Dec. 22, 1936. A. GOOD 2,065,274

KEYBOARD UNIT FOR LINE CASTING MACHINES

Filed Sept. 24, 1934 7 Sheets-Sheet 1

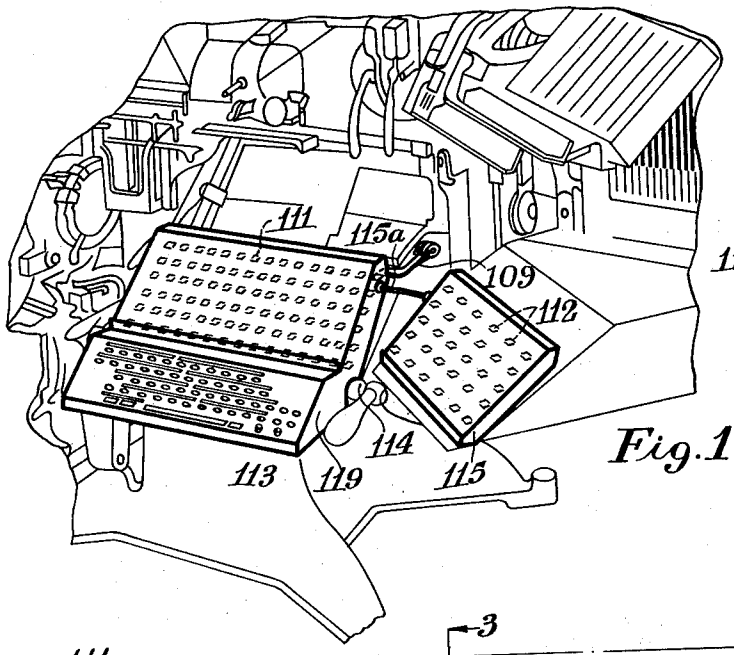


Fig. 1

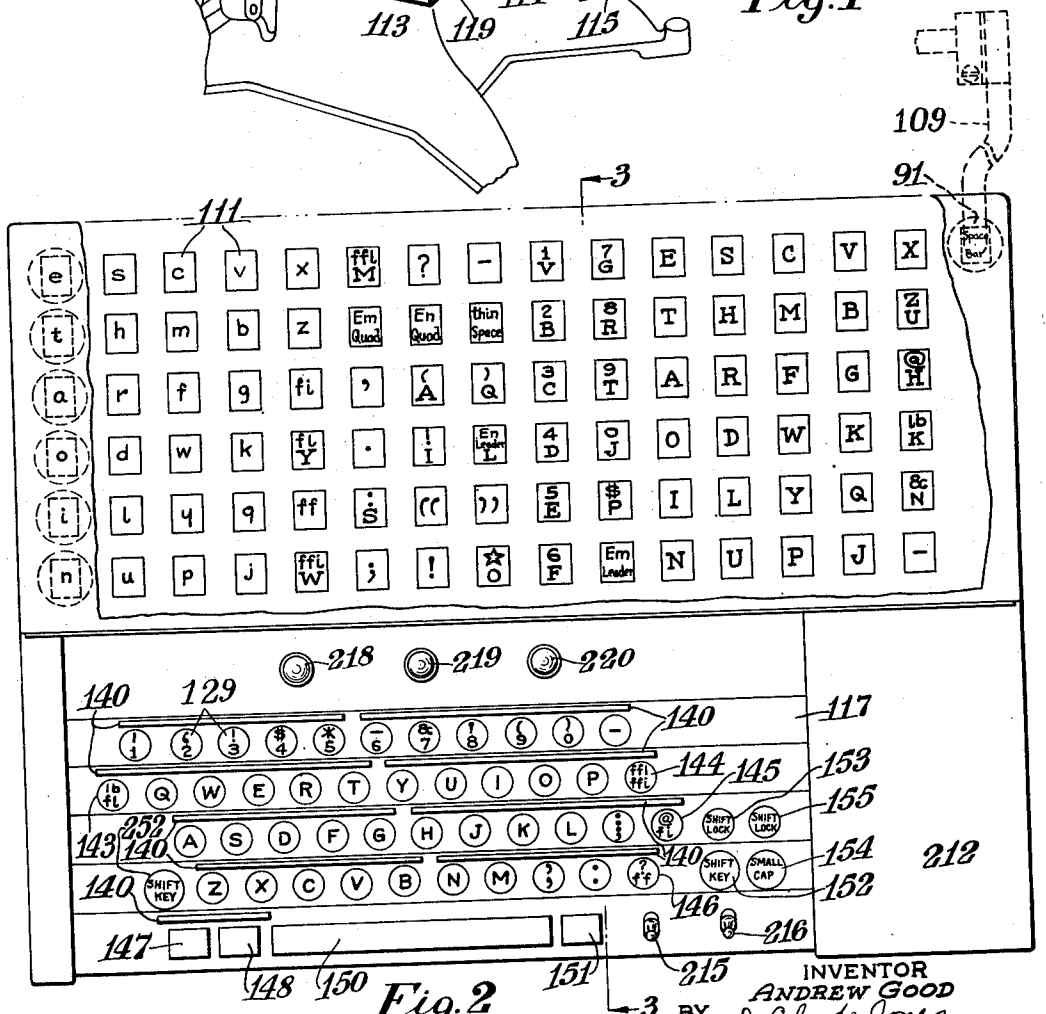


Fig. 2

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KEYBOARD UNIT FOR LINE CASTING MACHINES

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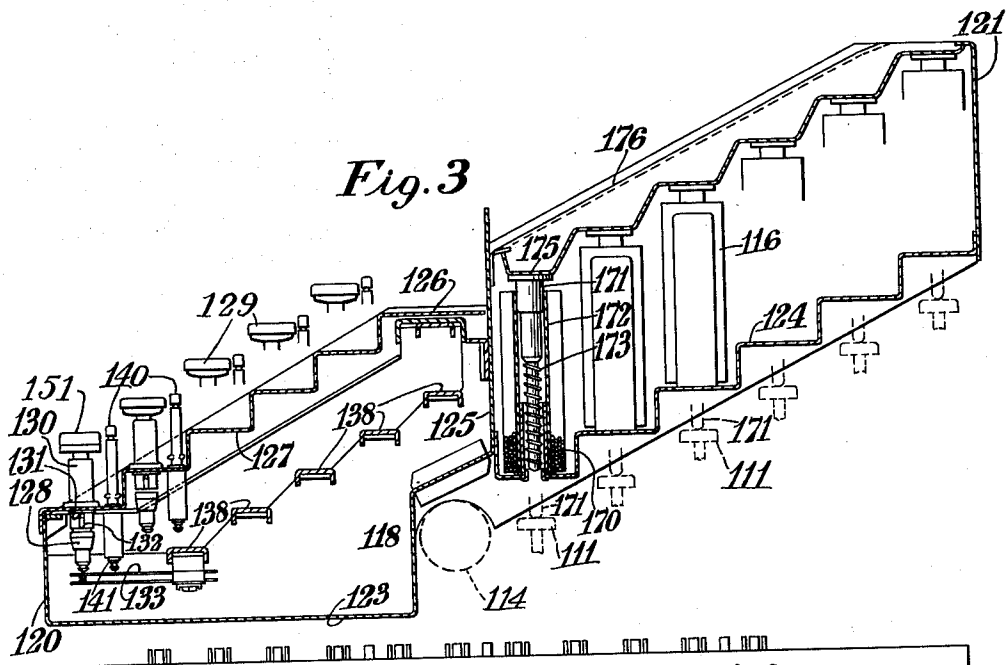


Fig. 3

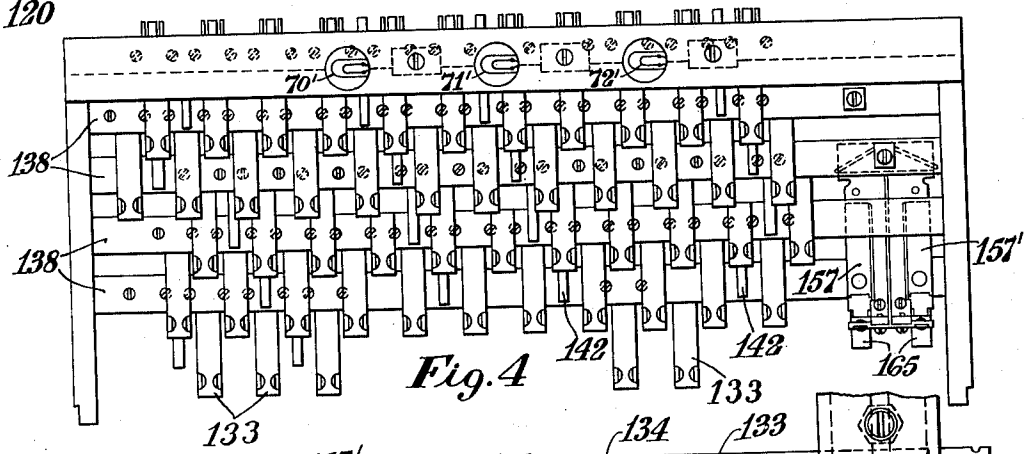


Fig. 4

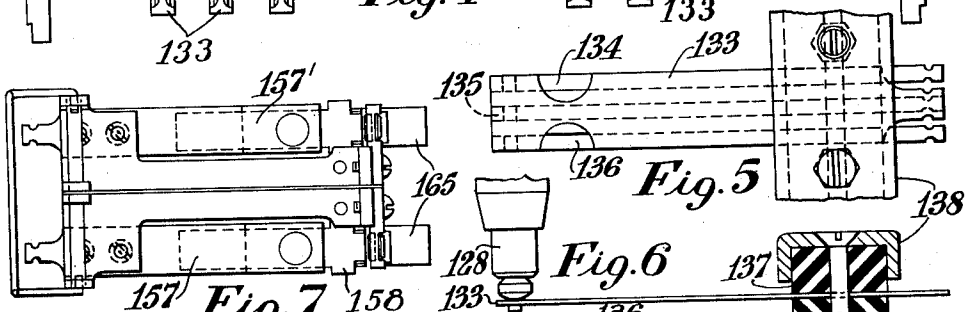


Fig. 5

Fig. 6

Fig. 7

Fig. 8

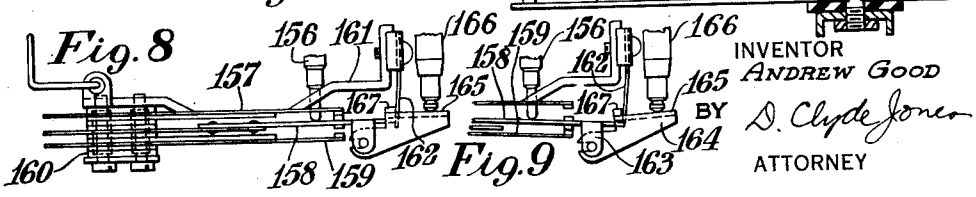


Fig. 9

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KEYBOARD UNIT FOR LINE CASTING MACHINES

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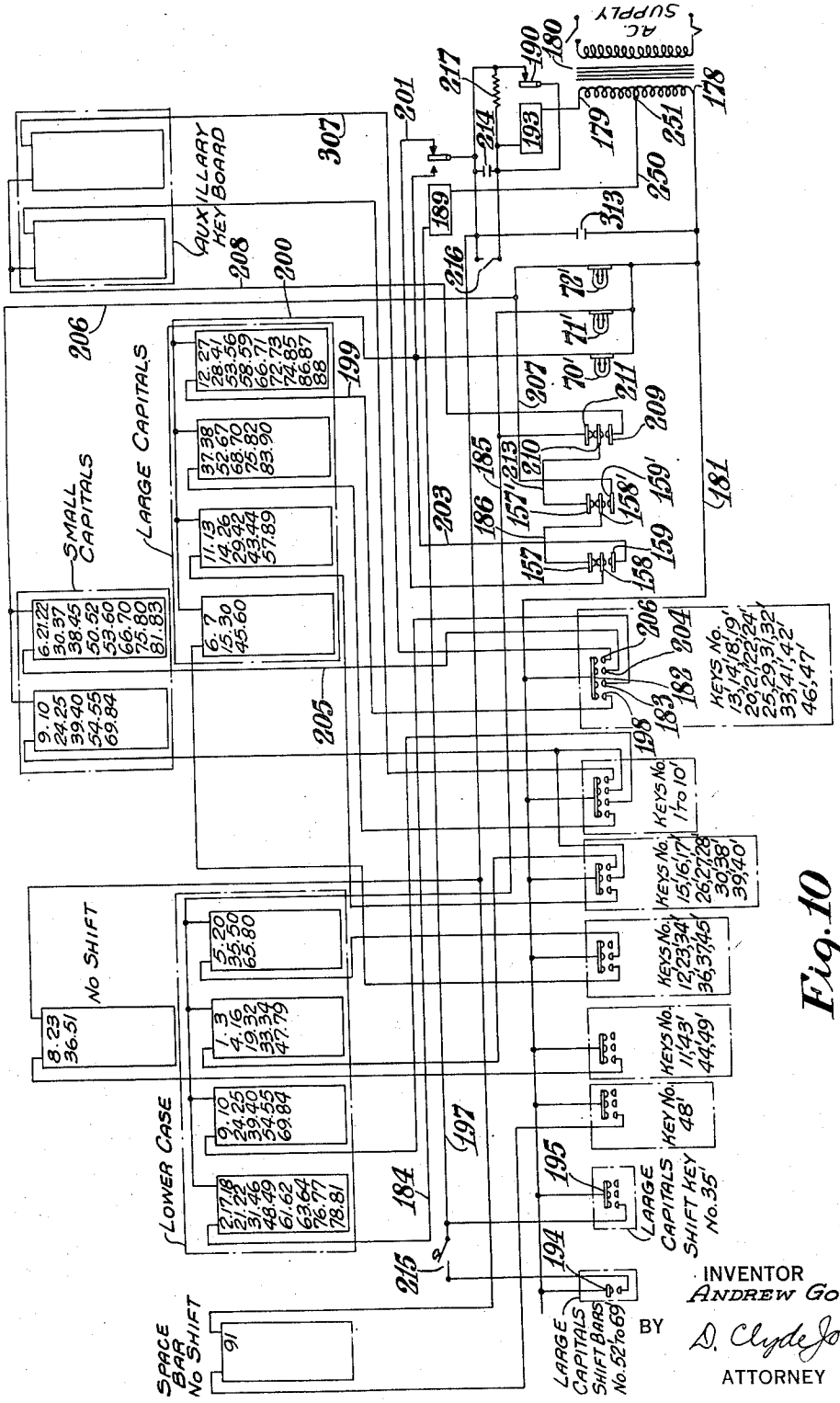


Fig. 10

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KEYBOARD UNIT FOR LINE CASTING MACHINES

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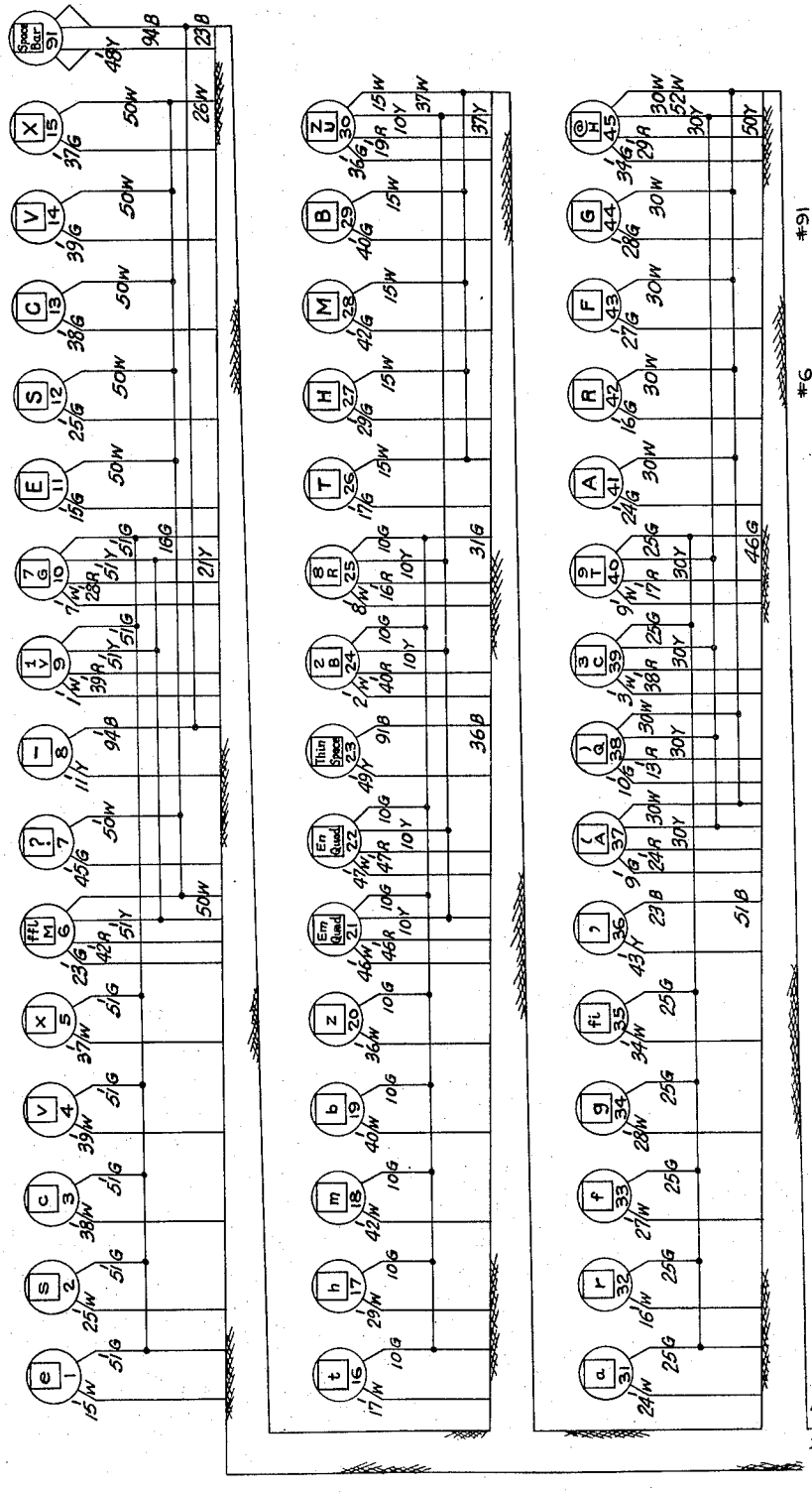


Fig. 11a

Fig. 11e Fig. 11f

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KEYBOARD UNIT FOR LINE CASTING MACHINES

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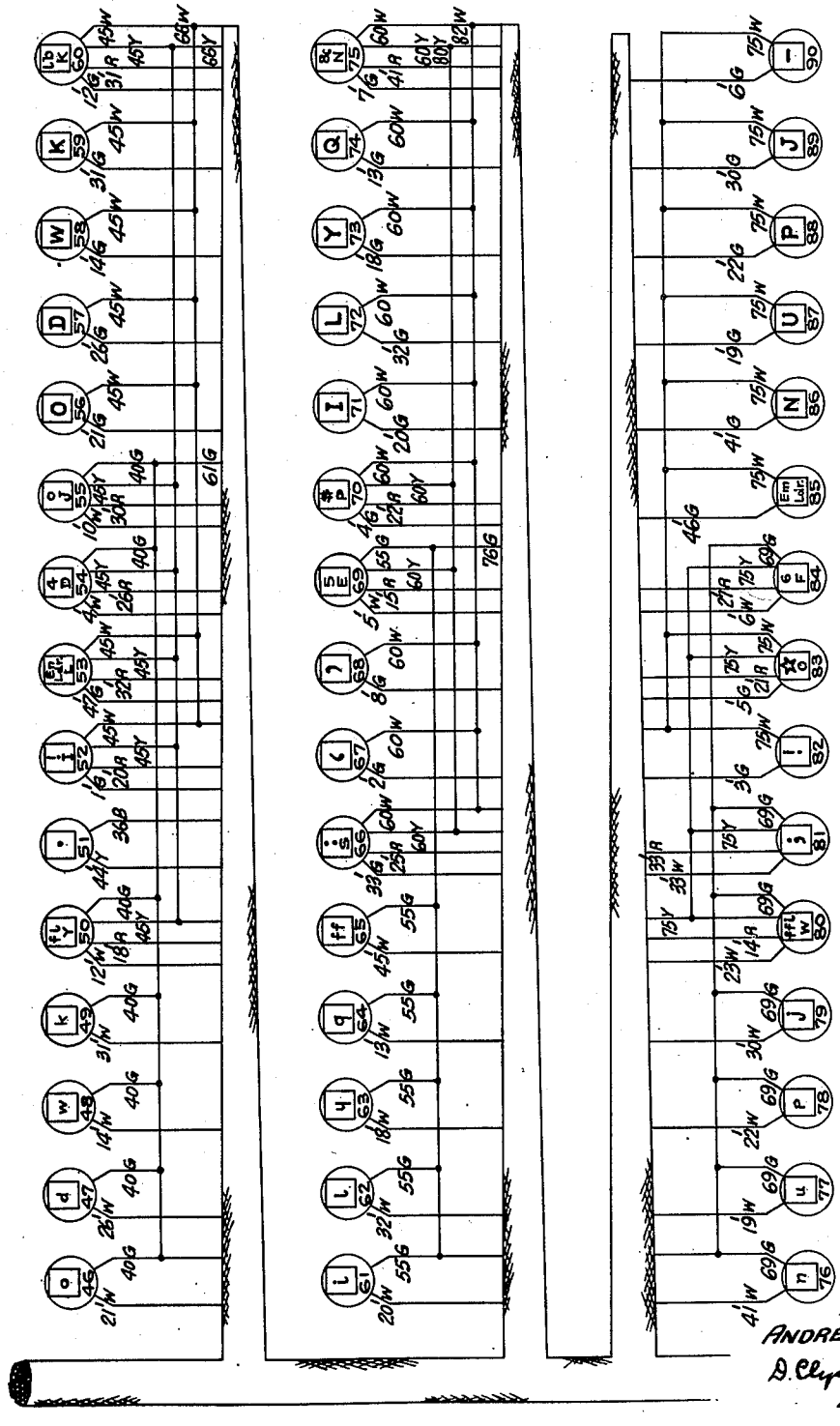


Fig. 11b

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KEYBOARD UNIT FOR LINE CASTING MACHINES

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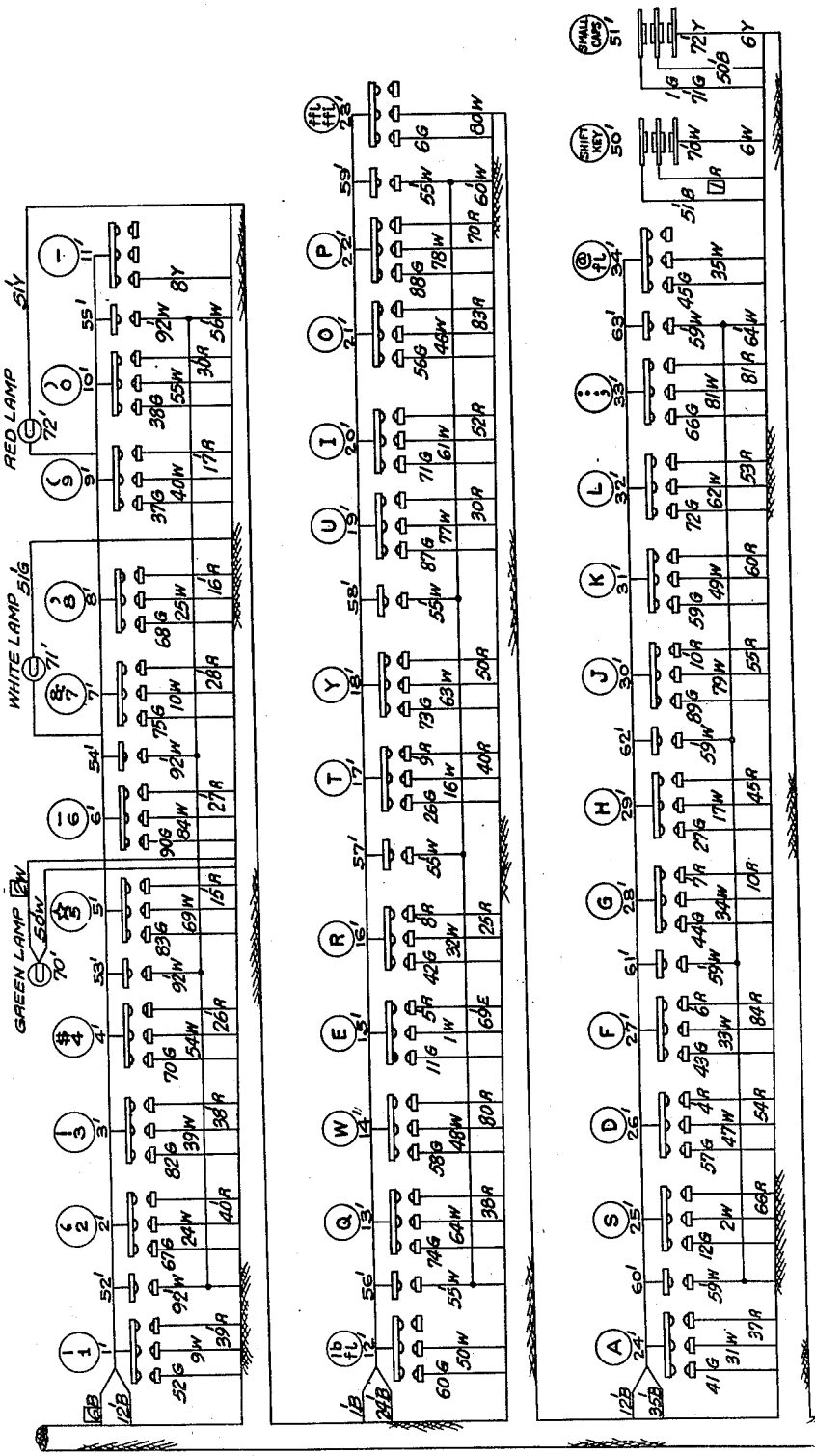


Fig. 11c

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KEYBOARD UNIT FOR LINE CASTING MACHINES

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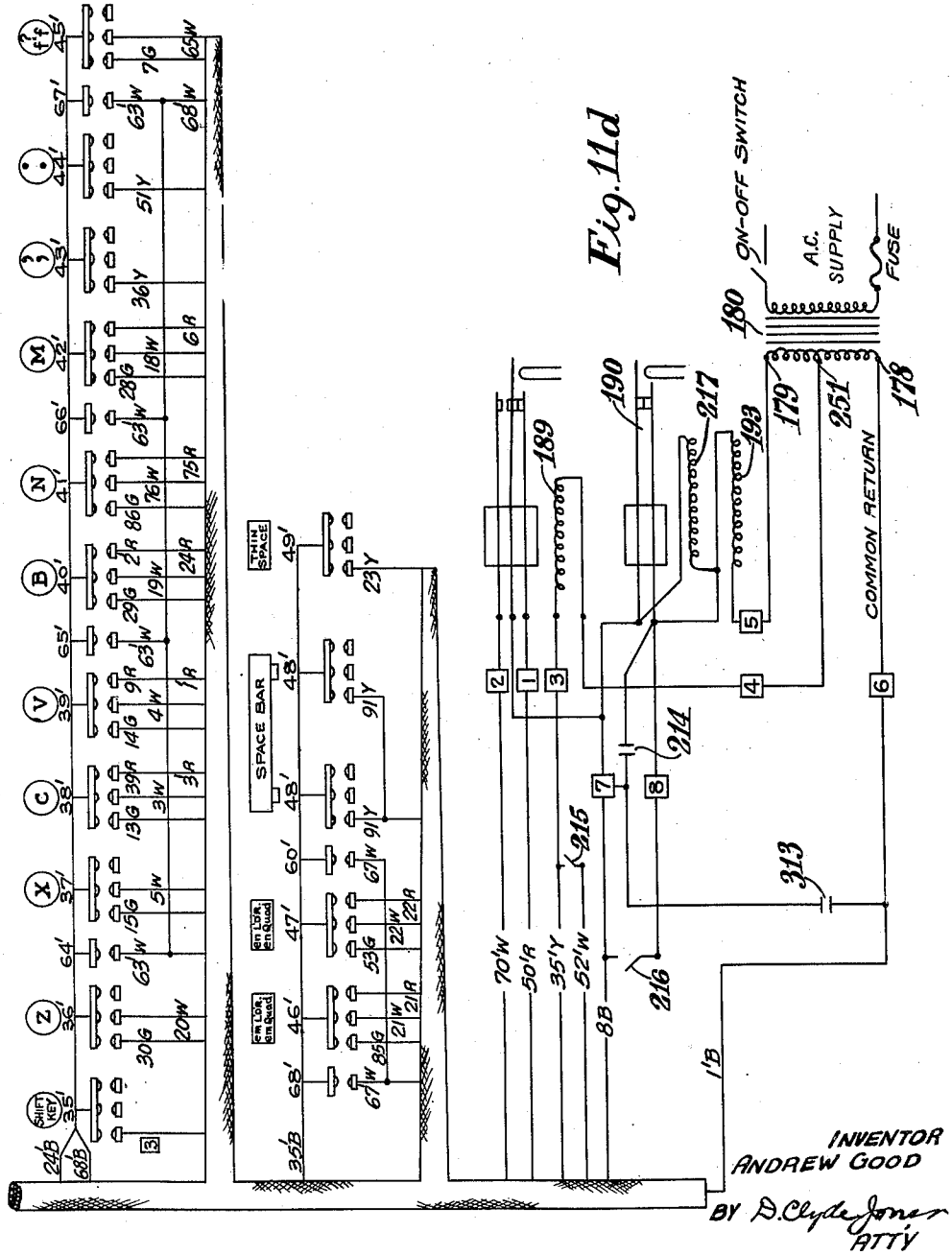


Fig. 11d

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UNITED STATES PATENT OFFICE

2,065,274

KEYBOARD UNIT FOR LINE CASTING MACHINES

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Application September 24, 1934, Serial No. 745,177

18 Claims. (Cl. 199—18)

This invention relates to a novel mechanism for selectively releasing the matrices of a line-casting machine.

The main feature of the invention is directed to a practical simplified keyboard and associated mechanism electrically operated thereby to release selectively the matrices of a line-casting machine, whereby the manipulation of the machine is greatly simplified and whereby the speed of line-casting is increased while reducing operator fatigue.

Another feature of the invention relates to a novel arrangement including a keyboard for selectively releasing all of the matrices of a standard line-casting machine, said keyboard having a smaller number of keys than the number of matrices to be released and having its keys arranged according to the arrangement of keys in a standard typewriter keyboard.

A further feature of the invention relates to a detachable supplementary keyboard unit adapted to be mounted in superimposed relation to the keys of a line-casting machine for operating all of the keys thereof, in which supplementary unit the keys are arranged according to the arrangement of keys in a standard typewriter keyboard, so that an operator familiar with the operation of a standard typewriter, can with a small additional amount of training, rapidly operate a line-casting machine.

An additional feature of the invention relates to a keyboard unit and associated means, by which both the keys in the main keyboard and the keys in the auxiliary keyboard of a line-casting machine, can be selectively operated.

Other features of the invention will appear from the detailed description and claims when taken with the drawings in which Fig. 1 is a fragmentary perspective view of a line-casting machine showing the supplementary keyboard mechanism of the present invention applied to the standard line-casting machine keyboard and to the auxiliary keyboard of such a machine; Fig. 2 is a plan view of the supplementary keyboard mechanism of the present invention with a portion of the solenoid compartment and the solenoids therein omitted to show more clearly the arrangement of the keys in the standard line-casting machine keyboard; Fig. 3 is a sectional view taken substantially on the line 3—3 of Fig. 2; Fig. 4 is a plan view of the contact spring assembly which is normally positioned directly under the actuators of the keys of the supplementary keyboard; Fig. 5 is a plan view and Fig. 6 is a side elevation of a single set of springs taken from the contact spring assembly of Fig. 4; Fig. 7 is a plan view of the shift key and shift lock mechanism; Fig. 8 is a side elevation of the mechanism shown in Fig. 7 with the springs thereof in their normal position while Fig. 9 is a fragmentary view of the mechanism shown in Fig. 8 but with the contact springs in their operated position; Fig. 10 is a schematic showing of the circuits which are selectively operated by the keys of the supplementary keyboard to operate the various solenoids, which in turn depress the keys of the standard line-casting machine keyboard or the auxiliary keyboard thereof; and Figs. 11*a*, 11*b*, 11*c*, and 11*d* when placed one above the other in the order named, are a complete wiring diagram of the circuits for operating the solenoids of the standard line-casting machine keyboard from the supplemental keyboard, the circuits for operating the solenoids superimposed over the keys of the auxiliary keyboard being omitted; Fig. 11*e* is a diagrammatic showing of the solenoids having four lead out conductors except the space bar solenoid 91; Fig. 11*f* is a diagrammatic showing of the space bar solenoid #91.

Referring to the drawings, 110 generally designates a line-casting machine of which only a portion thereof has been illustrated, but it will be understood that this machine may be of the general character of machines now sold under the trade names "Linotype" or "Intertype". As is well-known, such a machine includes a magazine for matrices corresponding to the different letters to be cast, which matrices are selectively released by escapements controlled by the ninety keys 111 of the usual machine keyboard. Means are also provided whereby the released matrices are moved into line-casting position and when the line is cast, the used matrices are restored to their proper position in the matrix magazine of the machine. Certain types of such line-casting machines are also provided with an auxiliary keyboard having keys 112 whereby an additional number of matrices corresponding to a different style of type may be selectively released from an auxiliary matrix magazine and moved to the line-casting position. It will be understood, however, that the present invention is not limited to a line-casting machine having an auxiliary keyboard, but is equally useful in operating line-casting machines with or without an auxiliary keyboard. It is unnecessary to describe further the construction and the operation of a line-casting machine, except to state that it is selectively operated by successively depressing desired keys of the ninety keys and space bar 109 which can be connected

to the space rod of the usual keyboard or any one of the keys of the auxiliary keyboard if such an auxiliary keyboard is used.

In accordance with the present invention, a supplementary keyboard unit, generally designated 113, is in part superimposed over the ninety keys of the keyboard, being supported on a portion of the frame and also on an elevator lift rod 114 forming a part of the line-casting machine. If the machine is equipped with an auxiliary keyboard a solenoid assembly or other auxiliary key operating mechanism comprising a unit 115 is attached to the machine frame over the keys 112 of the auxiliary keyboard, illustrated by way of example as being thirty in number, and is electrically connected to the main part of the supplementary keyboard unit 113 by a cable of conductors 115a. The supplementary keyboard unit includes a series of solenoids 116 (of which only six are illustrated at the left side in Fig. 2) mounted in stepped or staggered relation in such position that one of the solenoids is superimposed over each key 111 and the added space bar 109 of the line-casting machine keyboard. Similarly in the auxiliary operating unit 115, a solenoid 116 is mounted directly above each key 112 of the auxiliary keyboard of the line-casting machine if such an auxiliary keyboard is employed.

In the present arrangement, the solenoids 116 which actuate the keys 111 of the line-casting machine keyboard and the keys 112 of the auxiliary keyboard, are operated by electrical circuits controlled at the supplementary keyboard keys in the unit 113 which keys are arranged according to the sequence and arrangement of keys in a standard typewriter keyboard. Suitable key shift mechanisms are provided so that by the operation of a lesser number of supplementary keys, the solenoids 116 selectively depress all of the keys of the line-casting machine keyboard and the auxiliary keyboard as desired.

While the supplementary keyboard unit 113 may be made in various forms in accordance with this invention, it preferably comprises a sheet metal case having sides 118 and 119, front and rear walls 120 and 121, and a horizontal bottom portion 123 together with an inclined, stepped bottom portion 124, while a vertical partition 125 divides the case into a spring assembly compartment and a solenoid compartment for the solenoids 116.

The cover 126 of the spring assembly compartment which may be secured to the sides and front in any suitable manner, is formed into a series of steps with each step 127 having a series of openings provided with vertical guides 130 through which key stems 128 pass. Each key stem comprises a rod vertically movable in a guide 130 and terminating at its upper end in a key 129 similar to an ordinary typewriter key. The upward movement of each stem is limited by a guide pin 131 which engages the upper end of the slot 132 formed in the lower portion of the guide 130. The insulated extreme lower end of the stem engages a contact spring 133 which normally holds the stem 128 in its elevated position so that its pin is in engagement with the upper end of its related slot 132. The contact spring 133 is a part of a contact spring assembly and, as best shown in Figs. 5 and 6, is mounted in superimposed relation to a set of three contact springs 134, 135, and 136 in spaced horizontal alinement, being normally spaced from them by reason of its mounting in an insulating support 137. Since there are a series of keys and key stems for each step 127 of the cover and since there is a contact spring assembly for each key 129, there will likewise be a series of contact spring assemblies, the contact spring assemblies of each series being mounted on the underside of a channel-shaped cross bar 138 forming a part of a removable frame supported in the spacing assembly (see Fig. 4).

In the present arrangement each series of keys is divided into two groups as shown in Fig. 2 and each group of keys has associated therewith, a "large capital" shift bar 140. Each bar 140 near each end thereof, has an actuator 141 similar in construction and arrangement to the key stem 128 previously referred to. These bars which are slightly elevated above the tops of the keys in the related group, may function in connection with the solenoid circuits about to be described, as a key shift so that while the depression of a key 129 operates a solenoid to effect the release of a matrix corresponding to a lower case character, the simultaneous depression of such key with its related bar 140 operates a different solenoid to effect the release of a matrix corresponding to the same character in large capital size. Each stem 141 at each end of a shift bar 140 engages the uppermost contact spring of a pair of normally open contact springs 142 which are insulatedly mounted on a cross bar 138. Thus the depression of a shift bar 140 operates its pair of stems 141 to close two pairs of contact springs 142 which are electrically connected in multiple.

In addition to the usual keys found in a standard typewriter keyboard there are provided in the supplementary keyboard, a key 143 corresponding to the characters "lb" and "fl", the key 144 corresponding to "ffl" and "ffi", key 145 corresponding to "@" and "fl" and key 146 to "?" and "ff". In addition there is the short bar 147 corresponding to the "em leader" and the "em quad", and an additional short bar 148 corresponding to the "en leader" and the "en quad". There is also associated with the short bars 147 and 148, a common shift bar 140 which serves in the case of the bar 147 to shift from the "em quad" to the "em leader", while in the case of the bar 148 the shift bar serves to shift from the "en quad" to the "en leader". A space bar 150 similar to the usual space bar on a typewriter keyboard is also provided and in addition a "thin space" bar 151 is positioned in alinement with the space bar 150. Each of the various bars when depressed, operates to close contact springs, the purpose of which will be more fully set forth in connection with the circuits to be described.

The keyboard is also equipped with a "large" capital shift key 252 which is of the non-locking type, while the righthand end of the keyboard is equipped with a "large" capital shift key 152 and its related shift lock key 153, and in addition a "small" capital shift key 154 and its related shift lock key 155. As best shown in Figs. 8 and 9, the stem 156 of a shift lock key, normally engages the middle spring 158 of a spring assembly. This spring assembly in addition to a contact spring 157 is provided with the intermediate spring 158 normally contacting the spring 157, while below this intermediate spring there is provided the contact spring 159 which is normally out of engagement with the intermediate spring. It will be understood that these contact springs 157, 158, and 159 are mounted in insulation 160 on cross bars 138 so that their fixed ends are insulated from each other. A bracket 161 mounted on a cross bar 138 supports a vertical spring catch 162

in such a position that when the stem 156 depresses the intermediate contact spring 158 into engagement with the contact spring 159, this catch at its lower end engages the upper surface of the intermediate spring to hold the intermediate spring in its actuated position as shown in Fig. 9. The free end portion of the intermediate spring 158 is provided with a pair of down-struck ears 163 in which there is pivotally mounted a latch 164. This latch has a flat upper platform 165 in a position to be engaged by the stem 166 of a shift key such as 152. The latch 164 is also provided with a lug 167 normally engaging the left hand face of the catch 162 (Fig. 8) so that when the stem 166 is depressed to rock the latch 164 downward, the lug 167 disengages the free end of the catch from the end of the intermediate spring 158 so that this spring returns to its normal position as shown in Fig. 8. The stems of the keys 155 and 154 operate in the same manner as those of the keys 152 and 153 and need not be further described. It will be understood that the depression of either of the keys 152 and 154 will rock the corresponding latch 164 and thereby temporarily depress intermediate spring 158 or 158' into contact with its associated spring 159 or 159', but as soon as this key is released, the intermediate spring returns to its normal position. However, if one of the shift lock keys 153 or 155 is depressed, the intermediate spring 158 or 158' will be retained by the spring catch 162 in its operated position as shown in Fig. 9 until such time as the intermediate spring is released by the depression of one of the shift keys.

Although it has not been so shown in Figs. 1 to 9 of the drawings, in order to avoid complication of the disclosure, the conductors to the various sets of spring and spring assemblies are formed into a cable with branches which are conveniently supported on the upper surface of the bars 138.

It will be noted especially from Fig. 3 that while the compartment at the front end of the supplementary keyboard unit includes the key arrangement just described, the solenoid compartment at the rear of the partition 125 includes the key-actuating solenoids 116, one of which is provided for each of the ninety keys of the standard line-casting machine keyboard with an additional solenoid 91 making the total number ninety-one, provided to operate the added space bar 109 of the line-casting machine as will be further described. These solenoids are arranged in staggered relation on the stepped bottom 124 of the solenoid compartment. Each solenoid includes one winding 170 and in certain instances, two independent windings as will appear from the circuit diagram of Figs. 11*a* and 11*b*. Each solenoid is hollow and with its insulating lining 172 constitutes a mounting for a movable plunger 171 while a coil spring 173 within the sleeve 172 and encircling the lower end of the plunger, holds the plunger in its uppermost position. However, when the solenoid winding is energized, the plunger 171 is pulled downward electrically to depress its related key 111 in the keyboard of the linecasting machine, the upward movement of the plunger 171 being limited by the stepped portions 175 of a removable sub-cover of non-magnetic material, supported in the mechanism in any suitable manner. A removable cover 176 closes the solenoid compartment of the mechanism.

In the lower right hand corner of the unit as shown in Fig. 2, there is provided under the panel 212 space for a relay 189, a circuit breaker 193, a transformer 180 and spark arresting capacitors 313 and 314 illustrated only diagrammatically in Figs. 10 and 11*a*. There also projects from the unit, the actuating elements 215 and 216 of switches, the first of which disables the contacts 194 of the shift bars 140, whereas, the second switch 216 disables the circuit breaker as will appear more clearly in the circuit diagram of Fig. 10.

The supplementary unit is also provided with a green agate 218, a white agate 219 and a red agate 220, under which there are provided lamps respectively designated 70', 71', and 72' as shown in Figs. 10 and 11*c* and which will be hereinafter referred to.

The auxiliary operating unit 115 (see Fig. 1) which may be similar in construction and arrangement to the solenoid portion of the main unit just described is likewise provided with thirty solenoids 116 in stepped relation to be superimposed over the thirty keys of the auxiliary keyboard. Aside from the showing of the unit 115 in Fig. 1, the exact details of construction of this unit have not been illustrated because of its similarity to the mounting of the solenoids in the solenoid compartment of the main operating unit.

The spring assemblies positioned beneath the actuators of the supplementary keyboard are electrically connected to the ninety-one solenoids 116 in the solenoid compartment of the supplementary keyboard unit, by conductors wired in accordance with the wiring diagram shown in Figs. 11*a*, 11*b*, 11*c*, and 11*d*. It will be noted in this diagram that the solenoids superimposed over the keys of the auxiliary keyboard of the line-casting machine and the circuits for operating said solenoids have been omitted in order to simplify the disclosure. In this diagram the rectangles representing the usual keys of the line-casting machine and the circles representing the solenoids superimposed thereover are consecutively numbered in rows reading from left to right as follows: 1 to 15 inclusive, 16 to 30 inclusive, 31 to 45 inclusive, 46 to 60 inclusive, 61 to 75 inclusive and 76 to 90 inclusive, while the solenoid superimposed over the added space bar 109 of the line-casting machine is numbered 91. Certain of these solenoids, although they have the appearance of the others, are provided with two windings, but these double wound solenoids will be recognized by the four leads connected thereto, whereas the single wound solenoids have but two leads.

The keys, space bars and the spring assemblies related thereto of the supplementary keyboard unit are likewise consecutively numbered thus: 1', 2', 3', 4', 5' . . . 48' and 49'. The large capital shift key assembly is designated 50' and the small capital shift key assembly is designated 51' while the spring assemblies actuated by the capital shift bars 140 are indicated by the numerals 52' . . . to 69' inclusive. The green lamp is marked 70', the white lamp is marked 71', and the red lamp is designated 72'.

The conductors interconnecting the ninety-one solenoids with the contact spring assemblies and terminals of the supplementary keyboard, are formed into a cable which "fans" out, in accordance with standard telephone practice, to the several instrumentalities which they interconnect. It will be noted that each conductor adjacent the point where it emerges from the cable is designated by a numeral and a letter repre-

sentative of a color in the color code, used in the actual wiring. It will also be noted that certain of the numerals adjacent the solenoids, are primed to indicate that the conductor thus designated leads to a contact spring of a spring assembly designated by the same primed numeral. However, each conductor as it emerges from the cable branch adjacent the contact spring assembly, is likewise designated by a numeral and a letter, but in this case the numeral is not primed to indicate that this conductor terminates at a solenoid designated by that numeral. For example: the solenoid #1 in Fig. 11*a* has one conductor designated 15'*w* which indicates that this conductor is directly connected to a contact in the contact spring assembly 15' which conductor at that spring assembly is designated 1*w* to indicate that this conductor is connected to a corresponding *w* conductor of the solenoid #1. A second conductor connected to the solenoid #1, which incidentally is connected in multiple with a conductor leading to solenoids Nos. 1 to 10 inclusive, is designated 51'G. This conductor leads to the small capital key spring assembly 51'. It will be noted that this conductor at the last mentioned assembly is designated 1G to indicate that it leads to a G conductor at #1 solenoid. This conductor is also designated 71'G to indicate that it is connected in multiple to a similar G conductor at the lamp 71'. However, this conductor at the lamp 71, bears the designation 51'G. From the foregoing, it should be understood that a conductor at its end adjacent a solenoid, bears the number of the spring assembly to which it is connected, whereas, the end of this conductor adjacent that spring assembly is indicated by the numeral of its related solenoid.

While the circuit diagram of Figs. 11*a*, 11*b*, 11*c*, and 11*d* are necessary for the actual wiring and testing of the supplementary keyboard unit, the schematic circuit diagram of Fig. 10 will probably more simply disclose the circuit arrangement, and also indicate the circuit arrangement for operating the thirty solenoids which may be superimposed over the thirty keys of the auxiliary keyboard of the line-casting machine. In this schematic circuit diagram duplicate circuits are not repeated. Although, as previously mentioned, the main portion of this unit is provided with ninety-one solenoids of which ninety solenoids are superimposed over the ninety keys in the keyboard of the line-casting machine and the ninety-first solenoid is mounted in a position to operate the usual space lever of the machine, and although there are thirty solenoids for operating the thirty keys of the auxiliary keyboard on the machine (where such an auxiliary keyboard is used) these one hundred twenty-one solenoids are represented by six groups of rectangles, the first group including a single rectangle, is designated "space bar no shift"; a second group, "lower case"; a third group, "no shift"; a fourth group, "small capitals"; a fifth group, "large capitals"; and a sixth group, "auxiliary keyboard". Within each of these rectangles, there appear numerals which correspond to the numerals associated with the solenoids superimposed over the keys of the line-casting machine keyboard of Fig. 2. Likewise, all the key-actuated spring assemblies have not been represented, but instead a single spring assembly which is representative of a group of spring assemblies is shown and this indicated spring assembly has associated therewith the numerical designations of the other spring assemblies which are identical therewith. From this showing, it will be understood that any solenoid, the numerical designation of which appears in a rectangle or one of a group of rectangles is individually actuated in a circuit completed by its individual contact spring assembly on the depression of the proper key of the supplementary keyboard. Thus it will be understood that each of the circuits so grouped will be completed, under control of its individual key-actuating spring assembly in multiple with the other circuits that have thus been grouped together.

It will be noted that certain of the numerals, such as #9 and #10 appear in a rectangle associated with the "lower case" rectangle and also in a "small capital" rectangle, whereas, the numeral #6 appears in a "small capital" rectangle and also in a "large capital" rectangle. In this way, it is intended to convey the idea that the solenoid over the key #9 as well as the solenoid over the key #10 of the machine keyboard has two windings, one of which can be energized in a "lower case" circuit and the other winding can be energized in the "small capital" circuit. However, the solenoid superimposed over the #6 key of the line-casting keyboard has two windings, one of which is operated in the "small capital" circuit and the other winding is operated in the "large capital" circuit.

With this brief description of the circuit diagrams, their operation will best be understood by describing the method of operating the line-casting keyboard and the auxiliary keyboard thereof from the supplemental keyboard of the present invention. Let it be assumed that the operator desires to release a matrix of the line-casting machine corresponding to the lower case "a", that is, it is necessary for the solenoid superimposed over the key #31 of the line-casting machine keyboard to be energized in order to depress this key. To energize this solenoid, the key #24' of the supplemental keyboard is depressed. This is effective to close a circuit as follows: From the terminal 178 of the secondary winding of the transformer 180, conductor 181, spring contacts 182 and 183 of the key #24', conductor 184, winding of the solenoid superimposed over the 31st key of the line-casting machine keyboard, conductor 185, normally closed contacts 211 and 210 of the auxiliary keyboard shift key, conductor 213, normally closed contacts 157' and 158' of the small capital shift key, conductor 186, normally closed contacts 157 and 158 of the large capital shift key, conductor 201, back contact and armature of the relay 189, circuit breaker contacts 190, winding of the circuit breaker 193, terminal 179 of the secondary winding of the transformer 180. It will be noted that the white lamp 71' is connected across the conductors 181 and 185 so that it is lighted in multiple with any one of the lower case solenoids to indicate to the operator that lower case solenoids are being actuated by the depression of any of the supplementary keys. In this circuit the solenoid superimposed over the 31st key of the line-casting keyboard is energized and its plunger is pulled downward to operate this mentioned key of the line-casting keyboard which in turn releases the matrix corresponding to the lower case letter "a".

It should be understood that the circuit breaker 193 is provided to insure that the mentioned solenoid receives only a momentary impulse of current, so that its plunger will strike the line-casting machine key in the same manner as is

effected in the normal operation thereof when it is desired to release one matrix. It will be understood that with present line-casting machines, if any key is held depressed, matrices corresponding thereto will be released as long as the key is held depressed. The circuit breaker just referred to is provided to insure that only one matrix will be released irrespective of the length of time that a key in the supplementary keyboard is depressed. The operation of the circuit of the circuit breaker is as follows: When the circuit breaker winding 193 is energized it opens its contacts 190 so that the impedance 217 is then connected in series with the winding 193. The value of this impedance is such that the solenoid now connected in series therewith will not hold its plunger in its depressed condition, but instead will permit this plunger to restore to its normal condition. The switch 216 previously mentioned is connected in the circuit in such a way that when it is closed it will short circuit the impedance 217 so that if desired, the solenoid in the mentioned circuit will hold its plunger in its depressed position, thereby permitting matrices corresponding thereto to be released as long as the key in the supplementary keyboard is actuated.

In the event that the operator desires the matrix of a large capital "A" to be released instead of that of the lower case "a", in addition to depressing the key #24' of the supplemental keyboard he would also depress a large capital shift key which might either be the key 252 (see Fig. 2) or the capital shift bar 140 associated with the key 24'. In any event either the contacts 195 corresponding to the shift key 152 or the contacts 194 corresponding to the capital shift bar 140 will be depressed. It will be noted that if the switch 215 is closed, these two sets of contacts are connected in multiple so that the operator has the choice of either simultaneously depressing the large capital shift key 252 or the large capital shift bar 140 associated with the auxiliary key which it is desired to operate. With either of the sets of springs 194 and 195 closed by the operation of the mentioned key or bar, the relay 189 is energized to switch the circuit connections so that now the depression of key #24' operates the solenoid over the #41 key in the machine keyboard to release a capital A matrix. This energizing circuit for relay 189 is traceable from the terminal 178 of the secondary winding of the transformer 180, conductor 181, thence through either of the sets of contact springs 194 or 195, conductor 197, winding of the relay 189, thence through the conductor 250 to the terminal 251 of the secondary winding of the transformer 180. With the relay 189 thus energized, when the key #24' of the supplemental keyboard is depressed, the spring 182 will contact with the spring 198 and a circuit will thus be completed to energize the solenoid superimposed over the key #41 of the line-casting machine keyboard, corresponding to the large capital "A". The energizing circuit for this solenoid may be traced from the terminal 178 of the secondary winding of the transformer 180, conductor 181, contact springs 182 and 198, conductor 199, winding of the 41st solenoid, conductor 200, through the front contact and armature of the relay 189 and thence through the circuit breaker to the upper terminal 179 of the secondary winding of the transformer 180. It will be noted that while the relay 189 is energized, the green lamp 70' is lighted to indicate to the operator that the large capital shift key is actuated. It should be understood that the capital shift key 252 and the capital shift bar 140 are only momentarily operated in connection with one of the character keys of the supplemental keyboard. In the event that it is desired to release a series of matrices corresponding to large capital letters without the need of repeatedly depressing the shift key 252 or one of the bars 140, the shift lock key 153 may be depressed. With the large capital shift lock key depressed, a circuit will be completed for the 41st solenoid, that is the solenoid corresponding to the large capital A on the line-casting machine keyboard, which circuit is independent of the control of the relay 189. This circuit may be traced from the terminal 178 of the secondary winding 180 of the transformer, conductor 181, spring contacts 182 and 198 closed by the key 24' of the supplemental keyboard, conductor 199, solenoid of the 41st line-casting key, conductor 200 and 203, contacts 159 and 158 of the capital shift lock key, conductor 201, back contact and armature of relay 189, through the circuit breaker to the terminal 179 of the secondary winding of the transformer 180. It will be appreciated that as long as the shift lock key 153 is depressed, the operation of any of the keys of the supplemental keyboard will result in the energization of the solenoid of the corresponding large capital key in the line-casting machine keyboard.

In the event that it is desired to operate the small capital A key in the line-casting machine keyboard, the shift key 152 is operated to restore the contact springs 157, 158 and 159 to their normal position which springs have been operated by the shift lock key 153. If a single small letter is desired the small cap key 154 is depressed, but if it is desired to release a series of matrices corresponding to small cap letters, the shift lock key 155 is depressed. In any event the contact springs 158' and 159' controlled by these keys are brought into engagement in one case momentarily and in the other case until the shift lock key 155 is released. With the contact springs 158' and 159' in engagement, a circuit is closed from the terminal 178 of secondary winding of the transformer 180, conductor 181, contact springs 182 and 204 which are brought into engagement by the depression of the key #24' of the supplemental keyboard, conductor 205, winding of the solenoid over the key #37 of the line-casting machine keyboard, conductors 206 and 207, contacts 159' and 158', conductor 186, contact springs 157 and 158, conductor 201, back contact and armature of relay 189 and thence through the circuit breaker to the upper terminal of the secondary winding of the transformer. It will be noted at this time, that the red lamp 72' is connected across conductors 206 and 181 so that the red lamp is lighted in multiple with any of the small capital solenoids to indicate to the operator that the small capital matrices are being released by the depression of the supplementary keys.

If the line-casting machine is provided with an auxiliary keyboard (the circuits for which have been omitted in the circuit diagram of Figs. 11*a* to 11*d* inclusive) and if it is desired to operate any key or keys of this keyboard from the supplementary keyboard, an auxiliary keyboard shift key is depressed, the contacts 209, 210, and 211 of this key being indicated only in the schematic circuit showing of Fig. 10. In this instance certain contact spring assemblies which are oper-

ated by certain key actuators of the supplemental keyboard will be provided with a fourth contact spring instead of the three contact springs as shown in Fig. 5. If the operator desires to release a matrix corresponding to key of the letter "A" which may be an italicized "A" in the auxiliary keyboard, the operator will likewise depress the key #24' in the supplemental keyboard. Now since the auxiliary keyboard shift key 105 has been depressed, a circuit will be completed to energize the solenoid superimposed over the "A" key in the auxiliary keyboard. The energizing circuit for this solenoid may be traced from the terminal 178 of the secondary winding of the transformer 180, conductor 181, contact springs 182 and 206, conductor 307, winding of this solenoid, conductor 208, contacts 209, 210 of the auxiliary keyboard shift key, conductor 213, contacts 157' and 158' of the small capital shift key, conductor 186, contacts 157 and 158 of the large capital shift key, conductor 201, back contact and armature of the relay 189 and thence through the circuit breaker as previously described, to the terminal 179 of the secondary winding of the transformer. The solenoids superimposed over the remaining keys of the auxiliary keyboard of the line casting machine may be selectively operated in other circuits similar to that just described. It will be understood that these other circuits are controlled by the respective keys of the supplementary keyboard in conjunction with the mentioned auxiliary keyboard shift key mechanism which includes the contact springs 209, 210 and 211 arranged as a spring assembly.

It will be understood that the space bar 109 of the linotype machine will be operated by the 91st solenoid in a circuit completed through the contacts 48' actuated by the spacer 150 of Fig. 2. The circuit of this electromagnet is completed independently of any shift mechanism control. Likewise, the solenoids 8, 23, 36, and 51 are energized by circuits completed through the key contacts 11', 43', 44', and 49' independently of shift mechanism control.

This application is a continuation in part of application Serial No. 618,835, filed June 23, 1932.

What I claim is:

1. In a device for operating a slug-composing typesetting machine, provided with a main matrix magazine and an auxiliary matrix magazine, said device having a plurality of keys arranged according to the arrangement of keys in a standard typewriter keyboard, and means controlled by said keys for selectively releasing matrices from either of said magazines.

2. In a device for operating a slug-composing type-setting machine provided with a main keyboard and an auxiliary keyboard, said device having a plurality of keys arranged according to the arrangement of keys in a standard typewriter keyboard, and means including said keys for selectively operating said main keyboard and said auxiliary keyboard.

3. An operating unit for a line-casting machine comprising a front portion provided with keys arranged according to the arrangement of keys in a standard typewriter keyboard and an upwardly inclined portion provided with solenoids arranged in stepped relation, each solenoid having a core projecting downwardly in operative relation to a key of the line-casting machine and means controlled by said first-mentioned keys for selectively operating said solenoids.

4. An operating unit for selectively actuating the matrix-releasing means of a line-casting machine comprising a case having a plurality of solenoids arranged in stepped relation within the case to engage a matrix-releasing means, a keyboard having its keys arranged according to the arrangement of keys in a standard typewriter keyboard, and circuits selectively completed by said keys for energizing said solenoids.

5. In combination with the keys of a line-casting machine, each of certain of said keys corresponding to two characters, a solenoid provided with at least two windings superimposed over each two-character key, a core for each solenoid actuated by either of the windings of said solenoid, a supplementary keyboard, and circuits selectively completed by said supplementary keyboard for energizing any desired one of said windings.

6. In combination with the keys of a line-casting machine, each of certain of said keys corresponding to two characters, a solenoid provided with at least two windings superimposed over each two-character key, a core for each solenoid actuated by either of the windings of said solenoid, a supplementary keyboard provided with shift key mechanism and having its keys arranged according to the arrangement of keys in a standard typewriter keyboard, and circuits selectively completed by said supplementary keys and by said shift key mechanism for energizing any desired one of said windings.

7. In combination with a line-casting machine having elements for selectively releasing matrices corresponding to lower case, large capital and small capital letters, each small capital matrix-releasing element serving to release a matrix corresponding to two different characters, electromagnetic devices for operating said small capital matrix-releasing elements and each having multiple windings, a supplementary keyboard provided with keys, and circuits selectively controlled by said keys for operating said devices, each winding of each multi-winding device having its individual operating circuit completed by a different key.

8. In combination with a line-casting machine having elements for selectively releasing matrices corresponding to lower case, large capital and small capital letters, each small capital matrix-releasing element serving to release a matrix corresponding to two different characters, an electromagnetic device for operating each element, the electromagnetic devices for operating said small capital matrix-releasing elements each having two windings, a supplementary keyboard provided with keys and with shift key mechanism, and circuits controlled by said keys for operating said devices, the circuit for one of said windings of a device being completed by the operation of one of said keys and the circuit for the other winding of said device being completed by the joint operation of another of said keys and of said key-shift mechanism.

9. In a line-casting machine operating unit, a case having solenoids therein for actuating matrix-releasing elements, each solenoid being provided with a plunger movable through the bottom of said case, said case also having contact spring assemblies supported therein, key stems extending through the top of said case for actuating said spring assemblies, and conduc-

tors interconnecting said solenoids and said contact spring assemblies.

10. In a line-casting machine operating unit adapted to be superimposed over the keys of the keyboard of a line-casting machine, a case having solenoids therein, each solenoid being provided with a plunger movable to depress one of said keys, said case also having contact spring assemblies supported therein, keys having stems projecting through the top of said case for actuating said contact spring assemblies, said last-mentioned keys being arranged according to the arrangement of keys in a standard typewriter keyboard, and conductors interconnecting said solenoids and said contact spring assemblies, said conductors in cooperation with said contact spring assemblies serving to complete circuits for selectively operating said solenoids.

11. In a line-casting machine operating unit, a plurality of solenoids, each provided with a movable element, a plurality of keys on said unit, and means including either of two of said keys for selectively operating one of said solenoids.

12. In a line-casting machine operating unit, a plurality of solenoids, each provided with a movable element, a plurality of keys and shift key mechanism supported on said unit, and means including either of two of said keys and said shift mechanism for selectively operating one of said solenoids.

13. In combination with a line-casting machine having elements to release selectively the matrices from said machine, an electromagnet individual to each element for operating the same, a circuit for each electromagnet, means including a key for completing each circuit, and means for causing said electromagnet to operate each element momentarily only, in response to each completion of its circuit.

14. In combination with a line-casting machine having elements to release selectively the matrices from said machine, an electromagnet individual to each element for operating the same, a circuit for each electromagnet, means including a key for completing each circuit, means for causing said electromagnet to operate each element momentarily in response to each completion of its circuit, and means operated at will for disabling said last-mentioned means.

15. In an arrangement for selectively operating certain of the lower case character, large capital character and small capital character matrix-releasing elements of a slug composing typesetting machine, a group of solenoids each having a winding individual to one of said elements for actuating the same, a keyboard including character keys and provided with contacts individual to each key, a large capital shift key and a small capital shift key in said keyboard, each of said shift keys having normally open contacts and normally closed contacts controlled thereby, and an individual circuit for operating each of said solenoids, each circuit including the winding of its solenoid and extending through the contacts of a related character key as well as through contacts of said large capital shift key and through contacts of said small capital shift key.

16. In an arrangement for selectively operating certain of the lower case character, large capital character and small capital character matrix-releasing elements of a slug-composing typesetting machine, a group of solenoids each having a winding individual to one of said elements for actuating the same, a keyboard including character keys and provided with contacts individual to each key, a large capital shift key and a small capital shift key in said keyboard, each of said shift keys having normally open contacts and normally closed contacts controlled thereby, and an individual circuit for operating each solenoid corresponding to a desired lower case character releasing element, each circuit including the winding of its solenoid and extending through the contacts of a character key related to said last-mentioned solenoid as well as through the normally closed contacts of said large capital shift key and through the normally closed contacts of said small capital shift key.

17. In an arrangement for selectively operating certain of the lower case character, large capital character and small capital character matrix-releasing elements of a slug-composing typesetting machine, a group of solenoids each having a winding individual to one of said elements for actuating the same, a keyboard including character keys and provided with contacts individual to each key, a large capital shift key and a small capital shift key in said keyboard, each of said shift keys having normally open contacts and normally closed contacts controlled thereby, and an individual circuit for operating each solenoid corresponding to a desired small capital character releasing element, each circuit including the winding of its solenoid and extending through contacts of a character key related to said last-mentioned solenoid as well as through normally closed contacts of said large capital shift key and through the normally open contacts of said small capital shift key.

18. In an arrangement for selectively operating certain of the lower case character, large capital character and small capital character matrix-releasing elements of a slug-composing typesetting machine, as well as the auxiliary matrix-releasing elements of said machine, a group of solenoids each having a winding individual to one of said elements for actuating the same, a keyboard including character keys and provided with contacts individual to each key, a large capital shift key and a small capital shift key as well as an auxiliary shift key in said keyboard, each of said shift keys having normally open contacts and normally closed contacts controlled thereby, an individual circuit for operating each solenoid corresponding to a desired auxiliary matrix-releasing element, each circuit including the winding of its solenoid and extending through contacts of a character key related to said last-mentioned solenoid, as well as through normally opened contacts of said auxiliary shift key and through normally closed contacts of said small capital shift key and said large capital shift key.

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