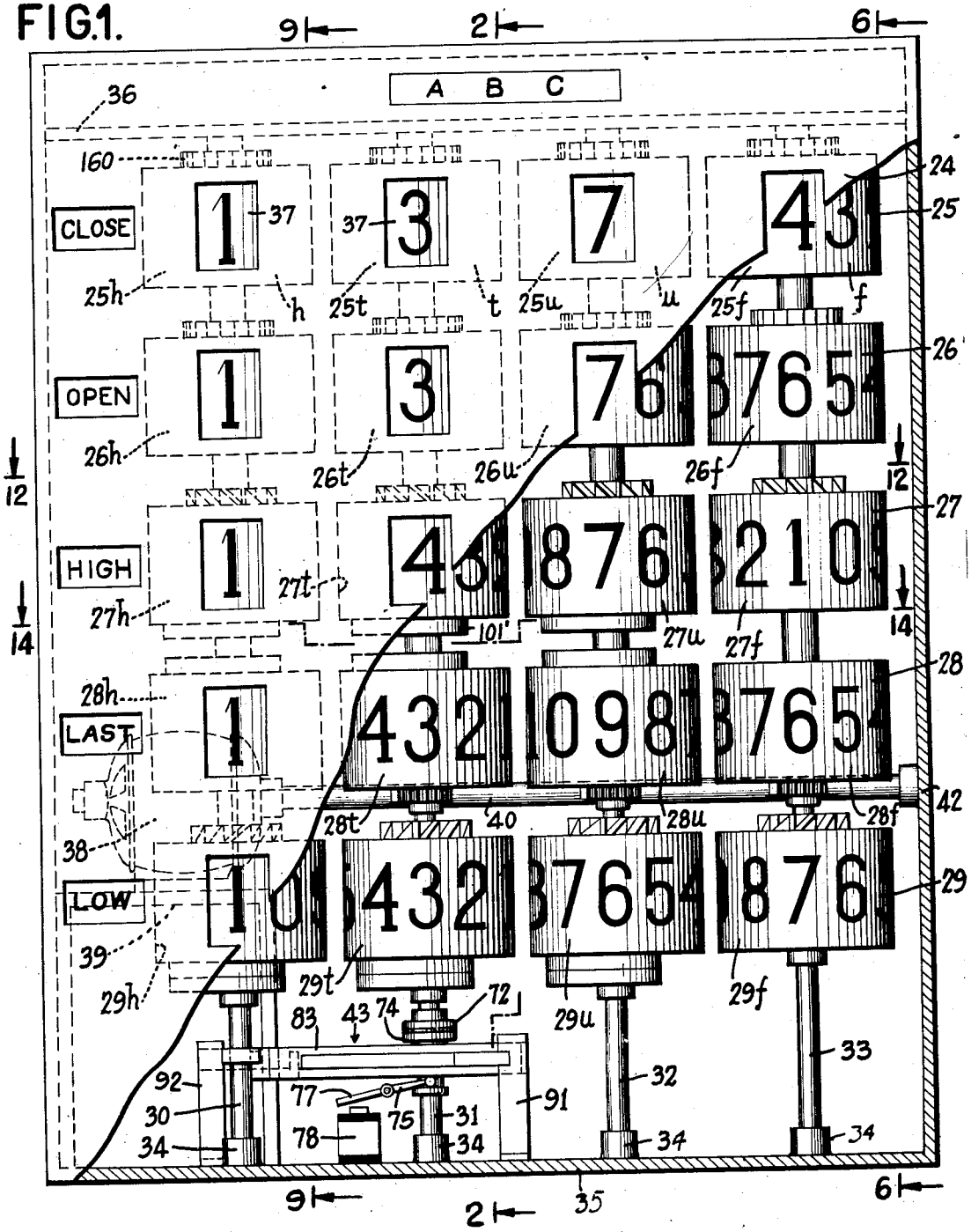
March 27, 1934. M. J. REYNOLDS 1,952,513

QUOTATION BOARD INDICATING APPARATUS

Filed Aug. 27, 1930 9 Sheets-Sheet 1

FIG.1.



Inventor

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By his Attorney

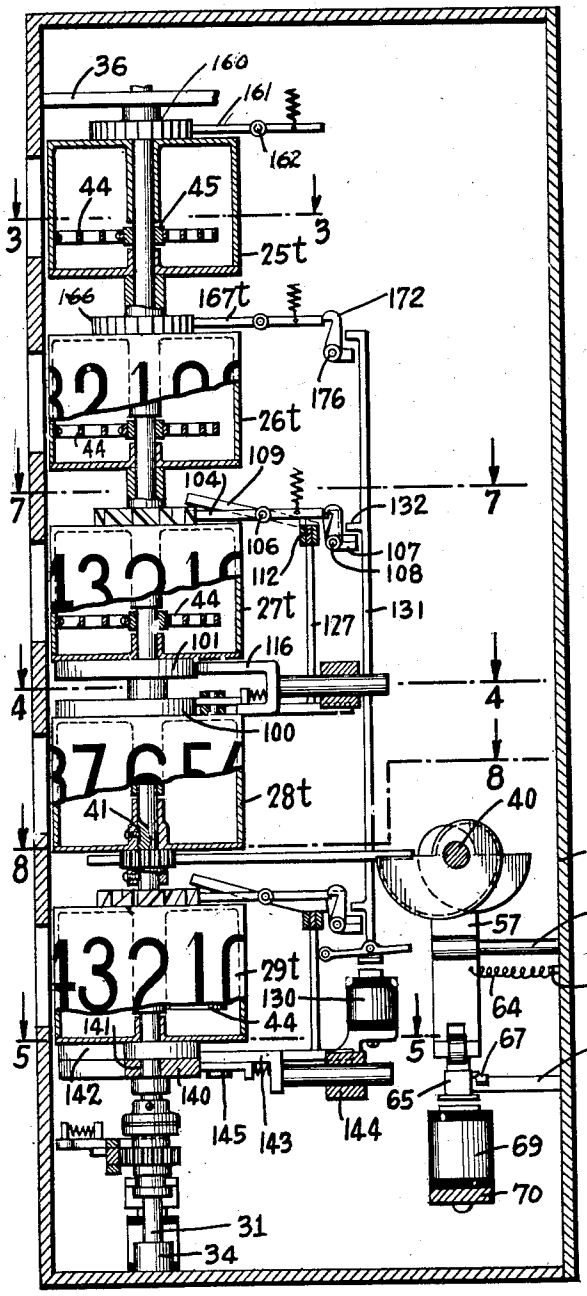
Eugene C. Brown

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QUOTATION BOARD INDICATING APPARATUS

Filed Aug. 27, 1930 9 Sheets-Sheet 2

FIG.2.



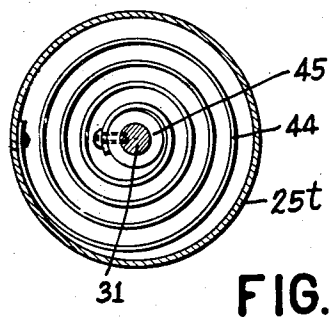


FIG.3.

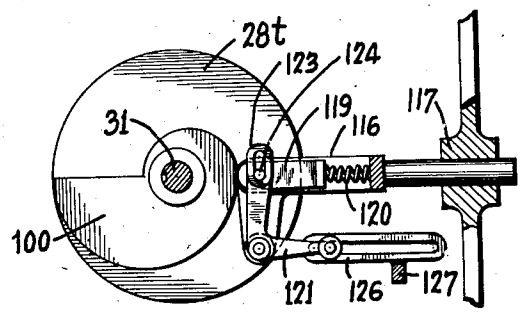


FIG.4.

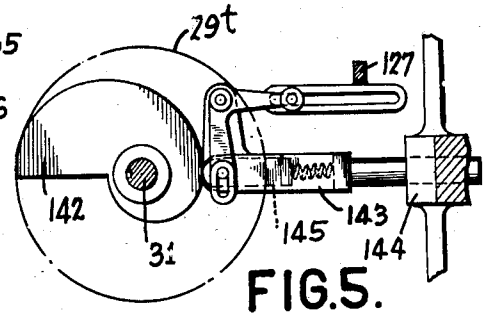


FIG.5.

Inventor
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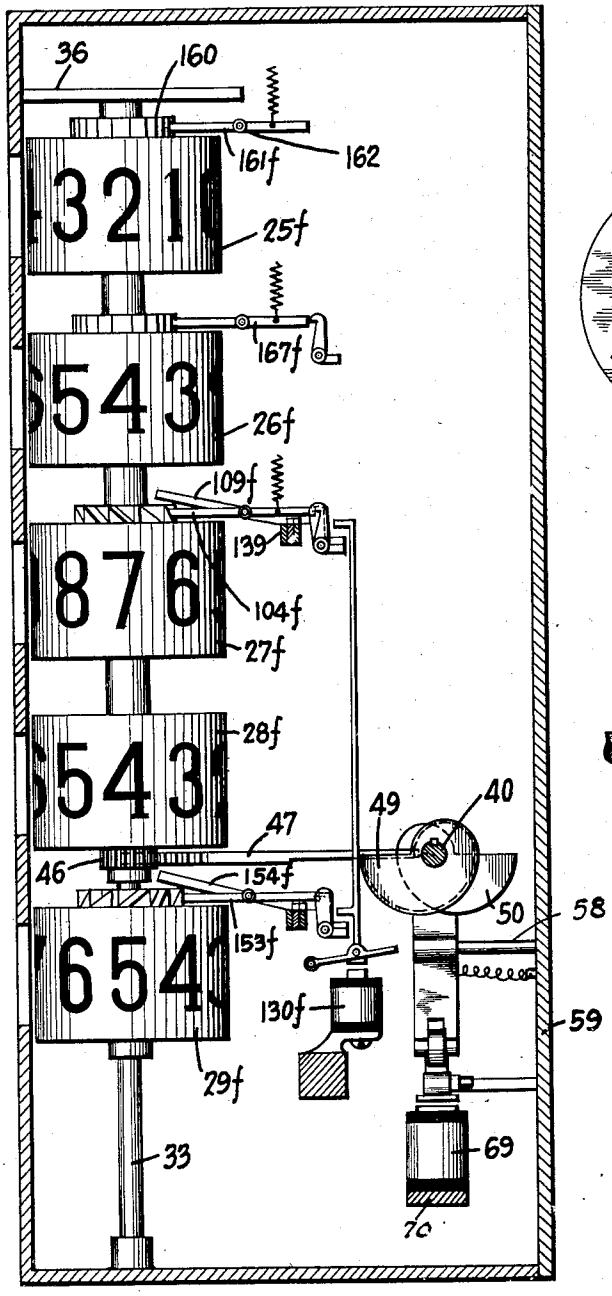
By his Attorney
Eugene C. Brown

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QUOTATION BOARD INDICATING APPARATUS

Filed Aug. 27, 1930 9 Sheets-Sheet 3

FIG.6.



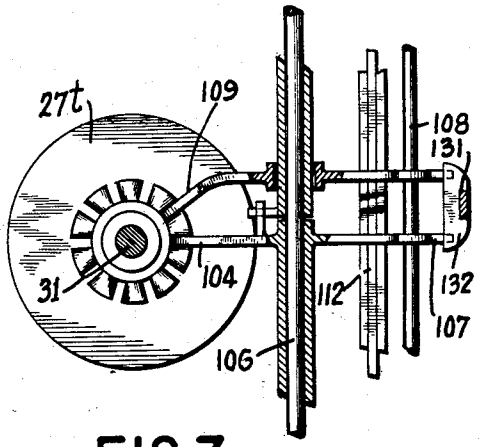


FIG.7.

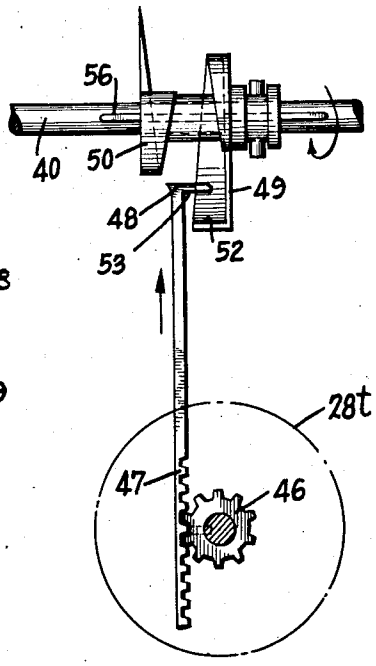


FIG.8.

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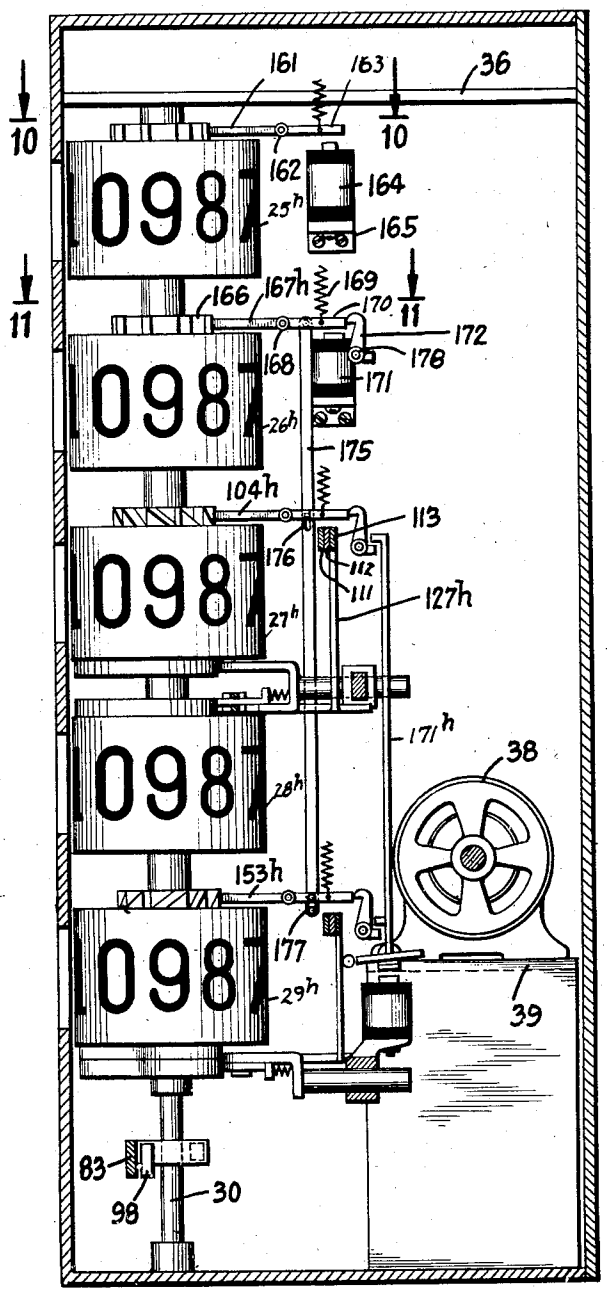
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QUOTATION BOARD INDICATING APPARATUS

Filed Aug. 27, 1930 9 Sheets-Sheet 4

FIG.9.



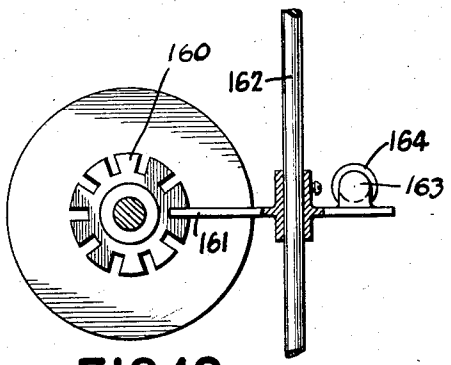


FIG.10.

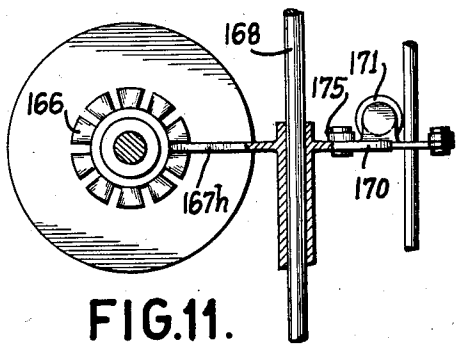


FIG.11.

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QUOTATION BOARD INDICATING APPARATUS

Filed Aug. 27, 1930 9 Sheets-Sheet 5

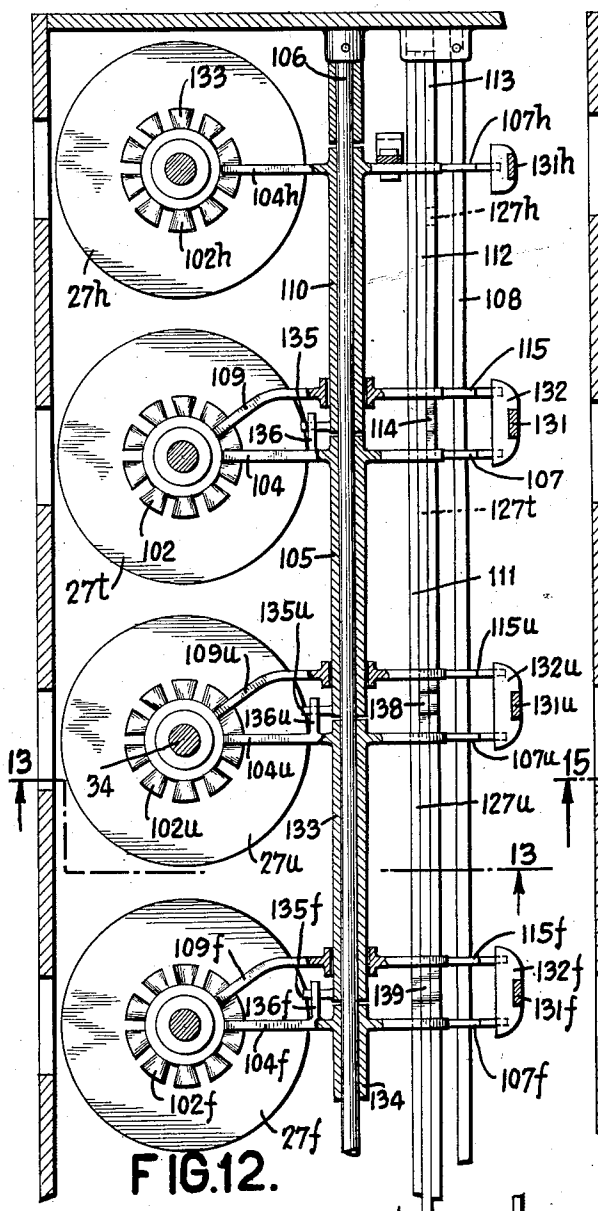


FIG.12.

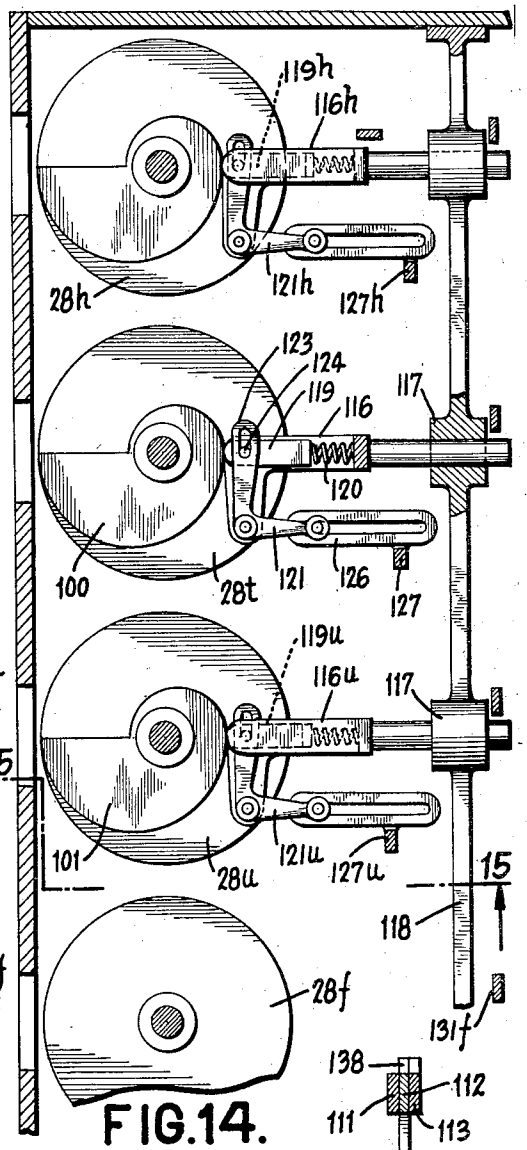


FIG.14.

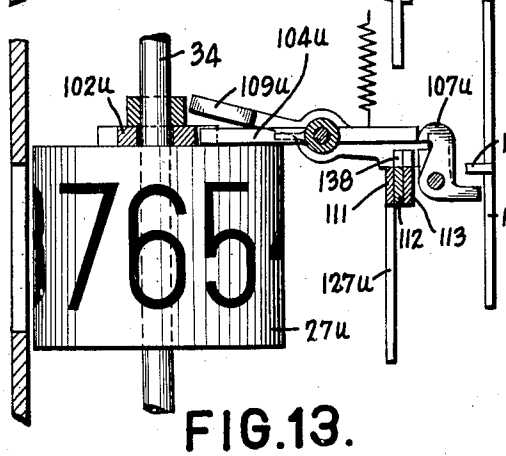


FIG.13.

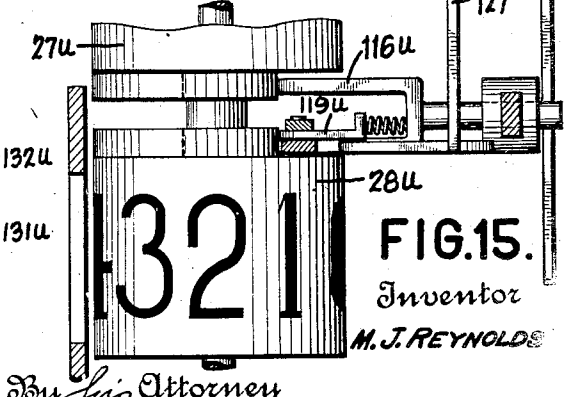


FIG.15.

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QUOTATION BOARD INDICATING APPARATUS

Filed Aug. 27, 1930 9 Sheets-Sheet 6

FIG.16.

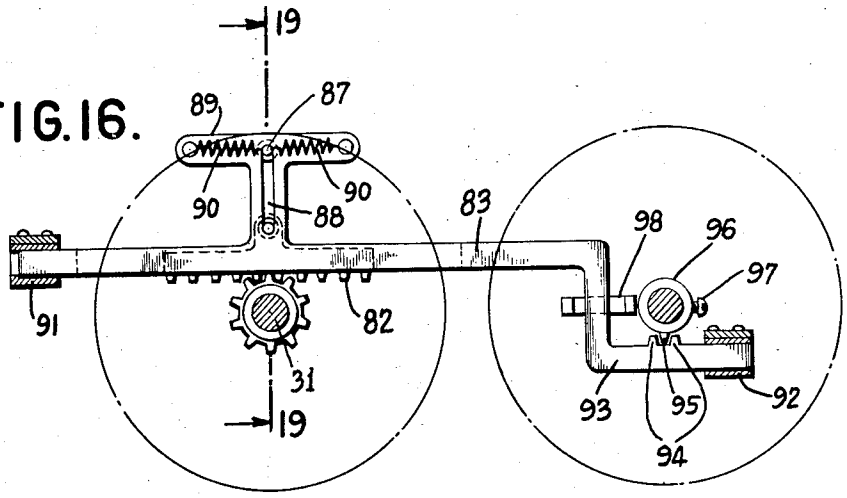
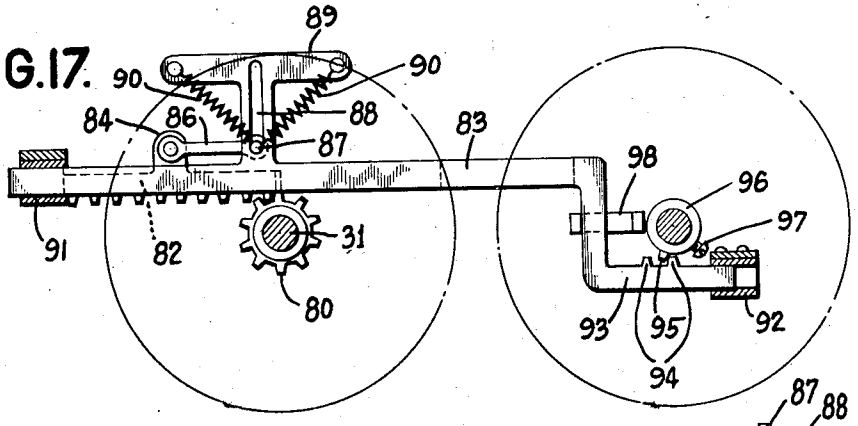


FIG.17.



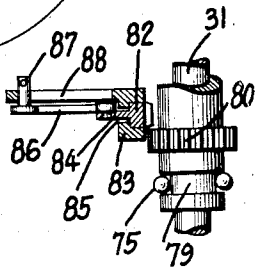
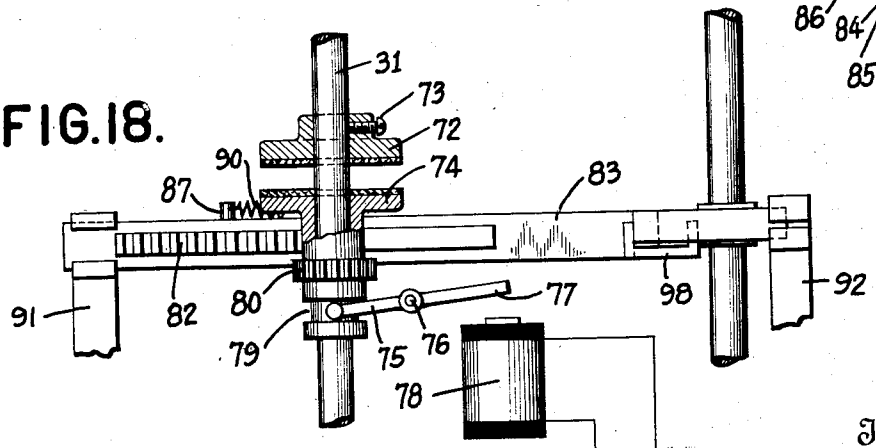


FIG.19.

FIG.18.



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By his Attorney

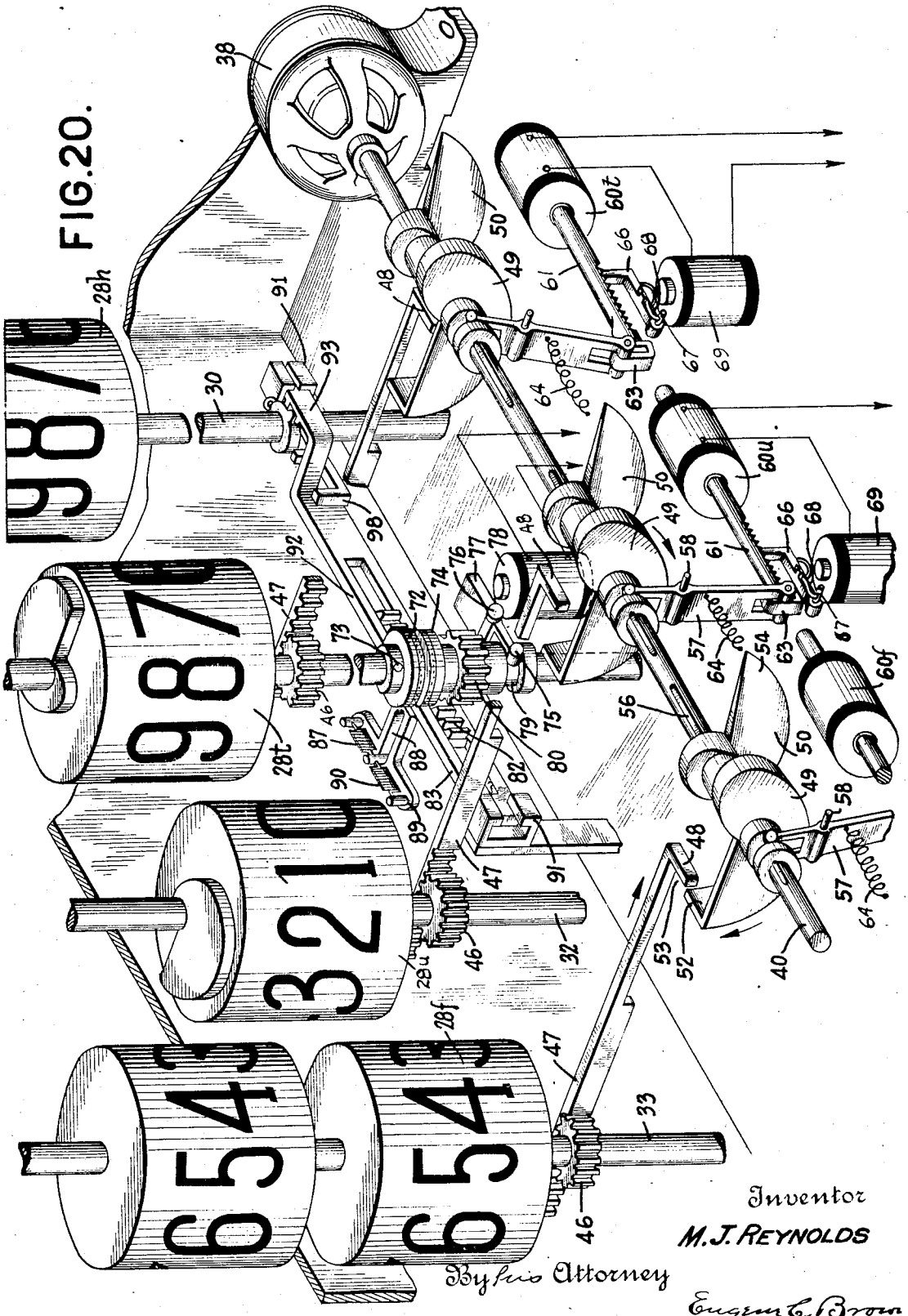
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QUOTATION BOARD INDICATING APPARATUS

Filed Aug. 27, 1930 9 Sheets-Sheet 7

FIG. 20.



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March 27, 1934. M. J. REYNOLDS 1,952,513

QUOTATION BOARD INDICATING APPARATUS

Filed Aug. 27, 1930 9 Sheets-Sheet 8

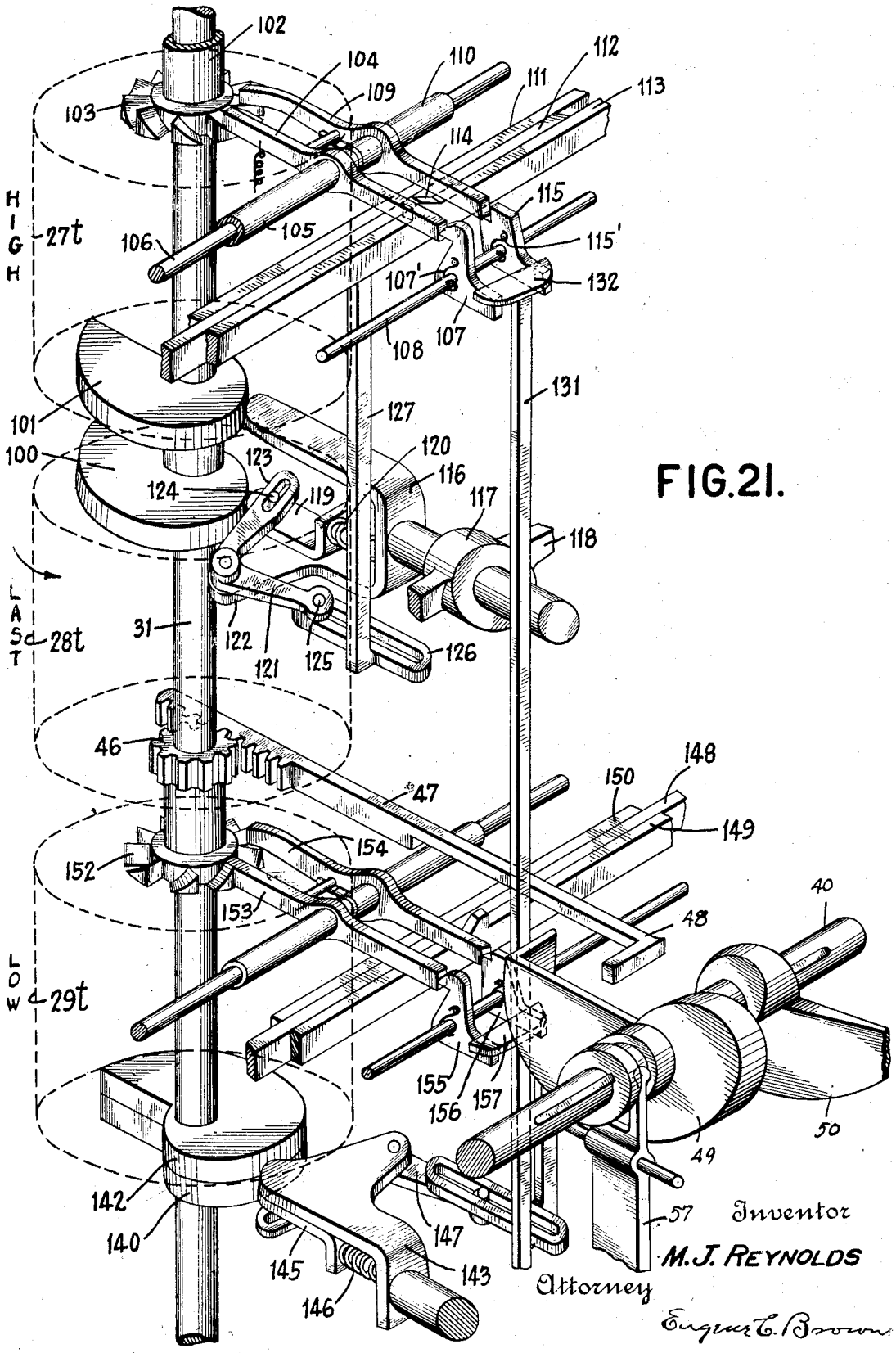


FIG.21.

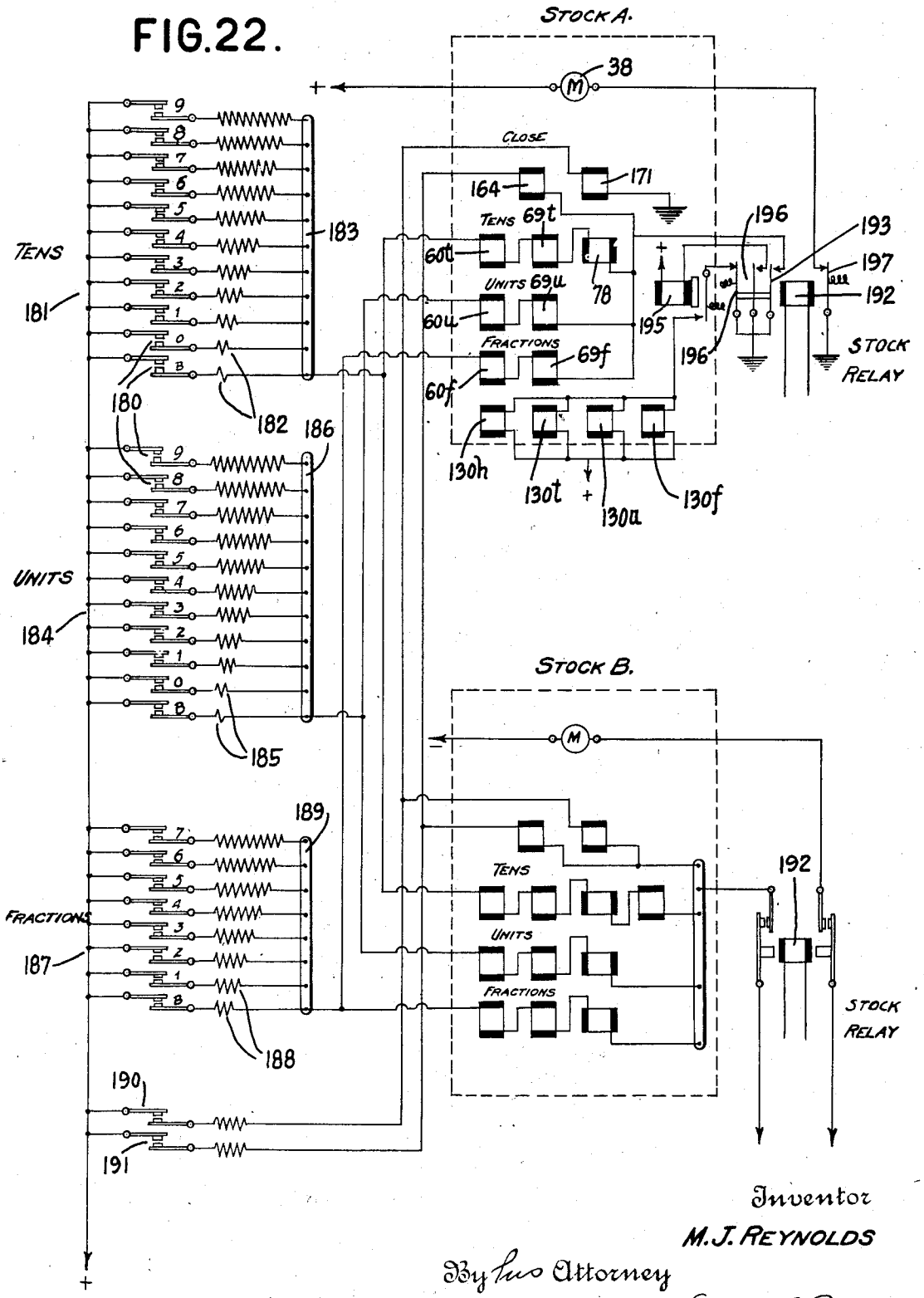
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QUOTATION BOARD INDICATING APPARATUS

Filed Aug. 27, 1930 9 Sheets-Sheet 9

FIG.22.



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Edgar C. Brown

Patented Mar. 27, 1934 1,952,513

UNITED STATES PATENT OFFICE

1,952,513

QUOTATION BOARD INDICATING APPARATUS

Marvin J. Reynolds, Montclair, N. J., assignor to The Western Union Telegraph Company, New York, N. Y., a corporation of New York

Application August 27, 1930, Serial No. 478,237

10 Claims. (Cl. 177—353)

This invention relates to automatic quotation boards for use in brokers' offices, banks and similar places, for posting quotations or prices of stocks, bonds or commodities in response to telegraph code signals.

The information ordinarily desired to appear on the quotation board is the "yesterday's close", "open", "high", "low" and "last" quotations of the stock, each of these quotations involving the hundreds, tens, units and fractions values thereof. In order to operate the quotation boards over a telegraph net work, from a single distributing apparatus and to permit each broker to choose from the total listings on the exchange the particular stocks which he desires, it is necessary to transmit signals corresponding to substantially every transaction occurring on the floor of the exchange, which involves, in each instance, signals for selecting the stock and the range, that is, whether the "open", "high", "low" or "last" quotation, and the signals for setting the indicating elements in accordance with the quotation. In one system extensively employed, such as shown in patent to Haselton No. 1,890,877, dated December 13, 1932, four channels of communication are used thus providing a separate channel for each of the hundreds, tens, units and fractions indicators. The indicators are stepped around to the required position by a number of successive impulses, the four channels being employed first to transmit the stock and range selection, then to transmit a succession of ten impulses for restoring the indicators to an initial or blank position and subsequently to transmit over each channel of communication a number of impulses corresponding to the particular digit representative of the hundreds, tens, units and fractions values of the quotation. Due to the necessity of transmitting signals for substantially all transactions occurring on the floor of the exchange, the time available for each individual quotation is relatively short and due to the involved nature of the signals they must be transmitted at a high rate of speed.

One of the objects of the present invention is to provide a quotation board mechanism which will operate in response to a small number of signals to post the desired information concerning each stock or item.

Another object is to enable the hundreds values of the quotation to be changed automatically without the transmission of special signals representative thereof.

A further object is to provide a quotation board mechanism in which the opening quotation of the day and the high and low quotations will be set up automatically and without the transmission of any special signals.

A still further object is to provide mechanism for causing the "yesterday's close" indicators to assume the setting of the "last" indicators at the conclusion of each day's business in readiness for the succeeding day.

Other objects and advantages will appear from the following description taken in connection with the accompanying drawings and appended claims.

In accordance with my invention I operate the tens, units and fractions indicators of the "last" group directly in response to telegraph code signals, the indicator drums being rotated in one direction to present higher digits in the indicating position and in the opposite direction to present lower digits to view. The hundreds indicator drum, when changes occur in the hundreds value of the quotation, is operated from the movement of the tens indicator drum from a digit of high order, as 9, to one of low order, as 0, or from movement of the tens drum from a digit of low order to one of high order. For instance, the movement of the tens drum from 9 to 0 due to a change in the quotation, as for instance from 90 to 100, causes the hundreds drum to operate to post a higher digit and the movement of the tens drum from 0 to 9 as in changing from 100 to 90 causes the hundreds drum to rotate in the opposite direction to post a lower digit.

This movement of the tens drum from a high digit to a low digit or from a low digit to a high digit, in order to operate the hundreds drum, must be continuous, such movement by small increments as in response to a gradually rising or falling market being ineffective to change the setting of the hundreds drum.

The "high" group of indicators follows the movement of the "last" indicators whenever a higher quotation is posted and the "low" indicators similarly follow the "last" indicators in response to a new low quotation.

At the conclusion of the day's business the "last", "high", "low" and "open" indicators are returned to blank position, at which time the "opening" group of indicators are placed in condition to respond to the first quotation of the particular stock transmitted on the following day, the "opening" indicators then locking up so as to be unresponsive to succeeding quotations transmitted during the day. The "yesterday's close" indicators are locked against movement during the course of operation of the board and

may be released prior to the restoration of the "last" indicators to zero or blank position after the close of the day's business to cause them to assume the position of the "last" indicators, thereby setting them in readiness for the succeeding day's business.

In order that the invention may be fully understood reference will be had to the accompanying drawings wherein:

Figure 1 is a front elevation of an indicator unit for a single stock, the front panel being partly cut away;

Figure 2 is a sectional view on the line 2—2 of Figure 1 showing the assembly of the tens indicator drums;

Figure 3 is a sectional view on the line 3—3 of Figure 2;

Figure 4 is a sectional view on the line 4—4 of Figure 2;

Figure 5 is a sectional view on the line 5—5 of Figure 2;

Figure 6 is a sectional view on the line 6—6 of Figure 1, showing the fractions drum assembly;

Figure 7 is a sectional view substantially on the line 7—7 of Figure 2;

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

Figure 9 is a sectional view on the line 9—9 of Figure 1, showing the hundreds indicator drum assembly;

Figure 10 is a sectional view on the line 10—10 of Figure 9;

Figure 11 is a sectional view on the line 11—11 of Figure 9;

Figure 12 is a sectional view on the line 12—12 of Figure 1, showing the "high" indicator drums in plan;

Figure 13 is a sectional view on the line 13—13 of Figure 12;

Figure 14 is a sectional view on the line 14—14 of Figure 1, showing the "last" indicator drums in plan;

Figure 15 is a sectional view on the line 15—15 of Figure 14;

Figure 16 is a plan view of the mechanism for operating the hundreds drum in response to the movement of the tens drum;

Figure 17 is a view similar to figure 16 showing the mechanism in position for shifting the hundreds drum in one direction;

Figure 18 is an elevation of the mechanism shown in Figure 17;

Figure 19 is a sectional view on the line 19—19 of Figure 16;

Figure 20 is a perspective view of the "last" indicator drums and the driving and control mechanism therefor;

Figure 21 is a perspective view of the "high", "last" and "low" drums of the tens group showing the manner in which the "high" and "low" drums follow the movement of the "last" drum; and,

Figure 22 is a diagram of a circuit arrangement which may be employed for controlling operation of the indicator board mechanism.

Referring to Figure 1 I have shown the front of a panel 24, (partly cut away) of a single quotation board unit, comprising five horizontal rows or groups of indicator drums 25, 26, 27, 28 and 29 for posting the "yesterday's close", "open", "high", "last" and "low" quotations, respectively, of a single stock. Each horizontal row consists of four drums *h*, *t*, *u* and *f* for indicating the hundreds, tens, units and fractions values of the quotation. Each of the hundreds, tens and units drums bears a blank and the characters 0 and 1 to 9, and the fractions drum bears a blank and the characters 1 to 7. The drums are mounted behind the panel 24 on vertical shafts 30, 31, 32 and 33, journaled in thrust bearings 34, carried by the base 35 of the unit, and in a plate 36 extending across the unit adjacent the top thereof. Windows 37 in the front panel 24 render visible a single character on each of the drums. The tens, units and fractions drums of the "last" group are operated in response to telegraphic code signals, as will appear subsequently, by an electric motor 38, mounted upon a shelf or bracket 39 at the rear of the hundreds drums and having a shaft 40 extending transversely back of the tens, units and fractions drums 28 and bearing in the side wall 42 of the unit. The hundreds indicator drums are not directly responsive to transmitted code signals but are operated in response to the movement of the tens drums from digit 0 to 9 or from 9 to 0, by a transfer mechanism, indicated generally at 43, hereinafter described, and the "yesterday's close", "open", "high" and "low" drums are automatically operated from the movement of the "last" indicators.

The drums of each vertical row are assembled independently upon the shafts 30 to 33, the "tens" group (Figure 2) comprising the "last" indicator drum 28*t*, keyed at 41 to the shaft 31, and the "close," "open," "high" and "low" drums 25*t*, 26*t*, 27*t* and 29*t*, respectively, loosely mounted for relative rotation, on the shaft and connected thereto for rotation therewith by spiral springs 44, secured at the outer ends to the drums and at the inner end to collars 45, keyed to the shaft. The corresponding indicator drums of the hundreds, units and fractions group are similarly assembled upon the shafts 30, 32 and 33, respectively.

The operating mechanism for the "last" indicators (Figures 8 and 20) comprises a pinion 46 fixed on each of the tens, units and fractions shafts, meshing with racks 47 extending inwardly therefrom and having a right angled end 48. Keyed to the motor shaft for sliding movement thereon are two integral cams 49, 50, for each of the tens, units and fractions drums, disposed adjacent the end of each of the racks 47. Cams 49 each have an internal cam surface 52 adapted, when the cams are shifted to the right (Figure 20) to engage the inner surface 53 of the ends 48 of the racks, to move the same outwardly, in the direction of the arrow, and thus to rotate the drums associated therewith in a clockwise direction, as viewed from the top, thereby to move a lower digit into indicating position. The cam face 52 decreases in width, toward the motor shaft, so that the extent of movement of the racks and hence the amount of rotation of the drums depends upon the distance the cams are moved along the motor shaft toward the rack. The cams rotate in the direction of the arrow, the surface 52 passing in back of the end 48 of the rack and engaging it at a point along the face of the cam, depending upon the previous setting of the rack, and moving the rack outwardly an amount depending on the position of the cam longitudinally of the shaft, until the cam passes across the tip of the offset end 48.

The cams 50 serve, when shifted to the left, (Figure 20), to move the racks in the opposite direction or inwardly to rotate the drums to bring larger digits successively into indicating position. Cams 50 are wide adjacent the motor

shaft, decreasing in width toward the end 54 so that the inward movement of the racks is in direct relation to the longitudinal movement or position of the cams 50 on the motor shaft. The cams are shifted longitudinally along the motor shaft, on the keys 56, by yokes 57, pivoted to stub shafts 58 extending inwardly from the rear wall 59 of the unit. The yokes are operated in one direction by solenoids 60*f*, 60*u* and 60*t*, the cores 61 of which are pivoted by pin and slot connections 63 to the lower end of the yokes. The yokes are moved in the opposite direction by retractile springs 64 secured to the yokes and to pins 65 (Figure 2). The yokes are locked in each set position by detents 66, pivoted on pins 67. The detents are held in engagement with one of a series of notches in the underside of the cores 61 by springs 68, and are released by detent magnets 69 mounted on a cross brace 70.

As will appear more fully hereinafter, with reference to the detailed description of Figure 22, upon the selection of a particular unit corresponding to a particular stock, the motor 38 is set into operation to rotate the cams 49, 50. The solenoids 60*t*, 60*u* and 60*f* are then energized by currents of a magnitude depending upon the desired setting of the tens, units and fractions drums to shift the cams along the shaft 40, the detent magnets 69 being simultaneously operated to release the solenoid cores. The cams 49, 50, rotate in their shifted position, to move the racks 47 either outwardly or inwardly, depending upon whether the cams have been shifted to the right or left, in Figure 20. The detent magnet 69 releases the detent 66 simultaneously with or prior to the de-energization of the solenoids 60 to lock the core in its shifted position. At the same time the motor 38 is brought to rest.

The hundreds drum 28*h*, as before stated, is operated to a higher or lower position by the movement of the tens drum 28*t* in moving from a high digit to a low digit or vice versa through mechanism which will now be described. The tens shaft 31 has a friction clutch element 72 fixed thereon as by a screw 73 (Figures 16, 17, 18, 19 and 20) for rotation with the shaft. A cooperating clutch element 74 is also mounted on the shaft in sliding engagement therewith and free to rotate relatively thereto. The clutch elements 72 and 74 are normally separated and are adapted to be brought into engagement by a yoke 75 pivoted at 76 and having an armature 77 operated by a magnet 78. The yoke 75 engages an annular groove 79 formed in a tubular extension of the clutch element 74. A pinion 80 is fixed to the tubular extension and when the clutch is engaged, the pinion meshes with a rack 82 positioned in a slideway 83. Rack 82, medially thereof, is provided with an ear 84 extending through a slot 85 in the slideway. A link 86 is pivoted to the ear 84 and is provided at the opposite end with a pin 87 extending upwardly through a slot 88 formed in a T-shaped arm 89 integral with the slideway 83. Retractile springs 90 extend between the pin 87 and the outer ends of the arm 89 and tend to maintain the rack normally centrally of the slideway. The slideway 83 is also mounted for limited longitudinal movement in a pair of guides 91 and 92 disposed at each end of the slideway. One end 93 of the slideway is provided with a pair of teeth 94 between which is positioned a single tooth 95, carried by a collar 96, secured to the shaft 30 by a screw 97. The movement of the slideway is limited, in each direction, by a U-shaped stop member 98.

The characters on the drums are arranged so that the blank position appears in one limit of rotation of the drum, the drum rotating to its other limit of movement to bring the numerals 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 successively into view, the numeral 9 being located at the opposite limit of the rotation of the drum.

The operation of the hundreds actuating mechanism is as follows: The hundreds drum is set by hand in the first instance to exhibit the correct hundreds value of the stock, by loosening the collar 96 and rotating the drum to bring the proper character into view. The collar 96 is then tightly set on its shaft with the tooth 95 extending between the teeth 94 of the slideway 83, and with the slideway positioned midway between the stop members 98. With the drum so set it will automatically respond to changes in the hundreds value of the quotation of one digit each direction, or for a change in the value of the quotation of one hundred or more points in either direction. Upon receipt of a tens indicator operating signal to actuate the solenoid 60*t*, the clutch magnet 78 is simultaneously operated therewith, as will subsequently appear, thus causing engagement of the clutch members to rotate the pinion 80 with the tens shaft and to bring the pinion into mesh with the rack 82 to move it a distance depending upon the extent of rotation of the tens drum. Assuming by way of example, that the reading on the "last" group of drums is 107.3 and that the subsequent quotation transmitted is 117.3, the tens drum upon rotating upward through one character, will drive the rack 82 one tooth to the left. Since this movement is not sufficient to bring the end of the rack to the left end of the slideway, the slideway remains stationary and the hundreds drum unoperated. Upon cessation of the operating signal, clutch 72, 74 is disengaged and the pinion 80 moved out of mesh with the rack, due to its weight, the rack being returned to its central position by the springs 90 acting on the link 86. Assume now that the market price of the security gradually increases to the following values: 135, 145, 165 and 195. The tens drum continues to rotate in the upward direction as each quotation is transmitted, and after the posting of each quotation the rack is returned to its central position.

The ends of the rack are spaced from the ends of the slideway such a distance that a change in the drum setting of at least five characters (fifty points) is required in order to cause the rack to engage either end of the slideway to move it in the guides 91, 92. Therefore, the movement of the tens drum from character 0 to 9, when occurring in increments of less than five characters, will not shift the slideway from its central position shown in Figure 16. However, in the example assumed, with the final reading of 195, if the succeeding quotation is 200, the tens drum is required to rotate continuously in a clockwise direction, as viewed from the top, from the character 9 to 0, or a distance of nine characters. The rack is thus moved to the right into engagement with the end of the slideway, thus forcing the slideway to the right against the stop member 98 and at the same time rotating the hundreds drum from character 1 to character 2.

The slideway may be held in its shifted position by a friction in the guides 91, 92, by a

spring detent or in any other suitable manner.

Excess rotation of the shaft 31 over that required to operate the slideway is taken up in slippage between the clutch elements 72, 74.

Upon release of the clutch magnet, the rack is returned to the center of the slideway. If a further increase of a hundred points occurs in the quotation, it will be necessary to reset the hundreds drum by hand through the collar 96, to a higher digit. However, changes of a hundred points occur only over considerable periods of time and the resetting of the hundreds drum can be effected during idle periods of the board.

Obviously, if the quotation drops from 200 back to 190, the tens drum, in rotating from 0 to 9 in one movement, will operate the slideway in the opposite direction to restore the digit 1 to view on the hundreds drum, the slideway again assuming its central position relative to the stop member 98. On a further decline of the quotation from the hundreds order to the tens order, as from 120 to 80, the slideway will be shifted to its extreme left position, thus rotating the hundreds drum from digit 1 to its blank position.

The mechanism for operating the "high" drums from the movement of the "last" drums will now be described. Referring to Figure 21, I have shown the operating mechanism for the tens "high" and "low" drums. A cam 100 is secured to the "last" drum to rotate therewith and with the shaft through operation of the rack 47 and pinion 46. A similar cam 101 is secured to the lower face of the "high" tens drum 27*t*. The strength of the spiral spring 44, which provides the driving connection between the shaft 31 and the "high" tens drum, is such as to cause this drum to follow the movement of the "last" tens drum unless restricted. Mounted on the upper face of the "high" tens drum is a cam wheel 102 having a plurality of radially extending cam shaped teeth 103.

A lever 104, fixed to a sleeve 105, loosely journaled on a cross rod 106, engages in a recess between the cam teeth and normally prevents the drum from rotating to a lower digit position by engagement with the rear side of the cam teeth. The lever 104 is adapted to be raised by the cam teeth, however, to permit the drum to follow the movement of the shaft 31 to a higher digit position.

A latch 107 pivoted on a cross rod 108 engages the free end of the lever 104 under the action of a spring 107', when the opposite end of the lever is elevated, and holds the same disengaged from the cam wheel. A second lever 109 pivoted on the sleeve 110, has one end normally disposed above an adjacent notch in the cam wheel out of engagement therewith. A number of sliding bars 111, 112 and 113 extend beneath the free end of the lever 109, bar 113 being provided with a wedge shaped projection 114 adapted, when the bar is shifted longitudinally, to force the lever 109 into engagement with the cam wheel to lock the "high" drum against rotation in either direction. A latch 115, also pivoted on rod 108, engages the free end of the lever 109 under the action of a spring 115' to lock the bar, when operated, into engagement with the cam wheel.

A U-shaped follower 116 is positioned between the drums 27*t* and 28*t* for engagement with the cams 100 and 101. The follower slides in a block 117 forming part of a cross brace 118 (Figure 14). An auxiliary follower 119 is carried by the lower arm of the main follower 116 and is urged towards the cam 100 by a compression spring 120. A bell crank lever 121 pivoted on an extension 122 of the lower arm of the main follower, has one end 123 slotted and engaged by a pin 124 carried by the auxiliary follower 119. The opposite end of the bell crank has a pin 125 engaged in the slotted end 126 of a vertical bar 127 integral with and depending from the cross bar 112.

The operation of the mechanism just described is as follows: Assuming the "last" tens drum and the "high" tens drum to be in their initial or blank position and that the "last" tens drum be moved in accordance with three successive quotations to exhibit the Figures 6, 8 and 5. Movement from the blank position to bring the numeral 6 into view is in a counter clockwise direction, as viewed from the top. During this movement the cam 100 moves the main follower 116 and auxiliary follower 119 rearwardly. Since the movement of the drum is in the direction of a higher digit, the "high" drum 27*t* follows the movement of the shaft 31 and comes to rest with the cam 101 in engagement with the upper arm of the main follower 116.

During this movement, lever 104 is moved out of engagement with the cam wheel and locked in such position by the latch 107, the function of which will appear subsequently. It is released, however, prior to the transmission of the succeeding tens signal by a magnet 130 (Figure 2) which actuates a trip bar 131, having a member 132 overlying the tail portions of the latches 107 and 115.

Upon the next movement of the "last" drum to exhibit the numeral 8, the "high" drum continues to follow the shaft 31, since the direction of rotation is towards a higher digit.

The next movement of the "last" drum to exhibit the numeral 5 is in the reverse direction, however, and due to the engagement of the lever 104 with the rear side of the cam teeth 103, the "high" tens drum is retained in its previous setting. Cam 101 therefore retains the follower 116 in its rearward position and cam 100 moves out of contact therewith, permitting the auxiliary follower 119 to move forward and rock the lever 121, thus moving the cross bar 112 through the depending rod 127, to the right (Figure 21). The bar 112, as will appear hereafter, locks the "high" units and fractions drums in their previous position so that they will not respond to a higher digit appearing in the units or fractions position.

Referring to Figure 14 it will be noted that the "last" hundreds drum 28*h* is provided with similar main and auxiliary followers 116*h* and 119*h*, and a lever 121*h* for operating a depending rod 127*h*, and that the "last" units drum is similarly provided with main and auxiliary followers 116*u* and 119*u*, and a lever 121*u* for operating a depending rod 127*u*. The rod 127*h* is secured to a cross bar 113 (Figure 9) to shift the same whenever the "last" hundreds drum rotates to a lower value than the "high" hundreds drum, and the rod 127*h* is connected to a cross bar 111 (Figure 13) to shift the same when the "last" units drum rotates to a lower value than the "high" units drum.

The "high" units drum 27*u* (Figure 12) is also provided with a cam wheel 102*u* and associated levers 104 *u* and 109*u*, the former being carried by a sleeve 133 journaled on the cross shaft 106, and the latter being loosely journaled on the end of the sleeve 105. The latches 107*u* and 115*u* serve respectively to lock the lever 104*u* out of engagement with the cam wheel and the lever

109*u* in engagement with the cam wheel, whenever these levers are operated to such positions. A trip bar 131*u*, having a member 132*u* overlying the tail portions of the latches 107*u* and 115*u*, is provided and is operated by a magnet not shown, similar to magnet 130.

Similarly, the "high" fractions drum 27*f* is provided with a cam wheel 102*f* and co-operating levers 104*f* and 109*f*, the former being carried by a sleeve 134 journaled on the shaft 106, and the latter being loosely journaled on the sleeve 133. Latches 107*f* and 115*f* serve to lock the levers 104*f* and 109*f* in a manner similar to levers 104 and 109, and the latches are tripped by a member 132*f* carried by the trip rod 131*f* actuated by a magnet 130*f*.

The "high" hundreds drum 27*h* also has a cam wheel 102*h* secured thereto, and a co-operating lever 104*h* carried by the sleeve 110 journaled on a shaft 106 and having a trip rod 131*h* actuated by a trip magnet 130*h*.

The sleeve 110 has a radially extending pin 135 disposed beneath a pin 136 extending from the lever 104 to cause the lever 104 to be moved out of engagement with its cam wheel 102 simultaneously with similar movement of the lever 104*h*. In the same manner the sleeve 105 has a radial pin 135*u* disposed beneath a pin 136*u* carried by a lever 104*u* and sleeve 133, is likewise provided with a pin 135*f* engaging the pin 136*f* carried by the lever 104*f*. The movement of any one of the levers 104*h*, 104*u* or 104*f* causes all of the corresponding levers of a lower order to be operated simultaneously therewith. When so operated, the levers are locked out of engagement with their cam wheels by the latches 107, 107*h*, 107*u* and 107*f*.

The operation of the "high" drums can best be explained by a series of examples followed by reference to Figures 12 and 14. Assume that all of the "last" and "high" drums are in their blank positions and a quotation of 75⅜ is received, the signals representing the digits of the quotation being received in succession to successively operate the "last" tens, units and fractions drums to post the numerals 7, 5 and 3. The corresponding "high" drums, since the movement of each drum is in an upward direction, assume the same positions. Let the next quotation be 83⅝. The "high" tens drum will move upwardly to exhibit the numeral 8, the cam wheel 102 rocking the lever 104 and through pins 135*u*, 136*u* and 135*f*, 136*f* disengaging the levers 104*u* and 104*f* from their cam wheels, in which position they are locked by the latches 107*u* and 107*f*. The "high" units and fractions drums will, therefore, follow the movement of the "last" units and fractions drums to exhibit the characters 3 and 5 respectively.

The trip rod operating magnets 130*h*, 130, 130*u* and 130*f* are arranged in the control circuit as will appear in connection with the description of Figure 22 so as to operate upon release of the stock selecting relay after the transmission of the final signal of a complete quotation. The levers 104, 104*u* and 104*f* are, therefore, released for reengagement with their cam wheels before the succeeding quotation is received. Assume now that the next quotation is of a value of 75-2/8. Upon movement of the tens drum downward to exhibit the character 7 the "high" tens drum is held in its previous position by the lever 104 thus causing the auxiliary follower 119 to actuate the shift bar 112 to carry the cams 138 and 139 (Figure 12) beneath levers 109*u* and 109*f* to force them into engagement with their cam wheels, thus locking the units and fractions drums against rotation in either direction so long as the "last" tens value remains below the previous setting of the "high" tens drum. The levers 109*u* and 109*f* are locked in this position by their latches, but the latches are tripped after the completion of the transmission of the quotation.

Assume the next quotation to be 81-2/8. The "last" tens drum upon moving up to again exhibit the numeral 8 moves the shift bar 112 through the auxiliary follower 119, so as to withdraw the cams 138 and 139 from beneath the levers 109*u* and 109*f*. The latches 115*u* and 115*f*, however, retain the levers in engagement with their cam wheels and prevent the units wheel from assuming the previous position 5 of the "last" units wheel before the succeeding unit and fraction signals are received, corresponding to the digits 1 and 2. After the completion of the transmission of the quotation the trip rods 131 operate to trip all of the latches.

Assuming as an alternative contingency that the preceding quotation of 81-2/8 had been 87⅞. Due to the locking action of the levers 109*u* and 109*f*, the "high" units and fractions drums are restrained from following the rotation of the "last" drums to post the character 7. The springs 44 through which the "high" drums are driven are placed under tension, however, by the rotation of the shafts 32 and 33 and upon release of the levers 109*u* and 109*f*, following the release of the stock selecting relay the "high" units and fractions drums rotate under the action of the springs 44 to their new high position as determined by the position of the followers 116*u* and 116*f*.

It will be noted, therefore, that upon movement of the "high" tens drum to establish a new high value in the tens position that the unit and fractions drums are released for movement in either direction to complete the quotation and that upon movement of the tens "last" drum to a lower position the "high" units and fractions drums are locked against rotation in either direction so that they will not respond to a higher units and fractions value of a quotation having a lower tens value then the previous high. The hundreds drum similarly controls the operation of the tens units and fractions drums and the units drums control the operation of the fractions drums.

The operation of the "low" drums is similar to that of the "high" drums except that the "low" drums respond only upon the establishment of a new low quotation.

Referring to Figures 2 and 21 a control cam 140 corresponding to the control cam 100 is keyed at 141 to the shaft 31 to rotate therewith. Cam 140 is reversed to position on shaft 31 with respect to cam 100. A cam 142 is secured to the "low" drum 29*t*, this drum and its cam being loosely journaled on the shaft and being driven therefrom by the spring 44. A main follower 143 is mounted adjacent the cams 140 and 142 so as to slide in a block 144 and is of such width as to be engaged by either or both of the cams. An auxiliary follower 145 is urged towards the cam 140 by a spring 146 and upon relative movement thereof with respect to the main follower operates a bell crank lever 147 which in turn operates a shift bar 148. Similar mechanism is provided, actuated by the relative movement of the hundreds and units "last" and "low" drums for operating the shift bars 149 and 150 respectively.

The "low" hundreds, tens, units and fractions drums are also provided with cam wheels 152 and cooperating levers 153 and 154 mounted in the same manner as the levers 104 and 109 and having locking latches 155 and 156 respectively coacting with their free ends. The locking latches are arranged to be tripped by plates 157 carried by the trip bars 131*h*, 131*u* and 131*f*. The cam wheels 152 are constructed so as to actuate the levers 153 when the "low" drums are moved to a lower position.

The operation of the "low" drum actuating mechanism being similar to that of the "high" drum mechanism, detailed description thereof is unnecessary.

The mechanism for posting the "yesterday's close" quotations comprises four drums 25*h*, 25*t*, 25*u* and 25*f* mounted on the shafts 30, 31, 32 and 33 respectively through the spiral springs 44. Each drum is provided with a locking wheel 160 having teeth corresponding in number to the positions of operation of the drum and normally engaged by locking levers 161 rigidly mounted upon a rod 162 extending between the side walls 42 of the unit. The hundreds locking lever 161 is provided with an armature portion 163 adapted to be actuated by a magnet 164 carried by a bracket 165, from the side wall of the unit. The "yesterday's close" drums are locked against rotation during the normal operation of the board by the levers 161. After the conclusion of the day's business, the magnet 164 may be operated by a transmitted signal to rock the levers 161, thus releasing the "yesterday's close" drums and allowing them to rotate under the tension of springs 44 to assume the position of the "last" indicator drums, in which position they are again locked by the levers 161, in readiness for the succeeding day's business.

The opening quotation of the day is recorded on the drums 26*h*, 26*t*, 26*u* and 26*f* also mounted on their respective shafts through the springs 44, each being provided with a locking wheel 166 and cooperating locking lever 167 rigidly mounted on the shaft 168 journaled in the opposite side walls 42 of the casing. The levers 167 are normally held in engagement with the locking wheels by springs 169, the hundreds lever having an armature portion 170 and an operating magnet 171. The latch 172 serves to lock the levers out of engagement with their locking wheels when actuated by the magnet 171.

A link 175 connects the hundreds lever 167 with the levers 104*h* and 153*h*, through the pin and slot connections 176 and 177 whereby levers 104*h* and 153*h* may be operated independently of lever 167 but the operation of lever 167 will cause both of the levers 104*h* and 153*h* to be released from engagement with their cam wheels and to be locked in such position by their respective latches. The latches 172 of the "open" drum levers 167 are fixed to their shaft 178 and are adapted to be tripped by the trip rod 131 acting through the tens latch 172.

At the conclusion of each day's transactions it is desirable to return the indicator drums, with the exception of the "yesterday's close" drums, to a blank position in readiness for the succeeding day's business. In order not to interfere with the setting of the hundreds drum, I prefer not to restore the tens drum to such position but to restore only the units and fractions drums. The operation of the mechanism for effecting this restoration and for preparing the "open" indicator drums so that they will respond to the opening quotation of the particular stock on the succeeding day is as follows.

The "last" units and fractions drums for all stocks are first operated to their blank position, the tens drums being left unchanged. After release of all of the stock relays the levers 167 for all stocks appearing on the board are tripped by the magnet 171 and are locked out of engagement with their locking wheels by the latches 172. The "open" drums being thus free to rotate, assume the angular position of their shafts corresponding to the hundreds and tens readings of the "last" drums and to the blank position of the "last" units and fractions drums. At the same time, through link 175, levers 104 and 153 of the "high" and "low" drums for each stock are disengaged from their cam wheels allowing the units and fractions drums to rotate to the blank position under the tension stored in springs 44.

It will be recalled that upon release of the stock or master relay, the trip magnets 130 were energized to trip the latches associated with all the locking levers. The magnet 171 is arranged to be operated independently of the stock relay, however, so that after operation thereof and the consequent locking of the "open" levers 167, "high" levers 104 and "low" lever 153 out of engagement with their respective locking and cam wheels, they will be retained in this position by their respective latches. Hence, upon the transmission of the first quotation on the succeeding day, the "open", "high" and "low" drums will be free to follow the movement of the "last" drums. At the completion of the posting of the opening quotation however, and upon release of the stock relay, the trip magnets will be operated to restore all of the levers into engagement with their locking and cam wheels. The "open" indicator drums will thus be locked against movement during succeeding quotations.

Reference will now be had to Figure 22 for a description of the circuit arrangement for controlling the portion of the indicator board mechanism. Contacts 180 represent the contacts of a receiving selector by means of which any of the contacts may be selectively closed in response to telegraph code signals. These contacts comprise a tens group 181 consisting of eleven contacts, B, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, connected respectively through resistors 182 of gradually increasing resistance, to a common bus bar 183; a group of eleven units contacts 184 similarly connected through the progressively increasing resistances 185 to a bus bar 186; a fractions group 187 of eight contacts connected to progressively increasing resistances 188 to a bus bar 189; a restoration contact 190 and a "yesterday's close" contact 191. The selector contacts 180 are common to the entire board, which may comprise any desired number of units of the type described. A stock relay 192 is provided for each stock and is adapted to be selectively energized through the receiving selector (not shown). A selector of the type described in a co-pending application of Wheeler and Sortore, Serial #422,148, filed January 20th, 1930, may be used. In the operation of the receiving selector when it is desired to post the quotation of a particular stock the stock or master relay 192 is first operated and locked up through contacts of the selecting system (not shown). The tens, units and fractions contacts 180 corresponding to the particular digit to be posted are next operated in succession. Assuming the quotation to be 183⅝, contacts 8, 3 and

5 of the tens, units and fractions groups will be closed in succession.

The bus bar 183 is connected to the tens solenoid 60*t* detent magnet 69*t* and clutch magnet 78 in series, the circuit being completed to ground through the contact and tongue 193 of the stock or master relay 192. Similarly, bus bars 186 and 189 are connected respectively to the units and fractions cam shifting solenoids and detent magnets 60*u*, 69*u* and 60*f*, 69*f*, the circuits being completed to ground, through tongue 193 of the stock relay. The "yesterday's close" contact 191 is connected to one terminal of the winding of the magnet 164, the circuit being similarly completed through the contact 193 of the stock relay. The restoration contact 190 is connected to the restoration magnet 171 and thence directly to ground.

The four trip magnets 130*h*, 130*t*, 130*u* and 130*f* are connected in parallel, their circuit being completed through the front contact of a slow release relay 195 and the back contact 196 of the stock relay to ground. The slow to release relay 195 is operated through the front contact and tongue 196 of the stock relay. The motor 38 is also operated directly through the front contact and tongue 197 of the stock relay.

During the course of posting a particular quotation, upon the closing of the stock or master relay 192, the motor 38 is set into operation to rotate the cams 49 and 50. At the same time the slow to release relay 195 picks up and prepares a circuit for the trip magnets 130, this circuit being opened at the back contact of the stock relay. Ground is also supplied through the front contacts of the stock relay to the "close" magnet 164 and the tens, units and fractions magnets 60 and 69. Upon transmission of the "tens" signal of the quotation 83⅝, contact 8 of the tens group 181 closes causing the detent magnet 69*t*, clutch magnet 78 and cam shifting solenoid 60*t* to operate to actuate the "last" tens drum. This is followed by closing of the contacts 3 and 5 of the units and fractions groups respectively to set the "last" units and fractions drums. After completion of the transmission of the fractions signal the stock relay 192 is released through the selective mechanism thus interrupting the circuit to the motor. The circuit is completed at the same time for the trip magnets 130, through the front contact of the slow to release relay 195 and back contact and tongue 196 of the stock relay, thereby causing the trip magnets to operate and to release the latches set during the posting of the previous quotation. This circuit is interrupted immediately thereafter by the release of the retarded relay 195.

When it is desired to release the "yesterday's close" drums to permit them to assume the position "last" drums, the stock relay is again selected followed by selection of the "close" contact 191.

To restore the "high" "low" and "last" units and fractions drums to blank position and to prepare the "open" drums so that they will respond to the opening quotation of the day the stock relay of each stock is selected and the units and fractions contacts B close to restore the "last" units and fractions drums to blank position. The stock relay is then released. The restoration contact 190 is then selected to operate the magnet 171, which as described above actuates all of the levers 167, 104 and 153 to cause them to be locked out of engagement with their locking and cam wheels, whereby "open" "high" and "low" drums take the position of the "last" drum and follow the new settings thereof upon transmission of the first quotation on the succeeding day.

Obviously many changes and modifications may be made in the construction of the indicators and in the arrangement for controlling the operation thereof. Therefore, I do not desire to be limited to the exact details shown and described except in accordance with the appended claims.

What I claim is:

1. In a quotation board an indicator for displaying one digit of a quotation, a second indicator for displaying a digit of higher order, means for operating said first indicator in either direction within definite limits and by small increments independently of said second indicator and means acting only upon a continuous extended movement of said first indicator for operating said second indicator.

2. In a quotation board an indicator for displaying tens digits, an indicator for displaying hundreds digits, means for operating said tens indicator and means for operating said hundreds indicator to a higher position only upon continuous movement of said tens indicator from a high to a low digit position through the intermediate digit positions.

3. In a quotation board, a pair of indicator drums for displaying digits from 0 to 9, means for rotating said drums in opposite directions to exhibit higher or lower numerals and means, acting upon continuous rotation of one of said drums, from digit position 9 to 0 or from 0 to 9 through digit positions 1 to 8, for moving said other drum to exhibit a higher or a lower numeral.

4. In a quotation board, an indicator drum, a motor driven cam, means operable by said cam for rotating said drum in one direction to exhibit higher numerals and in the other direction to exhibit lower numerals, and means for selectively modifying the action of said cam on said first means to control the extent of movement of the drum in either direction.

5. In a quotation board, indicator drums for displaying tens, units and fractions digits, separate motor driven cams, means operable by said cams for rotating each of said drums in either direction to exhibit higher or lower numerals, a common driving shaft for said cams and means for shifting said cams relative to said shaft and means for controlling the extent and direction of rotation of said drums in accordance with the amount of said shifting of the cams.

6. In a quotation board mechanism, a group of "last" indicators, means for operating each of said "last" indicators, a corresponding number of "close" indicators, operative connections between each "close" indicator and the corresponding "last" indicator whereby said "close" indicators tend to assume the position of said "last" indicators, means for normally retaining said "close" indicators against movement and means for releasing said "close" indicators, each of said "close" indicators upon release thereof assuming the position of the corresponding "last" indicator.

7. In a quotation board mechanism, a group of "last" indicator drums, individual shafts for said drums, a corresponding number of "close" indicator drums mounted on said shafts, flexible operative connections, including said shafts, between said "last" and "close" drums, means for rotating said shafts and "last" indicator drums, means for normally retaining said "close" drums against rotation with said shafts and means for releasing said "close" drums, to permit them to

assume the angular position previously given to their corresponding shafts.

8. In a quotation board mechanism, a group of "last" indicators, means for operating each of said "last" indicators, a corresponding number of "open" indicators, means for actuating said "open" indicators with said "last" indicators on the initial operation of the "last" indicators and means responsive to the normal operation of said "last" indicators for retaining said "open" indicators against movement with said "last" indicators, upon subsequent operation thereof.

9. In a quotation board mechanism, a group of "last" indicators, means for operating each of said "last" indicators, a corresponding number of "open" indicators, operative connections between each "open" indicator and the corresponding "last" indicator for operation of said indicators in unison, means normally retaining said "open" indicators against operation with said "last" indicators and remotely controlled means for releasing said retaining means to permit movement of said "open" indicators with said "last" indicators.

10. In a quotation board mechanism, a group of "last" indicators, means for operating each of said "last" indicators, a corresponding number of "close" indicators and "open" indicators, operative connections between said "last" indicators and the "close" and "open" indicators, means for normally retaining the "close" and "open" indicators against movement with said "last" indicators, means for releasing said "close" and "open" indicators and means for causing them to assume the position of said "last" indicators when so released, said means permitting said "open" indicators to operate in unison with the "last" indicator on the next operation thereof.

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