Aug. 19, 1930. E. KASSNER 1,773,145

CALCULATING MACHINE

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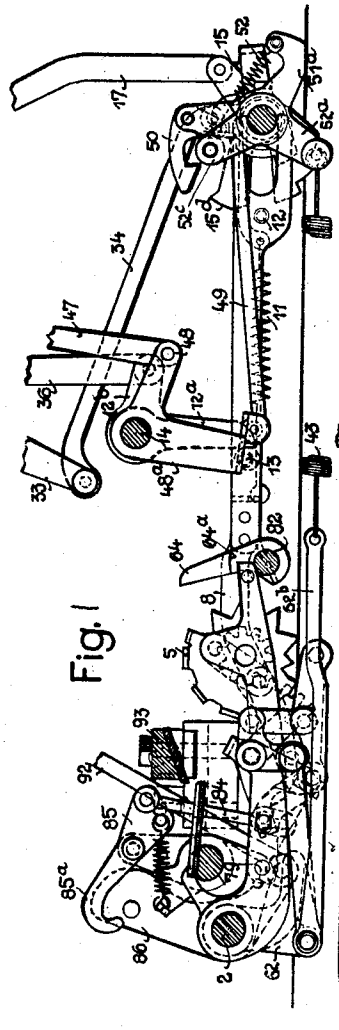


Fig. 1

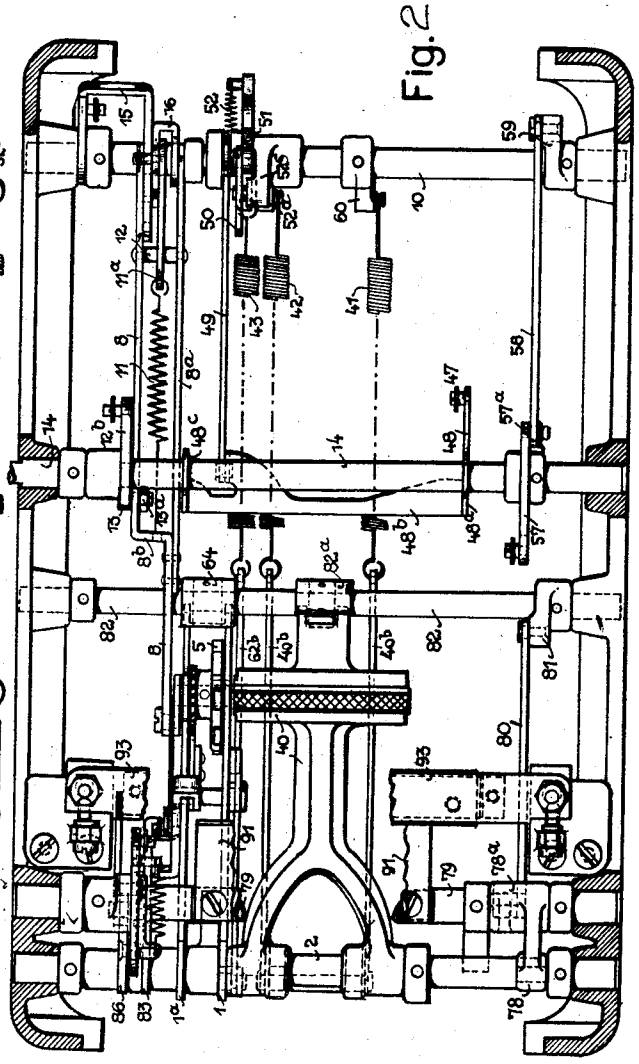


Fig. 2

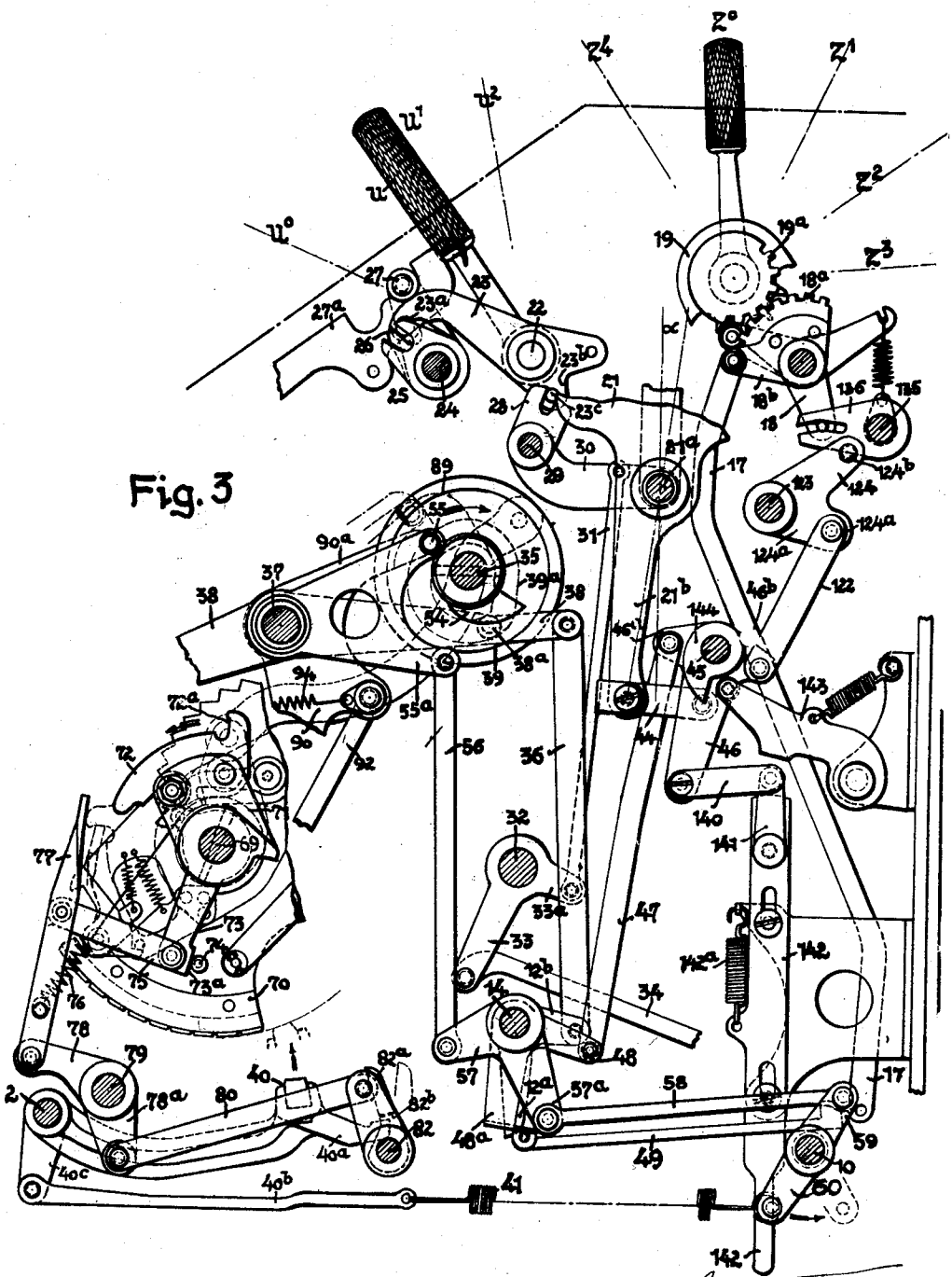
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Aug. 19, 1930. E. KASSNER 1,773,145

CALCULATING MACHINE

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Fig. 3



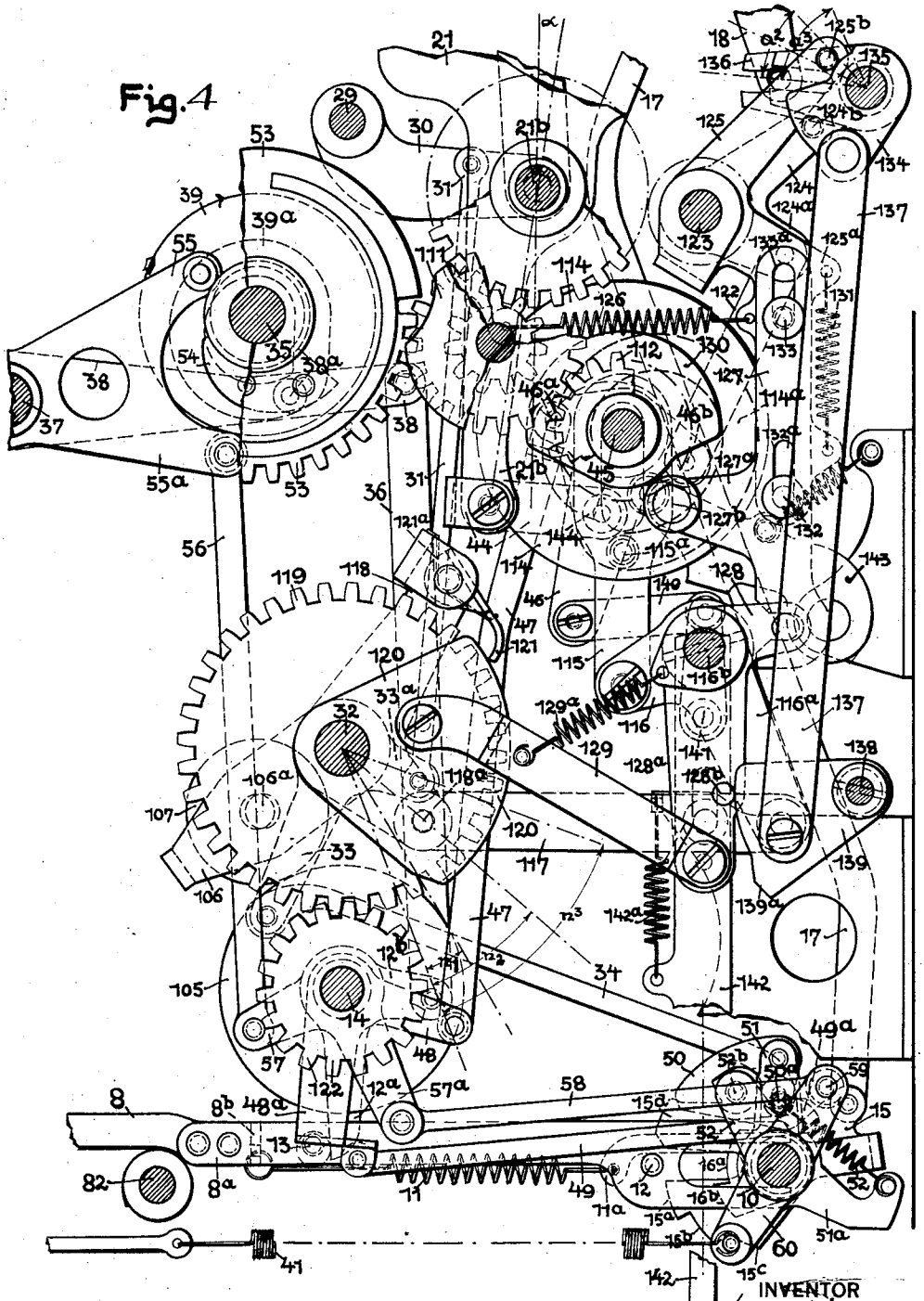
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CALCULATING MACHINE

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Fig. 4



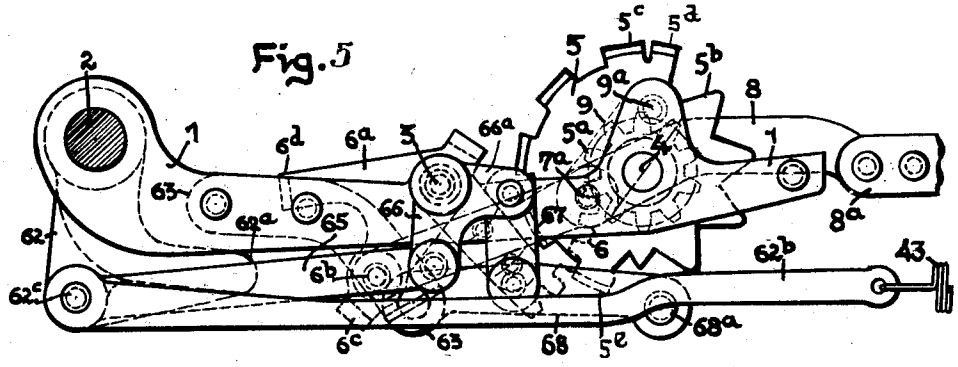
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CALCULATING MACHINE

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Fig. 5



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Fig. 6

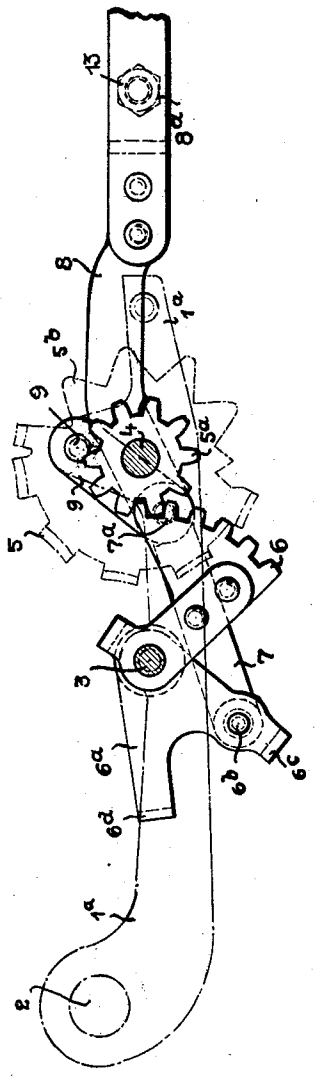
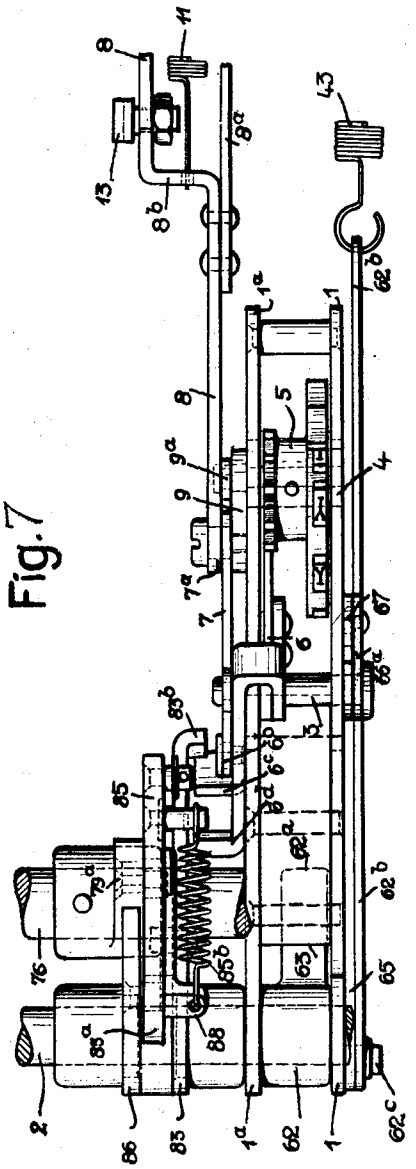


Fig. 7



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Fig. 8

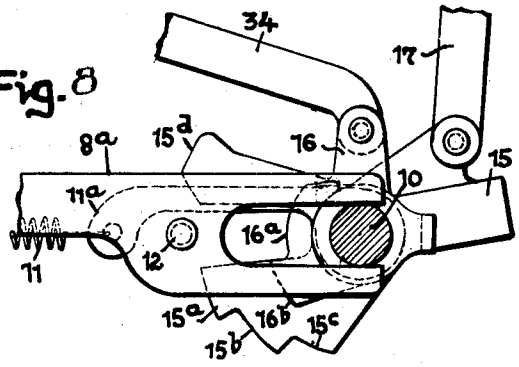


Fig. 9

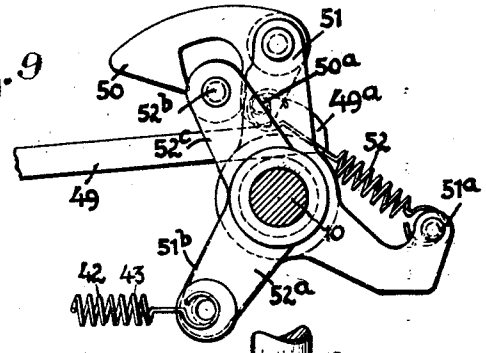
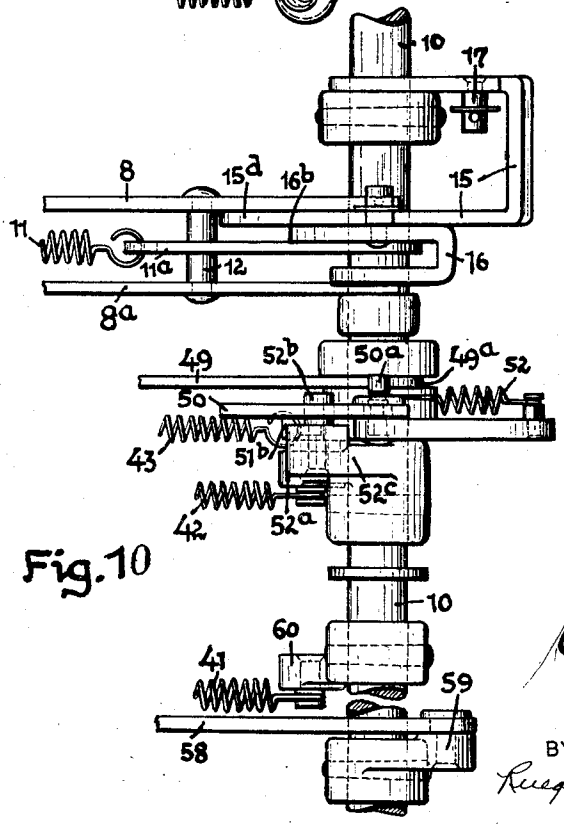


Fig. 10



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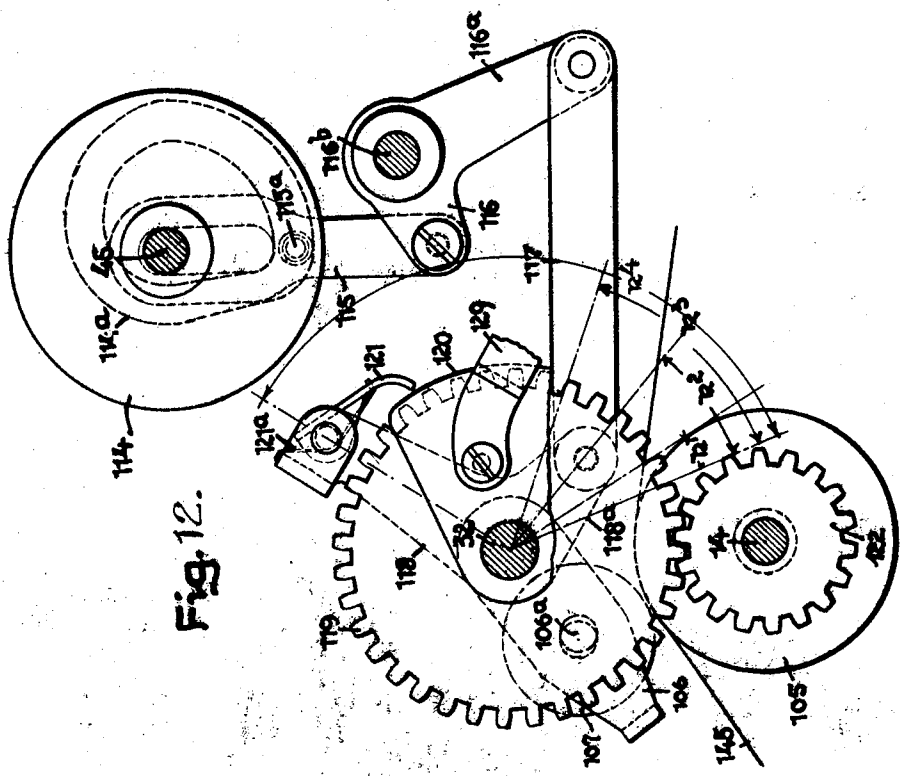


Fig. 12.

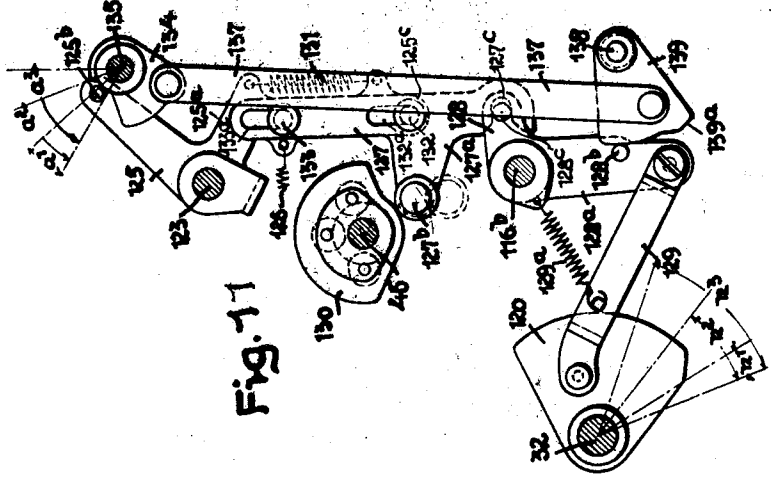


Fig. 11

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UNITED STATES PATENT OFFICE

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CALCULATING MACHINE

Application filed January 8, 1927, Serial No. 159,771, and in Germany March 8, 1926.

This invention relates in general to calculating machines and more particularly to automatic devices for printing distinguishing marks that indicate which of its various modes of operation the machine has performed or is performing, and feed devices for shifting the record strip to different extents according to the spacing desired between the printed items or lines.

The automatic device described herein for printing distinguishing marks, and feeding the record strip is particularly adapted to the combined duplex adding machine and cash register which is the subject matter of my copending application, Serial Number 159,770.

In mere adding machines, and in a particular kind of cash register, arrangements are known by which a distinguishing mark, that indicates the mode of operation for which the machine is set, is printed together with the calculation figures on the record strip. But in machines of the type contemplated herein, i. e. in combined duplex adding machines and cash registers, difficulties of a peculiar kind have to be overcome to obtain a proper relation between the selection of the distinguishing mark of the mode of operation and the extent of the record strip feed motion according as the strip is shifted by one, a few or a large number of lines. The manner in which these difficulties are surmounted by the present invention is intimately related with the two multi-position switches by which, according to said copending application, the combination devices of the machines are set for effecting all the different modes of operation of the same. Hence a feature of the present invention consists in means by which the throwing of said two multi-position switches causes the proper feed motion of the record strip, and also the setting of the corresponding distinguishing mark and the printing of the same on the strip, to be effected when the main driving shaft of the machine is revolved.

In the following table in the left hand column under I to VIII the various combinations of switch positions are enumerated exactly as in my copending patent application, and in the right hand column the requirements as to the strip feed or line spacing, and distinguishing mark are stated.

Switch positions (U and Z are switches)	Modes of operation
I U in position U^0	Single-line spacing on the record strip.
Z in position Z^0	No printing of distinguishing marks.
II U in position U^1	Six-line spacing on the record strip.
Z in position Z^0	T=Printing of distinguishing marks.
III U in position U^2	Six-line spacing on the record strip.
Z in position Z^0	Z=Printing of distinguishing marks.
IV U in position U^1	Three-line spacing on the record strip.
Z in position Z^3	L=Printing of distinguishing marks.
V U in position U^2	Six-line spacing of the record strip.
Z in position Z^1	Y=Printing of distinguishing marks.
VI U in position U^1	Single-line spacing on record strip.
Z in position Z^2	I=Printing of distinguishing marks at each item.
VII U in position U^2	Six-line spacing on record strip.
Z in position Z^4	A=Printing of distinguishing marks.
VIII U in position U^0	Single-line spacing on record strip.
Z in position Z^4	No printing of distinguishing marks.

An embodiment of the invention is illustrated in the drawings, in which

Fig. 1 is a side view and

Fig. 2 is a plan view of the device for

printing distinguishing marks and showing only so much of a device for cutting the record strip as is necessary for illustrating the invention.

Fig. 3 shows the links between the switches and the device for releasing the printing hammer to allow it to effect a printing operation.

Fig. 4 shows the record strip feed mechanism and the means by which this mechanism is caused to shift the record strip forward to different extents. This figure also shows the shaft and its associated parts for tensioning the springs of the printing mechanism.

Fig. 5 is a fragmentary side view showing on a still larger scale the device for printing distinguishing marks in its normal position.

Fig. 6 shows the motion transmitting members for rotating into its printing position the type wheel that prints the distinguishing marks.

Fig. 7 is a plan view thereof.

Fig. 8 is a fragmentary side view illustrating two stepped levers by means of which the movable member which rotates the type wheel into its printing position is set or by which the extent of its movement is determined.

Fig. 9 is a fragmentary side view illustrating a device for coupling a spring tensioning member to a spring tensioning shaft for the purpose of preparing the distinguishing mark printing device for action.

Fig. 10 is a fragmentary top plan view of the structure shown in Figs. 7 and 8.

Fig. 11 is a fragmentary side view showing separately the mechanism illustrated in Fig. 4 for effecting different extents of feed motion of the record strip.

Fig. 12 is a fragmentary side view showing the driving device illustrated in Fig. 4 for the record strip feeding mechanism.

The device for printing distinguishing marks

The distinguishing marks which are to be printed on the record strip to indicate the various modes of operation of the machine are engraved on the periphery of a small type-wheel 5 (Figs. 1 and 2). This type-wheel 5, which is shown more distinctly in Figs. 6 and 7, is loosely mounted on a shaft 4 journalled in a frame 1, 1^a. The frame 1, 1^a is arranged to be rocked on a shaft 2. In its normal position it is swung down by its own weight so that its right hand end rests upon the shaft 82 as shown in Fig. 1. As set forth in the above table, different distinguishing marks are to be printed in accordance with the different positions into which the two switches U and Z (Fig. 3) are thrown. This is accomplished, as will be more fully described later, by moving the extension 8 shown in Figs. 6 and 7 of a second frame 8, 8^a to different extents in its longitudinal direction through the different settings or positionings of the two switches U and Z. These different movements of the movable member or frame 8, 8^a, determined by the switches U and Z, are transmitted to the type-wheel in the following manner:

As shown in Figs. 6 and 7 the left end of the extension 8 of the frame 8, 8^a is connected by a pivot 7^a to a short rocker arm 9 that is pivotally connected by a pivot 9^a to the frame 1, 1^a. Also pivotally connected to the frame 1, 1^a by means of a pivot or shaft 3 is a lever plate 6^a that is connected by the pivot 6^b and a link 7 with a pivot 7^a. The four pivots 3, 9^a and 7^a, 6^b form a parallelogram pivot system whose parallel pairs of pivots 3, 6^b and 9^a, 7^a are deflected through equal angles when the extention 8 of the frame 8, 8^a is moved longitudinally. This movement is transferred by the toothed sector 6 rigidly connected to the lever plate 6^a, to the toothed wheel 5^a rigid with the type-wheel 5. By this means the type of the type-wheel that corresponds to the mode of operation to be indicated on the record strip is turned to the highest position of the wheel, i. e. into the position for printing. A rigid connection between the toothed sector 6 and the lever plate 6^a is effected by means of a U-shaped extension of the lever plate that straddles the side or cheek 1^a of the type-wheel carrier frame in the manner shown most clearly in Fig. 7.

The manner in which the two switches U and Z give rise to different extents of movement of the frame 8, 8^a according to the positions in which they are set relatively to each other will now be described.

The frame 8, 8^a whose right fork-shaped end is adapted to slide on the shaft 10 is acted upon by a spring 11 (Figs. 1 and 2) situated between the limbs 8 and 8^a of the frame which spring tends to pull the latter towards the right. The left end of the spring 11 is fixed to the connecting member 8^b (Figs. 2 and 7) between the limbs 8, 8^a. Normally the frame 8, 8^a is prevented from moving by a stop or striking member attached to the frame and consisting of an eccentric screw 13 that abuts upon an arm of a bell crank lever 12^a, 12^b (Fig. 1). At each revolution of the main driving shaft of the machine this bell crank lever is deflected to release the frame 8, 8^a. To this end the bell crank lever is connected with the main driving shaft 35 (Fig. 3) by the following gear.

Fixed on the main driving shaft 35 is a cam disk 39 into whose cam groove 39^a the roll 38^a of a rocker arm 38 extends, which arm is pivoted on the shaft 37. The movement thus imparted by the cam to the link 36 is transmitted to the arm 12^b of the aforesaid bell crank lever so that its vertical arm 12^a is deflected towards the right to liberate the frame 8, 8^a. As will be presently shown the frame or movable member 8, 8^a can now travel into any predetermined position. During the latter part of the revolution of

the main driving shaft, which executes only a single revolution for each operation or cycle of the machine, the bell crank lever 12^a, 12^b is returned by the aforedescribed interconnecting gear into its normal position in which it locks the frame 8, 8^a.

When the arm 12^a is deflected towards the right the frame 8, 8^a can be pulled by the spring 11 towards the right into any predetermined position. These positions are determined by means of two stepped levers 15 and 16 pivoted on the shaft 10 (Figs. 8 to 10), which levers are moved by means of intermediate gear or links connected to the two switches Z and U as will be hereinafter described. The stepped lever 15 has four steps 15^a, 15^b, 15^c and 15^d, while the stepped lever 16 has two steps 16^a and 16^b. Arranged on the frame 8, 8^a to cooperate with the said steps is a striking pin or roll 12 which occupies the position shown in Figs. 8 and 10 when the frame 8, 8^a is in its normal position. According as one or the other of the said steps is turned into the path of the striking pin 12 the frame 8, 8^a pulled to the right by the spring 11 will be stopped in its travel towards the right sooner or later by the striking of the pin 12 against the said step so that a different distinguishing mark of the type-wheel is always presented for printing to the record strip. The manner in which the different steps of the two stepped levers cooperate in order to prevent the printing of a distinguishing mark or to cause a predetermined mark to be printed according to the mode of operation for which the machine is set as represented in the above table will be described hereinafter.

Device for tensioning and detensioning the springs that actuate the printing hammers

The printing of the numerals and numbers is effected by a printing hammer 40 (Figs. 2 and 3) while the printing of the distinguishing mark is effected by the type-wheel 5 itself, the frame 1, 1^a being flung upwardly with the type-wheel 5 for this purpose. The springs 41, 42 for operating the printing hammer 40 (Fig. 2), and the spring 43 that actuates the type-wheel 5 have their right ends connected to arms which are fixed on the shaft 10. The spring 41 is connected to the arm 60 (Fig. 9) that is fixed on the shaft 10, and the spring 42 is connected to a bell crank lever 52^a, 52^c (Figs. 9 and 10) also fixed on the shaft 10. But the spring 43 that actuates the rocker frame of the type wheel 5 is connected to a three-armed spider 51, 51^a, 51^b (Figs. 9 and 10) that turns loosely on the shaft 10, but can be coupled to the bell crank lever 52^a, 52^c by means of a coupling member in the form of a hook 50. This hook is pivotally connected to the top arm 51 of the said three-armed spider, and a draught spring 52 connected to a pin 50^a of the hook 50 and to the arm 51^a of the spider tends to pull the hook 50 into engagement with the coupling pin 52^b of the bell crank lever 52^a, 52^c. The shaft 10 is caused to execute a part of a revolution whenever the main driving shaft 35 is revolved, the said motion of the shaft 10 being effected as shown in Figs. 3 and 4 by means of a cam 54 fixed on the main driving shaft and cooperating with the roll 55 of a swinging member 55^a to rock the shaft 10 by means of a pull bar 56, bell crank lever 57, 57^a, pull bar 58 and an arm 59 fixed on the shaft 10. By this oscillation of the shaft 10 the springs 41, 42 are tensioned to actuate the printing hammer 40 and print the numerals and numbers and thereupon the springs 41, 42 are detensioned due to the roll 55 slipping off the cam 54 of the main driving shaft. While the tensioning and detensioning device for operating the printing hammer 40 acts in every operation of the machine, the spring 43 for effecting the printing action of the distinguishing mark type-wheel is only tensioned whenever the coupling hook 50 couples the bell crank lever 52^a, 52^c with the spider 51, 51^a, 51^b. This coupling operation of the hook 50 is made dependent on the position of the switch U, which affects the hooked rod 49 (Figs. 9 and 10) whose hook 49^a abuts upon the pin 50^a of the coupling hook 50. As shown in the above table, a distinguishing mark must only be printed when the switch U is thrown into its position U^1 or U^2, but not when it is in its position U^0, and irrespective of the position of the other switch Z. It follows that the hooked rod 49 must hold the coupling hook 50 in its disengaging or uncoupling position when the switch U is in its position U^0, so that even though the bell crank lever 52^a, 52^c is deflected, no deflection or turning movement is imparted to the three-armed spider. But when the switch U is thrown into one of its positions U^1 or U^2, the hooked rod 49 releases the coupling hook 50, so that it engages with the coupling pin 52^b and causes the three-armed spider, to which the actuating spring 43 is attached, to participate in the rotary motion of the shaft 10 for the purpose of tensioning the spring 43 to cause the latter to effect the printing of a distinguishing mark. The manner in which the hooked rod 49 is set by the switch U will be described hereinafter.

The manner in which the printing hammer and the type-wheel rocker are released for printing operations will now be described:

The release of the printing hammer 40 (Figs. 1, 2 and 3), which turns loosely on the shaft 2, is effected positively by a rotary

movement of the carrier shaft 69, on which the type carriers 70 (Fig. 3) are loosely pivoted. The type carriers bear types at their bottom edges for printing the numerals 0 to 9 and are set into positions for printing in accordance with the keys depressed in a keyboard in the manner described in my copending patent application. Fixed on the type carrier shaft 69 is a supporting arm 71 which carries an arcuate push lever 72. On the same carrier shaft 69 is pivoted a feeler arm 73 whose striking surface 73^a bears against a pin 74 fixed on the adjacent type carrier 70. Whenever a numeral key in the keyboard is depressed, the rotation of the main driving shaft causes the type carrier 70 to move through a certain angle, and the feeler arm 73 is then made to follow the pin 74 by the action of a spring 76. This results in the push bar 77 (Fig. 3) being pulled towards the right by the link 75, so that the upper end of the bar 77 contacts with the periphery of the arcuate push lever 72. By this means the push bar is brought into the path of the striking member 72^a, so that when the carrier shaft 69 is turned through a partial revolution by motion transmitted to it from the main shaft 35, the push bar 77 is pressed downwards. This downward motion is transmitted through the bell crank lever 78, 78^a, link 80, arm 81 fixed to the shaft 82, to the arresting arms 82^a and 64 (Figs. 2 and 3). The first arresting arm 82^a belongs to the printing hammer 40 and its arresting surface 82^b, which locked the arm 40^a of the printing hammer, now releases the same (Fig. 3). The second arresting arm 64 (Fig. 1) belongs to the rocker support or frame, 1, 1^a of the type-wheel 5, and its arresting surface 64^a, which previously locked the rocker frame, now releases the same. By the oscillation or partial revolution imparted to the shaft 10 at each operation of the machine as described above, the springs 41 and 42 are tensioned before the printing hammer is released. Therefore as soon as this release is effected the springs 41, 42 attached through draught rods 40^b, to an arm 40^c of the printing hammer (Figs. 2 and 3) throw the latter upward, causing it to strike against the type-carriers 70, or against the record strip and ink ribbon, whereby the desired impression on the record strip is made. When the springs are detensioned during the second half of the cycle of operations, performed during the revolution of the main driving shaft of the machine, the printing hammer drops by its own weight and is then locked in its normal position by the arresting arm 82^a.

A similar motion to that performed by the printing hammer is also executed by the rocker support 1, 1^a that carries the type-wheel 5. As shown in Figs. 1 and 5 the spring 43 is attached to the said frame by means of a draught rod 62^b and an arm 62 that rotates on the shaft 2 and tends to lift the rocker support or frame 1, 1^a. Therefore as soon as the arresting arm 64 (Fig. 1) releases the end of the rocker support, this latter is flung upwards by the action of the spring 43, causing the type of the type-wheel 5, which has been set into its printing position, to strike against the record strip supported by the type carrier 70. By this means the distinguishing mark is printed on the record strip. When the spring 43 is detensioned, the rocker support falls by its own weight into its normal position, where it is locked by the arresting arm 64 as described above. The spring 43 is only tensioned whenever the switch U is thrown out of its normal position U^0 and thereby causes the coupling hook 50 (Fig. 9) to couple the spring tensioning member 51, 51^a, 51^b to the spring tensioning shaft 10.

Effect of the switch positions on the printing of the distinguishing mark

The effect of the different positions of the two switches U and Z on the printing of the distinguishing mark and on the selection of the distinguishing mark required in each case will now be described:

Mode of operation I.—In the mode of operation I according to the above table, in which the switches occupy their positions U^0 and Z^0, no distinguishing mark is printed on the record strip. The manner in which this comes about has already been described above. When the switch U is in its initial position U^0 the coupling hook 50 is held in its non-coupling position by the hooked rod 49 (Fig. 9). Consequently even though the spring tensioning shaft 10 is turned, the spring 43 which acts on the rocker support 1, 1^a of the type-wheel 5 remains untensioned, so that the rocker support with its type-wheel remains in its normal position. As regards the switch Z, this is ineffective in its position Z^0, so that it has no effect on the mechanism or combination devices of the machine.

Mode of operation II.—In this mode of operation the switches are in their positions U^1 and Z^0 as shown in the above table. By throwing the switch U from its initial position U^0 into its position U^1 the gear shown in Fig. 3 is moved. By this motion the curved arm 23 fixed to the pivot 22 of the lever U is swung round and by its pin 23^a that engages with the forked arm 26 fixed to the shaft 24, the forked arm 25 fixed on the shaft 24 is also swung. This rocking of the curved arm 23 is utilized to swing a rocker frame 21 pivoted on the pivot 21^a through the angle α indicated in Fig. 3. This is effected by means of a pin (not shown) that projects from the rocker frame 21 into the slot of the forked lever 25. Only a fragment of the rocker frame 21 is shown in Fig. 3, so as to disclose the gear or parts behind the same. The described swinging motion of the frame 21 is trans-

ferred by a downwardly extending arm 21b and a link 44 to an arm 46 pivoted on a shaft 45. This motion of the arm 46 is transferred by an arm 46a, the link 47, and the bell crank lever 48, 48a to the aforesaid hooked rod 49, which thus releases the coupling hook 50 (Figs. 9 and 10) so that the latter engages with the coupling pin 52b. Consequently when the spring-tensioning shaft 10 is now turned by a revolution of the main shaft not only the springs 41 and 42 are tensioned, but the three-armed spider 51, 51a, 51b is also carried around by the coupling hook 50 to tension the spring 43, so that the latter throws the rocker support 1, 1a with its type-wheel 5 upwards for the purpose of printing the distinguishing mark.

The manner in which the various distinguishing marks are selected for printing in the aforedescribed position of the gear will now be explained: As already described above, the selecting operation consists in the movable member of frame 8, 8a having its striking pin 12 (Fig. 8) pulled towards the right against one of the steps of the two stepped levers 15, 16 prior to each printing operation. Fig. 8 shows the position of the stepped levers when neither of them has been turned from its normal position by the switches U and Z, these positions of the stepped levers corresponding to the modes of operation I and II of the machine. In the mode of operation I, no distinguishing mark is printed because no tensioning of the spring 43 is effected as described. In the mode of operation II now under consideration the striking pin 12 as seen in Fig. 8 is moved to the right into contact with the step 16a, whereby the type-wheel 5 is rotated accordingly. The travel of the pin 12 from its normal position to the step 16a causes the type-wheel to execute the largest possible rotation provided for in the illustrated embodiment of the invention. This largest possible rotation of the type-wheel, which has six distinguishing marks, results in the last type, viz. the distinguishing mark T, being presented for printing to the record strip.

Mode of operation III.—To set the combination devices for effecting the mode of operation III, the switches are thrown into position U2 and Z0. When the switch U is thrown into position U2, motion is transmitted to the hooked rod 49 while the switch U passes from position U0 to U1 in the manner set forth in describing the mode of operation II with reference to Fig. 3. Consequently, the coupling hook 50, Fig. 8 effects a coupling operation, and the spring 43 is tensioned when the machine executes the operation for which it has been set. During the motion of the switch from U1 to U2 the pin 23a on the curved arm 23, Fig. 3 disengages itself from the forked lever 26, because the right hand limb or prong of the fork is shorter than the other prong and allows the pin 23 to swing over its top end. Therefore the rocker frame 21 remains stationary after it has swung through the angle α and the hooked rod 49 also has no further motion imparted to it and the coupling hook 50 remains in its coupling position. To secure the parts in this position, a spring arresting lever 27a is arranged to cooperate with the roll 27 of an arm fixed on the shaft 24. When the switch U is thrown into position U0 or U1 the roll 27 is held in a recess in the arresting lever 27a as shown in Fig. 3 and thus maintains the shaft 24 in the position into which it has been turned.

During the passing of the switch from position U1 to U2 a pin 23c fixed to a short downwardly extending arm 23b of the curved arm 23 enters the slot of a forked lever 28, the right hand prong of the fork being made shorter than the other prong for this purpose. The rocking of the switch from U1 to U2 is thus caused to effect a deflection of the bell crank lever 28, 30 fixed to the shaft 29, so that the arm 30 of the bell crank lever swings upwards. The upward motion is transmitted through the pull bar 31, the bell crank lever 33, 33a, and the link 34 to the stepped lever 16 (Fig. 8), so that the step 16b instead of the step 16a is moved into the path of the striking pin 12. Consequently, when the machine is now operated by the main driving shaft the movable member of frame 8, 8a is drawn by the spring 11 towards the right until its striking pin 12 reaches the step 16b. This motion of the frame 8, 8a, which is transmitted to the type-wheel 5, causes the latter to be rotated by four types, so that a different distinguishing mark than in the mode of operation II is printed, viz. the distinguishing mark Z.

Mode of operation IV.—In this mode of operation the switch U is thrown into position U1 and the switch Z into position Z3. Since the switch U occupies the position U1 the coupling hook 50 (Fig. 9) effects a coupling operation and the stepped lever 16 is in its initial position shown in Fig. 8. By the throwing of the switch Z into its position Z3 the stepped lever 15 is turned as will be presently described, so that its step 15c (Fig. 8) is placed in the path of the striking pin 12. As the step 15c is higher than the step 16a it projects beyond the latter so that, when the machine executes the cycle of operations for which it is set, the striking pin 12 is stopped by the step 15c. This travel of the frame 8, 8a corresponds to a rotation of the type-wheel by three types, so that the distinguishing mark L is printed on the record strip.

The manner in which the motion of the switch Z is transmitted to the step lever 15 (Fig. 3) will now be described. By throwing the switch Z from its ineffective initial

position Z^0 into position Z^3 the toothed disk or sector 19, 19^a fixed to the switch Z is made to turn the toothed sector lever 18, 18^a. The arm 18^b fixed to the sector 18^a transmits its motion by means of the downward extending connecting rod 17 to the stepped lever 15 (Fig. 8), whereby the latter is set accordingly.

Mode of operation V.—In this mode of operation the two switches are placed in positions U^2 and Z^1. As already explained in connection with the mode of operation III, in the position U^2 of the switch U the coupling hook 50 effects a coupling operation and the step 16^b (Fig. 8) is rotated into the path of the striking pin 12. The throwing of the switch Z into the position Z^1 results in the step 15^a of the stepped lever 15 being turned into the path of the striking pin by means of the motion-transmitting members described in connection with the mode of operation IV. The step 15^a projects beyond the step 16^b so that the former determines the travel of the frame 8, 8^a. The height of the step 15^a is such that it contacts with the striking pin 12 before this pin is moved, i. e. while the frame 8, 8^a is still in its initial position. Consequently, no rotation of the type-wheel 5 takes place when the machine is operated, so that the type 5^c is printed, this type being uppermost on the type-wheel in the normal position of the latter. By this means the distinguishing mark Y is printed on the record strip.

Mode of operation VI.—For this mode of operation the switches are thrown into position U^1 and Z^2. In the switch position U^1 the coupling hook 50 effects its coupling operation and the stepped lever 16 remains in its normal or initial position (Fig. 8). The throwing of the switch Z into position Z^2 results in the stepped lever 15 being turned into a position in which its step 15^b extends out beyond the step 16^a and lies in the path of the striking pin 12. When the machine is now operated the type-wheel is rotated by one type, and the distinguishing mark I is printed.

Mode of operation VII.—For this mode of operation the switches are thrown into the position U^2 and Z^4. The throwing of the switch U into its position U^2 results in the coupling hook 50 effecting its coupling operation, and in the step 16^b being turned into the path of the striking pin 12. By the throwing of the switch Z into its position Z^4 the toothed sector 19^a (Fig. 3) is turned counterclockwise, and hence the stepped lever 15 (Fig. 8) is turned clockwise so that its step 15^d is rotated towards the striking pin 12. The height of the step 15^d is such that its lower slanting edge pushes the striking pin 12 backwards or towards the left, and this motion of the frame or movable member 8, 8^a imparts a small counter-clockwise motion to the type-wheel to the extent of half the pitch of the types, so that the small type 5^d adjacent the first full type is set into its printing position. By this means the distinguishing mark X is printed.

Mode of operation VIII.—For this mode of operation the switches are thrown into positions U^0 and Z^4. In the switch position U^0 no coupling operation is effected by the coupling hook 50 (Fig. 9) so that no distinguishing mark is printed. Therefore the throwing of the switch Z into position Z^4 has no effect on the printing of the distinguishing mark.

The effect on the printing of the distinguishing marks of all the switch positions utilized in setting the machine for operation has now been described. It will now be explained how the type-wheel is held fast in the frame or rocker support 1, 1^a and secured against rotation from its set position in the act of printing a distinguishing mark.

An inspection of Fig. 6 will show that the locking of the type-wheel in its set position is necessary because, when the rocker support 1, 1^a is thrown upward, the movable member or frame 8, 8^a participates in this motion and, by its inertia, tends to displace the link parallelogram represented by the pivots, 3, 6^b and 9^a, 7^a. This would cause a rotary displacement of the type-wheel, which must be avoided to secure the proper printing of the distinguishing mark. To avoid such displacements the following arrangement is provided:

As already described above the spring 43 acts on the pull bar 62^b (Fig. 5), which is connected by a pivot 62^c to a bell crank lever 62, 62^a for the purpose of raising the type-wheel rocker support 1, 1^a. When the pull bar 62^b is pulled to the right by the spring 43 the bell crank lever 62, 62^a at first moves by itself through a small angle until its horizontal arm 62^a contacts with the curved abutment 63. (This abutment 63, which is located between the two cheeks 1 and 1^a of the rocker type-wheel support, is shown clearly in Figs. 5 and 7.) It follows that the pivot 62^c first executes a short ineffective movement towards the right before the rocker support 1, 1^a is lifted. This short ineffective movement is transmitted by means of a link 65 to a bell crank lever 66, 66^a that acts on a holding lever 68 by means of a link 67. The holding lever 68 is pivotally connected to the lower end of the aforesaid curved abutment 63 and therefore also to the rocker support 1, 1^a. When the holding lever 68 is lifted in the manner described, the roll 68^a attached to its free end enters into one of the recesses 5^b of the type-wheel and thus locks it in the position in which it has been set for printing. The pitch of the recesses 5^b corresponds to that of the types. When the rocker support 1, 1^a is flung upward after

the described initial motion of the bell crank lever 62, 62ª and the resultant locking operation of the roll 68ª, the type-wheel is locked in its position relative to the rocker support 1, 1ª and therefore cannot be displaced by the movable member or frame 8, 8ª. As shown in Fig. 11, the right end of the latter is guided by a fork on the spring-tensioning shaft 10, so that it participates in the upward motion of the type-wheel support 1, 1ª, but does not displace the type-wheel during the said upward motion of the same.

The lever plate 6ª (Fig. 6) which is fixed to the toothed sector 6, is provided with two projections 6ᵉ and 6ᵈ for cooperation with a strip cutting mechanism, which, however, is not claimed as a part of the present invention.

Record-strip feed-mechanism

The forward travel or feed motion of the record strip 145 is effected by two feed rolls 105 and 107 pressed against each other as shown in Fig. 12, the roll 105 being driven positively from the main driving shaft through the medium of toothed wheels. Fixed on the main driving shaft 35, Fig. 4, is a ratchet and toothed wheel 53 having teeth on a part of its circumference only. After the shaft 35 has executed one half of a revolution the teeth of the wheel 53 engage with a toothed wheel 111 that transmits their rotary motion through the toothed wheel 112 to the shaft 45, causing it to execute a complete revolution. As shown in Fig. 12, this revolution is transmitted by means of a cam disk to a vertical bar 115 which is provided with a roller 115ª that projects into the cam groove 114ª of the cam disk 114. Consequently, the bar 115, which is guided by its upper slotted end on the shaft 45, is moved positively up and down to reciprocate the arm 116 of a bell crank lever 116, 116ª and the bell crank lever 118, 118ª by means of the link 117. By this means a spring pawl 121 is oscillated through an angle n^4 during each revolution of the main driving shaft. In oscillating clockwise the pawl 121 travels along the smooth periphery of an engagement-preventing member in the shape of a sector 120, see Figs. 11, 12 and 4. In the position of the engagement-preventing member 120 shown in these figures the pawl 121 can only engage with the toothed wheel 119 during the last section n^1 of its angular movement and in so doing shifts the record strip 145 forward by a distance corresponding to the space of a single printed line, the said small turning movement of the wheel 119 being transmitted by the toothed wheel 122 to the feed roll 105. This small feed motion, effected during each forward oscillation of the pawl 121, corresponds to the mode of operation I set forth in the above table, for which the machine is set when the switches occupy their positions U^0 and Z^0. The pawl 121 is curved in such a way, that when it is oscillated backwards it slips over the teeth of the toothed wheel 119 and is returned to its initial position shown in Fig. 12 without affecting the wheel 119.

In the mode of operation II the record strip must be fed forward a distance corresponding to the spacing between six adjacent lines as indicated in the table. This feed motion is effected by throwing the switch into its position U^1, as shown in Fig. 3 to deflect the rocker frame 21 through an angle α. This deflection of the rocker frame is transmitted by means of the link 44 to the bell crank lever 46, 46ᵇ and by means of the link 122 to the bell crank lever 124, 124ª whose striking pin 124ᵇ, shown in the upper right hand corner of Fig. 4, supports a lever 125 which a spring 126 tends to rotate clockwise. The bell crank lever 125 pivoted on the shaft 123, also shown in Fig. 11, has an arm 125ª with a downwardly extending prolongation 125ᵉ provided with guide pins 132, 133 that project through slots 132ª, 133ª of a vertically reciprocable bar 127. This bar 127 is normally pulled into its utmost upper position by a spring 131 whose one end is attached to the arm 125ᵉ of the bell crank lever 125 and whose other end is connected to a hump at the right hand side of the bar 127. The latter has also a leftwardly extending arm 127ª which carries a roll 127ᵈ. By the aforedescribed clockwise oscillation of the bell crank lever 125 the said roll 127ᵈ is brought into the path of the cam 130 fixed on the shaft 45 which is revolved in the aforedescribed manner during the rotation of the main driving shaft. Consequently, when the shaft 45 rotates, the cam 130 presses the slotted bar 127 downwards while tensioning the spring 131, the bar 127 being held in its lowermost position, in which the roll 127ᵇ occupies the position indicated by broken lines in Fig. 11, during the greater part of the revolution of the shaft 45. When the bell crank lever 125, 125ª was deflected as previously described the bottom hook-shaped end 127ᶜ of the slotted bar 127 enters into engagement with the pin 128ᵉ of a bell crank lever 128, 128ª. Therefore the downward movement of the slotted bar 127 now effected by the cam 130 causes the bell crank lever 128, 128ª to be deflected, this deflection being transmitted through the link 129 to the engagement-preventing member or sector 120, so that the latter is turned counter-clockwise to such an extent that the pawl 121 (Fig. 12) will commence engaging with the toothed wheel 119 early enough to turn it through an angle n^3, which is sufficient to effect a six-line feed motion, i. e. the largest contemplated feed motion of the record strip. When the cam 130 subsequently completes its revolution, the slotted bar 127 (Fig. 11) is pulled upwards by the spring

131 and restored to the position indicated by dotted lines in Fig. 11, whereby the sector 120 is restored to its initial position by means of the members 128 and 192. In this restoring motion the spring 131 is assisted by the spring 129^a that acts on the link 129.

When the lever U is thrown back from its position U^1 into its initial position U^0 the mechanism that connects it with the bell crank lever 125 and 125^a turns the latter counter-clockwise so as to uncouple the slotted bar 127 from the bell crank lever 128.

Mode of operation III.—In this mode of operation, which is obtained by throwing the switches into positions U^2 and Z^0, a six-line spacing on the record strip is required as shown in the table. As the rocker frame 21 (Fig. 3) is deflected through the angle α both when the switch U is thrown in the position U^1 and in U^2 all the parts in question are operated in the same way as just described in the mode of operation II.

Mode of operation IV.—In this mode of operation a three-line spacing of the record strip is to be effected according to the above table. As the switch U is thrown into position U^1 to obtain this mode of operation, the slotted reciprocating bar 127 is deflected by the throwing of the switch U in the manner described above in reference to Fig. 12, so that the lower end of said bar is coupled to the arm 128. In order that this coupling of the bar 127 to the arm 128 may not give rise to a six-line spacing on the record strip, and to secure instead a three-line spacing, the throwing of the second lever Z into its position Z^3 is utilized for effecting the following functions:

By the throwing of the lever of the switch Z into position Z^3 (Fig. 3) the toothed sector or disk 19, 19^a is made to rotate the toothed sector lever 18, 18^a through a certain angle. The downwardly projecting arm 18 of the said lever then turns the arm 136 and the shaft 135 a short distance in a clockwise direction. Fixed on the shaft 135 is a cam disk 134 (Fig. 11) upon which a pin 125^b of the bell crank lever 125 abuts. Consequently the clockwise deflection of the cam 134 results in a counter-clockwise deflection of the bell crank lever 125 so that the bottom end of the slotted reciprocable bar 127 is uncoupled from the bell crank lever 128, and the movement of the feed motion regulator or engagement-preventing sector 120, which would otherwise occur as a result of the throwing of the switch U into its position U^1, is thus prevented from taking place, and in its stead a small movement of the engagement preventing member 120 is effected in the following manner: The cam 134, when turned clockwise as described, raises a connecting bar 137 and by this means turns a cam 139 clockwise round its pivot 138. The cam 139 is adapted to turn the engagement-preventing member 120 through different angles. When its contacting surface 139^a is raised into engagement with the pin 128^b of the bell crank lever 128^a the latter lever, by means of the link 129, rotates the sector 120 counter-clockwise to such an extent that the pawl 121 (Fig. 12) during its forward travel commences engaging with the teeth of the tooth wheel 119 early enough to turn the wheel 119 through an angle n^2, which results in the record strip being advanced by a distance corresponding to the space between three lines. Thus a three-line spacing, instead of a six-line spacing, is accomplished.

Mode of operation V.—In this mode of operation a six-line spacing on the record strip is required according to the above table. This spacing is effected when the switch U is thrown into its position U^2 as described above. The throwing of the second switch into the position Z^1 has no effect on the strip feed mechanism.

Mode of operation VI.—In this mode of operation a single-line spacing on the record strip is required. As the switch U is thrown into its position U^1 a six-line spacing would take place, but the throwing of the second switch into its position Z^2 has a similar effect to that described in connection with the mode of operation IV, to obtain which the switch Z is thrown into the position Z^3. The difference consists only in the fact that the smaller angle, through which the switch Z is moved in going into the position Z^2, and required for the mode of operation VI, corresponds to a proportionally smaller deflection of the cam 139 (Fig. 11), so that the contacting surface 139^a fails to reach the pin 128^b and the sector 120 remains in its normal position shown in Fig. 11, in which the record strip is only shifted forward for the distance of a single line, so that a single-line spacing is secured.

Mode of operation VII.—In this mode of operation a six-line spacing of the record strip is required. This is secured when the switch U is thrown into its position U^2, the backward rotation of the switch Z into its position Z^4 having no effect on the strip feed mechanism.

Mode of operation VIII.—In this mode of operation a single-line spacing on the record strip is required. This is obtained when the switch U remains in its initial position U^0, the throwing of the second switch into its position Z^0 having no effect on the strip feed as already stated.

I claim:

1. In a machine of the character described, the combination of a main driving shaft, a member mounted for rotation and bearing on its periphery a plurality of distinguishing characters, a slidable member geared to said rotatable member for rotating the latter during the sliding movement of the slidable member, releasable means normally re-

taining said slidable member against sliding movement, means operable during rotation of the driving shaft for releasing said retaining means, means automatically operative upon release of said retaining means to actuate said slidable member thereby to rotate said character-bearing member to bring a predetermined character into printing position, and adjustable means for stopping the slidable member at one of a plurality of positions.

2. In a machine of the character described, the combination of a main driving shaft, a member mounted for rotation and bearing on its periphery a plurality of distinguishing characters, a spring operated slidable member geared to said rotatable member for rotating the latter during the sliding movement of the slidable member, a stop member carried by said slidable member, a rockable member having a portion normally disposed in the path of movement of said stop thereby to retain said slidable member against movement, means operative during rotation of the driving shaft for rocking said retaining member out of the path of said stop to permit movement of said slidable member under the action of its spring thereby to actuate said character-bearing member to bring a predetermined character into printing position, and adjustable means for stopping the slidable member at one of a plurailty of positions.

3. In a machine of the character described, a rotatable member bearing on its periphery a plurality of distinguishing characters, a slidable member geared to said rotatable member for causing rotary motion of the latter in response to sliding movement of the slidable member, a spring secured to said slidable member for moving the same in one direction, a plurality of stepped surfaces adjustable into the path of movement of said slidable member thereby to stop the same at varying points, and manually operable means for selecting and actuating said stop surfaces.

4. In a machine of the character described, the combination of a main driving shaft, a member mounted for rotation and for bodily swinging motion, said member bearing on its periphery a plurality of distinguishing characters, releasable means normally retaining said member against rotation, means operable during the rotation of said driving shaft for releasing said retaining means, means automatically operative upon the release of said retaining means to rotate said character-bearing member thereby to bring a predetermined character into printing position, means for stopping the rotation of said member in said position, means for bodily swinging said character-bearing member, and means for supporting a record strip in the path of said character-bearing member during its swinging motion thereby to receive the imprint of the selected character.

5. In a machine of the character described, the combination of a main driving shaft, a member mounted for rotation and for bodily swinging motion, said member bearing on its periphery a plurality of distinguishing characters, releasable means normally retaining said member against rotation, means operable during the rotation of said driving shaft for releasing said retaining means, means automatically operative upon the release of said retaining means to rotate said character-bearing member thereby to bring a predetermined character into printing position, means for stopping the rotation of said member in said position, a normally detensioned spring for swinging said character-bearing member, and means for selectively tensioning said spring thereby to swing said character-bearing member to imprint the selected character.

6. In a machine of the character described having a main driving shaft and a fixed printing position, means for printing a distinguishing mark and comprising a pivotally mounted frame, a type-bearing member mounted for rotation in said frame, a second frame mounted for sliding movement and pivotally connected to said first frame, means for imparting sliding movement to said second frame, gearing between said second frame and said rotatable member whereby sliding motion of the frame will rotate said member, means for varying the length of said sliding motion thereby to rotate said member to select a predetermined character for printing, tension means for swinging said first frame toward the printing position, means for retaining said first frame against swinging motion during the selection of said character, and means automatically operative to release said retaining means at a predetermined point in the rotation of the driving shaft.

In testimony whereof I have signed my name to this specification.

ERNST KASSNER.