Aug. 21, 1934. L. M. POTTS 1,970,567

COMPOSING MACHINE

Original Filed June 5, 1929 5 Sheets-Sheet 1

Fig. 1

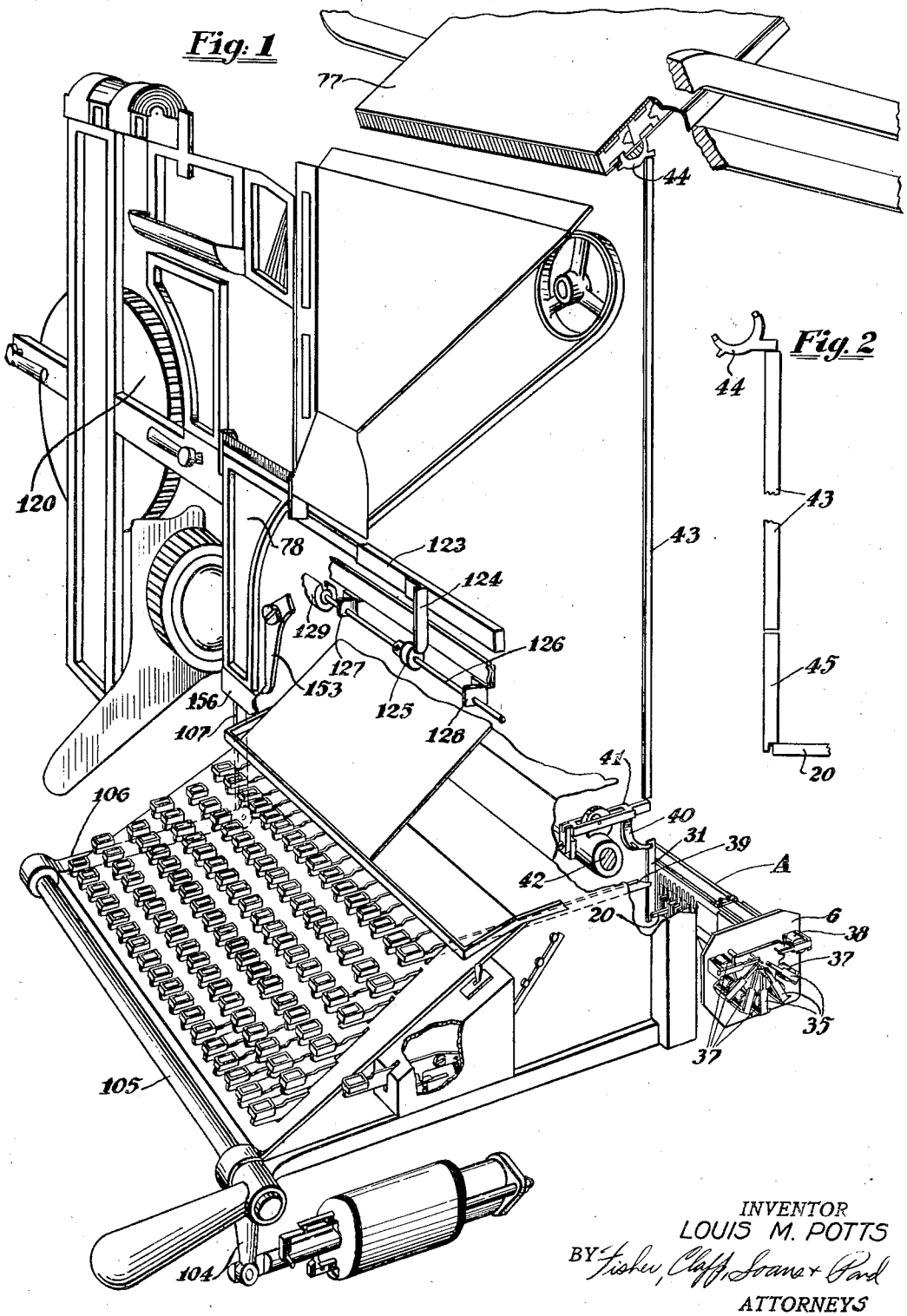


Fig. 2

INVENTOR
LOUIS M. POTTS
BY Fisher, Cluff, Soans & Card
ATTORNEYS

Aug. 21, 1934. L. M. POTTS 1,970,567

COMPOSING MACHINE

Original Filed June 5, 1929 5 Sheets-Sheet 2

Fig. 3

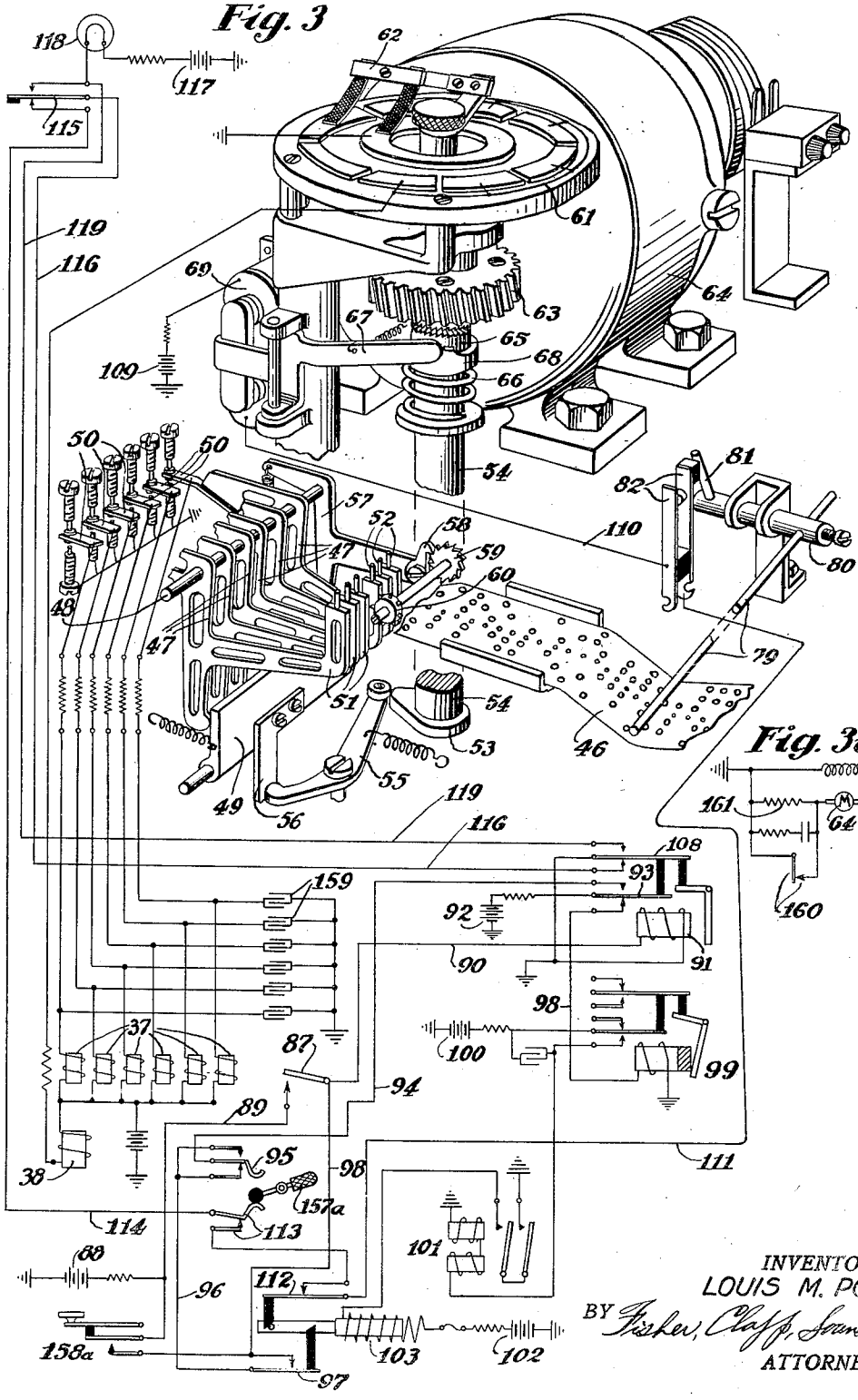


Fig. 3a

INVENTOR
LOUIS M. POTTS
BY Fisher, Clapp, Sears & Ford
ATTORNEYS.

Aug. 21, 1934. L. M. POTTS 1,970,567

COMPOSING MACHINE

Original Filed June 5, 1929 5 Sheets-Sheet 3

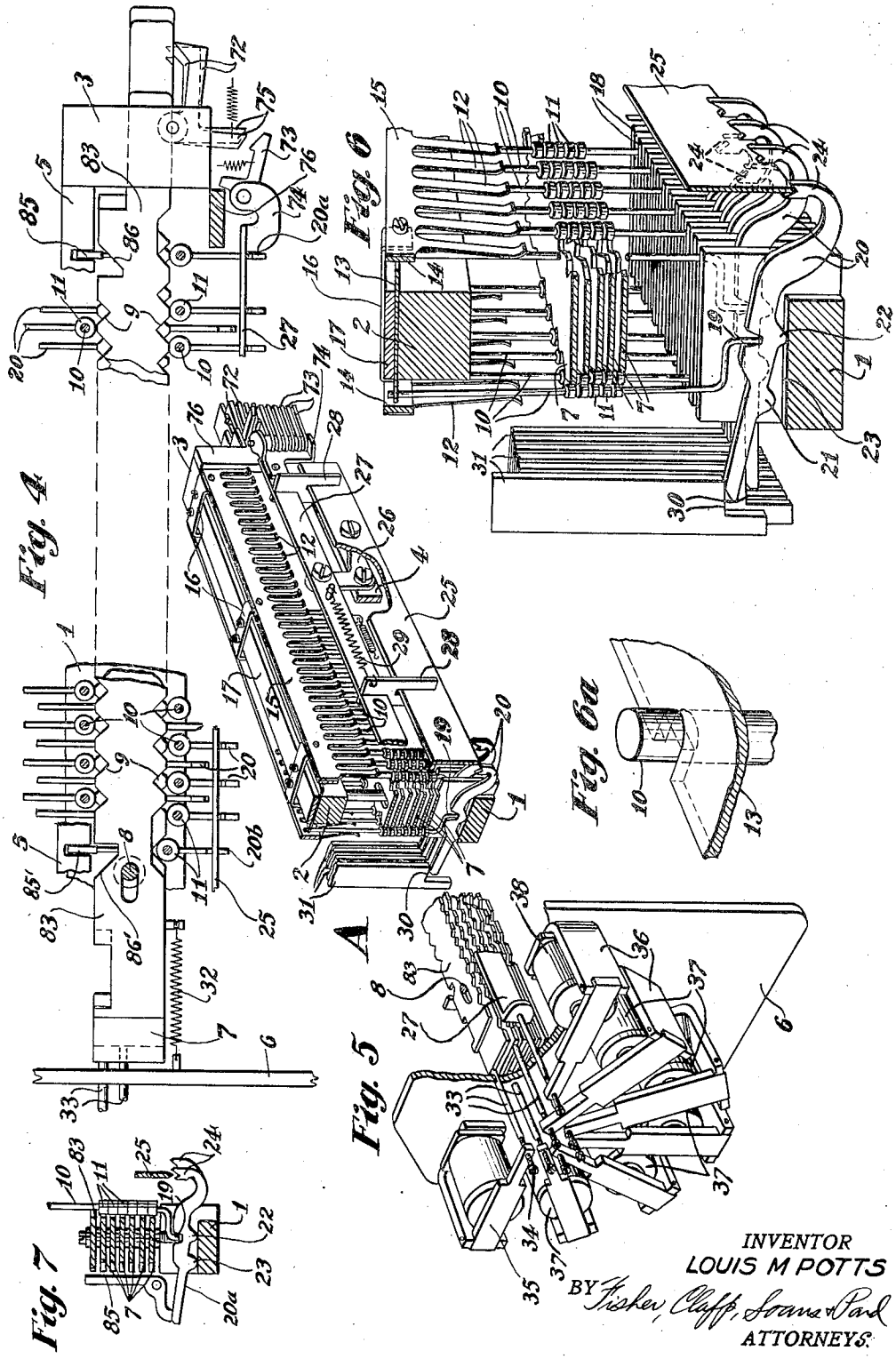


Fig. 4

Fig. 6

Fig. 6a

Fig. 5

Fig. 7

INVENTOR
LOUIS M POTTS
BY Fisher, Cluff, Soans & Paul
ATTORNEYS.

Aug. 21, 1934. L. M. POTTS 1,970,567

COMPOSING MACHINE

Original Filed June 5, 1929 5 Sheets-Sheet 4

Fig. 8

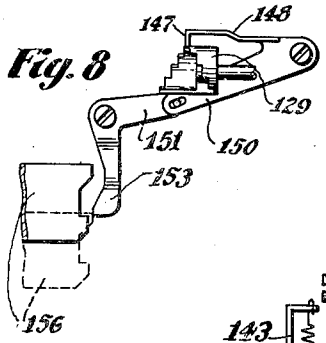


Fig. 9

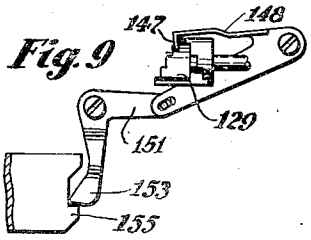
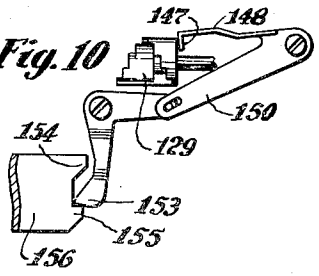


Fig. 10



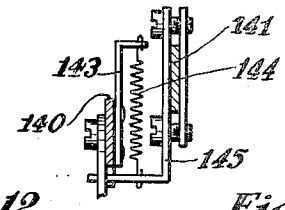


Fig. 12

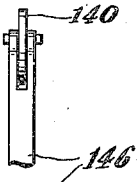


Fig. 13

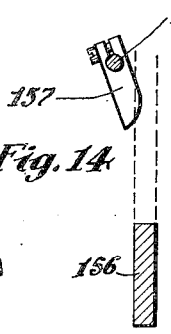
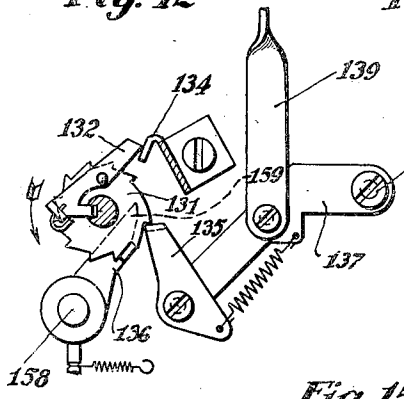
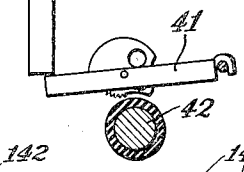
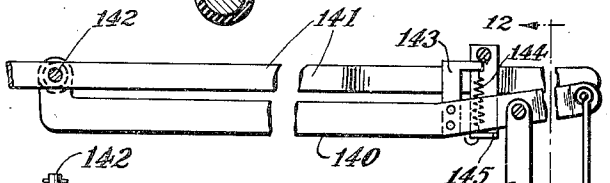


Fig. 14







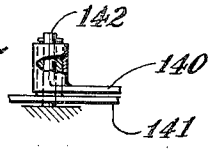
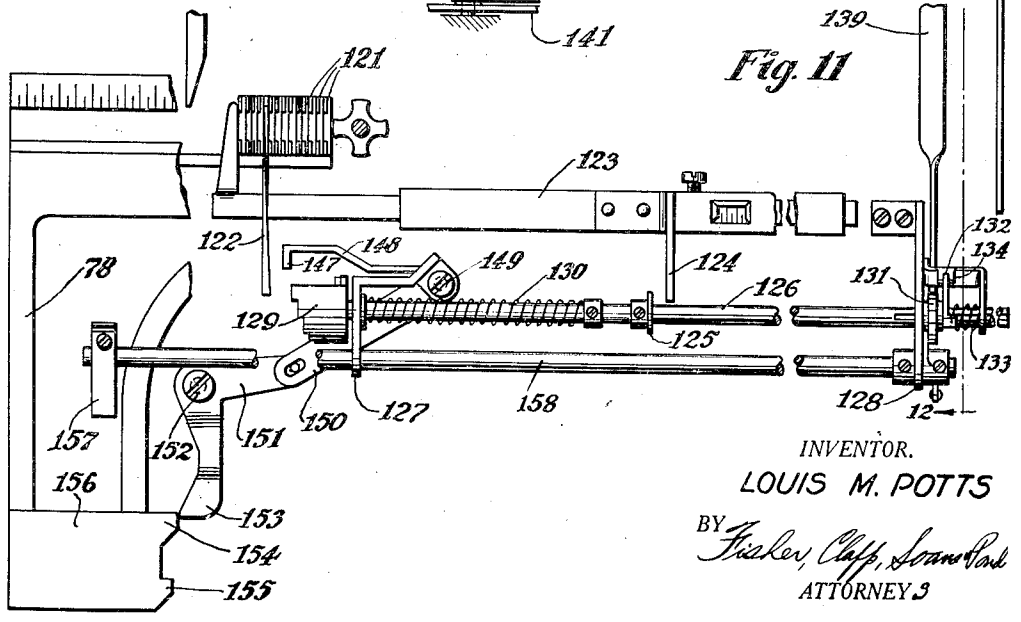


Fig. 15

Fig. 11



INVENTOR.
LOUIS M. POTTS
BY Fisher, Cliff, Lorance & Park
ATTORNEYS

Aug. 21, 1934. L. M. POTTS 1,970,567

COMPOSING MACHINE

Original Filed June 5, 1929 5 Sheets-Sheet 5

Fig. 16

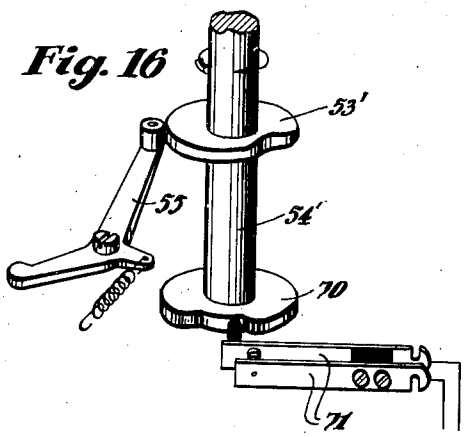


Fig. 18

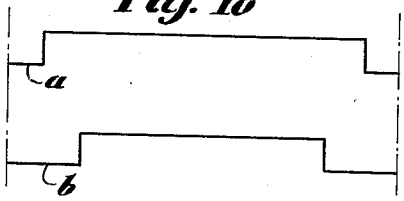


Fig. 19

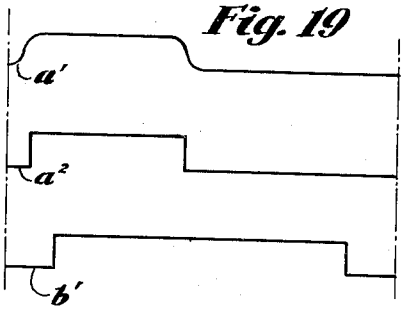
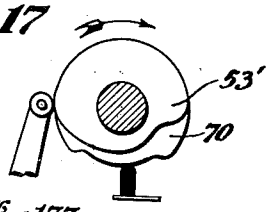


Fig. 17



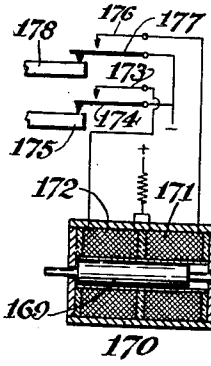


Fig. 22

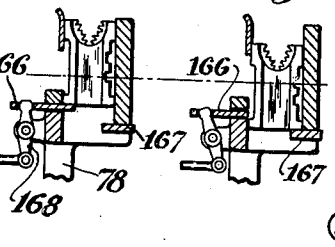


Fig. 23

Fig. 21

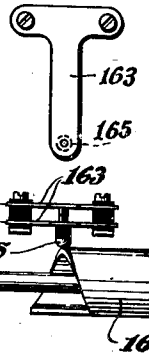
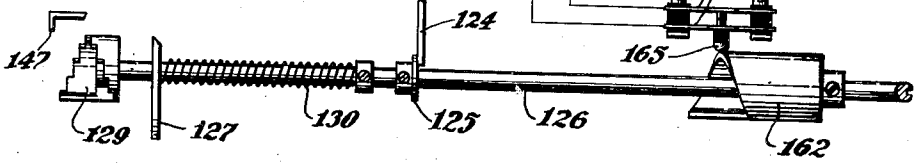


Fig. 20



INVENTOR.
LOUIS M. POTTS
BY Fisher, Clapp & Sommerford
ATTORNEYS.

Patented Aug. 21, 1934 1,970,567

UNITED STATES PATENT OFFICE

1,970,567

COMPOSING MACHINE

Louis M. Potts, Chicago, Ill., assignor, by mesne assignments, to Teletypesetter Corporation, Chicago, Ill., a corporation of Delaware

Application June 5, 1929, Serial No. 368,642
Renewed January 2, 1934

80 Claims. (Cl. 199—29)

The invention relates to composing machines and more particularly to automatically controlled line casting machines. The objects of the invention are to provide an improved compact selector or control mechanism adapted to be embodied as a unit in a standard line casting machine, and cooperate directly with the key-controlled mechanisms thereof to effect the automatic assembling of the matrices; to provide improved means for effecting the operation of the selector mechanism and which is preferably in the form of a tape-controlled, electrical transmitter that may be located adjacent or at a distance from the composing machine; to provide improved means for measuring the line of assembled matrices and which is variably operated in accordance with the number of wedge-shaped space bands in the assembled lines, and to provide means governed by the line measuring device for controlling or safe-guarding the automatic operation of the composing machine; to provide a shift mechanism adapted to be applied to a composing machine.

With these and other objects in view, the invention consists in the features of improvement hereafter set forth, illustrated in the preferred form in the accompanying drawings, and more particularly pointed out in the appended claims.

In the drawings:

Fig. 1 is a perspective view of a standard line casting machine, with the present improved controlling mechanism applied thereto.

Fig. 2 is a detail view of a slight modification.

Fig. 3 is a diagram of the selector controlling transmitter and circuits.

Fig. 3*a* is a diagram of the transmitter motor circuit.

Fig. 4 is a sectional plan view of the selector or control unit.

Fig. 5 is a perspective view thereof with parts broken away and parts shown in section.

Fig. 6 is a broken perspective view on an enlarged scale of a portion of the selector unit.

Fig. 6*a* is a detail showing how the selector rods are mounted.

Fig. 7 is a vertical cross section thereof, showing certain parts of the shift mechanism.

Figs. 8, 9, and 10, are detail views of a portion of the line measuring device with the parts shown in different positions.

Fig. 11 is a detail view in front elevation of the line measuring device and the operating mechanism for the space band reed.

Fig. 12 is a detail view with parts shown in section on the line 12—12 of Fig. 11.

Figs. 13, 14, and 15 are detail views of parts shown in Fig. 11.

Figs. 16 and 17 are perspective and plan views respectively, of a modified arrangement of the controlling and timing means.

Figs. 18 and 19 are charts of the timing operations.

Fig. 20 is a detail plan view of the line measuring device and a signalling attachment.

Fig. 21 is a detail elevation of one of the contacts shown in Fig. 20.

Figs. 22 and 23 show a bold and roman face attachment.

The selector or control unit A (see Figs. 4 and 7) is of compact construction, and such that it can be mounted in a standard line casting machine, for example the linotype, directly behind the keyboard, and when so mounted it will cooperate with the key-restoring weights of the machine to release the matrix operating cams.

The frame of the selector unit comprises a lower horizontal supporting base or bar 1, an upper horizontal bar 2 spaced from the lower bar, end brackets 3, front and rear fixed bars 4 and 5 and a magnet supporting plate 6 at one end. A set of six code or permutation bars 7 are horizontally disposed between the lower and upper bars 1 and 2, and slide longitudinally through guide openings formed in the end brackets 3 so that each code bar is shiftable to either one of two positions, the movement being limited by guide pins 8 fixed to the bars 1 and 2 and extending through slots in the code bars.

The code or permutation bars 7 are provided on both their front and rear edges with V-shaped notches 9, and the bars cooperate with two series of vertically disposed selector rods 10 arranged on opposite sides of the bars and provided with anti-friction rollers 11 which are pressed into engagement with the notched edges of the bars by spring fingers 12. The rods 10 are provided with notches near their upper ends and the projecting edges of a thin plate 13 on the upper face of the bar 2 extends within the notches and clamp bars 14 engage the upper end portions of the rods and hold them in engagement with the plate 13. The spring fingers are preferably in the form of depending extensions on thin strips 15, and these strips and the clamp bars 14 are secured to cross pieces 16 which are secured to the upper frame bar 2 by screws extending therethrough and through a strip 17 which holds the plate 13 in position.

The base 1 of the selector unit is in the form of a comb-bar and is provided with a series of

integral, upwardly and forwardly projecting guide fins or plates 18. The front and rear series of rods 10 extend within the spaces between the guides 18 and are provided with rearwardly and forwardly offset portions respectively, and terminate in depending ends 19 which extend within V-shaped notches in the upper edges of a series of selectable controlling levers 20. The latter are disposed between the guide fins or plates 18 and are free to move longitudinally and also oscillate. As shown, each lever has two lugs 21 and 22 on its lower edge which normally engage a horizontal seat 23 on the bar 1 and maintain engagement with such seat during the longitudinal movement of the lever. The lug 22 of each lever is disposed below the extension 19 of the corresponding rod 10 and forms a fulcrum upon which the lever can oscillate, as shown in Fig. 6.

The levers 20 are provided with upturned forward end portions 24 and the forward ends of the levers connected to the front and rear series of rods 10 are correspondingly disposed, when in normal position, in front and rear of the path of vertical movement of a universal bar 25. The latter is carried upon a pair of bell-cranks 26 (only one of which is shown) pivotally mounted on the fixed bar 4 and connected to a longitudinally movable actuating bar 27. The bars 25 and 27 engage guide slots in plates 28 on the frame bar 4 and are held in normal position by a spring 29. The universal bar 25 is provided with a beveled edge which is arranged to cooperate with V-shaped notches in the upturned forward ends of the levers 20, and the rear ends of the levers are disposed between shoulders 30 on the key-restoring weights 31 of the line casting machine.

The permutation bars 7 are each normally held in their left-hand positions by a series of springs 32 and these bars and the bar 27 are shifted to the right by a series of pins 33 slidably mounted in the plate 6, and engaged by adjusting screws 34 on the ends of a series of armature levers 35. These armature levers are pivoted in magnet frames 36 which are secured to the plate 6. The armature levers for shifting the permutation or code bars 7 are controlled by a set of six selector magnets 37. The armature for shifting the operating bar 27 is operated by a magnet 38.

By means of the magnets 37, the permutation or code bars 7 are positioned in different combinations and these bars are so notched that, in any setting, one of the rods 10 will be selected and shifted by its spring into a series of aligned notches of the bars and thereby moves the corresponding lever 20 longitudinally. If the selected rod is one of the series in front of the permutation bars, the corresponding lever is shifted rearwardly; whereas the selection of one of the rods in rear of the bars will move the corresponding lever forwardly. In either event, the forward end 24 of the selected lever is brought into the path of movement of the universal bar 25 and, when the bar 27 is shifted longitudinally by the operating magnet 38, bar 25 is depressed and the selected lever is oscillated, as shown in Fig. 6, to operate the corresponding matrix escapement mechanism of the line casting machine.

The weights 31 form parts of the key mechanism for the standard line casting machine. As shown in Fig. 1, each weight is interposed between a key lever 39 and a trip lever 40, which permits the operation of a cam lever 41 by a roller 42 and which lever, through a reed 43, operates a matrix escapement 44. If desired, as shown in Fig. 2, the controlling levers 20 of the selector unit could, through the medium of interposed parts 45, directly operate the reeds 43.

The selecting and operating magnets 37 and 38 could be controlled and timed in operation in response to telegraph signals having six selecting units and transmitted over a single line wire from a distant station. But since the operation of the selector which controls the matrix assembling mechanism of the composing machine must be arrested during the transfer of the assembled line of matrices to the casting mechanism, the operation and timing of the magnets is preferably effected by a local, motor-driven transmitter under control of a perforated tape. As shown in Fig. 3, the tape 46 has transverse rows of holes, each row having six code hole positions and representing a character or signal. The tape is also provided, as usual, with feed holes and, like telegraph tape now in use, can be prepared by a keyboard perforator or by a receiving reperforator which is responsive to selecting code signals transmitted from a distant station.

The tape selectively controls a series of six bell-crank levers 47 mounted on a pivot rod 48. The depending arms of these levers are spring-held in contact with a pivoted spring-held universal bar 49, and the horizontal arms of the levers are provided with a series of contacts 50, one for the circuits of each of the selecting magnets 37. The levers 47 are also provided with forwardly extending arms 51 having upturned ends provided with pins 52 in line with the code hole positions of the tape. The universal bar is oscillated to move the feeler pins 52 into and out of engagement with the tape by a cam 53 on a motor-driven shaft 54 and through the medium of a spring-held lever 55 having a follower or roller engaged by the cam and an arm engaging a lug 56 on the universal bar.

An additional spring-held lever 57 on the pivot 48 is also shifted by the universal bar 49 and carries a feed pawl 58 which operates a ratchet 59 and a pin toothed tape feed wheel 60. The circuit of the operating magnet 38 is controlled by a commutator disk 61 and brush 62, the latter being mounted on the upper end of the shaft 54. A gear 63 loose on the shaft is continuously driven by a motor 64 and is connected thereto by a shiftable clutch member 65. A spring 66 tends to hold the clutch closed and a pivoted spring-held arm 67 is arranged to cooperate with a cam 68 on the movable clutch member 65 to open the clutch and hold it open. The armature of a magnet 69 is fixed to the start-stop lever 67 and when energized holds the arm or lever in inoperative position, and, since the magnet is normally energized, the clutch is engaged to effect the rotation of the cam 53 and brush 62. As the cam 53 rotates, the levers 47 and 57 are relieved of the pressure of the universal bar 49, and the springs of the levers tend to lift the feeler arms 51 and feed pawl 58. The pins registering with the holes in a row of perforations on the tape will permit the feeler arms to rise high enough to close the circuits of the corresponding selector magnets 37 and thereby effect the movement of the corresponding permutation bars of the selecting or control unit. But the blank portions of the tape will prevent the energization of the other selecting magnets. Shortly after the selector magnets are thus energized, the brush 62 closes the circuit of the operating magnet 38 and the selected lever of the control unit is operated as described, by the universal bar 25. The reverse movement of the le-

vers 47 and 57, effected by the universal bar 49, opens the circuits of the magnets 38, withdraws the feeler pins from the tape and advances the tape one step to bring the next row of perforations into operative position.

The cam 53 and the commutator 61 and its brush 62 are so related that the selector magnets 37 are energized before the operating magnet 38, and the latter is de-energized before the circuits of the selector magnets are opened. Thus, in Fig. 18, in which the horizontal dimensions of the lines *a* and *b* represent the time of one revolution of shaft 54, the high part of line *a* represents the period during which the selector magnets are energized and the high part of line *b* represents the period during which the circuit of the operating magnet is closed.

Figs. 16 and 17 show a modification of the controlling and timing means for the magnets, in which the motor-driven shaft 54' is provided with a cam 53' for operating the feeler pin levers and also with a cam 70 for opening and closing contacts 71 interposed in the circuit of the operating magnet 38. With this arrangement, while the circuits of the selector magnets 37 are closed first, these magnets are de-energized before the circuit of magnet 38 is open. Thus, in Fig. 19, the line *a'* represents the movement of the feeler pins as effected by the cam 53', and the high portions of the lines a^2 and *b'* represent the times of closed circuit of the selecting and operating magnets respectively.

During each cycle of operation, with the arrangement shown in Fig. 3, the operating magnets 37 hold the corresponding permutation bars 7 in their shifted positions during the operation of the universal bar 25 which is effected by the magnet 38. With the controlling and timing means shown in Figs. 16 and 17, additional means is required for holding the selected permutation bars in shifted position. For this purpose, spring-held latches 72 (Figs. 4 and 5) are arranged to engage notches in the selected permutation bars to retain them in shifted position. A corresponding series of spring-held releasing pawls 73 are mounted on a bracket 74 that is fixed to the right-hand end of the bar 27. The longitudinal movement of this bar to the right, effected by the magnet 38, permits the engagement of the pawls 73 with forwardly projecting arms 75 on the latches 72, so that, when magnet 38 is de-energized and bar 27 moved to the left by its spring, the latches 72 are released and the shifted permutation bars restored by their springs 32. At the end of the return movement of bar 27, the pawls engage a fixed abutment 76 on the frame of the selector unit and are thus disengaged from the latches.

Normally, during the assembling of a line of matrices, the circuit of the magnet 69 (see Fig. 3) is closed, clutch 65 is engaged and shaft 54 rotates continuously. At each revolution, the selector mechanism as described, effects the operation of one of the escapements 44 (see Fig. 1) and a matrix is delivered in the usual manner from the magazine 77 to the elevator 78. The controlling tape 46 may be fed to the transmitter from a reel or directly from a perforator that is operated either manually or automatically in response to signals transmitted from a distant station. When the tape is fed directly from a perforator, it is passed beneath an arm 79 (see Fig. 3) on a rock shaft 80. The latter is provided with an arm 81 which normally holds a pair of contacts 82 in engagement. These contacts are interposed in the circuit of the stop-start magnet 69 and, if the operation of the perforator fails to keep pace with that of the transmitter, the tension of the tape shifts the rock shaft 80 and opens this circuit. Arm 67 then disengages clutch member 65 and arrests the transmitter and the composing machine controlled thereby.

To permit the operation of the composing machine in accordance with a six-unit telegraph code, and also provide for both upper and lower case characters, the selector unit is provided with an additional permutation bar 83 (see Figs. 4, 5, and 7) which is operated, not by a selector magnet, but under control of the other bars. Thus, upon receipt of a special upper case shift signal, the magnet-operated permutation bars 7 are positioned to effect the selection and operation of a lever 20^a, this lever, when oscillated by the universal bar 25, instead of operating a matrix escapement, shifts a bell-crank lever 85 (see Figs. 4 and 7), and the latter cooperates with the inclined cam edge of a notch 86 in the bar 83 to move it to its right-hand position. Then the continued operation of the controlling mechanism will effect the selection of upper case matrices. A similar lever 20^b effects the operation of a bell-crank 85' in response to a lower case signal and the latter co-operates with a cam notch 86' to restore the shift permutation bar. Preferably, as shown, the bell-crank levers 85 and 85' operate in guide slots in the fixed bar 5. The shift permutation bar 83, like the others, is provided with cam notches on both sides. With this arrangement, it is possible to employ a six-unit code to select over one hundred and twenty characters.

A special lever controlled by the selecting unit and the operation of which is effected by the universal bar in response to a line or elevator signal, instead of operating a matrix escapement, closes a switch contact 87 (see Fig. 3). When this contact is thus closed on the completion of the assembling of a line of matrices, a circuit is completed from battery 88 by conductors 89 and 90, through the coil of a relay 91. The operation of this relay closes a holding circuit from a battery 92 through the front contact of a switch 93, conductor 94, normally engaged contacts of switch 95, conductor 96, normally engaged contacts 97, and conductors 98 and 90, through the coil of relay 91. Thus, when this relay is energized by the operation of the switch 87, its circuit remains closed independently of this switch. The shift of relay contact 93 also opens a normally closed circuit from battery 92, through conductor 98 and the circuit of a slow-release relay 99. The release of the armature of this relay closes a circuit from a battery 100 through a relay 101 and the latter closes a circuit from a battery 102 through a solenoid magnet 103. The core of this magnet (see Fig. 1) is connected to an arm 104 on the elevator rock shaft 105 of the standard line casting machine and which, as usual, is provided with an arm 106 connected by a link 107 to the elevator 78. It is noted that a time interval intervenes after the receipt of a line or elevator signal before the elevator magnet 103 is energized, to permit the positioning of the last few matrices making up the line on the elevator.

The operation of the relay 91 also shifts a switch 108 which is interposed in the normally closed circuits of the transmitter stop-start magnet 69. This circuit may be traced as follows:— From battery 109 through the coils of magnet 69, conductor 110, contacts 82, conductor 111, normally closed contacts 112 and 113, conductor 114, the normally closed contact of a switch 115, con-

ductor 116 and the normally engaged contact of relay switch 108 to ground. The receipt of a line or elevator signal thus arrests the shaft 54 of the controlling transmitter after a single revolution. To avoid the operation of the selector unit during this revolution, the row of perforations of the tape following the perforations representing a line or elevator signal, is of such a nature that it will not effect any complete operation of the selector mechanism.

In addition to opening the circuit of the transmitter stop-start magnet 69, the switch 108 closes a circuit from a battery 117 through a signal lamp 118 and a conductor 119 through relay switch 108 to ground.

The initial movement of the core of the solenoid magnet 103 and the elevator 78 operated thereby, opens the normally closed contacts 112 in the circuit of the magnet 69, so that the transmitter and the selector mechanism cannot again operate until the elevator is returned to normal position. At the end of its stroke, the core of this magnet opens the contacts 97 in the locking circuit of relay 91, so that the control circuits are all restored to normal condition, except that the energizing circuit of magnet 69 remains open as described, until the elevator 78 returns to its normal lowermost position ready to receive another line of matrices.

In the standard line casting machine, the elevator 78 delivers the line to a horizontally moving carrier and the latter delivers it to the casting mechanism 120. To guard against the delivery of a line of matrices which is outside the casting range, that is to say, that is either too long or too short, means is provided for measuring the assembled line. For this purpose, it is controlled by a line measuring device and the latter is preferably arranged to measure the length of the assembled line and also the number of wedge-shaped space bands which, as is well known and understood, are employed in the standard line casting machine to effect the justification of the line.

As usual, the assembling of the matrices 121 which are of fixed thickness, that is to say, each matrix is of uniform thickness, and the wedge-shaped space bands 122, which vary in thickness, effects the movement of an assembler slide 123 (see Fig. 11) which forms part of the standard line casting machine. In the present construction, this slide is provided with a depending lug 124 which is arranged to engage a collar 125 on a rod 126. This rod is mounted in fixed brackets 127 and 128 so that it is free to move longitudinally and also rotate. A spirally stepped cam 129 is fixed to one end of the rod 126 and a spring 130 thereon normally presses the rod towards the right. The outer end of this rod slides through the hub of a ratchet wheel 131 and a spring-held dog 132 pivoted thereon engages a key way in the rod and so connects the ratchet and rod against relative rotation, but permits the independent longitudinal movement of the rod. A spring 133 on the rod tends to rotate it and normally holds the dog 132 in engagement with a fixed stop 134.

Spring-held feeding and holding dogs 135 and 136 co-operate with the ratchet 131 and the former is pivoted on a rock arm 137 which is carried on a fixed pivot 138 and is connected by a link 139 to a lever 140. The latter and the usual space band lever 141 of the standard line casting machine, are both pivotally mounted upon a stud 142. An arm 143 on the lever 140 is connected by a spring 144 to an arm 145 on the lever 141 and this spring normally holds an extension on the arm 145 in engagement with the lower edge of the lever 140.

The lever 140 is connected at its outer end to the upper end of the space band reed 146, which is operated by the space key or by the selection and operation of a special lever 20 by the automatic control unit and in turn effects the operation of the levers 140 and 141, so that the space band is delivered to the assembler slide and the rod or shaft 126 of the measuring device is rotated one step. The operation of lever 140 requires a greater degree of motion than that of lever 141, and this is permitted by the yielding connection between these levers.

In addition to the step-by-step rotary movement of the measuring rod 126, it is shifted to the left by the engagement of the arm 124 on the assembler slide with the collar 125, such engagement being effected at a predetermined point in the assembling of a line of matrices.

The spirally stepped cam 129 co-operates with a depending lug 147 on one arm 148 of a bell-crank pivoted at 149. The other arm 150 of this bell-crank has a pin and slot connection with a bell-crank lever 151 pivoted at 152. This lever is provided with a depending stop arm 153 which co-operates with lugs 154 and 155 formed upon an offset 156 on the elevator 78.

In the particular form of measuring device shown, the ratchet wheel 131 has ten teeth and the cam 129 is divided into ten divisions. The first division comprises a longitudinal slot extending throughout its length. The second division has a step the height of which when added to the thickness of the lug 147, equals the difference in thickness between the thin and thick ends of a space band. The second step on the cam has a height which when added to the thickness of the projection 43, is equal to twice the difference between the thickness of the thick and thin ends of a space band, and so on for each step of the cam, the height of each step of which exceeds the height of the preceding step by this difference in thickness between the ends of a space band; that is to say, by the amount of possible justification which can be effected by a single space band.

In the normal lowermost position of the elevator, the lug 147 is held in the position shown in Fig. 11 by the engagement of the stop arm 153 with the lug 154. The spirally stepped cam is variably positioned beneath the lug in accordance with the length of the line and also in accordance with the number of space bands in the line. Then, when the movement of the elevator is initiated, as described, the lug 154 thereon moves above the beveled end of the stop arm 153 and the latter can swing in clockwise direction to lower the arm 148 and lug 147. If the line is within the casting range, the movement of the stop arm 153 will be arrested by the engagement of the lug 147 with the cam 129 as shown in Fig. 8, and the continued movement of the elevator effects the delivery of the assembled line to the line casting mechanism and initiates such operation. But if the line is either too short or too long, the lug 147 of the lever 148 will clear either the left-hand edge or the right-hand edge respectively of the cam, as shown in Figs. 9 and 10, and the stop arm will engage the lug 155 and arrest the further vertical movement of the elevator. The amount of possible justification to bring a line to proper casting length depends, of course, upon the number of wedge-shaped space

bands in the line, but the improved measuring arrangement makes provision for the possible justification by measuring not only the length of the line of assembled matrices, but also the number of space bands in the line.

Near the end of the upward movement of the elevator, the projection 156 thereon engages a lug 157 on a rock shaft 158. The holding dog 136 is fixed to this rock shaft so that this dog is thereby disengaged and a projection 159 on the holding dog also disengages the feed dog 135. Hence, spring 133 rotates the parts of the measuring device back to initial position with the dog or pawl 132 engaging the stop 134. The operation of the elevator also, of course, as usual restores the assembler slide 123 so that spring 130 restores rod 126 and the parts carried thereby to their right-hand position.

In case the elevator mechanism is arrested as described, the elevator magnet 103 will remain energized since its core does not complete its working stroke, and while it opens the switch 112 in the transmitter start-stop magnet 69, it will not open the locking circuit of the relay 91. Hence, the transmitter and the selecting mechanism controlled thereby will remain at rest and with the signal lamp 118 lighted, thus notifying the attendant that adjustment of the apparatus is required. The attendant may then adjust or reset the line. If he desires to reset the line, he can shift the handle 157[a] (see Fig. 3), thereby opening the switch or key 113 and shifting the switch or key 95. The opening of key 113 prevents the re-starting of the controlling transmitter until the handle 157 is restored to normal. In either of its positions, key 95 will complete the locking circuit of the relay 91 at this point, but such circuit will be opened momentarily as the key passes from one position to another to open this circuit and restore the controlling circuits to operative position until the relay 91 is again energized. The line may be reset manually by means of the keyboard of the composing machine, and then by manually operating the key 158[a] which is connected in shunt around the selector control switch 87, relay 91 can be energized to effect the operation of the elevator mechanism in the manner previously described. The switches or keys 95, 113 and 158 can be manipulated at any time, if desired, to stop the automatic transmission and permit the manual control of the composing machine.

A switch 115 (see Fig. 3) is in position to be engaged by the clutch member of a standard line casting machine, which is shifted in case a matrix becomes jammed or misplaced in the distributing mechanism for the matrices. The shift of this switch will light the signal lamp 118 and arrest the operation of the controlling transmitter by opening the circuit of the magnet 69.

To prevent sparking at the contacts 50, condensers 159 are interposed in shunt around these contacts, Fig. 3[a] shows the circuit of the operating circuit for the transmitter motor. To insure the steady running of the motor, a governor is arranged to open and close contacts 160 connected in shunt around a resistance 161 in the motor circuit.

The line measuring device is also preferably provided with an additional cam 162 (see Fig. 20) on the longitudinally movable, rotatable rod 126. This cam is shaped like the cam 129, except that its edge is helical and is not stepped, and it is arranged to cooperate with a pair of contacts 163 in the circuit of a signal lamp 164, one of which contacts is provided with a ball-shaped projection 165. Cam 162 is adjustable and is so positioned that it will engage the projection 165, close the contacts and light the lamp, when four ems or other chosen amount can be added to the line of matrices to bring it to the minimum casting length. The attendant is thus notified when the line is about to attain its minimum casting length as is desirable, particularly when the composing machine is manually operated by the keyboard. Different cams 129 and 162 are provided for different sizes of space bands. Since the amount of possible justification in any assembled line of matrices is determined by the number of space bands contained in it and since the rotary movement of the cams 129 and 162 in effect measure the amount of possible justification, the signal lamp 164 controlled by the cam 162 indicates whether or not an assembled line is within the justifying range.

It is usual to have two embossings on each matrix. For example, one may be bold face and the other roman of the same character. Means are provided in hand operation for setting the matrices in either of two positions so that either character may be cast as desired.

Figures 22 and 23 show diagrammatically a signal controlled means for doing this. On the elevator 78 is provided a sliding plate 166 upon which the matrices may rest as shown in Figure 22 and the matrix will be in the position to cast ordinary roman characters. However, if the plate 166 is pulled to the left as shown in Figure 23 the matrix will drop to a lower position, rest on shelf 167 and will be in position to cast bold face. Up to this point the operation is the same as in an ordinary hand operated machine. The lever 168 however, instead of being provided with a finger piece for hand operation is linked to the plunger 169 of a double wound iron clad solenoid 170. This magnet is of a well known construction and if the right hand coil 171 is energized the plunger 169 will move to the right and the plate 116 will be moved to the left and bold face characters will be cast. If the left hand coil 172 is energized the plunger 169 will move to the left and the plate 166 will be moved to the right and matrices set thereafter will cast roman face.

One terminal of each coil of the solenoid is connected through a resistance to positive, the other terminal of the left hand coil is connected to contact 173, which is adapted to be engaged by a contact 174, connected to negative. The insulated tip of contact 174 engages the tip of lever 175, which is one of the levers 20 arranged to move the contact instead of tripping a matrix release. The other terminal of the right hand coil is connected to a contact 176 adapted to engage a contact 177, connected to negative. Contact 177 is arranged to be operated by lever 178, similar to lever 175, but responding to a different code setting of the permutation bars. It will be noted that this arrangement functions like a shift mechanism. If contact 173—174 is closed all of the characters thereafter will be roman face and if contact 176—177 is closed, bold face will be cast, until the condition is changed by the operation of the other contact.

The plate 166 on hand operated machine usually has the width of several matrices, so that if it is pulled out it will drop a considerable number of the preceding matrices to the bold face position. To avoid this the face may be made quite narrow so that it will engage only one thick matrix or two thin ones. Since a bold face char-

acter or roman face character is usually preceded by a space matrix of some sort, sufficient margin may be obtained in this manner so that the position of the matrices can be governed as desired from the perforated tape.

Obviously, many changes can be made in the details set forth without departure from the scope of the appended claims.

I claim as my invention:

1. In combination, a series of permutation members, a series of elements selected by the setting of said members, means to set a plurality of said members, a common actuator for the selected elements, and means controlled by certain settings of said members and operated by said actuator to set another of said members.

2. In combination, a series of permutation members, means to set a plurality of said members in varying permutations, a plurality of elements selectable by said members, a common actuator for the selected elements, and means controlled by two different settings of said members for moving one of said members in two different ways.

3. In combination, means to transmit a series of electrical signals each composed of a different permutation of a series of elementary signals, permutation mechanism composed of a series of elements, means controlled by said signals to set certain of said permutation elements each according to the corresponding elementary electrical signal, and means to set another of said permutation elements according to a complete signal.

4. In combination, a plurality of permutation members, a series of elements selected by the setting of said permutation members, and a common actuator for the selected elements arranged to cooperate with one of said elements to control one of said permutation members.

5. In combination, a series of controlling elements having different selecting and operating movements, a set of permutation members adapted to be positioned in different combinations to control the selecting movements of said elements, and means for effecting the actuating movements of certain of the selected elements to thereby position one of said permutation members.

6. In combination, a series of selectable controlling elements, a universal member for shifting said elements in one direction and a set of permutation members selectively controlling the movement of said elements in another direction into and out of cooperative relation with said universal member, and one of which permutation members is positioned by the selection and actuation of certain of said elements.

7. In combination, a series of longitudinally and transversely movable, selectable elements, a set of notched permutation bars and a universal bar for effecting the longitudinal and transverse movements respectively of said elements respectively, and means operated by certain of said elements for positioning one of said permutation bars.

8. In combination, a series of longitudinally slidable permutation members, notches cut in both sides of said members, a series of elements selectable by said members, some of said elements being located on one side and the others on the other side of said permutation members.

9. In combination, a series of selectable, controlling members, a universal actuating member, and means for selectively moving certain of said controlling members in one direction and other of said controlling members in a reverse direction to engage said universal member.

10. In combination a set of longitudinally movable, notched permutation bars, a plurality of elements disposed on opposite sides of said bars and selectable by movements in opposite directions into the alined notches of said bars, a universal actuating bar, and a plurality of controlling members moved in opposite directions by the selected elements into cooperative relation with said universal bar.

11. In combination, a plurality of controlling members, mounted side by side for pivotal and longitudinal movement, a universal actuating bar for effecting the pivotal, operative movements of said members, two series of elements for moving said controlling members longitudinally and in opposite directions into cooperative relation with said universal bar, and a set of longitudinally movable permutation bars disposed between the two series of elements and having notches in their opposite edges for selectively controlling the same.

12. In combination, a plurality of selectable controlling members mounted side by side for pivotal and longitudinal movement, a universal member for effecting the pivotal operating movements of said controlling members, a series of spring-pressed elements for moving said members longitudinally into and out of the path of movement of said universal member, and a set of longitudinally movable permutation bars having cam-shaped edges for selectively controlling said elements.

13. In combination, a series of permutation members, a magnet individual to each member and adapted when energized to operate the member, a latch adapted to hold each member in its operated position, a series of actuating elements selected according to the members operated, an actuating member for the selected element, and means operated by the actuating member to release said latches.

14. In combination, a series of permutation members, a magnet individual to each member and adapted when energized to operate the corresponding member, a latch adapted to hold each member in its operated position, a series of actuating elements selected according to the members operated, an actuating bar adapted to operate the selected element upon its forward movement and means operated by the return movement of the actuating bar to release said latches.

15. In combination, a series of permutation bars, magnets individual to certain of said bars and adapted to operate the bars, and mechanical means to operate another of said bars.

16. In combination, a set of permutation members, a series of elements selectively controlled by said permutation members, individual operating magnets for said members, a corresponding series of tape-controlled contacts interposed respectively in the circuits of said magnets, an intermittent feed for the controlling tape and rotary, motor-driven timing means for alternately operating said contacts and said tape feed.

17. In combination, a set of permutation members, a series of elements selectively controlled by said permutation members, a universal operated member for the selected elements, operating magnets for said permutation and said universal members, corresponding contacts interposed respectively in the circuits of said magnets, a rotary, motor-driven member for effecting and timing the engagement of said contacts, a perforated

tape controlling the engagement of the contacts of the permutation magnets, and an intermittent feed for the tape actuated by said rotary member.

18. In combination, a composing machine, permutation mechanism including a set of selecting magnets and an operating magnet, and a tape-controlled transmitter comprising a series of contacts, one individual to each of said magnets, an intermittent feed for the controlling tape, and a rotary, motor-driven member for effecting and timing the engagement of said contacts and for actuating said intermittent tape feed.

19. In combination, a perforated-tape-controlled transmitter including a series of contacts, a receiver selector device including a series of selecting magnets corresponding to said series of contacts, electrical connection between corresponding contacts and magnets, a series of elements selected according to the magnets energized, a power magnet to operate the selected element, means to close the contacts and energize the selecting magnets according to the perforations in the tape, and means to close the circuit of the power magnet after the closing of the selecting magnet circuits and to open such circuit before the opening of the circuits of the selecting magnets.

20. In combination, a composing machine having matrices of fixed thickness and matrices of variable thickness, means to assemble a line of matrices, line-measuring means variably operated in accordance with the number of matrices of varying thickness in the line, and means to control the operation of the composing machine according to the indication of said measuring means.

21. In combination, a composing machine having a stop device to arrest its operation, means to measure the length of a line, and means automatically controlled by said measuring means, to operate said stop device.

22. In combination in a composing machine, a plurality of matrices, means to assemble a line of matrices, measuring means operated according to the length of an assembled line of matrices, and a stop device automatically positioned by said measuring means to permit or arrest the operation of the composing machine.

23. In combination, a composing machine having matrix assembling and line casting mechanisms, means to measure the length of a line of matrices, means to start the operation of the line casting mechanism, and means to prevent the completion of the casting operation when the length of the line is outside the casting range.

24. In combination, a composing machine having matrix assembling and line casting mechanisms, a plurality of matrices, means to measure the length of a line of matrices, means to start the operation of the line casting mechanism, and means controlled by the line measuring means to prevent the completion of the casting operation when the length of the line is beyond the casting range.

25. In a composing machine having matrix assembling and line casting mechanisms, means to measure the length of an assembled line and determine its casting range, automatic means to control the operation of the matrix assembling mechanism and start the operation of the line casting mechanism, and means controlled by the measuring means to arrest the line casting operation and prevent its completion and also stop the operation of the automatic means when the line is outside the casting range.

26. In combination, a composing machine including matrix assembling means, automatic means including a set of permutation members and a universal member directly engaging and effecting the operation of the composing machine, means to arrest the operation of said automatic means, means to measure the length of a line of matrices, and means entirely mechanical controlled by said measuring means to operate the arresting means.

27. In a composing machine having matrix assembling and line casting mechanisms and line measuring means, a plurality of selectable members for controlling the operation of said matrix assembling mechanism, automatic means for selecting and operating said members and for initiating the operation of the line casting mechanism independently of the line measuring means, and means for preventing the complete operation of the line casting mechanism controlled by the line measuring means.

28. In a composing machine having matrix assembling and line casting mechanisms and line measuring means, a plurality of selectable members for controlling the operation of said matrix assembling mechanism, automatic mechanism for selecting and effecting the operation of said members, means under the sole control of said selecting mechanism for initiating the operation of the line casting mechanism, means for arresting and again starting the operation of said selecting mechanism controlled by the casting mechanism, and means controlled by the line measuring means for permitting or preventing the complete operation of the casting mechanism and the starting of the selecting mechanism.

29. In a composing machine having matrix assembling and line casting mechanisms, a plurality of selectable members mechanically controlling the assembling mechanism, a set of notched permutation bars mechanically and selectively determining the operation of said controlling members, automatic controlling means for positioning said bars in different combinations, line measuring means, an additional controlling member selectable by said permutation bars, means controlled solely by said additional member for arresting said automatic means and initiating the operation of the line casting mechanism, and means controlled by the line measuring means for preventing the complete operation of the line casting mechanism and the starting of the automatic controlling means when the assembled line of matrices is outside the casting range.

30. In a composing machine having matrix assembling and line casting mechanisms, and line measuring and transfer devices, a plurality of selectable members mechanically controlling the operation of the assembling mechanism, a set of permutation bars and a universal bar mechanically selecting and operating said controlling members, tape-controlled means for positioning said permutation bars in different combinations and for effecting the operation of said universal bar, an additional member selectable by said permutation bars, means under the sole control of said additional member for initiating the operation of the line transfer device and for arresting the operation of the tape-controlled means, and means under the joint control of the line transfer and measuring devices for again starting the tape-controlled means.

31. In a composing machine, a series of matrices, a series of justifying members, means to assemble a line of matrices including justifying members, means to separately count the num-

ber of justifying members in a line, and means to return said counting means to its starting point after a line of matrices has been assembled.

32. In a composing machine, a series of matrices each of uniform thickness and a series of matrices each of variable thicknesses, means to assemble lines composed of both kinds of matrices, means to measure the length of a line including the matrices of fixed thickness and the minimum thickness of the variable matrices, and separate means to measure the amount of possible justification of each line.

33. In a composing machine, a series of matrices each of uniform thickness, a series of matrices each of variable thickness, means to measure the combined thickness of the fixed matrices and the minimum thickness of the variable matrices, and separate means to count the number of matrices of variable thickness.

34. In a composing machine, means for assembling matrices and wedge-shaped space bands, a cam-shaped member, a cooperating member, means for effecting a relative movement of said members in one direction in accordance with the length of the assembled line, and means for effecting a relative movement of said members in another direction in accordance with the number of space bands on the assembled line.

35. In a line casting machine, means for assembling matrices and wedge-shaped space bands, a cam-shaped member, a controlling member cooperating therewith, means for effecting relative movements of said members in two different directions according to the length of the assembled line and the number of space bands therein respectively, line casting mechanism, and means for interfering with the operation thereof actuated by said controlling member.

36. In a composing machine having automatic justification within a certain range, means for indicating when a given amount of matter composed is within the justifying range.

37. In a composing machine having automatic justification within a certain range, and means to give a warning signal when a series of released matrices lack a predetermined amount of being within the justifying range.

38. In a composing machine, a series of character-controlling elements, a set of permutation bars operative to control the character controlling elements and a universal bar directly engaging said elements to select and operate the same a plurality of characters corresponding to a single element, and signal controlled means to select one of the characters.

39. In combination in a composing machine, matrix assembling mechanism, means for measuring the length and amount of possible justification of an assembled line of matrices, and means operated thereby for controlling the operation of the composing machine.

40. In combination in a composing machine, matrix assembling and line casting mechanisms, automatic operating means for said mechanisms, a measuring device movable in different ways in accordance with the length and amount of possible justification respectively of an assembled line of matrices, and means operated by said measuring device for permitting or preventing the operation of the line of casting mechanisms.

41. In combination in a composing machine, matrix assembling and line casting mechanisms, a set of permutation members and a universal member directly engaging and effecting the operation of said assembling mechanism and arranged to initiate the operation of said line casting mechanism, a line measuring device, and a stop device operated thereby for preventing or permitting the operation of said line casting mechanism.

42. In combination, matrix assembling mechanism, a set of tape controlled permutation members and a universal member directly engaging and effecting operation of said assembling mechanism, a line casting mechanism initiated in operation by said members, a driven shaft, devices on said shaft for effecting the operation and feed of the tape and the operation of said universal member, means controlled by the line casting mechanism for stopping and starting said shaft, and means controlled by the matrix assembling mechanism for permitting or arresting the operation of the line casting mechanism.

43. In combination in a composing machine, matrix assembling and line justification mechanisms, and means controlled by the matrix assembling mechanism for measuring the length and amount of possible justification of an assembled line.

44. In a composing machine, matrix assembling means, line justifying means, and a measuring device movable in two different ways to measure the length and amount of possible justifying respectively of an assembled line of matrices.

45. In combination in a composing machine, matrix assembling and line casting mechanisms, automatic means for effecting the operation of said assembling mechanisms and initiating the operation of said line casting mechanisms, means for measuring the length and number of contained space bands of an assembled line, a stop device controlled by said measuring means for permitting or arresting the operation of a line casting mechanism, and means controlled by the operation of the line casting mechanism for restoring said measuring means to normal.

46. In a typographical composing machine, the combination of a magazine containing a set of two-character matrices, automatic mechanism for effecting the release of the matrices therefrom, an assembler wherein the released matrices may be composed in line at an upper or lower level as required, and automatic electrical means associated with the assembler for controlling the level at which the matrices are composed.

47. In a typographical composing machine, the combination of a magazine containing a set of two-character matrices, automatic means for effecting the release of the matrices therefrom, an assembler wherein the released matrices are composed in line, an electrically operated auxiliary rail mounted in the assembler and adjustable to different positions during the composition of a line to control the level at which the matrices are assembled, and automatic means for operating said assembler rail in the required manner and at the proper time.

48. In a typographical composing machine, the combination of a magazine containing a set of two-character matrices, automatic mechanism for effecting the release of the matrices therefrom, an assembler wherein the released matrices are composed in line, an auxiliary rail section mounted in the assembler and magnetically adjustable to different positions during the composition of a line to control the level at which the matrices are assembled, and automatic means synchronized with the matrix releasing mechanism for operating the assembler rail section.

49. In a typographical composing machine, the combination of a magazine containing a set of

two-character matrices, tape-controlled mechanism for effecting the release of the matrices therefrom, an assembler wherein the released matrices are composed in line, and electrical tape-controlled means for controlling the level at which the matrices are composed in line.

50. In a typographical composing machine, the combination of a magazine containing a set of two-character matrices, electrical devices for effecting the release of the matrices therefrom, an assembler wherein the released matrices are composed in line, electrical devices for controlling the level at which the matrices are composed in line, and tape-operated mechanism governing the action of said electrical devices.

51. In a typographical composing machine, the combination of a magazine containing a set of two-character matrices, automatic mechanism for effecting the release of the matrices therefrom, an assembler wherein the released matrices are composed in line, an auxiliary rail mounted in the assembler and adjustable to different positions during the composition of a line to control the level at which the matrices are assembled, and automatically controlled electrically operated devices synchronized with matrix releasing mechanism for operating the assembler rail.

52. In a typographical composing machine, the combination of a magazine containing a set of two-character matrices, escapements controlling the release of the matrices therefrom, a series of power operated reeds for actuating the escapements, an assembler wherein the released matrices are composed in line, an auxiliary rail mounted in the assembler and electrically adjustable to different positions to control the level at which the matrices are composed, and unitary means operable automatically for controlling the operation of the reeds and the assembler rail, as required.

53. In a typographical composing machine, the combination of a magazine containing a set of two-character matrices, escapements controlling the release of the matrices therefrom, a series of power operated reeds for actuating the escapements, an assembler wherein the released matrices are composed in line, an auxiliary rail section mounted in the assembler and adjustable to different positions to control the level at which the matrices are composed, said adjustment being effected electrically, and tape-controlled mechanism for governing the operation of the reeds and the assembler rail section in proper synchronism.

54. In a typographical composing mechanism, the combination of a magazine containing a set of two-character matrices, escapements controlling the release of the matrices therefrom, a series of power operated reeds for actuating the escapements, a series of locking bars movable to active or inactive position singly or in groups to establish different combinations in controlling the operation of the individual reeds, an assembler wherein the released matrices are composed in line, an auxiliary rail section mounted in the assembler and adjustable to different positions to control the level at which the matrices are composed, electrical means for operating the rail, a perforated tape feed mechanism, means responsive to certain symbols in the tape for operating the locking bars, and means responsive to other symbols in the tape for controlling the operation of the assembler rail section.

55. In a typographical composing mechanism, the combination of a magazine containing a set of two-character matrices, escapements controlling the release of the matrices therefrom, a series of power operated reeds for actuating the escapements, a series of locking bars movable to active or inactive position singly or in groups to establish different combinations in controlling the operation of the individual reeds, an assembler wherein the released matrices are composed in line, an auxiliary rail section mounted in the assembler and adjustable to different positions to control the level at which the matrices are composed, electrical means for operating the rail, a perforated tape feed mechanism, means responsive to certain symbols in the tape for operating the locking bars, and means controlled by the locking bars and responsive to the other symbols in the tape for controlling the operation of the assembler rail section.

56. In a typographical composing machine, the combination of a magazine containing a set of two-character matrices, tape-controlled mechanism for effecting the release of the matrices therefrom, an assembler wherein the released matrices are composed in line, an auxiliary rail section mounted in the assembler and adjustable to different positions during the composition of a line to control the level at which the matrices are assembled, a pair of magnets for operating the assembler rail section, and electrical connections responsive to different perforation symbols in the tape for energizing one or the other of said magnets, as required.

57. In a typographical composing machine, the combination of a magazine containing a set of two-character matrices, escapements controlling the release of the matrices therefrom, a series of power-operated reeds for actuating the escapements, an assembler wherein the released matrices are composed in line, an auxiliary rail section mounted in the assembler and adjustable in different positions during the composition of a line to control the level at which the matrices are composed, a pair of magnets for operating the rail section, switches for closing an electrical circuit through one or the other of said magnets, and automatic means for controlling the power-operated reeds and for operating the switches in timed relation thereto.

58. In a typographical composing machine, the combination of a magazine containing a set of two-character matrices, escapements controlling the release of the matrices therefrom, a series of power-operated reeds for actuating the escapements, a series of locking bars operable automatically and movable to active or inactive position singly or in groups to establish different combinations in controlling the operation of the individual reeds, an assembler wherein the released matrices are composed in line, an auxiliary rail section mounted in the assembler and adjustable to different positions to control the level at which the matrices are composed, a pair of magnets for operating the rail section, and switches controlled by separate combinations of said bars for closing a circuit to one or the other of said magnets as required.

59. In combination, a series of permutation members, means to set said members in varying permutations in response to perforations in a tape, an element selected upon the permuted setting of said members, means for actuating the selected element, and an additional permutation member operated upon the predetermined setting of said other members through a selected element

actuated by said means to increase the number of possible permuted settings of said members.

60. In a composing machine, a series of matrices, an elevator to receive the matrices, mechanism to release the matrices, a series of permutation members set in accordance with perforations in a tape, elements selected upon the permuted setting of said members and mechanically connected to said mechanism, means to actuate the selected element and operate through the mechanical connection the mechanism to effect the release of the matrices and their assembly in the elevator, and means responsive to a predetermined setting of said permutation members as determined by perforations in the tape for actuating said elevator with the assembled matrices.

61. In a composing machine, a series of matrices, an elevator to receive the matrices, mechanism to release the matrices, a series of permutation members, a series of elements selected by the setting of said members, means to set said members in accordance with perforations in a tape, an actuator common to said elements and effective following the setting of the permutation members to operate said mechanism to release the matrices and cause their assembly in the elevator, and means responsive to a predetermined setting of the permutation members as determined by different perforations in the tape for actuating said elevator with the assembled matrices.

62. In a composing machine, a series of matrices, an elevator to receive the matrices, mechanism to release the matrices, a series of longitudinally and transversely movable selectable elements, a series of notched permutation bars set in accordance with perforations in a tape, means for effecting the longitudinal movement of said elements upon their selection by said permutation bars to effect the release of the matrices and their assembly in the elevator, and means responsive to a predetermined setting of the permutation bars as determined by a different group of perforations in the tape for actuating said elevator with the assembled matrices.

63. In a composing machine, a series of matrices, an elevator to receive the matrices, mechanism to release the matrices, a series of longitudinally slidable permutation members having notches cut in both sides, a series of elements selectable by said members, some of said elements being located on one side and the others on the other side of said permutation members, means to actuate the selected element and operate through the mechanical connection the mechanism to effect the release of the matrices and their assembly in the elevator, and means operated in response to a predetermined setting of said permutation members for actuating said elevator with the assembled matrices.

64. In a composing machine, a series of matrices, an elevator to receive the matrices, mechanism to release the matrices, a series of longitudinally slidable permutation members having notches cut in both sides, a series of elements selectable by said members, some of said elements being located on one side and the others on the other side of said permutation members, means to actuate the selected element and operate through the mechanical connection the mechanism to effect the release of the matrices and their assembly in the elevator, and means responsive to the selection and operation of one of said elements as determined by a particular setting of said permutation members for actuating said elevator with the assembled matrices.

65. In a typographical composing machine, the combination of a magazine containing a set of two character matrices, automatic mechanism for effecting the release of matrices therefrom including a plurality of permutation members set in accordance with perforations in a tape, an element selected upon the permuted setting of said members to effect the release of said matrices, an assembler wherein the matrices released through said element may be composed in a line at an upper or lower level as required, and means operated in response to a predetermined setting of said members for controlling the level at which the matrices are composed.

66. In a typographical composing machine, the combination of a magazine containing a set of two-character matrices, automatic means for effecting the release of matrices therefrom including a plurality of permutation members set in accordance with the perforations in a tape, an element selected upon the permuted setting of said members to effect the release of said matrices, an assembler wherein the released matrices are composed in a line, an auxiliary rail section mounted in the assembler and adjustable to different positions during the composition of a line to control the level at which the matrices are assembled, and means operated in response to a predetermined setting of said members and through a selected element for operating said assembler rail section in the required manner and at the proper time.

67. In combination, a series of permutation members, a series of elements selected by the setting of said members, means to set said members permutably, an actuator for the selected elements, an additional permutation member, and means controlled by certain settings of the other permutation members and operated by said actuator for setting said additional member.

68. In a typographical composing machine, the combination of a magazine containing a set of two character matrices, automatic mechanism for effecting the release of the matrices therefrom including a plurality of elements arranged to be set in permutations, means selected upon the permuted setting of said elements, an assembler wherein the released matrices may be composed in a line at an upper or lower level as required, and means operated in accordance with the operation of said means for controlling the level at which the matrices are composed in the assembler.

69. In a typographical composing machine, the combination of a magazine containing a set of two character matrices, automatic mechanism for effecting the release of the matrices therefrom including a plurality of elements arranged to be set in permutations, a plurality of members, one of which is selected upon the permuted setting of said elements, an assembler wherein the released matrices may be composed in a line at an upper or lower level as required, and means operated in accordance with the selection and operation of certain of said members and dependent on the level at which the matrices are to be composed in the assembler.

70. In a typographical composing machine, the combination of a magazine containing a set of two character matrices, automatic mechanism for effecting the release of the matrices therefrom including a plurality of elements arranged to be set in permutations, and a movable rail mounted in said assembler and adjustable to different positions during the composition of a line to control the level at which the matrices

are assembled, and means operated in accordance with the selection of certain of said elements for actuating said assembler rail in the required manner and at the proper time.

71. In a composing machine, a series of matrices, an assembler to receive the matrices, mechanism to release the matrices, a series of permutation members set in accordance with character formations on a control strip, elements selected upon the permuted setting of said members and mechanically connected to said mechanism, means effective through the mechanical connections and controlled by the selected element for actuating said mechanism to release the matrices and assemble them in the assembler, and means responsive in accordance with a certain character formation on the control strip for actuating the assembler with the assembled matrices.

72. In a composing machine, a series of matrices, an assembler to receive the matrices, mechanism to release the matrices, a series of longitudinally slidable permutation members, electro-magnetic means responsive to electrical conditions as determined by character formations in a control strip for setting said members, and a series of elements selectable by said members operating said mechanism to assemble the matrices in the assember.

73. In a composing machine, a series of matrices, an assembler to receive the matrices, mechanism to release the matrices, a series of longitudinally slidable permutation members, an electro-magnet individual to each member responsive to electrical conditions as determined by the character formations in a control strip for setting said members, and a series of elements selectable by said members for effecting the operation of said mechanism and the assembly of the matrices in said assembler.

74. In combination, a selecting device having elements to be selected and operated, a form controlled device, an electrical connection between the selecting device and the form controlled device, a magnet adapted to operate a selected element according to the setting of the selecting device by the form controlled device, and means included in the form controlled device to close the circuit of said magnet.

75. In combination, a selecting device including selecting elements and elements to be selected, a magnet individual to each selecting element and effective to cause its operation, a universal magnet operative on one of the selected elements, a form controlled device, an electrical connection between the form controlled device and the selecting device, and means in the form controlled device to time the operation of the individual and universal magnets.

76. In combination, a selecting device including selecting elements and elements to be selected, a form controlled unit, an electrical connection between the form controlled unit and the selecting device, and means in the form controlled unit to alternately change the setting of the selecting elements and operate the selected element.

77. In combination, a permutation device including permutation elements and members to be selected according to their setting, magnets individual to said permutation elements and operative to effect the setting thereof to select a member, a universal magnet common to all members, a form controlled device, a motor to drive the same, electrical connections between the form controlled device and the selecting device over which said individual magnets are controlled, and a contact in the form controlled device to energize the universal magnet in timed relation to the energization of the individual magnets.

78. In a composing machine, a plurality of different character matrices, an escapement individual to each character matrix, means to select the escapements for operation, a magnet common to all escapements, and means to operate the selected escapement directly from said magnet.

79. In combination, a composing machine, a selecting device attached to the composing machine, an entirely mechanical connection between the selecting device and the composing machine and controlled from said selecting device to assemble the matrices, a form controlled unit separate from the composing machine, an electrical connection between the form controlled unit and the selecting device over which said latter device is operated, and means to control the rate of operation of the composing machine from the form controlled unit.

80. In a permutation device, a series of code magnets, a permutation element corresponding to each code magnet, an additional permutation element, a series of members selected according to the operation of said permutation device, a universal magnet adapted to operate the selected members, and means to operate the additional permutation element by said universal magnet.

LOUIS M. POTTS.