Oct. 6, 1936. R. HOOVER ET AL 2,056,452

PRINTING QUOTATION BOARD

Original Filed May 9, 1930 4 Sheets-Sheet 1

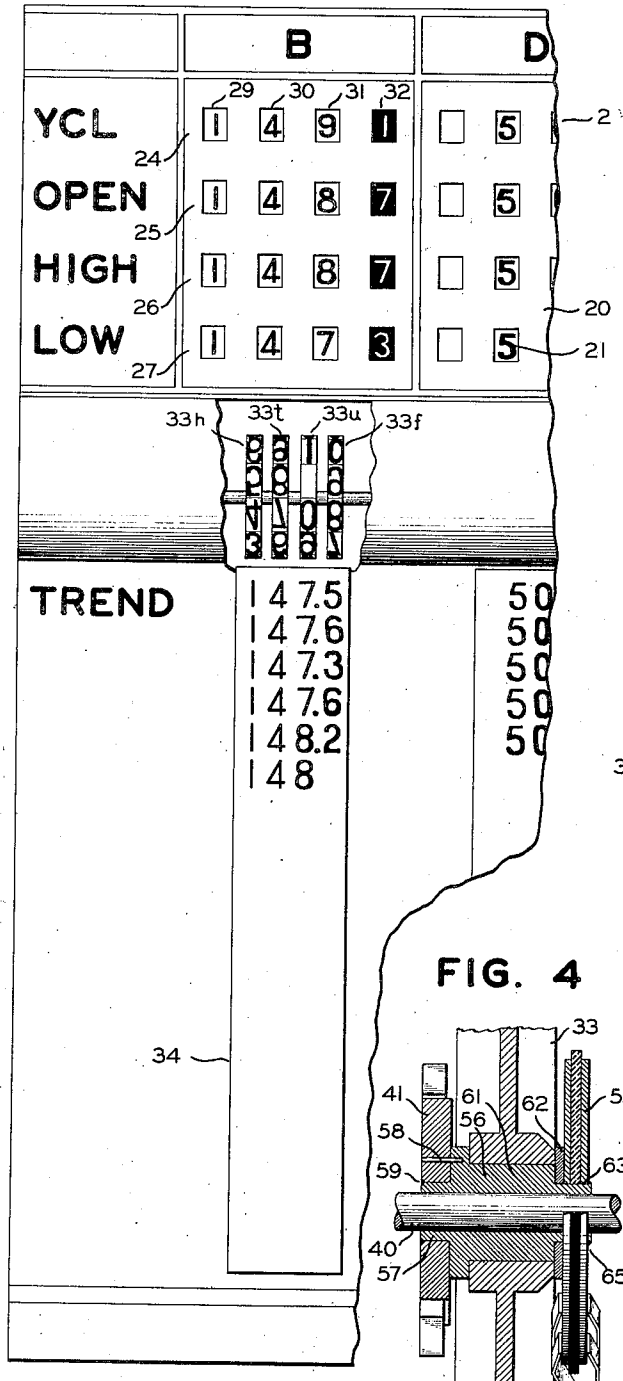


FIG. 1

FIG. 4

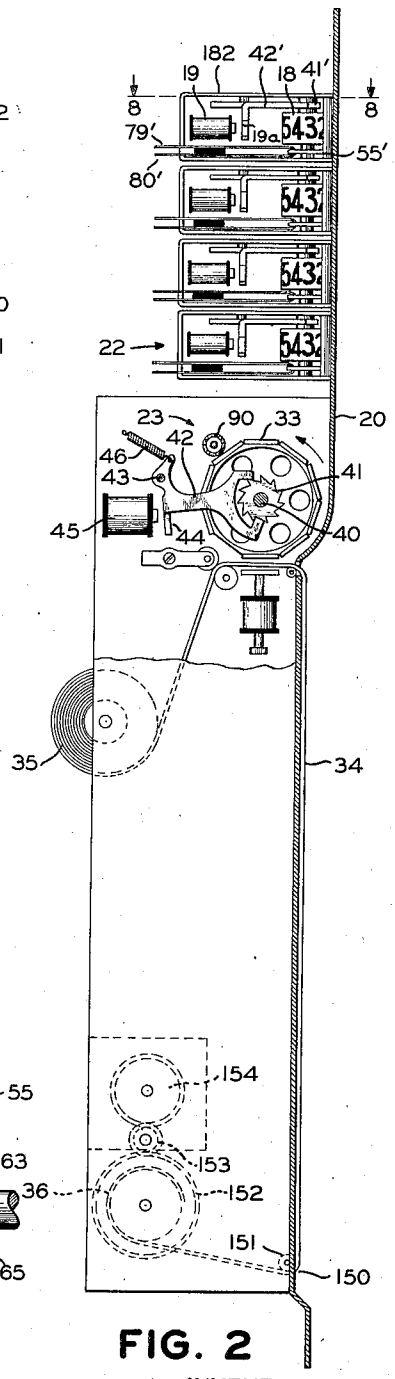


FIG. 2

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Oct. 6, 1936. R. HOOVER ET AL 2,056,452

PRINTING QUOTATION BOARD

Original Filed May 9, 1930 4 Sheets-Sheet 2

FIG. 5

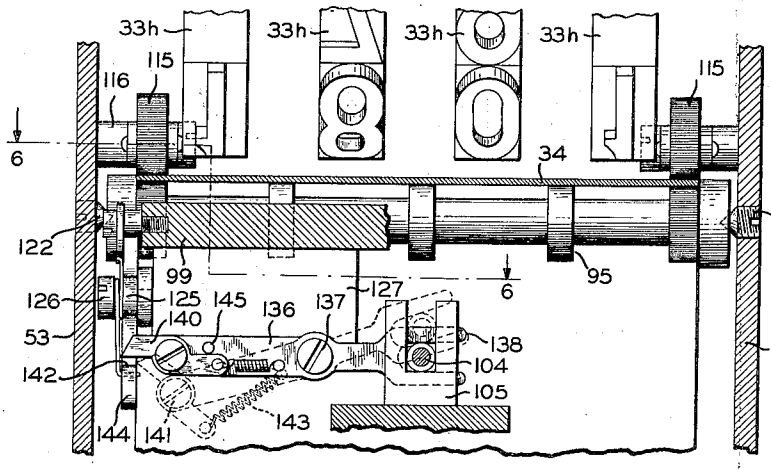


FIG. 3

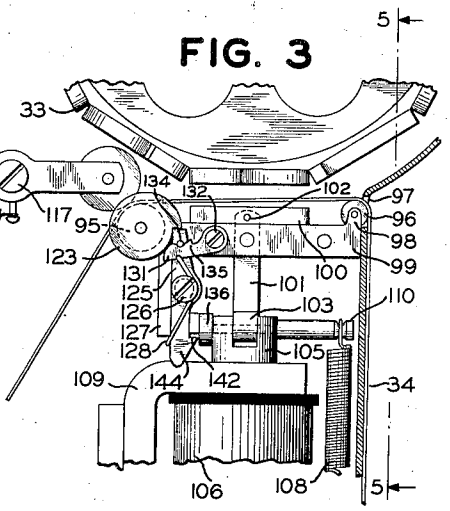


FIG. 6

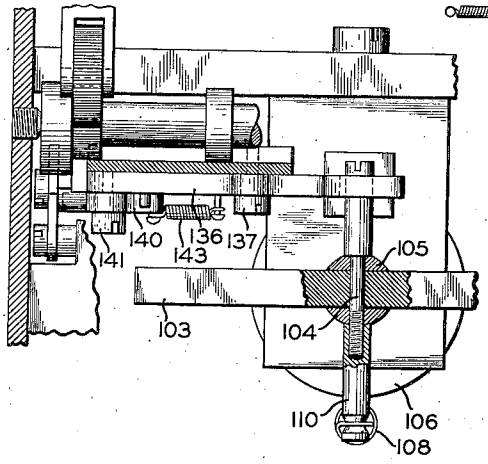


FIG. 7

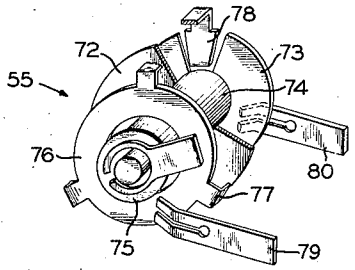
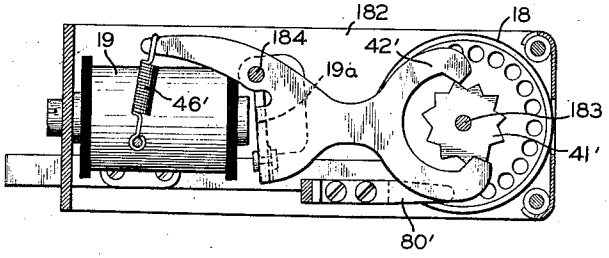


FIG. 8



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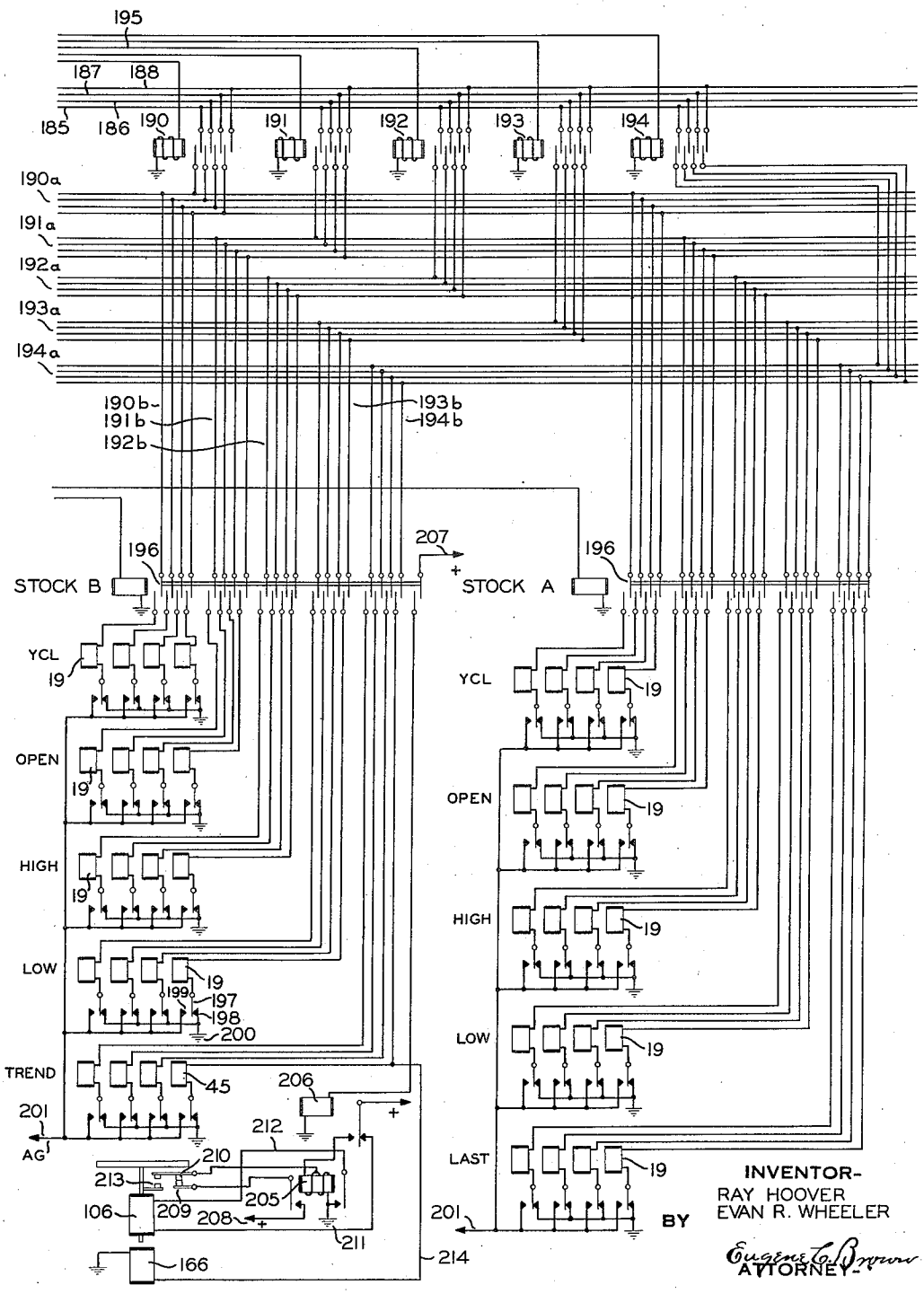
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Oct. 6, 1936. R. HOOVER ET AL 2,056,452

PRINTING QUOTATION BOARD

Original Filed May 9, 1930 4 Sheets-Sheet 3

FIG. 9



Oct. 6, 1936. R. HOOVER ET AL 2,056,452

PRINTING QUOTATION BOARD

Original Filed May 9, 1930 4 Sheets-Sheet 4

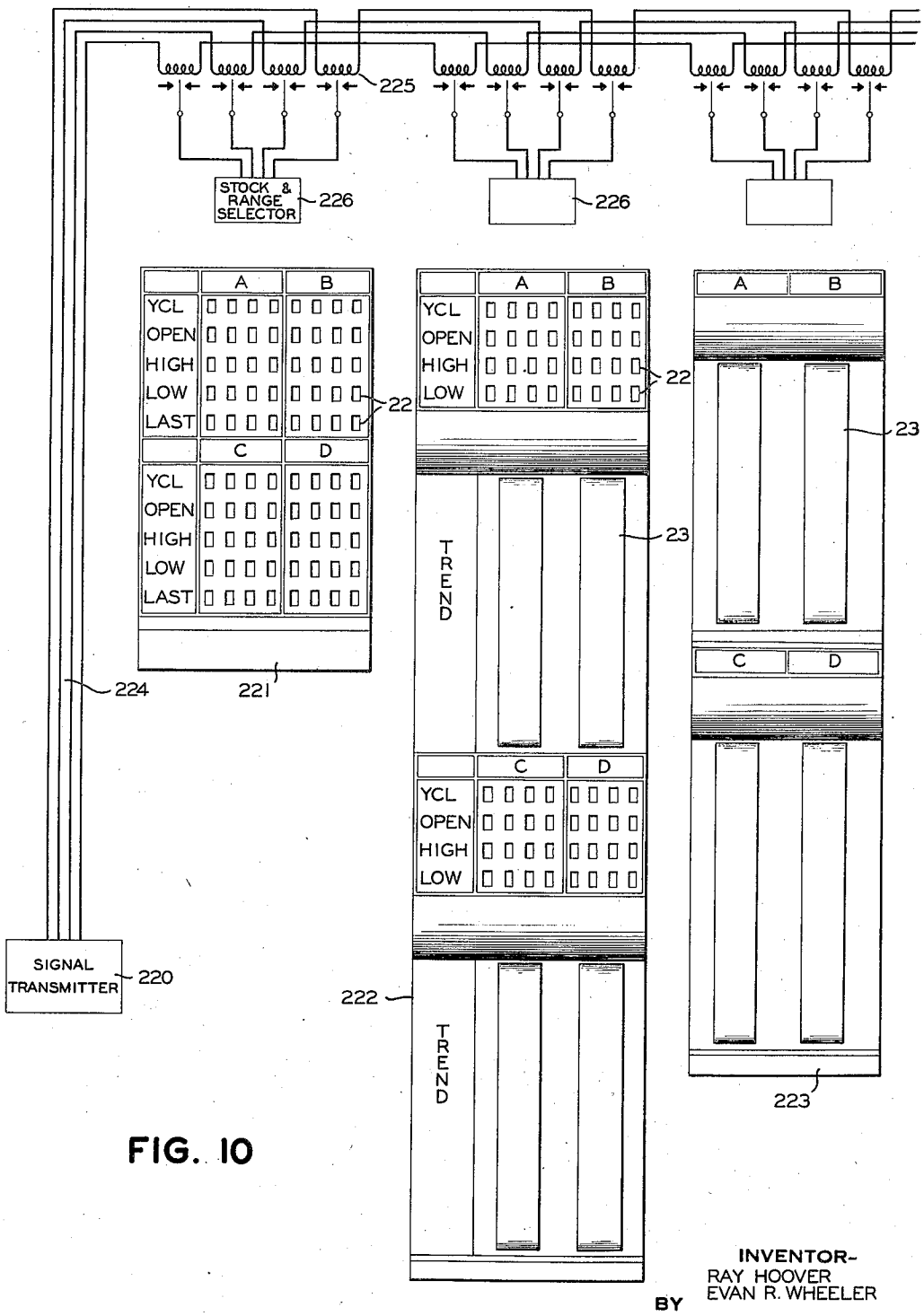


FIG. 10

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Patented Oct. 6, 1936 2,056,452

UNITED STATES PATENT OFFICE

2,056,452

PRINTING QUOTATION BOARD

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Original application May 9, 1930, Serial No. 451,140. Patent No. 1,972,341, dated September 4, 1934. Divided and this application August 27, 1931, Serial No. 559,765

16 Claims. (Cl. 177—353)

This invention relates to a quotation board mechanism and more particularly to apparatus for visibly indicating or posting information concerning different items such as stock, bond and commodity quotations in response to telegraph signals. This application is a division of application Ser. No. 451,140, filed May 9, 1930, entitled Quotation Board System and Apparatus, and issued September 4, 1934, as Patent No. 1,972,341.

One system of posting stock quotations automatically at a plurality of separate places such as brokers' offices and banks from a common transmitting point, now in use, involves the use of four channels of communication extending between the transmitting station and the receiving quotation board apparatus, separate channels being employed to transmit signals corresponding to each of the hundreds, tens, units and fractions (in eighths) values 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. A single line wire may be employed, of course, with a rotary distributor at the receiving station for distributing the signal impulses to the four control channels of the quotation board apparatus.

The quotation board as heretofore constructed employs a group of four indicating units each having a dial or drum bearing the numerals 1 to 9, 0 and a blank, the 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 "yesterday's close", "open", "high", "low", and "last" quotations of the stock.

The four control channels are also employed for selecting concurrently the range and the stock. For this purpose, each group of indicators comprising the range; i. e., the "yesterday's close", "open", "high", "low", and "last" quotations, and combinations thereof are designated by single digit numbers and each stock is arbitrarily designated by a three digit number, the stocks having the greatest volume of sales and hence those most often quoted being designated by digits of low order as 111, 121, 211, etc.

The range is selected by transmitting over channel one for instance, a number of electrical impulses corresponding to the digit number of the range to be posted and the stock is selected by sending over channels two, three and four impulses corresponding in number to the hundreds, tens and units digits, respectively, of the stock designating number. The receiving apparatus in response to such impulses selects the stock and range and subsequently operates to transfer the four transmitting channels from the selecting mechanism to the magnet windings of the four indicating units of the range and stock selected. Each indicator unit may then be operated by transmitting the required number of impulses over the channels connected thereto.

In order to eliminate accumulative errors, means is preferably provided for restoring each indicator to "blank" or unison position before transmitting the quotation or answer. The restoration is accomplished by transmitting a series of ten impulses over each channel to step the indicators around to "blank" position. The ten impulses are sufficient to restore any of the indicators to unison position even in the most unfavorable setting thereof and if this position is reached with a particular indicator before the entire ten restoration impulses have been applied thereto, the ground connection is automatically removed from the winding of the indicator magnet so that the remaining impulses are ineffective to rotate the indicator further. At the conclusion of the transmission of the restoration impulses the ground connection is automatically restored to each indicator magnet so that it will respond to a further group of impulses termed the "answer" group, corresponding in number to the number of the digit of the quotation to be posted, so as to set the indicator dials in the desired position.

The present invention has for one of its objects to provide a printing apparatus for a quotation board which may be operated by the same type of signals as those employed in the above system and which may be operated concurrently with such "indicator boards" from the same signals.

Another object is to provide a printing apparatus which may be employed in place of any of the groups of indicator units used in the so-called indicator boards and in which no change is required in the transmitted signals or in the indicator board control apparatus, to operate the same.

Another object is to produce stock quotation boards in which different combinations of indicator units and printing units may be employed, that is, in which the quotations of certain stocks may be posted by means of indicators, others

by printing the quotation on suitable paper tapes in characters of sufficient size to be discerned at a distance and in which the quotations of still other stocks may be posted by the use of indicators for certain of the ranges such as "yesterday's close", "open", "high", and "low" and by printing mechanism for other of the ranges as the "last", all of said arrangements being usable for different stocks on the same board and different boards being arranged differently, all of said boards being operable by the same transmitted signals.

Further and more specific objects, features and advantages will more clearly appear from the detailed description given below taken in connection with the accompanying drawings which form a part of the specification.

The invention consists in the novel features of construction, arrangement, combination of parts, and electrical connections constituting the printing and paper feed unit and the control mechanism therefor and in the combination of such unit with the indicator units, as hereinafter described by way of example only, as being illustrative of one embodiment of the invention.

Reference will be had to the accompanying drawings for a detailed description of the invention wherein:

Figure 1 is a front view of a portion of a stock quotation board having provision for a number of stocks, in which a combination of indicator units and printing mechanism is used for each stock or item;

Figure 2 is a vertical section through the indicator board shown in Figure 1;

Figure 3 is a side elevation of a fragment of one of the printing units, shown in its relation to the face of the quotation board.

Figure 4 is a vertical sectional view of one of the type wheel units;

Figure 5 is a vertical sectional view of the paper feeding and metering device taken on the line 5—5 of Figure 3;

Figure 6 is a horizontal sectional view of the paper metering mechanism on the line 6—6 of Figure 5;

Figure 7 is an exploded view of the commutator employed in connection with each type wheel for controlling the application to and removal of ground from the windings of the type wheel operating magnets;

Figure 8 is a horizontal sectional view of the indicator unit on the line 8—8 of Figure 2;

Figure 9 is a diagrammatic illustration of the electrical equipment and control circuits for the indicator units of a stock or item in which the "last" quotation is posted, in one instance by means of a printing unit and in the other instance by means of direct reading indicators; and

Figure 10 is a somewhat diagrammatic view of a remote control system for a plurality of boards of different types.

A system for transmitting signals representative of stock or other item quotations, is described in a co-pending application of R. Steeneck, Serial No. 414,105, filed December 14, 1929, entitled "Signal transmitting apparatus" and issued January 30, 1934, as Patent No. 1,945,420, and in a co-pending application of R. Hoover, Serial No. 406,357, filed November 11, 1929, entitled "Selecting and indicating system", and issued October 9, 1934, as Patent No. 1,976,398, a receiving apparatus is described, which is particularly adapted for the operation of a stock quotation or bulletin board in response to transmitted signals to automatically select a stock and a particular range thereof, such as the "yesterday's close", "open", "high", "low", or "last" quotation and to operate a series of indicators for posting a desired price or quotation of such selected stock.

The printing mechanism comprising the present invention is so constructed and arranged that it may be operated directly from the system and apparatus described in the said Hoover application in place of or concurrently with any of the indicator units and without the use of any additional apparatus or changes in the circuit arrangement.

Reference will now be had to Figures 1 and 2 in which we have shown a portion of a quotation board comprising a front panel 20 having a number of apertures or windows 21 behind which are disposed a plurality of direct reading indicator units 22 and a printing unit 23. Four groups of direct reading indicator units 24, 25, 26 and 27 are provided for each stock appearing at the corresponding respectively to the "yesterday's close", "open", "high", and "low" quotations of the stock, each group of indicators consisting of four units 29, 30, 31 and 32.

Each indicator unit has a drum or cylinder 18 bearing digit characters adapted to be rotated around by a step by step movement, by means of a magnet 19 in response to electrical impulses, so as to bring the proper character appearing on the drum into view through the windows 21. Each drum is operated entirely independently of every other drum as will appear hereinafter, the construction of the indicator unit being subsequently explained more fully with reference to Figure 7. In place of the four indicator units corresponding to the "last" quotation, the printing unit 23 is employed.

The printing unit has four type wheels 33*h*, 33*t*, 33*u* and 33*f*, by means of which the hundreds, units, tens and fractions values of the "last" quotation are printed upon a strip of paper 34 which extends from a reel 35, beneath the type wheels 33 and downward across the face of the panel 20 to a take-up roller 36 upon which it is rewound. The printing occurs at the lower side of the type wheels 33 after which the paper is automatically fed downward along the board a distance sufficient to bring the printed quotation into view. A sufficient length of paper is provided at the face of the board to expose a number of successive quotations of each stock, so as to give the trend of the market for a predetermined number of quotations.

In accordance with the usual method of operating indicator stock quotation boards, at the conclusion of each day's business the indicators may be set in their blank positions, with the exception of the "yesterday's close" indicators, which are operated to post the "last" quotation of the day in readiness for the opening of the market on the succeeding day. At the opening of the market when the first sale occurs of any particular stock the indicators corresponding to the "open", "high" "low" and "last" quotations are connected in parallel through the selecting system and the first sale simultaneously recorded upon each of these indicators. Subsequent sales occurring during the day actuate the "last" group of indicators only, except in those cases in which the "last" sale also establishes a new "high" or a new "low" for the day, in which event either the "high" or "low" indicators are operated simultaneously with

the "last" indicators. It will be noted that the "last" indicators are operated in each case.

The printing unit 23 is so constructed, as will appear in detail hereinafter, that it may be operated directly from the same signals which are employed for operating the "last" indicators, the printing unit and paper feed operations occurring automatically without the transmission of any special or additional signals or without any change in the control apparatus employed for operating the "last" group of direct reading indicators, other than an extra contact upon one of the relays of the stock selecting system. Therefore, the quotation board, may at the selection of each broker, employ direct reading indicators entirely for certain stocks and printing apparatus in combination with indicators for other stocks or the board may be composed entirely of printing units in case range quotations other than the "last" are not desired and the printing boards or combination indicator and printing boards may be operated from the same signals and over the same system employed for operating the indicator boards, as will appear from reference to Fig. 10.

Reference will now be had to Figures 3 to 6 for a detailed description of the printing unit. The four type wheels 33*h*, 33*t*, 33*u* and 33*f*, corresponding to the hundreds, tens, units and fractions digits of the quotation to be printed are mounted for individual rotation upon a fixed shaft 40. Each wheel is provided with a star or ratchet wheel 41 by which it is individually operated with a step-by-step movement by a double armed pawl or anchor 42 pivoted upon a shaft 43 which is common to each type wheel unit. The pawls 42 each have a right angled armature portion 44 by means of which they are actuated by an individual electro-magnet 45.

The type wheels rotate in a counter-clockwise direction as viewed in Figure 2. Each stroke of the armature 44, in a closing direction, in response to an electrical impulse transmitted to the magnet 45, causes the upper pallet of the pawl to move downwardly against a tooth of the ratchet wheel to rotate the same counter-clockwise one twenty-second of a revolution. Upon release of the armature, the pawl 42 is moved upwardly by a retractile spring 46 to cause the lower pallet of the pawl to engage the ratchet wheel to move the same in the same direction another twenty-second of a revolution.

The type wheel has eleven flat sides bearing the characters 1 to 9 and 0 and a blank side. It is moved the distance of one character for each impulse received by its operating magnet 45.

Each type wheel unit comprises in addition to the type wheel 33, and ratchet wheel 41, a commutator 55, the unit being mounted upon a sleeve 56 bearing on the shaft 40. The ratchet wheel 41 is mounted upon a reduced portion 57 of the sleeve 56 and is secured to the sleeve by a pin 58. The reduced end of the sleeve is offset at a number of points 59 to further secure the ratchet wheel thereto. The type wheel 33 is mounted on a reduced portion 61 of the sleeve for a limited rotation thereon and is retained against lateral movement by a disc or washer 62 carried by a further reduced portion 63 of the sleeve 56. The commutator 55, the construction of which will be presently described, abuts against the washer 62. The commutator is fixed in definite angular position relative to the sleeve 56 by offsetting the reduced portion 63 of the sleeve 56 into the outer face of the commutator, as indicated by the numeral 65.

Obviously, the type wheels 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 printing wheels may be restored before each printing operation to a predetermined or unison position, as for instance with the blank portion thereof in printing position, and then set in the correct printing position by transmitting to their operating magnets, impulses corresponding in number to the digit which it is desired to print. We prefer to employ the latter method of operation in order to bring the same into accord with the method employed for operating the direct reading indicator units, so that the printing mechanism may be operated in combination with an indicator board or from the same signals employed for operating the indicator board.

The commutator 55 mounted rigidly with the ratchet wheel for rotation therewith, provides the means for controlling the restoration of the printing wheels to such predetermined or unison position prior to transmitting the impulses corresponding to the new quotation. Referring to Figure 7 which is an exploded view of the commutator it comprises an insulating disc 72 having a disc shaped metallic contact member 73 mounted upon one side thereof, the contact member 73 having a tubular hub 74 extending through the insulating disc and being riveted over as shown at 75 against the opposite side of the insulating disc to secure these parts together. An annular metallic contact member 76 is disposed at the opposite side of the insulating disc 72 from the contact member 73 and is secured to the disc by tabs 77 which extend over the edge of the disc. The contact member 73 has a sector cut away and the contact member 76 has a sector 78 disposed within the cut away portion of the member 73. The sector 78 and annular contact member 76 are insulated from the contact 73 and each of these contacts are provided with brushes 79 and 80 respectively. The commutator is mounted relative to the type wheel in such angular position that the sector 78 is engaged by the brush 80 when the blank portion of the type wheel is in the printing position.

The contact member 73 is grounded, as by means of a contact strip 82. The brushes 79 and 80 are mounted upon an offset portion 83 of the bracket 49 and are provided with terminal lugs 81 and 81' for making the electrical connections thereto. Lug 81' is connected by conductor 84 to one terminal of the operating magnet, the opposite terminal of the magnet being connected to the line as will appear fully hereinafter and lug 81 is connected, as by conductor 85 to a contact of the selecting mechanism (not shown) whereby it may be selectively grounded.

The operation of the commutator is as follows. When it is desired to restore the printing wheels to their predetermined initial position prior to making a new setting, ten restoration impulses are supplied to the operating magnets through the selecting apparatus, as fully described in the aforesaid Hoover application, the operating circuit for the magnet 45 being completed through the brush 80 and the grounded contact 73.

Assuming for instance, that the type wheel was set to print the character for the numeral 6, the first five impulses would step the type wheel around to bring the numerals 7, 8, 9, 0, and the blank portion thereof, successively into the printing position. At the moment the blank portion

of the wheel reaches the printing position, the brush 80 engages sector 78 of the commutator which, as stated before, is insulated from the grounded contact 73. The segment 76 of the commutator is ungrounded at the selecting mechanism at this time, and consequently, the circuit to the magnet is not completed during the transmission of the remaining five restoration impulses. The type wheel therefore remains set in its unison or blank position at the end of the transmission of the restoration impulses.

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

At the conclusion of the restoration impulses, the selecting mechanism operates to apply a ground through the brush 79 to the sector 78. The required number of impulses for stepping the type wheel into the new position may then be transmitted, the grounded circuit of magnet being completed through the sector 78 and brush 79. As soon as the first impulse is received the commutator rotates to place the contact 73 in engagement with the brush 80 so as to restore the normal ground to the magnet, the actuating ground at the same time being removed from the sector 78 in readiness for the next restoration cycle. The operating circuit connections for the printing unit and the direct reading indicators which may be associated therewith are shown more fully in Figure 9 and will later be described with particular reference thereto.

Separate inking rollers 90, rest upon each type wheel. Since the type wheels rotate to each printing position through the unison position, they make an average of one complete revolution for each quotation printed. In certain instances, where the wheel is set to print a number of high digit, as nine, and the succeeding quotation involves the printing of a number of low digit, as one, the low digit character will not be carried past the inking roller in moving into printing position and therefore, will not be inked immediately preceding printing. Two successive occurrences of this condition cannot occur, however, without a complete revolution of the type wheel and complete inking thereof.

Prior to the opening of the exchange, each morning for the transaction of business, a number of groups of unison or restoration signals are transmitted for each stock and a thorough inking of the type wheels thus effected at this time. In the case of those stocks or items which are active, the type wheels will make successive revolutions past the inking rollers at frequent intervals. In the case of the less active stocks, a considerable period may elapse between each operation of the printing wheels. Ordinarily the character to be printed will be inked just preceding the printing operation but in order to provide for those occasions referred to, in which two successive printings occur a long time apart, without an intermediate inking of the character to be printed, a slow drying ink should be employed. Inks are available and in general use on stock quotation tickers which will remain moist on the type wheel under favorable atmospheric conditions for several days and which under the most severe conditions met in operation, will remain sufficiently moist to make a good impression, for several hours. An adequate inking of the type wheels is therefore assured at all times.

It will be readily understood that in printing successive quotations of the same stock it will be unnecessary to reset the type wheels for the entire hundreds, tens, units and fractions values of the quotation but only for those values in which changes occur since the last preceding quotation. The remaining type wheels may be left in their last set position or may be returned to blank or unison position, thereby printing only the changes occurring in the quotation. The hundreds, tens, units and fractions digits will always be printed in the same relative position transversely of the paper tape and when a single digit as the fractions or units is printed alone the column or positioning of the printing will indicate ordinarily whether the printed character represents a units or fractions value of the quotation. However, in order to avoid confusion and to definitely indicate fractions values from units values irrespective of position on the tape, we prefer to print the fractions in a distinctive manner either as to color or form or both.

The provision of individual inking rollers 90 for each type wheel and the use of individual type wheels for each digit of the quotation, permits such distinctive color to be employed for the fractions. We prefer to employ red ink for the fractions inking roller and black or other differently colored ink for the units, tens, and hundreds rollers.

The paper strip 34 upon which the printing is recorded is of a width sufficient to extend across the face of the four type wheels and extends from the roll 35, mounted between the side plates 53 and 54, over a metering roller 95, thence beneath the type wheels and around an idler roller 96 and through an aperture 97 to the front of the indicator board panel 20. The idler roller 96 is mounted between offset lugs 98 at the ends of a plate 99 which extends crosswise between the side plates 53 and 54.

Individual platens or hammers 100, are positioned beneath each type wheel and have stems 101 pivoted thereto by pins 102, the stems having vertical sliding engagement in apertures in the cross plate 99. The heads of the platens normally rest on the plate 99 and the lower ends of the stems are disposed directly above a universal platen actuating bar 103 pivoted centrally on a pin 104 in the forked upper end of the plunger 105 of a printing solenoid 106. The plunger 105 is returned to its lower position after each printing stroke by a coiled spring 108 secured to an extension 110 of the pivot pin 104. The solenoid is mounted between the arms of the U-shaped bracket 109.

After the type wheels have been set in printing position, the solenoid 106 is energized, as will hereinafter appear, to raise the universal bar 103 against the platen stems, to move the platens upwardly against the paper 34 and force the same into contact with the type wheels. The pivoted connection between the plunger 105 and the universal bar 103 compensates for any inaccuracy in the construction of the actuating mechanism and insures all of the platens making a complete stroke. The pivoted mounting of the platens on the stems compensates for slight irregularities in the setting of the type wheel or in the location of the characters thereon.

The paper is maintained under constant tension by the take up mechanism disposed at the lower end of the board, and the paper is fed forward, after each printing operation, a distance sufficient to bring the printed quotation into view at the front of the board.

The paper is gripped between the knurled sur-

face of the metering rollers 95 and knurled rollers 115 positioned adjacent each margin of the paper. The rollers 115 are mounted on the ends of levers 116 pivoted on stub shafts 117 threaded into the side plates 53 and 54 respectively, and each wheel is pressed against the metering roller by a spring 118.

The shaft of metering roller 95 is pivoted on pin bearings 122 in the side plates 53 and 54 and is retained against rotation under the tension of the paper by a stop wheel 123 having a shoulder 124 engaging a stop arm 125 pivoted on a pin 126 threaded into a bracket 127 suspended from the cross plate 99. The stop arm is normally held in engagement with the shoulder of the stop wheel by a spring 128 encircling the pivot 126 and having one end engaging the lower end of the stop arm. A latch 131, pivoted at 132 in a recess in the cross plate 99, is pressed upwardly by the opposite end of the spring 128, against a pin 134 carried by the stop arm 125. The latch is notched at 135 to engage the pin 134 when the stop arm is moved out of engagement with the stop wheel.

A lever 136, pivoted at 137 to the bracket 127, has a forked end 138 in which the end of the pin 104 engages to rock the lever each time the plunger 105 operates to print a quotation. The lever 136 carries a dog 140 pivoted thereto at 141, an end of the dog normally extending over the shoulder 142 of the stop arm 125.

Upon upward movement of the solenoid plunger, the left end (Figure 5) of the lever 136 is swung downwardly, the dog 140 engaging the shoulder 142 of the stop arm, and pivoting to the position shown in dotted lines in Figure 5 against the action of a coiled spring 143 until the shoulder 142 is cleared and then moving down below the inclined lower edge 144 of the stop arm. Upon the return or downward stroke of the plunger, the left end of the lever, in swinging up, carries the dog in to contact with the inclined face of the stop arm and re-acting against the stop pin 145, throws the stop arm out of engagement with the stop wheel. Pin 134 engaging in notch 135 of the latch 131 holds the stop arm withdrawn. The metering roller shaft 95 is thus freed to rotate, under the tension of the paper 34, in a clockwise direction, as seen in Figure 3. During the first part of this rotation the eccentric portion of the stop wheel engages the free end of the latch 131, depresses it and permits the stop arm to return under the action of spring 128 into position to again stop the metering roller shaft after it has made one revolution.

The diameter of the metering roller is such as to permit the printed portion of the paper to be drawn into view at the front of the board.

The paper passes down the face of the board and through an aperture 150 at the bottom thereof and around an idler roller 151 to the take-up roller 36, mounted between the side plates 53 and 54. A gear 152 fixed to the take-up roller meshes with an idler gear 153, meshing in turn with a gear 154 driven by a spring motor, not shown.

Reference will now be had to Figures 2 and 8 which show the construction of the indicator units 22 which may be employed in conjunction with the printing unit. The indicator unit comprises a rectangular casing 182 having the drum 18 bearing the characters 1 to 9, 0 and a blank portion, mounted on a vertical shaft 183 bearing in the frame 182. The drum has a star or ratchet wheel 41' secured to the upper side thereof, and a commutator 55', similar to commutator 55 of the printing unit, fixed to the underside. The magnet 19 mounted within the casing has an armature 19a, pivoted on a vertical shaft 184, the armature having a right angled extension terminating in the two armed pawl 42' which engages the star wheel to step the drum around. A spring 46' moves the pawl in the opposite direction. A pair of brushes 79' and 80' engage the opposite sides of the commutator to control the application of a ground to the winding of the magnet 19. The casing has an aperture or window in its front side to cause a single character to be exposed at a time.

In Figure 9 we have shown the circuit connections for operating the quotation board units of two stocks or items B and A. Stock B comprises four groups of direct reading indicators, the operating magnets 19 only of which are shown, corresponding to the "yesterday's close," "open", "high" and "low" quotations, and a printing unit for printing the last quotation or trend, the printing wheel operating magnets 45 only being shown. The board mechanism for stock A is similar to that of stock B except that direct reading indicator units are employed for posting the "last" quotation in place of the printing unit.

The mechanism and system by which the particular stocks and the range, that is whether "yesterday's close", "open", "high", "low" or "last" quotations, to be posted are selected, forms no part of the present invention, being fully disclosed in said aforesaid application of R. Hoover. A portion only of the operating circuit is shown for the purpose of explanation.

The four channels of communication over which the signal impulses for operating the hundreds, tens, units and fractions magnets are represented by the conductors 185, 186, 187 and 188 respectively. Each of these conductors extend in multiple to the contacts of a group of range relays 190, 191, 192, 193 and 194, which determine which group of magnets 19 or 45 of any particular stock are to be operated. The range relays are controlled through the selecting mechanism (not shown) through conductors 195. The opposite contacts of each of the range relays 190 to 194 are connected to groups of conductors 190a, 191a, 192a, 193a and 194a common to the entire board and from which multiple connections 190b, 191b, 192b, 193b and 194b are made to the multi-contact stock relay 196 of each stock. The stock relays are also selectively controlled through the selecting mechanism, to determine the particular stock, the magnets 19 or 45 of which are to be operated. The connections 190b to 194b are continued through the contacts of the relay 196 to the windings of the magnets of the "yesterday's close", "open", "high", "low" and "last" indicators or printing units.

The switch tongues 197 and associated contacts 198 and 199 represent diagrammatically the commutator 55 or 55' and serves when on contact 198 to apply the normal ground 200 to the magnet windings, the tongue reversing to contact 199 when the indicator drums or printing wheels are in unison or blank position, to remove the normal ground and connect the magnet windings to the ground control contacts of the selecting mechanism through conductor 201.

Upon closing of one of the stock relays 196, as that for stock B, and one of the range relays, as

relay 194, the four signal conductors 185 to 188 are connected directly to the windings of the type wheel magnets 45 and upon transmission of the ten unison or restoration impulses over the lines, the type wheels will be moved to unison or blank position and held there by removal of the normal ground 200 from the magnet windings. Thereafter, and before the signals corresponding to the new quotation are transmitted over the lines 185 to 188, a ground is applied to the conductor 201 to cause the magnets to respond to the subsequent signal impulses. If the new quotation to be printed is 147⅝, for instance, one impulse would be transmitted over line 185 to set the hundreds printing wheel, four over line 186, seven over line 187 and five over line 188 to set the tens units and fractions wheels respectively, in readiness for the operation of the printing solenoid 106.

It will be understood that by operating two or more of the range relays, as the "last" and "high" relays 194 and 192 that the group of "high" indicators and the printing unit may be operated simultaneously.

The control circuit for the solenoid 106 includes a locking relay 205 and a control relay 206. The winding of relay 206 is grounded at one end and connected to one contact 207 of the stock relay 196, the cooperating contact having a source of potential applied thereto. Upon closing of the stock relay 196 to select a particular stock, relay 206 picks up and applies battery through its front contact to the grounded winding of locking relay 205 which then operates to complete a locking circuit from battery 208, left hand front contact of relay 205, and contacts 209 and 210 to the mid-point of the winding of relay 205. A circuit is also prepared for the solenoid 106 from the ground 211, right hand contact of relay 205 and conductor 212 to one terminal of the solenoid 106, the circuit being open at the back contact of relay 206.

This circuit condition is established upon selection of the stock and prior to transmitting the restoration and quotation signal impulses. At the completion of the transmission of these signals, the stock relay 196 releases and in so doing causes the tongue of relay 206 to drop back on its back contact, thus completing the circuit to the solenoid 106 and causing the same to operate to complete the printing operation. The upward movement of the plunger, through extension 213 opens the contacts 209 and 210 thus interrupting the locking circuit of relay 205 and the downward stroke of the solenoid plunger, releases the metering roller 95 to feed the printed quotation into view. The contacts 209 and 210 are shown in Figure 9.

The exposed portion of the paper at the front of the board may be of any desired length and preferably should show from ten to twenty quotations. However, at times a broker or one of his customers may desire to examine the quotations on a portion of the tape which has already been wound in the take-up roller and this may be accomplished by merely grasping the paper and pulling it outwardly at the front of the board. The spring motor associated with gear 154 is tightened up by this action and serves to rewind the paper on the take-up roller when the paper is released.

At the time the paper is held withdrawn from the take-up roller, the tension on the paper is released at the metering roller 95 and should a printing occur at this time it would not feed out into view. The latch 131 serves to hold the stop arm 125 out of engagement with the stop wheel after the printing so that when tension is restored to the paper, the metering roller is free to make a revolution and feed the quotation into view.

It is obvious of course that the metering roller may be positively driven so as to rotate one revolution each time the stop arm is withdrawn from engagement with the stop wheel, as through a slip clutch or spring motor. Furthermore, the winding magnet 166 may be supplied with impulses from a purely local impulse generator instead of using the signal impulses or a winding motor individual to each printing unit or common to a number of units, may be employed.

It will be noted that a printing unit has been produced in which the type wheels may be set simultaneously or in succession and in which the printing from all four type wheels is accomplished in a single operation of the platen. The printing and paper feeding is effected automatically without the transmission of any special or extra signals other than those required to effect the stock selection and no changes are required in the selecting and control apparatus and circuits employed for quotation boards employing indicator units, other than the addition of an extra contact to the stock relay. The printing apparatus is rapid in operation and will keep pace with the indicator units and operates on the same signals whereby printing quotation boards, indicator quotation boards or combinations of indicator and printing quotation boards may be operated in the same transmitting system.

In Figure 10 we have illustrated a quotation board system comprising transmitting station equipment 220 located at the stock exchange or other central point and a number of quotation boards 221, 222 and 223, which may be located in different brokers' offices. Each quotation board provides facilities for posting four stocks, A, B, C, and D. Board 221 uses direct reading indicators 22 for the entire range of quotations, that is, for the "yesterday's close", "open", "high", "low", and "last" quotation. Board 222 employs direct reading indicators 22 for the "yesterday's close", "open", "high", and "low" quotations and a printing unit 23 for posting the trend of the market. Board 223 dispenses with all direct reading indicators and employs only printing units 23 for each stock for posting the trend.

Each board is operated from the common transmitting equipment 220 over the same group of conductors 224, four conductors being employed to control the hundreds, tens, units, and fractions indicators or type wheels. At each quotation board a relay 225 is included in series with each of the conductors 224 and the transmitted signals are thus repeated to the stock and range selecting mechanism 226 which controls the quotation board mechanism.

It is possible thus, to transmit a group of signals over the lines 224 representative, for instance, of the "last" and "high" quotation of stock A and to simultaneously operate all of the boards therefrom, the "last" and "high" direct reading indicators of stock A operating at board 221, the "high" indicators and printing unit operating at board 222, and the printing unit alone operating at board 223. Various other arrangements and combinations of printing units and direct reading indicators may be used. For in-

stance, all three arrangements or any two thereof shown in Figure 20 may be used with a single board for different stocks or items. The transmitting equipment 228 may be of the construction described in the aforesaid application of R. Steeneck and the stock and range selection mechanism 226 may be of the form shown in the Hoover application referred to above.

Obviously, other forms of direct reading indicators and printing mechanisms may be used, as long as they respond to the same signals. Therefore we do not desire to be limited to the particular form shown and described but contemplate by the term "direct reading indicators", as used in the appended claims, all forms of indicators in which the character carrying member is viewed directly as distinguished from those which produce a printed record from which the quotation is read.

Many changes and modifications of the structure will occur to those skilled in the art and we do not desire to be restricted to the specific construction shown and described.

What we claim is:

1. In a quotation board unit for posting information relating to a particular item, a group of direct reading indicators individual to said unit for indicating a certain range of values concerning said item, a tape, a printing mechanism integral with said unit arranged to print upon said tape additional successive values relative to said item, and means for selectively operating simultaneously one or more of said indicators and said printing mechanism for posting on said unit information concurrently both directly and in printed form.

2. In a quotation board unit for posting information relating to a particular item, groups of indicator units arranged horizontally in each group, said groups being disposed vertically one above the other, for indicating a certain range of information concerning said item, and a printing mechanism arranged to print upon a vertically moving tape additional information in horizontal lines, and means for selectively operating said indicator groups and printing mechanism either separately or together for posting said information in a vertically arranged column.

3. In a quotation board unit for displaying "open", "high", "low" and "last" values of a particular item comprising a plurality of groups of direct reading indicators for displaying the "open", "high" and "low" values, and a printing mechanism for displaying a number of successive "last" values in printed form, operating signal channel means common to both the printing means and the groups of indicators, and means for selectively coupling the printing mechanism and indicator groups separately or two or more together to the signal channel means whereby one or more values relating to a single item may be individually displayed separately or concurrently displayed together.

4. In a quotation board unit for displaying a quotation as the "open", "high", "low" or "last" value of a particular item comprising a plurality of groups of direct reading indicators for displaying the "open", "high" and "low" values, and a printing mechanism for displaying a number of successive "last" values in printed form, operating signal channel means common to both the printing means and the groups of indicators for transmitting operating signals thereto, and means for coupling selectively the printing mechanism and one or more of the indicator groups to such signal channel means whereby a quotation may be displayed simultaneously as a "last" value in printed form and as one or more of the other of said values directly.

5. A unitary quotation board for posting information concerning a plurality of items regarding some of which it is desired to post information of a certain character which may include one or more types, and regarding others of which it is desired to post information of another character which may or may not include information of the first type, said board being subdivided into sections to be viewed as a unit and arranged for information of a predetermined character relating to a particular item, said units being comprised either of one or more groups of direct reading indicators or a printing means or both together according to the character of the information to be posted upon said unit, signal channel means over which signals arrive for operating the posting means, and means for selectively connecting one or more of said posting means to the signal channel means whereby the posting means selected in each board unit may be operated to post the type of information to which they are adapted from the same operating signals.

6. A unitary quotation board for posting one or more ranges of information concerning a plurality of items, said board being subdivided into sections to be viewed as a unit upon which information relating to a particular item is to be posted, each unit of said board comprising one or more direct reading indicators for posting information as to certain ranges to be received directly and a printing means for posting other ranges of information successively in printed form, means for selectively operating the indicators or the printing means separately or together for displaying upon said board one or more ranges of said information in one or more forms.

7. A quotation board unit for posting one or more ranges of information relating to a particular item and having one or more groups of direct reading indicators for posting information as to certain ranges, and a printing means for posting other ranges of information successively in printed form, and means responsive to received signals for selecting and operating the printing means of said unit alone or together with one or more of said indicator groups.

8. A quotation board unit for posting two or more ranges of information relating to a particular item and having one or more groups of direct reading indicators for posting information as to certain ranges, and a printing means for posting other ranges of information successively in printed form, and means for selecting and operating said indicator groups and said printing means separately or together in response to signals received for displaying upon said unit the information directly, as to any one of certain ranges, and in printed form, as to the other ranges.

9. A quotation board for posting a plurality of ranges of information concerning several items including a unit for each item comprising for certain items a plurality of impulsively operated step-by-step direct reading indicators, for certain other items an individual printing mechanism, including impulsively operated step-by-step printing wheels, and for still other items both indicators and a printing mechanism, said indicators and printing mechanism being arranged for displaying different ranges of the in-

formation, a pulse generator means common to both the printing mechanism and the direct indicators and operating in response to signals received, and means responsive to the signals relating to a particular item for selectively completing the circuits from the pulse generating means to said indicators and printing mechanism either separately or together in accordance with units designated for the item and the range or ranges of information to be displayed, and means included in the indicators and printing mechanism for stepping those selected into position at the same time whereby they may be concurrently set for posting the information.

10. In a quotation board unit for posting quotations of several ranges concerning a particular item, one or more groups of direct reading indicators for posting information as to certain ranges and having an indicator wheel for each digit of the quotation to be posted and a printing mechanism for posting information as to certain other ranges in printed form and likewise having a printing wheel for each digit, a common circuit means for the respective digit wheels of each over which pulses arrive for simultaneously setting the wheels of the indicators and the printing mechanism, and means for selectively connecting the respective digit wheels of the printing mechanism alone or together with those of one or more groups of indicators to the common circuit means.

11. In a quotation board for posting information concerning a plurality of items, a plurality of direct reading indicators for indicating certain information relative to said items, an individual printing mechanism for each of predetermined ones of said items for indicating additional information concerning said predetermined items, operating signal circuits common to both the direct reading indicators and the printing mechanisms, actuating means individual to each of said indicators and printing mechanisms, responsive to operating signals transmitted over said signal circuits, and means for selectively completing said signal circuits to said indicators and to said printing mechanism.

12. In a quotation board for posting information concerning a plurality of items, a plurality of direct reading indicators for each item for indicating certain information relative to said item, an individual printing mechanism for each item for indicating additional information concerning said item, and means controlled from the same source of signals for selectively operating said indicators and printing mechanism either separately or together.

13. In a quotation board for posting information concerning a plurality of items, direct reading indicators for indicating certain information concerning said items, an individual printing mechanism for each of predetermined ones of said items for indicating additional information relating to said items, means for operating said indicators and printing mechanism by the same signals, signal conductors, and means for selectively connecting said conductors to said indicators and printing mechanism.

14. In a quotation board for posting information concerning a plurality of items, a combination of direct reading indicators for displaying certain information relative to said items, an individual printing mechanism for certain predetermined ones of said items for indicating additional information concerning the same, and selectively controlled means responsive to a single source of signals for operating said indicators and printing mechanism together to display the same information or for operating the same separately.

15. In a quotation board for posting information concerning a plurality of items, a plurality of direct reading indicators for indicating certain information concerning said items, an individual printing mechanism for each item for recording the quotation of said items on individual tapes, means for operating said indicators and printing mechanism from the same telegraph code signals, signal circuits, and means for selectively completing said signal circuits to said indicators or to said printing mechanism.

16. In a quotation board for posting information concerning the price of a plurality of items, a plurality of direct reading indicators and an individual printing mechanism for each of said items, means for operating said indicators and printing mechanism by the same telegraph code signals, and means for selectively operating said indicators and printing mechanism either separately or together, said printing mechanism recording the last price quotation of said items, and said indicators indicating the ranges of prices of said items.

RAY HOOVER.
EVAN R. WHEELER.