

May 31, 1932.

R. HOOVER ET AL

1,861,414

QUOTATION BOARD PRINTING UNIT

Filed May 4, 1931

2 Sheets-Sheet 1

FIG. 1

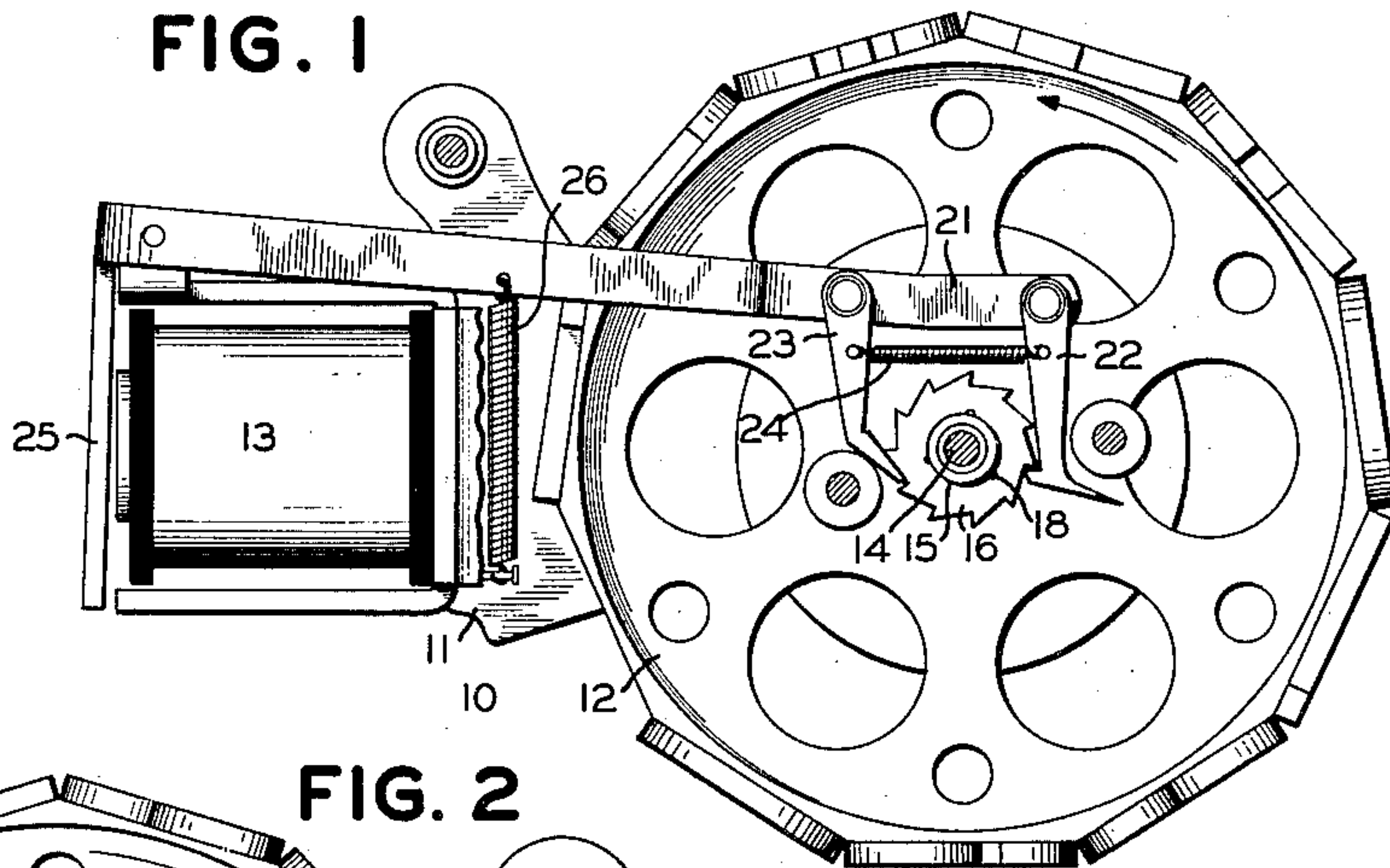


FIG. 2

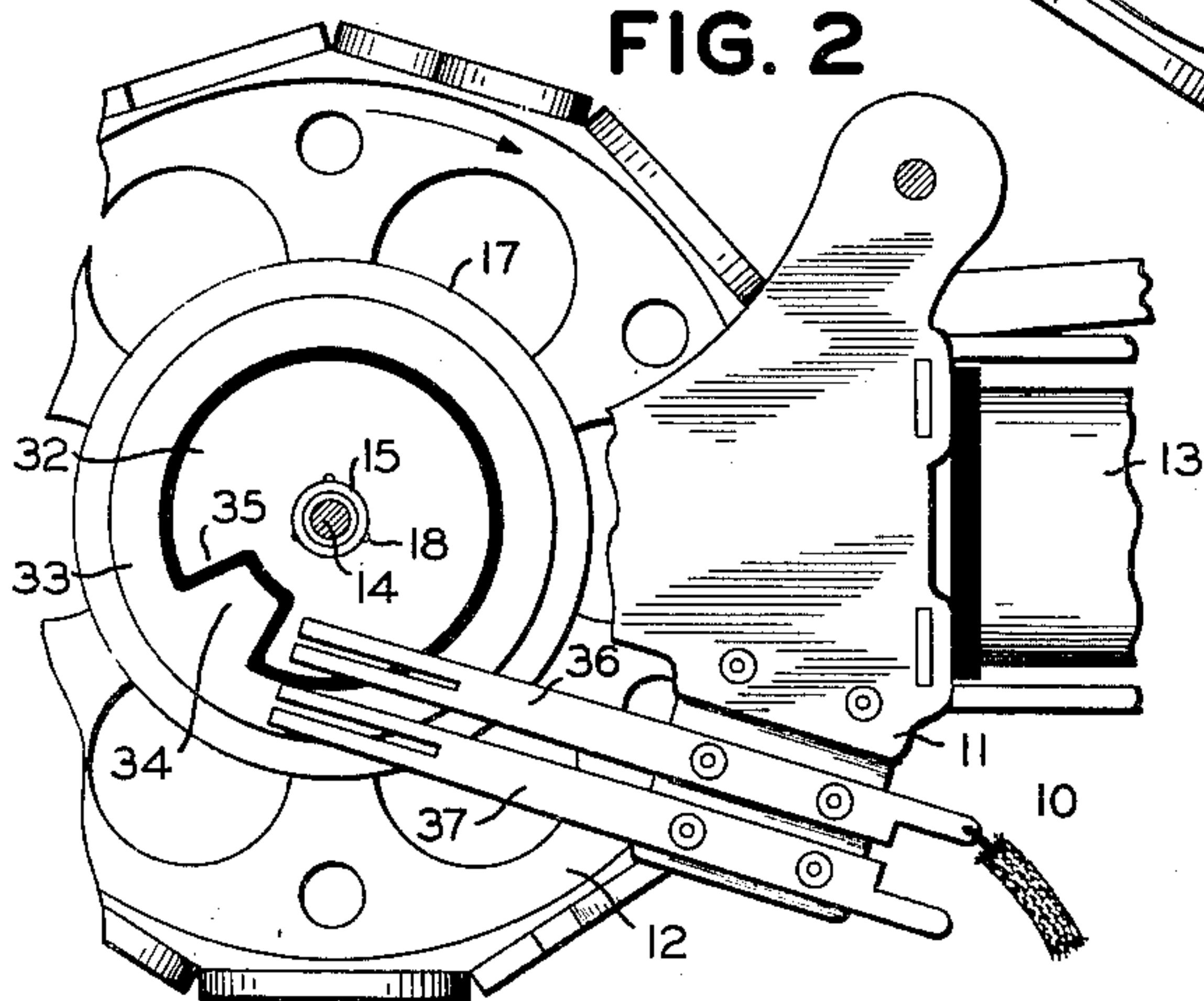


FIG. 3

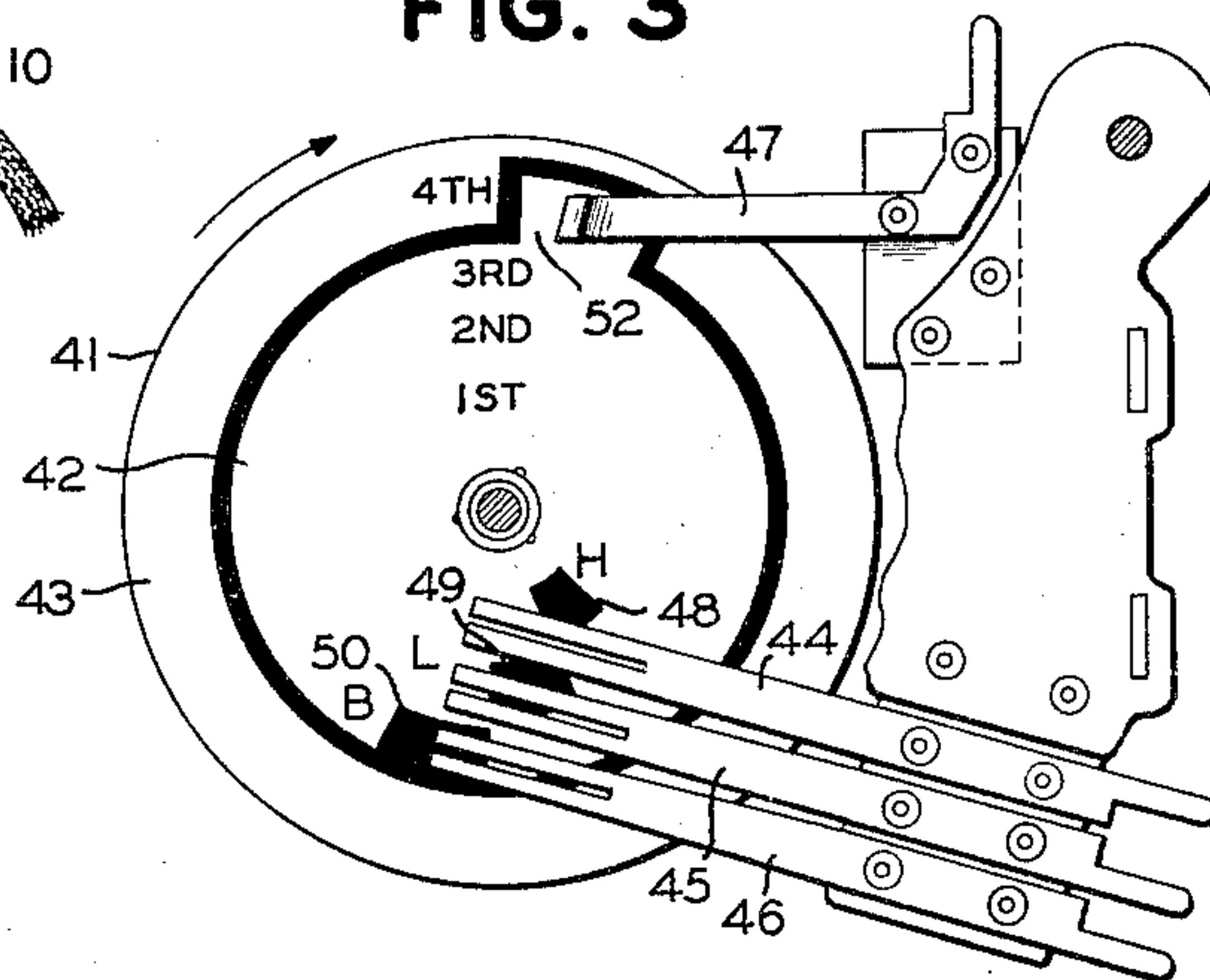
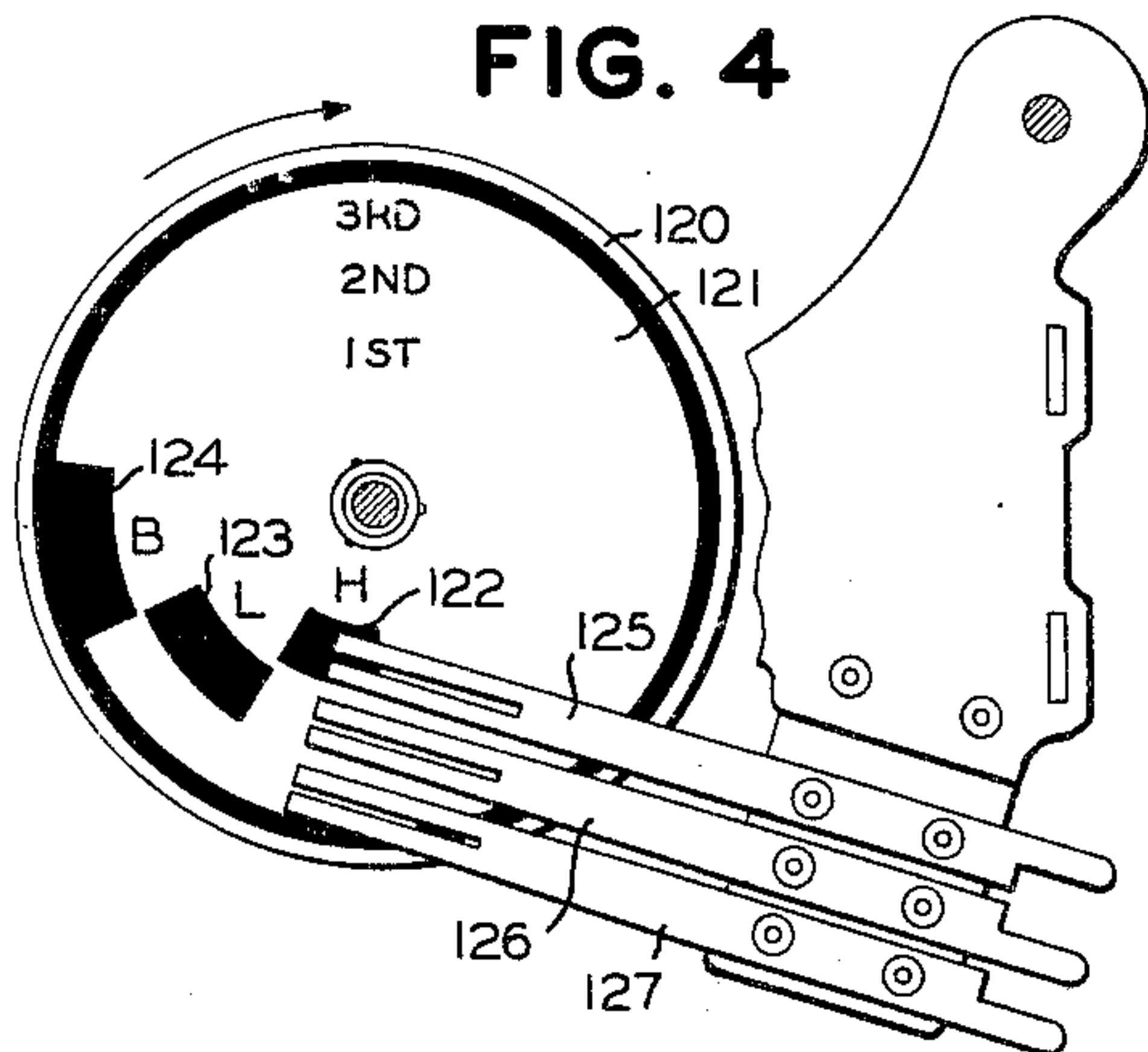


FIG. 4



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2 Sheets-Sheet 2

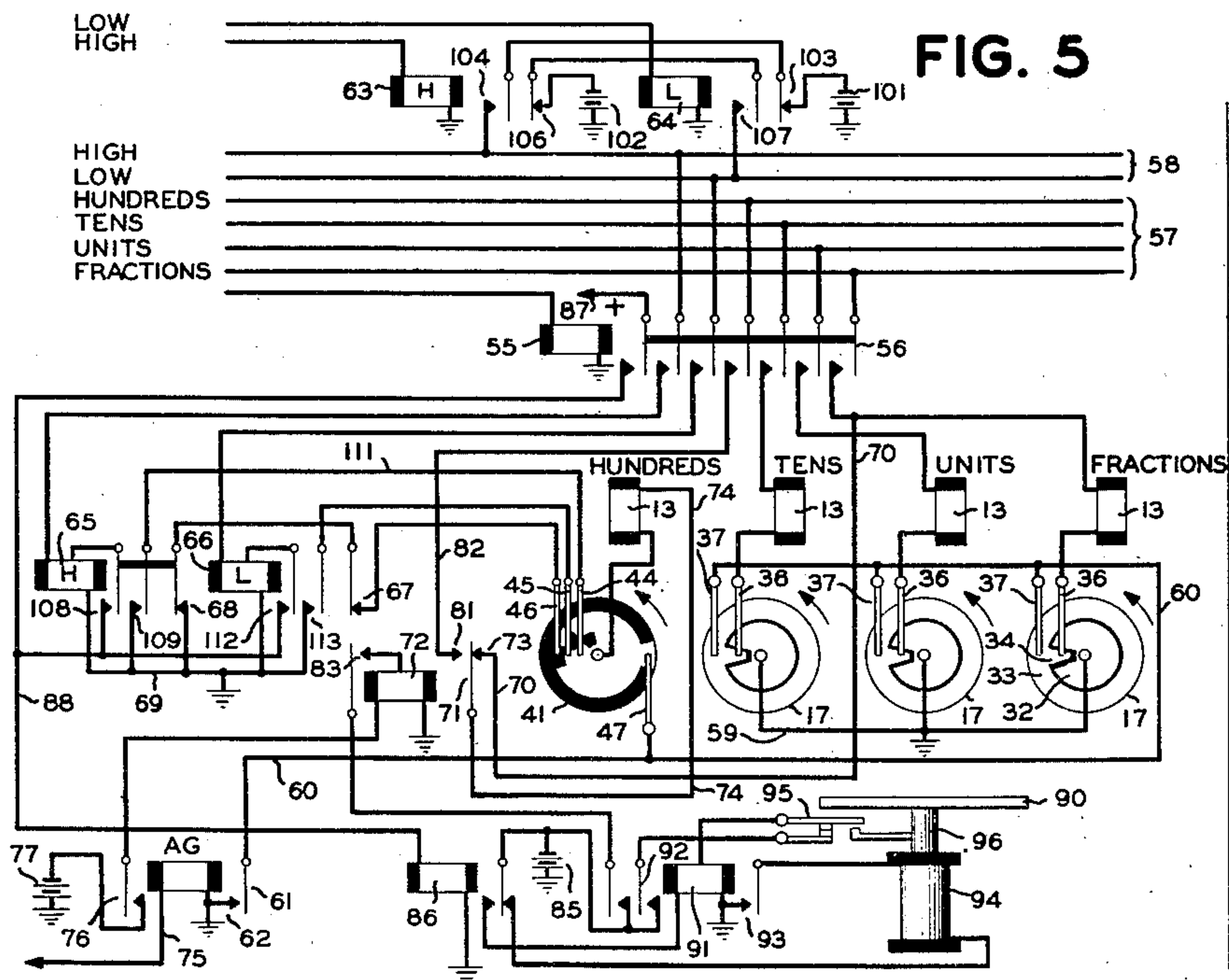


FIG. 6

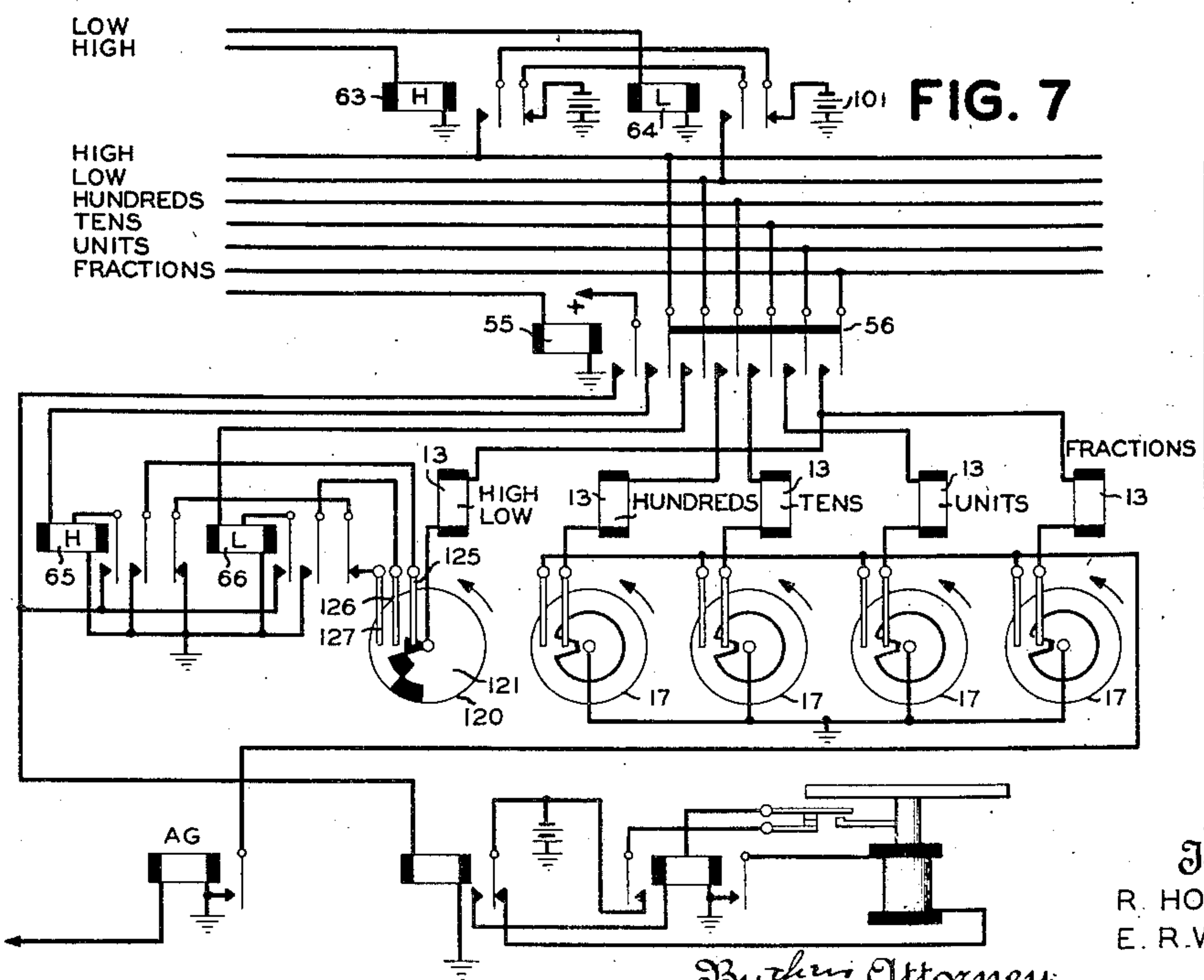
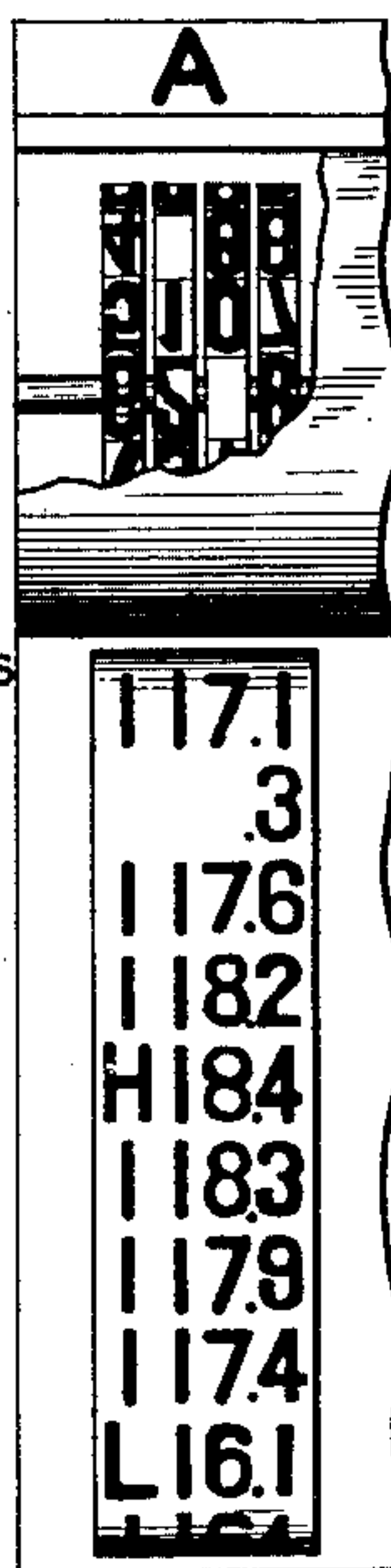
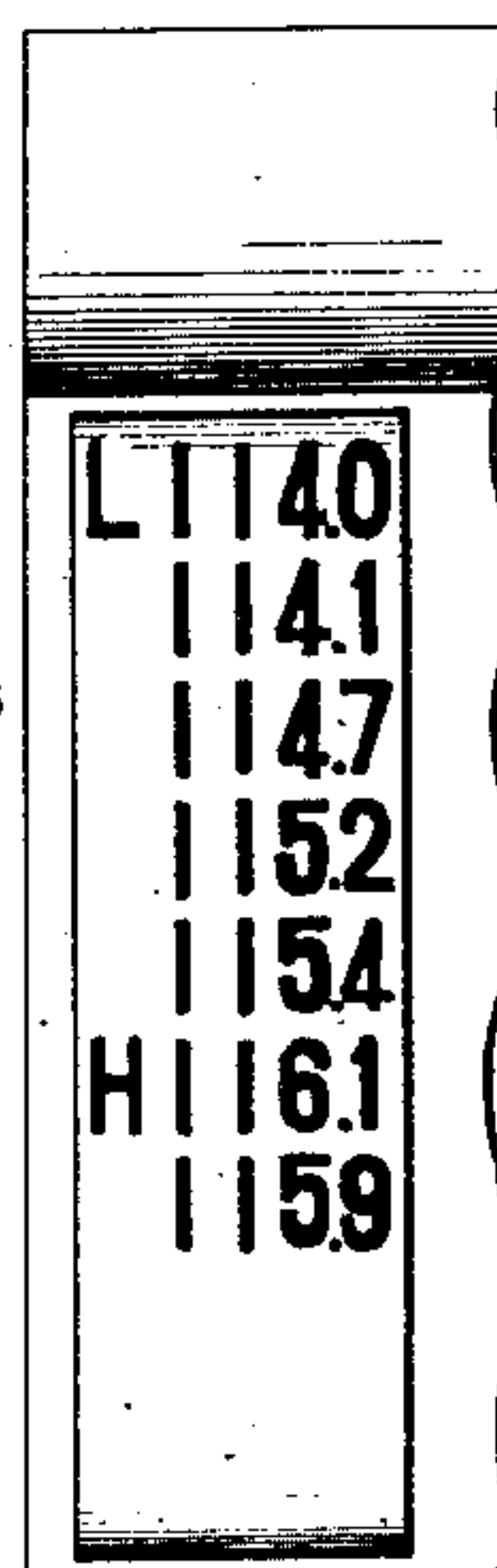


FIG. 8



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QUOTATION BOARD PRINTING UNIT

Application filed May 4, 1931. Serial No. 535,067.

This invention relates to a quotation board mechanism for automatically printing in visible form information concerning different items, such as stock, bond, and commodity quotations in response to telegraphic signals, and more particularly to apparatus which, in addition to displaying information of the usual character, such as quoted market value, can, when desirable be operated to indicate the fact that the information is of an unusual character, for example that a quotation represents a high or low value for the day; and it has for an object to provide a combined display unit with means for selectively displaying both types of information with one group of indicators. According to our invention, such indicators are preferably in the form of printing or type wheels arranged to display the information in printed form on a sheet or tape of paper, or other material.

A system now in commercial use for automatically posting stock quotations at a plurality of separate places, such as brokers' offices and banks, from a common transmitting point, involves the use of four channels of communication extending between the transmitting station and the receiving station embodying the quotation board apparatus, separate channels being employed to transmit signals corresponding to each of the hundreds, tens, units, and fractions (in eighths) values or digits of the quotation. The four transmitting channels may comprise four separate line wires or two line wires, each having battery of positive and negative polarity applied alternately thereto in a series of impulses, in conjunction with polarized relays at the receiving station for responding to the polarity of the current transmitted over each of the lines. One form of such a system is described and claimed in the co-pending application of Ray Hoover entitled "Electrical selecting and indicating system," filed November 11, 1929, Ser. No. 406,357 and assigned to The Western Union Telegraph Company.

In another form the transmission from a distant initial or sending station may be accomplished over a single wire to a local decoder or repeater station from which the

various channels of impulses are separated and sent out to the various quotation boards. Or again, the single wire may go directly to the subscriber's cabinet where a decoder separates signal channels and transmits them to the quotation board mechanism in the usual manner.

Quotation boards as heretofore constructed employ a group of four indicating units, each having a dial or drum bearing the numerals 1 to 9, 0 and a blank, four units being disposed side by side behind suitable apertures so that when properly set up the numerals on the dials may be directly observed to give the quotation. Ordinarily, five of such groups of indicators are provided for each stock or item, corresponding to the quotation "ranges" chosen to be posted, such as "yesterday's close," "open," "high," "low," and "last" quotations of the stock, and signals are transmitted to the quotation board to operate these at appropriate times. On the other hand, the number of range signals transmitted is by no means limited to five. Other signals representing any combination of the above ranges or signals to indicate "bid," "ask," "up," and "down" or any other desirable "range" or other information may be transmitted.

In an arrangement described and claimed by us in an application entitled "Printing quotation board," filed May 9th, 1930, Ser. No. 451,140, and assigned to Western Union Telegraph Company, it has been proposed to use, in place of one or more of the "range" groups of indicators provided for each stock, a printing unit which shall make the information visible in printed form on a paper tape or other sheet material. Ordinarily the group of indicators corresponding to the "last" quotation will be displaced by the printing unit. This arrangement enables the consecutive quotations to be kept in view for an extended length of time as new quotations are being printed on the tape, and thus indicate what is termed the "trend" of the stock being quoted upon.

It will be observed that in the quotation board system as above described, there is included among the groups of indicators for

the various stock "ranges" a group for the "high" and "low" ranges. However, when consecutive quotations occur in printed form, as for instance, on a strip or tape of paper, a person referring to the information displayed thereon in order to ascertain the trend of the stock being quoted upon, would find that the information would be more useful if there were means printed on the tape for indicating such quotations as represented a new "high" or a new "low" a "bid" or "asked" or other special value. Although each new "high", "low", "bid", or "asked" or other value could be indicated in a system having the required number of stock range indicators such as referred to above, their position with respect to other quotations of the stock would not be shown. In addition, in the printing unit of the type described in our aforesaid application, the various range quotations would occur printed on the tape, but they could not be readily identified without making a comparison between the printed quotations and the range indicators of the quotation board.

It is obvious that my invention may be embodied in one or more of the five groups of range indicators for indicating directly, instead of printing, the fact that the quotation displayed represents a "high", "low" or other special value. This may be accomplished by employing a unit in the indicator which will display a character indicating such information simultaneously with the characters indicating the value of the quotation.

More particularly, therefore, it is an object of our invention to provide a printing unit adapted to be used in a system such as described in the above mentioned applications which will have means to print an indication along with the quotation printed by such unit, which will signify that the quotation is of an unusual character, for example, that it represents a new "high", a new "low", a "bid", or "asked" or other quotation of special significance or value.

This is accomplished by providing an "H" and an "L", or a "B" and an "A", or other desirable characters on a type wheel, which may be either the type wheel corresponding to the hundreds digits or an extra type wheel included in the printing unit and arranged to print in a separate column, and which is arranged to respond to the "high", "low", "bid", "ask", or other suitable range selecting signal transmitted in connection with the stock quotation signals.

Therefore another object of our invention is to provide a type wheel unit having a type wheel with means to print an "H", "L", "B", "A", or other special character on the tape with or as a part of the quotation, and which may be selectively brought into position to print a predetermined one of the special

characters to designate the range or any other special characteristic of the quotation displayed.

Still another object is to provide a type wheel arrangement responsive to certain signal impulses to cause a predetermined special character carried by the type wheel to be rotated into printing position.

A still further object is to provide a special commutator arrangement which will control the rotation of the type wheel to bring the special characters into printing position in response to certain range signal impulses.

A still further object of our invention is to provide special control arrangement which will render the type operating means unresponsive to other signal impulses after it has responded to a range signal impulse which brings a special character into printing position.

These and other objects are effected by our invention, as will be apparent from the following description and claims taken in connection with the accompanying drawings which form a part of this application, in which:

Fig. 1 is a side elevation of the type wheel unit with one arm of the framework cut away;

Fig. 2 is a side elevation of the opposite side of the type wheel to that shown in Figure 1, and shows a commutator of the type utilized in connection with those type wheels of the printing unit which carry no special characters;

Fig. 3 is a view in elevation of the type of commutator utilized in connection with the type wheel carrying the special characters, when such type wheel carries in addition ordinary numerical characters;

Fig. 4 is a view in elevation of the type of commutator utilized in connection with a type wheel carrying only special characters;

Fig. 5 is a circuit diagram of a printing unit in which the type wheel for the hundreds digits carries the special characters in addition to the ordinary characters;

Fig. 6 is a diagrammatic view showing a section of a tape printed by the arrangement shown in Figure 5, and also the position of the type wheels;

Fig. 7 is a circuit diagram of a printing unit in which a separate type wheel is provided for printing the special characters; and

Fig. 8 is a diagrammatic view showing a section of a tape printed by the arrangement shown in Figure 7.

In the quotation board system described in the aforesaid co-pending Hoover application entitled "Electrical selecting and indicating system", a train of signals comprising three groups is utilized to operate the quotation board apparatus for properly posting each quotation. The signal groups are a "selec-

tor" group which selects the section of the quotation board which is allotted to the stock or commodity being quoted upon and which further selects the proper set of range indicators, such as "high", "low", etc.; a "restoration" group for bringing the selected indicators to unison position; and an "answer" group for setting up the quotation on the indicators. According to the present invention we propose to use the same type of signal train to operate the printing unit. The ordinary quotation is set up and printed by the printing unit in much the same manner as described in our aforesaid application, where the printing unit is substituted for the "last" range indicator.

In the description of our invention a quotation board arrangement using special characters to designate the "high" and "low" range values only has been chosen as illustrative of the principles involved. Since the characters in most common use are the letters "H" and "L", these will be used in the description. It is to be understood, however, that any other agreed symbols may be used instead of "H" and "L" to designate the "range" values.

For setting up the special type wheel in the printing unit to print the H or the L, we employ the signal included in the selector group of the train for the purpose of selecting the "high" or "low" set of range indicators, to select in addition a circuit which will cause the special type wheel to be set up and maintained with H or L in printing position, according to whether the selecting signal is the one which would select the "high" or "low" set of indicators.

According to our invention, each type wheel unit in a printing unit is preferably constructed and arranged substantially in accordance with the units described in the copending application of Ray Hoover, entitled "Stock quotation boards", filed April 3, 1931, Ser. No. 527,588, and assigned to The Western Union Telegraph Company, several of these units being assembled together to form the type wheel assembly of the printing unit. The construction of each of the type wheel units is substantially the same, except for the fact that the type wheel employed to print the special characters, carries "H" and "L" as the characters on two of its faces and has a special control commutator associated therewith.

Referring now to the drawings, we show in Figs. 1 and 2 a type wheel unit 10 which may be utilized to print ordinary characters in the quotation, and which when modified, as will presently be described, will also print the special characters. The unit comprises a framework 11, a type wheel 12 carried at one end of the framework, and an operating magnet 13 carried at the other end of the framework. The type wheel is rotatably

supported on a hollow shaft or spacing member 14 extending transversely between side arms embodied in the framework. A sleeve 15 surrounds the hollow shaft 14 and carries a ratchet wheel 16 at one side of the type wheel and a control commutator 17 at the other side. The ratchet wheel 16 and the commutator 17 are held in fixed relation relative to each other by portions of the sleeve being upset as shown at 18.

The type wheel has eleven flat faces formed on its rim. Ten of the faces bear the characters 1 to 9 and 0, and one of the faces is blank. The type wheel rotates in a counter clockwise direction as viewed in Fig. 1 and is moved the distance of one character, or one eleventh of a revolution, for each impulse of the actuating magnet 13. The type wheel is rotated by the ratchet in a step by step movement produced through a pawl arm 21 having a pair of pallets 22 and 23 which alternately engage the teeth on opposite sides of the ratchet wheel. A spring 24 holds the pallets in engagement with the ratchet wheel. An armature 25 extends from the left end of the pawl arm, near its pivot point, across the rear face of the magnet. Each stroke of the armature in a closing direction, in response to an electrical impulse transmitted to the magnet 13, causes the pawl arm to move upwardly, which with the outer pallet 22 at the right end of the pawl arm in engagement with the face of a tooth of the ratchet wheel, rotates the same counter clockwise one twenty-second of a revolution. Upon release of the armature the pawl arm is moved downwardly by a retractable spring 26 which with the inner pallet 23 in engagement with the face of a tooth on the other side of the ratchet wheel moves the latter in the same direction another twenty-second of a revolution, thus rotating the type wheel the space of one character for each impulse.

The desired number of type wheel units as described above are assembled in side by side relation, as shown in Fig. 6, to form the type wheel assembly for a printing unit. The type wheels of the several units are held in axial alignment by means of a stay rod 27 being passed transversely through the hollow shafts 14, this stay rod being shown in cross section at the axis of the type wheels in Figs. 1 and 2.

Obviously, when it is desired to print from the type wheels they may be set in printing position by rotating the same from the last set position until the proper character is moved into printing position or the type wheels may be restored to a predetermined unison position before each printing operation, as for instance, with the blank position thereof in printing position, and then set in the correct position for printing the desired characters by transmitting to their operating magnets impulses corresponding to

the number or digit which it is desired to print from each type wheel. We prefer to employ the latter method of operation for printing the numerical characters in order to bring the same in accord with the method employed for operating direct reading or indicator units which have been heretofore utilized in quotation systems, while for printing the special character, we prefer to employ the former method so that the printing mechanism may be operated in combination with an indicator board from the same signals as employed for operating the indicators.

According to our invention when a stock quotation is printed which represents a high value for the day, or a new high, or any other value which would be displayed on the high range indicator, as described in the foregoing applications, the letter "H" is printed along with the quotation. On the other hand, when a stock value is printed which represents low for the day, or a new low, or any other quotation which would be displayed on the low range indicator of the above mentioned system, the letter "L" is printed along with the stock quotation.

According to one embodiment, provision is made for printing the H and L in the hundreds position, in which case, it displaces the digit in the hundreds position for that quotation.

According to another arrangement the H and L are printed in a separate position or, in other words, in a separate column from the columns of the digits representing the quotation, preferably at the left of the hundreds position.

Referring to Figs. 3, 5, and 6, the embodiment of my invention as arranged to print the H and L in the hundreds position will now be described. The printing unit consists of four type wheel units arranged in axial alignment as shown in Fig. 6; one for each digit or column of digits occurring on the tape and corresponding to hundreds, ten, units, and fractions. The type wheel units arranged to print the tens, units, and fractions, are constructed according to the embodiment shown in Figures 1 and 2 and described above. The type wheel utilized for printing the hundreds digit is substantially identical in structure with the aforesaid units with the exception that two of the characters at the rim of the wheel have been removed and replaced by H and L, and the commutator 17 has been replaced by a special commutator such as shown in elevation in Fig. 3, and shown diagrammatically in Fig. 5 as the commutator on the extreme left.

The two characters replaced are preferably characters of higher value such as the 9 and the 0. The H may occur in the place of the 9, and the L occur in the place of the 0. The displacement of characters of higher value in the hundreds column detracts very little

from the usefulness of the hundreds type wheel unit because of the fact that stock values of above \$899.00, for instance, would rarely be quoted. Of course, the blank position is allowed to remain on the type wheel because it is extremely desirable to have no character printed from this type wheel in certain instances. When a high or low stock quotation is to be printed, the hundreds type wheel is rotated so that the H or the L, as the case may be, is rotated into printing position. In the quotation thus printed no numerical digit or, in other words, no hundreds value will occur in the hundreds column for that quotation. This is not objectionable, however, because the hundreds value may be readily interpolated from the normal quotations printed just prior to the higher or lower quotations, for rarely will the hundreds value of the quotation be changed with the printing of the new higher or lower quotation. In case it should change the new value would be apparent or readily interpolated.

The commutator 17 controlling the type wheels for printing the tens, units, and fractions comprises a disc 31 of insulating material having an inner and outer annular segment of conducting material 32 and 33 mounted on one face of the disc. The inner and outer conducting segments are spaced apart so as to be insulated from each other. The outer segment 33 has a sector 34 on one side projecting inwardly into a recess 35 in the inner segment. Two brushes 36 and 37 are arranged to press upon the segments as they rotate, and are positioned so that brush 36 normally pressing on the inner segment will pass onto the inwardly projecting sector 34 of the outer segment as the sector passes underneath the tip of the brushes. The commutator is secured in such angular relation to the type wheel that the blank comes into printing position as the inner brush passes onto the sector 34 of the outer segment. The purpose of this arrangement will be explained later.

The commutator 41 for controlling the type wheel in the hundreds position is shown in Figure 3 and comprises an inner conducting disc or segment 42 and an outer nonconducting segment 43 mounted on the outer face of a suitable disc. The face of the commutator may be considered as being divided into four zones over which four separate contact brushes 44, 45, 46 and 47 slide as the commutator and type wheel rotate. The inner zones comprise a portion of the conducting surface 42 interrupted at one point by small non-conducting segments 48, 49 and 50 in the respective zones, while the other zone comprises the non-conducting surface 43 interrupted by a small segment 52 of the conducting surface.

A description of the operation of a printing unit embodying these features will now

be given. Assuming for instance, that a normal quotation for a stock "A" is to be posted and that such quotation is 118.2 and that stock posting apparatus including the printing unit as diagrammatically illustrated in Fig. 5 is allotted to this stock. Responsive to the stock selecting signals the selector mechanism selects the stock relay 55 and operates the same to close the multicontact switch 56. This connects the circuits and relays associated with the printing unit to the four signal channel lines 57 and the two "high" "low" lines 58. These are bus lines running to each stock posting section of the quotation board. Since neither H nor L is to be printed in connection with this quotation, there is no potential on either of the "high" or "low" bus lines. The multicontact switch 56 having been closed, the printing unit is in condition to receive the second or restoration group of signals comprising a series of ten impulses over the four signal channel lines 57. These impulses are communicated through the multicontact switch 56 to the windings of the respective actuating magnets 13.

As already described the three type wheels for printing the tens, units, and fractions digits operate in the same manner. It is, therefore, sufficient to describe the operation of the fractions type wheel. The operating circuit for the magnet of this type wheel is completed either through the inner brush 36, the inner segment 32, and the ground wire 59 or the inner brush 36, the sector 34, outer brush 37, and actuating ground wire 60.

Let it be assumed that the commutator 17 instead of being in the position corresponding to unison or blank position, as shown in Figure 5, is in some other position such as shown in Figure 2. In such a case the inner brush 36 is in contact with the inner conducting segment 32, and the circuit is completed through the commutator shaft and the grounded wire 59 as shown.

Let it be further assumed that the type wheel and commutator are set with the numeral 4 in printing position. The first seven restoration impulses received steps the type wheel around to bring the numerals 5, 6, 7, 8, 9, 0, and the blank portion successively into printing position. At the moment the blank portion of the type wheel reaches printing position the inner brush 36 engages the sector 34 of the outer segment which, as stated before, is insulated from the inner grounded segment. The sector 34 and the outer segment 33 are ungrounded at this time, the actuating ground contact being open, and consequently the circuit from the magnet 13 is broken and the magnet remains unresponsive during the transmission of the three remaining impulses. The type wheel, therefore, remains set in its unison or blank position at the end of the transmission of the

restoration impulses. In like manner, the type wheels for printing the tens and units digits will be restored to their respective blank position from whatever prior position they might have been set, leaving all three type wheels in a corresponding position or, in other words, in a unison position.

Ten restoration impulses enable the type wheel to be set in blank position from the most unfavorable previous setting thereof, that is, with the numeral 1 in printing position.

However, the provisions for restoring the hundreds type wheel to blank position, to which position it is to be restored in connection with the present assumed quotation of 118.2 as well as in all cases when neither H nor L is to be printed, is somewhat different from the other type wheels. The control commutator for this type wheel is shown in Fig. 3 and the circuit connections in Fig. 5. For the operation of restoring the hundreds type wheel to blank position, it is assumed that it is now in some position other than blank, such as for instance the position to print the numeral 6. In this position the brush 47 in contact with the outer zone of the commutator will be in engagement with the non-conducting sector 43 and the brushes 44, 45 and 46 in contact with the three inner zones will be in engagement with the conducting disc 42. With the tongues of the main high and low relays 63 and 64 and the supplementary high and low relays 65 and 66 in position as shown in Figure 5, which is their normal position when neither H nor L is to be printed, it will be observed that the only brush 46 engaging the third or next to the outer zone will be grounded. The circuit is completed through the third zone, the outer tongue 67 of the supplementary low relay, the outer tongue 68 of the supplementary high relay, and the grounded wire 69 as shown.

In this manner, the circuit through the coil or windings of the actuating magnet of the hundreds type wheel is prepared for responding to the restoration impulses. However, instead of connection being made with the hundreds signal channel for the reception of the restoration impulses, connection is made therefor with the fractions signal channel. The reason for this is that in practice, in certain instances, it is customary to omit printing all of the digits or values in the quotation except the last, the other digits being obtained by reference to the indicator section for that stock, or other periodically printed quotations which include all of the digits. When such is the practice, the H or L would be printed in the quotation omitting the other digits except the last or fractions digit. It is for the purpose of stepping the H or L into printing position, as will be presently described, that the stepping impulses

during the restoration period are taken from the fractions signal channel.

Referring now to the diagram shown in Figure 5, a wire 70 branching off from the wire connecting the fractions operating magnet through the multicontact switch to the fractions signal channel, runs to the tongue 71 at the right end of a relay 72 controlled by the actuating ground relay AG. This tongue normally engages the contact 73 connected to a wire 74 leading to the coil of the hundreds actuating magnet. From this coil the circuit connects with the conducting disc 42 of the hundreds commutator. With transmission of the restoration impulses the actuating magnet will step the hundreds type wheel around in a counter clockwise direction, as viewed in Figure 5, until the brush 46 engaging the third zone is brought over the nonconducting segment 50 of this zone. This will occur at the end of the fourth restoration impulse, whereupon the ground connection for the circuit through the coil 13 of the actuating magnet will be broken and the magnet remain unresponsive for the remaining six of the ten restoration impulses. In this restored position the type wheel would have its blank face in printing position.

Between the end of the restoration impulse period and the beginning of the answer impulse period an impulse is received through wire 75 which operates the actuating ground relay. In Figure 5 each of the commutators are shown as normally restored in blank or unison position, and it will be observed that the outer commutator brush leading from each commutator is connected to the line wire 60 leading to the tongue 61 of the actuating ground relay. When the actuating ground relay has been operated, this tongue will be connected with the grounded contact 62, thereby grounding all of the aforesaid brushes, which will complete the circuit from the several operating magnets to the ground.

However, since the hundreds type wheel magnet receives its restoration impulses from the fractions signal channel, it will be necessary to connect it with the hundreds signal channel before the answer impulses can be transmitted thereto. This is accomplished by the actuating ground relay at the time the actuating ground is applied. When the actuating ground relay AG is operated, an auxiliary tongue 76, connected with a grounded battery 77, applies battery to the relay 72 which disconnects the actuating magnet lead wire 74 from the wire 70 in the fractions signal channel circuit and connects the wire 74 to the wire 82 leading to the hundreds signal channel. As the last named relay 72 operates it closes a contact 83 applying a locking circuit to this relay. Current for this is supplied from a grounded battery 85, through a circuit prepared by a relay 86 which was operated when the multicontact switch 56 closed.

The circuits to the several stepping magnets are all now completed and ready to respond to the answer group of signal impulses. As soon as the first impulse is received by each stepping magnet, the type wheels and commutators are stepped around the space of one character; simultaneously therewith the inner brushes 36 of the commutators for the tens, units, and fractions type wheels will be moved off the inwardly projecting sector 34 of the outer conducting ring or segment 33 onto the inner conducting segment 32, thus reestablishing normal ground through the inner segment, the axis of the commutator and the grounded lines 59, as shown. At the same time, the first answer impulse received by the stepping magnet of the hundreds type wheel steps that wheel around the space of one character causing the brush 47 engaging the conducting sector 52 (see Fig. 3) of the outer zone to pass onto the non-conducting sector 43, interrupting the actuating ground circuit; simultaneously therewith the brush 46 engaging the third zone passes from the non-conducting sector 50 onto the conducting plate 42 of the commutator which now establishes the ground circuit for the stepping magnet through the tongue 67 of the L relay and 68 of the H relay to the grounded line 69.

For setting up our assumed quotation of 118.2, one answer impulse is transmitted to the stepping magnet of the hundreds type wheel which steps it around to place the digit 1 in printing position. Likewise, one impulse is transmitted to the stepping magnet of the tens type wheel to step the digit 1 thereon in printing position. Eight signal impulses are transmitted to the units wheel stepping magnet stepping the type wheel around the space of eight characters bringing the digit 8 into printing position. Two signal impulses are transmitted to the fractions stepping magnet stepping that type wheel around the space of two characters bringing the digit 2 into printing position.

After the answer signals have been received and the type wheels have been set up in response thereto, the quotation is printed by means of a platen 90 being brought up against the faces of the type wheels to imprint the characters on a suitable paper tape. The platen is actuated in the following manner.

During the transmission of the first or selecting group of signal impulses the stock relay was closed and battery was applied to relay 86 which in turn closed a circuit applying the battery 85 to the platen solenoid controlling relay 91 which through the tongue 92 closed a locking circuit through the relay from the same battery. The operation of this control relay prepared a circuit from a grounded contact 93 through the platen actuating solenoid 94 back to a contact leading to the tongue of the aforesaid relay 86 which

has battery applied thereto and which was removed from the solenoid circuit contact when the aforesaid relay was actuated. In the locking circuit of the platen control relay 91 is a switch 95 adapted to be opened as the platen 90 rises to meet the type wheels. The circuit having been prepared in this manner, at the end of the transmission of the answer group of signals, the stock relay releases the multi-contact switch and opens the circuit completed therethrough which in turn causes the relay 86 to release the tongue connecting with the grounded battery 85 which then moves over to complete the circuit from the battery through the platen actuating solenoid 94 and the previously grounded contact 93 thus energizing the solenoid to carry the core 96 thereof and the platen 90 mounted thereon upward to meet the type wheels. During this upward stroke the locking circuit switch 95 is opened which releases the tongue connecting with the grounded contact 93 and opens actuating solenoid circuit permitting the platen to return to normal position. At the time the stock relay 55 was released, or in other words the circuits therethrough disconnected, the actuating ground relay was released also. This leaves the circuit controlling the printing unit in condition for reception of the next train of signals for posting the next stock quotation.

We will now assume that the next stock quotation is a new high quotation and the H is to be printed along with the posting of a quotation. The new quotation will be assumed as H18.4. For setting up the printing unit to post this quotation the train of signals comprising the three groups will be transmitted thereto as in the above described case of a normal quotation. However, in the first or selecting group of signals a signal impulse will be included to operate the main H relay 63 which initiates the preparation of circuits to bring the H on the hundreds type wheel into printing position. This signal impulse corresponds to the impulse in the system described in the aforesaid Hoover application entitled "Electrical selecting and indicating system", for selecting the "high" range indicator unit. The circuit from the main H relay is connected in the system to receive this "high" range signal impulse.

Referring to the upper portion of the diagram in Fig. 5 it will be seen that separate batteries 101 and 102 are provided to correspond with the main H relay 63 and the main L relay 64. The H relay battery 101 is connected through the normally closed contact 103 of the L relay, thence through the normally open contact 104 of the H relay to the branch which extends up from the top or "high" bus line. The L relay battery 102 is connected through the normally closed contact 106 of the H relay, thence through the

normally open contact 107 of the L relay to the branch which extends up from the "low" bus line. When the H relay is actuated in response to the range signal of the selecting group, the tongues are moved toward the left closing the contact 104 applying the H battery 101 to the H bus line branch, at the same time opening the contact 103 to the L battery, so that battery potential is present in only one of the shunt wires between the two relays 63 and 64. The reason for applying battery through the interlocking action of both relays is to prevent both a high and a low signal being transmitted to the printing unit at the same time.

Battery having been applied to the H bus line, when the stock relay is actuated closing the multi-contact switch 56, battery will be applied from the H battery through the second contact from the left of the multi-contact switch to the H supplementary relay 65 establishing a circuit through this relay and grounded wire 69, as shown. At the same time, battery is also applied from the branch wire 87 at the left of the multi-contact switch marked plus, placing potential on the contact 108 at the left of the auxiliary H relay 65. The relay 65 being actuated closes a tongue on this contact establishing a locking circuit through the relay to the grounded wire 69. A branch 109 from the grounded wire leads to a tongue which is closed upon operation of the relay 65 and grounds a wire 111 leading to the inner or first commutator brush 44 engaging the inner zone of the hundreds wheel commutator. At the same time, it will be observed, the circuit from the second brush 45 is completed through the central contact 113 of the L relay 66 which is normally open but since the L relay has not been operated, the second brush is left ungrounded. The ground circuit from the third brush 46 through the normally closed contact 67 of the L relay 66 and the normally closed contact 68 of the H relay 65 will be opened at the contact 68 by the H relay when it is actuated. In this manner, ground circuit is established for the first brush 44 while the circuit to the second and third brushes 45 and 46 is open, the circuit to the fourth brush 47 being normally open until after the actuating ground is applied at the end of the second group of signals.

The various circuits having been thus prepared by the first or selecting group of signals, the printing unit is in condition now for responding to the second or restoration group of signals. As already described, in connection with the previous example, the windings of the stepping magnet of the hundreds wheel will receive its restoration impulses through the fractions signal channel. As the stepping magnet of the hundreds wheel responds to the restoration impulses it will be stepped around until the non-conducting segment 48

of the inner or first commutator zone (see Fig. 3) passes under the first brush 44, breaking the ground circuit of the magnet, after which it will remain unresponsive to the remaining restoration signals. As the non-conducting segment 48 in the first zone of the commutator corresponds to the printing position of the H character on the hundreds type wheel, the latter will now be in position for printing this character in the hundreds column on the paper recording tape. It is to be observed that the position to which the hundreds type wheel has now been restored is not its normal position, and further that since the brush 47 connected to the actuating ground circuit is not in engagement with the conducting sector 52 of the fourth zone none of the brushes will be grounded when actuating ground is applied. Therefore, with H in printing position the hundreds type wheel will not respond to the answer impulses.

The restoration signals acting on the stepping magnets of the tens, units, and fractions type wheel will restore them to normal or blank position in the same manner as described in connection with the foregoing example. The restoration signal group having been received, the actuating ground is applied as in the former example, preparing the circuits for the reception of the answer group of signals. In case the practice should be to transmit only the last or fractions digit, four answer signal impulses will be transmitted to the fractions magnet 13 stepping corresponding type wheel around the space of four characters bringing the digit 4 into printing position, the tens and units type wheels remaining in their normal or blank position. In such instance, an answer signal would not move the hundreds type wheel, instead, its operating magnet being ungrounded, as described above, it would remain in its present position, which, it will be recalled, is in position for printing the H character. Then, as described in connection with the foregoing example, the platen solenoid will be actuated to lift the platen and print the quotation as H blank blank point 4, (H — — .4), in other words the quotation as posted on the recording tape will consist of the H, two blank spaces in which nothing appears, the point, and the 4. A similar quotation is illustrated in Fig. 6 as .3, it being the second quotation occurring on the tape. This quotation, interpolating from the one appearing just above, will be read as 117.3.

In case the practice is to print all of the digits of the quotation, answer signals will be transmitted over each of the four signal channels. The fractions type wheel will be stepped into position as described above for printing the digit 4. Similarly, the units type wheel will be stepped around eight spaces in position to print the digit 8. The tens type wheel will be stepped around one

space in position to print the digit 1. However, as for the hundreds type wheel, it will be remembered that it was restored with the H in printing position, and that in this position the stepping magnet is ungrounded and, therefore, unresponsive to any answer signal. This will leave the hundreds type wheel in position to print the H when the platen is actuated. The platen is actuated as heretofore described and the quotation is printed in the form assumed, that is, H18.4. It will be observed that the quotation in this form will not have a numeral digit in the hundred position. However, such digit will be readily interpolated from the quotation appearing above it as the numeral 1.

The operation of the printing unit will now be described in connection with the posting of a quotation representing a low value, in which L is to be printed in place of the digit appearing in the hundreds column on the recording tape. We will assume as an example, that the quotation to be posted is L16.1. The response of the various relays and circuits to the three groups of signal impulses in the signal train will be substantially the same as in the above described examples. The "low range" selecting signal will operate the main L relay 64 which will connect the L battery 102, through its interlocking relation with the main H relay 63 as heretofore described, to the L bus line. Upon operation of the stock relay 55, the multi-contact switch 56 will close and place the L battery potential on the L auxiliary relay 66 and move the tongues thereof toward the left, closing two sets of contacts and opening a third. This establishes a locking circuit from wire 88 having plus potential, through contact 112 and the relay 66 to the ground, a ground circuit through contact 113 to the second brush 45 of the hundreds type wheel commutator, and opens a ground circuit through contact 67 ungrounding the third brush 46 on the left side of the hundreds type wheel commutator. The H auxiliary relay 65 having remained in its normal position, it will be observed that the circuit through the middle contact 109 is open, which leaves only the second brush 45 on the hundreds wheel commutator grounded to establish a circuit through the coil of the stepping magnet.

The printing unit having responded to the selecting group of signals, the operating magnet of the several type wheels will now be prepared to respond to the restoration group of signals to step the type wheels around. Assuming for purposes of illustration, that a high quotation has been posted immediately preceding this operation and that the hundreds type wheel was set with the H in printing position, the operating magnet in response to the restoration signals would now begin stepping the hundreds type

wheel around from this position in a counter-clockwise direction. There being eleven faces on the type wheel, the L will be brought into printing position with the tenth or last restoration impulse and the type wheel will have been required to make a complete revolution, save on space. This represents the extreme conditions under which this type wheel would be called upon to function, and illustrate that with the commutator arrangement utilized, the type wheel can be rotated through normal or blank position and restored to some other selected position, which in this case was with the L in printing position.

The restoration signals will bring the tens, units, and fractions wheels into normal position as in the ordinary case. At the end of the restoration group of signals, the actuating ground is applied which establishes ground circuit to the coils of the stepping magnets for the tens, units, and fractions type wheels, but not to the coil of the stepping magnet to the hundreds type wheel. This, as explained in connection with example of posting a high quotation where H is printed, is because in this position the brush 47 connecting with the actuating ground wire 60 is on the non-conducting portion 43 of the fourth or outer zone, and cannot apply actuating ground, and as set forth above, both of the other brushes are open circuited and cannot establish a circuit to ground.

The actuating ground having been applied, the stepping magnets for the tens, units, and fractions type wheels will respond to the answer impulses transmitted over their respective signal channels to step them around in position to print the digits 16.1. However, as just explained above, the stepping magnet for the hundreds type wheel is ungrounded and remains with the L in printing position, just as set by the restoration signals. After the transmission of the answer group of impulses printing will be effected, as already described in connection with the aforesaid examples, and the quotation which will appear on the recording tape as L16.1.

Referring now to the other embodiment of my invention, as illustrated, particularly in Figs. 4, 7, and 8 it is possible to at all times print all the numeral digits comprising a quotation of four digits, and in addition thereto print H or L in connection with the high and low quotations in a column at the left of the hundreds column. To accomplish this, five type wheels, instead of four, are employed in the printing unit. Four of these operate in normal response to the signals sent over the hundreds, tens, units, and fractions signal channels, as in the case of the previous systems described in the aforesaid applications. The fifth type wheel is arranged to carry the special characters, which in the present embodiment are H and

L, and is arranged to bring H and L into printing position according to whether a "high or low range" selecting signal is transmitted to the quotation board.

The control commutator 120 for the fifth or HL type wheel is shown in Fig. 4. It is substantially the same as the control commutator for the hundreds type wheel in the other embodiment of my invention herein described, except that it has three zones instead of four, the fourth zone employed in connection with applying actuating ground being unnecessary. The commutator comprises a conducting surface 121 arranged in three zones, corresponding to H, L, and blank. The first, second, and third zones have non-conducting sectors 122, 123, and 124 respectively, which are so located that they will pass underneath one of the brushes 125, 126, 127 as the corresponding character comes into printing position.

Referring to Fig. 7, such a printing unit is shown in diagrammatic form in connection with the portion of the quotation board system circuit peculiar to the unit. In Fig. 8 a section of the recording tape is shown, illustrating the type of quotations posted by the printing unit illustrated in Fig. 7.

The operation of this unit will now be described by assuming, as examples, one quotation of the ordinary type, one containing H, and one containing L. The operation of the circuits and relays is substantially the same as the embodiment already described, and a detailed analysis will not be given in connection with this embodiment. For the ordinary quotation assume that 115.4 it to be posted. In response to the first or range selecting group of signals the stock relay 55 will be actuated, closing the multi-contact switch 56 and establishing a signal circuit from the four signal channels through the coils of the stepping magnets 13 of each of the four numerical character type wheels the control commutator 17 to the grounded wire as shown. The circuit to the stepping magnet for the special or HL character type wheel is connected from the incoming line for the fractions type wheel, and continued through the conducting portion 121 of the HL type wheel commutator 120 (see Fig. 4). From the conducting portion of the commutator the circuit is completed through the outside brush 127, a normally closed contact of the auxiliary L relay 66 and a normally closed contact of the auxiliary H relay 65 to the grounded wire 69.

When the restoration signals are received, the four normal character type wheels will be stepped around and restored to their union or blank position, which will take place in accordance with the foregoing description in connection with the other embodiment. The HL type wheel will be stepped around until the non-conducting sector 124, corre-

sponding to blank in the outer zone of the commutator has come underneath the outer brush 127, thus opening the ground circuit from the stepping magnet and stopping the HL type wheel with the blank in printing position.

At the end of the restoration period the actuating ground is applied through the operation of the relay AG establishing a ground circuit from the coils of the stepping magnets in the usual manner, thus preparing the printing unit for the answer signal impulses. It will be observed, however, that the actuating line does not connect with the commutator of the fifth or special HL type wheel, and therefore, this type wheel will not respond to the answer signal group. The actuating ground having been applied, the stepping magnets of the four character type wheels will respond to the answer signals and will be stepped around until the hundreds wheel presents the numeral 1 in printing position, the tens the numeral 1 in printing position, the units the numeral 5 in printing position, and the fractions wheel the numeral 4 in printing position after which printing will be effected as previously explained, thus posting the assumed quotation. As already stated, the HL type wheel was restored to blank position and rendered unresponsive of the answer group of signals and, consequently, it will print no character when the printing platen is operated.

It will now be assumed that it is desired to post a quotation which represents a high quotation, as for example, H 116.9. The numerical part of the quotation will be set up on the type wheels after being restored to normal blank position in the same manner as in case of an ordinary quotation. The HL type wheel in this case is set with the H in printing position. This is brought about by actuation of the H relay 63 in response to a "high range" selecting signal impulse in the first signal group. The actuation of this relay connects battery 101 through the multicontact switch 56 to the auxiliary high relay 65 which operates to ground the inner brush 125 engaging the inner or first zone of the HL type wheel and at the same time operates to unground the outer brush 127 engaging the third zone. The circuit for the brush engaging the middle zone being normally open at the auxiliary low relay 66 therefore, only the inner brush 125 remains grounded. As restoration impulses are received from the fractions type wheel signal channels the HL type wheel is stepped around until the non-conducting sector 122 in the inner zone of the commutator is brought under the brush 125 and the ground circuit from the stepping magnet interrupted thereby. This position of the commutator corresponds to the position of the type wheel set to print the H character. As already explained, this

type wheel is at all times unresponsive to the answer group of signals and, therefore, after the answer group has set the four numeral type wheels in position to print the numerals 116.1, the printing unit is ready for printing the quotation with H occurring in front or to the left of the numerical part of the quotation. As a result, when the platen is actuated, the assumed quotation will be printed at H116.1.

In like manner, if we assume that a quotation is to be posted which represents a low, such as for example, L114.0, the HL type wheel will be set up to print an L by the transmission of a "low range" signal, and the other type wheels in the printing unit will be set up in the usual manner. The "low range" signal operates the low relay 64 to apply battery to the low auxiliary relay 66 which operates to apply ground to the middle brush 126 of the HL commutator 120, at the same time, ungrounding the outer brush 127, the inner brush 125 at this time being normally ungrounded. In this manner, the HL type wheel is prepared to be stepped around by the restoration signals until the non-conducting sector 123 in the middle zone of the commutator comes underneath the brush 126 interrupting the circuit through the coil of the stepping magnet with L in printing position, where it will remain, the type wheel being unresponsive to the restoration signals. After HL type wheel has been set to print L in this manner, and the other type wheels having been set up in the normal manner, the platen will be operated printing the quotation L114.0 as assumed.

From the foregoing description of our invention, it will be seen that we have devised a printing unit arranged to print characters which will designate "high" and "low" quotations as they occur in the stock sales or other commodity reports and, by this means, enable the printing unit to display information in addition to the "trend" of a stock or commodity posted. In this way stock quotation boards are rendered more effective and more complete to better enable an observer to associate the immediate trend of stock with the progress of the day's quotations.

It is obvious from the foregoing that the printing unit might be equipped with type wheels carrying the letters "B" and "A" or other symbols instead of or in addition to the "H" and "L" to designate "bid" and "ask" quotations. Likewise, it is obvious that the special type characters need not be limited to one or one pair, and that a printing unit may be equipped for printing any desired number of special characters by suitably modifying the structural arrangement.

It will be apparent, also, to those skilled in the art that while we have shown our invention as embodied in and applied to a printing unit, the principles set forth might be

embodied in a unit utilizing indicator wheels or other means to display the characters to direct view instead of in printed form.

While we have shown our invention in but two forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible to various other changes and modifications without departing from the spirit thereof, and we desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

We claim as our invention:

1. In quotation board systems, a printing unit for printing a number of quotations in consecutive order and embodying, in combination, one or more type wheels arranged for printing numerical characters to represent the quantity value of the quotations, and another type wheel carrying one or more special characters and arranged to respond to selective signals designating any desired one of the special characters for printing the same, in connection with certain quotations, to designate a quality value of the quotations.

2. In quotation board systems, a printing unit for printing a number of quotations in consecutive order and embodying means including one or more type wheels carrying the numerals 1 to 9 and 0 arranged for printing the quantity value of the quotations, and means including an additional type wheel carrying the letters H and L said means being arranged to respond to selective signals designating either the H or the L for printing the same, in connection with certain quotations, to indicate the quality value or range of the quotation.

3. In quotation board apparatus, a printing unit for printing a number of quotations in consecutive order and embodying means including one or more type wheels carrying the numerals 1 to 9 and 0 and arranged for printing certain digits in the quotations, and means including another type wheel arranged for printing a certain other digit in the quotation and carrying certain lower numerical characters and carrying in addition letters, characters, or symbols in place of certain higher numerical characters and arranged to print a suitable numerical character in connection with the usual quotations, and in response to special signals received in connection with other quotations to selectively print a letter, character, or symbol.

4. In an electrical indicating system, the combination of a set of indicators, means associated with each indicator for actuating the same in response to signal impulses, means for controlling said actuating means to cause the indicators to be restored to unison position, and means for selectively modifying the controlling means associated with one or more of said indicators to cause the same to be re-

stored to some position other than unison position.

5. In an electrical indicating system, the combination of a printing unit embodying a set of type wheels, actuating means for each type wheel, means operable to energize the actuating means in response to a certain group of signal impulses in a train of impulses for causing the type wheels to be restored to a unison position, and a combination of relays operable in response to signal impulses selectively inserted in another group of impulses in the train for establishing a circuit which will cause at least one of the type wheels to be restored to a position other than the unison position.

6. In quotation board apparatus for posting information relating to commodity or other items, a printing unit embodying a set of character carriers, actuating means for each character carrier, means associated with the actuating means to render the character carrier responsive to a train of signal impulses including a selecting group, a restoration group, and an answer group, and means responsive to signal impulses in the selecting group to render at least one of the character carriers selectively responsive to either the restoration group of signals alone or both the restoration and answer group of signals.

7. In quotation board apparatus for posting information relating to commodity or other items, a printing unit embodying a set of type wheels, actuating means for each type wheel, and means associated with the actuating means to render the type wheels responsive to a train of signal impulses including a selecting group, a restoration group, and an answer group, and means responsive to signal impulses in the selecting group to render at least one of the type wheels selectively responsive to either the restoration group of signals alone or both the restoration and answer group of signals.

8. In an electric indicating system, the combination of a set of indicators, an electromagnet associated with each indicator for actuating the same in response to signal impulses, means for interrupting the flow of current to said electro-magnetic means, said interrupting means being arranged to interrupt the current to the magnet of each indicator as the latter reaches a predetermined position in its rotation, and means to selectively control the circuit interrupting means for one of said indicating magnets to interrupt the current as the indicator reaches one of a plurality of predetermined positions in its rotation.

9. In a quotation board apparatus for posting information concerning commodities or other items, a unit embodying a plurality of rotors each arranged to carry a series of characters at its periphery, at least one of said rotors being arranged to carry special

characters at its periphery, actuating means for each rotor, means associated with each actuating means for rendering said rotors responsive to one combination of signal impulses for causing the same to present predetermined regular characters in a definite angular position, and additional means associated with the actuating means for the rotor or rotors carrying special characters for rendering said rotors responsive to another combination of signal impulses for causing the same to present predetermined special characters in said position.

10. In quotation board apparatus, the combination of a printing unit embodying a set of type wheels carrying type characters on their periphery at least one of said type wheels carrying special characters on a portion of its periphery, actuating means for each type wheel, means associated with the actuating means to render the type wheels responsive to a train of signal impulses, for bringing the type characters into printing position, and means responsive to certain selective signal impulses in the train to render the actuating means for the type wheel carrying the special characters responsive to one combination of signal impulses in the train to bring one of the special characters into printing position, or to another combination of signal impulses to bring one of its regular characters in printing position.

11. In a printing unit for quotation boards, the combination of a type wheel unit including a type wheel having faces formed at its periphery and carrying thereon a series of characters including a blank, certain of said characters being adapted to convey information representing value, certain other of the characters adapted to convey information of a significance other than value, electro-magnetic actuating means for rotating the type wheel in response to electric signal impulses, and means cooperating to complete an energizing circuit through said actuating means and to selectively interrupt such circuit to bring either the ordinary or special characters carried by the type wheel into printing position.

12. In an electrical indicating system, the combination of a printing unit embodying a set of type wheels, electro-magnetic means operable to rotate each type wheel, means for rendering the electro-magnets responsive to certain impulses in a train of signal impulses to rotate the type wheels, means for controlling the response of the rotating magnets to stop the type wheels in a predetermined unison position, and means for modifying the control means to cause at least one of the type wheels to stop in a position other than the predetermined unison position.

13. In a quotation board system, the combination of a printing unit embodying a set of type wheels, and electro-magnetic means

associated with each type wheel for rotating the same in response to signal impulses, means to establish a signal impulse circuit through each magnet to the ground, a commutator for each type wheel connected in series with the impulse circuit and arranged to rotate with the type wheel, said commutator embodying means to interrupt the impulse circuit in accordance with a predetermined angular position of the type wheel, and means cooperating with the commutator of one or more of said type wheels for selectively modifying the circuit interrupting action of the commutator to cause the type wheel to be restored to one of a plurality of predetermined positions.

14. In an electrical indicating system, the combination of a printing unit embodying a set of type wheels, including one or more regular type wheels carrying at their periphery a series of type characters, and a special type wheel carrying at its periphery one or more special characters, electro-magnetic means operable to effect rotation of each type wheel, circuit closing means for rendering the rotating means responsive to certain "restoration" impulses in a train of signal impulses to rotate the type wheels, circuit interrupting means for controlling the response of the rotating means to stop the regular type wheels in a predetermined unison position, control means operable in response to impulses selectively included in the train for causing the rotating means of the special type wheel to stop the same at a position displaying a special character, means operable to render the rotating means of the type wheels restored to unison position responsive to "answer" impulses in the train for advancing them to a position which will display predetermined regular type characters, and means for rendering the special type wheel unresponsive to the "answer" group of impulses.

15. In a printing unit for quotation boards, the combination of the type wheel unit including a type wheel, electro-magnetic actuating means for rotating the type wheel in response to electric signal impulses, means cooperating to complete an energizing circuit through the actuating means and to interrupt said circuit when the type wheel is rotated into one of several positions, and means to select the position at which the interruption shall take place.

16. In a type wheel unit for quotation board systems, the combination of a control commutator comprising a conducting surface embodying a plurality of zones, a brush in engagement with each zone, and means to selectively complete a circuit through the commutator through any one of the brushes.

17. In a type wheel for quotation board systems, the combination of a type wheel, electro-magnetic means for rotating the type wheel, a control commutator disposed to ro-

tate with the type wheel and comprising a conducting surface embodying a plurality of zones, a brush in engagement with each zone, and means to selectively complete a circuit through the commutator to ground through any one of the brushes, each of said commutator zones including a non-conducting sector arranged to pass under the brush corresponding to that zone and interrupt the circuit through the brush and the commutator when the type wheel is in a predetermined angular position.

18. In a type wheel unit for quotation board systems, the combination of a type wheel having one or more special characters and a blank disposed at its periphery, electro-magnetic means for rotating the type wheel, a control commutator disposed to rotate with the type wheel and comprising a conducting surface embodying zones corresponding to each special character, a brush in engagement with each zone, the blank character zone brush being normally grounded, the special character brushes being normally ungrounded, and means including relays corresponding to each special character and arranged to selectively operate to ground one of the zone brushes and simultaneously unground the normally grounded zone brush corresponding to blank.

19. In a type wheel unit for quotation board systems, the combination of a type wheel having one or more special type characters and a blank disposed at its periphery, electro-magnetic means to rotate the type wheel to bring the type characters into printing position, a control commutator disposed to rotate with the type wheel and comprising a conducting surface embodying a zone corresponding to each special type character, a brush in engagement with each zone, means cooperating with the commutator to selectively complete a circuit through the commutator to ground any one of the zones and zone brushes, means associated with each commutator zone to interrupt the circuit through the zone and zone brush as the type character, corresponding to the zone selected, reaches printing position, and means associated with the commutator to reestablish the circuit through the commutator after a certain type character is brought into printing position.

20. A type wheel unit embodying a type wheel carrying one or more special type characters including a blank, a supporting framework, means supported by the framework and including an electro-magnet for rotating the type characters into printing position, a control commutator supported to rotate in a definite relation to the type wheel, means to establish a circuit through the magnet and the commutator in series, said commutator including a conducting surface arranged to embody a zone corresponding to each special

character including the blank, and a brush corresponding to each zone fixed to the framework with one end in engagement with its respective zone, and means to selectively complete the circuit to ground through either zone and brush, each of said zones including a non-conducting sector arranged to pass under the zone and brush, interrupt the circuit and arrest the motion of the type wheel as the corresponding type character comes into printing position.

21. In a type wheel printing unit for quotation board systems, the combination of a type wheel carrying a series of regular type characters and a plurality of special type characters including H L, and a blank, means including an electro-magnet for rotating the type wheel in response to signal impulses, a control commutator disposed to rotate with the type wheel and comprising a conducting surface embodying first, second and third regular zones corresponding to the H, L, and blank, respectively, and a fourth zone constituting an extra zone corresponding to the blank, a brush in engagement with each of the respective zones, means to selectively complete a circuit from the commutator to ground through any one of the regular zones and zone brushes, each of said commutator zones, not including the fourth, being formed to include a relatively small sector of non-conducting material so angularly disposed in relation to the respective special type characters that as the special type character corresponding to that zone comes into printing position, the non-conducting portion will pass under its zone brush and interrupt the circuit, whereby a predetermined special type character may be brought into printing position by selecting the circuit through the zone and brush corresponding thereto; said fourth zone having its surface formed to include a relatively small sector of conducting material so angularly disposed that it will pass under the zone brush as the blank character reaches printing position, and means to ground the fourth zone brush; whereby a predetermined regular character may be brought into printing position, by bringing the blank into printing position, regrounding the circuit through the fourth zone and brush, and thus render the rotating means again responsive to impulses which will cause the type wheel to rotate into the required position.

22. In quotation-board systems, an indicator unit for displaying a quotation and embodying, in combination, one or more indicator wheels arranged for displaying the quantity value of the quotations, and another indicator wheel carrying one or more special characters and arranged to selectively display in response to special signals received in connection with certain quotations, any

desired one of the special characters to designate a quality value of the quotation.

23. In quotation board apparatus, the combination of an indicator unit including an
5 indicator wheel having faces formed at its periphery and carrying thereon a series of characters including a blank, certain of said characters being adapted to convey information representing value, certain other of the
10 characters adapted to convey information of a significance other than value, electro-magnetic actuating means for rotating the indicator wheel in response to electric signal impulses, and means cooperating to complete
15 an energizing circuit through said actuating means to selectively interrupt such circuit to bring either the ordinary or special characters carried by the indicator wheel into display position.

20 In testimony whereof we affix our signatures.

RAY HOOVER.
EVAN R. WHEELER.

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