 1931

2 Sheets-Sheet 1



Aug. 16, 1932.

E. F. WATSON

1,871,933

TELEGRAPH PRINTER

Filed Sept. 1, 1931

2 Sheets-Sheet 2

FIG. 2A

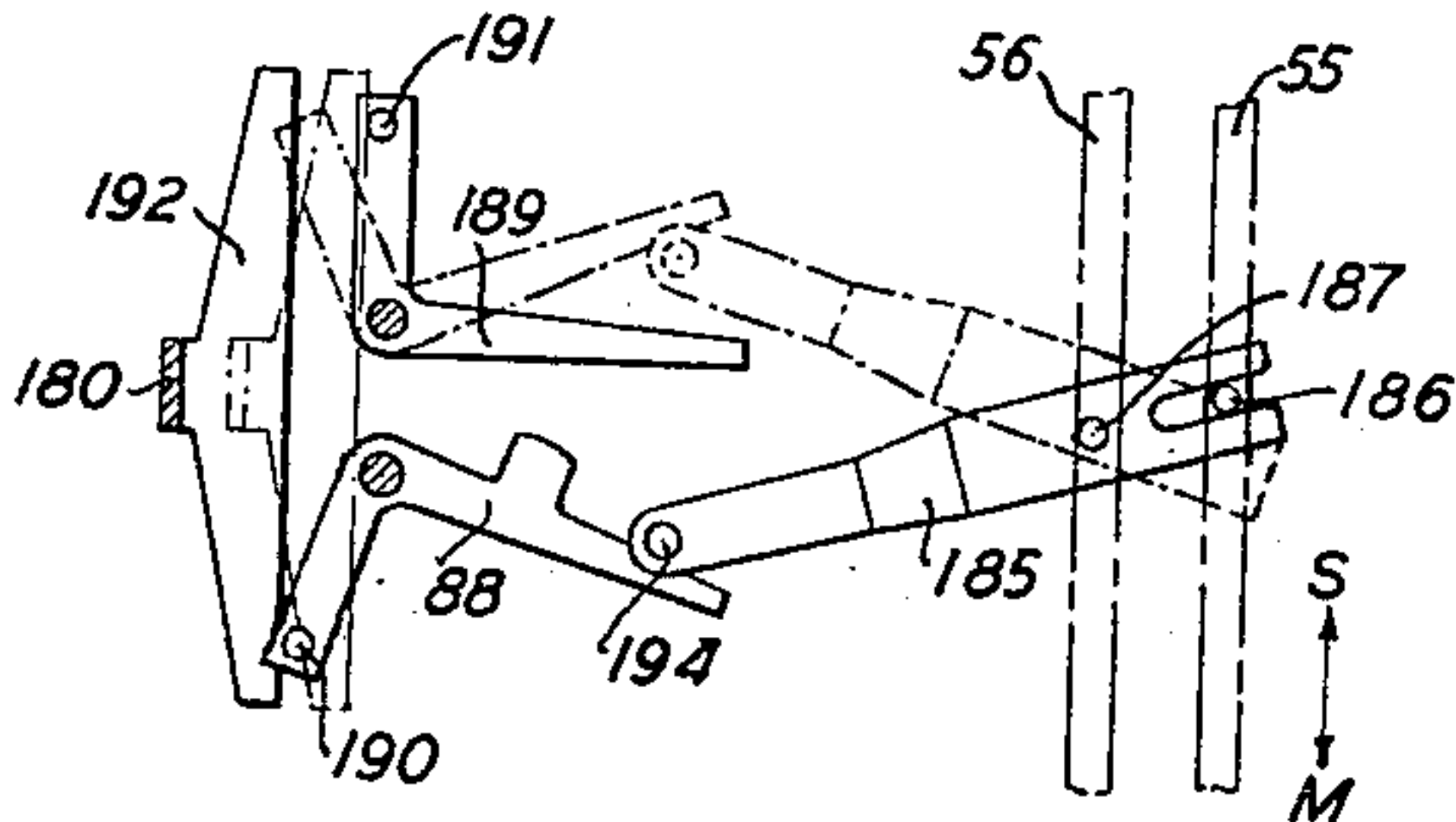


FIG. 2B

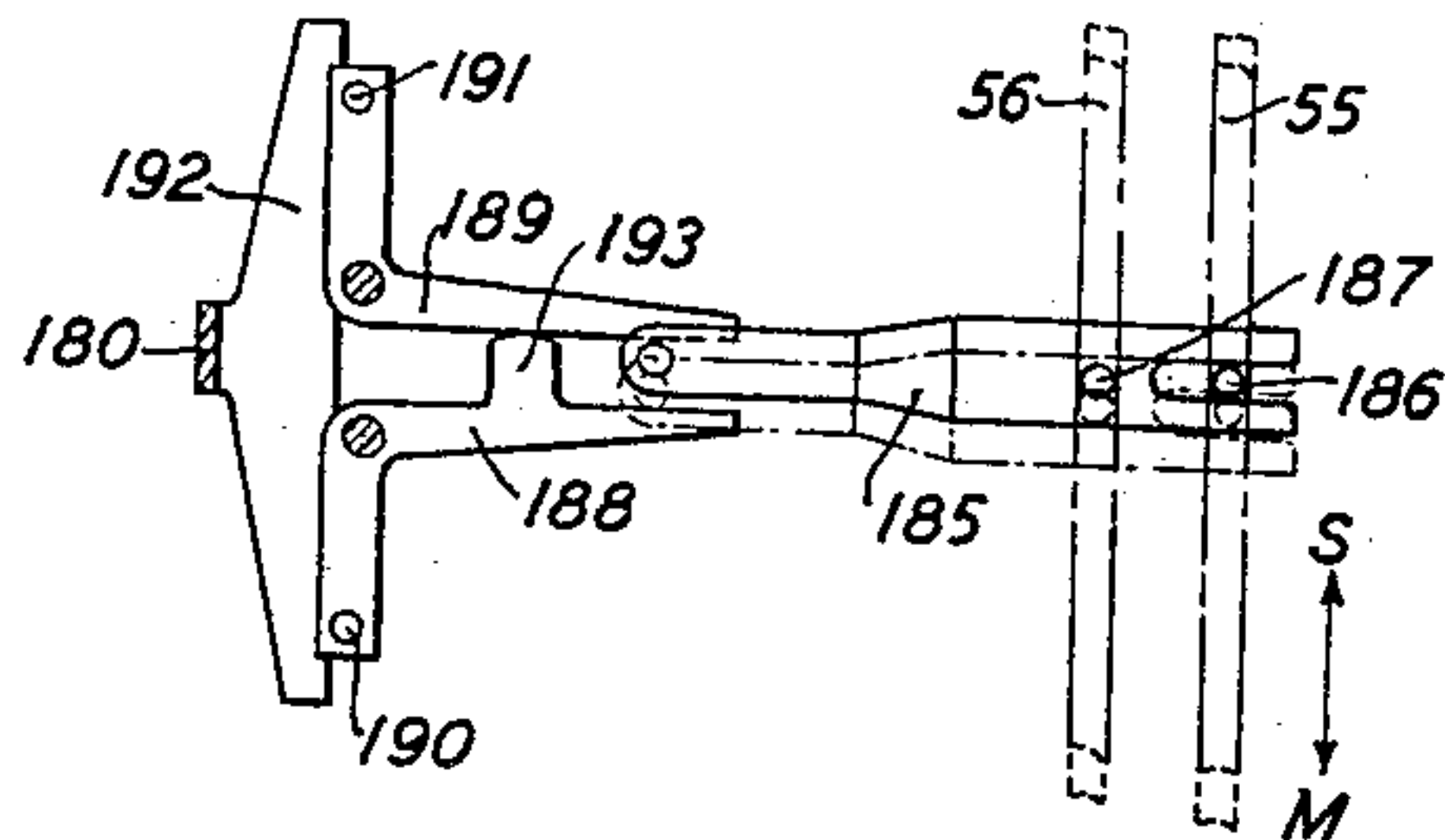


FIG. 5

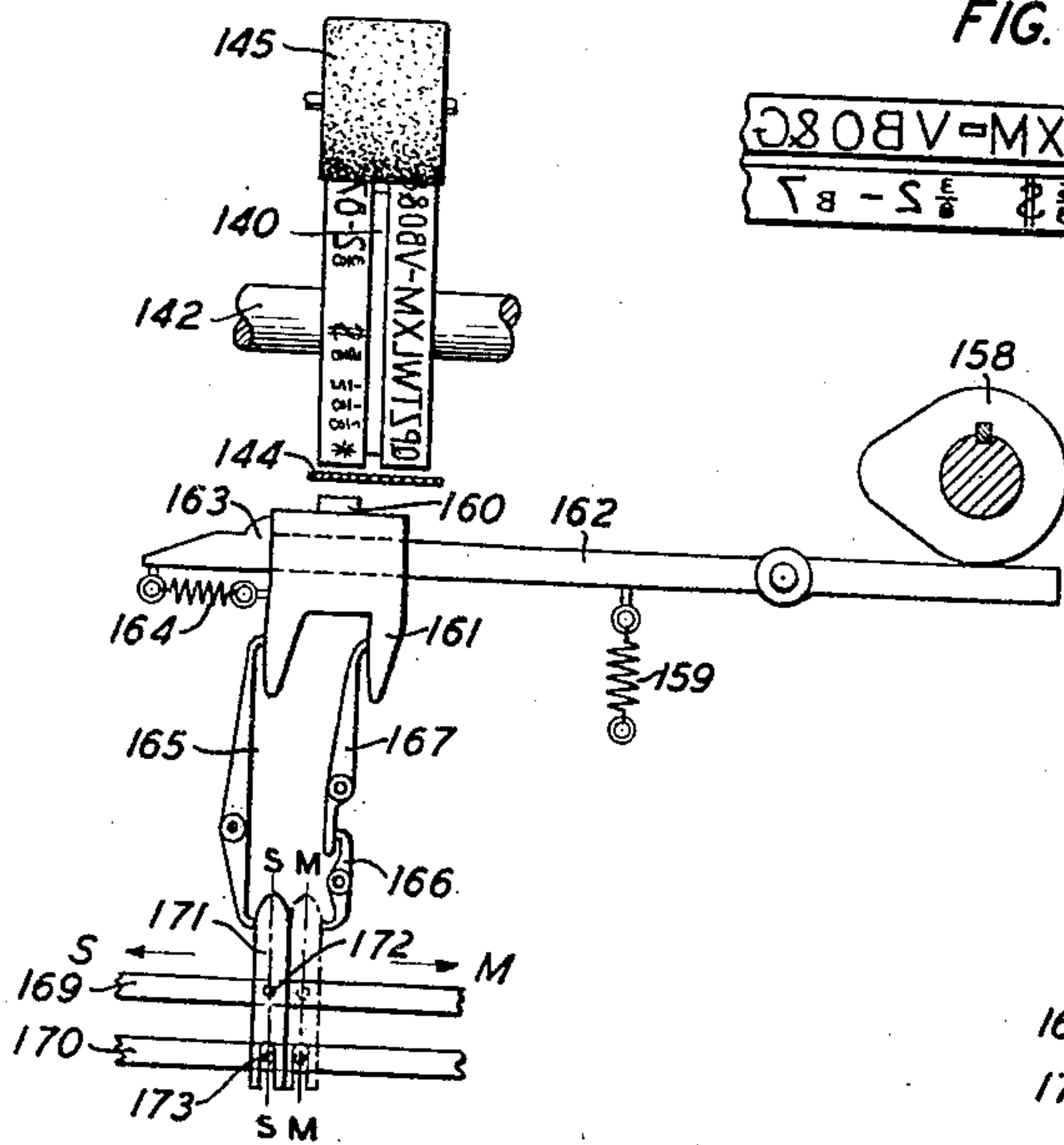


FIG. 3

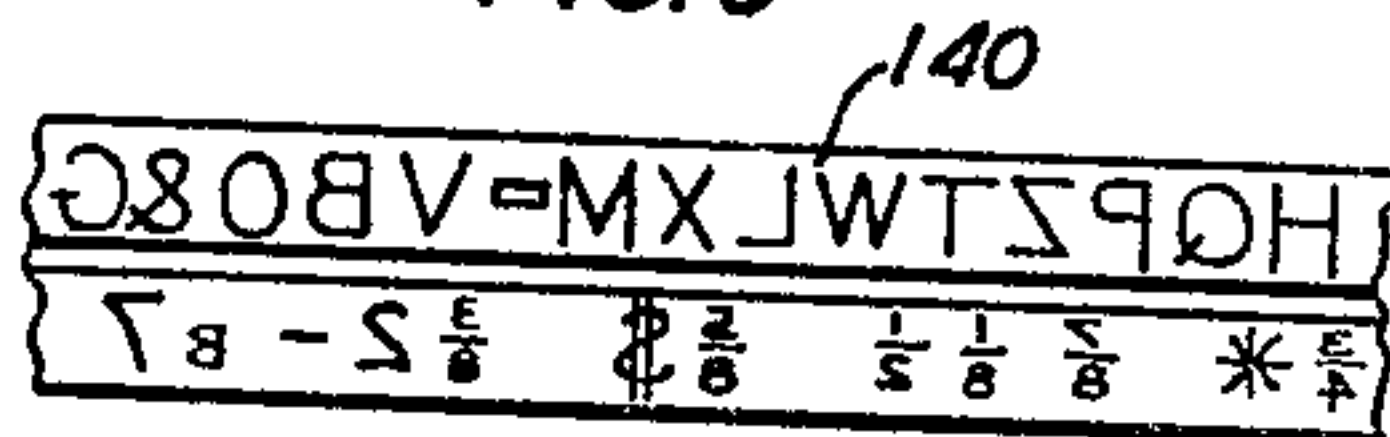


FIG. 7

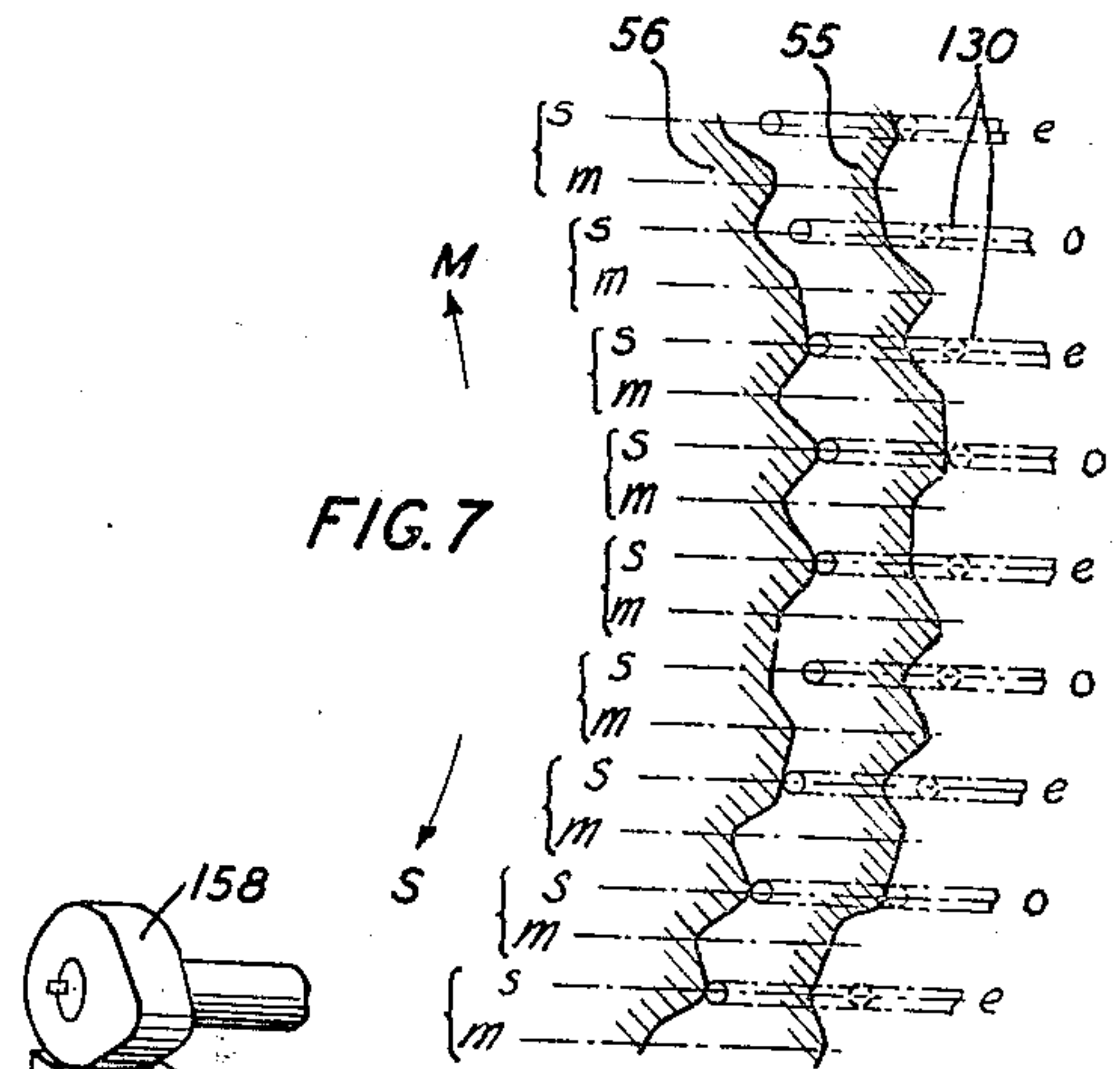


FIG. 8

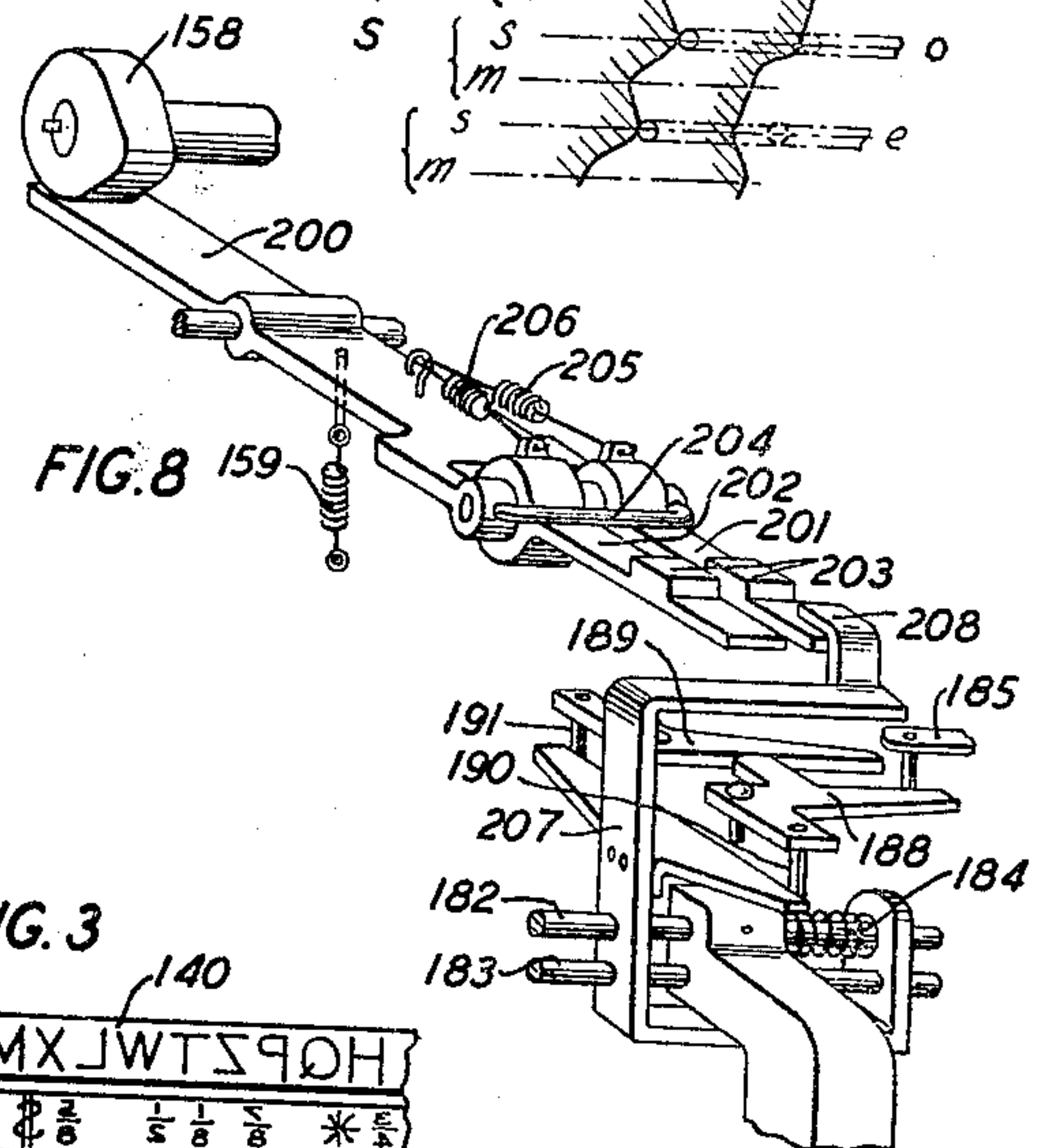


FIG. 6A

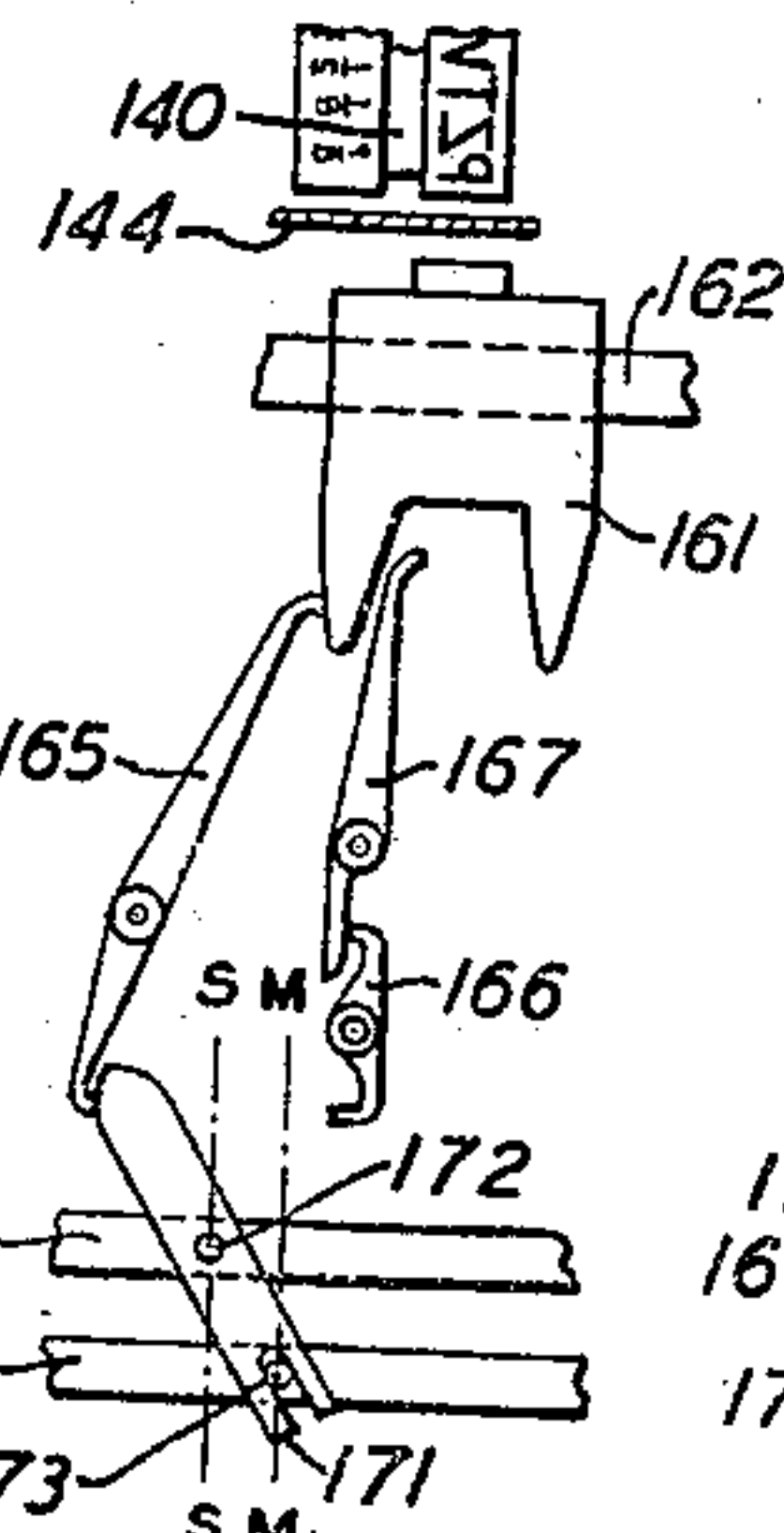
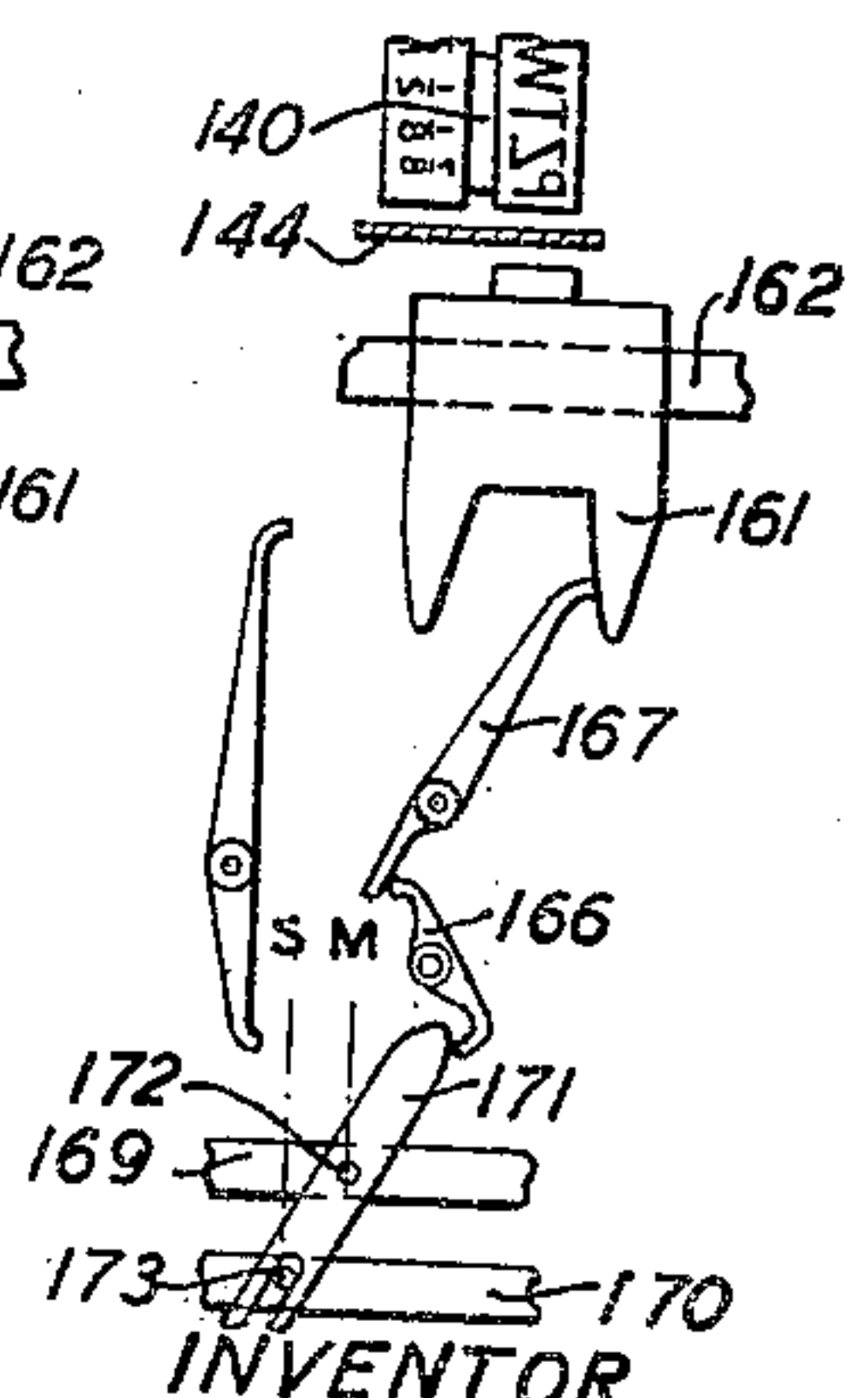


FIG. 6B



INVENTOR
E. F. WATSON

BY

ATTORNEY

UNITED STATES PATENT OFFICE

EDWARD F. WATSON, OF LARCHMONT, NEW YORK, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK

TELEGRAPH PRINTER

Application filed September 1, 1931. Serial No. 560,632.

This invention relates to telegraph recorders and more particularly to recorders embodying a character type carrier for printing characters of two different kinds in a double line.

Recorders of this type have a common use in certain telegraph systems, such as circuits for quotation service in which it is desirable to print groups of identifying letters in the upper part of a double line and the corresponding quotations in the lower part.

Systems of this kind have been operated on a five-unit code, i. e., each character whether of the upper or lower case, has required the transmission of five signal units, in which case it has been necessary, as in ordinary printing telegraph systems to send a shift signal whenever a shift from one case to the other was desired. It is evident that for quotation service a shift signal would be required, on the average, for every two or three characters transmitted.

It has been proposed to adopt a six-unit code for quotation service, whereby special shift signals would be eliminated with a considerable saving in line time. With such an arrangement, the line signal units have been utilized for the selection of a position of the type wheel, and the sixth signal unit for determining whether the character were to be printed in the upper or the lower portion of the double line.

It is an object of the present invention to utilize a signal code for the selection of any one of a plurality of character types arranged in two groups on the type carrier of a character recording device, and at the same time for the differentiation between the characters in the two groups, as by printing such characters in two portions of a double line corresponding to those groups, the differentiation between characters being in accordance with the selected position of the type carrier.

A more specific object of the present invention is the printing of characters in a double line in response to a six-unit code and the selection of one or the other of two printing positions of the type hammer in response to the similarity or dissimilarity of two of the

signal units in a six-unit series of a code signal.

In accordance with the invention, a telegraph printer, when adapted for operation by a six-unit code, may have a type wheel with as many as sixty-four different types arranged in two rows on its periphery, the printer being arranged for positioning of the type wheel in sixty-four different positions responsive to the setting of six units of selecting mechanism; each selecting mechanism is adjusted in accordance with a unit impulse of a six-unit signal, which by permutation will provide for sixty-four different signal combinations. Means are provided for controlling the printing hammer to print in the one of two printing positions which is aligned with the type group in which a character type has been selected, the means for controlling the hammer being in turn controlled jointly by two units of the selecting mechanism.

The invention will be described in connection with the attached drawings in which:

Figure 1 is a schematic representation of a quotation service system of the start-stop type comprising a common transmitting station and a line including a plurality of receiving stations, and showing in a simplified exploded view only enough of a six-unit character recording device for the understanding of the invention;

Figs. 2A and B are detailed views of the case shift levers;

Fig. 3 is a developed view of a portion of the printing surface of the type wheel;

Figs. 4A and B are views showing the relations between certain elements of a permutation unit of the recording device under marking and spacing conditions, respectively, viewed from the rear of the machine as shown in Fig. 1;

Fig. 5 shows an alternative arrangement of the type hammer and the shift mechanism therefor;

Figs. 6A and B show the arrangement illustrated in Fig. 5 in different operated positions;

Fig. 7 shows details of the permutation mechanism; and

Fig. 8 shows an alternative arrangement.

for the control of the type hammer in which two type hammer faces are provided.

Reference will first be made to Figs. 5, 6A and 6B which show in simplified, schematic form an arrangement for shifting of the type hammer face from one to the other case, in accordance with the invention. In this arrangement the type hammer comprises the pivoted shank or lever 162 carrying the type hammer face 160 on a slidable member or shuttle 161 capable of being shifted on the shank to place the face 160 in alignment with the upper or lower case letters on the type wheel 140.

For the positioning of a desired character on the type wheel in juxtaposition to the hammer face 160 for printing any known selecting mechanism may be assumed, such mechanism usually comprising a plurality of selecting units individually and sequentially responsive to respective signal units of incoming code signals. For the present purpose corresponding selecting members 169 and 170 of two selecting units are shown, these members being also utilized for the proper shifting of the hammer face 160 according to the positioning of a character in one or the other case in response to the setting of all the selecting units.

Each of the selecting members 169 and 170 carry a small pivot 172 and 173, respectively, for supporting and positioning at different angles a floating finger 171 in accordance with the different settings of the members 169 and 170. The finger 171 is arranged to engage with its free end lever 165 and lever pair 166, 167 which in turn engage projections on the shuttle on the printing hammer. The effect of incoming signals on the members 169 and 170 is, in the case of a spacing signal, to place the members in a position towards the left, thereby placing the pivots 172 and 173 in position S—S and in the case of a marking signal, to place the members towards the right, thereby placing the pivots 172 and 173 in positions M—M. When both pivots are in position S—S the finger 171 will be aligned with the line S—S, as shown, in full lines in Fig. 5, in which case it may touch the lever 165 without operating it; when both pivots are in position M—M the finger 171 will be aligned with the line M—M, as shown, in dot and dash lines in Fig. 5, in which case it may touch lever 166 without operating it. Thus, when both members 169 and 170 are adjusted by similar signals, the shuttle 161 will not be affected, but will be held by spring 164 against a stop 163 on the shank 162 for printing in the lower case. When, on the other hand, the members 169 and 170 are adjusted by dissimilar signals, the shuttle 161 will be shifted toward the right on the shank 162 for printing in the upper case; thus, as shown in Fig. 6A, the pivot 172 being in position S due

to a spacing signal and the pivot 173 being in position M due to a marking signal, the finger 171 will be moved out of its parallel position and assume an angular position, thereby operating lever 165 to shift the shuttle 160 to the upper case; and as shown in Fig. 6B the positions of the pivots being reversed due to reverse signals, the finger 171 will assume an angular position to operate levers 166 and 167 and again shift the shuttle to the upper case. When now at the proper time the cam 158 operates the printing hammer the type face 160 will press the paper tape 144, which is wide enough for printing of characters in an upper and a lower line, against a selected character type in either the upper or the lower case; there being only one printing face on the type hammer, only the letter in the selected case will be printed.

Referring now to Fig. 1 in which the invention is shown in its preferred form, the line L includes a plurality of receiving relays R, R—1, etc. located at different line stations and a transmitting station TS. The transmitting station TS includes a transmitter T of any known type arranged for a six-unit code and having six transmitting contacts included in the line circuit through a transmitting distributor D of the start-stop type. The line circuit forms a closed loop connecting battery B through the segments of distributor D, contacts of transmitter T, the windings in series of all the relays R and back to battery. When the distributor D is in its stop position, this loop circuit is closed by the brush arm bridging the common ring and the marking segment MS and all the receiving relays are operated to marking position. Transmission is started whenever a circuit (not shown) is closed in a well known manner for the operation of the start magnet SM which releases the brush arm of the distributor. Upon leaving its normal position, the brush arm passes over the spacing segment SS, whereby a spacing signal is transmitted over the loop causing all the receiving relays to release to spacing position. The brush arm thereafter passes over segments 1, 2, 3, 4, 5 and 6 in succession causing the receiving relays to operate in accordance with the combination of open and closed contacts set-up in the transmitter T. The brush arm finally comes to a stop on the marking segment MS again closing the loop circuit and thus completing the transmission of a character.

Referring now to the reception of such a series of permutation signals by one of the receiving stations, the operations of receiving relay R are transferred to a polarized printer magnet PM, which controls all the operations of the printing device for the selection of a desired character and for the printing of the character in the upper portion

or in the lower portion of a double line on a printing surface, such as a paper tape.

With the printer magnet PM in the marking position, as shown, a spring 101, exerting a pull on pivoted lever 102, applies a pressure to the left on a flutter disc 103 which in turn causes the horizontal arm 105 of the flutter lever 104 to rest against the armature of the printing magnet PM. When the first spacing signal is received, the armature of printing magnet PM moves to the right thereby removing the stop for the horizontal arm 105. The flutter disc 103 is fixedly mounted on a cam drum 110, which forms a sleeve slidably mounted on the selector shaft 111 but arranged to rotate with the shaft; thus, in response to the operation of the printer magnet the flutter disc 103 and with it the cam drum 110 move a distance to the left under the pressure of spring 101 until the left hand end of the cam drum engages the fixed stop 112.

Selector shaft 111 is intermittently driven, in a direction shown by the arrow at its left hand end, through a friction coupling 113 and proper gearing from a constantly revolving motor shaft 114 connected to a motor, not shown; however, the shaft 111 is prevented from rotating by stop arm 115 fastened to the cam drum 110 and the free end of which engages a fixed stop 116; when, as described, the cam drum 110 moves to the left the stop arm 115 disengages the stop 116, thus permitting the rotation of shaft 111 and cam drum 110.

The flutter disc 103 has along its periphery a series of corrugations, seven in number, for the purpose of fluttering the lever 104 seven times as the disc makes one revolution, thereby causing the horizontal arm 105 of flutter lever 104 to move up and down; however, when, due to the signals, the armature of the printer magnet moves to the left, the downward movement of the arm 105 is prevented and the lever 104 causes the cam drum 110 to flutter in an axial direction on selector shaft 111 due to the corrugations in the flutter disc. The speed of rotation of the selector shaft 111 is timed so that each of the seven raised portions or corrugations of the flutter wheel will raise arm 105 once for each unit impulse received over the loop circuit with the result, that each marking pulse in a signal combination will place the cam drum 110 towards the right for the time of its duration, whereas, each spacing pulse will place the cam drum towards the left for the time of its duration. Thus, as the cam drum 110 makes one revolution it will pass through seven periods corresponding to the duration of seven unit impulses and in each period it will be either to the right or to the left depending upon whether the corresponding unit pulse is a marking or a spacing pulse, respectively. Upon the completion of the transmission of an impulse series, the cam drum will have

completed a revolution and, due to the marking signal now being placed on the line, the cam drum will move to the right in time for the stop arm 115 to engage the stop 116, thereby bringing the cam drum to a stop.

The fluttering operation of the cam drum 110 during a revolution in unison with received signal pulses is effective in storing up a setting on the selecting or permutation mechanism in the printer in accordance with the impulse combination transmitted. For this purpose the cam drum 110 carries six pairs of cam lugs, namely, spacing lugs 11 to 16 and marking lugs 21 to 26, the pairs of lugs being angularly and progressively displaced with respect to each other with a spacing corresponding to the angular spacing between the corrugations in flutter disc 103. Each pair of camming lugs is furthermore axially aligned with selector levers 31 to 36, which in turn cooperate with transfer levers 41 to 46 for the setting of code discs 51 to 56.

The setting of the code discs from the movements of cam drum 110 will be described only in connection with the first permutation unit, shown at the extreme right, which is responsive to the first impulse of a signal combination received from the line, since the operations for setting the other code discs is the same. In this description reference will also be made to Figs. 4 and 5 which illustrate a portion of the drum 110 with the camming lugs 11 and 21 of the first unit and their cooperation with the associated selector lever 31 in the marking and spacing positions, respectively, of the cam drum 110. The spacing lug 11 is placed diametrically opposite the marking lug 21 on cam drum 110, but these lugs are axially displaced a small distance.

The selector lever 31 has a spacing projection *a* aligned with the lug 11 when the cam drum is in spacing position and a marking projection *b* aligned with the lug 21 when the cam drum 110 is in marking position; the spacing lug 11 will clear both projections *a* and *b* in marking position, and marking lug 21 will clear both projections *a* and *b* in the spacing position of the cam drum. The lugs are shaped to exert a camming action on these projections to impart a small angular movement to the selector lever 31 about its pivoting point 120, whereby two other projections *c* and *d* on the selector lever 31 are caused to take one of two positions. The projections *c* and *d* cooperate with projections *e* and *f*, respectively, of the transfer lever 41 in such a manner, that in the case of marking, the projection *d* is aligned with projection *f* and projection *c* is out of alignment with projection *e*, whereas, in the case of spacing, projection *c* is aligned with projection *e* and projection *d* is out of alignment with projection *f*. The transfer lever 41 is hinged on a bail 121 which may be raised and lowered

through the roller 122 from cam 123 mounted on the selector shaft 111; the transfer lever 41 has a projection *g* fitted into a slot *h* cut into the periphery of the code disc 51 for placing the disc in one of two angular positions, the disc being rotatable about the shaft 142.

During a complete revolution of cam drum 110 the pairs of camming lugs will pass into succession before corresponding projections on the selector levers 31 to 36 and due to the fluttering of the drum in response to received signals the lugs will operate the selector levers into their marking or spacing position in accordance with signals received. Shortly before the completion of the revolution the projection on cam 123 will raise the roller 122 for an instant thereby raising the bail 121 carrying all the transfer levers 41 to 46. With the selector lever 31 in marking position, the projection *d* will be in the upward path of projection *f* of the transfer lever 41, thereby imparting a small angular displacement to the transfer lever, which in turn places the code disc 51 in its marking position; with the selector lever 31 in spacing position, the projection *e* would be in the path of projection *e* of the transfer lever, thereby placing the code disc 51 in its spacing position. In this manner all the code discs 51 to 56 are adjusted to their spacing or marking positions in accordance with a received signal combination.

Each of the code discs 51 to 56 has a plurality of notches cut into its periphery, and the arrangement of these notches is different in all the discs so that one of a plurality of stop pins 130 may be selected by the setting of these discs, for the positioning of the type wheel 140. As shown for one of the stop pins 130 these pins comprise a straight portion 131 which is forced into engagement with the notched periphery of all the code discs by means of a spring 132; the other end of the pin 130 is pivoted at 133.

For each setting of the discs one of the stop pins 130 will be admitted to its inward position, due to the alignment of the notches associated therewith in all the code discs, while all other stop pins will be held out by a raised portion on at least one of the discs. The selected stop pin thus enters into the path of the type wheel stop arm 141 which together with the type wheel 140 is mounted on the type wheel shaft 142 driven through friction clutch 143 and gearing from motor shaft 114. The same setting of the code discs, which caused the selective operation of the stop pin 130 referred to, is also instrumental in releasing the stop arm 141 from its previous position in engagement with another stop pin 130 which is forced into its outer position by the camming action of one or more of the notches. The stopping of arm 141 by engagement with the selected stop pin

130 places a type on type wheel 140, corresponding to the received signal, in alignment with the printing hammer 181 ready for printing.

In the past only five code discs have been provided for the selection of stop pins and for the complete utilization of the possible combinations of the five-unit code thirty-two stop pins have been provided for the stopping of the type-wheel in thirty-two different positions. In accordance with the preferred form of the invention the sixth selecting unit associated with the cam drum 110 is made to operate a sixth code disc, which also cooperates in the selection of the stop pins. With this arrangement sixty-four selections are possible and the code discs may be notched for as many as sixty-four stop pins, whereby the type wheel may be stopped in sixty-four different positions. As is shown in Fig. 3, illustrating a developed portion of the printing surface of the type wheel 140, in accordance with a preferred form of the invention, the characters are arranged in two groups with letters in the upper case and incidentals in the lower case.

In the following description of the type wheel and its associated printing hammer, reference will also be made to Figs. 2A and 2B.

As shown in Fig. 1 the paper tape 144 is interposed in the usual manner between the type wheel 140 and the printing hammer face 181; and means (not shown) are provided for advancing the printing tape between each printing operation; the tape is sufficiently wide to permit the printing of the upper case in a line in the upper portion of the tape and of the lower case in a line in the lower portion of the tape, as is usual for quotation service. An ink roller 145 engages the types on the wheel 140.

The printing hammer comprises a lever 153 which carries at its printing end a shuttle 180 provided on its upper surface with the type imprinting element or platen 181. The shuttle 180, mounted on guides 182 and 183 fastened on the lever 153, is normally held, under tension of spring 184, in a position to print characters in the upper case. The shuttle 180 also carries an operating bar 192 which by means of spring 184 is held in engagement with a pin 190 fastened on bell crank lever 188 and with a pin 191 fastened on bell crank lever 189; the spring tension is taken up, in normal position of these elements, by a spacer 193 carried by the lever 188, the levers 188 and 189 being pivoted on the stationary frame of the printer.

Similar to the embodiment described in connection with Figs. 5, 6A and 6B, a floating finger 185 is pivotally hinged on pins 186 and 187 integral with the selecting discs 55 and 56. (In the drawings the disc 55 is shown broken into two parts, and the upper part is

shown in proper relation to the transfer lever 45, the spacing of which from the adjacent transfer levers 44 and 46 is shown greatly exaggerated for the sake of clearness, whereas the lower part of the disc 55 is shown in proper operating relation to disc 56 with respect to the finger 185.) At its left-hand end the finger 185 carries a pin 194 for engagement and operation of levers 188 and 189 against the tension of spring 184 for shifting of the printing face 181 into alignment with the lower case of types on the type wheel 140. In Fig. 2B the finger 185 is shown in two positions corresponding to the setting of the selecting discs 55 and 56 with their pivoting pins 186 and 187 in response either to two marking or two spacing pulses, in which instance, the levers 188 and 189 remain unoperated and printing will take place in the upper case. In Fig. 2A the finger 185 is shown in two positions in which either the lever 188 or the lever 189 is operated to shift the shuttle 180 to the printing position for the lower case. These angular positions of finger 185 result from settings of the selecting discs 55 and 56, such that one disc is in marking position and the other in spacing position in response either to a marking pulse followed by a spacing pulse or to a spacing pulse followed by a marking pulse, as the case may be.

Printing cam 158 is arranged to be driven in unison with the selector shaft 111 by means, not shown, and to force the printing hammer into engagement with the printing tape 144 and the type wheel against the tension of spring 159 once for each revolution of shaft 111, the timing of this operation being such that it will take place shortly after the type wheel has been positioned for printing.

As shown in Fig. 3 the type characters on the type carrier 140 are placed in staggered relation in such a manner that the upper case types will be aligned for printing in, say the odd printing positions of the carrier and the lower case types in the even printing positions. It is consequently necessary, when the fifth and sixth impulses are similar, that discs 55 and 56 in their similar position, leave the hammer face 181 in the upper case and cause the type wheel 140 to stop in an odd position, whereas when the fifth and sixth impulses are dissimilar the discs 55 and 56 in their dissimilar positions must cause the hammer face 181 to be shifted to the lower case and the type wheel 140 to stop in an even position. For the simultaneous attainment of these two sets of control, the five selecting discs 51 to 55 may have their notches cut in any desirable manner for the selection of any pair of stop pins 130, a pair comprising two pins corresponding to an odd and an even position of the type wheel 140; the notching of the sixth disc 56 must so correspond to that of disc 55 that the cuttings for each of the odd stop pins

will be alike and those for each of the even pins will be opposite in the two discs.

The principle of cutting of the discs 55 and 56 is illustrated schematically in Fig. 7, which shows corresponding portions of the edges of the discs with the associated stop pins 130; even and odd pins are marked *e* and *o*, respectively. The notches in the discs are so formed that when in the spacing position of a disc, certain pins are permitted to fall inward into their notches, in the marking position the pins will be forced outward by cam portions and vice versa; the spacing and marking positions of the portion of the disc assigned to each pin are marked *s* and *m*, respectively, in Fig. 7.

In the spacing position of both discs, as illustrated, all the even pins are prevented by one or the other of the discs from falling inward, as will also be the case when both discs are moved upward into marking position. Since, as stated above, the lower cases on the type wheel are selected by the even pins no such character can be selected under these two conditions, also under these conditions the type hammer will be left in the upper case for printing of any character selected by one of the thirty-two odd pins in accordance with the settings of all six permutation discs 51 to 56, discs 55 and 56 acting as one disc since the odd cuttings in both are alike for any one odd pin.

With the disc 56 in spacing position, as shown, the disc 55 moved upward in marking position all the odd pins will be prevented by one or the other of the two discs from falling inward, as will also be the case when the positions of the discs are reversed; since as stated above the upper case characters on the type wheel are selected by the odd pins, no such character can be selected under these two conditions; also, with the discs in opposite positions, the type hammer will be shifted for printing in the lower case, the characters of which may be selected by the thirty-two even pins in accordance with the settings of all six permutation discs 51 to 56, the discs 55 and 56 again acting as a single disc, since the even cuttings in both are alike for any one even pin when the discs are in opposite positions.

Fig. 8 shows an alternative form of the control means for the printing hammer which may be incorporated in the printer shown in Fig. 1 for cooperation with the selecting mechanism and the type wheel thereof. In accordance with this arrangement the printing hammer comprises an operating lever 200 which carries at its right hand end the two hammers 201 and 202 each provided with a platen surface 203; the platen on hammer 201 aligned with the lower case and that on hammer 202 with the upper case on the type wheel 140. The angular relation between the hammers 201 and 202 and the

lever arm 200 is normally maintained, as shown in the drawings, by the engagement of the hammers with the bail 204 under tension of springs 205 and 206. A shuttle 207 is mounted on guide pins 182 and 183 mounted on the frame of the printer and is held in normal position by spring 184. The operation of the shuttle is controlled through the bell crank levers 188 and 189 and the finger 185 operating in conjunction with code discs 55 and 56 (not shown) and in a manner similar to that described in connection with Figs. 2A and 2B. Integral with the shuttle is a projection 208 which, in the two positions of the shuttle 207, will reach into the upward path of one or the other of the hammers 201 and 202. Thus, when the printing cam 158 forces the hammers upward by means of the lever 200 one hammer will be held back by the projection 208 and only the other hammer will be thrown against the paper tape and the type wheel for printing in the corresponding case.

What is claimed is:

1. In a telegraph printer, a type wheel having types arranged in two groups, the types in one of said groups being staggered with respect to the types in the other group, a plurality of code discs responsive to a combination of received impulses for positioning of said type wheel and an arm operable jointly by two of said code discs, the operation of said arm determining the group in which a type shall be printed.

2. In a telegraph printer, a type wheel having types arranged in two rows for selection by a series of signal pulses of a code, a type hammer slidably mounted on an actuating lever, and selecting means for shifting said hammer with respect to said two rows of types in response to two signal pulses of said series.

3. In a telegraph printer, a type wheel having types arranged in two groups, a type hammer slidably mounted on an actuating lever, a plurality of code discs each movable responsive to an electric impulse, a lever pivoted on two of said discs, the position of said lever at any time being determined by the previous movement of said two discs.

4. In a telegraph printer, a printing lever having two printing hammers yieldably mounted thereon, a movable shuttle having an obstructing element integral therewith which engages either one or the other of said printing hammers, selecting means for operating said shuttle in response to received signals whereby either one of said hammers may be selectively prevented from printing while said lever is actuated for printing.

5. A telegraph printer, comprising a type carrier having type characters arranged in upper case and lower case groups, platen means for printing in either the upper or the lower case, a plurality of permutation mem-

bers each adjustable in opposite directions in response to opposite signal impulses for the selection of a type character to be printed, mechanical control means for said platen means connected to two of said permutation members, responsive to similar adjustments of said members to cause said platen means to print in one case and responsive to dissimilar adjustments of said members to print in the other case.

6. In a telegraph printer, a plurality of code discs, each disc being capable of being shifted in opposite directions in response to opposite signal impulses, a cam-operated shuttle, a type platen mounted on said shuttle, a type wheel having the type divided into an upper case and a lower case group, a common operating lever pivoted on two of said discs, a pair of bell crank levers selectively operable by said common lever for controlling said type platen to print a type in one of said cases after said two code discs are shifted in the same direction and to print a type in the other case after said two discs are shifted in opposite directions.

7. In a telegraph printer, a rotatable type wheel having characters arranged in two groups, a printing hammer slidably mounted on a cam operated lever, a plurality of selector members, and shifting means operable by two of said selector members for shifting of said hammer, said means being adapted to remain in control of said hammer at all times.

8. A telegraph printer comprising a wheel provided with two rows of types, a printing lever, a printing hammer slidably connected to said lever, and means responsive to received signals for rotating and positioning said type wheel, characterized by means responsive to two elements of said received signals for positioning the printing hammer adjacent to the selected row of said rows of types.

In testimony whereof, I have signed my name to this specification this 28th day of August, 1931.

EDWARD F. WATSON.