Sept. 1, 1931. S. MORTON ET AL 1,821,110

SELECTING AND PRINTING MECHANISM

Filed March 20, 1929 6 Sheets-Sheet 1

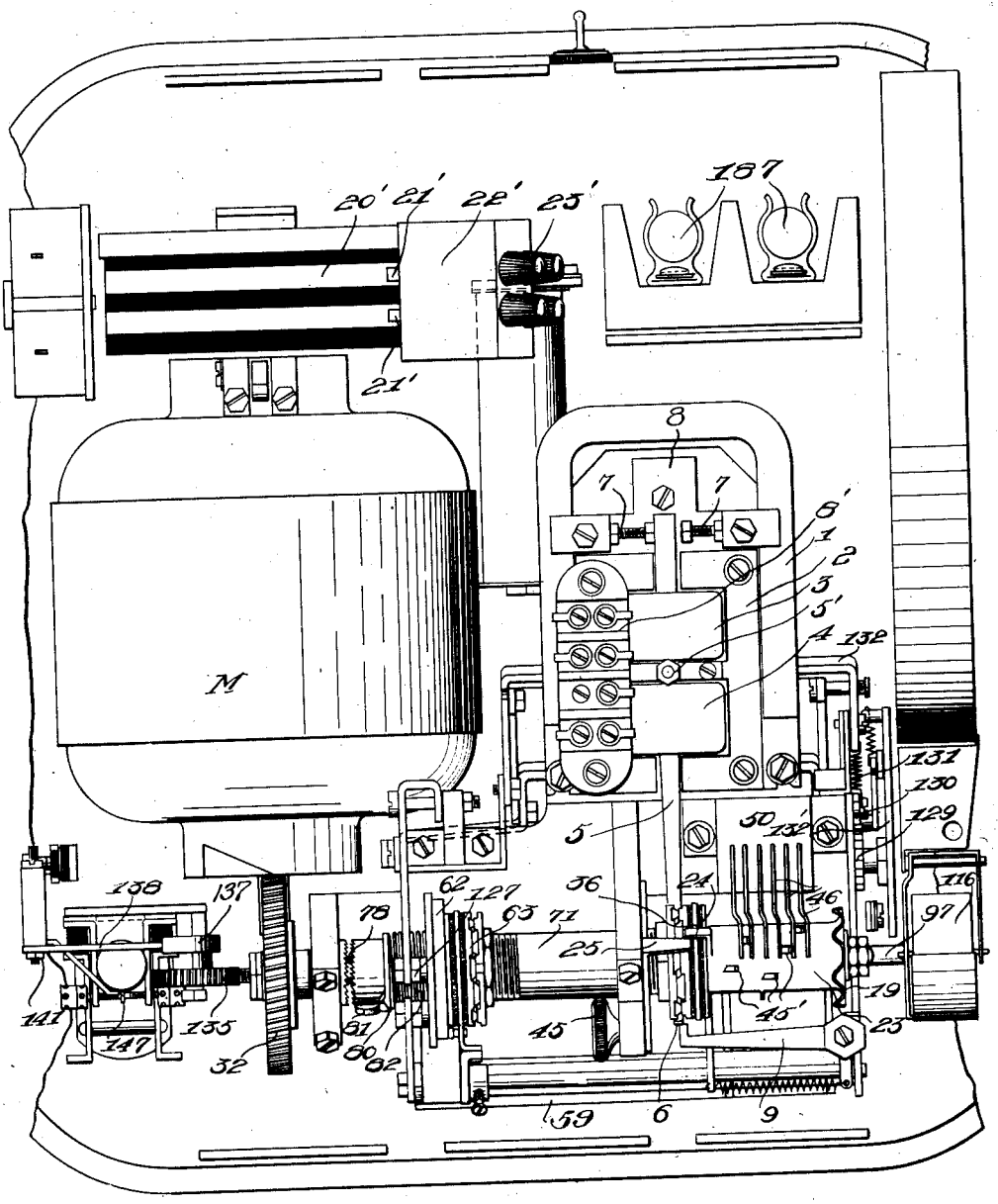


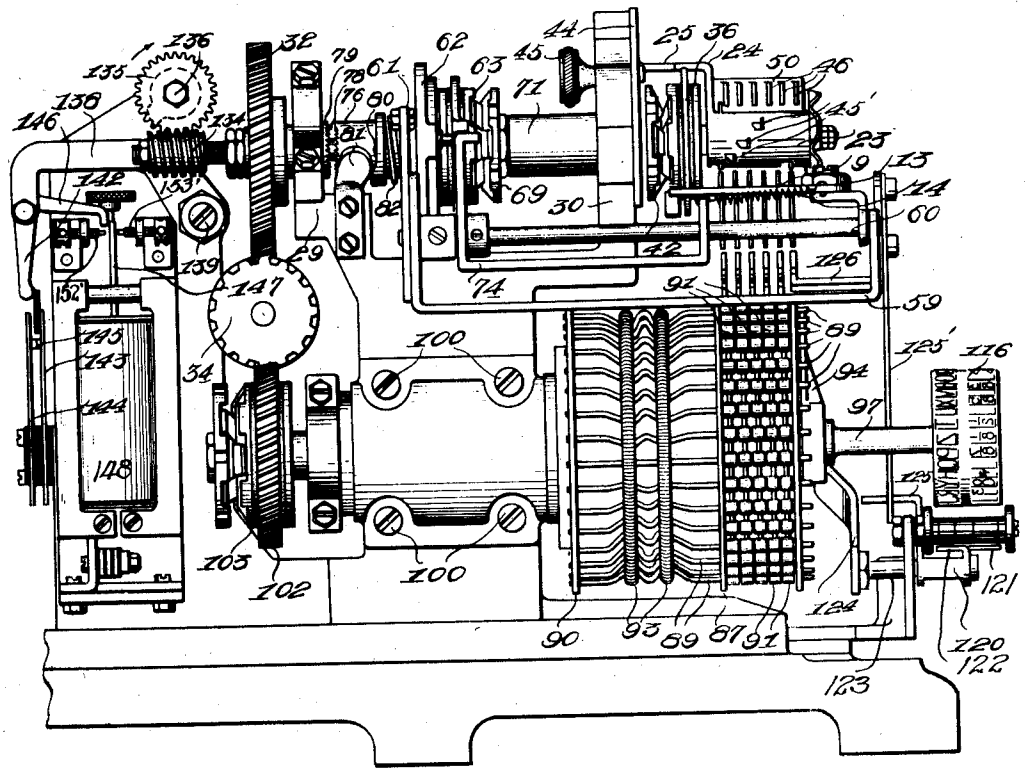
FIG. 1

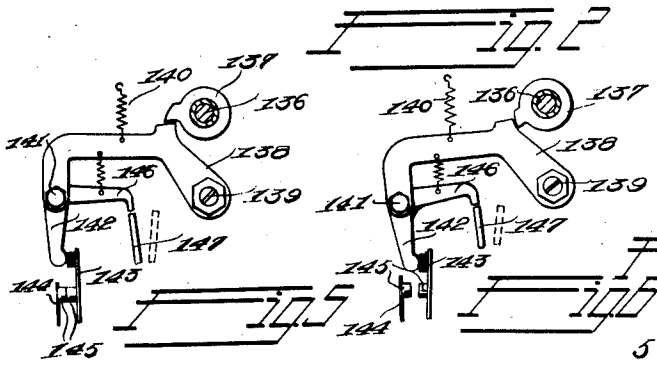
INVENTORS
Sterling Morton
Howard L. Krum
BY Edward E. Kleinschmidt
Strauch & Hoffman
ATTORNEYS

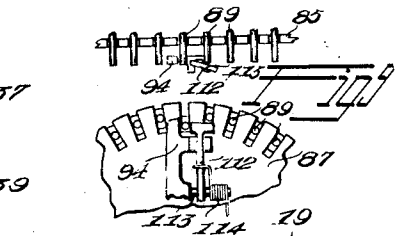
Sept. 1, 1931. S. MORTON ET AL 1,821,110

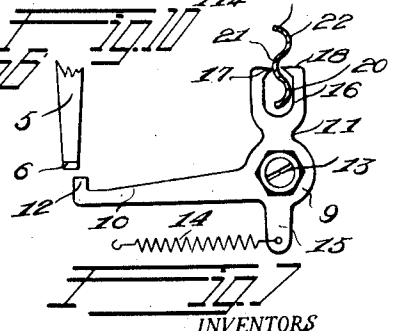
SELECTING AND PRINTING MECHANISM

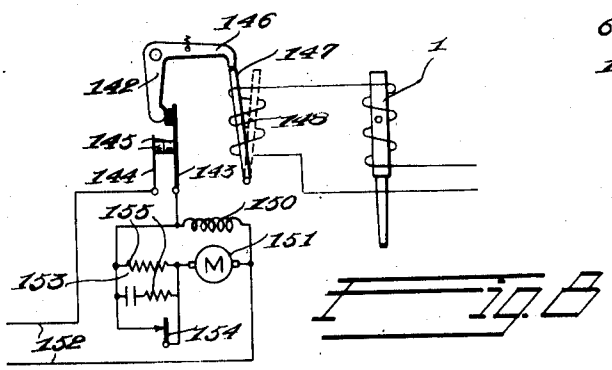
Filed March 20, 1929 6 Sheets-Sheet 2











INVENTORS
Sterling Morton
Howard L. Krum
BY Edward F. Kleinschmidt
Strauch & Hoffman
ATTORNEYS

Sept. 1, 1931. S. MORTON ET AL 1,821,110

SELECTING AND PRINTING MECHANISM

Filed March 20, 1929 6 Sheets-Sheet 3

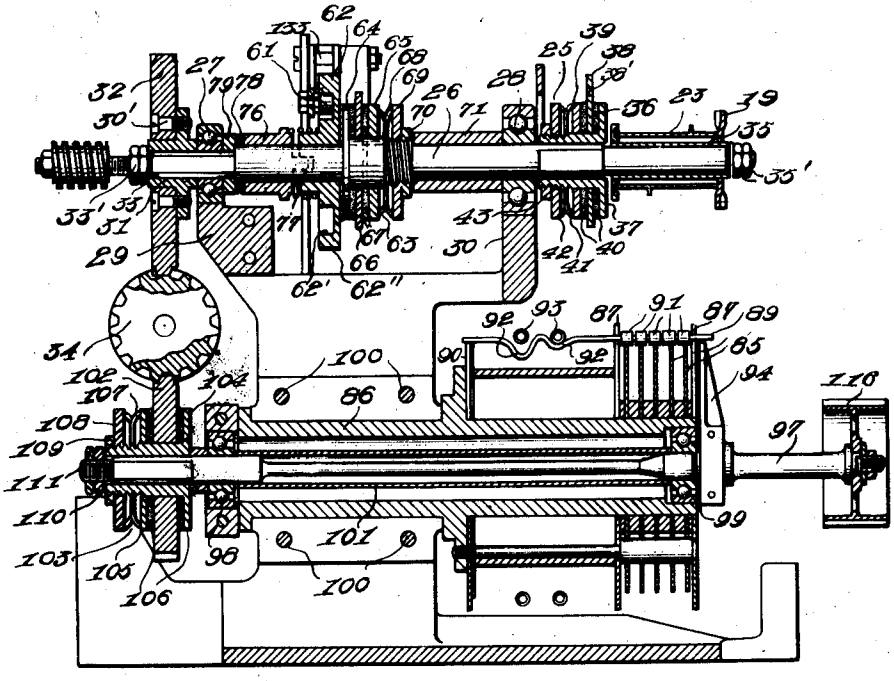


FIG. 4

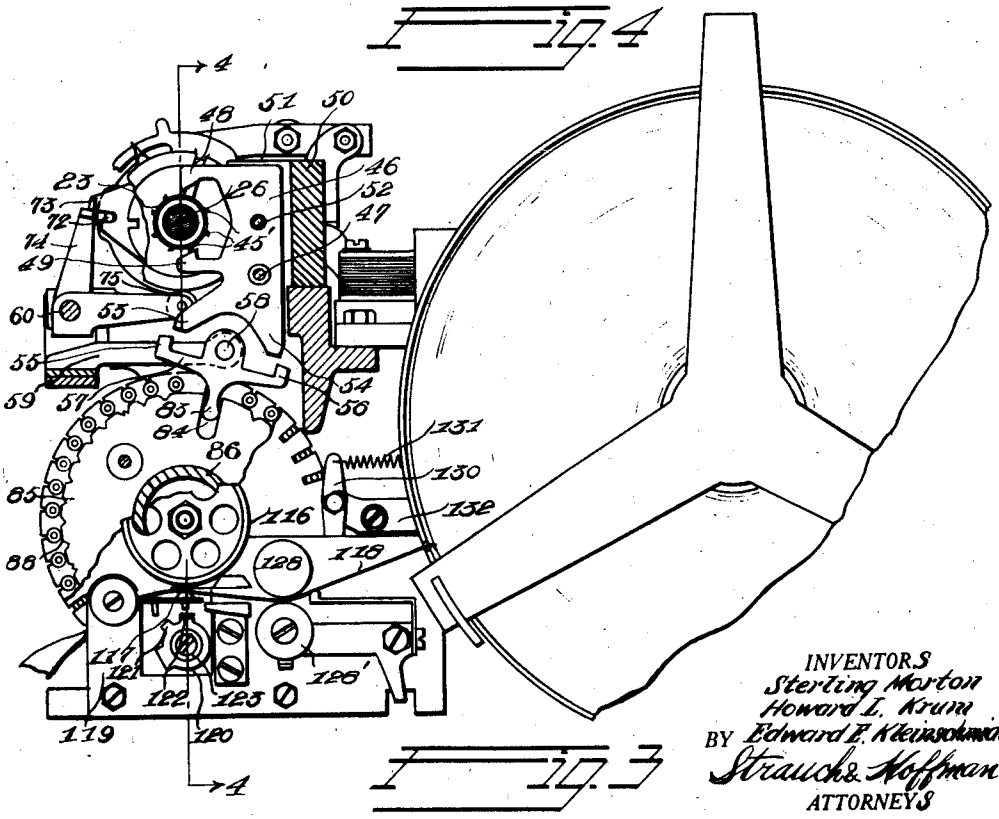


FIG. 3

INVENTORS
Sterling Morton
Howard L. Krum
BY Edward F. Kleinschmidt
Strauch & Hoffman
ATTORNEYS

Sept. 1, 1931. S. MORTON ET AL 1,821,110

SELECTING AND PRINTING MECHANISM

Filed March 20, 1929 6 Sheets-Sheet 4

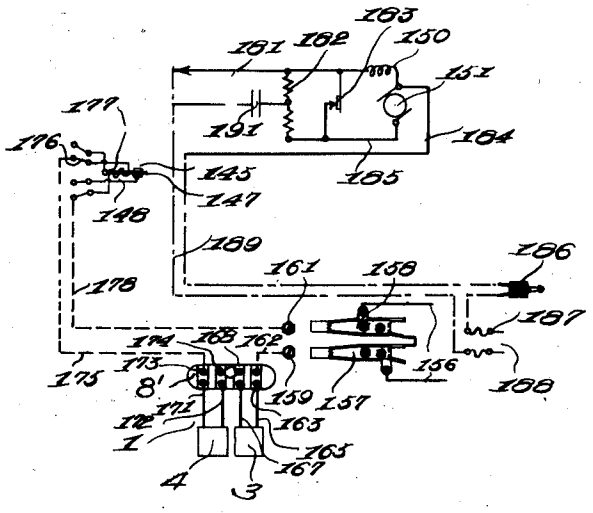


Fig. 11

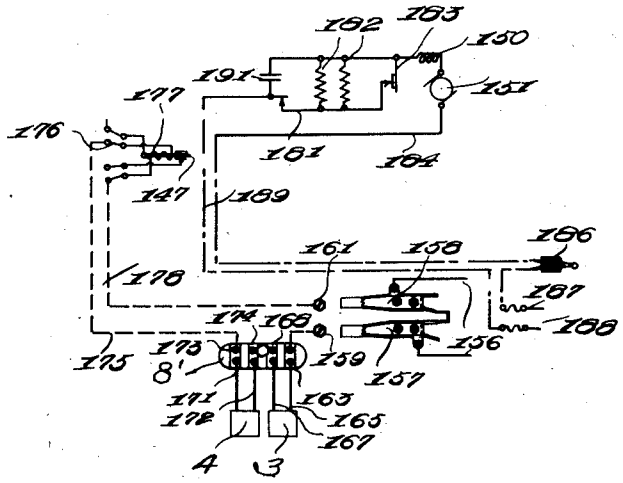


Fig. 12

Inventors
Sterling Morton
Howard L. Krum
Edward E. Kleinschmidt

By Straub & Hoffman
Attorneys

Sept. 1, 1931. S. MORTON ET AL 1,821,110

SELECTING AND PRINTING MECHANISM

Filed March 20, 1929 6 Sheets-Sheet 5

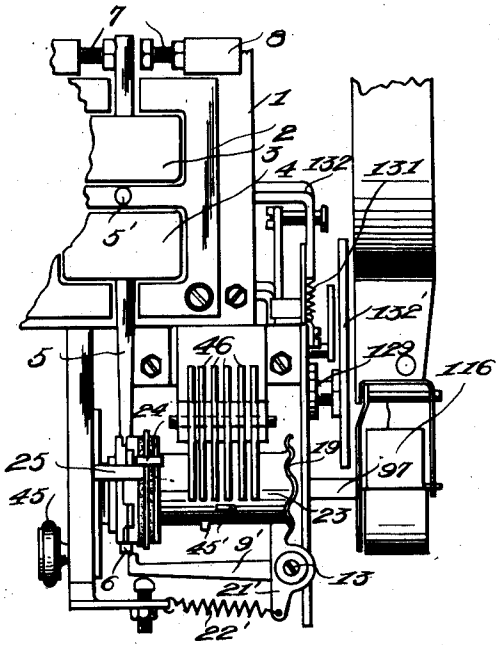


Fig. 16

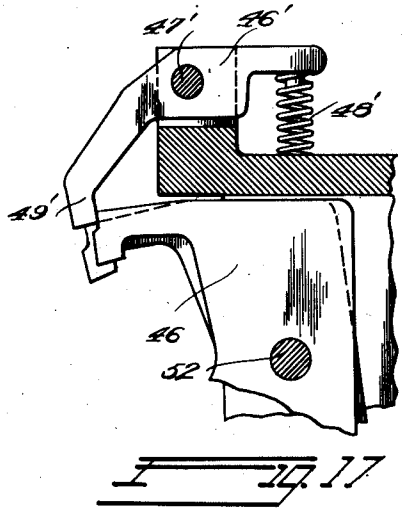


Fig. 17

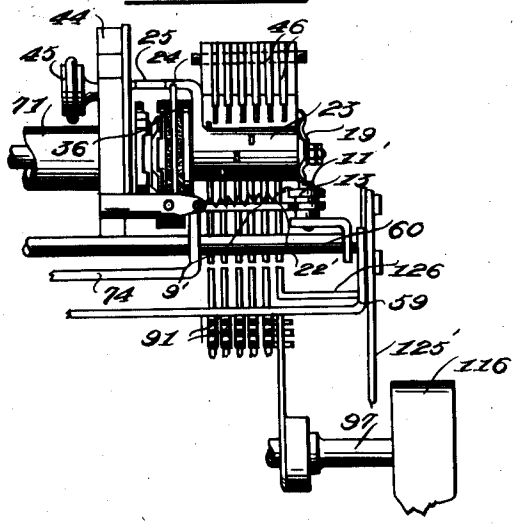


Fig. 15

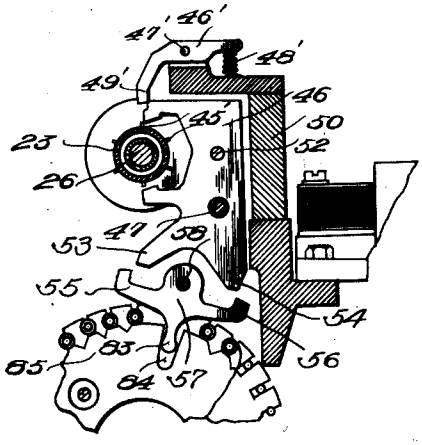


Fig. 18

Inventors
Sterling Morton
Howard L. Krum
Edward E. Kleinschmidt
By Strauch & Hoffman
Attorneys

Sept. 1, 1931. S. MORTON ET AL 1,821,110

SELECTING AND PRINTING MECHANISM

Filed March 20, 1929 6 Sheets-Sheet 6

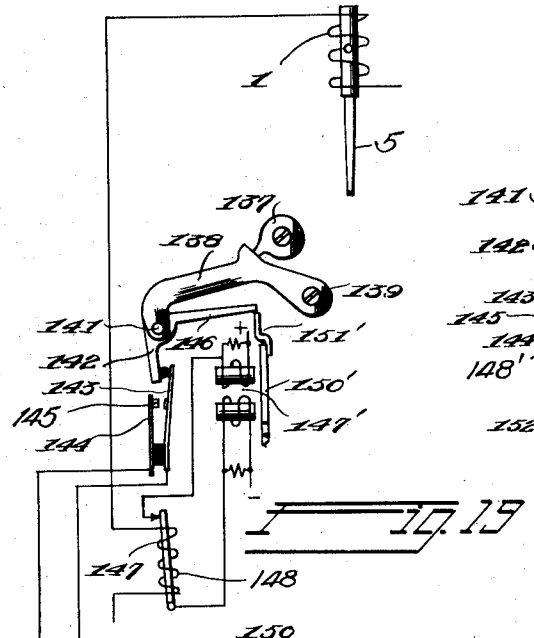


FIG. 19

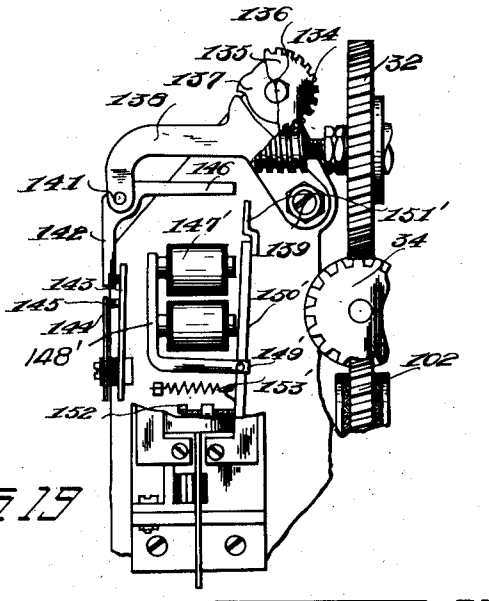
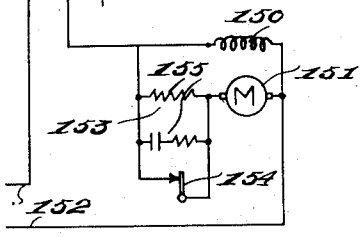


FIG. 21



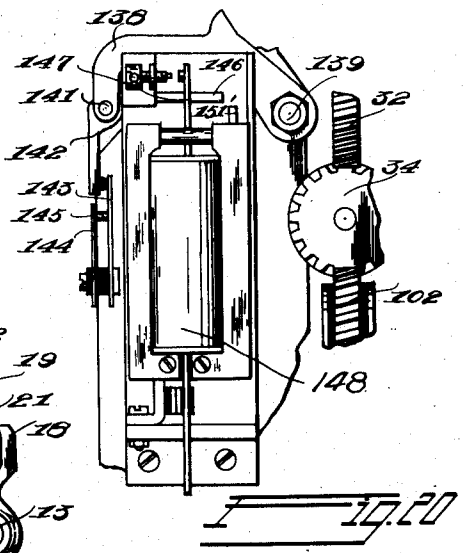


FIG. 20

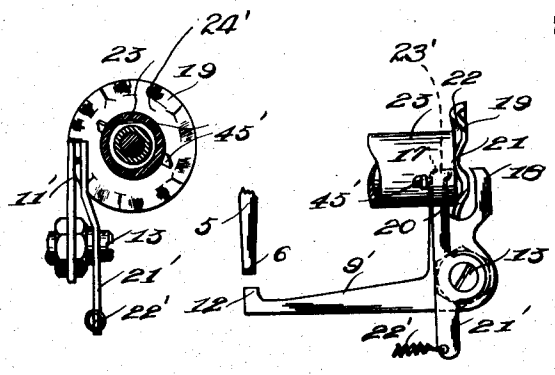


FIG. 14

FIG. 13

Inventors
Sterling Morton
Howard I. Krum
Edward E. Kleinschmidt

By Strauch & Hoffman
Attorneys

Patented Sept. 1, 1931

1,821,110

UNITED STATES PATENT OFFICE

STERLING MORTON, OF CHICAGO, HOWARD L. KRUM, OF KENILWORTH, AND EDWARD E. KLEINSCHMIDT, OF PARK RIDGE, ILLINOIS, ASSIGNORS TO TELETYPE CORPORATION, OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE

SELECTING AND PRINTING MECHANISM

Application filed March 20, 1929. Serial No. 348,612.

Our present invention relates to selecting and printing mechanisms and is especially suitable for printing telegraphs, but is also equally applicable to various other types of selective devices.

The recent increase in the volume of stock transactions in a fixed period of time has made it necessary to use stock tickers having a much higher speed of operation than that of the present tickers, so that the lag between a sale and its appearance on the tape may be a minimum. To produce a stock ticker that will operate at the desired high speed and one that will be commercially feasible, we have discovered that it is necessary that all of its parts which operate at high speed shall have the minimum inertia consistent with durability and reliability. In the present invention, by following such requirements, and using other means described in the specifications, a ticker has been produced in which the noise is reduced to a minimum—a highly desirable characteristic of a stock ticker.

In accordance with our invention, the magnet which operates in response to the received impulses to variably control the selective mechanism is preferably of the polarized type so that it may be operated directly from the line signals without a relay and so that the signals used may be of alternating polarity rather than of current and no current intervals. Such signals give the maximum accuracy of reception.

In our invention, the magnet armature which controls the selecting mechanism mechanically is light, yet rigid, and is long so that its tip will have a large motion to eliminate narrow margins and requirements for great accuracy of construction. The method of selection is such that the armature has an extremely small amount of work to perform and acts with respect to the selective mechanism merely to control the selection, the actual power for moving the elements of the selective mechanism being furnished by a local power drive.

Provision is also made for utilizing substantially a full signal interval for positioning the character to be recorded, and recording it. Accordingly, the positioning and printing of one character takes place while the next signal is operating the selecting device. Furthermore, the movement of the tape to produce the spaces between letters has been arranged to occupy as long an interval as possible, so that the motion of the tape will be comparatively uniform and better adapt the high speed ticker to methods of projecting a magnified image of the tape on a screen for the use of customers of a brokerage house.

In order that high speed operation may be obtained, an overlap has been provided by using two sets of selectors, the primary set being controlled by the incoming signals and the second set being controlled by the first set, and so arranged that the setting of all the first set is transferred at one time to the second set, whereupon the first set is free to operate in response to a succeeding code, while the second set has almost the entire interval of one signal to operate the character selecting and printing mechanism. We have also made provision to perform this transfer operation with a minimum amount of power and with great rapidity. In addition, we have provided improved printing and tape feed mechanisms adapted to high speed operation with little jar. The power for performing these operations in our preferred form of invention is supplied from a continuously rotating motor and in order to prevent noise and unnecessary strains, a novel clutch mechanism is provided. In order to operate our improved mechanisms at high speed, special provision is made in the design of parts to insure uninterrupted operation and long, useful life with a minimum of maintenance costs as well as to permit the manufacture by quantity production methods at low cost. Accordingly, a primary object of our invention is to provide novel, low cost, efficient and durable selecting mechanisms and printing apparatus especially adapted to high speed operation and suitable for stock tickers and other printing telegraph mechanisms.

Further objects of the invention are such as may be obtained by a utilization of the various combinations, subcombinations, and

principles hereinafter set forth and as are defined by the scope of the appended claims.

As shown by the drawings, Figure 1 is a plan view of a preferred embodiment of the invention in which the front part of the machine is shown at the right of the drawings.

Figure 2 is a left side elevation with parts broken away of the form of invention shown in Figure 1.

Figure 3 is a front elevation thereof with some parts in section.

Figure 4 is a section on line 4—4 of Figure 3.

Figures 5 and 6 are detailed showings of the control for the circuits of the motor provided for supplying power to the printing mechanisms in the preferred embodiment of the invention.

Figure 7 is a detailed showing of the flutter lever and cam in the preferred embodiment of our invention.

Figure 8 is a circuit diagram employed in connection with a preferred embodiment of our invention.

Figures 9 and 10 are respectively top and side detail views illustrating the means on the stop arm on the typewheel shaft, for preventing chattering when the typewheel is stopped.

Figures 11 and 12 are circuit diagrams showing preferred forms of electrical connections.

Figures 13 and 14 are fragmentary side and ends views showing a modified form of flutter lever and flutter cam arrangement.

Figure 15 is a fragmentary side elevational view corresponding to Figure 2 disclosing the modified form of flutter lever in operative relation with the pin barrel and selector mechanism.

Figure 16 is a top plan view of the construction illustrated in Figure 15.

Figures 17 and 18 are fragmentary sectional views showing a modified arrangement of the selectors with latching means for holding the selectors in either operated position.

Figure 19 is a circuit diagram of a modified form of motor control and

Figures 20 and 21 are fragmentary elevational views showing the mechanism employed in Figure 19.

Referring to Figure 1, our preferred mechanism is controlled by a single selector magnet which may be of any well known construction. As shown, the selector magnet is of a sensitive polarized type such as used in stock ticker operation and comprises a permanent U-shaped magnet 1, surrounding the pole pieces 2. Disposed between the pole pieces 2 are the magnet windings 3 and 4 which are energized in accordance with impulses received over a signalling line (not shown) to operate the armature 5. Armature 5 is pivotally supported on the armature bearing 5 in any conventional manner and has a protruding extension 6 formed on one end thereof. The motion of the armature 5 is limited by the adjustable screws 7, carried by the member 8 on the magnet 1 and adapted to separately engage the opposite sides of the inner end of the armature 5. As shown, a terminal block 8′ of the usual construction is supported in any well known manner above the magnet coils 3 and 4 for marking the necessary circuit connections as will be explained more fully hereinafter.

As the magnet 1 energizes and deenergizes in accordance with marking and spacing impulses received over the signalling line, the extension 6 of armature 5 is moved into and out of the path of a flutter lever 9 shown in detail in Figure 7. The flutter lever 9 comprises two arms 10 and 11 arranged substantially at right angles to each other, the outer and of the arm 10 having a stop 12 formed thereon and adapted when the armature 5 is moved to the right to engage the extension 6 thereof. The flutter lever 9 is pivotally mounted on a pin 13 about which it is normally urged in a clockwise direction by spring 14, one end of which is secured to the frame and the other end to an extension 15 on the flutter lever 9. The other arm 11 of the flutter lever 9 terminates in a bifurcated jaw 16 having extensions or cam followers 17 and 18 formed thereon, the purpose of which is to be described hereinafter.

In operative relation with the bifurcated jaw 16 is the flutter cam 19 having a plurality of radially arranged right and left corrugations or apexes such as 20, 21 and 22 formed thereon and disposed at equal distances from the median plane thereof. The apex of each corrugation alternately engages either of the extensions or followers 17 or 18 of the bifurcated jaw 16 as the flutter cam 19 is moved by them in a manner to be described in detail hereinafter.

The flutter cam 19 is secured to and rotatable with a longitudinally slidable cam drum or pin barrel sleeve member 23, driven by a motor M as described hereinafter and having limit stops for its longitudinal movement. The motor M is of the usual construction and as will appear hereinafter may be either of the direct or alternating current type and is provided with rings 20′ carried on the motor shaft over which brushes 21′ held in position in block 22′ by caps 23′ wipe. As the flutter cam member 19 moves past projections 17 and 18, it will cause the flutter lever 9 to undergo either a clockwise or counterclockwise movement about pivot 13. The spring 14 normally urges the flutter lever 9 in a clockwise direction and accordingly holds the flutter cam 19 and the pin barrel sleeve 23 against its right stop position. With the pin barrel member 23 at its extreme right position a left apex 21 of the flutter cam 19, as it moves past and engages projection 17, moves the flutter

lever 9 counterclockwise carrying its stop 12 out of the path of armature 5. This condition is shown in Figure 7. As the inclined portion of the flutter cam; that is, the portion just preceding the right hand apex 22 passes through the jaw 16 of the flutter lever 9, the right hand apex 22 engages projection 18 and rocks the lever 9 in a clockwise direction. If at that instant, the line signal is such that the armature 5 is in its left hand position, the complete motion of the flutter lever 9 will be permitted and the pin barrel 23 will accordingly remain in its normal right hand position. If at such an instant, however, the signal received is such that the armature 5 is in its right hand position, the stop 12 of the flutter lever 9 will engage with the projection 6 on the armature 5. The movement of the flutter lever 9 will accordingly be arrested. Inasmuch as lever 9 cannot move the flutter cam 19 it will be forced to the left as its right apex 22 passes the extension or follower 18. In this manner the pin barrel sleeve 23 will be moved to the right or left in accordance with the received spacing or marking impulses.

As will be clear to those skilled in the art, all of the movements of the pin barrel sleeve 23 is accomplished substantially entirely by power supplied by the motor M driving the pin barrel; that is, not only is the power for rotating the pin barrel 23 supplied from this original source, but due to the shaping of the flutter cam 19, the rotational power is translated into a linear movement for moving the pin barrel sleeve 23 to the right or left, although this movement is controlled by the line magnet. Except therefore for releasing the clutch in response to a start impulse there is a minimum requirement of power from the line magnet, the sole requirement of the line current during the signalling period, being to move the armature 5 which is free from any encumbrance such as in the case of a relay. The receiving line magnet may therefore be of a very delicate structure responsive to very small currents and having a minimum of inertia and may therefore operate at a very high speed. Inasmuch as the local source of power supply may be of any value within practical limits, the pin barrel 23 may rotate and move longitudinally at a very high speed.

It will be noted that normally the pin barrel sleeve 23 is maintained in its extreme right hand position as the follower 17 engages the left hand apex 21 due to the spring 14 which normally rocks the flutter lever 9 in a clockwise direction and which is made of sufficient power to force the pin barrel to its right hand position. It will, of course, be understood that the pin barrel is rotated at a speed which is in synchronism with the speed of code impulsing, each impulse being received just before the right hand corrugation is engaging the follower 18 and tending to rock the flutter lever 9 in a clockwise direction.

With the pin barrel in its extreme right hand position, the apex 21 engaging follower 17 holds the projection 12 of the flutter lever 9 out of the path of the stop 6, leaving the armature free to operate.

As the right hand apex 22 engages the follower 18 and tends to rock the flutter lever 9 in a clockwise direction with the aid of spring 14, the projection 6 of the armature 5 depending on the character of the received impulse, will either be in or out of the path of projection 12.

From the above description, it will be noted that the flutter lever 9 acts as a combined flutter lever and spring lever for the pin barrel 23, inasmuch as the spring 14 provides the energy which, acting through the follower 17, forces the pin barrel 23 to the right in response to a spacing impulse. During the rotation of the pin barrel 23 and in response to a marking impulse which moves armature 5 to the right so that projection 6 is in the path of stop 12, the follower 17 engages and follows the corrugation at the projection 21 by the action of spring 14 until stop 12 engages the projection 6 on the armature 5 whereupon further movement of the flutter lever 9 is arrested. An instant later the outwardly sloping portion of the projection 20 engages the follower 18 and as a result of further rotation of cam 19 the pin barrel 23 is moved to the left.

In order to provide a smooth and even spring tension on the pin barrel selector, the combined flutter lever construction disclosed is replaced by two independent levers one of which functions as a flutter lever to engage the flutter cam and the other of which functions as the spring lever to supply the uniform and smooth spring tension on the pin barrel. This modification is disclosed in Figures 13 to 16 in which similar characters are employed for the same parts as in the preferred modification. As shown, the flutter lever 9′ is pivotally mounted on a pin 13 about which it normally may be rocked as described. The flutter lever 9′ is provided with an arm 11′ which terminates in bifurcated jaw 16 having extension or cam followers 17 and 18 formed thereon, the purpose of which has been described above. In operative relation with the bifurcated jaw 16 is the flutter cam 19 having a plurality of radially arranged right and left corrugations or apexes such as 20, 21 and 22 formed thereon and disposed at equal distances from the median plane thereof. The apex of each corrugation alternately engages either of the extensions or followers 17 or 18 of the bifurcated jaw 16, as the flutter cam 19 is moved past them in a manner described.

A second lever 21′ is pivotally mounted on

the pin 13 and normally moves in a clockwise direction thereabout by a spring 22′, one end of which is secured to the lever 21′ and the other end to the frame work in any suitable manner. Lever 21′ is provided with a tooth or follower 23′ which rides over the smooth surface 24′ of the cam 19 adjacent to the cam barrel 23 under action of the spring 22′.

As described in connection with the first modification, the flutter cam 19 carried by the pin barrel 23 is rotated thereby, and barrel 23 is rotated by motor M. Normally the spring 22′ will move the lever 21′ clockwise about the pivot pin 13. The projection 23′ on the lever 21′ engages the apex 21 as the flutter cam 19 rotates and forces the pin barrel 23 to its right hand position. As the flutter cam 19 continues to rotate the follower 23′ follows the corrugations on the flutter cam 19 rocking the lever 21′ alternately counterclockwise and then clockwise. Simultaneously as the followers 18 and 17 successively engage the projections on the flutter cam 19, the flutter lever 9′ is rocked first clockwise and then counterclockwise about the pin 13. This will be the condition of operation during the spacing impulse intervals when the armature 5 is in its left hand position and without the path of the stop 12.

In response, however to a marking impulse, the armature 5 as described above moves to the right and into the path of the stop 12. At this instant, the follower 18 engages the projection 22 on the flutter cam 19. Due to the obstruction in the path of stop 12, the lever 9 cannot rock and accordingly the flutter cam 19 and pin barrel 23 must move to the left as the cam 19 rotates. Simultaneously the follower 23′ of the lever 21′ is following the corrugations of the flutter cam 19 by action of its spring 22′. As the flutter lever 19 moves to the left, it rocks the lever 9′ counterclockwise about its pivot 13. If during the next impulse interval a spacing impulse is received, the armature 5 is moved to the left releasing the stop 12 and the spring 22′ will thereupon rock the lever 21′ clockwise about its pivot 13 and through the surface on barrel 23 will move the flutter cam 19 to the right as described above. It will be clear from the above description that the follower 23′ will keep the spring pressure from wearing one side of the flutter cam and maintain even pressure by eliminating the bumping action of a spring lever.

In order to insure synchronous operation, the pin barrel sleeve 23 is rotated on the start-stop principle, the start and stop impulses controlling the rotation of the selector cam drum or pin barrel 23 in unison with the remote transmitting distributor (not shown) which is transmitting the code combinations of impulses to which the printer is responsive. By this unison of operation, the character signals sent out by the transmitter may be properly received by the selecting mechanism and translated into letters and characters as will be described.

The transmission of the start impulse, in the present case, being a spacing impulse, the pin barrel selector is normally held against rotation. To this end there is connected with the selector cam drum 23, a selector cam stop arm 24, Figure 4, arranged to engage a stop lug 25 which may be carried on the frame of the apparatus in any well known manner but is preferably carried by an orientation adjustment as will be described hereinafter. The engagement of the stop arm 24 with the stop lug 25 occurs only when the selector cam drum or pin barrel is in its left hand position. This condition is obtained when the pin barrel sleeve 23 having rotated to a position at which stop arm 24 engages lug 25 a marking impulse is received. In response to a marking impulse at this instant, the armature 5 is moved to its right hand position and as the flutter lever 9 is rocked clockwise by the right hand apex 22 engaging the follower 18, the armature 5 and flutter lever 9 engage as described above and the flutter cam 19 is moved to the left, moving the selector cam drum or pin barrel 23 in a similar direction until the stop arm 24 engages stop lug 25. Engagement of these two prevents rotation of sleeve 23 as will be described. This is the normal stop condition. A received spacing impulse will rock the armature 5 to the left releasing thereby the flutter lever 9. Spring 14 now moves the flutter lever 9 and through flutter cam 19 shifts the selector cam drum or pin barrel 23 to the right withdrawing stop arm 24 from engagement with a stop lug 25.

The selector cam drum or pin barrel 23 is now rotated by motor M as will now be described. As shown in Figure 4, the sleeve 23 is loosely mounted on a main shaft 26 rotatively mounted in anti-friction bearings 27 and 28 supported on the spaced upwardly extending brackets 29 and 30 of the frame of the ticker, the rear end portion of the shaft 26 of reduced diameter having keyed thereto in any desired manner, a flanged bushing 31.

Secured to the flange of bushing 31 by screws 30′ is a worm gear 32 in meshing engagement with a worm 34 mounted on the shaft of the motor M. A nut 33 and lock nut 33′ on the shaft 26 retains the bushing 31 and gear 32 in position.

The forwardly extending end of the shaft 26 which is also of reduced diameter carries a sleeve 35 retained in position by the nuts 35′ and on which the selector cam drum or pin barrel 23, flutter cam 19 and selector cam stop 24 are adapted to slide.

Mounted on the shaft 26 between bracket

30 and the selector cam drum 23 is a friction clutch 36 comprising a flanged sleeve member 37 keyed to the shaft 26 in any conventional manner, the flanged portion of sleeve member 37 being adjacent the selector cam drum 23, and rotatably mounted on the sleeve 37 is a drive disc 38, and a plate 39 between which a friction member 40 as for example a felt disc is placed, a similar friction member 40 being positioned between the drive disc 38 and the flanged portion of the sleeve member 37. The plate 39 is engaged by the slit annular spring 41 which presses against the disc 42 in threaded engagement with the end of the sleeve member 37 and held in position by means of the nut 43, the tension of the spring 41 being regulated by the disc 42 and locknut 43.

As will now be clear, the friction mechanism may be removed as a unit without altering the adjustments. The drive disc 38 which is driven by the motor M, through shaft 26 and flanged sleeve 37 at all times is in operative relation with the selector cam drum 23 through the medium of the selector cam stop arm 24. When the selector cam drum 23 is in its left stop position as described above, the selector cam stop arm 24 engages the stop lug 25 and as a result the drive disc 38 will slip with respect to the rotating sleeve member 37 and the selector cam drum is stationary. The stop arm 24 has a horizontal portion which passes through a slot 38′ in selector friction disc 38 so that when this disc rotates, the drum 23 rotates with it.

In response to a start impulse, sleeve 23 is moved to the right, as described above and the selector cam stop arm 24 is moved out of engagement with the stop lug 25. The selector cam drum 23 is thereupon rotatively driven through sleeve 37. In this manner the transmission of a starting or spacing impulse starts the selector drum revolving.

The speed of rotation of the selector cam drum 23 is such that when the transmitting distributor has revolved a sufficient distance to transmit the first impulse the selector cam drum is revolved to the proper position to receive it. When the transmitter has revolved to the position to send out the second impulse, the selector cam drum will also have rotated to a similar position and so on. At the end of the revolution, after the sixth impulse has been received, as will be described, the reception of the stop impulse which is a marking impulse in this case, rocks the armature 5 to the right, bringing it in the path of the flutter lever 9. The two will thereupon engage as described above and move the drum to the left or stop position. At this period in the revolution, the drum has made a complete revolution and stop arm 24 is in operative relation with stop lug 25 and when the drum is moved to the left, the two engage bringing the drum to a stop.

In the present case, the selector cam drum 23 is geared to rotate one twelfth faster than the transmitter, but it is so constructed that the distance from the position where it can receive one impulse and where it can receive the next impulse is one twelfth greater than the distance where the transmitting distributor can send one itself and the next. This difference in speed between the selector cam drum 23 and the transmitting distributor is provided in order to insure that the selector drum will return to its normal stop position before the transmitting distributor. As will be noted from the above description, the transmitting distributor transmits the start impulse which controls the starting of rotation of the selector cam drum. Accordingly if the selector cam drum should reach its normal position, after the transmission of the start impulse and after the transmitting distributor has started rotating, the drum would come to a stop as it would not at that instant receive the start impulse. Thus, it is essential that the selector cam drum reach its normal position before the transmitting distributor in order that it may be in condition to receive an impulse.

The only alternative would be to maintain the two units at exactly the same speed which in practice has been found to be impossible as in a short time even a slight difference would cause the transmitting distributor and receiving mechanism to fall out of step so that when the transmitting distributor was sending out the first impulse of a character signal, the selector cam drum might be in a position to receive the second impulse. By rotating the selector cam drum slightly faster than the transmitting distributor, the former completes its revolutions somewhat sooner than the transmitting distributor. In order to correct for this difference in speed, the selecting positions of the cam drum are spread further apart than are the transmitting positions of the distributor. Thus if the transmitting distributor travels 45 degrees from the first to the second transmitting position, the selector cam drum is arranged to travel 48¾ degrees in traveling from the first to the second selecting position. Inasmuch however as the selector cam drum travels one twelfth faster it will reach its second selecting position at the same time that the transmitting distributor will reach its second position.

When the selector cam drum has completed a revolution it comes to a stop until the transmitting distributor again sends out a start impulse. Although the speed of the selector cam drum is slightly faster than the proper speed, the only effect will be that it will remain at rest slightly longer. Although there will be a slight error in each selecting position the mechanism is so constructed as to provide for this and due to the fact that the

selector cam drum starts its revolution in unison with the transmitting distributor this error never becomes very large.

From the above description, it will be clear that the relative position of the cam drum 23 with respect to the received signals is very important inasmuch as the drum must be at a position such that the stop arm 24 engages stop lug 25 before the start signal is received and must be in proper position to receive the message code impulses. This is in part taken care of by adjusting the speed of rotation. It is however also important to start the rotation at a predetermined position of the cam drum 23.

To this end, an orientation plate 44 having a code is mounted on bracket 30 carrying the stop lug 25 directly behind the selector cam friction clutch 36. Carried on the plate 44 is a thumb nut 45; the turning of which moves the orientation plate and with it the stop lug 25. To take an orientation range a test sentence such as "The quick brown fox., etc." is transmitted to the printer continually while the range is being taken. While this sentence is being received the orientation scale is shifted by the thumb nut toward zero until errors begin to appear in the test sentence. Then it is moved back slowly until these errors disappear. This position indicates one limit of the orientation range. The same performance is repeated toward the opposite end of the scale and the other limit is found. After the two limits or extreme positions of perfect printing have been found the orientation scale is set midway between these two points.

The selector cam drum 23 comprises a hollow cylinder with twelve selector cams 45′ projecting from its outer surface. Six of these cams are marking cams and six are spacing cams.

Associated with each pair of selector cams 45′; that is, a pair comprising a spacing and a marking selector cam, is one of six selector levers 46, Figure 3, pivotally mounted on a shaft 52 suitably carried by the stock ticker frame, and on the same horizontal center line as shaft 26. Each of said levers 46 comprises arms 48 and 49 located respectively above and below the selector cam drum 23. The ends of the arms 48 and 49 are offset with respect to each other, the lower or marking arm 49 being offset toward the back and upper or spacing arm 48 being offset toward the front of the printer. This is done so that when the marking cam individual to this particular selector lever lines up with the arm 49, the spacing cam individual thereto will pass to the rear of the spacing arm 48 and when the spacing cam is in line with the spacing arm 48, the marking cam will pass to the front of the marking arm.

Accordingly, in response to a marking impulse, the selector cam drum 23 is moved to the left as described above, the extension 49 of the selector lever 46 will be engaged by the associated cam 45′, and the spacing cam will pass by the extension 48. As a result of the engagement of the cam 45′ with the extension 49, the selector 46 is rocked about its pivot 52 in a counterclockwise direction. On the other hand, in response to a spacing impulse the selector cam drum 23 will be moved to the right hand position, as described above and the cam individual to the selector 46 will engage the arm extension 48 rocking the selector lever 46 in a clockwise direction about the pivot 52. In this manner the selector levers 46 are set in one or the other of its positions in accordance with the received code. As will be described more fully hereinafter, the first five selector levers are operated in accordance with code combinations of impulses to make a selection and the sixth selector lever operates in response to a sixth or shift pulse to select letters or numerals.

These selector levers are carried in a selector lever unit or guide 50 located to the right of the selector cam drum 23 which functions to hold the selector levers 46 in position so that they can be moved to either the spacing up position or marking down position by the selector cams 45′ as described above. The selector levers are mounted in slots 51 in the guide 50, Figures 1 and 3, a spring 52′ being inserted in the slot with each selector lever 46 against the side of the slot to assure that it will remain well placed by the action of the corresponding cam 45′. These selector levers, it will be noted, have no normal position but remain set in either operated position until the impulse in a succeeding code is such as to shift it to the opposite position. Inasmuch as they have no normal position, very little power is necessary to operate them and the number of operations is reduced as they do not operate until a change in the code signal is received.

As explained in the above, the selector levers 46 have no normal position and are arranged to be maintained in either operated position until a corresponding code impulse moves them to their alternate position. In order to insure against accidental movement of the selector levers to an alternate position, a latching means is provided as shown in the modified forms in Figures 17 and 18. As shown in these figures, a jocky 46′, pivotally mounted on the pin 47′ is normally urged about the pivot 47′ by a compression spring 48′. A projection 49′ on the jockey 46′ engages the edge of the selector lever in one position and the top of the lever in the opposite position. A jockey such as jockey 46′ is provided for each of the selector levers and is individual thereto. With the forward selector lever 46 in the position shown in Figure 17, the extension 49′ on the jockey 46′ engages the edge of the selector lever 46 and

maintains the selector lever in this position. In the event however that the selector lever is operated to its alternate position as shown by the selector lever just behind the first selector lever shown, the selector lever as it moves will rock the jockey 46′ about its pivot 47′ in a clockwise direction compressing the spring 48′ until projection 49′ moves over the edge of the selector lever 46 whereupon jockey 46′ will be rocked counterclockwise by action of its spring 48′ to press against the top of selector lever 46 and maintain it in its new position. Similarly when the selector lever 46 is rocked to its present position, it will raise the jockey 46 compressing the spring 48′ until its edge passes over the right edge of the projection 49′ to the side as shown and whereupon the compression spring 48′ again rocks the jockey 46′ in a counterclockwise direction and the projection 49′ will engage the side of the projection of the selector lever 46. In this manner the selector levers are each held in their operated position immediately after their operation.

Referring again to the first modification, each of the selector levers 46 is provided with a pair of downwardly extending diverging arms 53 and 54 adapted to operatively engage the projections 55 and 56 respectively of a transfer T-lever 57 associated with each selector lever 46. Each transfer lever 57 is in alignment with the selector lever 46 above it and is pivotally mounted on a pivot shaft 58 carried by a transfer bail 59, Figure 2, mounted on the transfer bail shaft 60, suitably attached to the printer frame. The transfer bail 59 is provided at its end with a roller or cam follower 61 and is in operative relation with a main or operating cam 62.

The main or operating cam 62 is located to the rear of the selector cam drum 23 and is mounted on the main shaft 26 for rotatable movement with respect thereto and between the brackets 29 and 30 of the printer frame and comprises internal and external cam surfaces 62′ and 62″, the transfer bail roller or follower 61 being controlled by the internal cam surface 62′. The operating cam 62 is driven by a friction clutch 63 positioned on the main shaft 26 and to the right of said operating cam, the friction clutch being substantially identical with the friction clutch 36 described in detail above and comprising friction plates 64 and 65, a drive disc 66, felt friction discs 67, an annular spring 68, spring plate 69 and nut 70, the whole being assembled in the same manner as described above for the friction clutch 36, the friction plate or sleeve 64 being keyed to the main shaft 26 in any desired manner. In order to retain the clutch 63 in position, a spacing sleeve 71 is provided on the main shaft 26 between the friction clutch 63 and anti-friction bearing 28. The operating cam 62 is driven by the friction clutch 63 by means of a suitable pin connection 72, Figure 3, positioned between the operating cam 62 and drive disc 66. During predetermined cycles in the operation, the drive disc 66 is held against rotation and cam 62 is therefore stationary. To this end the drive disc 66 has formed on its periphery adjacent the pin connection 72, a stop lug 73 adapted to be engaged by a trip bail 74 at a certain interval in the cycle of operation of the printer. The trip bail 74 pivotally mounted on transfer bail shaft 60 is provided with a follower 75, Figure 3, adapted to move on a cam portion provided on the drive disk 38. When the clutch 36 has been released and rotated over a predetermined distance, the follower 75 riding over cammed portion of drive disk 38 rocks the bail 74 moving the trip bail out of engagement with stop lug 73.

With the trip bail 74 engaging the stop lug 73, the drive disc 66 will be prevented from turning and will slip relative to rotational movement of the clutch and accordingly the operating cam 62 will not be rotated. When the trip bail 74 disengages the stop lug 73, the clutch will be released to rotate the operating cam 62.

Slidably mounted on the main shaft 26 and to the left of the operating cam 62 is a sleeve member 76 operatively connected to the hub of the operating cam 62 by means of interengaging tooth members 77 shown in dotted lines in Figure 4. The sleeve member 76 comprises the sliding element of a toothed or grab clutch 78, the fixed portion 79 of which is keyed to the main shaft 26, directly to the right of the anti-friction bearing 27, Figure 4. Formed on the extreme right edge of the sleeve member 76 is a flange having a side cam surface 80, Figure 2, adapted to engage a fixed cam follower 81, the member 76 being normally held to the right out of engagement with the fixed member 79 against the tension of a coiled spring 82 positioned between the member 76 and the operating cam 62. The initial movement of the operating cam 62 and sleeve member 76 as described above rotate cam 80 until the cam follower 81 rides over the shoulder of the cam and the sleeve member 76 is moved to the left by action of spring 82 engaging the fixed member 79 on the main shaft 26. In this manner the main or operating cam 62 is started slowly at first from power through the friction clutch 63 and after a short initial movement is directly and positively coupled to the drive shaft through the grab clutch. In this manner the advantages of a positive grab clutch connection for transferring power is obtained while at the same time the shock or jar due to sudden starting by engagement of the teeth of such a clutch is obviated through the use of the friction clutch 63. In operation the friction

clutch 63 when released as described above, starts the rotation of cams 62 and 80. After cam 80 has rotated a few degrees, the grab clutch 78 engages and carries the cams 62 and 80 nearly to the end of the revolution, when follower 81 rides over the shoulder of cam 80 forcing the sleeve 76 to the right against the action of spring 82 and the clutch member 78 becomes engaged. The friction clutch 63 continues to drive the main or operating cam for the small remainder of the revolution until it is stopped by the stop lug 73 on the drive disc 66 of the clutch 63 striking against the cam release trip bail arm 74.

As the main cam 62 rotates, the transfer bail roller 61 rides over the cammed portion and moves the bail 59 and transfer levers carried thereon forward toward selector levers 46 and as roller 61 reaches the peak of the cam, the transfer levers 57 are forced against their individual selector levers 46. As the transfer levers 57 engage selector levers 26, they will be rocked about their pivots 58 in either a clockwise or counterclockwise direction depending on the setting of the selector levers. If selector lever 46, for example, has been rocked counterclockwise in response to a marking setting of selector cam 45′, the arm 54 will engage the extension 56 rocking the transfer lever 57 clockwise as the transfer lever is moved toward the selector levers 46.

Each of the transfer levers 57 is provided with a head 83, Figure 3, projecting into a slot 84 of an individual notched selector disc 85, one such disc being provided for each of the transfer levers 57. Selector discs 85 are freely supported for relative rotation on a sleeve 86, Figure 4, supported in the frame work and are disposed between guiding comb plates 87. The selector disks 85 are provided with V-shaped notches cut along their circumferential edges 88 in a manner well known in the art. As will appear from the following, each disc has two positions. For each combination of setting of these discs, corresponding V-shaped notches on each disc will be in alignment with each other. At right angles to and equally placed around the circumference of the selector discs 85 and guided in slots in the guide plates 87 and a supporting member 90, are a series of stop members 89 provided with cam rollers 91. Each of the stop members 89 is pivotally or otherwise carried on the periphery of the supporting member 90 and is formed with two bowed or depressed portions 92 between the suporting member 90 and the guide plates 87, the depressed portions 92 being adapted to receive circular coiled radially contractible springs 93, by the action of which stop members 89 are urged into engagement with the V-shaped notches on discs 85. It will be understood however that the members themselves may be constructed of spring wire material for this purpose if so desired. As stated above, for each setting of selector discs 85, one of the stop members 89 will have five of the notches under it in the five discs in alignment and will accordingly be forced by springs 93 into the notches, it being understood by those skilled in the art that only one such alignment of the notches can exist at a time.

With the five discs there are thirty-two possible combinations and accordingly any one of the thirty-two stop pins can be selected and the typewheel stopped in any one of thirty-two positions. Only thirty-one of these positions are utilized for characters, the thirty-second position which corresponds to the all marking combinations, having no characters. The stop pin for this position not only stops the type wheel but prevents the tape feed from operating. The typewheel is blank in this position. By the use of a shift mechanism, it is possible to print sixty characters although in the present proposed printer some of these positions are not utilized.

As each of the transfer selector levers 57 is rocked about its pivot 58 as described above, it will in turn move the head 83 moving the associated selector disc 85 to either of its two operative positions. If the transfer lever 57 is rocked clockwise, it will rotate its associated disc 85 counterclockwise. If lever 57 is rocked counter clockwise, it will rotate disc 85 clockwise. As the discs assume new positions, a new alignment of the notches will occur permitting one of the stop pins to drop therein as described above.

It will be noted from the description thus far given that although the selector cam drum 23 is operated successively, the code impulses are received and in turn successively position the selector levers 46, the transfer operation for setting the selector disks 85 takes place in a single operation as a result of the movement of the transfer levers 57 by the transfer bail lever arm 59 operating on the main cam 62. As soon as this transfer has taken place, the selector levers 46 are free for re-operation in accordance with the new permutation while the selector discs 85 selectively control the operation of the printing mechanism as will now be described.

It will also be noted that the selector levers 46 and selector disks 85 have no normal position but are rocked to their marking or spacing position in accordance with each received code so that in the event the selector levers are already in the position to which the code impulse is to operate them, no operation is necessary, eliminating the number of selector operations necessary. Due to the pivoted arrangements of these members and the absence of means tending to return them to a normal position, it will also be clear that lit-

tle power is necessary for performing the operations thereof to their marking or spacing positions.

Attention is also called to the fact that although there are six selector levers 46 there are only five code selecting discs 85. The sixth selector lever 46 controls a shift mechanism, as will be hereinafter described, which determines whether a letter or figure shall be printed.

Rotating in operative relation with the stop pins 89 is an index arm or type wheel stop arm 94, Figures 2 and 4, the details of which are shown in Figures 9 and 10. The stop arm 94 is secured through the sleeve member 96 to a shaft 97 for rotation therewith. The shaft 97 is mounted in anti-friction bearings 98 and 99 carried in the ends of the sleeve member 86 which is rigidly secured to the printer frame in any suitable manner as for example by means of the bolts 100. A spacer sleeve 101 encircles the intermediate portion of the shaft 97 and abuts the inner raceways of the anti-friction bearing members 98 and 99. The shaft 97 is driven by means of a worm wheel or gear 102 operatively connected to the motor worm 34. Power is transferred from the motor and gear 102 to the shaft 97 through the drive disc of a friction clutch 103 mounted on the inner end of the shaft 97. The friction clutch 103 is substantially identical in structure with the friction clutches 36 and 63 described above and comprises a sleeve and friction plate member 104 keyed in any desired manner to the end of the shaft 97. Slidably mounted on the member 104 is a friction plate member 105, the worm wheel or gear 102 having friction faces on its sides adapted to engage friction discs 106 positioned on the sleeve member 104 on each side of the worm wheel 102. The friction plate 105 is spring pressed by a split annular spring 107 which also engages a disc 108. A nut 109 in threaded engagement with the sleeve member 104 retains the friction clutch 103 in operative relation. Disc 108 in threaded engagement with the end of the sleeve member and locknut 109 serve to regulate the tension on the spring 107. The end of the shaft 97 is threaded to receive the nut 110 and locknut 111. The worm wheel or typewheel gear 102 transfers the power from the motor M through the friction clutch 103 to rotate the typewheel. The shaft 97 thus always tends to rotate, but may be stopped when the index or stop arm 94 secured to the typewheel shaft 97 engages any one of the operated index stop pins 89. As has already been stated, these stop pins normally extend out of the path of the stop arm 94 as it rotates with the typewheel 116. When however one of these stop pins is dropped into a row of aligned notches of the selector discs 85, this stop pin 89 moves into the path of the stop arm 94 and will engage it when the stop arm 94 reaches it bringing the shaft 97 to a stop thereat. In this manner the typewheel shaft may be selectively stopped at any position in its rotation. With the shaft 97 stationary, the friction clutch 103 will slip, i. e., the gear 102 will still rotate due to its direct connection with the motor M.

The typewheel stop arm 94 is equipped with a latch 112 which passes over the end of the pin 89 which is in the path of the arm and engages with the opposite side thereof to prevent rebound, when the rotating arm 94 is suddenly brought to a stop by engagement with the operated pin 89. As shown in Figures 9 and 10, the latch 112 is pivotally connected to the index stop arm 94 on pin 113 and is retained in alignment with the arm by means of the tension spring 114 carried by the pin 113. The upper end of the latch 112 terminates in a cam surface 115, Figure 9, so that when the index stop arm 94 engages a stop 89 the latch will ride over the pin 89 against the tension of the spring 114 and the latch will be forced inwardly to engage the other side of the pin after it has passed said pin to prevent rebound of the index arm 94 as stated above.

Secured to and rotatable with shaft 97, in any suitable manner, is a typewheel 116, Figure 4. The typewheel 116 comprises a cylinder having two individual rows of characters formed on its outer surface as for example letters and numerals. When the index or stop arm 94 engages a stop pin 89 the shaft 97 is brought to a stop and the selected character on the typewheel 116 determined by this stop position, may be printed.

Having thus brought the typewheel 116 to a stop with the character selected in operative position so that the same may be printed, the printing operation will now be described.

As already explained, the typewheel 116 mounted on the opposite end of the typewheel shaft 97 is divided into two sections, one containing letters and the other numerals. In operative relation with the typewheel are platens 117, which as will be explained, are raised and press a tape 118 passing between the platen 117 and the typewheel 116, the printed type being determined by the position in which the index arm 94 has been stopped in the manner described above.

The platens 117 secured to a suitable extension 119 on the printer frame, are arranged side by side directly beneath and in operative relation with the two sections of type on the typewheel 116. Positioned beneath the platens 117 is a rocking member 120 having two oppositely disposed lugs 121 and 122 arranged thereon and adapted to be selectively brought under the letter type or the numeral type on the typewheel 116 to raise the corresponding platen 117 above the leaf spring to print the character selected, as will be

described. Member 120 is supported by a pivot post 123 carried on a printing bail 124 and provided with an extension 125 through which it is in operative connection with a member 125'. Member 125' has operatively connected thereto a lever 126 which in turn is connected to the sixth T-lever 57.

Member 120 is rocked angularly by member 125' which in turn is operated by the sixth transfer of T-lever 57 through lever 126 in accordance with the control by the sixth lever 46 in turn positioned by the sixth impulse as described. When the rocking member 120 is thus actuated as described above and takes an angular position in which the leaf spring 122 is uppermost, a numeral will be printed on the tape. If on the other hand, the sixth impulse is such that member 120 takes the angular position in which the leaf spring 121 is uppermost, a letter will be printed.

The upward movement of the rocking member 120 for actual printing is accomplished through the printing bail 124 which is pivoted to the frame of the machine and is rocked by the printing follower 127, Figure 1, operated by the channel of the main operative cam 62. As the operating cam 62 is rotating in the manner described above, the printing follower 127 moves to the apex of the cam and rocks the printing bail 124 and through it the rocking member 120 is raised upwardly pressing the tape against the type wheel. The typewheel as has already been described has previously been brought to a stop at a predetermined position in accordance with the received code. The member 120 has also been rocked in accordance with the sixth or shift pulse and lug spring 121 or 122 is in uppermost position to determine whether a letter or numeral is to be printed. The member 120 is now raised by bail 124 through lug 121 or 122 and presses the tape against the typewheel. After printing, the tape 118 must be moved a distance of one letter space in order to present a fresh surface for printing. To this end a feeding mechanism is provided comprising a wheel 128 in operative relation with a pressure wheel 128' between which the tape 118 is fed. Wheel 128 is attached to the ratchet wheel 129, Figure 1. The ratchet wheel 129 is driven by a pawl 130 actuated by a spring 131. The pawl is withdrawn against its spring tension by a feed bail 132 operated by a cam follower 133, Figure 4, carried on the outer edge of the operating cam 62. In order to properly guide the tape, a tape guide 132' with flanged ends is provided between which the tape moves as it is fed by the feed roller. As will now be clear, the operating cam has three followers, two of which are controlled by the internal cam surface 62' and the third of which is controlled by the external cam surface of the main cam.

It will be noted that immediately after the operating or main cam 62 starts rotating, the printing bail roller 127 rides to the peak of the cam, thus rocking the printing bail 124 and lifting the rocker member 120 against the printing hammer or platen 117 pressing the tape 118 against the typewheel 116 and printing a character. As the printing bail roller 127 rides down the cam 62, the transfer bail roller 61 is riding up and as it reaches the peak the transfer levers 57 are forced against the selector levers 46 and the selection set up in the selector levers is transferred to the code discs 85.

The transfer of the selector lever settings is thus transferred to the selector discs 85 substantially immediately after printing of the character in accordance with the previous setting. The new alignment of the discs forces out the previously operated stop pin 89 and releases the typewheel shaft for rotation to the new position determined by the new stop pin in operated position. The printer is thus operated over substantially all of the line time.

While the transfer bail roller 61 is riding to the peak of the internal cam surface 62', the feed bail roller 133 is riding the external cam surface and the motion transmitted operates the feed pawl 130 to engage the next tooth of the feed ratchet. As the roller rides down the cam 62 the feed bail 132 moves the feed bail pawl 130 thus stepping the ratchet 129 one tooth moving the tape 118 forward one letter space. Accordingly the letter spacing operation is prepared during the printing operation and completed immediately after the printing.

The operation of the apparatus thus far described will now be given. Assuming that a code is received comprising a start impulse which is always spacing and a code comprising a marking, spacing, marking, spacing and spacing impulse for the first five impulses and a spacing for the sixth impulse.

As already explained, the stop condition is a marking impulse, the armature 5 is to the right and drum 23 is to the left. Arm 24 and lug 25 are in engagement and the clutch 36 is therefore slipping as motor M rotates sleeve 37. In response to a spacing or start impulse, the selector armature 5 is moved to the spacing or to its left position and out of the path of the flutter lever 9, permitting the flutter lever 9 to move by action of its spring 14 in a clockwise direction to in turn move the selector cam drum 23 toward the right. As a result of this longitudinal movement of drum 23, the stop arm 24 disengages the stop lug 25 and initiates the rotation of the selector cam drum 23. At this instant the projection 17 is opposite the corrugation 22, the lever 9 being in its alternate position from that shown in Figure 7. During the next movement, the projection 17 is engaged by corrugation 21 and lever 9 is rocked counter

clockwise until the projection 12 is out of the path of armature 5.

The first code impulse being a marking impulse, the selector armature 5 is moved to the marking or right hand side which it is now free to do as the projection 12 is out of its path. As the flutter cam 19 continues to rotate, projection 18 is engaged by a corrugation 20 and rocks lever 9 clockwise. The flutter lever 9 is however blocked by the selector armature 5 and accordingly the flutter cam 19 is moved to the left as it rotates. As a result the marking cam 45′ on the drum will be moved into line with the marking arm of the first selector lever 46 and will move this lever to the marking position as the cam or drum 23 rotates.

The succeeding impulse or second impulse of the code being a spacing impulse, the selector armature 5, is moved to the left and spacing position and the flutter cam 19 is thus released and the selector cam drum 23 is permitted to move to the right again. The second spacing cam is thus brought into line with the spacing arm of the second selector lever 46 and as the selector drum rotates the second selector lever 46 will be moved to the spacing position. This operation is repeated for the third, fourth and fifth impulses of this code in the same manner.

The sixth impulse being a spacing impulse, consequently the sixth selector lever 46 is moved to the spacing position as described. After the reception of the sixth selecting impulse, the stop impulse is received. As this impulse is always marking, the selector armature 5 is in the path of the flutter lever 9 and the selector cam drum 23 is moved to the left. At this point in the rotation, the stop arm 24 strikes against the stop lug 25 and the selector cam drum 23 is held at rest until the reception of the next start impulse.

During the rotation of the selector cam drum 23 and after the reception of the fourth impulse, the roller of the cam release or trip bail 74 rides into a depression in the edge of the friction disc 38. Through the action of a spring this roller follows the depression, the bail 74 is rocked until it disengages stop 73 and the operating cam 62 is released. The operating cam 62 starts to rotate shortly after the reception of the fifth impulse and through bail 124 operates the printing mechanism. However the letter printed will not be the one just selected, but a letter selected by the previous rotation of the cam drum as explained above. Following the sixth impulse, the operating cam 62 has reached a position at which it operates the transfer bail 59 and the combination set up in the selector levers 46 will be transferred to the code discs 85. The selector cam drum 23 may at this time be at rest as described above or started into rotation again by a start impulse of the succeeding code. The operating cam however continues to rotate, operating the spacing mechanism for moving the tape to present a new space for printing. Thereafter the cam is stopped as stop 73 engages the cam release bail arm 74.

The printing of the letter for the code, the selection for which has just been described, does not take place until the next selection is received and the selector cam drum 23 has revolved far enough to release the operating cam 62. When the selection has been transferred to the code discs 85, the operation of these discs to their new positions moves the operated pin 89 against which the typewheel stop arm 94 was previously held outwardly and permits the stop arm to rotate until it strikes against a newly operated pin 89 which was permitted to move inwardly due to the notches in the code disc 85 being in line in this position in accordance with the new code received.

It will be seen from the above description that a letter which is selected during one revolution of the cam drum is not printed until another revolution of the cam drum. In other words, while one character is being selected, the preceding character is being printed. A complete overlap of the apparatus is thus provided and the printer is operating at all times utilizing the full line time available while the code is being received.

In order to maintain the motor in operation as little as possible, provision is made to normally maintain the motor non-operating and start in response to code impulses. To this end, there is mounted on the rear end of the main shaft 26, Figure 2, a worm 134 in engagement with a worm wheel 135 pivotally supported on the printer frame in any convenient manner on pin 136. Adjacent the worm wheel 135 and secured for rotation therewith is a cam 137, Figures 5 and 6, sleeved to the pin 136. Beneath the cam 137 and in operative engagement therewith is a substantially U-shaped lever 138 on fixed pivot 139 and adapted to be rocked thereabout by the cam 137 against the action of a spring 140 one end of which is carried by the arm and the other on the frame work in any suitable manner. Pivotally secured to the free end of the lever 138 by pin 141, is a bell crank lever 142, one arm of which engages one of the spring arms 143 of a make and break switch, the spring arm 143 and co-acting spring arm 144 having abutting contact points 145 and controlling the circuit of motor M.

The other arm 146 of the bell crank lever 142 is in operative relation with an armature 147 of a magnet 148. Armature 147 moves between two adjustable limit stops 152′ and 153′. Colorized magnet 148 is connected in series with the winding of magnet 1 and is suitably mounted on the printer frame. The

motor M comprising a field winding 150 and armature winding 151 is connected across a source of power 152 through a speed regulator 153 of a well known construction comprising a contact make and break device 154 and electrical contacts 154. Normally the magnet 148 in series with the magnet 1 operates its armature 147 in response to original line currents.

Normally the apparatus is in the condition shown in Figure 6. The cammed portion on cam 137 is in engagement with a projection on member 138 and has rocked member 138 about its pivot 139. The magnet 148 at this time holds its armature 147 over to the marking side or full position shown in the path of bell crank 142 so that as member 138 is rocked, the bell crank 142 is rocked about pivot 141 and the two contacts 145 are disengaged. In response to a spacing or start impulse, the armature 147 is operated to the dotted position shown in Figure 8 and the bell crank 142 is free to permit the contacts 145 to engage. The motor circuit is thereupon closed and drives pin 136 and cam 137.

As cam 137 is rotated, its enlarged portion passes over the projection of member 138 and member 138 is rocked by its spring in a clockwise direction about pin 139 to the position shown in Figure 5. In this position, the contacts remain closed irrespective of the position of armature 147. As the cam 137 rotates it rocks the lever 138 moving the lever 142 vertically from time to time. During each revolution when the raised portion of cam 137 engages member 138 the bell crank is rocked. If, however, a stop or marking impulse is received, the armature 147 of magnet 148 is moved to the full position shown. As the lever 138 is rocked about its pivot 139 at the end of the cycle of operations, the end 146 of the bell crank 142 engages the armature 147 and bell crank 142 is rocked counterclockwise about its pivot 141 causing contacts 145 to disengage and opening the circuit of motor M.

In the above, the electro-magnet 148 connected in series with the line magnet 1 is shown as a mechanical interference mechanism in which the armature 147 is positioned either in or out of the path of the end 146 of the bell crank 142. In the modifications shown in Figures 19 to 21, the winding 148 is shown as a repeater relay which by means of its armature 147 controls the circuit of a magnet 147′. In this modification, similar numerals are used for equivalent parts shown in the first modification.

In Figures 20 and 21 the magnet 147′ is carried on a frame 148′ to which is pivoted at 149′ an armature 150′ provided with an extension 151′. A stop 152′ limits the movement of the armature 150′. A spring 153′ normally holds the armature in the non-operated position shown in Figure 21.

The remaining mechanism is similar to that disclosed in connection with the preferred form. As shown, a worm 134 mounted on the rear end of the main shaft 26, Figure 2, engages with a worm wheel 135, pivotally supported on the frame in any convenient manner on pin 136. In addition to the worm wheel 135 and rotatable therewith is a cam 137 carried on the pin 136. Beneath the cam 137 and in operative relation therewith is a substantially U-shaped lever 138 on fixed pin 139 arranged to be rocked thereabout by the cam 137 against the action of a spring 140 one end of which is secured to the arm 138 and the other end to the frame work in any suitable manner. Pivotally secured to the free end of the lever 138 by pin 141 is a bell crank lever 142, one end of which engages one of the spring arms 143 of a make and break switch, the spring arm 143 and co-acting spring arm 144 having abutting contacts 145 and controlling the circuit of the motor M.

The other arm 146 of the bell crank lever 142 is in operative relation with the projection 151′ on the armature 150′ of the magnet 147′.

Normally the apparatus is in the condition shown in Figure 19. The shoulder of the cam 137 has previously engaged the projection on the lever 138 and has rocked the latter about its pivot 139. At this instant the received signal is a stop or marking impulse which operates the line magnet 1 and the relay 148. The armature 147 of relay 148 is moved to engage its contact as shown in Figure 19 and a circuit is thereupon completed for the magnet 147′ from the negative side of battery through the lower winding of the magnet 147′, the armature of relay 148 in engagement with its contact to the upper winding of the magnet 147′ to the positive side of battery. The magnet 147′ is thus energized and operates its armature 150′ against the tension of the spring 153′ until the projection 151′ is in engagement with the extension 146 of the bell crank 142 as shown in Figure 19. Accordingly as the lever 138 is rocked about pivot 139 as stated above, the bell crank 142 is rocked in a counter clockwise direction about its pivot 141 and moves the spring arm 143 as shown to disengage the contacts 145, thus opening the circuit of the motor M.

In response to a start or spacing impulse, the line magnet 1 operates as indicated above and simultaneously the relay 148 is deenergized whereupon armature 147 is restored to its normal position disengaging its contact and the circuit of the winding of the magnet 147′ is opened. The magnet 147′ is deenergized and the spring 153′ rocks the armature 150′ about the pivot 149′ to disengage the extension 146 of the bell crank 142. The spring contact arm 143 thereupon rocks the

bell crank 142 in a clockwise direction until the contacts 145 engage, closing the circuit of the motor M and starting rotation as described above. After the shoulder of cam 137 has passed the projection on lever 138 the lever 138 is moved upwardly by its spring as described above and thereafter the contacts 145 remain closed independently of energization or deenergization of magnet 147'. The above cycle of operation is then repeated when a complete revolution has been completed and the shoulder on the cam 137 again engages the projection on lever 138.

Figures 11 and 12 are schematic diagrams of preferred circuit connections. In Figure 11, the signalling line 156 is shown connected to the terminal jacks 157 and 158 provided with connections 159 and 161. These are shown separated from the jacks at the left thereof for purposes of illustration. But it will be understood that normally these are secured in the jacks. Extending from connection 159 is a conductor 162 which extends to the connecting strap 163 on the terminal block 8'. The strap 163 communicates through conductor 165 to one of the selector coils 3 of the selector magnet 1. The other terminal of this coil extends over the conductor 167 to the second conductor strap 168 on the terminal block 8'. Similarly the second winding 4 of the selector magnet 1 is connected over conductors 171 and 172 to the conductor straps 173 and 174 respectively. Conductor strap 173 is connected over the conductor 175 through the terminal connector 176 to the coil 177 of the motor control relay 148, the other terminal of which extends over the conductor 178 to the terminal 161 connected to the positive side of the signalling line 156. With the circuit connections, as shown, coils 3 and 4 of the selector magnet 1 may be connected either in series or in parallel. In order to connect the coils in series, the rings 168 and 174 are jumped as shown in the preferred embodiment. In order to connect these coils in parallel, it is merely necessary to jump the straps 173 to 168 and the ring 174 to ring 163.

As described heretofore, the motor control relay 148, controls motor control contact 147 to engage its contact 145 when the relay is energized with the selector coils. As will be understood, the showing here is diagrammatic, the details by which the contact 145 is closed being shown in Figures 5, 6 and 8. The contact 145 is connected over a conductor 181 to resistance 182 and to the governor control contact 183 in parallel. The conductor also extends through the field winding 150 of the motor and ends over the conductor 184 to the opposite side of the source of power. The armature circuit extends through the resistance 182, conductor 185 to the other side of the armature 151, the opposite terminal being connected to conductor 184. The conductor 184 extends to the power switch 186 which may be of any well known construction, operable to one of either of two positions in which it remains set the one position being an open circuit in which the circuit is opened and the second a closing circuit. The opposite terminal of the power switch extends through fuses 187 to a direct current source of power 188. The opposite side of this source of power extends over the conductor 189 to a one-half microfarad condenser 191 connected in the circuit and shunting the motor control contacts to prevent arcing thereon during operation. The operation of the apparatus will be obvious from the above description. When impulses are received which operate the selector coils, these also flow in series through the motor control relay 177, which in turn on operating its contact, as described in detail above, closes the motor circuit which is thereupon started into operation for driving the printer to operate during the impulsing period.

In Figure 12, the circuit connection when an alternating current motor is employed is disclosed. Similar characters are employed for similar parts. It will be noted that the circuits are substantially the same except for the details of the motor circuit. The motor control contact 145 is connected over conductor 181 to the two resistances 182 connected in parallel across the circuit instead of in series as shown in the direct current system. A circuit then extends in multiple through the governor control contact 183 and through the field winding 150 and armature winding 151 in series to the opposite side of the alternating current source over conductor 184. With the exception of this difference in circuit construction, the similar arrangement is employed.

The principles and desirable features here described are likewise applicable to a wide range of selecting mechanisms and other devices.

What we claim as new is:

1. A selector mechanism comprising a cam drum, means for rotating said cam drum, and means whereby said first mentioned means also operates said cam drum longitudinally.

2. A selector mechanism comprising a cam drum, means for rotating said cam drum, and means whereby said first mentioned means also operates said cam drum longitudinally, said last mentioned movement of said cam drum being selectively controlled in accordance with received code combinations of impulses.

3. A selector mechanism comprising a cam drum, means for rotating said cam drum, means whereby said first mentioned means also operates said cam drum longitudinally, and means for selectively controlling said last mentioned movement of said drum in ac-

cordance with received code combinations of impulses.

4. In a selector mechanism, a cam drum, a source of power for rotating said cam drum, cam mechanism carried by said drum, and means cooperating with said cam mechanism for translating the rotary motion of said first mentioned power means to move said drum longitudinally.

5. In a selector mechanism, a cam drum, a source of power for rotating said cam drum, a cam carried by said cam drum, means cooperating with said cam for translating the rotary motion of said first mentioned power means to move said cam drum longitudinally, and means responsive to received code combinations of impulses for controlling said last mentioned movement of said cam drum.

6. In a selector mechanism, a cam drum, a flutter cam carried on said cam drum, a flutter lever cooperating with said flutter cam for moving said cam drum to predetermined positions, means for rotating said cam drum, and electromagnetic means responsive to received code combinations of impulses and controlling the operation of said flutter lever for variably operating said cam drum longitudinally in accordance with received code combinations of impulses.

7. In a selector, a rotating cam drum, means for moving said cam drum longitudinally, and means responsive to received code combinations of impulses for permitting or preventing said movement of said cam drum.

8. In a selector, a cam drum, a motor for rotating said cam drum and for moving said cam drum longitudinally, and electromagnetic means responsive to received code combinations of impulses for preventing or permitting such longitudinal movement of said cam drum in accordance with received code combinations of impulses.

9. In a selector, a rotating pin barrel, a motor for rotating and moving said pin barrel longitudinally, and electromagnetic means responsive to received code combinations of impulses for preventing or permitting such longitudinal movement of said pin barrel in accordance with received code combinations of impulses, the operation of said electromagnetic means in accordance with the impulses being substantially unimpeded during all impulsing periods.

10. In combination, a rotating pin barrel, an electromagnet responsive to received code combinations of impulses, and means dependent upon the energization of said electromagnet but otherwise functioning independently thereof for operating said pin barrel longitudinally.

11. In a selector apparatus, an electromagnet responsive to received code combinations of impulses, an armature therefor, said armature being unimpeded during each impulsing period for movement in accordance with the energization of said electromaget, and selector mechanism variably operated in accordance with the operation of said armature.

12. In a selector apparatus, an electromagnet responsive to received code combinations of impulses, an armature therefor, said armature being unimpeded during each impulsing period for movement in accordance with the energization of said electromagnet, selector mechanism, and means for variably operating said selector mechanism in accordance with the operation of said armature.

13. In a selector apparatus, a rotatable distributor mechanism, a source of power for driving said distributor mechanism, an electromagnetic means for controlling the application of said source of power to said distributor, said electromagnetic means being responsive to a received impulse for permitting the application of said source of power to said distributor whereby said distributor is rotated in synchronism with received impulses.

14. In combination, a plurality of selector mechanisms, a second set of selector mechanisms individual to each of said first selector mechanisms, a shift mechanism and means for operating said second set of selector mechanisms in accordance with the operation of said first selector mechanisms and for simultaneously operating said shift mechanism in accordance with the operation of one of said selector mechanisms.

15. In combination, a plurality of selector levers, a sixth pulse selector lever, a plurality of second selector levers, one for each of said first selector levers, and shift mechanism for operating said second selector levers in accordance with the operation of said first mentioned selector levers and for simultaneously operating said shift mechanism in accordance with the operation of said sixth pulse selector lever.

16. In a selector apparatus, a plurality of pivoted selector levers, means responsive to code combinations of impulses for variably operating said selector levers, a sixth pulse selector lever, a plurality of second selectors one individual to each of said first set of selector levers, a shift mechanism, and means for operating said second selector levers in accordance with the operation of said first selector levers and for operating said shift mechanism in accordance with the operation of said sixth pulse lever.

17. In a selector mechanism, a pin barrel selector, marking and spacing cams on said pin barrel selector, selector levers, one for each pair of marking and spacing cams, said selector levers being arranged to be operated by their individual pairs of cams in accordance with the operation of said pin barrel as said cams come into operative relation with said selector levers.

18. In a selector mechanism, a plurality

of pivoted selector levers, each having a plurality of positions, said selector levers having however no normal position, means responsive to received code combinations of impulses for operating said selector levers to either of their positions, and flat friction springs for holding said selector levers in their operated positions.

19. In combination, a drive shaft, a cam drum selector, a sleeved member on said shaft, means for transmitting power from said shaft through said sleeved member to rotate said cam drum selector, a second sleeve member on said shaft, an operating cam, and means for transmitting power through said second sleeve member to said operating cam.

20. In combination, a drive shaft, a pin barrel selector, a sleeved member on said shaft, means for transmitting power from said shaft through said sleeved member to rotate said pin barrel selector, a second sleeve member on said shaft, an operating cam, means for transmitting power from said second sleeve member to said operating cam, a grab clutch connection secured to said shaft, and means responsive to the initial rotation of said cam for driving said cam through said grab clutch connection.

21. In combination, a distributor mechanism, a cam barrel selector, an operating cam, a driving shaft, means for transmitting power from said driving shaft to said cam barrel selector for rotating said cam barrel selector, means controlled by said cam barrel selector for applying power directly from said source of power to said operating cam after a predetermined rotation of said cam barrel selector.

22. In combination, a rotating selector, a first set of selector mechanisms variably operated in accordance with received code signals by said rotating selector, an operating cam, a second set of selectors, a typewheel, means controlled by said second selectors for variably operating said typewheel, a printing hammer in operative relation with said typewheel, said operating cam controlling the transfer of power from said first set of selector mechanisms to said second set of selectors and for operating said printing hammer, and means whereby said cam is controlled by said rotating selector.

23. In combination, a rotating sleeve comprising a plurality of marking and spacing cams, selector levers, one individual to each pair of marking and spacing cams, a motor, means for transmitting power from said motor to said rotating sleeve, means responsive to received code combinations of impulses for operating said rotating sleeve whereby said selector levers are variably operated, a typewheel, a printing hammer therefor, and a tape in operative relation with said typewheel, an operating cam, a cam mechanism controlled by said rotating sleeve for starting said operating cam into operation, means controlled by said operating cam for selecting a character on said typewheel in accordance with the operation of said selectors and means controlled by said operating cam for operating said printing hammer against said selected character on said typewheel and for feeding said tape past said typewheel.

24. In combination, a rotating member having a plurality of marking and spacing cams thereon, a selector lever individual to each pair of marking and spacing cams, each of said selecting levers being provided with toothed projections offset from each other whereby, with said rotating member in one position, one tooth will be in engagement with the marking cam while the other is out of engagement with the spacing cam, and with the rotating member in the other of its positions, the other tooth is in engagement with the spacing cam and the first tooth out of engagement with the marking cam whereby said levers are operated in accordance with the longitudinal position of said rotating member.

25. In combination, a rotating member having a plurality of marking and spacing cams thereon, a selector lever individual to each pair of marking and spacing cams, each of said selecting levers being provided with projections offset from each other whereby with said rotating member in one position, one tooth will be in engagement with the marking cam while the other is out of engagement with the spacing cam and with the rotating member in the other of its positions, the other tooth is in engagement with the spacing cam and the first tooth is out of engagement with the marking cam whereby said levers are operated in accordance with the longitudinal position of said rotating member, a second marking and second spacing projection on each of said selector levers and transfer mechanism in operative relation with each of said selector levers, said transfer mechanism having projections operated by either said marking or said spacing projections depending upon the operated position of said selecting levers.

26. In combination, selector mechanism responsive to received code combinations of impulses, a rotating typewheel, a cam mechanism, a printing hammer for said typewheel, a tape, a feed mechanism for said tape, a platen comprising oppositely disposed lug members, means controlled by said cam for conditioning said typewheel for printing operation in accordance with the operation of said selector mechanism, means controlled by said cam for conditioning one of said lug members for operation, and means controlled by said cam for operating said printing hammer against said typewheel to print the selected character.

27. In combination, selector mechanisms responsive to received code combinations of impulses, a rotating typewheel, a cam mechanism, a printing hammer for said typewheel, a tape, a feed mechanism for said tape, a platen comprising oppositely disposed lug members, means controlled by said cam for conditioning said typewheel for printing operation in accordance with the operation of said selector mechanism, means controlled by said cam for conditioning one of said lug members for operation, means controlled by said cam for operating said printing hammer against said typewheel to print the selected character, and means controlled by said cam for operating said feed mechanism to present a fresh surface of said tape for printing operation.

28. In combination, a rotatable member having a plurality of marking and spacing cams thereon, a selector lever individual to each pair of marking and spacing cams, each of said selecting levers being provided with toothed projections offset from each other whereby with said rotatable member in one position one tooth will be in engagement with the marking cam while the other is out of engagement with the spacing cam, and with the rotatable member in the other of its positions the other tooth is in engagement with the spacing cam and the first tooth out of engagement with the marking cam whereby said levers are operated in accordance with the longitudinal position of said rotatable member, means for moving said rotatable member longitudinally, and electromagnetic means responsive to received code combinations of impulses and substantially unimpeded during impulsing periods for controlling the longitudinal position of said rotatable member.

29. In combination, a rotatable member having a plurality of marking and spacing cams thereon, a selector lever individual to each pair of marking and spacing cams, each of said selecting levers being provided with toothed projections offset from each other whereby with said rotatable member in one position one tooth will be in engagement with the marking cam while the other is out of engagement with the spacing cam, and with the rotatable member in the other of its positions the other tooth is in engagement with spacing cam and the first tooth is out of engagement with the marking cam whereby said levers are operated in accordance with the longitudinal position of said rotatable member, a flutter cam carried on said rotatable member, a flutter lever cooperating with said rotatable member for moving said member to predetermined longitudinal positions, means for rotating said rotatable member, and electromagnetic means responsive to received code combinations of impulses and controlling the operation of said flutter lever for variably operating said rotatable member longitudinally in accordance with received code combinations of impulses.

30. In combination, a rotatable member having a plurality of marking and spacing cams thereon, a selector lever individual to each pair of marking and spacing cams, each of said selecting levers being provided with toothed projections offset from each other whereby with said rotatable member in one position one tooth will be in engagement with the marking cam while the other is out of engagement with the spacing cam, and with the rotatable member in the other of its positions the second tooth is in engagement with the spacing cam and the first tooth out of engagement with the marking cam whereby said levers are operated in accordance with the longitudinal position of said rotatable member, means for moving said rotatable member longitudinally and means responsive to received code combinations of impulses for permitting or preventing said movement of said rotatable member.

31. In combination, a rotatable member having a plurality of marking and spacing cams thereon, a selector lever individual to each pair of marking and spacing cams, each of said selecting levers being provided with toothed projections offset from each other whereby with said rotatable member in one position one tooth will be in engagement with the marking cam while the other is out of engagement with the spacing cam, and with the rotatable member in the other of its positions the other tooth is in engagement with the spacing cam and the first tooth is out of engagement with the marking cam whereby said levers are operated in accordance with the longitudinal position of said rotatable member, a second marking and second spacing projection on each of said selector levers, and transfer levers in operative relation with said selector levers, said transfer levers having projections, means for moving said rotatable member longitudinally, means responsive to received code combinations of impulses for permitting or preventing said movement of said rotatable member, and means for bringing either said marking or spacing projections on said transfer levers into operative relation with said associated selector levers depending upon the operative position of said selector levers.

32. In combination, a rotatable member having a plurality of marking and spacing cams thereon, a selector lever individual to each pair of marking and spacing cams, each of said selecting levers being provided with toothed projections offset from each other whereby with said rotatable member in one position one tooth will be in engagement with the marking cam while the other is out of engagement with the spacing cam, and with

the rotatable member in the other of its positions the other tooth is in engagement with the spacing cam and the first tooth is out of engagement with the marking cam whereby said levers are operated in accordance with the longitudinal position of said rotatable member, a second marking and second spacing projection on each of said selector levers and transfer levers in operative relation with said selector levers, said transfer levers having projections, an operating cam, a driving shaft, means for transmitting power from said driving shaft to said rotatable member for rotating said member and for moving it longitudinally, means controlled by said rotatable member for applying power from said source of power to said operating cam, and means controlled by said operating cam for operating said transfer levers into operative relation with said selector levers whereby the projections on said transfer levers are operated by either said marking or spacing projections on said selecting levers depending upon the operating position of said selector levers.

33. In combination, a rotatable member having a plurality of marking and spacing cams thereon, a selector lever individual to each pair of marking and spacing cams, each of said selecting levers being provided with toothed projections offset from each other whereby with said rotatable member in one position one tooth will be in engagement with the marking cam while the other is out of engagement with the spacing cam, and with the member in the other of its positions the other tooth is in engagement with the spacing cam and the first tooth is out of engagement with the marking cam, whereby said levers are operated in accordance with the longitudinal position of said rotatable member, a second marking and second spacing projection on each of said selector levers, a set of transfer levers, one for each of said selector levers operated by either said marking or said spacing projections depending on the operated position of said selecting levers, an operating cam, a second set of selectors in operative relation with said transfer levers, a typewheel, means controlled by said operating cam for variably operating said transfer levers in accordance with the operation of said selector levers, whereby said second set of levers is operated in accordance with the operation of said first set of selector levers, means controlled by said second set of selectors for variably operating said typewheel, a printing hammer engaging said typewheel, said operating cam operating said printing hammer, and means whereby said cam is controlled by said rotatable member.

34. In combination, a rotatable member having a plurality of marking and spacing cams thereon, a selector lever individual to each pair of marking and spacing cams, each of said selecting levers being provided with toothed projections offset from each other whereby with said pin barrel selector in one position one tooth will be in engagement with the marking cam while the other is out of engagement with the spacing cam, and with the rotatable member in the other of its positions the other tooth is in engagement with the spacing cam and the first tooth is out of engagement with the marking cam whereby said levers are operated in accordance with the longitudinal position of said rotatable member, a second marking and second spacing projection on each of said selector levers, a set of transfer levers, one for each of said selector levers operated by either said marking or said spacing projections depending on the operated position of said selecting levers, an operating cam, a second set of selectors in operative relation with said transfer levers, a typewheel, means controlled by said operating cam for variably operating said transfer levers in accordance with the operation of said selector levers, whereby said second set of levers is operated in accordance with the operation of said first set of selector levers, means controlled by said second set of selectors for variably operating said typewheel, a printing hammer engaging said typewheel, said operating cam operating said printing hammer.

35. In combination, a rotatable member having a plurality of marking and spacing cams thereon, a selector lever individual to each pair of marking and spacing cams, each of said selecting levers being provided with toothed projections offset from each other whereby with said rotatable member in one position one tooth will be in engagement with the marking cam while the other is out of engagement with the spacing cam, and with the rotatable member in the other of its positions the other tooth is in engagement with the spacing cam and the first tooth is out of engagement with the marking cam whereby said levers are operated in accordance with the longitudinal position of said rotatable member, a second marking and second spacing projection on each of said selector levers and transfer levers in operative relation with said selector levers, said transfer levers having projections operated by either said marking or said spacing projections depending on the operated position of said selecting levers, means for rotating said rotatable member, and means whereby said first mentioned means also operates said rotatable member longitudinally, said last mentioned movement of said rotatable member being selectively controlled in accordance with received code combinations of impulses.

36. In combination, a rotatable member having a plurality of marking and spacing cams thereon, a selector lever individual to each pair of marking and spacing cams, each

of said selecting levers being provided with toothed projections offset from each other whereby with said rotatable member in one position one tooth will be in engagement with the marking cam while the other is out of engagement with the spacing cam, and with the rotatable member in the other of its positions, the other tooth is in engagement with the spacing cam and the first tooth is out of engagement with the marking cam whereby said levers are operated in accordance with the longitudinal position of said rotatable member, a second marking and second spacing projection on each of said selector levers, and transfer levers in operative relation with said selector levers, said transfer levers having projections operated by either said marking or said spacing projections depending on the operated position of said selecting levers, a source of power for rotating said rotatable member, a cam carried by said rotatable member and means cooperating with said cam for translating the rotary motion of said first mentioned power means to move said rotatable member longitudinally, and means responsive to received code combinations of impulses for controlling said last mentioned movement of said rotatable member.

37. In combination, a rotatable member having a plurality of marking and spacing cams thereon, a selector lever individual to each pair of marking and spacing cams, each of said selecting levers being provided with toothed projections offset from each other whereby with said rotatable member in one position one tooth will be in engagement with the marking cam while the other is out of engagement with the spacing cam, and with the rotatable member in the other of its positions the other tooth is in engagement with the spacing cam and the first tooth out of engagement with the marking cam whereby said levers are operated in accordance with the longitudinal position of said rotatable member, a source of power for rotating said rotatable member, a flutter cam carried by said rotatable member, a flutter lever cooperating with said flutter cam for moving said rotatable member to predetermined positions, means for rotating said member, and electromagnetic means responsive to received code combinations of impulses and controlling operation of said flutter lever for variably operating said member longitudinally in accordance with received combinations of impulses.

38. In combination, selector mechanism, a source of power, electromagnetic means responsive to received code combinations of impulses for variably controlling the application of said source of power to said selector mechanism, and second electromagnetic means responsive to said received code combinations of impulses for starting said source of power into operation.

39. In combination, selector mechanism, a source of power, electromagnetic means responsive to received code combinations of impulses for variably controlling the application of said source of power to said selector mechanism, means controlled by said code combinations of impulses for rendering said source of power operative, said source of power being operative thereafter during the remaining impulsing period independently of said last mentioned means.

40. In combination, selector mechanism, a source of power, electromagnetic means responsive to received code combinations of impulses for variably controlling the application of said source of power to said selector mechanism, a pivoted lever jointly controlled by said code combinations of impulses and said source of power for rendering said source of power operative during said impulsing period, means controlled by said pivoted lever, and means for controlling said pivoted lever for maintaining said source of power normally nonoperative, said means being responsive to received impulses for releasing said pivoted lever whereby said source of power is rendered operative, said lever being arranged to maintain said source of power in operation during the remainder of the impulsing period, and means controlled by said source of power for rendering said source of power inoperative at the end of an impulsing period.

41. In combination, a selector mechanism, a source of power, electromagnetic means responsive to received code combinations of impulses for variably controlling the application of said source of power to said selector mechanism, a pivoted lever jointly controlled by said code combinations of impulses and said source of power for rendering said source of power operative during said impulsing period, means controlled by said pivoted lever, means for controlling said pivoted lever for maintaining said source of power normally non-operative, said means being responsive to received impulses for releasing said pivoted lever whereby said source of power is started into operation, said pivoted lever being arranged to maintain said source of power in operation during the remainder of the impulsing period, and means controlled by said source of power for rendering said source of power inoperative at the end of an impulsing period, said means being operated periodically.

42. In a selector mechanism, a pin barrel, a source of power for rotating said pin barrel, a cam carried by said pin barrel, spring means for moving said pin barrel longitudinally and means cooperating with said cam and selectively controlled in accordance with received code combinations of impulses for controlling the operation of said pin barrel.

43. In a selector mechanism, a pin barrel,

a flutter cam carried on said pin barrel, a spring operated lever cooperating with said flutter cam for moving said pin barrel to predetermined positions, a flutter lever for controlling the movement of said pin barrel in accordance with received code combinations of impulses, means for rotating said pin barrel and an electromagnetic means responsive to the received code combinations of impulses for controlling the operations of said flutter lever whereby said pin barrel is moved longitudinally in accordance with received code combinations of impulses.

44. In a selector apparatus, a plurality of selector levers, said selector levers having a plurality of operated positions, means responsive to received code combinations of impulses for variably operating said selector levers to their operated positions, a jockey member individual to each of said selector levers, and spring means in operative relation with each of said jockey members for moving said jockey members to engage individual selector levers in either of their operative positions whereby said selector levers are maintained in their operated positions.

45. In combination, a selector mechanism, a source of power, said selector mechanism being normally in a non-operative condition and said source of power being normally disconnected from said selector mechanism, a signalling line, an electromagnet and a relay connected in series in said signalling line, said electromagnet being responsive to a code of predetermined character over said signalling line for rendering said selector mechanism operative, an electromagnet controlled by said relay in response to an impulse of predetermined character, and mechanism controlled by said relay-controlled electromagnet for starting said source of power into operation.

46. A selector mechanism comprising selector operating means having two modes of motion, one of said modes acting to time the operation of the selector mechanism, and the other mode acting according to received code combinations of signals, and a local source of power for supplying both modes of motion.

47. A selector mechanism comprising selector operating means having two modes of motion, one of said modes acting to time the operation of the selector mechanism, and the other mode acting according to received code combinations of signals, the power for both of said motions being entirely independent of the power furnished by the incoming signals.

48. A selector mechanism comprising a series of selectors, an element adapted to operate said selectors, means to determine the selector to be operated, said element having two modes of motion, both deriving power for their operation from a drive independent of said means, one of said motions determining the time of operation, and the other of said motions determining the direction in which the selectors are moved.

49. In a selecting device, a series of selectors, an element adapted to operate said selectors, signal operated means, means to move said element to determine the selector to be operated, and means to move the element to determine the motion of the selected selector, both of said last mentioned means deriving their power from a source independent of the signal operated means.

50. In combination a selector mechanism comprising a series of elements; a member common to all of said elements; a magnet; means independent of the magnet to move the common member; means to modify said motion according to the energization of said magnet; and means controlled by the common member to set the elements in combinations in accordance with the received code combinations.

51. In combination a selector mechanism comprising a series of elements; a member common to all of said elements for variably operating said elements; a magnet responsive to received code combinations of impulse conditions for modifying the operations of said common member; and means whereby said magnet has no restraining influence during the interval it responds to the received impulse conditions.

52. In a permutation code device, a series of notched selecting members, means for operating said selecting members to bring certain of said notches in selective alignment, selectable elements selected by movement into said aligned notches; and common resilient means for forcing said elements into said aligned notches; said notches being operative when moving out of selective alignment to lift the selected element out of the notches.

53. In a permutation code device, a series of notched selecting discs, means for operating said selecting discs to bring certain of said notches into selective alignment; selectable elements adapted to rest in the selectively aligned notches; and common resilient means for forcing said elements into the aligned notches; said notches being operative when out of selective alignment to hold said elements in unselected position.

54. In a permutation code device, a series of selecting members; means for variably operating said members; a series of elements, each having a normal and a selected position; common resilient means for selectively moving said elements from normal to selected position in accordance with operation of said members; and means to move said elements from selected to normal position by power applied by the selecting members.

55. In a permutation code device, a series of selecting members; means for variably

operating said members simultaneously; a series of elements each having a normal and a selected position; common resilient means for moving said elements from normal to selected position in accordance with operation of said members; and means to move said element from selected to normal position by power applied by said selecting members.

56. In a selecting mechanism, a plural position member capable of making certain selections, a plurality of individual elements operated upon the selective actuation of said member, a plurality of discs movable in various combinations and having no normal position, and means operated subsequently to the operation of said elements for operating said discs.

57. In a selecting mechanism, a plural position member capable of making certain selections, a plurality of individual elements operated upon the selective actuation of said member, a plurality of notched members movable in various combinations and having no normal position, and means operated subsequently to the operation of said elements for operating said last mentioned members to align the notches therein.

58. In a selecting mechanism, a plural position member capable of making certain selections, a plurality of individual elements operated upon the selective actuation of said member, a plurality of notched members movable in various combinations and having no normal position, means operated subsequently to the operation of said elements for operating said last mentioned members to align the notches therein, and means selected upon the alignment of said notches.

STERLING MORTON.
HOWARD L. KRUM.
EDWARD E. KLEINSCHMIDT.