

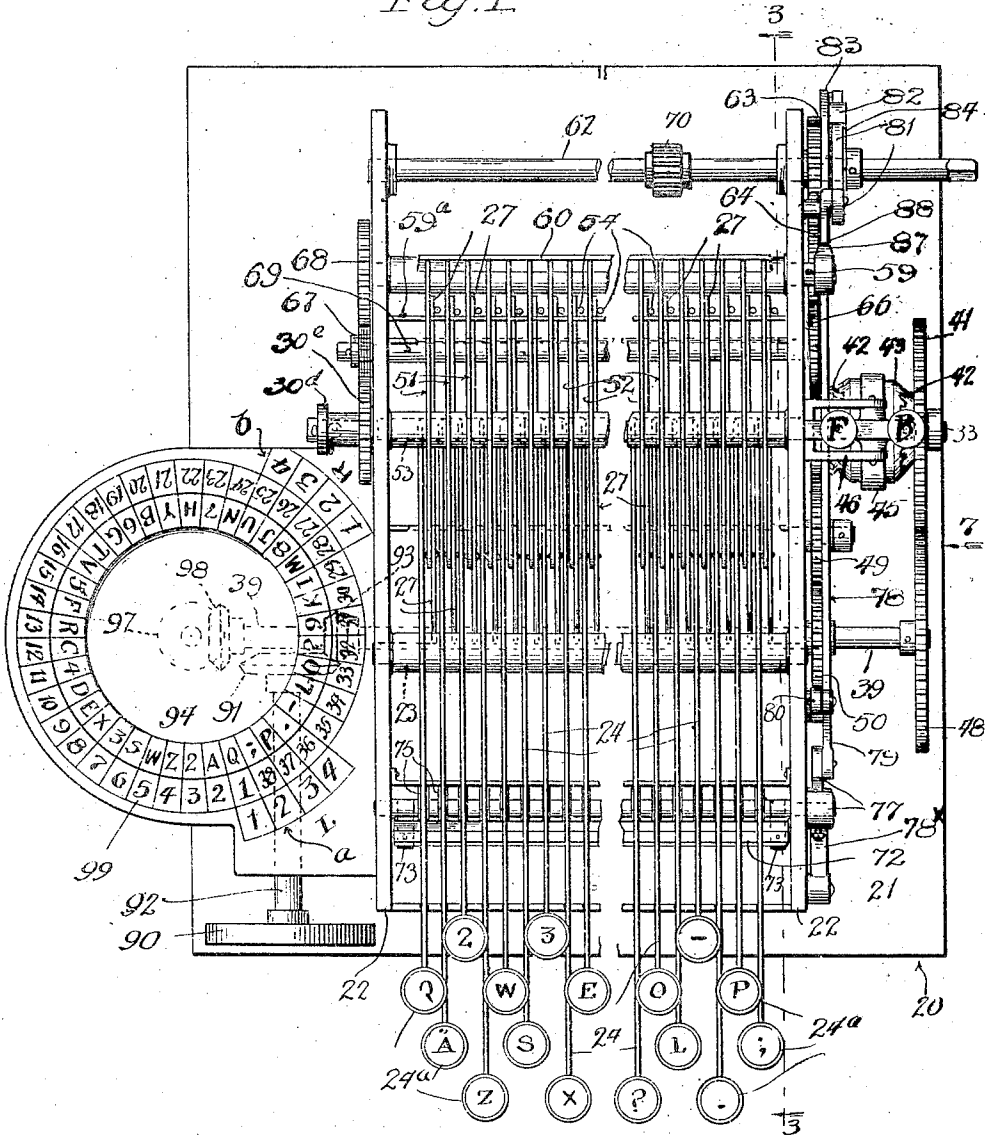
E. W. FULLER.
MACHINE FOR ENCIPHERING AND DECIPHERING MESSAGES.
APPLICATION FILED MAR. 8, 1912

1,038,556.

Patented Sept. 17, 1912

5 SHEETS—SHEET 1.

Fig. 1.



Q	A	2	Z	W	3	X	E	O	4	C	R	F	5	V	T	G	B	Y	H	7	N	U	J	8	M	I	K	9	P	L	-	P	;				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38

Fig. 2.

Witnesses:

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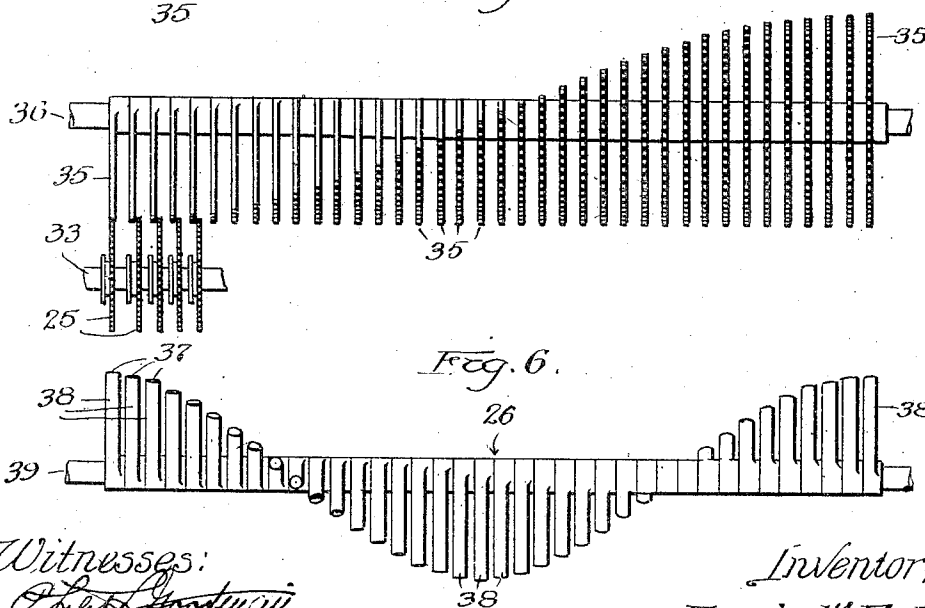
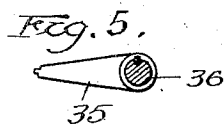
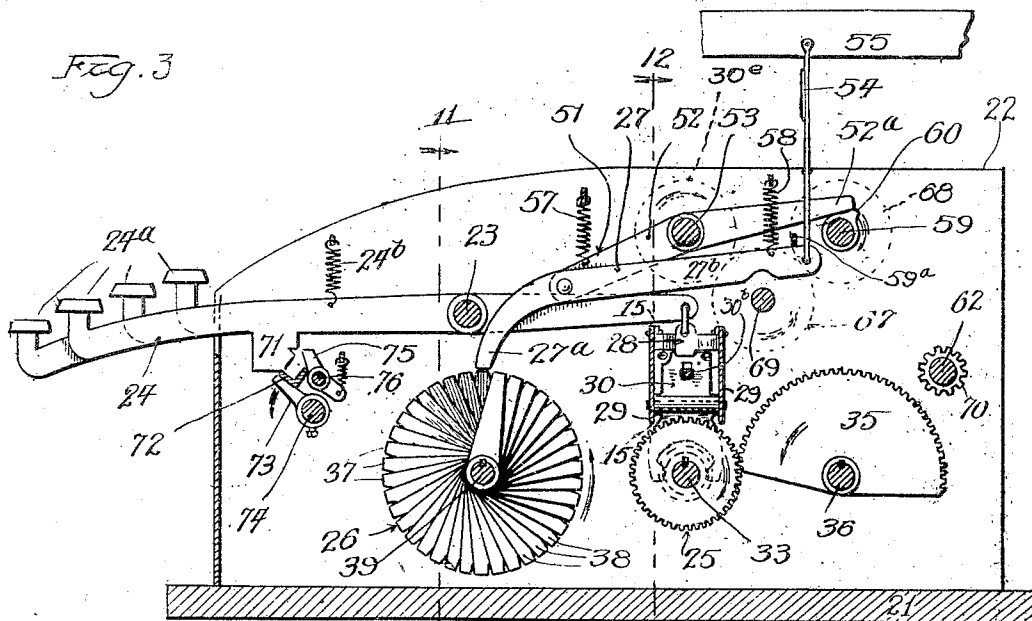
by *Erwin W. Fuller*
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5 SHEETS—SHEET 2.



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MACHINE FOR ENCIPHERING AND DECIPHERING MESSAGES.
APPLICATION FILED MAR. 2, 1912.

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5 SHEETS—SHEET 3.

Fig. 7

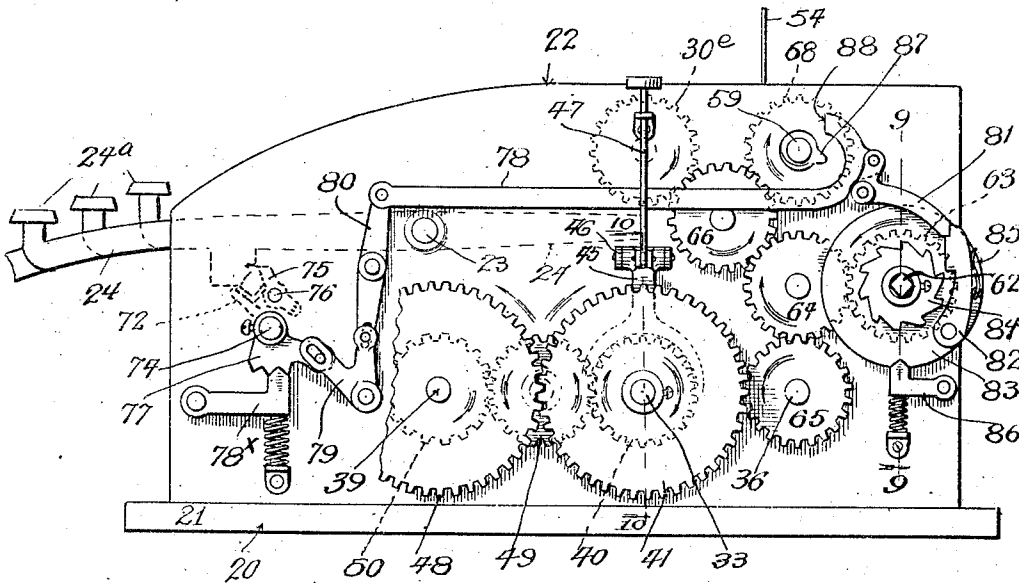


Fig. 8.

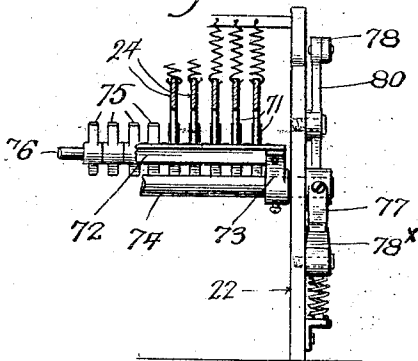


Fig. 9.

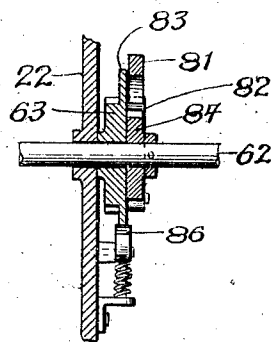
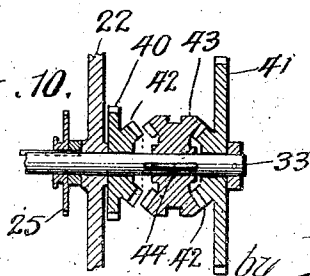


Fig. 10.



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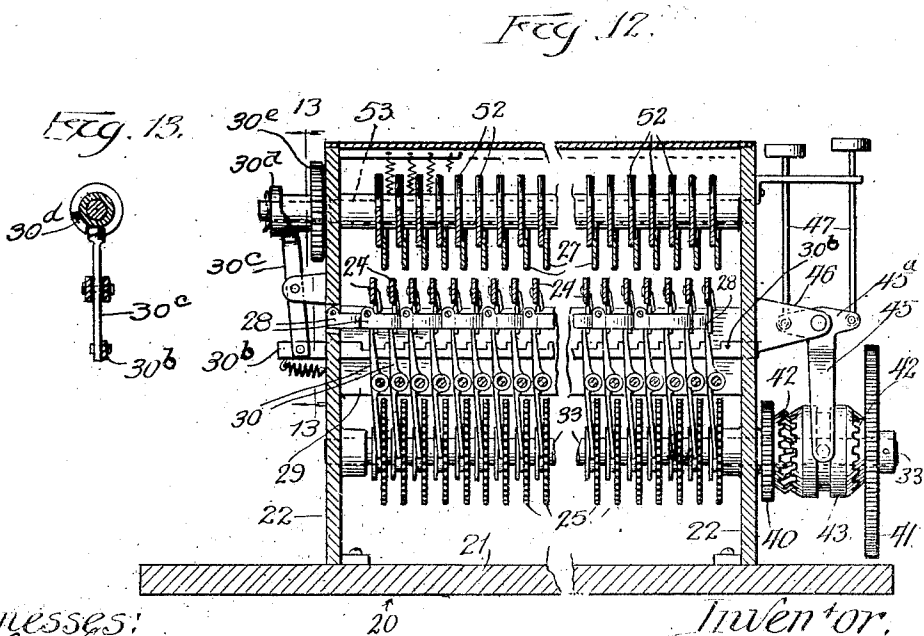
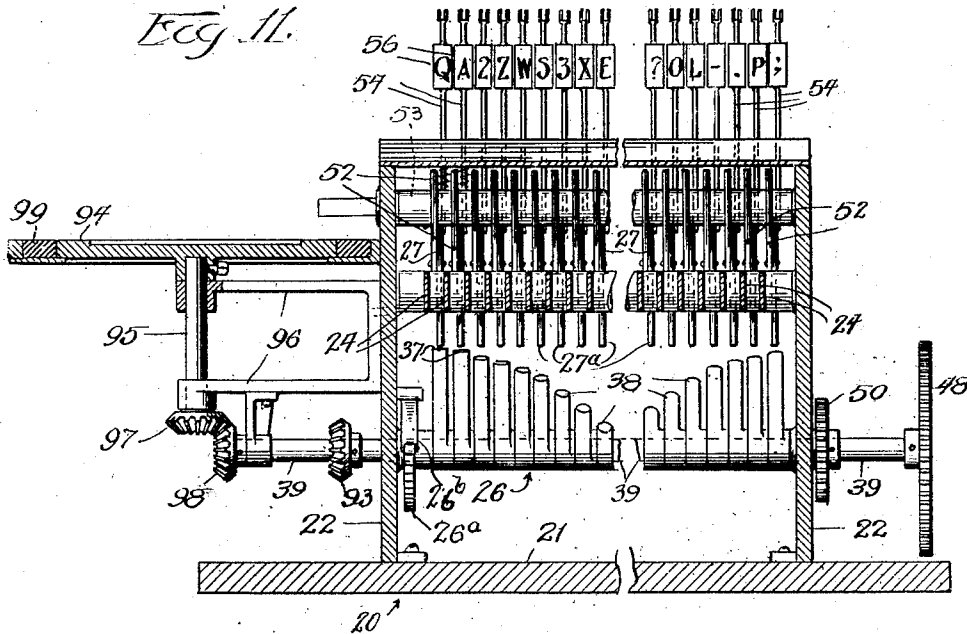
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E. W. FULLER.
MACHINE FOR ENCIPHERING AND DECIPHERING MESSAGES.
APPLICATION FILED MAR. 8, 1912.

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5 SHEETS—SHEET 4.



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Patented Sept. 17, 1912.

5 SHEETS—SHEET 5.

Fig. 14.

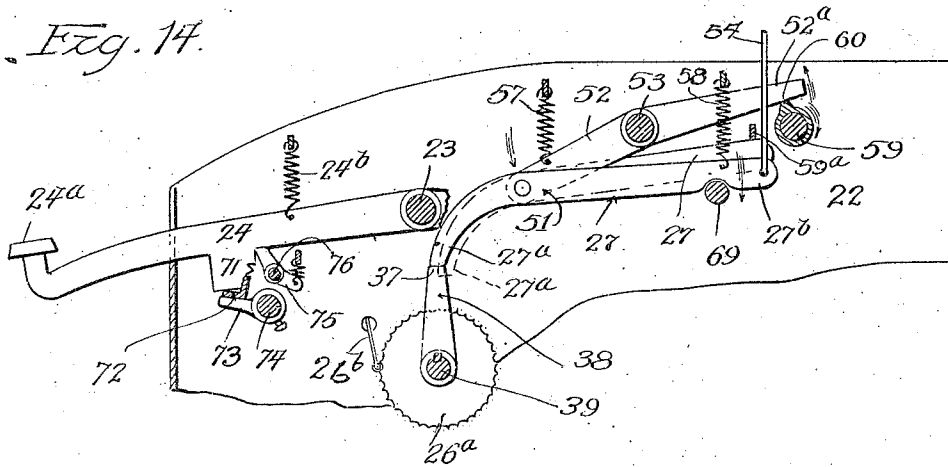


Fig. 15.

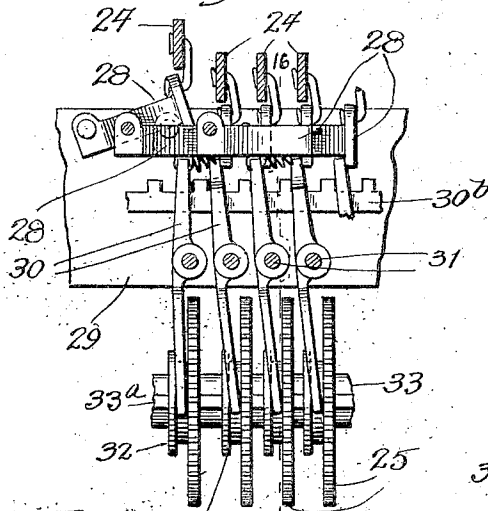


Fig. 16.

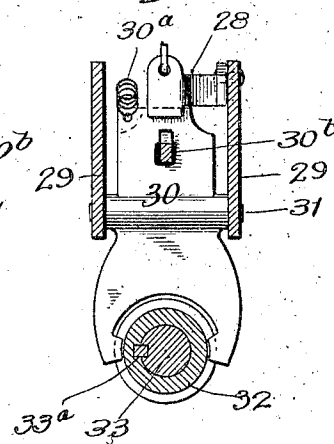


Fig. 17.

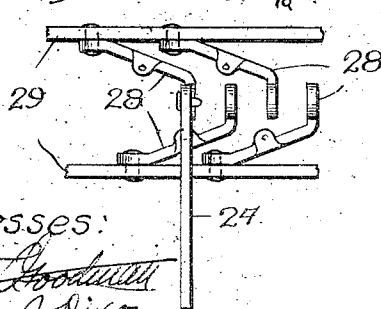
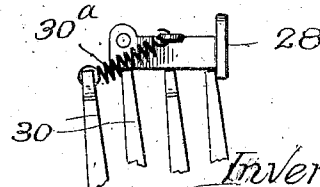


Fig. 18.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR ENCIPHERING AND DECIPHERING MESSAGES.

1,038,556.

Specification of Letters Patent.

Patented Sept. 17, 1912.

Application filed March 8, 1912. Serial No. 682,337.

To all whom it may concern:

Be it known that I, ERWIN W. FULLER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Machines for Enciphering and Deciphering Messages, of which the following is a specification.

This invention relates to machines for enciphering and deciphering messages, and is designed for use in preparing messages in cipher incapable of translation without the use of a machine operating on the principle of the one with which the message is prepared, and then only when the predetermined "key" or "code" thereto is known to the person performing the act of translating the message on such a machine. The desideratum in machines of this type is the production of cipher or code messages in which any given character shall not necessarily represent (more than once) any character used in the message, thereby making it utterly impossible to decipher the message without the knowledge of the "key" or "code," even if the machine be at hand. Another requisite is to make possible the use of a large number of different "keys" or "codes" whereby one may communicate with several persons having duplicate machines, yet none but those having the pre-arranged keys may translate any message into an intelligible communication.

One object of the present invention is to provide a machine of novel construction arranged in such manner that it may be used in connection with any standard typewriter in use at the present time, and coupled thereto in such manner that an intelligible message may be transformed into a meaningless conglomeration of characters by the simple operation of striking the keys of the machine in the manner of writing on the typewriter; and thereafter said cipher message may be translated into an intelligible message (by a recipient of the cipher message, having knowledge of the pre-arranged key) by properly setting a certain dial and striking the keys of a duplicate machine in the order of the cipher message.

Another object is to provide a machine of this class in which the transforming mechanism is capable of being operated by power or by hand.

Another object is to provide a machine

of this class in which the "key" or "code" may be altered during the enciphering or deciphering of the message, thus making it more complex and difficult to solve by an unauthorized person having in his possession one of the machines in question.

Another object is to provide a machine which is comparatively simple in construction, reliable in operation and not liable to get out of repair.

Another object is to provide a machine of this class in which the "key" may be altered by the simple manipulation of a handwheel forming part of the machine, whereby the "key" may be readily changed once or several times during the preparation and translation of the message.

Other objects and advantages will appear in the course of this specification, and with all of said objects and advantages in view, this invention consists in a code message preparing and translating machine capable of a variety of forms of construction, adaptable to any standard typewriting machine.

It further consists in a code or cipher message machine having a key controlled selecting mechanism for effecting a continuous transposition of the characters used in the message.

It further consists in the several other novel features hereinafter fully described and claimed.

In the drawings furnished herewith, Figure 1 is a plan of a machine embodying one form of my present invention, the middle portion of the machine being broken away to enable the view to be made as large as possible upon the sheet; Fig. 2 is a diagrammatic view of the keyboard of the machine; Fig. 3 is a longitudinal section taken on the line 3—3 of Fig. 1; Fig. 4 is a detail plan of certain members of the transposing mechanism; Fig. 5 is a side view of a segmental rack forming part of the transposing mechanism; Fig. 6 is a front elevation of the selecting mechanism; Fig. 7 is a side elevation of the machine looking in the direction of the arrow 7 in Fig. 1; Fig. 8 is a detail front view of certain key locking mechanism and associated parts; Fig. 9 is a detail vertical section of a pawl and ratchet mechanism on the main driving shaft, the section being taken on the line 9—9, Fig. 7; Fig. 10 is a detail section of a clutch mechanism, the line of section being indicated at 10—10 in Fig. 7; Fig.

11 is a vertical cross section taken on the line 11—11 of Fig. 3; Fig. 12 is a vertical cross section taken on the line 12—12 of Fig. 3; Fig. 13 is a detail section taken on the line 13—13 of Fig. 12; Fig. 14 is a detail side elevation of certain levers and associated parts showing one key lever in depressed condition; Fig. 15 is a detail fragmental section taken on the line 15—15 of Fig. 3; Fig. 16 is a detail vertical section taken on the line 16—16 of Fig. 15; Fig. 17 is a plan of certain dogs seen in Fig. 15 and Fig. 18 is a front elevation of one dog and certain shift levers.

15 In general the machine comprises a set of character key levers that control the entire operation of the machine, each key lever being associated with a gear wheel and a suitably driven segmental rack normally out of mesh with the gear wheel, but capable of being thrown in engagement therewith as a result of the depression of any key and acting to partially rotate said gear wheel. The number of teeth upon the segmental racks determines the arc of revolution of the gear wheels and controls the active position of certain character selecting mechanism with reference to a series of levers that actuate the key levers of a typewriter to print the cipher characters or actuate character displaying targets so as to display such cipher characters to the operator whereby he may observe their value. Locking mechanism is associated with the key levers for locking all but the one depressed, and mechanism, under the control of each key lever, acts to set the machine in motion to print or display a character and thereafter to stop the machine at the end of a cycle of operation.

40 Referring to said drawings, which show one embodiment of my present invention, 20, represents a supporting frame of suitable form, having a base 21, and two vertical side frames 22, spaced apart and adapted to form the supports for the operating mechanism of the machine. Fulcrumed upon a common shaft 23, is a set of character key levers 24, that have keys 24^a, bearing characters such as the letters of the alphabet, numbers, punctuation marks, etc., said keys being preferably arranged in the form of a keyboard, such as one similar to the keyboard of the ordinary "Remington" typewriter. Individual springs 24^b, secured to the character key levers and some stationary portion of the machine, act to return any given key to normal position after having been depressed.

Associated with the key levers 24, and 60 under their control, is transposing mechanism capable of transposing the character indicated on any key (depressed by the operator) to some other character and in the form of transposing mechanism shown in 65 the drawings, each key lever coöperates with

a toothed wheel, for instance a gear wheel 25, which is rotated (by means hereafter described), as a result of the depression of an associated key lever, thus effecting a certain manipulation of selecting mechanism 26, in such manner that some one of a series of levers 27, is operated to cause a resultant character to be exhibited, printed or otherwise made readable. In the means shown for accomplishing this result, each key lever is connected to an individual dog 28 (see Figs. 3, 15, 18, inclusive) pivoted to supporting bars 29, carried by the side frames. Below each dog 28, is a forked shift lever 30, arranged between the supporting bars 29, and fulcrumed thereon as by a shaft 31. The upper end of each shift lever 30, is normally held against its associated dog as by a coiled tension spring 30^a, the ends of which are attached to the shift lever and one of the dogs. Because of the close spacing of the shift levers, each spring connects any given lever with some dog farther along the series (see Fig. 18), and one upper corner of each dog is cut away to permit of this arrangement. The gear wheels 25, are each slidably mounted upon a rotary shaft 33, journaled in the side frames, and said gear wheels are held against rotation on said shaft as for instance by means of a spline 33^a, seated in grooves formed in the shaft and hub portions of the gear wheels. The forked end of each shift lever engages a grooved hub 32, of its associated gear wheel to provide means for shifting the gear wheels back and forth on their common shaft.

Means are provided for returning any released shift lever and its associated gear wheel back to normal or inoperative position, and as shown said means comprises a reciprocatory toothed bar 30^b, lying transversely of the machine and extending through aligned holes in the upper ends of the shift levers. Any shift lever is free to swing forward in the space between the adjacent teeth of the bar, but if said bar be moved toward the left (as viewed in Fig. 15) that shift lever which has been moved into working position is thereby forced back by the tooth immediately in front of it, said tooth striking the front face of the shift lever and swinging it back. The shift bar is shown as connected to the lower end of a lever 30^c, (see Fig. 12) fulcrumed between its ends upon a bracket secured to one side frame and having its free end in engagement with a cam 30^d, carried by a gear wheel 30^e, journaled on a stud shaft projecting out from the side frame. The cam is arranged to rock the lever and reciprocate the bar 30^b, near the end of a cycle of operation.

It is to be observed that if any given dog is raised out of engagement with its associated shift lever, a spring 30^a, swings the

upper end of the released shift lever in a direction to slide its associated gear wheel along the shaft 33, to a second position, thereby bringing it into operative position to be actuated by a certain element of the transposing mechanism. Behind said gear wheels 25, is located a series of segmental racks 35, (see Figs. 3 and 4) fast upon a shaft 36, journaled in the side frames, there being one rack associated with each gear wheel and normally out of mesh therewith; but capable of intermeshing with an associated gear wheel. In the form of keyboard shown there are 38 keys, a corresponding number of key levers, dogs, shift levers, gear wheels and segmental racks, and each gear wheel is shown as formed with thirty-eight teeth to correspond with the number of key levers. The number of teeth on the segmental racks, however, may vary as shown from one tooth to thirty-eight teeth and said racks may be arranged in certain order, depending upon the number of teeth contained in any given rack, for instance rack having one tooth may be placed on the left-hand side of the machine, rack having two teeth placed next thereto, and so on, rack having thirty-eight teeth being placed at the right-hand end of the machine, as viewed from the front. Thus in the machine illustrated, each rack bears a number of teeth equal to the number of its associated character key, depending upon the position of said key in the keyboard, for instance the key bearing the character Q, is number 1 on the keyboard, and consequently the segmental rack associated with said key and adapted to intermesh with the gear wheel under the control of said key, has one tooth. In a cycle of operation, the entire gang or series of segmental racks is given one complete rotation, consequently if one of said gear wheels is thrown into mesh with its associated rack, then the entire gang or series of gear wheels 25, and their common shaft are thereby rotated through a certain arc of a circle, depending of course upon the number of teeth contained in the rack effecting such movement. In the arrangement shown, however, each rack advances the gear wheels two teeth (center to center) more than the number of teeth borne by any rack, but this does not interfere with the perfect operation of the machine in any respect whatever, and it may be possible to employ teeth of such pitch as to move the gear wheels a number of teeth equal to the number of teeth on the racks.

It is now obvious that by depressing any key, the gear wheels and their common shaft will be turned through an arc of a circle, depending upon the number of teeth on the rack that is thrown into mesh with the gear wheel. The rotation of said shaft is utilized in changing the position of the selecting

mechanism, and thereby effecting a transposition of the character, indicated on the key depressed, to some other character. In the form of selecting mechanism shown, it has a series of abutments or trips 37, arranged in the form of a spiral, there being one abutment place corresponding to each key lever. The abutments may comprise the end faces of arms 38, (see Figs. 3, 6, 11, 14) secured upon a rotative shaft 39, journaled in the side frames. This arrangement provides a selecting mechanism having a spirally arranged series of abutments or trip arms that determine or select the lever 27, of the series which is to be actuated as a result of depressing of one of the character key levers. A toothed wheel 26^a, secured to the shaft 39, engages with a detent 26^b, to afford means for positively holding the selecting mechanism in position.

The shafts 33, 39, are geared to rotate in unison, two trains of gearing being here shown, one for rotating the mechanism in one direction and the other for rotating it in a reverse direction.

Referring to Figs. 1, 7, 10 and 12, the shaft 33, bears two gear wheels 40, 41, thereon, and each provided with a clutch member 42, between which is a co-acting clutch member 43, slidably mounted on the shaft 33, and held against rotation thereon, as for instance by a spline 44. As shown, said clutch members have co-acting clutch teeth, whereby the slidable member may be coupled to either gear wheel 40, 41, so as to cause the same to rotate with the shaft 33. A forked lever 45, pivoted on a bracket 46, secured to one side frame of the machine, engages the slidable member of the clutch by means of the ordinary pin and groove connection, and said forked lever is rocked as by rods 47, having buttons upon their upper ends and connected to a cross bar 45^a, of the lever 45. By depressing the proper rod, the clutch member may be thrown into operative connection with either gear wheel 40, 41. The gear wheel 41, meshes with a gear wheel 48, fast on the shaft 39, and the gear wheel 40, meshes with an intermediate gear 49, that meshes with a gear wheel 50, fast on the shaft 39. This arrangement provides a simple means for effecting forward and backward rotation of the selecting mechanism in unison with the rotation of the segmental racks of the transposing mechanism. It is now apparent that if the shaft 33, is turned through the instrumentality of a rack and its associated gear wheel, the selecting mechanism will be correspondingly rotated either forward or backward, depending upon the position of the clutch member 43, thereby bringing some certain arm 38, into an upstanding position ready to trip its associated lever 27, whereas all of the remaining arms 38, are left in

some oblique position with respect to the vertical and in position to be non-effective with respect to the other levers 27.

Associated with the selecting mechanism is a series of compound levers 51, that are arranged to actuate suitable printing mechanism, as for instance they may actuate the key levers of a typewriter or they may actuate character displaying targets. The compound levers 51, correspond in number to the key levers and in the form shown are located over the remainder of the operating mechanism. Each such compound lever comprises one lever 52, fulcrumed between its ends upon a rod 53, secured to the side frames, and each lever has pivoted thereto at its forward end a second lever which is the lever 27, heretofore referred to. The forward end of each lever 27, is turned downward to provide a terminal end 27^a, lying immediately above the selecting mechanism and in vertical alinement with its axis of rotation. To the long arm 27^b, of each lever 27, is secured a link or rod 54, the upper end of which may be attached to the character key lever 55, of a typewriter having a keyboard corresponding to the keyboard of the machine, or said link may have a target 56, displaying the character.

Coiled springs 57, are secured to the forward ends of the levers 52, and to some stationary portion of the machine, and coiled springs 58, are secured to the long ends of the levers 27, and to some stationary portion of the machine. A cross bar 59^a, placed immediately above the levers 27, limits the upward pull of the springs 58, on the long end of the levers 27. Below the arms 52^a, of the levers 52, is a rotative shaft 59, journaled in the side frames of the machine and having a longitudinally extending rib 60, thereon that is arranged to strike the arms 52^a, once in a cycle of operation and raise said ends of the levers 52, said movement of the levers having the effect of pressing down the forward ends of the levers 27. It is to be noted that although the terminal ends 27^a, of the levers 27, are in alinement above the selecting mechanism, yet only one abutment 37, of the entire series of abutments is presented to said terminal ends at any one time, so that if the levers 52, be rocked in the direction of the arrow, (see Fig. 14) the levers 27, will thereby be depressed, and all but one will be free to swing down toward the shaft 39, using the bar 59^a, as a fulcrum, whereas the one whose terminal end is presented to an abutment will be prevented from swinging down toward the shaft, but said abutment will act as a fulcrum for that lever, whereupon its long end will be swung downward (see Fig. 14) thereby drawing down the link 54, and actuating the proper key of the associated typewriting mechanism or displaying the target bearing character in such

manner that the operator may observe which character has been affected by the depressing of any given key.

The operating mechanism of the machine is driven from the main drive shaft 62, by simple forms of gearing, one train of gears 63, 64, 65, being arranged between the main drive shaft and shaft 36, of the segmental transposing racks. A second train of gears 66, 67, 68, and a counter shaft 69, is employed to drive the shaft 59. The gear wheel 30^a, carrying the cam 30^a, meshes with the gear wheel 67, and receives its rotary movement therefrom. The drive shaft may be a continuously rotating one, and I have shown the same as provided with a pinion 70, adapted to be geared to any suitable form of motor and have shown said shaft as formed with a squared end adapted for the reception of a crank or drive wheel. Preferably the gear wheel 63, is loose on the drive shaft and arranged to be coupled thereto by pawl and ratchet mechanism hereafter described, and means, under the control of each key lever, are provided for throwing said clutch into operative connection and automatically throwing said clutch out of action at the end of a cycle of operation. In the means shown, each key lever has a downward projection 71, beneath which is a cross bar 72, (see Figs. 3 and 8) secured to two arms 73, ordinarily secured upon a rock shaft 74, journaled in the side frame of the machine. Above said rock shaft 74, are a series of dogs 75, rotatively mounted on a rod 76, and adapted to be swung into notches formed in the downward projections 71, whenever any key lever is depressed. The bar 72, engages said dogs and normally holds them out of the notches in the levers and a spring is provided for each dog operating to throw the same into engagement with the lever.

Upon the rock shaft 74, is secured a segmental member 77, which engages with a spring pressed detent or pawl 78^a, that acts to hold said segmental member, and its shaft in either of the two positions occupied thereby. The shaft 74, is arranged to reciprocate a release bar 78, and thereby effect the coupling of the drive shaft with the gearing of the machine, and as shown, said mechanism comprises a bell crank lever 79, (see Fig. 7) one arm of which connects with the segmental member 77, and the other with a rock bar 80, pivoted between its ends to one side frame, and connected at its upper end with the release bar 78. To the other end of the release bar is pivotally secured a detent 81, pivoted upon the side frame and adapted to contact with a pawl 82, carried by a disk 83, fast to the gear wheel 63, but loose upon the shaft 62. The drive shaft 62, bears a ratchet wheel 84, fast thereon, with which ratchet wheel said pawl 82, is

caused to engage as by a spring 85, secured to the disk 83, and bearing against the pawl. A spring pressed detent 86, arranged to enter a notch in the disk 83, acts to hold said disk stationary and in proper position when it arrives at a position of rest.

The shaft 59, bears a lug 87, which is arranged to strike against a bearing face 88, on the release bar to shift said bar into a second position. In Fig. 7 said lug 87, has just passed the bearing face 88, having thereby shifted the bar from left to right, swung the dog 81, down into the position indicated and raised the dogs 75, out of engagement with the key levers. The dog 81, is shown as in engagement with the pawl 82, having thrown it out of connection with the ratchet wheel 84.

In preparing or translating messages with this machine, it is necessary that the selecting mechanism be set at some arbitrary point before the first letter of the message is struck. This is accomplished by means of a hand wheel 90, (see Fig. 1) a bevel gear wheel 91, connected thereto as by a shaft 92, and meshing with a bevel pinion 93, fast on the shaft 39. By turning the hand wheel 90, in the proper direction, the selecting mechanism is thereby turned in either direction to set the same at the predetermined initial or starting point. Associated with said selecting mechanism and moving in unison therewith, is a dial 94, carried by a vertical shaft 95, (see Fig. 11) which is journaled in a bracket 96, secured to the side frame. Said vertical shaft 95, bears a miter pinion 97, which meshes with a miter pinion 98, fast on the shaft 39. Said dial 94, bears characters arranged around on its face near its periphery which characters correspond with the characters denoted on the keys and are arranged in the same sequence. Said characters are arranged to be brought into register with certain other characters shown on a stationary portion of the frame at *a*, *b*, which are also identified by letters "L", "R", signifying left and right. If desired, a second dial 99, of ring like form and also bearing characters arbitrarily arranged around the same, may be employed between the dial 94, and the stationary portion of the frame. The dial 99, is simply employed for the purpose of making a large number of combinations and making it more difficult and complicated to attempt to solve any given message. By reason of the miter gears 97, 98, on the shafts 95, 39, (see Fig. 11) the dial and selecting mechanism are caused to move in unison so that if the handwheel 90, be turned to move the dial from the position shown in Fig. 1, (where Q registers with the numeral 1 on the scale *a*) to a position where some other character on the dial registers with said numeral 1, then the selecting mechanism will be rotated

to bring into active position an arm thereof corresponding with the key that bears the same character as the one which has been brought into register with the numeral 1 on the scale *a*; for instance, if the handwheel 90, be turned to the left until the character O on the dial registers with the numeral 1 on the scale *a*, then the dial will have been moved thirty-two spaces from its initial position and the selecting mechanism will have been moved thirty-two spaces or steps from its initial position, viz.: the one in which the first arm was in active position; thereby bringing the thirty-third arm into active position.

In the operation of the machine, the hand wheel 90, is first turned to set the selecting mechanism at the starting or initial point, and in the drawings the wheel has been turned to bring the character Q on the dial opposite the number 1 of the series "L". Corresponding with this location of the dial, the first arm (to the left) of the selecting mechanism has been caused to assume an upright position underneath the terminal end of the first lever 27. The initial or starting point may, however, be varied by turning the hand wheel, but it is absolutely necessary for both the sender and the recipient of the message to have knowledge of this starting point, which is the key to the message. Having first set the dial as indicated, the sender writes his message by striking the keys denoting the characters comprising the message. Assume that the first key struck is Q, or the first key in the keyboard—the first act which takes place is the raising of the dog 28, connected with the key lever of the key denoting Q, whereupon the shift lever 30, associated with said dog shifts its associated gear wheel 25, into mesh with its associated segmental rack of the transporting mechanism—which in this case has but one tooth. By this time the key lever has swung the bar 72, part way down, the dogs 75, (with the exception of the one associated with the key lever depressed) having swung into the notches of the other key levers, and the remainder of the downward movement of said key lever turns the shaft 74, and segmental member 77, to second position, thereby raising the dog 81, out of engagement with the pawl 82, through the instrumentality of the bell crank 79, rock bar 80, and release bar 78. This permits the pawl 82, to engage with the ratchet 84, thereby coupling the drive shaft 62, to the gear wheel 63, and causing the shaft 36, to be rotated in the direction of the arrow.

In a cycle of operation, the segmental racks 35, are given one complete rotation, but inasmuch as only one segmental rack has been thrown into mesh with any of the gear wheels, that rack effects a partial rotation of said gear wheel. In this case the seg-

mental rack, having but one tooth, is intermeshed with its associated gear wheel, consequently said gear wheel is rotated a distance equal to three teeth (center to center) thereby moving the selecting mechanism three steps, or, in other words, bringing the fourth arm of the series into upright position. The key corresponding to the fourth arm is Z, and is the character which will be exhibited by the character bearing element or character printing element actuated by the lever 27. By this time the rib 60, on the shaft 59, is in position about to engage the arms 52^a, of the levers 52, and in the continued rotation of said shaft 59, said rib 60, passes underneath the arms 52^a, raises said arms and depresses the forward ends of the levers 52, and therewith all of the levers 27, one of which (the fourth one in this instance) strikes against the abutment presented to it, thereby causing the long or rear end of that lever to be swung down against the action of the spring 58, shifting down the link 54, and actuating the key lever of the typewriter to which said link is attached, or exhibiting the target carried by said link. The remaining levers 27, by reason of the positions of the arms 38, of the selecting mechanism are free to swing down, with the cross bar 59^a, acting as a fulcrum, the coiled springs 58, acting to hold the long ends of said levers against the bar 59^a. During the remainder of the cycle of operation, the rib 60, passes the ends of the arms 52^a, and the cam 30^a, draws back the bar 30^b, returns the released shift lever to inoperative position, whereupon the dog 28, drops in front of said shift lever and finally the lug 87, on the shaft 59, strikes the bearing face 88, of the release bar, moving it to the position seen in Fig. 7, thereby swinging the dog 81, down into active position and raising the bar 72. The continued rotation of the drive shaft brings the pawl 82, into engagement with the dog 81, whereupon said pawl is detached from the ratchet.

Assuming now that it is desired to send the message "Add" in cipher and it is understood that the key or code is Q, 1 on 1, L, F, in other words that the letter Q on the dial registers with the numeral 1 on the ring dial and the number 1 on the ring registers with the numeral 1 on the index indicated by L and that the clutch 43 has been set to drive the selecting mechanism in the direction indicated by the arrow. The dials and clutch are set in accordance with this key, by turning the ring dial 99, until the character 1 thereon registers with the character 30 1 on the scale *a*, and thereafter by turning the handwheel 90, (toward the right or left) to bring the letter O on the dial 94, opposite the characters 1 on the ring dial and scale *a*. Rotation of the handwheel 92, causes rotation of the selecting mechanism

shaft 39, and when the handwheel 90, has been turned far enough to bring the character O on the dial 94, opposite the character 1 on the scale *a*, it will be observed that the thirty-third arm of the selecting mechanism is brought to an upright active position, because the dial shaft 95, and selecting mechanism shaft 39, rotate at equal speeds and the number of arms 38, are equal to the number of characters on the dial 94, and are spaced uniformly around the shaft. The keys A D D are now struck, one after the other, and translated into I T W. This translation is accomplished as follows, reference being had to the diagrammatic chart illustrated in Fig. 2, which shows the characters denoted on the keys, arranged in a straight line and identified by the numerals 1 to 38, inclusive, said numerals also representing the position of each key and the relative position of each arm of the selecting mechanism. It will be seen that when the key A (2) is depressed, the selecting mechanism is rolled back four steps from its initial position, viz. the point where the thirty-third arm was in active position to trip the character presenting lever, which controls character O of the typewriting machine or display targets. In depressing the keys, bearing the characters A D D the selecting mechanism was therefore rolled back first four steps (when A was struck), bringing it to a position where I was printed, then rolled back twelve steps more (when D was struck), bringing it to a position where T was printed, and then rolled back twelve more steps (when D was again struck), bringing it to a place where the character W was printed. In translating this message, the operator first sets the dials to the initial or key point (O 1 on 1 L F) as in sending the message, and strikes the character keys I T W in succession but after he has struck a key and before striking the next key he first re-sets the dial 94 to bring the same character thereon, as the one which he has struck, into register with the numeral 1 on the scale *a*, that is, after he has struck the key bearing the character I, he turns the dial to bring the character I thereon opposite the numeral 1 of the scale *a* before striking the key bearing the character T, and thereafter turns the dial to bring the character T thereon into register with the numeral 1 of the scale *a* before he strikes the character W. This re-setting of the dial for each character to be printed is necessary in translating the message, but is not so in preparing the message.

It is obvious that a great variety of combinations or codes may be devised in connection with a machine of this class, and that it is practically an impossibility to decipher the simplest message, because the same cipher letter may never be used a sec-

ond time for indicating the corresponding letter in the message. It is obvious that the messages may be prepared upon the machine and transmitted by letter, telegraph
5 or otherwise, to a second party who having knowledge of the key-board and having a duplicate machine, may readily translate the same into an intelligent message.

I realize that various alterations and
10 modifications of this device are possible without departing from the spirit of my invention, and I do not therefore desire to limit myself to the exact form of construction shown and described.

15 I claim as new and desire to secure by Letters Patent:

1. In a machine of the class described, the combination of a key lever, a gear wheel associated therewith, a segmental rack normally out of mesh with said gear wheel,
20 but capable of intermeshing therewith, a shift lever under the control of said key lever and operatively connected to said gear wheel, movement of said shift lever in one direction being adapted to throw the gear wheel and segmental rack into mesh with each other, means for rotating said segmental rack, selecting mechanism operatively
25 connected to said gear wheel and arranged to be actuated therefrom, individual character presenting elements each having a certain character thereon and arranged to be acted upon by said selecting mechanism, and independent actuating means for actuating said character presenting element affected by the selecting mechanism.

2. In a machine of the class described, a key-board the keys of which denote certain characters, a key lever for each key, a dog
40 carried by each lever, a spring actuated shift lever normally in engagement with an associated dog, a shiftable gear wheel associated with each shift lever and arranged to be shifted thereby, a common shaft upon which all of said gears are slidably but non-rotatably mounted, a segmental rack associated with each gear wheel, said gear wheels being normally out of mesh with their associated racks but capable of being
45 thrown into mesh therewith, one at a time, upon the depression of a key lever, driving means for rotating said racks, selecting mechanism actuated from said gear wheels, and character presenting elements arranged
50 to be acted upon by said selecting mechanism.

3. In a machine of the class described, the combination of a series of individual character presenting elements, a series of corresponding character denoting keys, operative
60 connections for said character presenting elements, under the control of said keys, and having means for changing the relation between the keys and the individual character presenting elements, including an indi-

cating dial whereby said change may be made known.

4. In a machine of the class described, a series of independent character presenting levers, a series of character denoting keys,
70 controlling the action of said levers, and means for changing the relation between any key and the levers, whereby different levers are actuated upon the depressing of the one and the same key a number of times
75 in succession.

5. In a machine of the class described, a key controlled, rotary selecting mechanism, having a series of active places arranged around its axis of rotation, and a series of
80 suitably operated, character presenting elements, each capable of co-acting with an active place on said selecting mechanism.

6. In a machine of the class described, a key controlled, rotary selecting mechanism, having a series of abutments arranged spirally around its axis of rotation, and a series of
85 suitably operated character presenting elements, each capable of co-acting with one of said abutments on said selecting mechanism.

7. In a machine of the class described, a key controlled, rotary selecting mechanism, having a series of arms arranged around its axis in spiral formation, the terminal ends
95 of said arms acting as stops, any one of which may be brought into active position, and a series of suitably operated character presenting elements each capable of co-acting with one of said arms of said selecting
100 mechanism.

8. In a machine of the class described, a key controlled gear wheel, a suitably driven, rotary segmental rack with which said gear wheel may be thrown into mesh by the action
105 of a key, a selecting mechanism driven from said gear wheel and having a series of active places arranged spirally thereon, a series of character presenting levers each of which is adapted for engagement with an active place on said selecting mechanism, movable members supporting one end of
110 said character presenting levers, yieldable supports for the other ends of said levers and means for rocking said movable supports and therewith the character presenting levers toward the selecting mechanism.

9. In a machine of the class described, a key controlled gear wheel, a rotary segmental rack with which said gear wheel may be thrown into mesh by the action of said
120 key, a rotary selecting mechanism arranged to be rotated by said gear wheel, said selecting mechanism having a series of abutments arranged spirally around its axis of rotation, and a series of character presenting levers associated with said selecting mechanism, and having aligned portions arranged to be acted upon by some one of
125 said abutments of the selecting mechanism.

10. In a machine of the class described, a series of key controlled gear wheels, a series of associated segmental racks, each of which is capable of being thrown into mesh with its associated gear wheel by the action of a key, each succeeding rack of the series having at least one more tooth than the one preceding it, a rotary selecting mechanism geared to rotate in unison with said gear wheels, and having a series of active places thereon, and a series of individual character presenting levers having alined portions, any one of which is adapted to be affected by one of said active places on the said selecting mechanism.

11. In a machine of the class described, a key controlled gear wheel, means for effecting a partial rotation thereof, selecting mechanism driven by said gear wheel, individual character presenting elements associated therewith, and arranged to be engaged one at a time by said selecting mechanism, trains of right and left hand gearing between said gear wheel and selecting mechanism, and clutch mechanism for throwing either of said trains of gearing into operation.

12. In a machine of the class described, key controlled selecting mechanism having a series of abutments, a series of levers asso-

ciated therewith; means for simultaneously rocking all of the levers, and character presenting levers fulcrumed upon said first named levers and arranged to be simultaneously moved toward said selecting mechanism in such position that one of said character presenting levers contacts with and fulcrums upon an acting abutment.

13. In a machine of the class described, key controlled selecting mechanism having a series of radial, spirally arranged arms, any one of which may be brought to an active position, rock levers and means for rocking said levers, and character presenting levers, one pivotally connected with each rock lever, and having a terminal end arranged to contact with an active arm of the selecting mechanism, whereby when said rock levers are moved into operative position, one of said character presenting levers engages said active arm and is given a separate and independent action.

In witness whereof, I have hereunto signed my name, at Chicago, Cook county, Illinois, this 2nd day of March, A. D. 1912.

ERWIN W. FULLER.

Witnesses:

PHILIP L. GOODMAN,
ARTHUR J. DIXON.