July 7, 1942. W. F. QUINBY 2,288,645

POSTING SYSTEM

Filed Nov. 16, 1939 15 Sheets-Sheet 1

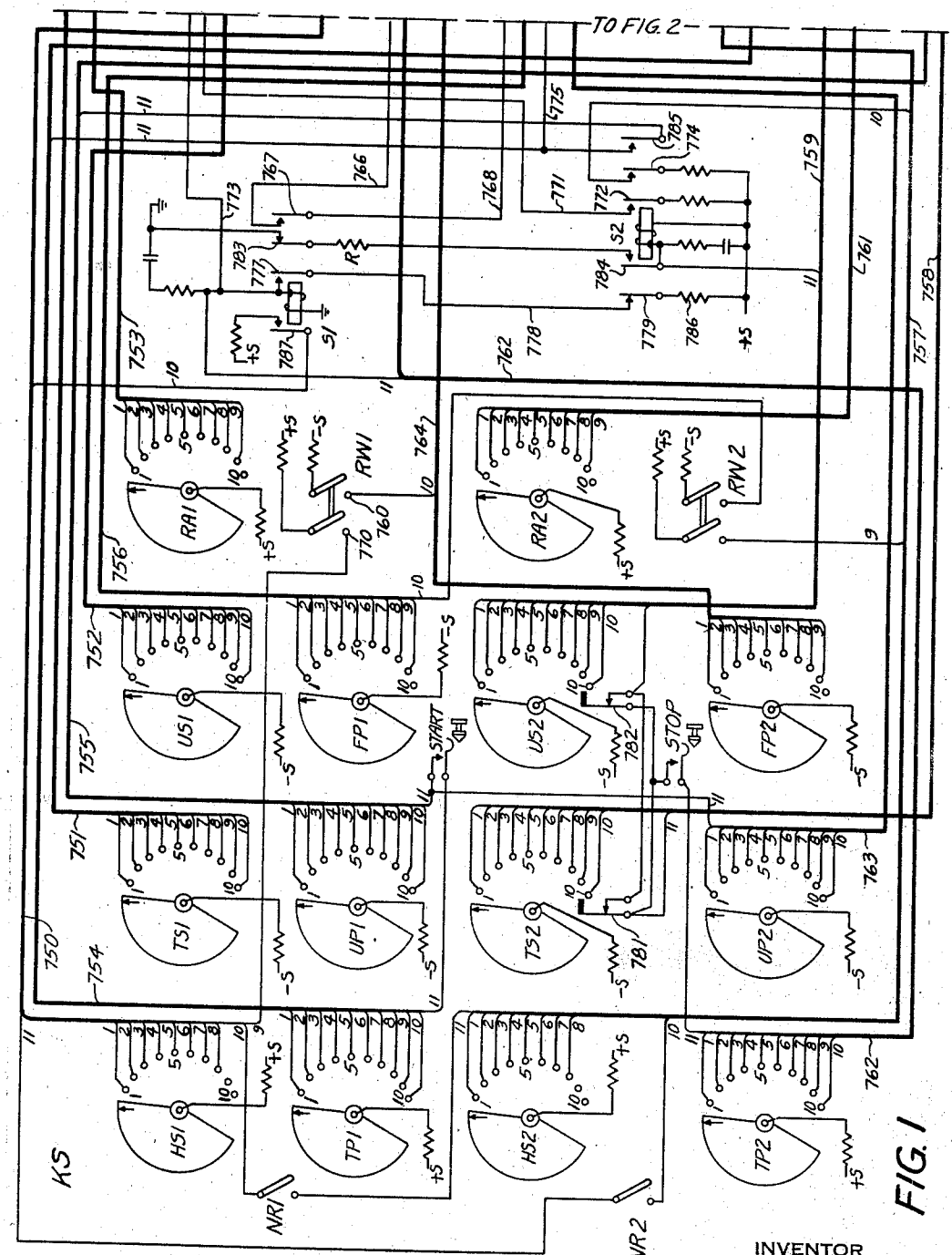


FIG. 1

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Filed Nov. 16, 1939 15 Sheets-Sheet 2

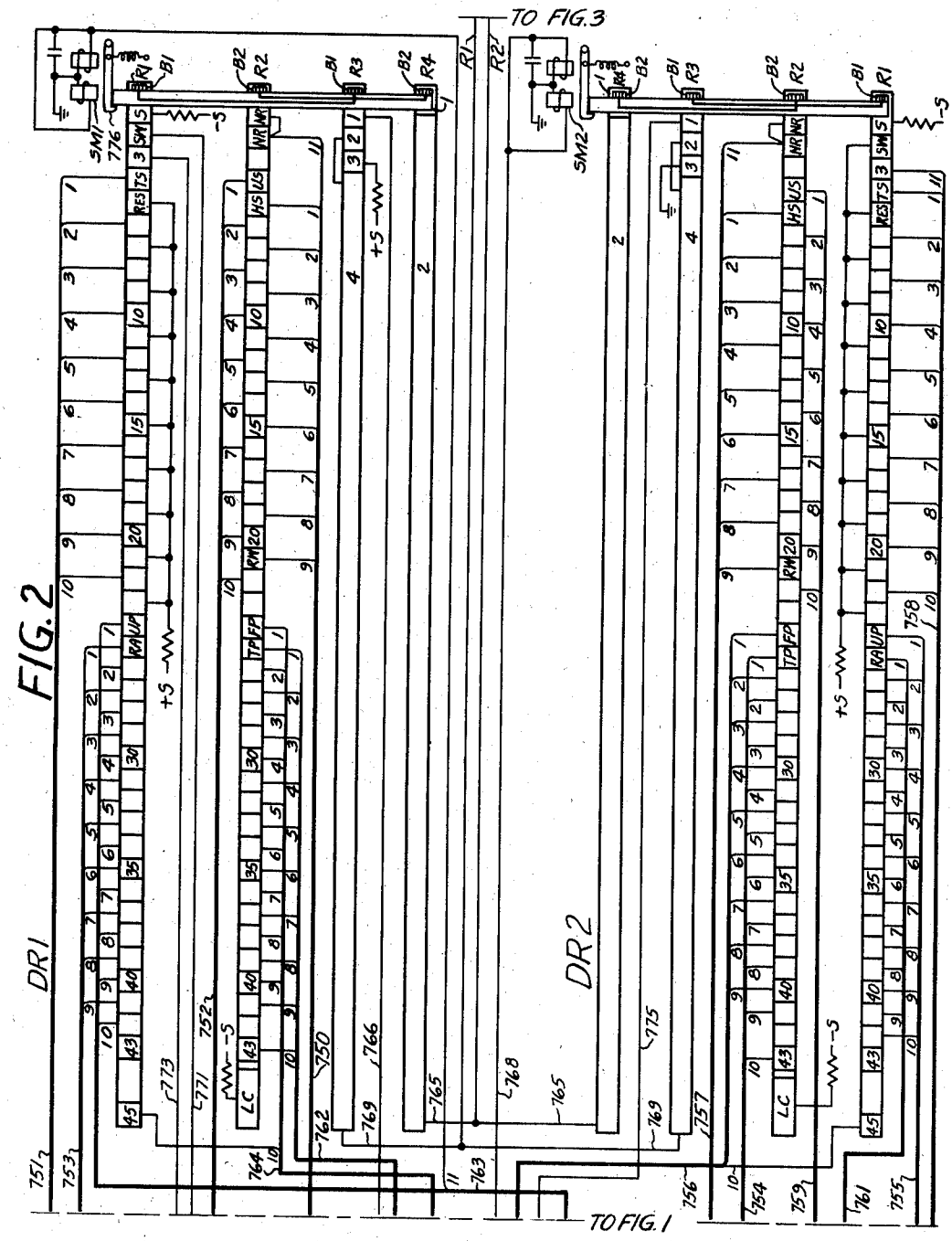


FIG. 2

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July 7, 1942. W. F. QUINBY 2,288,645

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Filed Nov. 16, 1939 15 Sheets-Sheet 3

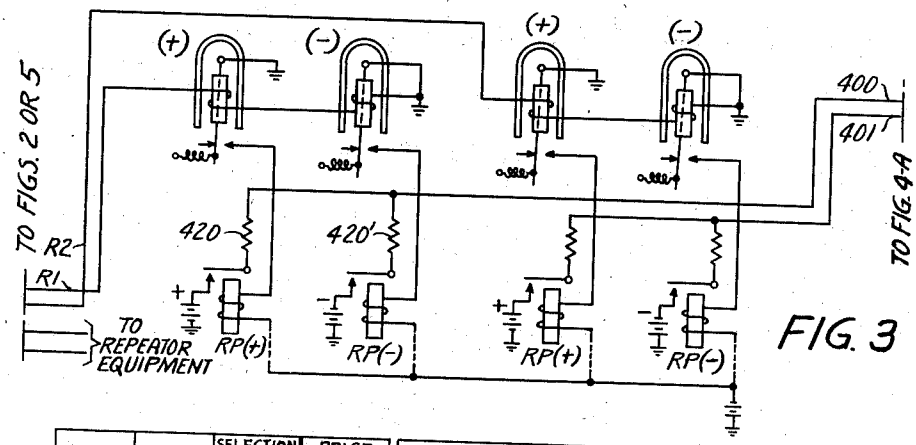


FIG. 3

DIGIT	FRACTIONS	SELECTION CODE 1	2	3	4	PRICE CODE 2	3	4	5
1	1/8	o	o						o
2	1/4	o		o				o	
3	3/8	o			o			o	o
4	1/2		o	o			o		
5	5/8		o		o		o		o
6	3/4			o	o		o	o	
7	7/8	o					o	o	o
8			o			o			o
9				o		o		o	o
0					o	o	o		o
BLANK									

FIG. 6

RANGE	RANGE CODE 1	2	3	4	5
OPEN (TUF)		o	o		
HI (TUF)			o		o
HI (UF)			o	o	o
LO (TUF)	o				
LO (UF)	o		o		
LAST (TUF)	o			o	
LAST (UF)	o		o	o	
UNISON (TUF)			o		
HI-LA (TUF)	o	o			
HI-LA (UF)	o	o	o		
LO-LA (TUF)	o	o		o	
LO-LA (UF)	o	o	o	o	
YCL (H)		o			
YCL (TUF)			o	o	
YCL (H) RESTORATION				o	
RR					o

FIG. 7

TREND RANGE	TREND RANGE CODE 1	2	3	4	5
WO		o	o		o
F-RW		o		o	o
E-RW	o				o
LOD	o			o	o
NOM			o		o
C-RW	o	o			o
D-RW	o	o		o	o
B-RW		o			o
A-RW			o	o	o
RR					o

FIG. 8

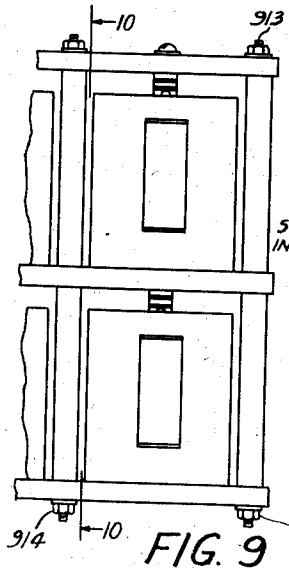


FIG. 9

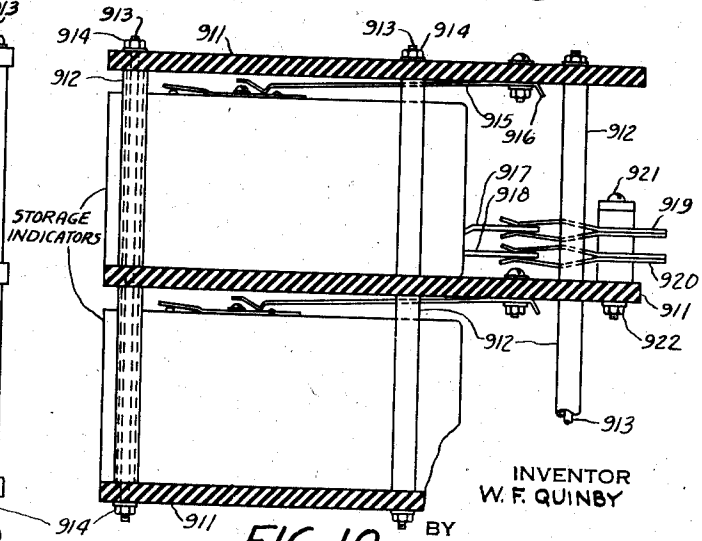


FIG. 10

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July 7, 1942. W. F. QUINBY 2,288,645

POSTING SYSTEM

Filed Nov. 16, 1939 15 Sheets-Sheet 4

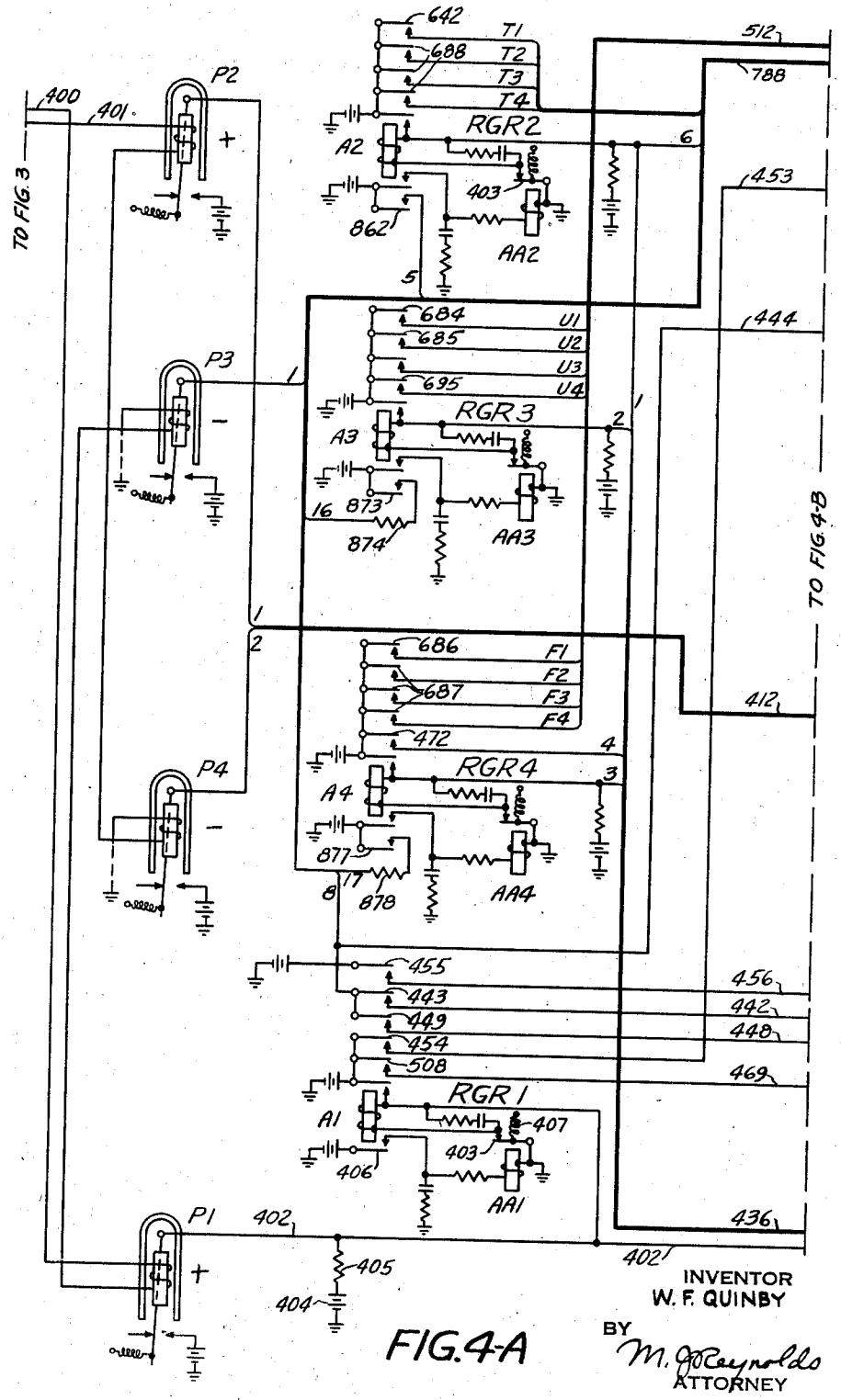


FIG. 4-A

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July 7, 1942. W. F. QUINBY 2,288,645

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Filed Nov. 16, 1939 15 Sheets-Sheet 5

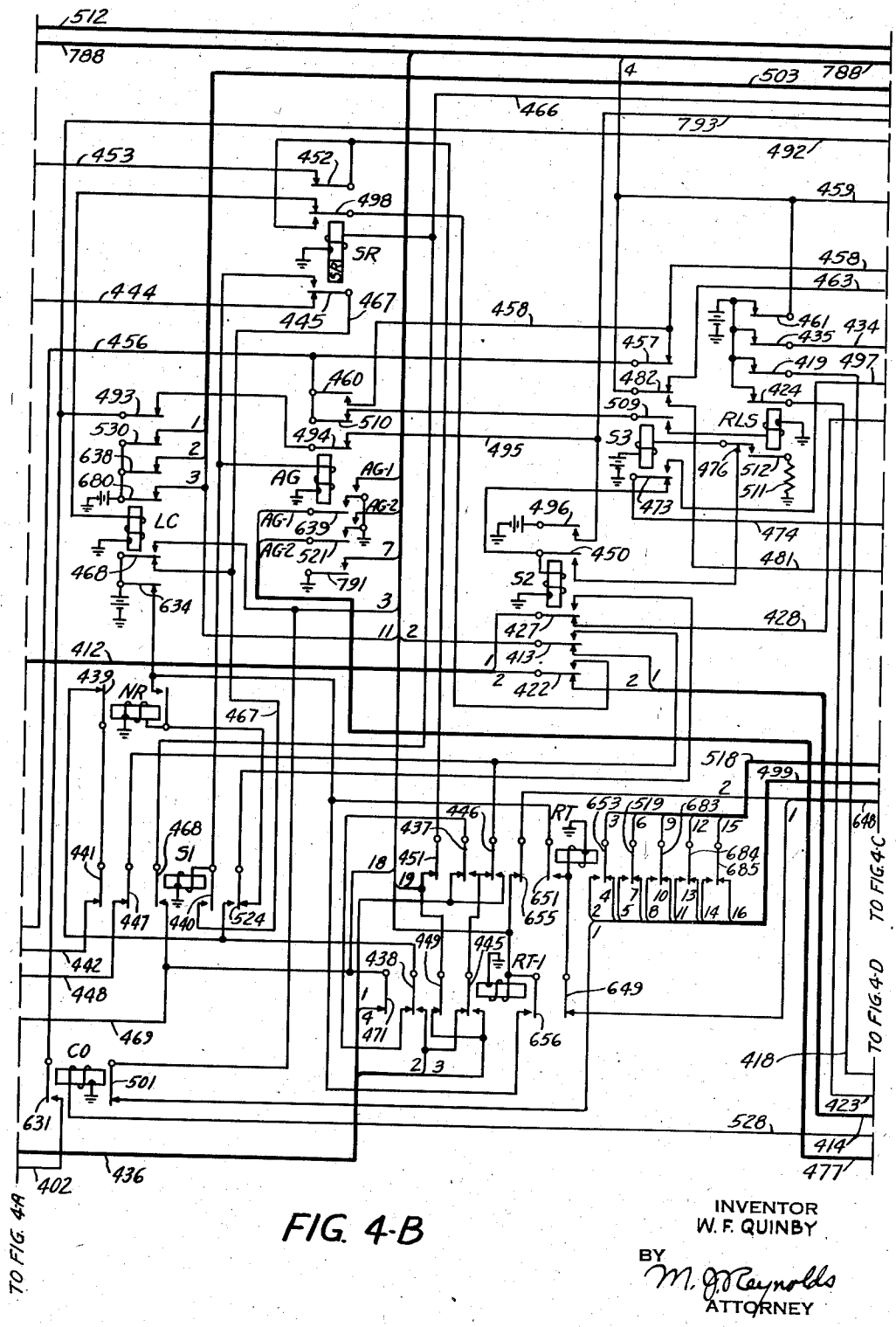


FIG. 4-B

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July 7, 1942. W. F. QUINBY 2,288,645

POSTING SYSTEM

Filed Nov. 16, 1939 15 Sheets-Sheet 6

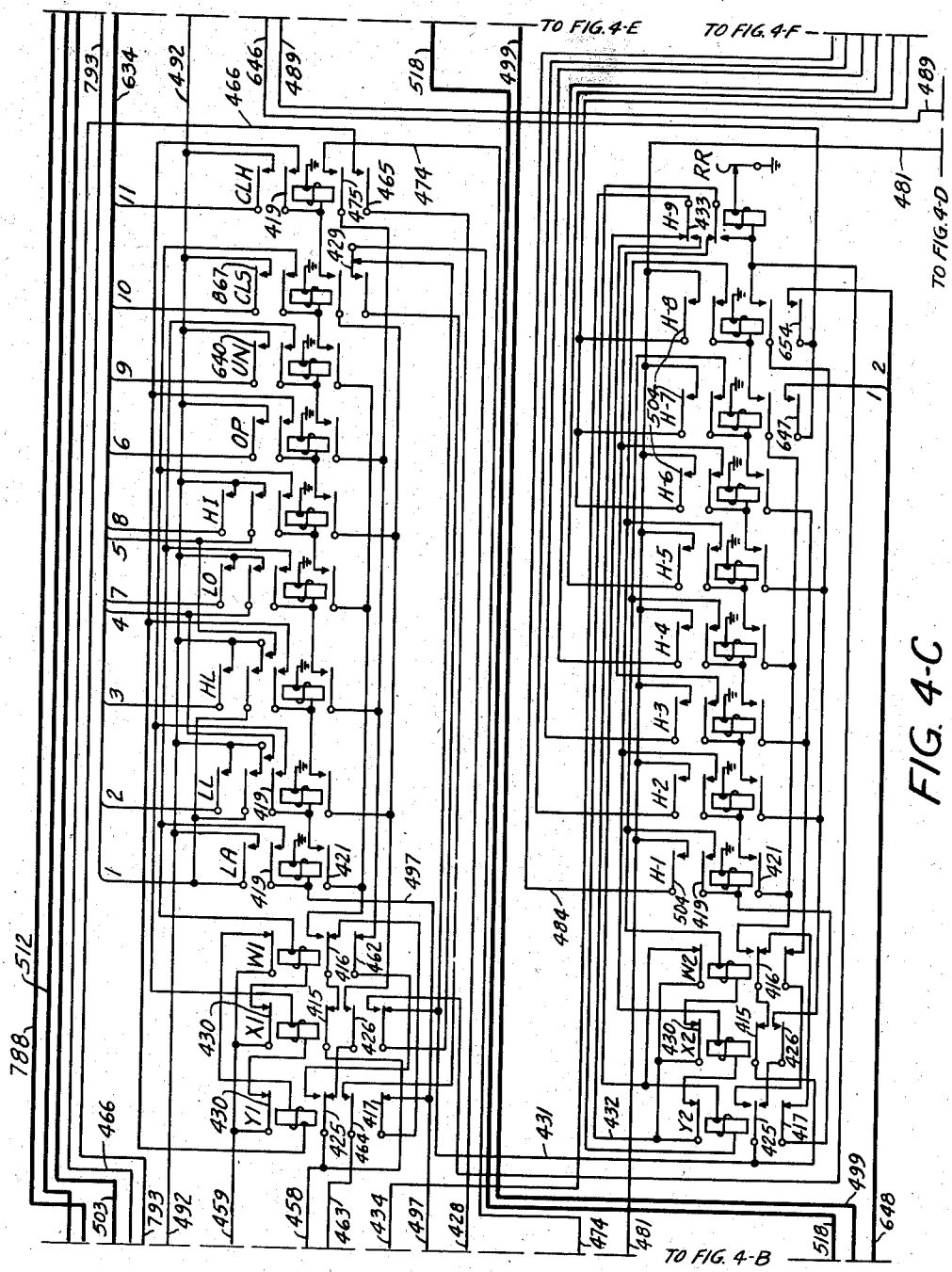


FIG. 4-C

INVENTOR
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July 7, 1942. W. F. QUINBY 2,288,645

POSTING SYSTEM

Filed Nov. 16, 1939 15 Sheets-Sheet 7

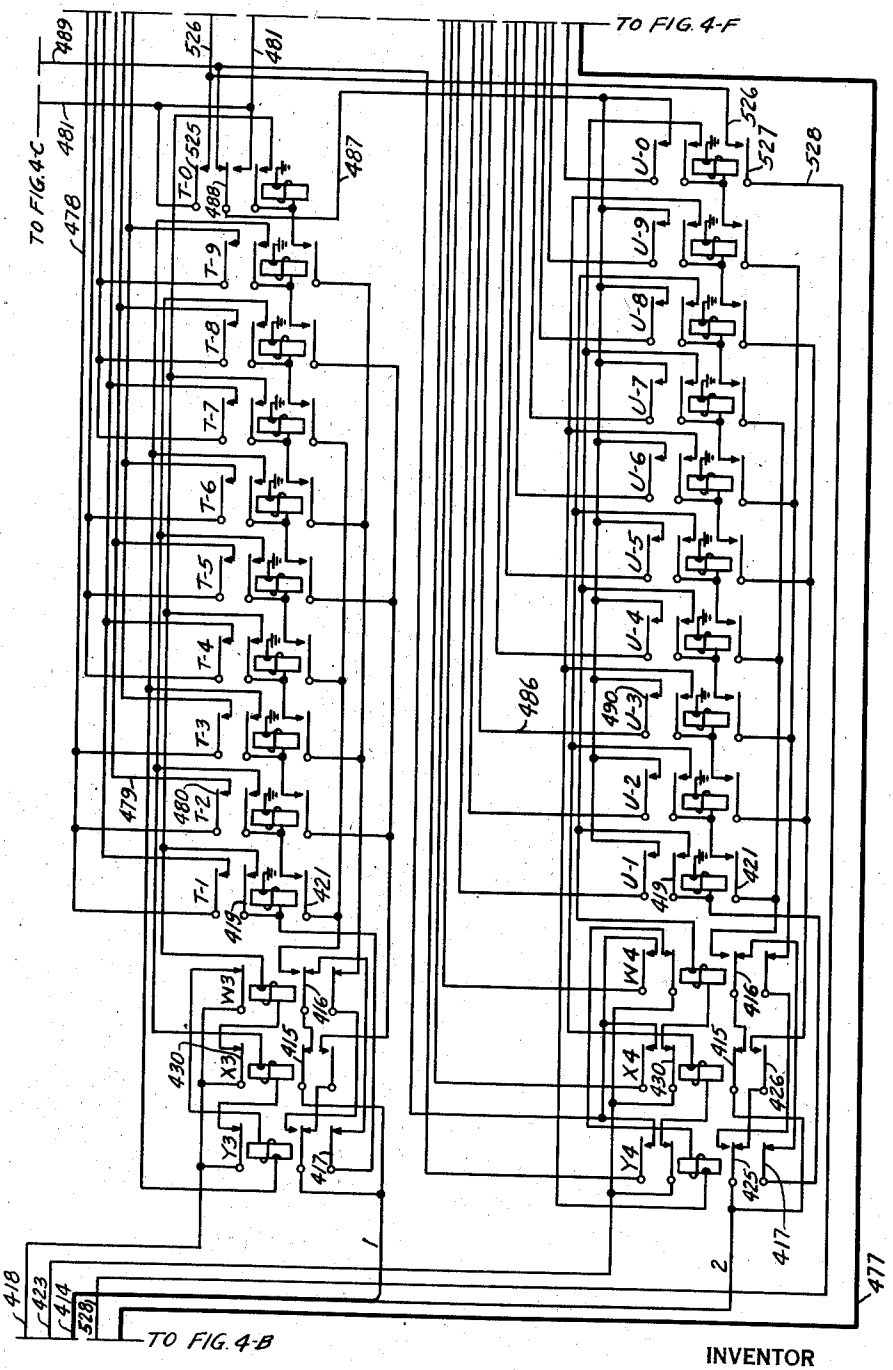


FIG. 4-D

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POSTING SYSTEM

Filed Nov. 16, 1939 15 Sheets-Sheet 8

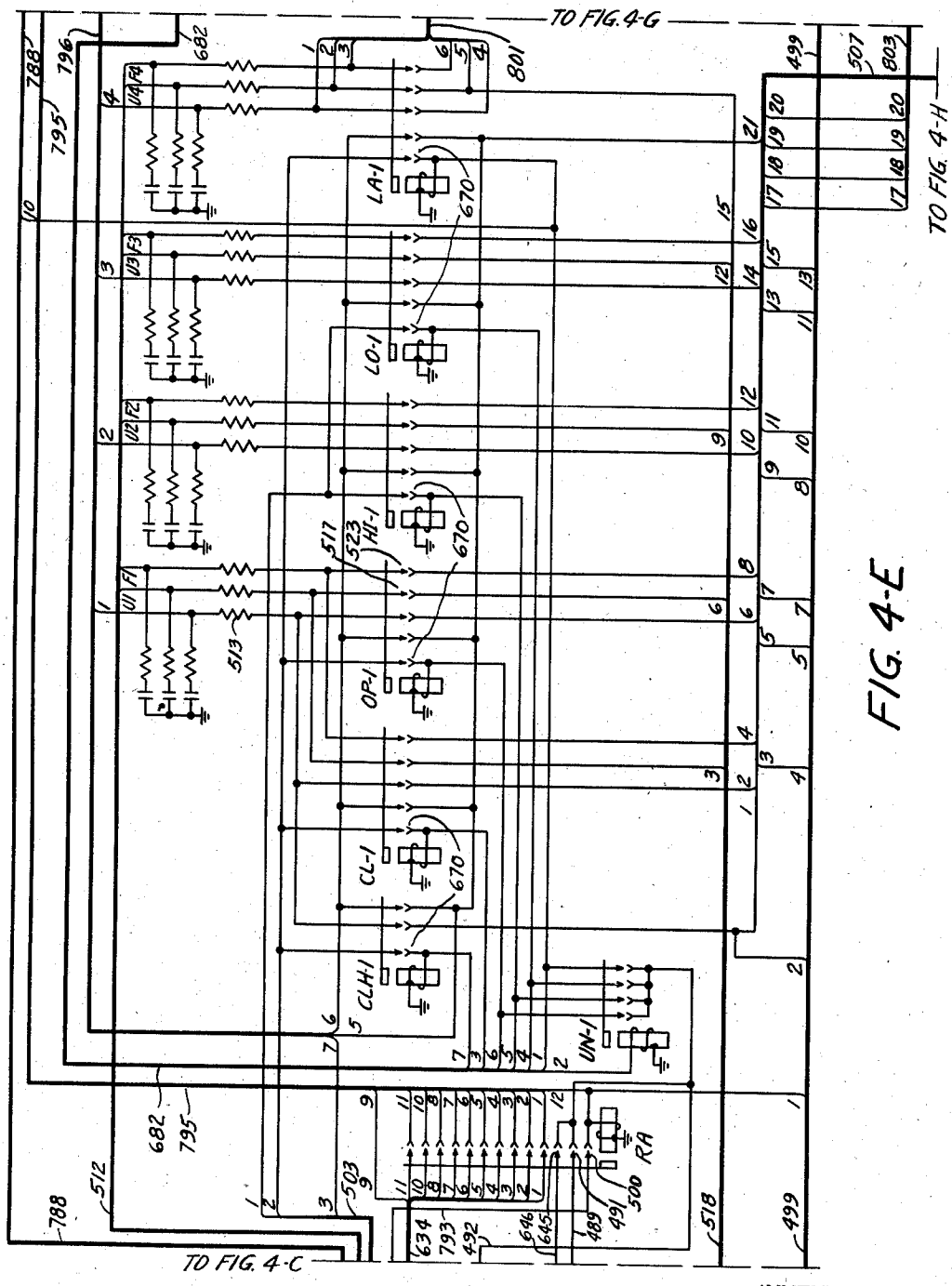


FIG. 4-E

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POSTING SYSTEM

Filed Nov. 16, 1939 15 Sheets-Sheet 9

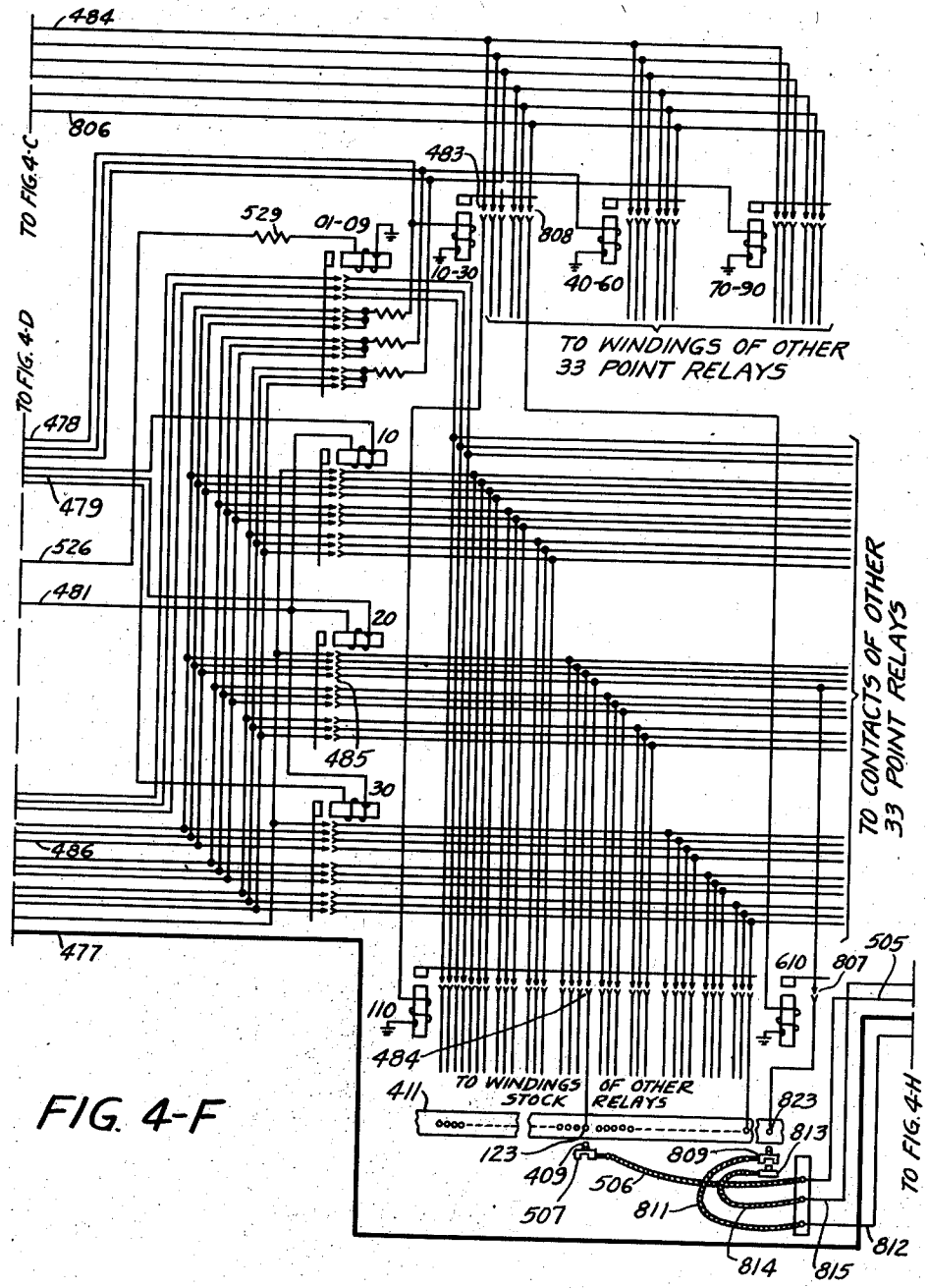


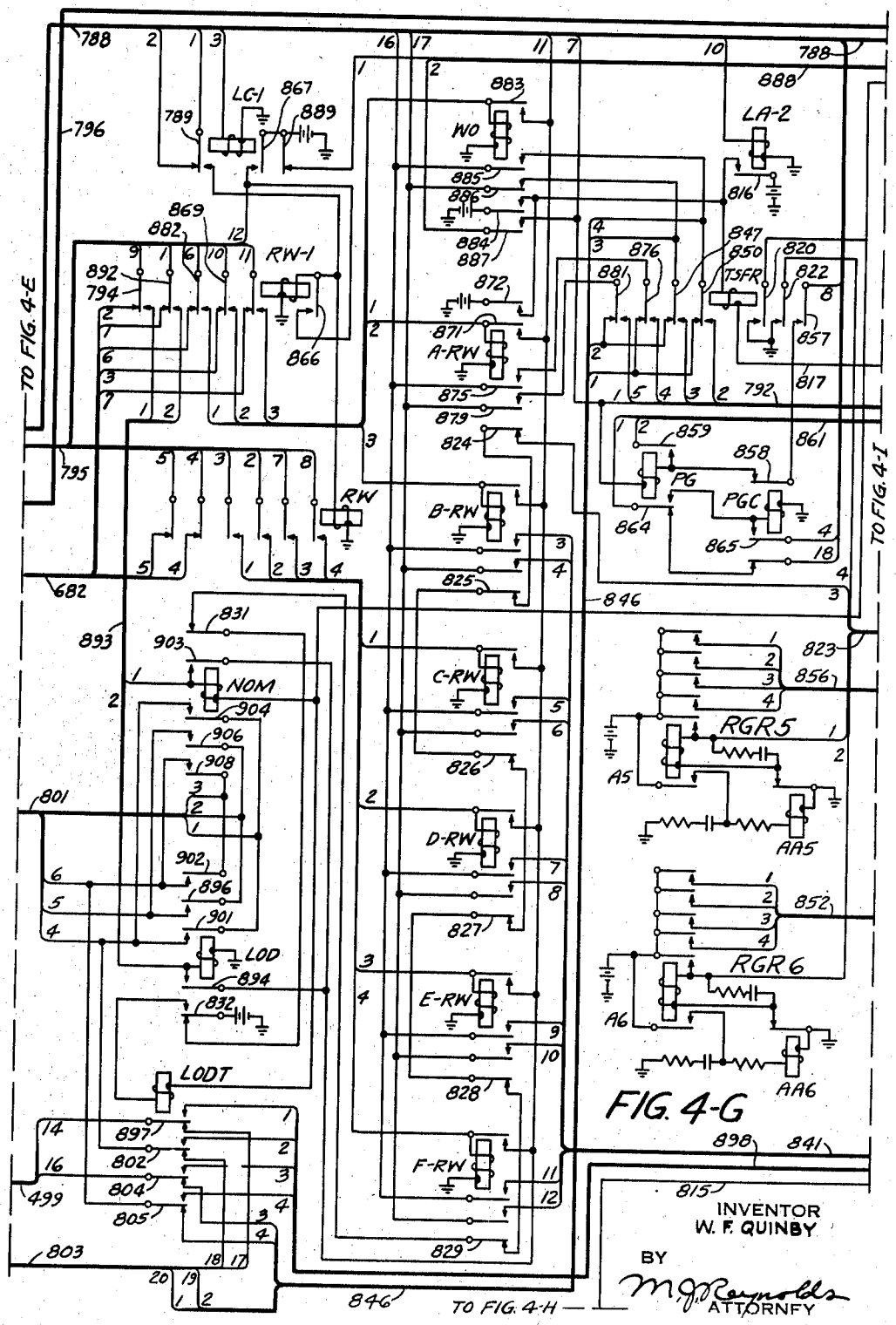
FIG. 4-F

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July 7, 1942. W. F. QUINBY 2,288,645

POSTING SYSTEM

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July 7, 1942. W. F. QUINBY 2,288,645

POSTING SYSTEM

Filed Nov. 16, 1939 15 Sheets-Sheet 11

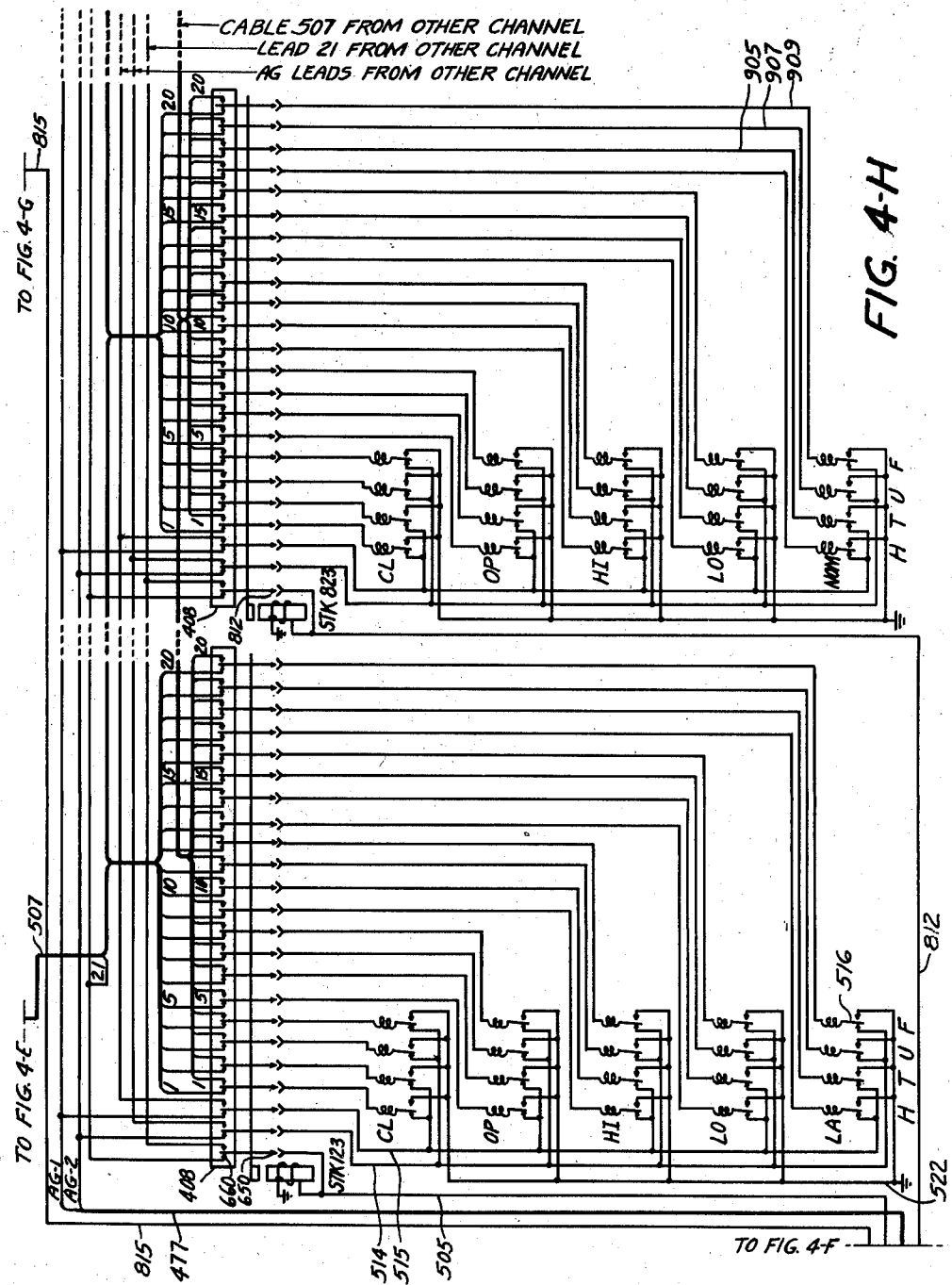


FIG. 4-H

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POSTING SYSTEM

Filed Nov. 16, 1939 15 Sheets-Sheet 12

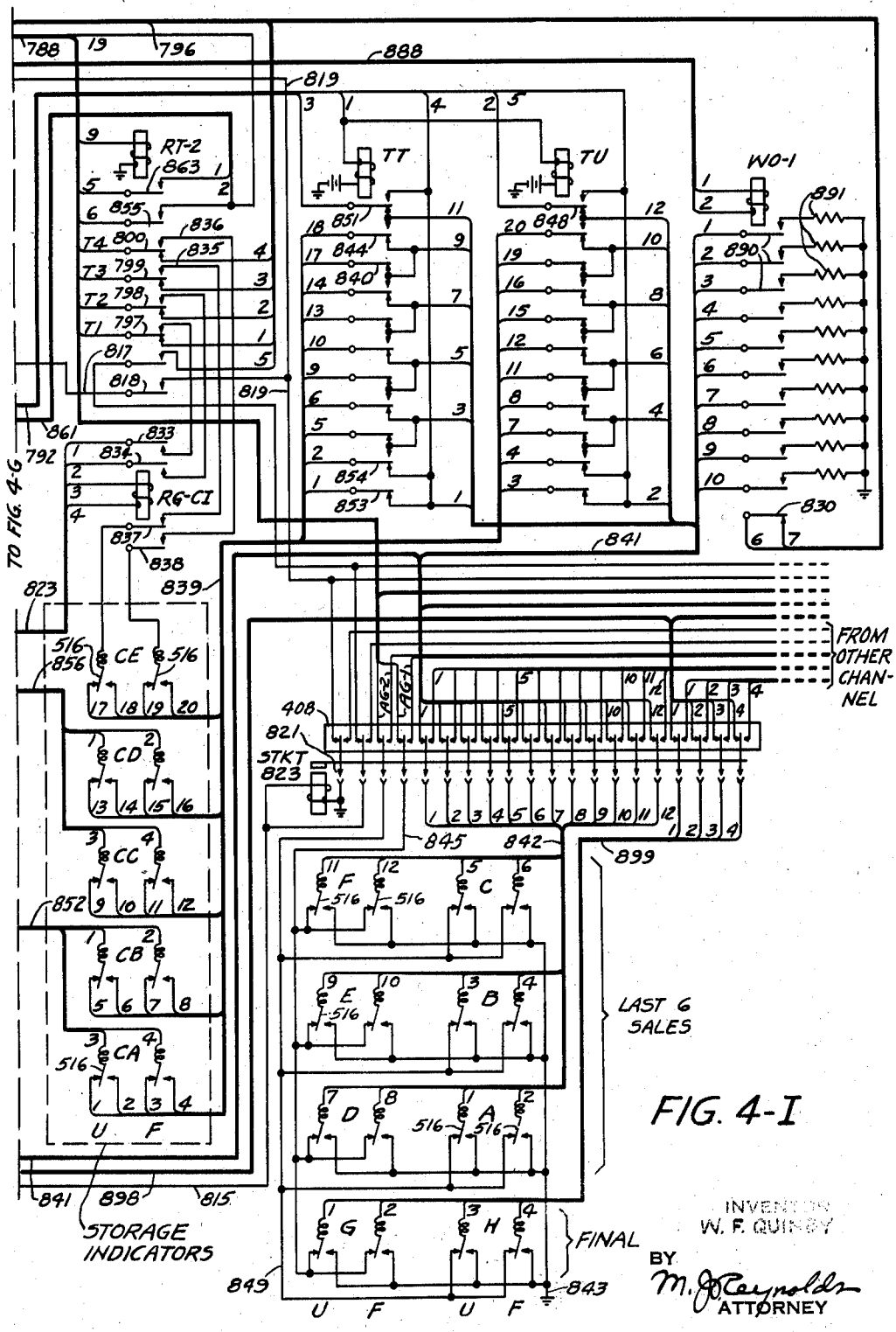


FIG. 4-I

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July 7, 1942. W. F. QUINBY 2,288,645

POSTING SYSTEM

Filed Nov. 16, 1939 . 15 Sheets-Sheet 13

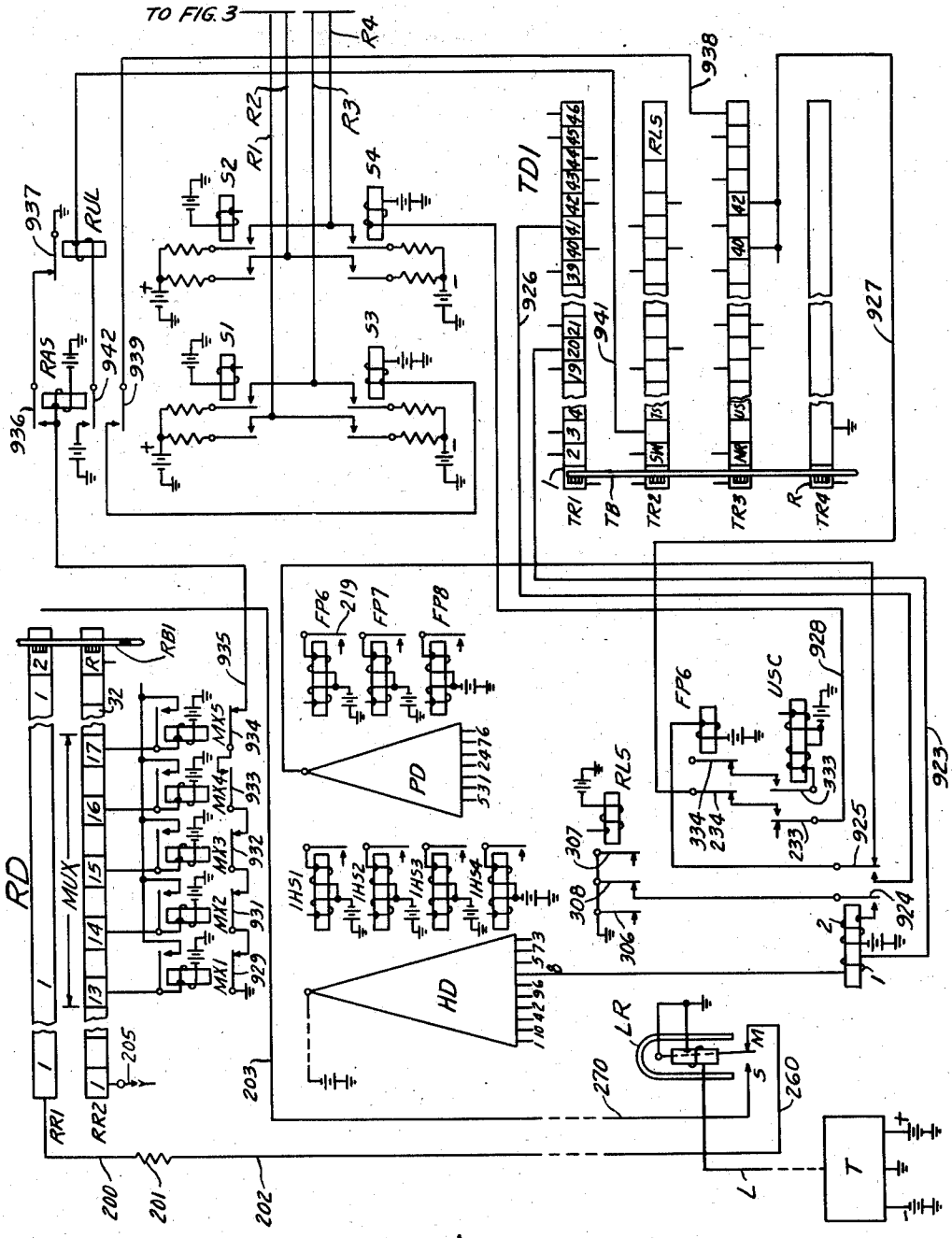


FIG. 5

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POSTING SYSTEM

Filed Nov. 16, 1939 15 Sheets-Sheet 14

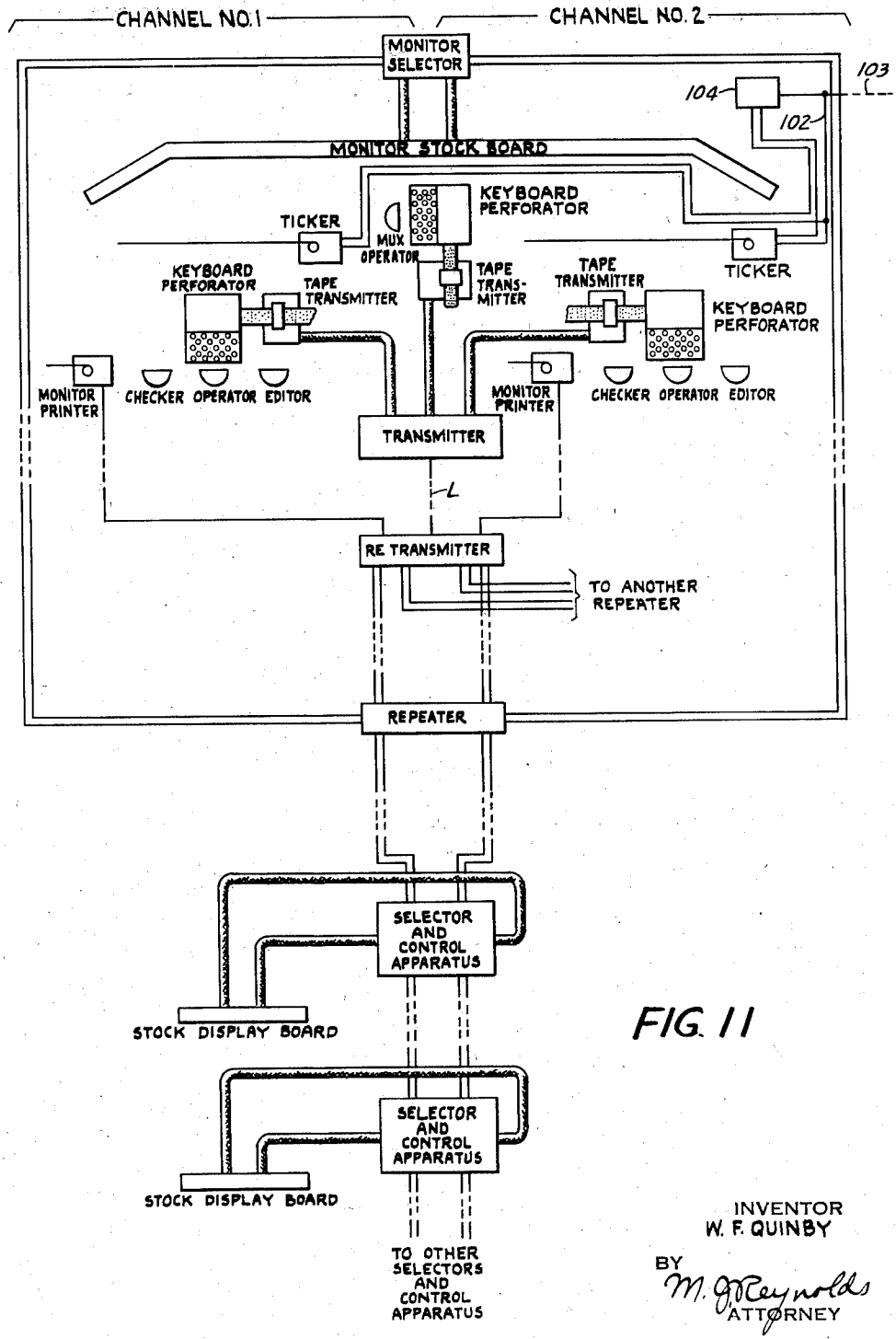


FIG. 11

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POSTING SYSTEM

Filed Nov. 16, 1939 15 Sheets-Sheet 15

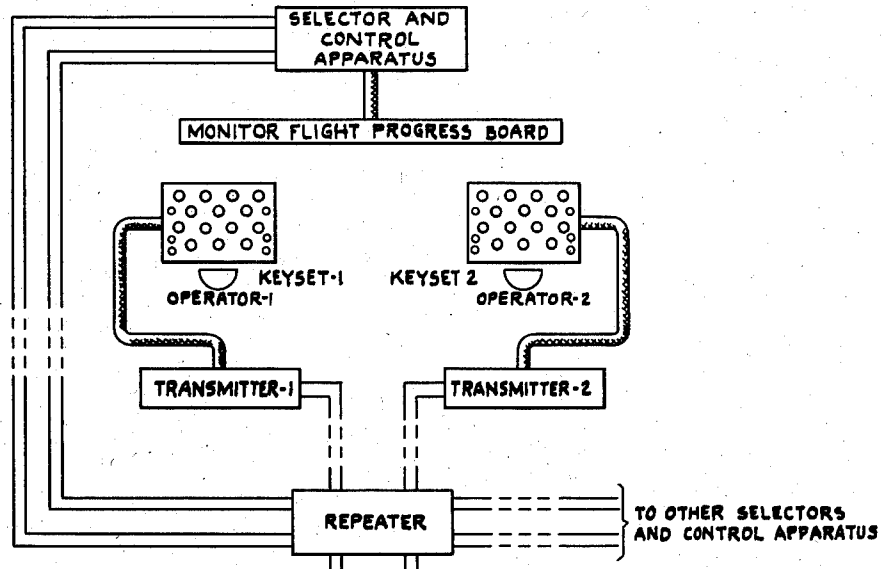


FIG. 12

FLIGHT PROGRESS BOARD					
ORDER OF ARRIVAL	FLIGHT NUMBER	MARKER-1 ALTITUDE	MARKER-1 TIME	MARKER-2 ALTITUDE	MARKER-2 TIME
1					
2					
3					
4					
5					
6					

FIG. 13

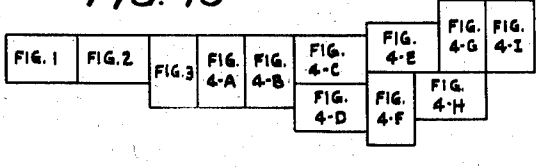


FIG. 14

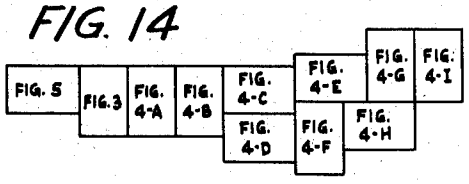


FIG. 15

RA SWITCH SETTINGS	RANGE RW KEY UNOPERATED	RANGE RW KEY OPERATED
1	LA	LOD
2	LL	D-RW
3	HL	C-RW
4	LO	E-RW
5	HI	F-RW
6	OP	WO
7	UN	NOM
8	CLS	A-RW
9	CLH	B-RW

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Patented July 7, 1942

2,288,645

UNITED STATES PATENT OFFICE

2,288,645

POSTING SYSTEM

William F. Quinby, Graniteville, S. C., assignor to The Teleregister Corporation, New York, N. Y., a corporation of Delaware

Application November 16, 1939, Serial No. 304,736

14 Claims. (Cl. 177—353)

The invention relates to a system for the transmission and reception of signals for actuating posting devices to display different items of information, and more particularly to such a system in which different items of information may be posted on a group of associated posting devices and the information thus posted subsequently may be transferred from certain of the posting devices to other posting devices of the group without the necessity of retransmitting the information thus transferred.

The system is especially applicable to the posting of stock quotations wherein the last prices received in succession are posted by electrical indicators in successive order to indicate the trend of the market, but is also adapted to any announcement or bulletin service other than market quotation services, for example, to post at airports and transportation terminals information relating to the movements of vehicles, such as the altitude, time of arrival and departure of aircraft.

In systems heretofore devised for posting the trend of the stock market it has been the general practice to print the prices of the various stocks on paper strips by means of telegraph printers, there being one of such strips of paper for each of the stocks posted. These systems were complicated in structure and required frequent adjustments of the printing apparatus and replacement of the paper strips to maintain the systems in operation.

The present invention obviates various of the foregoing disadvantages attendant to printing systems, and provides a relatively simple system wherein the prices or other information may be posted on electromagnetic indicators such as, for example, the indicator shown in Patent No. 2,049,499, granted August 4, 1936 to M. L. Haselton, and subsequently transferred to a group of memory indicators for storage while the first named indicators are being restored to their blank settings, after which the prices stored in the memory indicators are set up on other indicators of the group. One group of memory indicators is sufficient for as many stocks or items as may be posted, although, preferably, a single group of indicators is employed with each of the channels of communication, the indicators of each of the stocks or items posted being automatically placed in operative relationship with the group of memory indicators each time the group of indicators of the stock are selected for operation.

An object of the present invention is a system in which the items of information displayed on a group of posting devices may readily be transferred from certain of the posting devices of the group to others of the group without the necessity of retransmitting the information thus transferred.

A further object is a quotation system for stocks or other items wherein the last prices are successively posted on a series of electromagnetic indicating devices in a predetermined order to show the trend of the market.

Another object of the invention is a quotation system wherein the information is displayed on different sets of posting devices in successive order as received.

Another object of the invention resides in the provision of means for storing the prices posted on sets of indicating devices comprising a series of indicators, and transferring the stored prices to the indicating devices of a prior set in the series during the time that a new price is being received.

A still further object of the invention resides in changing the setting of any of the indicators at will without changing the settings of the other indicators of the series.

Additional objects and advantages of the invention will be apparent from the following description, taken in connection with the accompanying drawings and specifically pointed out in the appended claims.

In order that the invention may be more fully understood, reference will be had to the following drawings disclosing one embodiment thereof in which:

Figs. 1 and 2 illustrate a keyset and transmitting apparatus for transmitting step-by-step signals suitable for the operation of the system.

Fig. 3 represents a repeater for the step-by-step signals.

Figs. 4A to 4I represent the receiving apparatus responsive to the step-by-step signals to operate the board mechanism.

Fig. 5 illustrates the transmitting and retransmitting apparatus for converting permutation code signals into step-by-step signals, and the transmission of the step-by-step signals over two lines, each of which provides two channels of communication.

Fig. 6 shows a suitable code for item selection.

Fig. 7 shows a suitable code for selecting the various ranges either singly or in combination.

Fig. 8 shows a suitable code for selectively actuating the indicators of the bulletin or trend board to post a plurality of announcements or values concurrently and thus provide a bulletin

or stock trend service or a service for posting information relative to the control of airway traffic.

Fig. 9 shows a view in front elevation, partly broken away, of the storage devices of Fig. 4I.

Fig. 10 shows a view in side elevation of the devices of Fig. 9.

Fig. 11 shows a diagram of the entire system according to one embodiment of the invention.

Fig. 12 shows a diagram of the entire system in accordance with another embodiment of the invention.

Fig. 13 shows the arrangement of the various sheets of drawings comprising the system of Fig. 12.

Fig. 14 shows the arrangement of the various sheets of drawings comprising the system of Fig. 11, and

Fig. 15 shows the range selections employed with the system of Fig. 12.

General description of the system

In accordance with the present invention, a system for furnishing a quotation service to subscribers' stations under control of operators' keysets is schematically shown on Fig. 11 of the drawings.

The transmitting equipment comprises a plurality of keyboard perforators and tape transmitters for initiating the signals required for the transmission of the various quotations of stocks or other items of information. These signals are stored on relays and subsequently transmitted over the conductor L through the medium of a rotary distributor. The transmitted quotations of channel 1 are interspersed with those of channel 2 so that channel 1 and channel 2 quotations are transmitted alternately, there being a channel 2 quotation or a blank signal, as the case may be, inserted between successive channel 1 quotations and vice-versa. If, for example, quotations are transmitted from channel 1 only, each quotation will be followed by a blank signal corresponding in length to the transmission of a quotation from channel 2.

The information to be transmitted is taken from a stock ticker located in front of each operator. These tickers are arranged to print quotations or such other information as appears on the ticker tape. The ticker adjacent to the channel 1 operator or operators prints quotations of certain stocks only characterized by the first letter of the stock abbreviation included within the alphabetical range of A to J, the other ticker adjacent to the channel 2 operator or operators printing quotations of other stocks, for example, quotations characterized by the first letter of the stock abbreviation included within the alphabetical range K to Z. A line 102 extends from each ticker to a common line wire 103 over which stock quotations and other information are received without respect to classification of the same. The received telegraphic intelligence preferably is divided into groups recorded upon separate tickers in accordance with the telegraph system shown in Patent No. 1,814,902, issued July 14, 1931 to R. F. Dirkes. This system is shown on Fig. 11 at 104. Adjacent to each operator is an editor who places a distinguishing mark upon the ticker tape when the quotation is a new high or a new low and adjacent to and on the other side of each operator preferably is a checker who compares each transmitted quotation appearing on the monitor stock board with the original quotation appearing on the ticker tape.

A multiplex operator is provided with a keyboard perforator for perforating characters on a tape representative of a message which may comprise additional quotations to increase the capacity of the system for quotation disseminating purposes or the message may comprise other information, for example, special announcements or the issuance of instructions to operatives at a remote point, the tape thus prepared passing through a tape transmitter and thus to the transmitter employed for transmitting the information set up by the other operators.

The transmitter is connected by way of line L to a retransmitter which may be remotely situated from the transmitting apparatus, if desired. The retransmitting equipment comprises a rotatable distributor RD, Fig. 5, for selectively distributing the signals received over the line L to various groups of storage relays which respond in accordance with the signals received.

The distributor shown is of the start-stop type and preferably is arranged to make one revolution for each quotation transmitted. The storage relays control the signals which are transmitted by means of two retransmitting distributors, one of which is shown in diagrammatic form as TDI on Fig. 5, to a plurality of repeater stations where the signals are regenerated as received and transmitted to quotation board selector and control apparatus. The two transmitting distributors above referred to begin their cycles of operations successively, one retransmitting distributor being provided for each of the two channels. Two complete revolutions of a distributor are required for the transmission of each quotation over its associated channel, although one quotation is completed at the completion of each revolution of each retransmitting distributor. The retransmitting equipment includes a group of storage relays for controlling the operation of a message printer in accordance with the signals received over the multiplex channel. The transmitting and retransmitting equipments of Fig. 11 are disclosed in complete detail in my co-pending application, Serial No. 55,510, filed December 21, 1935 for Signaling system, now Patent No. 2,248,822, issued July 8, 1941, the transmitting equipment being shown in diagrammatic form and designated by the letter T on Fig. 5, which also illustrates certain modifications required in the retransmitting apparatus to make it more suitable for use with the system of the present invention.

Each retransmitting distributor transmits signals over a two-wire communication channel, preferably though not necessarily, through the repeating apparatus shown in schematic form on Fig. 3, to the selector and control apparatus.

The selector is divided into two parts, there being one part for channel 1 and a corresponding part for channel 2 quotations. As these parts of the selector are functionally independent and similar in operation, a clear understanding of the operation of the selector will be obtained from a description of one part only as, for example, that part comprising the equipment employed for channel 1 quotations which will be described hereinafter in greater detail.

The selector equipment at the subscriber's station is similar to the monitor selector at the central transmitting station and comprises regenerative relays for correcting the line signals received over the two line pairs of conductors, to correspond to a predetermined constant signal length thereby to enable the system to operate at higher speeds and with greater

reliability than would otherwise be obtained. Certain of these regenerated signals actuate relay counting devices for storing range intelligence, other of the signals operate controlling devices and still others are diverted to the display board for the normalization and subsequent actuation of the indicator units.

It will be understood that two line conductors are employed for each of the two quotation channels, making a total of four line conductors brought into each selector. Two polarized relays in each selector are connected in series with each of these conductors in such a manner that one of each pair of relays is responsive to impulses of positive polarity and the other is responsive to negative impulses received over the line. The selectors are preferably grouped in series so that the lines are continued through several selectors preferably and thence to ground. The selectors are adapted to control the operation of display boards for posting prices of stocks and the like classified as to their open, high, low or last characteristics of previous closing prices and also to concurrently post on indicating devices a plurality of last prices regarding any selected item thereby to indicate the trend of the market or item. The selector is also adapted to control the operation of bulletins or announcing boards in railroad stations or airports for the dissemination of information which would, for example, relate to the control of airway traffic.

The display board may be of the type disclosed in the patent to R. L. Daine, No. 1,658,516, dated February 7, 1928, arranged in horizontal tiers of units sections, each section comprising a plurality of items. Each item or stock space is covered by a mask having apertures thereon through which are viewed the indicator units that display the various prices or other information. These indicators may be of the type shown in Patent No. 2,049,499, granted August 4, 1936 to M. L. Haselton, although other indicators may be used with this invention as, for example, the indicator unit shown in Patent No. 1,965,376, granted July 3, 1934 to R. M. Hicks, or the indicators shown in Patent No. 1,979,028, granted October 30, 1934 to J. B. Ewart.

Another arrangement in accordance with the present invention for controlling the operation of the selector and control apparatus of Fig. 11 is shown in schematic form on Fig. 12 of the drawings. In this arrangement each operator is provided with a keyset connected by a cable to a transmitter, the keysets and transmitters being shown in detail on Figs. 1 and 2 respectively of the drawings.

Each transmitter is connected by means of two conductors to the repeater of Fig. 3 which repeats the signals transmitted by the transmitter to the selector and control apparatus for posting flight control or progress data upon the flight progress board and the monitor board located preferably before the operator.

The selector and control apparatus of Figs. 11 and 12 is shown in detail on Figs. 4A to 4I of the drawings, the display board being shown on Figs. 4H and 4I. The selector and control apparatus may be operated by any suitable source of signals received over a line from the transmitting apparatus, such as the keyset and transmitters of Figs. 1 and 2. Other transmitting apparatus, however, may be employed as, for example, the transmitting and retransmitting apparatus disclosed in my co-pending application, Serial No. 55,510, filed December 21, 1935 for Signaling system, Patent No. 2,248,822, or the transmitting means disposed in my co-pending application, Serial No. 167,541, filed October 6, 1937, for Transmitting means, now Patent No. 2,187,892, issued January 23, 1940.

The transmitting apparatus of each of my co-pending applications employs a four-unit code for the item selection, range, and digits of the price, a three-unit code being employed for the fractions part of the price. A fifth unit is added to the range signals whenever a quotation is repeated to a subscriber for the purpose of verifying the quotation or for selecting a particular set of display devices, as will hereinafter be described in further detail. The verification of a quotation is hereinafter referred to as rewrite, and a rewrite key (RR) is used for such quotations. In the system of the present invention, the operation of the rewrite key not only is employed for verifying the quotation, but also for causing the selector and control apparatus to function, thereby to enable any of the trend prices or items represented thereby to be selected at will by the operator.

Operation of the transmitter

Referring first to Figs. 1 and 2 which show transmitting apparatus at the central transmitting station, which in the case of New York stocks is located within New York city, or in the case of posting information relative to the control of airway traffic is located preferably at the airway traffic control center. The transmitting apparatus includes a keyset KS and two transmitting distributors designated DR1 and DR2 for transmitting the information set up on the keyset to the selector and control apparatus over one of the channels of communication, the transmitting apparatus of Figs. 1 and 2 being provided in duplicate when two channels are employed for the transmission of information to the display board. This arrangement provides a system wherein each channel is functionally independent of the other and, in cases where one channel is sufficient to take care of the message requirement as, for example, on bulletin and announcing boards and flight progress boards and the like, the other channel and associated apparatus may be dispensed with without departing from the spirit of the invention.

The keyset KS shown on Fig. 1 comprises the settable switches HS1, TS1 and US1 upon which are set up the hundreds, tens and units digits of a three-digit number representative of the item to be selected, a range switch RA1 settable in accordance with the desired characteristic of the item to be posted and a group of value or price switches TP1, UP1 and FP1 upon which are set up the tens, units and fractions values of the price to be posted. The keyset also comprises the no-reset switch NR1 which is employed for preventing the resetting of certain of the indicators of the different stocks or other items selected and a switch RW1 which is employed to render certain of the receiving apparatus ineffective to post certain of the numerical values set up on the keys TP1, UP1 and FP1 and for the additional purpose of enabling any desired one of the indicators representing the trend of the market, or the different items of information posted on a flight progress board for the control of airway traffic, to be selected at will for operation without affecting the settings of the indicators representing the trend

or flight information as will hereinafter be explained in greater detail.

As illustrated, the keyset KS is of sufficient size to enable the complete posting of information for two items to be set up in advance before the transmitting distributors DR1 and DR2 are set into operation to transmit the information set up on the keyset. A start button is also provided to set the distributors into operation and a stop button is employed to bring the distributors to rest after the information set up on the keyset has been transmitted.

In the arrangement of Fig. 2, two distributors are employed to transmit a complete message, the distributors operating alternately. During the first revolution of the distributor DR1 the stock number and range signals are transmitted in accordance with the settings of the switches HS1, TS1, US1 and RA1. Upon the completion of the first revolution of the distributor DR1, the distributor DR2 makes a revolution during which revolution the restoration and price impulses are transmitted, the restoration impulses causing the selected indicators to be restored to their normal or blank positions and the price impulses causing the indicators to be actuated to settings in accordance with the settings of the switches TP1, UP1 and FP1. During this revolution of the distributor DR2 the stock number and range of the item set up on the switches HS2, TS2, US2 and RA2 are transmitted, the stock number being transmitted concurrently with the restoration impulses of item 1 and the range impulses being transmitted concurrently with the price signals of item 1.

At the completion of this revolution of the distributor DR2 the distributor DR1 is set into operation to transmit the restoration impulses to the selected indicators of item 2 and the price impulses thereof to cause the selected indicators of item 2 to be actuated to positions in accordance with the settings of the price switches TP2, UP2 and SP2. Relays S1 and S2 are employed to control the alternate operation of the distributors DR1 and DR2 and for controlling certain other functions of the transmitting apparatus as will appear more clearly as the description proceeds.

The transmitting distributor DR1 comprises the rings R1, R2, R3 and R4, the rings R1 and R3 being bridged by the brushes B1 and rings R2 and R4 by the brushes B2. The transmitting distributor DR2 likewise comprises the rings R1, R2, R3 and R4, the rings R1 and R3 being bridged by the brushes B1 and the rings R2 and R4 by the brushes B2. The rings R4 of each of the distributors are solid except for the last or rest segment 1, the solid segments 2 are connected together by the conductor 765 and in electrical circuit with the conductor R2. Ring R3 of the distributor DR1 comprises four segments of which segment 1 is connected by way of conductor 766, make contact and armature 767 of relay S1, conductor 768 to the windings of the start magnet SM2 from whence the circuit is continued to ground. Segments 2 and 4 of the ring R3 are in electrical circuit with each other and connected by means of the conductor 769 to conductor R1 and segment 4 of ring R3 of the distributor DR2 which is in electrical circuit with segment 2 of the ring R3. Segment 3 of the ring R3 of the distributor DR1 is connected through resistance, preferably, to positive battery. Segment 3 of the ring R3 of the distributor DR2, however, is connected to ground.

Referring now to ring R1 of the distributor DR1, the stop segment S thereof is connected through resistance to negative battery. Segment SW is connected by way of conductor 771 to the make contact and armature 772 of relay S2 and thence through resistance to positive battery. Segment 3 of the ring R1 is connected by way of conductor 773 to the winding of relay S1 from whence the circuit is continued to ground, conductor 773 also being connected to conductor 11 of cable 762 extending to the stop button. Segments 4 (TS), 6, 8, 10, 12, 14, 16, 18, 20 and 22 are connected by way of conductors 1 to 10 of cable 751 to terminals 1 to 10 respectively of the switch TS1, the wiper of which is connected to negative battery. Segments RES 7, 9, 11, 13, 15, 17, 19, 21 and 23 are connected through resistance to positive battery. Segments UP, 26, 28, 30, 32, 34, 36, 38, 40 and 42 are connected by way of conductors 1 to 10 of cable 763 to contacts 1 to 10 respectively of the switch UP—2, the wiper of which is connected to negative battery. Segments RA, 27, 29, 31, 33, 35, 37, 39 and 41 are connected by conductors 1 to 9 of cable 753 to contacts 1 to 9 respectively of the switch RA—1, the wiper thereof being connected to positive battery. Segments 43 and 44 are unconnected. Segment 45 is connected by way of conductor 10 of cable 764 to terminal 760 of switch RW1, the switch blade thereof being connected to negative battery through resistance.

Segments NR of the ring R2 are connected by way of conductor 11 of cable 750 to the switch NR2 from whence the circuit is continued by way of conductor 10 of cable 757, make contact and armature 774 of relay S2 through resistance to a source of positive battery. Segment 3 of the ring R2 is unconnected. Segments US, 6, 8, 10, 12, 14, 16, 18, 20 and 22 are connected by way of conductors 1 to 10 of cable 752 to segments 1 to 10 respectively of the switch US1, the wiper of which is connected to negative battery. Segments HS, 7, 9, 11, 13, 15, 17 and 19 are connected by way of conductors 1 to 8 of cable 750 to terminals 1 to 8 of the switch HS1, the wiper of which is connected to a source of positive battery. Segment RW is connected by way of conductor 9 of cable 750 to terminal 770 of the switch RW1 from whence the circuit is continued through resistance to positive battery. Segment 23 is unconnected. Segments FP, 26, 28, 30, 32, 34, 36, 38 and 40 are connected by way of conductors 1 to 9 of cable 764 to terminals 1 to 9 respectively of the switch FP2, the wiper of which is connected to negative battery. Segments TP, 27, 29, 31, 33, 35, 37, 39, 41 and 43 are connected by way of conductors 1 to 10 of cable 762 to terminals 1 to 10 of the switch TP2, the wiper of which is connected to positive battery. Segment 44 is unconnected. Segment LC is connected through resistance to negative battery.

In a similar manner rings R1 and R2 of the distributor DR2 are connected to the keyset, the tens stock number segments, units price and range segments being connected to the keyset by cables 758, 755 and 761 whereby the desired number of impulses is transmitted in accordance with the settings of the switches TS2, UP1 and RA2 respectively.

Ring R2 of the distributor DR2 has its segments US, HS, FP and TP connected to the switches US2, HS2 and FP1 and TP1 by the cables 759, 757, 756 and 754 respectively.

The switching and restoration impulses are transmitted by the ring R1 and, as indicated, are of positive polarity.

Operation of transmitter

The operation of the transmitting apparatus of Figs. 1 and 2 will best be understood by consideration of a specific example. Assume, for example, that the transmitting apparatus is employed for posing the quotations of stocks, commodities and the like and it is desired to post a unison quotation 56⅜ for the stock Western Union having a stock designation number 123 and, furthermore, that it is desired to post the price of wheat now selling at $1.02⅝, the stock designation number of wheat being 823. Assume further that each of the above quotations is the first quotation of the day for their respective items.

The keyset KS is operated in the following manner: Switches HS1, TS1 and US1 are set to positions 1, 2 and 3 respectively corresponding to the stock number 123 for the stock Western Union, the range key RA1 is set to position 7 corresponding to the range unison, and price keys TP1, UP1 and FP1 are set to positions 5, 6 and 3 respectively. Switches HS2, TS2 and US2 are set to positions 8, 2 and 3 respectively corresponding to the designation number 823 for the commodity wheat, the range switch RA2 is set to position 7 and the price switches TP2, UP2 and FP2 are set to positions 2, 5 and 9 respectively, the switches TP2 and UP2 being set to the units and fractions values respectively of the quotation for wheat to be transmitted, it being assumed that wheat is one of the items having groups of indicators for posting the open, high, low, nominal and previous closing prices and the trend of the item. The start key is now momentarily depressed.

The operation of the start key closes a circuit from negative battery at segment S of ring R1 of the distributor DR2, brush B1, segment 1 of ring R3, conductor 775, conductor 11 of cable 763, winding of start magnet SM1 and thence to ground, thereby causing the start magnet SM1 to operate and attract the latch 776 thereby setting the distributor DR1 into operation. As the distributor brush B1 engages segment 3 of the ring R3, battery at segment 3 of ring R3 is applied by way of the brush B1, segment 3 of the ring R1, conductor 773, winding of relay S1 and thence to ground causing relay S1 to operate and lock by way of its armature 777, conductor 778, break contact and armature 779 of relay S2 through resistance to battery.

When the distributor brush B1 engages segment TS of ring R1, a circuit is closed from negative potential at the wiper of switch TS1, terminal 1, conductor 1 of cable 751, segment TS of ring R1 of the distributor DR1, brush B1, segment 4 of the ring R3, conductor 769, extending to the line conductor R1 thereby transmitting the first impulse of negative polarity corresponding to the tens digit of the stock selection number. The engagement of brush B2 with segment US of the ring R2 completes a circuit from negative potential at the wiper of switch US1 and terminal 1 thereof, conductor 1 of cable 752, segment US of ring R2, brush B2, segment 2 of ring R4, conductor 765, extending to the line R2 thus transmitting the first negative impulse corresponding to the units digit of the stock designation number.

The engagement of brush B1 with segment RES of ring R1 causes a signal of positive potential to be transmitted to the line R1 by the brush B1. The engagement of segment HS by the brush B2 causes an impulse of positive polarity to be transmitted to the line R2 over the following circuit: Positive battery at wiper of switch HS1 and terminal 1 thereof, conductor 1 of the cable 750, segment HS of ring R2, brush B2, segment 2 of ring R4, conductor 765 extending to the line R2, this signal of positive potential being the signal representing the hundreds digit 1 of the stock number.

The engagement of segment 6 of the ring R1 by the brush B1 completes a circuit from negative potential through contacts 2 of the switch TS1 to the line R1 thus transmitting the second impulse for the tens digit 2 of the stock number to the line R1. The engagement of segment 6 of the ring R2 by the brush B2 causes the second impulse of negative polarity to be transmitted from terminal 2 of the switch US1 to the line R2, this impulse representing the second impulse of the units digit of the stock designation. When the brush B1 engages terminal 7 of the ring R1, a second impulse of positive polarity is applied to the line R1 and no impulse is applied to the line R2, since, it will be recalled, the wiper of switch HS1 is resting on its terminal 1 and the circuit therefore is open at terminal 2 of the switch HS1.

When brush B2 engages terminal 8 of the ring R2, a circuit is closed from negative potential at the wiper of switch US1, terminal 3 thereof, conductor 3 of cable 752, segment 8 of ring R2, brush B2, segment 2 of the ring R4, conductor 765 and thence to the line R2, this being the third impulse of negative polarity on the line R2 representing the units digit 3 employed for the stock selection designation.

As the odd numbered segments 9 to 23 of the ring R1 are traversed by the brush B1, eight additional impulses of positive polarity are transmitted to the line R1, these impulses including the two positive impulses previously transmitted to the line R1 being employed for timing the selector and control apparatus as will hereinafter be explained in greater detail. The entire stock designation number has now been transmitted.

The even numbered segments 24 to 42 of the ring R1 are employed for transmitting impulses corresponding to the setting of the switch UP2. Segment FP and the even numbered segments 26 to 40 of the ring R2 are employed for transmitting impulses corresponding to the setting 9 of the switch FP2, the tenth impulse being generated locally in the receiver as will be hereinafter described in greater detail. Segment TP, 27 and the following odd numbered segments, including segment 43 of the ring R2, are employed for transmitting impulses in accordance with the setting of the switch TP2, the switches TP2, UP2 and FP2 being employed for controlling the price signals corresponding to the stock designation set up on the switches HS2, TS2 and US2. Since during the first revolution of the distributor DR1 the stock designation signals controlled by the switches HS2, TS2 and US2 have not been transmitted, the impulses sent over the line under control of the switches TP2, UP2 and FP2 during this revolution of the distributor DR1 are without effect and will, therefore, not be traced in detail.

The engagement of segment RA of the ring R1 by the brush B1 completes a circuit from positive battery at the wiper of the switch RA1 and terminal 1 thereof, conductor 1 of cable 753, segment RA of the ring R1, brush B1, segment 4 of the ring R3, conductor 769 extending to the line

R1 thus transmitting the first range signal of positive polarity.

As the brush B1 engages segments 27, 29, 31, 33, 35 and 37 of the ring R1, six additional range impulses of positive polarity are transmitted to the line R1 thus completing the range signal for unison which comprises seven impulses. As the brush B1 engages segment 39 of the ring R1, the line R1 is extended to terminal 8 of the switch RA1 but, as will be recalled, the switch RA1 is set to its position 7 and the circuit, therefore, is open at terminal 8 of the switch RA1. When brush B2 engages segment LC of the ring R2, a signal of negative polarity is applied to the line R2.

The distributor DR1 now comes to rest with the brushes thereof in the position shown on the drawing, the stock designation number and the range signals for the stock Western Union having been transmitted during this revolution of the distributor DR1.

When the brush B1 engaged segment S of the ring R1, negative potential at segment S was applied by way of the brush B1 to segment 1 of the ring R3, conductor 766, make contact and armature 767 of relay S1, conductor 768, winding of the start magnet SM2 and thence to ground causing the start magnet SM2 to operate and set the distributor DR2 into operation. When the brush B1 of the distributor DR2 comes into engagement with the segment SW of the ring R1, positive battery at segment SW is transmitted by way of brush B1, segment 2 of the ring R3, which is in electrical circuit with segment 4 of ring R3, conductor 769, extending to the line R1 thereby transmitting a switching signal of positive polarity over the line R1 to control the receiving apparatus. When the brush B1 engages segment 3 of ring R3, ground is applied to segment 3 of ring R1, conductor 11 of cable 758, contacts of the switches 781 and 782 in parallel, conductor 11 of cable 759 and thence to the winding of relay S2 causing relay S2 to operate and at its armature 779 remove battery from the locking circuit of relay S1 thus causing relay S1 to release. The release of relay S1 at its armature 783 applies ground through resistance R, make contact and armature 784 of relay S2 to maintain relay S2 operated after brush B1 has passed its segment 3. The release of relay S1 at its armature 767 interrupted the circuit to the start magnet SM2 causing the start magnet SM2 to release and arrest the movement of the brushes at the completion of their revolution.

When brush B1 engages segment TS of the ring R1, a circuit is closed from negative potential at the wiper of switch TS2 and terminal 1 thereof, conductor 1 of cable 758, segment TS of ring R1, brush B1, segment 4 of ring R3, conductor 769 to the line R1 thereby transmitting the first impulse of the tens digit of the stock designation set up on the switches HS2, TS2 and US2. When brush B2 engages segment US of the ring R2, a circuit is closed from negative potential at the wiper of switch US2 and terminal 1 thereof, conductor 1 of cable 759, segment US of ring R2, brush B2, segment 2 of ring R4, conductor 765 extending to the line R2 thereby transmitting a negative signal corresponding to the first impulse of the units digit of the stock abbreviation set up on the switch US2.

When brush B1 engages the restoration segment RES of ring R1, positive potential is applied by way of the brush B1, segment 4 of ring R3, conductor 769, to the line R1. When brush B2 engages segment HS of the ring R2, a circuit is completed from positive battery at the wiper of switch HS2, terminal 1 thereof, conductor 1 of cable 757, segment HS of the ring R2, brush B2, segment 2 of the ring R4, conductor 765 to the line R2, thereby transmitting the first pulse of positive polarity of the hundreds digit of the stock designation set up on the switch HS2. As brush B2 engages segments 7, 9, 11, 13, 15, 17 and 19 of the ring R2, seven additional impulses of positive polarity are transmitted over the line R2 to correspond with the digit 8 set up on the switch HS2. When brush B2 passed over segment 6 of the ring R2 a second impulse of negative polarity was transmitted from the switch US2 to the line R2 and the engagement of brush B2 with segment 8 of ring R2 caused the third impulse to be transmitted over the line R2 corresponding to the digit 3 set up on the switch US2.

When brush B1 engaged segment 6 of ring R1, the second impulse of negative polarity was transmitted from the switch TS2 to the line R1, this being the signal corresponding to the tens digit 2 of the stock number. The passage of brush B1 over the odd numbered segments 7 to 23 inclusive of ring R1 caused nine additional restoration impulses of positive polarity to be transmitted over the line R1 for normalizing the indicators selected by the switches HS1, TS1 and US1 which, in the example assumed, are the indicators corresponding to the stock Western Union.

When brush B1 engages segment 24 (UP) of the ring R1, negative potential at the wiper of switch UP1 is applied by way of terminal 1 thereof, conductor 1 of cable 755, segment UP of the ring R1, brush B1, segment 4 of the ring R3, conductor 769 and thence to the line R1. When brush B2 engaged segment 24 (FP) of the ring R2, negative potential at the wiper of switch FP1, terminal 1 thereof, conductor 1 of cable 756, segment FP of the ring R2, brush B2, segment 2 of the ring R4 was applied to conductor 765 and thence to the line R2.

The engagement of brush B1 with segment RA of the ring R1 completed a circuit from positive potential at the wiper of switch RA2 and terminal 1 thereof, conductor 1 of cable 761, segment RA of the ring R1, brush B1, segment 4 of the ring R3, conductor 769 and thence to the line R1. When brush B2 engaged segment TP of the ring R2, positive potential at the wiper of the switch TP1 and terminal 1 thereof is extended by way of conductor 1 of cable 754, segment TP of the ring R2, brush B2, segment 2 of the ring R4, conductor 765 and hence to the line R2. When the brush B2 engaged segments 26 and 28 of the ring R2, two additional impulses of negative polarity were transmitted to the line R2 to represent the fractions digit 3 of the price and four additional impulses of positive polarity were transmitted to the line R2 by the passage of the brush B2 over segments 27, 29, 31 and 33 of the ring R2 thereby completing the transmission of the signal representing the tens digit of the price set up on the switches TP1, UP1 and SP1. As brush B1 traversed segments 26, 28, 30, 32 and 34 of the ring R1, five additional impulses of negative polarity were impressed upon the line R1 thus completing the transmission of the signal representing the units digit 6 of the price. Six additional range impulses of positive polarity were transmitted over the line R1 during the time that the brush B1 traversed segments 27, 29, 31, 33, 35 and 37 of the ring R1 thus completing the

transmission of the range signal unison set up on the switch RA2. When segment LC of the ring R2 is engaged by the brush B2, negative potential is applied to the line R2. The start magnet SM2 being released at this time, the brushes come to rest in the position shown on the drawings.

While the distributor DR2 was making its first revolution the indicator restoration and price actuation impulses for the stock Western Union were transmitted concurrently with the stock number and range impulses for the commodity wheat, the restoration impulses being transmitted concurrently with the stock number impulses during the first half of the revolution and the price impulses concurrently with the range impulses during the latter half of the revolution. With the distributor DR2 at rest, a circuit is closed from negative source of potential on segment S of ring R1, brush B1, segment 1 of ring R3, conductor 775, make contact and armature 785 of relay S2, conductor 11 of cable 755, conductor 11 of cable 763, winding of start magnet SM1 and thence to ground thereby causing the start magnet SM1 to operate and release the brushes B1 and B2 of the distributor DR1 for their second revolution.

When brush B1 engages segment SW of the ring R1, positive battery at armature 772 of relay S2 and make contact thereof is applied by way of conductor 771, segment SW of the ring R1, brush B1, segment 2 of the ring R3 which is in electrical circuit with segment 4 of the ring R3, conductor 769, extending to the line R1, as a switching signal to the receiving apparatus. When brush B1 engages segment 3 of the ring R1, positive battery at segment 3 of ring R3 is extended by way of brush B1, segment 3 of ring R1, conductor 773 to the winding of relay S1 thereby causing relay S1 to operate and at its armature 783 interrupt the locking circuit for relay S2 and causing relay S2 to release. Relay S1 at its armature 777 is held locked by way of conductor 778 to positive battery at armature 779 and break contact of relay S2.

During the first half revolution of the distributor DR1 the stock number set up on the switches HS1, TS1 and US1 and the restoration impulses for the indicators selected by the switches HS2, TS2, US2 and RA2 during the first revolution of the distributor DR2 are transmitted.

When segment 24 (UP) of ring R1 is engaged by brush B1, a circuit is closed from negative potential at the wiper and terminal 1 of switch UP2, conductor 1 of cable 763, segment UP of ring R1, brush B1, segment 4 of ring R3, conductor 769, extending to the line R1, this being the first impulse of the signal representing the digit 5 set up on the switch UP2. The engagement of segment 24 (FP) of ring R2 by the brush B2 completes a circuit from negative potential at the wiper and terminal 1 of switch FP2, conductor 1 of cable 764, segment FP of the ring R2, brush B2, segment 2 of ring R4, conductor 765, extending to the line R2 thereby transmitting a signal of negative polarity as the first impulse of the digit set up on the switch FP2.

When brush B1 engages segment RA and the six succeeding odd numbered segments of ring R1, seven impulses of positive polarity are transmitted from the switch RA1 to the line R1. As brush B2 passes over segments 25 and 27, two impulses of positive polarity are transmitted from contacts 1 and 2 respectively of the switch TP2 to the line R1 representing the digit 2 set up on the switch TP2.

When the even numbered segments 26 to 40 of the ring R2 are traversed by the brush B2, eight additional impulses of negative polarity are transmitted over the line R2 from the switch FP2. When brush B1 engages segments 26, 28, 30 and 32 of the ring R1, negative potential at the wiper of the switch UP2 is applied by way of contacts 2, 3, 4 and 5 thereof respectively to the line R1 thus completing the transmission of five impulses of negative polarity over the line R1 representative of the units digit 5 of the price set up on the switch UP2.

When segment LC is engaged by the brush B2, negative battery of segment LC is applied by way of brush B2 and segment 2 of the ring R4, conductor 765 and thence to line R2.

The distributor DR1 comes to rest at the completion of its revolution due to the released condition of the start magnet SM1 which resulted when the circuit to its winding was interrupted at armature 785 of relay S2. During the second revolution of the distributor DR1 the stock number and range of the stock Western Union set up on the switches HS1, TS1, US1 and RA1 were transmitted concurrently with the restoration impulses for the selected indicators of the commodity wheat and the price actuation impulses.

During the second revolution of the distributor DR1, the switches TS2 and US2 are moved to their positions ten thereby to transmit a release signal to the selector and control apparatus comprising the receiver, this signal comprising a stock number having the tens digit thereof 0 and units digit thereof 0. In the assumed example the release signal is the stock number 800 now set up on the switches HS2, TS2 and US2.

The movement of switches TS2 and US2 to their positions ten caused the switch contacts 781 and 782 respectively thereof to be opened thereby interrupting the operate circuit for relay S2 which is in a released condition following the removal of ground from its locking circuit at the armature 783 of relay S1 when relay S1 operates. With relay S2 released, the operate circuit to the start magnet SM1 is interrupted at armature 785 of relay S2 and the distributor DR1 is brought to rest by the latch 776 thereof. Relay S1 remains locked by way of its armature 777, conductor 778 to battery at the armature 779 and break contact of relay S2 thereby maintaining the start magnet SM2 energized and thus causing the distributor DR2 to operate to transmit the release signal 800 to the selector from the switches HS2, TS2 and US2.

The stop-button is now depressed to bring the distributor DR2 to rest. When brush B1 of the distributor DR2 engages its segment 3 during the second revolution thereof, ground at segment 3 of ring R3 is applied by way of brush B1 to segment 3 of ring R1, conductor 11 of cable 758, contacts of the stop-button, conductor 11 of cable 762 to one end of the winding of relay S1. Since the other end of the winding is connected to ground relay S1 is short-circuited and releases, the resistance 786 connected to armature 779 of relay S2 being employed to prevent damage to the apparatus and circuits when this ground is applied to relay S1 to release the same. The release of relay S1 at its armature 787 interrupts the operate circuit to start magnet SM2 thereby causing start magnet SM2 to release and

bring the distributor DR2 to rest at the completion of its revolution with the brushes in the position shown on the drawings.

The switches RW1 and RW2 of the keyset KS are employed to apply positive potential to segments RW of ring R2 of the distributors DR1 and DR2 respectively and negative potential to segments 45 of ring R1 of the distributors DR1 and DR2 whereby a rewrite or special range signal of positive polarity is transmitted over the line R2 by the passage of brush B2 across its associated segment RW and negative polarity is transmitted over the line R1 by the engagement of brush B1 with its associated segment 45.

As is well known, the prices of stocks appearing on a ticker tape may include the units and fractions characters only of the stock price, the tens and hundreds digits thereof, if any, not being shown. If, for example, the last price of a stock posted on the display board of Fig. 4H is 33⅞ and the succeeding price following this stock designation on the ticker tape is 4½, representing a price of 34½, a movement of the units and fractions indicators only is required as the tends indicator is already positioned to display the digit 3. Therefore, the indicator for displaying the tens price digit is not operated. This condition is referred to herein as the no-reset of tens digit indicators, the switches NR1 and NR2 of the keyset being employed for this purpose. The operation of switch NR1 completes a circuit from positive battery at the make contact and armature 787 of relay S1, conductor 10 of cable 750, contacts of switch NR1, conductor 11 of cable 757, segment NR of ring R2 of the distributor DR2, brush B2, segment 2 of ring R4, conductor 765, extending to the line R2. It will be noted that the transmission of this no-reset signal occurs just in advance of the restoration signal and is applied to the line R2 when the distributor DR2 has operated sufficiently to cause the brush B2 to come into engagement with segment 2 of ring R4. The operation of the no-reset switch NR2 applies positive battery at armature 774 and make contact of relay S2 by way of conductor 10 of cable 757, contacts of switch NR2, conductor 11 of cable 750 to the segment NR of ring R2 of the distributor DR1 from whence the circuit is continued by way of brush B2 and segment 2 of ring R4, conductor 765, to the line R2, this signal occurring just before the transmission of the restoration signal from ring R1 of the distributor DR1.

Repeater

The operation of the repeater shown on Fig. 3 will now be described.

Referring to Fig. 3, the four vertical rows of relays of which the top relay only is shown, are used for repeating the signals received over the lines R1 and R2, the repeated signals being transmitted over lines 400 and 401 respectively. Each of the lines R1 and R2 is extended through two polar relays to ground, the polar relays being so connected as to respond selectively to positive and negative impulses in the manner indicated on the drawing, the polar relay designated (+) in series with the line R1, for example, responds to signals of positive polarity only received over the line and the polar relay designated (—) responds to signals of negative polarity only.

When a positive signal is received over the line R1 the first (+) polar relay is operated and closes a circuit from its grounded armature to the winding of the associated repeating relays RP (+) of which the first of the series only is illustrated on the drawing, the circuit being continued to grounded battery, thereby causing each of these relays to operate and apply a positive potential to the make contact and operated armature of the relay through a resistance 420 to the associated outgoing line 400. As negative potential is received over the line R1, the (+) polar relay is released and the (—) polar relay is operated. The release of the (+) polar relay releases the (+) repeating relays RP, and the operation of the (—) polar relays causes the (—) repeating relays RP to operate and apply negative battery at their contacts and operated armatures through a resistance 420' to the line 400. In a similar manner impulses of a positive and negative polarity on the line R2 cause the (+) and (—) polar relays to operate and at their grounded armatures cause their associated RP (+) and RP (—) relays to operate selectively to apply impulses of positive and negative potential respectively to the line 401.

While Fig. 3 shows in detail only sufficient repeating relays to transmit impulses over the lines 400 and 401, it will be understood that the windings of each of the repeating relays RP (+) and RP (—) are in series with several other relays similarly designated and provided with contacts and circuit connections for repeating the impulses received over the incoming lines R1 and R2 to a plurality of pairs of outgoing conductors 400 and 401. Furthermore, the repeating equipment of Fig. 3 represents in diagrammatic form the equipment required to repeat the impulses received over one channel, a duplicate set of repeating equipment being provided for repeating the signals received over the other channel as shown on Fig. 11 of the drawings.

Description of selector

The apparatus and circuits of the receiving mechanism shown on Figs. 4A to 4I will now be described. Fig. 4A shows the polarized line relays and signal regenerator units of the selector. Fig. 4B shows the switching relays used to control various functions of the receiving apparatus. Fig. 4C shows the counting relay chain for storing the range and hundreds digit of the item number. Fig. 4D shows two relay counting chains for storing the tens and hundreds digits of the item number. Fig. 4E shows the range relays for selectively completing circuits to one or more ranges of the selected stock or other item under control of the range relay counting chain shown on Fig. 4C. Fig. 4F shows a portion of the stock or item selecting relays for completing a circuit to any one of a plurality of groups of indicator devices under control of the hundreds, tens and units relay counting chains shown on Figs. 4C and 4D and also discloses a plug and jack arrangement whereby flexible means are provided for conditioning the indicating devices of any stock or item for response to price digit information corresponding to any stock or item designation number. Fig. 4G shows the range and control relays and signal regenerator units employed for the operation of the trend posting indicating devices. Fig. 4H discloses a portion of the display board and shows means for transferring the indicating devices of any stock or item for operation from either channel. Fig. 4I shows certain transfer and wipe-out relays, a set of storage devices referred to hereinafter as storage or memory indicators for storing the several prices of a stock or other item as a new

price is received and a portion of the display board upon which a plurality of successive prices or other items of information are posted in succession and simultaneously displayed to indicate the trend of the market, the indicating devices for showing the trend being individual to each stock or item and controlled from either of two channels in accordance with the settings of the transfer means **408**.

It will be recalled that each quotation is composed of four parts, item designation number, range, restoration and actuation of the selected indicators, which are transmitted in the order here given, the entire transmission requiring one complete revolution of each of the distributors DR1 and DR2 of Fig. 2. These signals are received successively on the polarized line relays P1 to P4, Fig. 4A. During one revolution of either transmitting distributor, the signals corresponding to the stock number and range characteristics of one quotation are transmitted and stored in the selector while restoration and actuation impulses corresponding to a previous quotation are transmitted to the selected indicators of the previous quotation. This arrangement has been effected by operating all regenerator units RGR1 to RGR4 under control of one polarized line relay P1 for restoration of the indicators while a new stock number is being concurrently transmitted to the other three polarized line relays P2 to P4. Subsequently, while the signals corresponding to the various digits of the price of a previous quotation are being received by the line relays P2, P3 and P4, the signals for the range selection for a succeeding quotation are being received by the line relay P1.

The manner in which restoration impulses are transmitted simultaneously to the selected indicators by three regenerator units, in the case of stocks having indicators not arranged for the posting of trend prices, or five regenerator units when the selected stock or item is associated with trend indicator display devices, under control of signals from one line relay, and the various switching operations required for these features will be described hereinafter.

The term regenerator or regenerator unit as herein referred to shall be defined as comprising relays A1 and AA1 of regenerator RGR1, Fig. 4A, for example, together with their interconnecting circuits, and may be of the type disclosed in Patent No. 1,965,377, issued July 3, 1934 to R. M. Hicks et al. It will be understood that the signals repeated by the line relays P1 to P4, Fig. 4A, may not be most suitable for the fast operation of the indicator units required with the system herein described. Irregularities in the repeated signals are corrected by the regenerator units in the following manner:

As the armature of line relay P1 moves to its operated position, a circuit is closed from battery at the make contact of relay P1 through the armature thereof over conductor **402** to the winding of relay A1 and thence to ground through the break contact and armature **403** of relay AA1, causing relay A1 to operate. It should be noted that battery **404** through resistance **405** is continuously connected to conductor **402** thereby causing energization of the winding of relay A1 which does not operate over this circuit due to the limitation of current by resistance **405**. As relay A1 closes its armature **406**, relay AA1 is energized and, upon operation, opens the circuit to the relay A1 at armature **403** of relay AA1. The relay AA1 is slow to operate, being restrained in the unoperated position by a spring **407** attached to its armature. The relay A1 now releases, opening the operating circuit to relay AA1 at armature **406** of relay A1. When relay AA1 has released, ground is again applied to one end of the winding of relay A1. This cycle of operation is repeated for each pulse received from the line relay P1, and thus provides for predetermined length signals to be transmitted from the regenerator unit. The battery **404**, connected through resistance **405** to the winding of relay A1, is provided to maintain a fixed amount of flux in the magnet core of this relay, so that its operating time will not be greater during reception of a first pulse of a series of pulses than it is for the succeeding impulses.

Restoration and actuation impulses for the tens, units and fractions indicators of each range are transmitted from regenerators RGR2, RGR3 and RGR4 respectively, the regenerator RGR2 actuating the regenerators RGR5 and RGR6, Fig. 4G, employed for posting trend quotations. Regenerator RGR1 transmits ten impulses to regenerators RGR2, RGR3 and RGR4 for restoration to blank of the selected indicators and operates the various relays of the relay counting chain used for range selection.

It will be noted that the apparatus shown on Figs. 4A to 4I for receiving signals and controlling the operation of indicators therefrom is duplicated within the selector for actuating the indicators of channel 2 stocks or items, the display board shown on Figs. 4H and 4I being common to both channels.

The indicators of Fig. 4H are disposed in five groups for displaying the closing, open, high, low and nominal or last prices, as the case may be, respectively of each of the selected items, the quotations appearing on these groups of indicators comprising the hundreds, tens, units and fractions digits of the closing price, whereas the prices corresponding to open, high, low and last or nominal quotations usually comprise but three digits, these being the tens, units and fractions digits of the various quotations.

Provision has been made, however, for actuating not only each of the foregoing indicators but also indicators corresponding to the hundreds digit of the open, high, low and nominal or last ranges. This feature is useful for indicating values corresponding to special services such as the posting of the volume of sales.

The indicators of Fig. 4I, for example those of item 823, are arranged in eight groups, each group comprising two indicators for posting the units and fractions digits of the several values of the item. The indicators designated A, B, C, D, E, and F are employed to post the last six sales of the item and the indicators G and H the final price of the item which, in the case of wheat for example, may be posted, as is well known, as a "split" final price.

The indicators may receive their impulses over either channel as, for example, if it is desired to change the indicators corresponding to the commodity wheat, Figs. 4H and 4I, to receive signals over the other channel corresponding to the item number 745, the switches **408** associated with the groups of indicators for posting the wheat prices would be moved to the right and the plug **809**, Fig. 4F, removed from jack No. **823** of the jack panel **411** and inserted into jack No. **745** of the jack panel associated with the other channel of the system.

A group of storage indicators CA to CE, Fig. 4I,

is provided for each of the two channels, each group of storage indicators being common to all of the trend posting devices of the associated channel. The storage indicators CA to CE are employed for storing the prices set up on the trend indicators A to E respectively and thereafter for transferring the stored price settings to the indicators B to F respectively, this being accomplished automatically during the time signals for a new quotation to be set up on the indicators designated A are being received.

Referring now to Figs. 9 and 10 of the drawings there is shown thereon the apparatus for supporting the storage indicators of Fig. 4I and establishing circuit connections thereto. Each indicator is mounted on strips of insulating material 911 such as hard rubber, fibre, "Bakelite" or the like held in spaced relation from one another by the insulating tubing 912 through which passes a rod 913 threaded for engagement with the nut 914 by means of which the structure is held together. The storage indicators pass between two adjacent shelves 911 and are separated from electrical contact with one another laterally by the insulating tubes 912. A spring member 915 is in electrical contact with the frame of the storage indicator unit and is provided with an electrical terminal 916. The coil of the unit is connected preferably to terminal 917 and the switch 516, Fig. 4I is adapted to connect the other end of the coil to terminal 916 or terminal 918 in accordance with the setting of the unit. Slip connections 919 and 920 are provided to engage terminals 917 and 918 respectively when the indicator is inserted into the mounting structure. The slip connections 919 and 920 are insulated from one another by means of insulating washers or the like as is well known in the art to which this invention pertains and are each held securely in position by the screw 921 and the nut 922.

In the embodiment of my invention herein illustrated the values posted by the indicators of Fig. 4I are set up on the tens and units switches of the keyset KS and received by the selector apparatus as tens and units price signals. The employment of a designation number having 8 for the hundreds digit thereof for an item selection number, causes the selector to function to transmit the price information received as tens and units digits to the display board in such a manner that it is posted on the units and fractions indicators respectively.

When the quotation is accompanied by a rewrite signal, any of the indicators A to F of Fig. 4I may be selected for operation and actuated to new settings without causing the prices stored on the indicators A to F to be transferred to the storage indicators whereby a price posted in error, for example, on any of the trend indicators may be corrected without changing the settings of the other indicators of the trend.

Operation of selector

The operation of the various circuits of the selector and control apparatus shown in Figs. 4A to 4I will now be described.

In the foregoing description of the transmitting and receiving equipment it was assumed that signals representing a quotation of 56⅜, unison range for the stock Western Union having a designation number 123 and the quotation 2⅝, unison range for the commodity wheat having a designation number 823 were transmitted in succession over the conductors 400 and 401. It will now be assumed that these signals are about to be received by the line relays P1 to P4, Fig. 4A. It will be understood that frequently more than one of the following circuits are completed simultaneously, whereas in describing the same it will, of course, be necessary to describe them successively.

At the beginning of the quotation a negative impulse is received simultaneously over lines 400 and 401, Fig. 4A, causing relays P3 and P4 to operate. Circuits completed by the operation of relay P3 will first by described.

Battery at the make contact and armature of relay P3 is connected to conductor 1 of cable 788 and thence to armature 789 and break contact of relay LC1, Fig. 4G, conductor 2 of cable 788, armature 413 and break contact of relay S2, Fig. 4B, conductor 1 of cable 414, armature 415 and break contact of relay X3, Fig. 4D, armature 416 and break contact of relay W3, break contact and armature 417 of relay Y3 to the winding of relay T1 which operates and locks on a circuit through its armature 419 and make contact in series with the winding of relay W3, break contact and armature 430 of relay X3, conductor 418 to battery at the break contact and armature 419 of relay RLS, Fig. 4B. Relay W3 does not operate at this time as both ends of its winding are connected to battery. When the negative pulse is removed from line 400, relay P3 releases and removes battery from one end of the winding of relay W3, permitting relay W3 to operate in series with relay T1 over the circuit just described.

As the second negative pulse is received over line 400, relay P3 again operates causing the operation of relay T2 over a circuit from battery at the armature of relay P3, conductor 1 of cable 788, armature 789 and break contact of relay LC1, conductor 2 of cable 788, armature 413 and break contact of relay S2, conductor 1 of cable 414, armature 415 and break contact of relay X3, armature 416 and make contact of relay W3, armature 421 and make contact of relay T1 to the winding of relay T2. Relay T2 locks over its armature 419 and make contact through the winding of relay X3, break contact and armature of relay Y3 to battery on conductor 418. Relay X3 does not yet operate as its winding is short-circuited by the operated armature of relay P3. As the second negative impulse is removed from line 400, relay P3 releases thereby permitting the operation of relay X3 in series with relay T2. The opening of break contact and armature 430 by the operation of relay X3 caused relays T1 and W3 to release. The tens digit 2 of the stock number is now stored in the tens counting chain as no additional negative pulses are transmitted over line 400 during the time allotted for the transmission and reception of signals for the stock number, relay P3 will not again reoperate during this time.

As the first negative pulse is received over line 401 relay P4 operates and applies battery to conductor 2 of cable 412 thereby causing the operation of relay U1 of the units counting chain, Fig. 4D. The circuit is completed from battery at the operated armature of relay P4 over conductor 2 of cable 412, armature 422 and break contact of relay S2, conductor 2 of cable 414, armature 415 and break contact of relay X4, armature 416 and break contact of relay W4, break contact and armature 417 of relay Y4, through the winding of relay U1 to ground. Relay U1 locks over its armature 419 and make contact

through the winding of relay W4, break contact and armature 430 of relay X4, conductor 423, armature 424 and break contact of relay RLS to battery. As the first negative pulse is removed from line 401, relay P4 releases and permits the operation of relay W4.

As relay P4 operates in response to the second negative pulse over line 401, battery is again applied to conductor 2 of cable 412 to the armature 422 and break contact of relay S2, conductor 2 of cable 414, armature 415 and break contact of relay X4, armature 416 and make contact of relay W4, armature 421 and make contact of relay U1 and thence to the winding of relay U2 which operates and locks over its armature 419 in series with relay X4, break contact and armature of relay Y4 to battery on conductor 423. As the second negative impulse is removed from line 401, relay P4 releases causing the operation of relay X4. The opening of the break contact and armature 430 by the operation of relay X4 causes the relays W4 and U1 to release.

The third negative impulse over conductor 401 operates relay P4 thereby connecting battery to conductor 2 of cable 414, armature 425 and break contact of relay Y4, armature 426 and make contact of relay X4, armature 421 and make contact of relay U2, to the winding of relay U3, causing relay U3 to operate. Relay U3 locks over its armature 419 in series with relay Y4, break contact and armature of relay W4, to battery on conductor 423. As the third negative impulse is removed from line 401, relay P4 releases and removes the battery from one side of the winding of relay Y4, thereby permitting relay Y4 to operate in series with the relay U3. The operation of relay Y4 causes relays X4 and U2 to release, the locking circuit for these latter relays being interrupted at break contact and armature 430 of relay Y4. The units digit 3 of the stock number is now stored in the units counting chain and no further negative impulses are received over conductor 401 during the time allotted for the transmission and reception of the stock number signals.

Immediately following the termination of the first negative impulse on lines 400 and 401, a positive impulse is applied to each of these two lines simultaneously thereby causing relays P1 and P2 to operate. As the operation of relay P2 at this time controls the counting chain relays Y2, X2, W2 and H1 to H9, Fig. 4C, for registration of the hundreds digit of the item designation number, the circuit under control of this relay will now be described.

As relay P2 operates in response to the first positive pulse over line 401, it connects battery through its armature to conductor 1 of cable 412, armature 427 and break contact of relay S2, conductor 428, make-before-break contact 429 of relay CLS, Fig. 4C, conductor 431, armature 415 and break contact of relay X2, armature 416 and break contact of relay W2, break contact and armature 417 of relay Y2, and thence to the winding of relay H1, causing relay H1 to operate and lock by way of its armature 419 and make contact in series with relay W2, break contact and armature 430 of relay X2, conductor 432, break contact and armature 433 of relay H9, conductor 434 to battery at the break contact and armature 435 of relay RLS. Relay W2 does not operate at this time as its winding is short-circuited by battery on the operated armature of relay P2. As the first positive pulse is removed from line 401, relay P2 releases and removes the short-circuit from the winding of relay W2, which operates in series with relay H1. The digit 1 corresponding to the hundreds digit of the stock number in the example assumed is now stored on the hundreds relay counting chain, and as no more positive pulses will be transmitted over line 401 during the time allotted for the transmission and reception of item designation signals, relay P2 will not reoperate during this time.

It will be noted that ten impulses employed for the restoration of the selected indicators to their blank positions and for various timing purposes are transmitted to the receiving apparatus during the portion of the cycle of operation wherein the signals for the item designation number are received. These timing and restoration impulses are transmitted over the line 400 and cause relay P1 to operate once for each impulse received. These impulses are of positive polarity, the first impulse thereof being applied to the line 400 simultaneously with the first positive impulse of the hundreds digit signal received over the line 401. The operation of relay P1 in response to the first positive impulse received over the line 400 applies battery by way of conductor 402 to the winding of relay A1 of the regenerator RGR1, the circuit being continued through the break contact and armature 403 of relay AA1 to ground, thereby causing relay A1 to operate. The operation of the regenerator unit having been previously described, it will be henceforth assumed that the operation of relay A of a regenerator in response to a received signal will cause the received signal to be regenerated to a signal of predetermined uniform duration without further reference to the controlling action of the associated AA relay which operates and releases under control of the A relay, henceforth for the reason of brevity, the operation of relay A may be referred to as the operation of the regenerator unit.

Regenerators RGR2, RGR3 and RGR4 are operated at this time from regenerator RGR1 over the following circuit: Grounded armature 403 and break contact of relay AA2, winding of relay A2, conductor 1 of cable 436, break contact and armature 437 of relay RT, Fig. 4B, break contact and armature 438 of relay RT1, break contact and armature 439 of relay NR, armature 441 and break contact of relay S1, conductor 442, make contact and armature 443 of relay A1, conductor 444, break contact and armature 445 of relay SR, conductor 467, break contact and armature 468 of relay LC, to battery thereby causing regenerator RGR2 to operate.

Regenerator RGR3 operates on a circuit extending from the winding of relay A3, by way of conductor 2 of cable 436, break contact and armature 445 of relay RT1, break contact and armature 446 of relay RT, armature 447 and break contact of relay S1, conductor 448, make contact and armature 449 of relay A1 to battery.

The circuit for operating regenerator RGR4 extends from the winding of relay A4 through conductor 3 of cable 436, break contact and armature 449 of relay RT1, break contact and armature 451 of relay RT, armature 452 and break contact of relay SR, conductor 453, make contact and armature 454 of relay A1 to battery.

The operation of regenerator RGR1 closed a circuit at armature 455 and make contact of relay A1, conductor 456, armature 457 and break contact of relay S3, conductor 458, armature 415 and break contact of relay X1, armature 416 and break contact of relay W1, armature 417 and

break contact of relay Y1, to the winding of relay LA causing relay LA to operate and establish a locking circuit in series with the winding of relay W1, break contact and armature 430 of relay X1, conductor 459, armature 461 of relay RLS to grounded battery at the break contact thereof. As relay A1 releases battery is removed from one end of the winding of relay W1 which operates in series with relay LA.

At the first positive pulse is removed from line 400, relay P1 releases and regenerators RGR1 to RGR4 subsequently release. Regenerators RGR1 to RGR4 operate in the manner described in response to each of the ten positive timing and restoration impulses received over the line 400. As the second positive impulse is received these regenerators again operate and a circuit is closed from grounded battery at armature 455 and make contact of relay A1, conductor 456, armature 457 and break contact of relay S3, conductor 458, armature 415 and break contact of relay X1, armature 416 and make contact of relay W1, armature 421 and make contact of relay LA to the winding of relay LL which operates and locks in series with the winding of relay X1, break contact and armature 430 of relay Y1 to battery on conductor 459. When relay A1 releases the battery is removed from one terminal of the winding of relay X1 causing relay X1 to operate and interrupt at its break contact and armature 430 the locking circuit for relays W1 and LA thereby causing these relays to release.

As relay A1 reoperates in response to the third positive signal received over the line conductor 400, battery is again applied to conductor 458, armature 425 and break contact of relay Y1, armature 426 and make contact of relay X1, armature 421 and make contact of relay LL and thence to the winding of relay HL, thereby causing relay HL to operate. As relay HL operates it closes a locking circuit from its winding in series with the winding of relay Y1, break contact and armature of relay W1 to battery on conductor 459. Relay Y1 operates in series with relay HL immediately following the release of relay A1, and the break contact and armature 430 of relay Y1 opens the holding circuit for relays X1 and LL thereby causing these latter relays to release.

As relay A1 moves its armature 455 into engagement with the make contact thereof in response to the fourth positive signal, battery is connected to conductor 458 and thence to armature 425 and make contact of relay Y1, armature 462 and break contact of relay W1, armature 421 and make contact of relay HL to the winding of relay L0 which operates and locks in series with the winding of relay W1, break contact and armature of relay X1 to battery on conductor 459. Relay W1 operates immediately following the release of relay A1 and opens, through its break contact and armature 430, the holding circuit for relays Y1 to HL thereby causing these relays to release.

As the fifth positive pulse is received over line 400, relays P1 and A1 again operate causing battery to be applied to conductor 458, armature 415 and break contact of relay X1, armature 416 and make contact of relay W1, armature 421 and make contact of relay L0 to the winding of relay HI causing relay HI to operate. As relay HI operates it locks in series with the winding of relay X1, break contact and armature of relay Y1 to battery on conductor 459. As relay A1 releases at the termination of the fifth impulse, battery is removed from one end of the winding of relay X1 which then operates and at its armature 430 and break contact opens the holding circuit for relays W1 and L0 causing these relays to release.

As relay A1 operates in response to the sixth positive impulse over line conductor 400, battery is applied to armature 425 and break contact of relay Y1, armature 426 and make contact of relay X1, armature 421 and make contact of relay HI to the winding of relay OP which operates and locks in series with relay Y1, break contact and armature 430 of relay W1 to battery on conductor 459.

The release of relay A1 causes the relay Y1 to operate in series with relay OP and armature 430 of relay Y1 to interrupt the holding circuit for relays X1 and H1 causing these relays to release.

The seventh positive pulse causes relay A1 to operate thereby connecting battery to armature 425 and make contact of relay Y1, armature 462 and break contact of relay W1, armature 421 and make contact of relay OP and the winding of relay UN, causing this relay to operate and lock in series with relay W1, break contact and armature 430 of relay X1, to battery on conductor 459. Following the release of relay A1, relay W1 operates in series with relay UN which causes the release of relays Y1 and OP by the interruption of their locking circuit at armature 430 and break contact of relay W1.

As relay A1 operates in response to the eighth positive impulse over conductor 400, battery is again applied to armature 415 and break contact of relay X1 and thence to armature 426 and make contact of relay W1, armature 421 and make contact of relay UN, to the winding of relay CLS, causing this relay to operate and lock in series with the winding of relay X1, break contact and armature of relay Y1, to battery on conductor 459. Relay X1 operates after relay A1 releases and at its break contact and armature 430 opens the holding circuits for relay W1 and UN which release.

As the ninth positive impulse is received, relay A1 again closes its armature 445 thereby applying battery to conductor 458, armature 425 and break contact of relay Y1, armature 426 and make contact of relay X1, armature 421 and make contact of relay CLS thereby operating relay CLH which locks in series with relay Y1, break contact and armature of relay W1 to battery on conductor 459. The release of relay A1 at the end of the ninth impulse, causes relay Y1 to operate in series with relay CLH. The opening of armature 430 and break contact of relay Y1 interrupts the circuit for relays X1 and CLS which release. As relay CLH closes its contacts, a circuit is completed from battery at break contact and armature 461 of relay RLS, conductor 459, armature 482, and break contact of relay S3, conductor 463, armature 464 and make contact of relay Y1, armature 465 and make contact of relay CLH, conductor 466 and thence to the winding of relay SR, causing relay SR to operate. The operation of relay SR at its armature 445 completed a circuit from battery at the armature 468 and break contact of relay LC, armature 445 and make contact of relay SR to the windings of relays AG and S1, causing relays AG and S1 to operate and lock through armature 440 and make contact of relay S1, conductor 467 and thence to battery at the break contact and armature 468 of relay LC. Relay SR is

maintained in the operated position by means of two circuits which are commonly extended from the winding of relay SR to armature 468 and make contact of relay S1 at which point the circuit divides, one continuing by way of conductor 469, make contact and armature 508 of relay A1 when operated to battery and the other parallel circuit is extended from the make contact of armature 468 of relay S1, armature and break contact 471 of relay RT1, conductor 4 of cable 436, make contact and armature 472 of relay A4 to battery when relay A4 is operated. Due to the slow-to-release characteristic of relay SR, it does not release until relays P1 and P4 cease to function at the termination of the series of positive pulses on line 400 and negative pulses on line 401, which immediately follow the operation of the SR relay.

As the tenth positive pulse is received, relay P1 and regenerator RGR1 operate. Regenerators RGR2, RGR3 and RGR4 do not operate as their operating circuits are open at armatures 441 and 447 of relay S1, and armatures 445 and 452 of relay SR. Relay S2 operates over a circuit extending from one end of its winding to the break contact and armature 473 of relay S3, conductor 474, make contact and armature 475 of relay CLH, break contact and armature 462 of relay W1, make contact and armature 425 of relay Y1, conductor 458, break contact and armature 457, and make contact and armature 460 of relays S3 and AG respectively in parallel, conductor 456, make contact and armature 455 of relay A1 to grounded battery. Relay S2 upon operating closes a locking circuit through its armature 450 and make contact, break contact 476 of make-before-break contacts of relay RLS and thence to the winding of relay S3, the other end of which is connected to grounded battery. Relay S3 does not operate at this time as battery is now connected to both ends of its winding. Upon the release of relays P1 and A1 at the termination of the tenth positive impulse from line 400, the operating battery is removed from relay S2 which then maintains its operated position by way of the locking circuit previously described in series with relay S3, thereby causing relay S3 to operate. The reception of this tenth or switching impulse from the line 400 prepares the selector equipment for the proper utilization of the signals to be received over conductors 409 and 401 from the transmitting and repeating apparatus during the revolution of the transmitting distributor DR2.

The operation of relay AG applies ground to conductors AG1 and AG2 of cable 477 and 788 but, since in the assumed example, the instant quotation is the first of a series of quotations, the circuits are opened at contacts of the stock relays such as shown on 4H and 4I and are therefore without effect at this time.

The operation of relay AG at its armature 791 applies ground to conductor 7 of cable 788 and thence by way of conductor 1 of cable 792 to the windings of relays TT and TU, Fig. 4I, thereby causing the tens and units transfer relays TT and TU to operate. The operation of relays TT and TU at this time is without effect since, in the assumed example, the indicators associated with stock 123 are employed for posting the open, high, low last and closing prices only.

It will be noted that relays H1, Fig. 4C, T2 and U3, Fig. 4D, have been operated in response to signals received corresponding to the hundreds, tens and units digits of the stock number 123. The manner in which circuits through these relays are completed in part to select stock number 123 will now be described. Relay 10—30, Fig. 4F, operates in series with relay 20 over the following circuit: Ground at winding of relay 10—30, conductor 478, armature 480 and make contact of relay T2, Fig. 4D, conductor 479, winding of relay 20, conductor 481, make contact and armature 482 of relay S3, conductor 459, armature 461 and break contact of relay RLS to battery. It will be noted that the selection of relays 10—30 and 20 was determined by the tens digit characteristic of the stock number. Relay 110, Fig. 4F, operates from a circuit extending from its winding through contacts 483 of relay 10—30, conductor 484, armature 504 and make contact of relay H1, conductor 481, make contact and armature 482 of relay S3, conductor 459, armature 461 and break contact of relay RLS to battery. The selection of relay 110 is determined by the hundreds digit of the stock number in combination with the operated 10—30 relay. The circuit to jack 123 of jack panel 411 is not completed until after the switching signal is received, as will appear more clearly as the description proceeds.

As the pulse multiple to the indicators of channel 1 terminates at contacts of all stock relays, such as relay STK 123, Fig. 4H, which have their switches 408 moved to the channel 1 position, it is apparent that the operating circuit for any stock relay will not be closed until after the indicators of a previously selected stock have been adjusted and the previously operated stock relay on the same channel has released.

As the eleventh positive pulse, which is the first of the seven pulses required for the selection of the unison range for stock number 123 in the example assumed, is received over line 400, relay P1 and regenerator RGR1 again operate. Battery at armature 455 and make contact of relay A1 is applied to conductor 456, armature 460 and make contact of relay AG, conductor 458, armature 425 and make contact of relay Y1, armature 462 and break contact of relay W1, armature 475 and make contact of relay CLH, conductor 474, armature 473 and make contact of relay S3, conductor 497 to the winding of relay LA, causing relay LA to operate and lock in series with relay W1, break contact and armature 430 of relay X1, conductor 459, armature 461 and break contact of relay RLS to battery.

Relay W1 does not operate, however, until relay A1 releases. As the eleventh positive pulse is removed from line 400 and relays P1 and A1 release and relay W1 operates and the locking circuit for relays CLH and Y1 is interrupted at the break contact and armature 430 of relay W1, causing relays CLH and Y1 to release. Relay A1 operates in response to the twelfth positive pulse on line 400 causing the operation of relay LL over the following circuit: Battery, armature 455 and make contact of relay A1, conductor 456, armature 460 and make contact of relay AG, conductor 458, armature 415 and break contact of relay X1, armature 416 and make contact of relay W1, armature 421 and make contact of relay LA to the winding of relay LL and thence to ground. As relay LL operates and closes its locking armature a circuit is completed from the winding of relay LL, armature 419 and make contacts thereof to the winding of relay X1, break contact and armature 430 of relay Y1, to battery on conductor 459. Relay X1 operates over this circuit when relay A1 releases. The opera-

tion of relay XI opens the locking circuit for relays WI and LA which release.

As the thirteenth positive pulse is received over line 400, relays PI and AI again operate causing the operation of relay HL in a manner previously described. It will be noted, however, that the operating circuit for the range relay counting chain for this cycle of operation includes the operated armature 460 and make contact of relay AG as a connecting means between conductors 456 and 458, whereas these conductors were previously connected by armature 457 and break contact of relay S3 for the first operation of the range counting chain.

As the thirteenth positive pulse is removed from line 400, relays PI and AI release thereby removing battery from one end of the winding of relay YI which operates in series with relay HL and at its armature 430 and break contact interrupts the locking circuit for relays XI and LL thereby causing them to release.

As relay AI operates in response to the fourteenth positive pulse, battery is applied to conductor 458 as previously described, armature 425 and make contact of relay YI, armature 462 and break contact of relay WI, armature 421 and make contact of relay HL to the winding of relay LO which operates and locks in series with relay WI, break contact and armature 430 of relay XI, to battery on conductor 459. As relay AI releases relay WI operates and at its break contact and armature 430 interrupts the circuit for relays YI and HL which release.

As the fifteenth positive pulse is received on the line 400, relays PI and AI again operate and cause battery to be placed on conductor 456, armature 415 and break contact of relay XI, armature 416 and make contact of relay WI, armature 421 and make contact of relay LO, to the winding of relay HI which operates and locks in series with relay XI, break contact and armature 430 of relay YI to battery on conductor 459.

As the fifteenth impulse is removed from conductor 400, relays PI and AI release and relay XI operates in series with relay HI and at its break contact and armature 430 interrupts the circuit to relays WI and LO which release.

As the sixteenth and seventeenth impulses are received over conductor 400, relays OP and UN respectively operate, relay WI operating in series with relay UN as the seventeenth impulse terminates.

When the switching impulse is received on conductor 401, relay P4 operates and applies battery to conductor 2 of cable 412, armature 422 and make contact of relay S2, armature 498 and break contact of relay SR to the winding of relay LC and thence to ground thereby causing relay LC to operate. The operation of relay LC at its armature 468 removed battery from the holding circuit of relays SI and AG which release. When armature 468 of relay LC engages its make contact, battery is applied to conductor 3 of cable 788 extending to the winding of relay LC—1, Fig. 4G, thereby causing relay LC—1 to operate. The release of relay AG at its armature 791 removes ground from conductor 7 of cable 788 thereby causing relays TT and TU, Fig. 4I, to release.

Relay RA, Fig. 4E, now operates over the following circuit: Winding of relay RA, conductor 1 of cable 499, break contact and armature 501 of relay CO, make contact and armature 468 of relay LC to grounded battery. Relay RA locks over its operated contact 500, conductor 793, make contact and armature 496 of relay S2 to battery. As brush B2 of the distributor DR1 passes off segment LC of the ring R2, the negative switching impulse is removed from line 401 and relays P4 and LC release. It will be noted that as relay LC operated, the armatures 530, 638 and 680 removed battery from conductors 1, 2 and 3 of cable 503, thereby interrupting the locking circuit for range relays CLH1 to LA1, Fig. 4E. As none of these range relays were operated at the time relay LC operated, these circuits were without effect. The release of relay LC prepared these circuits for subsequent operation.

The operation of relay RA completes a circuit from the operation of a stock relay which, in the example assumed, is that relay associated with stock number 123 which operates as follows: Winding of stock relay STK 123, Fig. 4H, conductor 505, flexible conductor 506, Fig. 4F, plug 507, jack 123, contacts 484 of relay 119, contacts 485 of relay 29, conductor 486, armature 490 and make contacts of relay U3, Fig. 4D, conductor 487, armature 488 and break contact of relay T—0, conductor 489, operated contacts 491 of relay RA, conductor 492, armature 493 and break contact of relay LC, armature 494 and break contact of relay AG, conductor 495, make contact and armature 496 of relay S2 to battery.

Relay UN1, Fig. 4E, operates on a circuit from the winding of this relay, conductor 2 of cable 682, break contact and armature 794 of relay RW—1, Fig. 4G, conductor 9 of cable 795, conductor 9 of cable 634, armature 640 and make contact of relay UN, Fig. 4C, conductor 492, armature 493 and break contact of relay LC, armature 494 and break contact of relay AG, conductor 495, make contact and armature 496 of relay S2 to grounded battery.

Range relays OP—1, HI—1, LO—1 and LA—1 now operate under control of the operated relay UN1, Fig. 4E, in parallel, corresponding to the open, high, low and last ranges respectively comprising a unison range selection, over a circuit from their windings through the operated contacts of relay UN1, conductor 492, armature 493 and break contact of relay LC, armature 494 and break contact of relay AG, conductor 495, make contact and armature 496 of relay S2 to battery. Relays OP—1, HI—1, LO—1 and LA—1 upon operating lock through an associated contact 670 thereon to battery at armatures 530 and 638 of relay LC.

The stock relay STK 123 now locks by way of its contact 650, contacts 660 of switch 498, conductor 21 of cable 507 through contacts of relays OP—1 to LA—1 in parallel, conductor 6 of cable 796, armature 830 and break contact of relay WO1, conductor 7 of cable 795, conductor 3 of cable 503, break contact and armature 680 of relay LC to grounded battery.

The transmitting distributor DR1, Fig. 2, has now completed its first revolution during which signals corresponding to the stock number 123, price 56⅜, unison range, has been received. During the time of this revolution the receiving apparatus of Figs. 4A to 4I, has operated to select the stock relay STK 123, Fig. 4H, and close the circuit to the indicator units of the open, high, low and last ranges of this stock through operated contacts of relays OP—1, HI—1, LO—1 and LA—1 respectively to the contacts of regenerators RGR1, RGR2 and RGR3. The indicator

units corresponding to the tens, units and fractions digits of these ranges will be subsequently actuated to display the quotation 56⅜ on each of these four ranges. As this quotation is the first quotation on channel 1, it is assumed that all indicators of channel 1 stocks and other items are now at their blank settings with the result that the following restoration impulses will now move these indicators from their blank settings. It will also be recalled that at this time stock relay STK 123 and range relays OP—1 to LA—1 are held operated through their locking contacts. As the description proceeds it will be noted that these relays do not release until after all impulses required for the operation of the indicators of the selected stock have been received.

A description of the operation of the receiving apparatus in response to signals received during the first revolution of the transmitting distributor DR2, Fig. 2, to display the quotation 56⅜ on the indicators of the stock position 123, Fig. 4H, whose selection has just been completed follows.

As the switching impulse of positive polarity is received over line 400, relay P1 operates thereby causing the operation of regenerator RGR1 which in turn operates regenerators RGR2, RGR3 and RGR4 in unison. Regenerator RGR2 operates on a circuit from the winding of relay A2, conductor 1 of cable 436, break contact and armature 437 of relay RT, break contact and armature 438 of relay RT1, break contact and armature 439 of relay NR, armature 441 and break contact of relay S1, conductor 442, make contact and armature 443 of relay A1, conductor 444, break contact and armature 445 of relay SR, break contact and armature 468 of relay LC and thence to battery.

Regenerator RGR3 operates over a circuit from the winding of relay A3, conductor 2 of cable 436, break contact and armature 445 of relay RT1, break contact and armature 446 of relay RT, armature 447 and break contact of relay S1, conductor 448, make contact and armature 449 of relay A1, conductor 444, break contact and armature 445 of relay SR, break contact and armature 468 of relay LC to battery. Regenerator RGR4 operates over a circuit from the winding of relay A4, conductor 3 of cable 436, break contact and armature 449 of relay RT1, break contact and armature 451 of relay RT, armature 452 and break contact of relay SR, conductor 453, make contact and armature 454 of relay A1 to grounded battery.

The regenerator RGR1 also causes the operation of relay RLS from ground at the winding of relay RLS, make contact and armature 509 of relay S3, break contact and armature 510 of relay AG, conductor 456, make contact and armature 455 of relay A1 to grounded battery.

As relay RLS operates, it closes a circuit from ground through resistance 511 over its armature 512 and make contact to the winding of relay S3, thereby holding relay S3 operated. As armature 512 of relay RLS moves to its operated position, contact 476 of relay RLS is opened and causes relay S2 to release.

As relay RLS moved its armature 461 to the operated position, battery was removed from conductor 459, armature 482, and make contact of relay S3, conductor 481, winding of relay 20, conductor 479, make contact and armature 480 of relay T2, conductor 478, winding of relay 10—30, thereby causing relays 20 and 10—30 to release. Relay 119, Fig. 4F, releases as its operating circuit is opened at armature 461 of relay RLS and at contacts 483 of relay 10—30. Relays UN and Y1, Fig. 4C, release as their holding circuit is opened at armature 451 of relay RLS. Relays UN1 and RA, Fig. 4E, release as their holding circuits are opened at armature 496 of relay S2. Locking circuits for counting relay chains H1 to H9, T1 to T0 and U1 to U0 are opened at armatures 435, 419 and 424 respectively of relay RLS causing the release of relays H1 and W2, T2 and X3, U3 and Y4, which were operated as a result of signals transmitted during the first revolution of the transmitting distributor DR1, Fig. 2.

As regenerator RGR2 operates, battery is applied to conductors T1 to T4 of cable 788, armatures 797 to 800 and break contacts of relay RT—2, conductors 1 to 4 of cable 795, resistances 513, closed contacts of relays OP1, HI1, LO1 and LA1, thereby extending the circuit to conductors 6, 10 and 14 of cable 507 and conductor 4 of cable 801, armature 802 and break contact of relay LODT, Fig. 4H, conductor 18 of cable 803, extending to conductor 18 of cable 507. As regenerators RGR3 and RGR4 operate battery is applied to conductors U1 to U4 and F1 to F4 of cable 512, through resistances 513, closed contacts of relays OP1, HI1, LO1 and LA1 at which point the units leads U1 to U4 are diverted by way of conductors 6, 9, 12 and 15 respectively of cable 518 through armatures 519, 683, 684, and 685 and their break contacts of relay RT, to conductors 7, 10, 13 and 16 of cable 499 and thence to conductors 7, 11 and 15 of cable 507, the conductor 16 of cable 499 being continued by way of armature 804 and break contact of relay LODT, conductor 19 of cable 803 to conductor 19 of cable 507, in which cable conductors 6, 8, 10, 12, 14 and 16 are connected directly to contacts of relays OP1, HI1 and LO1, the conductors 18 and 20 thereof being connected to conductors 18 and 20 of cable 803, armatures 802 and 805 and their associated break contacts of relay LODT, the circuit being continued by way of conductors 4 and 6 of cable 801 to the contacts of relay LA1. The conductors 6 to 20 of cable 507 extend the circuits through contacts of switch 408, Fig. 4H, and contacts of relay STK 123, to indicators of the ranges OP, HI, LO and LA and the commutator switches thereof over conductors 514 and 515, contacts of relay STK 123 and switch 408 through conductors AG1 and AG2 of cable 477 to armatures 521 and 639 of relay AG which are at this time in their unoperated position. Since, in the example assumed, all indicators of stock 123 are now in their blank position prior to the transmission of the price 56⅜, unison range, all of the indicators of stock 123 will have their switches 516 moved to the left as shown on Figs. 4H and 4I and consequently none of these indicators will respond at this time to the ten restoration pulses of which the first pulse has just been received.

As the switching impulse is removed from line 400, relay P1 and regenerators RGR1 to RGR4 release. Relay A1 at its armature 455 removes battery from conductor 456, armature 510 and break contact of relay AG, armature 509 and make contact of relay S3 to the winding of relay RLS, causing relay RLS to release. As relay RLS moves its armature 512 to the unoperated position the holding circuit for relay S3 is interrupted and relay S3 releases.

In the assumed example the quotation for stock 123 is immediately followed by a quotation for

wheat having a stock number 823, unison range, and a price of 2⅝, the stock number for wheat being transmitted concurrently with the indicator restoration impulses of stock 123 and the range signal for wheat concurrently with the price impulses for stock 123.

A signal of negative polarity is now received over conductors 400 and 401 causing the operation of relays P3 and P4 respectively. The operation of relay P3 causes relay T1, Fig. 4D, to operate in response to the first pulse for the tens digit 2 and the operation of relay P4 operates relay U1 to register the first pulse of the units digit 3 of the stock number 823. As the brush B1 of distributor DR2, Fig. 2, passes over the sixth segment of rings R1 and R2, a second negative pulse is sent over the lines 400 and 401 causing the operation of relays P3, T2, P4 and U2. As the distributor brush passes over segment 8 of ring R2, relay U3 operates thereby storing the digits 2 and 3 in the tens and units counting chains respectively representative of the tens and units digits of stock number 823.

As brush B2 engages segment 5 (HS) of ring R2 of the distributor DR2, a positive pulse is sent over line 401, causing relays P2 and H1 to operate and register the first impulse corresponding to the signal for the hundreds digit 8, by the operation of relay H1 of the hundreds relay counting chain. As brush B2 engages segments 7, 9, 11, 13, 15, 17 and 19 of ring R2, seven additional pulses of positive polarity are sent over the line 401 causing relay P2 to operate seven times and thus operate relay H8 thereby storing the hundreds digit 8 in the counting chain employed for the hundreds digit of the item designation.

As the brush of distributor DR2 came into engagement with segment 5 of ring R1, a signal of positive polarity is again applied to conductor 400 thereby causing relay P1, Fig. 4A, to operate. As relay P1 moves its armature to the operated position regenerators RGR1 to RGR4 operate in the manner previously described.

Relay LA of the range counting chain operates on a circuit from the winding of this relay, break contact and armature 417 of relay Y1, break contact and armature 416 of relay W1, break contact and armature 415 of relay X1, conductor 458, break contact and armature 457 of relay S3, conductor 456, make contact and armature 455 of relay A1 to grounded battery. Relay LA locks in series with relay W1, break contact and armature 430 of relay X1, conductor 459, armature 461 and break contact of relay RLS to grounded battery. As the brushes leave segment 5 of the distributor DR2 the positive signal is removed from conductor 400 causing the release of relay P1 and regenerators RGR1 to RGR4 and the operation of relay W1 in series with relay LA as previously described. As regenerators RGR2, RGR3 and RGR4 operated in response to the second positive signal, battery was applied, by way of conductors T1 to T4 of cable 788 and U1 to U4 of cable 512 to the indicator units of ranges OP, HI, LO and LA but, as hereinbefore stated, these pulses are without effect at this time since it is assumed that the indicators of the item wheat are now on blank as this is a first quotation for wheat.

As the odd numbered segments 7 to 21 of ring R1 of the distributor DR2 are traversed by brush B1, eight additional pulses are applied successively to conductor 400 causing the operation of relay P1 and regenerators RGR1 to RGR4 in response to each of these pulses and the operation and release of relays LL to UN, Fig. 4C, and the operation of relay CLH of the range relay counting chain. As the tenth positive pulse is applied to conductor 400 relays P1, A1 and CLH operate and as the tenth positive pulse is removed from line 400, relay Y1 operates in series with the locking circuit for relay CLH over a circuit from grounded battery, break contact and armature 461 of relay RLS, conductor 459, armature 430 and break contact of relay W1, winding of relay Y1, make contact and armature 419 of relay CLH, thence through the winding of relay CLH to ground. As relay Y1 operated the locking circuit for relays CLS and X1 was opened at the break contact and armature 430 of relay Y1 causing relays CLS and X1 to release.

Relay SR operates over a circuit from its winding, conductor 466, make contact and armature 465 of relay CLH, make contact and armature 464 of relay Y1, conductor 463, break contact and armature 482 of relay S3, conductor 459, armature 461 and break contact of relay RLS to battery.

Relays AG and S1 operate in parallel when armature 455 of relay SR moves to its operated position.

Relay SR, it will be recalled, is slow to release and remains operated on subsequent pulses from regenerators RGR1 and RGR4 over a circuit from the winding of relay SR, armature and make contact 468 of relay S1, conductor 469, make contact and armature 508 of relay A1 to battery, and a circuit from relay SR, armature 468 and make contact of relay S1, armature 471 and break contact of relay RT1, conductor 4 of cable 436, make contact and armature 472 of relay A4 to grounded battery.

As relay AG operated its armatures 521 and 639, ground is applied by way of conductors AG1 and AG2 of cable 477 to the winding of the indicators of stock relay STK 123 thereby preparing these indicators for operation in response to additional impulses over lines 400 and 401.

Relay S1 locks by way of its armature 440 and make contact, conductor 467 to battery at the break contact and armature 468 of relay LC, thereby holding relay AG operated.

As the eleventh positive impulse is applied to conductor 400, relays P1 and A1 operate but regenerators RGR2, RGR3 and RGR4 do not operate therefrom as their operating circuits are open at contacts of relays SR and S1, the circuit to relay A2 is open at armature 441 and the circuit to relay A3 is open at armature 447 of relay S1, the battery supply to both of these circuits being interrupted at armature 445 of relay SR, and the operating circuit for relay A4 is open at armature 452 of relay SR.

Relay S2 operates over a circuit from its winding, break contact and armature 473 of relay S3, conductor 474, make contact and armature 475 of relay CLH, break contact and armature 462 of relay W1, make contact and armature 425 of relay Y1, conductor 458, make contact and armature 460 of relay AG in parallel with the break contact and armature 457 of relay S3, conductor 456, make contact and armature 455 of relay A1 to grounded battery. Relay S2 locks by way of its armature 450 and make contact thereof, contact 476 of relay RLS in series with the winding of relay S3 to grounded battery. Relay S3 does not operate at this time as its winding is short circuited by armature 455 and make contact of relay A1.

As the eleventh positive pulse is removed from line 400, relays P1 and A1 release, thereby causing the operation of relay S3 in series with the locking circuit of relay S2. As armature 791 of relay AG came into engagement with the make contact thereof ground was applied to conductor 7 of cable 788 thereby causing the operation of relays TT and TU.

It will be noted that relays H8, T2 and U3 have been operated in response to signals received for the hundreds, tens and units digits of the designation number 823 assigned to wheat. The manner is which circuits through these relays are completed in part to select the item number 823 will now be described.

Referring first to Fig. 4C, it will be noted that armatures 504 of relays H7 and H8 are connected in parallel to the corresponding armature 504 of relay H6 in such a manner that the operation of relays H6, H7 or H8 will result in the selection of an item having the hundreds digit 8, thus the operation of relays H8, T2 and U3 causes battery to be applied to jack 823 over a circuit comprising the operated contacts 807 of relay 610 and operated contacts 485 of relay 20. Relay 610 operated on a circuit from ground through the winding of relay 610, operated contacts 808 of relay 10—30 to battery on conductor 806. It will be understood that relay 610 is similar in all respects to relay 110 and is provided with thirty-three pairs of contacts of which the contact 807 is shown on Fig. 4F by way of illustration, these contacts being connected through the relays 10, 20 and 30 and the jacks of jack strip 411 in a manner similar to relay 110. Thus when relay RA operates just before the transmitting distributor DR1 starts the succeeding revolution thereof to transmit restoration and resetting impulses to the selected indicators, battery is applied to jack 823, this circuit being continued by way of plug 809, flexible conductor 811 and conductor 812 to the winding of relay STK 823 causing relay STK 823 to operate and lock by way of its contact 812 to battery on conductor 21 of cable 507. The plug 809 is provided with a recess adapted to receive the plug 813, which is inserted therein, thereby extending battery by way of plug 813, flexible conductor 814, conductor 815 to the winding of the trend relay STKT 823 thereby causing relay STKT 823 to operate during the time that relay STK 823 is operated.

As the brushes of the distributors DR2 engage their segments 24, negative battery is applied to conductors 400 and 401 thereby operating polarized relays P3 and P4 to receive the first signal of the units and fractions portion of the price 56⅜.

As relay P3 operates a circuit is closed from battery at the armature thereof by way of conductor 1 of cable 788, armature 789 and break contact fo relay LC1, conductor 2 of cable 788, armature 413 and make contact of relay S2, armature 446 and break contact of relay RT, armature 445 and break contact of relay RT1, conductor 2 of cable 436 to the winding of relay A3, causing relay A3 to operate and transmit the first actuation impulse to the units indicators of the open, high, low and last ranges of the selected stock STK 123.

The circuit for the operation of the units digit indicator of each of the four ranges open, high, low and last will now be traced: Battery at armature 684 and make contact of relay A3, conductor U1 of cable 512, resistance 513, contact 517 of relay OP1, conductor 6 of cable 518, armature 519 and break contact of relay RT, conductor 7 of cable 499, conductor 7 of cable 507, contacts of switch 408, contacts of relay STK 123 thence through the winding of the units digit indicator of the range OP, contact of switch 516, conductor 514, contact of relay STK 123, contact of switch 408, conductor AG2 of cable 477, armature 521 and make contact of relay AG to ground. The circuit for operating the units digit indicator of the high range of stock 123 is completed from battery at armature 685 and make contact of relay A3, conductor U2 of cable 512, resistance 513, contact of relay HI1, conductor 9 of cable 518, armature 683 and break contact of relay RT, conductor 10 of cable 499, conductor 11 of cable 507, contacts of switch 408, contacts of relay STK 123, winding of the units digit indicator of the high range, conductor 514, contacts of relay STK 123, contacts of switch 408, conductor AG2 of cable 477, armature 521 and make contact of relay AG to ground. The circuit for the operation of the units digit indicator of the low and last ranges from contacts of relay A3 through conductors U3 and U4 respectively are similar to the circuits just described and will, therefore, not be traced.

As relays P3 and A3 release battery is removed from the windings of the units indicators of the selected ranges causing the indicators to become positioned to display the digit 1. As the indicators are moved from their normal or blank positions, the switch 516 of each indicator is moved to the right contact and remains so moved until the blank position is again reached. As each switch 516 is moved to the right due to the actuation of the associated indicator from blank, the winding of the indicator is disconnected from ground on conductor AG1 or AG2 and connected to ground at conductor 522.

As the stock price to be displayed is 56⅜ in the example assumed, five additional negative signals will be applied to conductor 400, causing the operation of relay P3 and regenerator RGR3 to respond and transmit five additional pulses to the units indicators of the unison range to display the units digit 6. No additional negative impulses on line 400 are received immediately following the sixth negative impulse.

It will be noted that relay P4 and regenerator RGR4 respond to three signals of negative polarity over conductor 401 during the time that the first three negative signals were received on line 400, causing the operation of the indicator units of the fractions portion of the stock price of the ranges OP, HI, LO and LA from contacts and armatures 686 and 687 of relay A4 through conductors F1, F2, F3 and F4 of cable 512.

The circuit for the operation of the fractions indicator of the open range follows: Battery at armature 686 and make contact of relay A4, conductor F1 of cable 512, resistance 513, contact 523 of relay OP1, conductor 8 of cable 507, contacts of switch 408, operated contacts of relay STK 123, winding of the fractions indicator of open range, switch 516, conductor 514, contacts of relay STK 123 and switch 408, conductor AG2 of cable 477, armature 521 and make contact of relay AG to ground. The circuit for the operation of the fractions indicators of the other ranges is similar to the circuit just traced, the circuit for the fractions indicator of the last range including armature 805 and break contact of relay LODT, and armature 850 and break contact of relay TSFR, Fig. 4G.

Three negative pulses only are transmitted on conductor 401 to display the fractions portion ⅜ of the price and thereafter no negative impulses are transmitted on conductor 401 during the time allotted for the transmission and reception of the fractions price signal.

As the brushes of the distributor DR2 engage their segments 25, a positive pulse was transmitted on conductor 401 causing the operation of relay P2 and regenerator RGR2. Relay A2 of this regenerator operates on a circuit from its winding, conductor 1 of cable 436, break contact and armature 437 of relay RT, break contact and armature 438 of relay RT1, make contact and armature 524 of relay S1, make contact and armature 427 of relay S2, conductor 1 of cable 412, armature and make contact of relay P2 to grounded battery.

As relay A2 operates, battery is applied by armatures 642 and 688 and their respective make contacts of relay A2 to conductors T1, T2, T3 and T4 of cable 788 and thence through circuits previously described to the windings of the tens digit indicators of open, high, low and last ranges causing these indicators to operate.

Four additional impulses of positive polarity on conductor 401 cause the indicators of the tens digit of the unison range (UN) indicators to operate to display the digit 5, each successive pulse causing the selected indicators to step ahead one position to display the next higher digit. No further signals are transmitted on conductor 401 during the time allotted for the transmission of signals for the tens price digit and therefore, for the remaining time, relays P2 and A2 remain unoperated. The slow-to-release relay SR which has been previously operated as hereinbefore described was maintained in its operated condition during the time that the price impulses for stock 123 and the range impulses for the item 823 are received.

As the brush B1 of the distributor DR2 engages segments 25, 27, 29, 31, 33, 35 and 37 of the ring R1, seven impulses of positive polarity are transmitted over the line 400, causing relay P1 to operate and thus store the range signal unison in the range counting chain of Fig. 4C, by operating the range relay UN.

When brush B2 of distributor DR2 comes into engagement with segment LC of ring R2, a signal of negative polarity is applied to conductor 401 causing relay P4 to operate and apply battery to conductor 2 of cable 412, armature 422 and make contact of relay S2, armature 498 and break contact of relay SR to the winding of relay LC which operates. The opening of the armatures 530, 638 and 690 of relay LC removes battery from conductors 1, 2 and 3 of cable 503 causing the release of range relays OP1 to LA1, Fig. 4E, and the stock relay STK 123. Relays S1 and AG release as their locking circuits are interrupted at armature 468 and break contact of relay LC.

As brush B2 passes off segment LC at the end of the revolution of distributor DR2, relay P4 releases and at its armature opens the operating circuit of relay LC which releases and restores battery to conductors 1 and 2 of cable 503, thereby preparing these circuits for locking the range relays, Fig. 4E. The release of relay LC also applied battery by way of conductor 3 of cable 503 to a contact on each of the range relays in parallel which upon operation of one or more of these range relays is applied by way of conductor 21 of cable 507 to the locking contact 650 of each of the relays STK for maintaining the selected stock relay STK in the operated position for the reception of the subsequent impulses to the associated indicators. Locking battery for the selected relay STK is carried through contacts on the range relays to provide ample time for a previously selected stock relay to release before locking battery is again applied to the contacts of all gang relays of the channel 1 group.

The operation of relay LC at its armature 468 caused relay RA to operate and lock by way of its contact 590 to battery at the make contact and armature 496 of relay S2.

The distributor DR2 has now completed its revolution thus transmitting the restoration and price signals for the stock 123 concurrently with the stock number 823 and unison range thereof respectively and the distributor DR1 is now set into operation to transmit the restoration and price signals for the stock number 823.

Relays H8, T2 and U3, Figs. 4C and 4D, in the selector are operated and locked in a manner heretofore described, to relay RLS. This combination of relays causes the selection of the relays STK 823, Fig. 4H, and STKT 823, Fig. 4I, under control of the code numbers 823, 723 or 623 by the armature 504 of relays H8 and H7 being connected to the corresponding armature 504 of relay H6.

Relay RT1 operates from battery at armature 496 and make contact of relay S2, break contact and armature 494 of relay AG, break contact and armature 493 of relay LC, conductor 492, contact 645 of relay RA, conductor 646, armature 654 and make contact of relay H8, conductor 2 of cable 648, armature 655 and break contact of relay RT, winding of relay RT1 to ground. Relay RT1 locks over a circuit from the winding, armature 656 and make contact of relay RT1, break contact and armature 634 of relay LC to grounded battery.

Relay RT2, Fig. 4I, is connected in parallel with the winding of relay RT1 by means of conductor 9 of cable 788 and is therefore held operated during the time that relay RT1 is operated. Also relay LA2, Fig. 4G, is connected by way of conductor 10 of cable 788 in parallel with the winding of relay LA1, Fig. 4E, and therefore is operated during the time that relay LA1 is operated. Relay LC1, Fig. 4G, is connected by way of conductor 3 of cable 788 to the make contact of armature 468 of relay LC and thence to battery whereby relay LC1 is operated whenever relay LC is operated. The operation of relay LA2 at armature 816 thereof and make contact applies battery to the winding of relay TSFR, conductor 817, armature 818 and make contact of relay RT2, conductor 819, contacts of switch 400, operated contacts 821 of relay STKT 823 and thence to ground. The operation of relay TSFR at its armature 822 applied ground to conductor 4 of cable 823, winding of relay RG—CI, Fig. 4I, conductor 3 of cable 823, break contact and armature 824 of relay A—RW, break contact and armature 825 of relay B—RW, armature 826 and break contact of relay C—RW, break contact and armature 827 of relay D—RW, armature 828 and break contact of relay E—RW, break contact and armature 829 of F—RW, break contact and armature 831 of relay NOM, break contact and armature 832 of relay LOD to battery thereby completing a circuit to the regenerator cut-in relay RG—CI as will subsequently be described in greater detail.

The operation of relay RT1 at its armature 438 and make contact, connects polarized relay P2 to regenerator unit RGR3 and the armature 445 and make contact of relay RT1 connects relay P2 to regenerator RGR4 in order that the impulses transmitted over the tens price channel may actuate the indicators in the units position and the impulses transmitted over the units channel may cause the indicators in the fractions position of the selected item wheat to operate. In the example assumed the digits 2 and 5 transmitted over the tens and units channel respectively will be subsequently posted by the indicators in the units and fractions positions respectively of the wheat display position representing a price of $1.02⅝ by displaying the digit 2⅝, which is accomplished in the following manner:

As relay P2 operates in response to the first positive pulse on conductor 401 a circuit is closed from battery at the armature of relay P2, conductor 1 of cable 412, armature 427 and make contact of relay S2, armature 524, and make contact of relay S1, armature 438 and make contact of relay RT1, conductor 2 of cable 436, winding of relay A3, break contact and armature of relay AA3 to ground causing the regenerator RGR3 to operate. As the armatures of relay A3 engage their make contacts, battery is applied to conductors U1, U2, U3 and U4 of cable 512, resistances 513 and thence to contacts of the range relays OP—1, HI—1, LO—1 and LA—1.

Circuits are now completed whereby the operation of relay A2 of regenerator RGR2 at the armatures 642 and 688 thereof applies battery to conductors T1 and T2 of cable 788 extending to armatures 797 and 798 respectively of relay RT2 from whence the circuit is continued by way of the make contacts of these armatures to make contacts and armatures 833 and 834 of relay RG—CI, conductors 1 and 2 of cable 823 to the windings of relays A5 and A6 of regenerators RGR5 and RGR6 respectively thereby causing regenerators RGR5 and RGR6 to operate under control of regenerator RGR2 to transmit restoration and storage impulses to the trend indicators of the selected item and subsequently actuate the trend indicators B to F to their new settings in accordance with the values stored in the storage indicators, Fig. 41.

Conductors T3 and T4 of cable 788 extend to armatures 799 and 800 of relay RT2 from whence the circuit is continued through the make contacts of relay RT2 by way of conductors 835 and 836, make contacts of armatures 837 and 838 of relay RG—CI to the windings of the U and F storage indicators CE which operate in series with the U and F indicators E during normalization of the indicators E and subsequently in series with the indicators F during actuation of the indicators F to their new settings.

This will best be understood by the consideration of a specific example. Assume, by way of example, that the indicator U of E displays the digit 6, and the indicator F of E the digit 7 and the storage indicators CE are resting on their blank positions. As regenerator RGR2 operates to apply battery to the winding of the U indicator CE over the circuit just described, this battery impulse is continued by way of switch 516 and left contact of the units indicator CE, conductor 17 of cable 839, armature 840 and break contact of relay TT, conductor 9 of cable 841, contacts of switch 408 and relay STKT 823, conductor 9 of cable 842, winding of units indicator E, and right contact of switch 516 to ground on conductor 843. The first restoration impulse causes the units indicator E to be advanced to position 7 and the units indicator CE to be advanced to position 1. As the units indicator CE advanced to position 1, switch 516 thereof moved to the right thereby closing a circuit from switch 516 and right contacts thereof by way of conductor 18 of cable 839, armature 844 and break contact of relay TT and thence by way of conductor 9 of cable 841 to the winding of the units indicator E, switch 516 and right contact thereof to grounded conductor 843. The second restoration impulse would therefore be applied to the units indicators CE and E over the circuit just described causing the units indicator E to be advanced to position 8 and units indicator CE to be advanced to the position 2.

The third and fourth restoration impulses advance the units indicator E to positions 9 and 10 and the units indicator CE to positions 3 and 4 respectively.

The fifth restoration impulse advances the units indicator CE to position 5 and the units indicator E to position 11 or blank. As the units indicator E advances to position 11 the switch 516 thereof is moved to the left thereby disconnecting the indicator winding from grounded conductor 843 and establishing a circuit from the winding of the units indicator E by way of conductor 845, contacts of relay STKT 823 and the switch 408, conductor AG1 of cable 788 extending to contacts of the relay AG, Fig. 4B, which is unoperated during the time restoration impulses are received and therefore the circuit is open at contacts of relay AG thereby preventing further operation of the units indicators E and CE in response to additional restoration impulses, the indicator E now being on its blank position and the storage indicator CE being set to position 5.

At the termination of the restoration impulses relay AG operates causing the operation of relays TT and TU.

During the reception of the price impulses for the trend indicators A, ten actuating or resetting impulses are received by the indicators CE, the switch 516 of these indicators now resting against its right contact, and, in the case of the units indicator, in circuit with conductor 18 of cable 839, armature 844 and make contact of relay TT, conductor 11 of cable 841, contacts of switch 408 and relay STKT 823, conductor 11 of cable 842, winding of the units indicator F, switch 516 and left contact thereof, conductor 845, contacts of relay STKT 823 and switch 408, conductor AG1 of cable 788, contacts of relay AG and thence to ground. The first actuation impulse received from relay A2 applies battery to the units storage indicator CE in series with the units indicator F thereby causing the indicator F to be advanced to its position 1 and the storage indicator to its position 6. The four following actuation impulses advance the units indicator F to its position 5 and the storage indicator to its position 10. When the sixth actuation impulse is received, the units indicator F is advanced to display the digit 6 and the units storage indicator CE is advanced to its position 11 or blank position at which time switch 516 of the units indicator CE is moved to the left thereby interrupting the circuit to the winding of the units indicator F whereby the units indicator F is not responsive to additional actuation

impulses but comes to rest in position 6. In like manner the setting 7 of the fractions indicator E is transferred to the fractions indicator CE during normalization of the fractions indicator E and the stored setting in the fractions indicator CE is subsequently transferred to the fractions indicator F whereby the price 67/8 stored in the indicators E was transferred to the storage indicators and subsequently posted by the indicators F during the restoration and actuation of the indicators A to post a new price.

However, since the price 2⅝, in the first example assumed for the item wheat is the first price of the day for wheat all of the indicators A to F will be on their blank positions with their switches 516 moved to the left and the restoration impulses received therefor during the first half of the revolution of the distributor DR1 will be ineffective to cause restoration of the selected indicators in the manner just described as these indicators are now resting at their blank position.

When brush B1 engages segment 24 of ring R1 a negative pulse is received over the line 400 causing relay P3 to operate in response to the first impulse of the signal for the fractions digit 5 of the price. The operation of relay P3 applies battery to conductor 1 of cable 788, armature 789 and break contact of relay LC1, conductor 2 of cable 788, armature 413 and make contact of relay S2, armature 446 and break contact of relay RT, armature 445 and make contact of relay RT1, conductor 3 of cable 436 to the winding of relay A4, thereby causing the regenerator unit RGR4 to operate and apply battery to conductors F1, F2 and F3 of cable 512 thereby to operate the fractions indicators of the OP, HI and LO ranges of relay STK 823, Fig. 4H. When relay A4 operates and applies battery to conductor F4 of cable 512, this circuit is extended through resistance 513, operated contacts of relay LA1, conductor 6 of cable 801, armature 805 and break contact of relay LODT, conductor 4 of cable 846, armature 850 and make contact of relay TSFR, conductor 2 of cable 792, armature 848 and make contact of relay TU, conductor 2 of cable 841, contacts of switch 408 and relay STKT 823, conductor 2 of cable 842, winding of fractions indicator A, switch 516 and left contact thereof, conductor 849, contacts of relay STKT 823 and switch 408, conductor 849, contacts of relay STKT 823 and switch 408, conductor AG2 of cable 788, contacts of relay AG and thence to ground, thereby causing the operation of the fractions indicator A. As the distributor brush B1 engages segments 26, 28, 30 and 32 of the ring R1 of the distributor DR1, four additional negative impulses are received over the line 400 thereby operating the relay P3 and regenerator RGR4 to cause the fractions indicators of the OP, HI and LO ranges of item number 823 and the fractions indicator A associated with relay STKT 823 to be stepped ahead to display the digit 5.

During the time that the brush B2 of the distributor DR1 was passing over the even numbered segments 24 to 40, nine negative impulses were received over line 401 thereby causing the operation of relay P4 and regenerator RGR2. The operation of relay A2 applied resetting impulses to the conductors T1 to T4 thereby operating regenerators RGR5 and RGR6 to transfer the settings of the storage indicators to the indicators B to F but, since in the example assumed, the price received over the lines 400 and 401 is the first price of wheat for the day, there is no storage in the storage indicators CA to CE and the restoration impulses are without effect at this time.

When the distributor brush B2 engages segment 25 of the ring R2 of distributor DR1, a positive impulse is received over line 401 causing relay P2 to operate and apply battery to conductor 1 of cable 412, armature 427 and make contact of relay S2, armature 524 and make contact of relay S1, armature 433 and make contact of relay RT1, conductor 2 of cable 436 to the winding of relay A3 causing the regenerator RGR3 to operate. The operation of regenerator RGR3 applies battery to conductors U1, U2, U3 and U4 of cable 512, resistances 513, contacts of relays OP1, HI1, LO1 and LA1 to conductors 6, 9, 12 and 15 of cable 518, armatures 519, 683, 684 and 685 and the break contacts thereof of relay RT, conductors 7, 10, 13 and 16 of cable 499, conductors 7, 11 and 15 of cable 507, the conductor 16 of cable 499 extending to armature 804 and break contact of relay LODT, conductor 3 of cable 846, armature 847 and make contact of relay TSFR, conductor 3 of cable 792, armature 851 and make contact of relay TT, conductor 1 of cable 841, contacts of switch 408 and relay STKT 823, conductor 1 of cable 842, and thence to the winding of units indicator A, thus causing the units indicator A to operate and the units indicators of the open, high and low ranges of the item wheat to be actuated.

The operation of relay P2 in response to the second positive impulse received over line 401 caused regenerator RGR3 to operate and step the units indicators of the OP, HI and LO ranges of the relay STK 823 and the units indicator A associated with the relay STKT 823 to display the digit 2.

The switches TS2 and US2 of Fig. 1 having been set to their positions 10, the second revolution of the distributor DR2 which occurs, it will be recalled, immediately following the completion of the revolution of distributor DR1, causes the stock number 800 to be transmitted over the lines 400 and 401 as a release signal to the selector.

Relays TO and UO, Fig. 4D, operate in response to the tens and units digits 0 of the stock number release signal, relay W3 operating in series with relay TO, and relay W4 in series with UO as the impulse representing the tenth negative signal over lines 400 and 401 is removed.

When armature 482 of relay S3 moves to the operated position, a circuit is closed from battery at armature 461 of relay RLS, conductor 459, armature 482 and make contact of relay S3, conductor 481, armature 425 and make contact of relay TO, conductor 526, make contact and armature 527 of relay UO, conductor 528, winding of relay CO to ground thereby operating relay CO. A circuit is also closed from battery at armature 461 of relay RLS, conductor 459, armature 482 and make contact of relay S3, conductor 481, armature 525 and make contact of relay TO, conductor 526, resistance 529, Fig. 4F, to the winding of relay O1—O9 and thence to ground, causing relay O1—O9 to operate.

As brush B2 engages segment LC of the ring R2, a signal of negative polarity is applied to conductor 401 causing relay P4 to operate and apply battery to conductor 2 of cable 412, armature 422 and make contact of relay S2, armature 498 and break contact of relay SR to the winding of

relay LC which operates. The opening of the armatures 530, 638 and 680 of relay LC removes batter from conductors 1, 2 and 3 of cable 503 causing the release of the operated range relays OP1 to LA1 and the item selection relays STK 823 and STKT 823. Relays S1 and AG release as their locking circuits are interrupted at armature 468 and break contact of relay LC.

As the negative signal is removed from conductor 401, relay P4 releases and at its armature opens the operating circuit of relay LC which releases and restores battery to conductors 1 and 2 of cable 503 thereby preparing these circuits for locking the range relays during the transmission of a subsequent quotation. The release of relay LC also applies battery through conductor 3 of cable 503 to a contact of each of the range relays in parallel, which upon operation of one or more of these range relays is applied by way of conductor 21 of cable 507 to the locking contact 650 of each of the stock relays STK, Fig. 4H, of all the relays STK associated with indicators classified according to their close, high, low and last characteristics, such as relay STK 123, for maintaining the selected relay STK in the operated position for reception of the subsequent impulses to the associated indicators.

The release of relay LC completed a circuit from battery at armature 496 and make contact of relay S2, conductor 495, break contact and armature 494 of relay AG, break contact and armature 493 of relay LC, armature 631 and make contact of relay CO, conductor 402, winding of relay A1, break contact and armature 403 of relay AA1 to ground thereby operating relay A1 of regenerator RGR1. Regenerators RGR2, RGR3 and RGR4 operate from regenerator RGR1 as previously described but perform no other function at this time.

Relay RLS operates on a circuit from its grounded winding, make contact and armature 509 of relay S3, break contact and armature 510 of relay AG, conductor 456, make contact and armature 455 of relay A1 to battery. Relays S2, CLH and Y1, O1—O9 and CO release as their several locking circuits are interrupted at break contacts and armatures 476 of relay RLS.

As armature 496 of relay S2 moves to the unoperated position, relay A1 releases causing the release of regenerators RGR2 to RGR4. As armature 455 of relay A1 moves to the unoperated position, battery is removed from the winding of relay RLS causing relay RLS to release. Relay S3 releases as the holding circuit thereof is opened at armature 512 and make contact of relay RLS.

The price 2⅝ corresponding to the item wheat is now posted by the U and F indicators of the open, high and low ranges of relay STKT 823 and by the U and F indicators of position A associated with the relay STKT 823. Assume, by way of example, that the next successive price of wheat is $1.03⅛. The manner in which the A indicators operate to post the new price, 3⅛, and the receiving apparatus operates to post the price 2⅝ on the B indicators of the item wheat will now be described.

Since the U and F indicators A are not resting on their blank positions at the time restoration impulses are received over lines 400 and 401, these restoration impulses cause the A indicators U and F to be actuated to their blank positions in series with the storage indicators U and F of the CA position. The operation of regenerator RGR6, Fig. 4G, in response to the first restoration impulse applied battery to conductor 3 of cable 852, winding of CA storage indicator U, switch 516 and left contact thereof, conductor 1 of cable 839, armature 853 and break contact of relay STKT 823, conductor 1 of cable 842, winding of units indicator A, switch 516 and right contact thereof to ground at conductor 843, thereby causing the units indicators CA and A to operate in series and, as regenerator RGR6 releases at the termination of the first restoration impulse, the units indicator CA is advanced to position one and the units indicators A to position three. As the units indicator CA moved to position one, the switch 516 thereof moved to the right, thereby substituting conductor 2 of cable 839 and armature 854 and break contact for conductor 1 of cable 839 and armature 853 and break contacts respectively of the circuit just described.

The following eight restoration impulses received over the line 400 cause the units storage indicator CA to be advanced to position 9 and the units indicator A to its blank position with the switch 516 thereof in engagement with its left contact, thereby interrupting the pulsing circuit to the indicators and rendering them unresponsive to the tenth restoration impulse received over the line 400.

During the time that the setting of the units indicator A was being transferred to the units storage indicator CA, the fractions indicator A was being transferred to the fractions storage indicator CA. Since the digit 5 was displayed by the fractions indicator A at the beginning of restoration impulses, six impulses were required to restore the fractions indicator A to blank and advance the fractions storage indicator CA to its position 6.

At the completion of the restoration impulses received over the line 400, relay AG is operated and actuation impulses corresponding to the price 3⅛ are received over the tens and units channels and cause the A indicators U and F to be actuated to their positions 3 and 1 respectively.

While brush B2 is passing over segments FP, 26, 28, 30, 32, 34, 36, 38 and 40 of ring R2 of the transmitting distributor, nine negative impulses are received over the line 401 causing the relay P4 to operate and apply battery to conductor 2 of cable 412, armature 422 and make contact of relay S2, armature 498 and make contact of relay SR, armature 451 and break contact of relay RT, conductor 19 of cable 788, make contact and armature 855 of relay RT2, Fig. 4I, conductor 6 of cable 788 to the winding of relay A2, thereby causing regenerator RGR2 to operate. The operation of regenerator RGR2 applies battery to conductors T1 to T4 of cable 788, conductor T1, extending to armature 797 of relay RT2 from whence the circuit is continued by way of the make contact and make contact and armature 833 of relay RG—CI, conductor 1 of cable 823 to the winding of relay A5 thereby causing regenerator RGR5 to operate. In a similar manner conductor T2 is connected to armature 798 of relay RT2 from whence the circuit is continued by way of its make contact, make contact and armature 834 of relay RG—CI, conductor 2 of cable 823 to the winding of relay A6, thereby causing regenerator RGR6 to operate. The battery impulses transmitted over conductors T3 and T4 of cable 788 are applied by way of armatures 799 and 800 and make contacts of relay RT2, make contacts and armatures 837

and 838 of relay RG—CI to the windings of the storage indicators CE.

Regenerator RGR5 is connected by way of cable 856 to the windings of the indicators CC and CD and regenerator RGR6 is connected by way of cable 852 to storage indicators CA and CB. It will be recalled that, at the time this impulse is received, storage indicator U of the position CA is set to position 9 and the CA fractions indicator to position 6. The operation of regenerator RGR6 applies battery to conductor 3 of cable 852, winding of units indicator CA, switch 516 and right contact, conductor 2 of cable 839, armature 854 and make contact of relay TT, conductor 3 of cable 841, contacts of switch 403 and relay STKT 823, conductor 3 of cable 842, winding of units indicator B, switch 516 thereof and left contact, conductor 849, contacts of relay STKT 823 and switch 408, conductor AG2 of cable 788, contacts of relay AG and thence to ground. As the negative impulse is removed from conductor 401, relay P4 and regenerators RGR2, RGR5 and RGR6 release thereby causing the units storage indicator CA to be advanced to position 10 and the units indicator B to position 1. The second negative impulse on conductor 401 caused regenerator RGR6 to operate and set the units indicator B ahead to display the digit 2 and the units storage indicator CA to be advanced to its blank position, thereby moving the switch 516 of the storage indicator U of the CA position to the left and bring the winding of the CA units indicator in circuit with conductor 1 of cable 839 which is open at armature 853 of relay TT, thereby making the units indicator B unresponsive to the eight additional impulses about to be received and causing the units indicator CA to remain at its blank position.

The fractions indicator B was moved to its position 2 in series with the winding of the fractions indicator CA which was advanced from position 6 to position 8 during this operation. The three following impulses cause the fractions indicator B to be stepped ahead to display the digit 5 and the fractions indicator CA to be stepped ahead to its blank position. The price 2⅝ has now been transferred from the A to the B indicators of the item wheat, the B indicators being actuated to their settings during the time that the A indicators were being actuated to post the price 3⅛.

Nine resetting impulses of negative polarity are received over line 401 causing the operation of relay P4 and regenerators RGR2, RGR5 and RGR6. The manner in which the tenth resetting impulse is generated will now be described.

The operation of relay AG applied ground to conductor 7 of cable 788 extending to one end of the winding of relay PG, Fig. 4G. At the completion of the actuation impulses, relay SR is caused to release and close a circuit from battery at the armature 468 and break contact of relay LC, armature 445 and break contact of relay SR, conductor 444, conductor 8 of cable 788, armature 857 and make contact of relay TSFR, Fig. 4G, armature 858 and break contact of relay PGC, winding of relay PG to ground on conductor 7 of cable 788 thereby causing relay PG to operate and apply battery by way of its armature 859 to conductor 2 of cable 861, make contact and armature 855 of relay RT2, conductor 6 of cable 788 and thence to the winding of relay A2 thereby causing regenerator RGR2 to operate. The operation of relay A2 at armature 862 and make contact thereof applies battery to conductor 5 of cable 788, armature 863 and make contact of relay RT2, conductor 1 of cable 861, armature 864 and make contact of relay PG to the winding of relay PGC and thence to ground, thereby causing relay PGC to operate and at its armature 858 interrupt the circuit to relay PG which releases. Relay PGC upon operation locks by way of its make contact and armature 865, conductor 4 of cable 788 to battery at the break contact and armature 461 of relay RLS. The operation of the pulse generator cut-off relay PGC prevents further operation of regenerator RGR2. This local operation of regenerator RGR2 causes the transmission of the tenth impulse to the storage indicator units, nine impulses having been received as negative impulses over the fractions channel.

In the specific embodiment of my invention shown on Fig. 4I of the drawings, six prices are simultaneously displayed by the indicators A to F, the prices displayed on the indicators A to E being transferred to the storage indicators CA to CE and subsequently posted on the indicators B to F. It will be understood, however, that a much greater number of prices or values of an item may be posted without departing from the invention by merely increasing the number of indicators employed for posting the trend prices and correspondingly increasing the number of storage indicators and duplicating the control circuits therefor.

Selection of particular groups of indicators

Any of the indicators A to F may be selected for operation and actuated to any desired setting without transferring the first settings of the selected indicators to the indicators of higher alphabetical position. Assume, by way of example, that it is desired to change the setting of the indicator A without changing the settings of any of the indicators B to F. This is accomplished in the following manner:

The switch RW, Fig. 1, is operated to close its contacts and the stock number, range and price switches of the keyset KS are moved to their proper positions and the start key is actuated. The operation of the re-write key RW applies negative battery to segment 45 of the ring R1 of the associated distributor, thereby causing a signal of negative polarity to be received over the line 400 during the time relay LC, Fig. 4B, is operated.

The operation of relay LC, it will be recalled, at its armature 468 and make contacts thereof, applies battery to conductor 3 of cable 788 and thence to the winding of relay LC1, Fig. 4G, causing relay LC1 to operate. Relay P3 operated in response to the rewrite signal received over conductor 400 and applied battery to conductor 1 of cable 788, armature 789 of relay LC1 and make contact thereof, thence to the windings of relays RW1 and RW in parallel thereby causing relays RW1 and RW to operate. Relay RW1 locks by way of its armature 836 and make contact thereof to the make contact and armature 867 of relay LC1 and thence to battery thereby holding relay RW operated.

Referring now to Fig. 15 which shows the ranges corresponding to the settings of the switch RA with the RW key operated, it will be noted that the switch RA is set on its position 3 to rewrite the indicators A thereby causing relay CLS of the range counting chain, Fig. 4C, to operate.

The operation of relay CLS at its armature 867 applies battery to conductor 10 of cable 634, contacts 868 of relay RA, conductor 10 of cable 795, armature 869 and make contact of relay RW1, conductor 2 of cable 870 to the winding of relay A—RW which operates, relay RA having operated when relay LC1 moved its armature 867 into engagement with the associated make contact thereby applying battery to conductor 12 of cable 795. The release of relay LC at its armature 680 applies battery to conductor 11 of cable 788, make contact and armature 871 of relay A—RW thereby causing relay A—RW to be locked in the operated position until relay LC again operates.

The operation of relay A—RW at its armature 872 applies battery to the winding of the relay TSFR from whence the circuit is continued by way of armature 818 and make contact of relay RT2, conductor 819 to ground at contact 821 of relay STKT 823, thereby causing relay TSFR to operate. Relay A—RW at its armature 824 removed battery from conductor 3 of cable 823 extending to the winding of the regenerator cut-in relay RG—CI thereby preventing the operation of relay RG—CI and the regenerators RGR5 and RGR6 and the storage indicators CE. The units indicator A is operated by regenerator RGR3 from battery at armature 873 and make contact of relay A3, resistance 874, conductor 16 of cable 788, armature 875 and make contact of relay A—RW, armature 876 and make contact of relay TSFR, conductor 4 of cable 792, conductor 1 of cable 841, contacts of switch 408 and relay STKT 823, conductor 1 of cable 842, winding of units indicator A, switch 516 and right contact to grounded conductor 843 for restoration impulses and switch 516 and left contact to ground on conductor 849 for actuation from blank to position 1, the succeeding actuation impulses being transmitted over a circuit including grounded conductor 843.

The fractions restoration and actuation impulses are received from armature 877 and make contact of relay A4 through resistance 878, conductor 17 of cable 788, armature 879 of relay A—RW and make contact thereof, armature 881 and make contact of relay TSFR, conductor 5 of cable 792, conductor 2 of cable 841, contacts of switch 408 and relay STKT 823, conductor 2 of cable 842 to the winding of the fractions indicator A.

Conductors 16 and 17 of cable 788 are also extended to armatures of relays B—RW to F—RW which operate similar to relay A—RW in accordance with the range signal received. The operation of any of the relays B—RW to F—RW removes battery from the winding of relay RG—CI and completes circuits from regenerators RGR3 and RGR4 to the selected U and F indicators respectively of positions B to F thereby enabling any of these indicators to be actuated to a new setting without operating the storage indicators CA to CE.

Wipeout

To wipe out the prices set up on the indicators A to F, the range switch of the keyset is set on its position 6 and the RW key operated. The relay OP of the range counting chain operates and applies battery to conductor 6 of cable 634, contacts of relay RA, conductor 6 of cable 795, armature 882 and make contact of relay RW1, conductor 1 of cable 870 to the winding of relay WO causing relay WO to operate and lock by way of its armature 883 and make contact to battery on conductor 11 of cable 788. The operation of relay WO at its armature 884 and make contact applies battery to the winding of relay TSFR, causing relay TSFR to operate and at its armature 822 apply ground to the winding of relay RG—CI causing relay RG—CI to operate and at its armatures 833 and 834 complete operating circuits for regenerators RGR5 and RGR6.

While restoration impulses are being received over the line 400, the indicators A to E are restored to their blank positions and their settings transferred to storage indicators CA to CE. Indicators F are restored by restoration impulses over conductors 16 and 17 of cable 788, armatures 855 and 886 and make contacts of relay WO, armatures 850 and 847 and make contacts of relay TSFR, conductors 3 and 2 of cable 792, armatures 848 and 851 and break contact of relays TU and TT respectively and thence by way of conductors 11 and 12 of cable 841 to the indicators F.

The operation of relay AG at the completion of the restoration impulses applies ground to conductor 7 of cable 788, make contact and armature 887 of relay WO, conductor 2 of cable 888, winding of relay WO1, conductor 1 of cable 888, break contact and armature 889 of relay LC1 to battery thereby causing relay WO1 to operate and at its armature 830 interrupt the locking circuit to relays STKT 823 and STK 823 causing relays STKT 823 and STK 823 to release, the release of relay STKT 823 disconnecting the windings of indicators A to E from conductors 1 to 10 of cable 841. The operation of relay WO1 at its armatures 890 connects conductors 1 to 10 of cable 841 through resistances 891 to ground thereby substituting the resistances 891 for the indicators A to E during normalization of the storage indicators CA to CE.

As the ten resetting impulses are received by the storage indicators CA to CE, these indicators operate in series with the resistances 891 through armatures 890 of relay WO1 thereby restoring the storage indicators to their blank positions.

The operation of relay LC at the completion of the revolution of the transmitting distributor removes battery from conductor 11 of cable 788, thereby releasing relay WO. With relay AG released, relay WO1 releases and relays TT and TU release. The release of relay WO at its armature 884 causes the release of relay TSFR and relay RG—CI.

Posting final prices

The indicators G and H of Fig. 4I are employed for posting the final price of the day which, in the case of wheat, for example, may be two prices comprising a "split" final price. The posting of a "split" final price is accomplished in the following manner. To post a price on indicator G, the stock designation number 723, in the case of wheat, is employed thereby selecting relay STKT 823 by means of the armature 504 of relay H7 which is connected to the corresponding armature of relays H6 and H8 of the hundreds digit counting chain, Fig. 4C. The operation of relay H7 at its armature 647 applies battery to conductor 1 of cable 648, break contact and armature 649 of relay RT1 to the winding of relay RT which operates and locks by way of its make contact and armature 651 to battery at break contact and armature 634 of relay LC.

The range switch of the keyset KS is set to

its terminal 1 and the key switch RW is operated thereby causing relay LA of the range counting chain to operate. Relays RW and RW1 operate when the rewrite signal is received. The operation of relay LA applies battery to conductor 1 of cable 634, contacts of relay RA, conductor 1 of cable 795, armature 892 and make contact of relay RW1, conductor 2 of cable 893, winding of relay LOD and thence to ground causing reday LOD to operate, and lock by way of its make contact and armature 894 to conductor 11 of cable 788 extending to break contact and armature 689 of relay LC and thence to battery.

The operation of relay LOD at its armature 892 and make contact thereof applied battery to the winding of relay LODT from whence the circuit is continued by way of conductor 819, armature 820 and make contact of relay TSFR to ground, thereby causing relay LODT to operate. Regenerator RGR3 is controlled at this time from relay P2 over the following circuit: Battery at make contact and armature of relay P2, conductor 1 of cable 412, armature 427 and make contact of relay S2, armature 524 and make contact of relay S1, armature 438 and break contact of relay RT1, armature 437 and make contact of relay RT, armature 445 and break contact of relay RT1, conductor 2 of cable 436 and thence to the winding of relay A3. The operating circuit for the units indicator G is as follows: Battery at armature 895 and make contact of relay A3, conductor U4 of cable 512, resistance 513, conductor 2 of cable 801, armature 896 and make contact of relay LOD, conductor 5 of cable 801, conductor 15 of cable 518, armature 685 and make contact of relay RT, conductor 14 of cable 499, armature 897 and make contact of relay LODT, conductor 1 of cable 898, contacts of switch 408 and relay STKT 823, conductor 1 of cable 899 and thence to the winding of the units indicator G.

The operation of relay P3 caused regenerator RGR2 to operate over the following circuit: Battery at make contact and armature of relay P3, conductor 1 of cable 788, armature 789 and break contact of relay LC1, conductor 2 of cable 788, armature 413 and make contact of relay S2, armature 446 and make contact of relay RT, conductor 1 of cable 436, extending to the winding of relay A2 of regenerator RGR2. The operation of relay A2 of regenerator RGR2 applies battery to conductor T4 of cable 788, armature 869 and break contact of relay RT2, conductor 4 of cable 796, resistance 513, conductor 1 of cable 801, armature 901 and make contact of relay LOD, armature 802 and make contact of relay LODT, conductor 2 of cable 898, contacts of switch 408 and relay STKT 823, conductor 2 of cable 899, and thence to the winding of the fractions indicator G. The U and F indicators G are operated over the circuit just described in accordance with the signals received over the tens and units channels of conductors 490 and 491.

When it is desired to set up a price on the units and fractions indicators H of wheat, for example, the stock number 823 is employed thereby causing the operation of relays H3 and RT1 in parallel with relay RT2 and the switch RW of the keyset is moved into engagement with its contacts. The range switch RA is set to its position 1.

The operating circuit for the units indicator H is as follows: With relay RT1 operated, regenerator RGR3 is controlled by the relay P2 over the following circuit: Battery, make contact and armature of relay P2, conductor 1 of cable 412, armature 427 and make contact of relay S2, armature 524 and make contact of relay S1, armature 439 and make contact of relay RT1, conductor 2 of cable 436 and thence to the winding of relay A3. The fractions regenerator RGR4 is controlled by relay P3 at this time over the following circuit: Battery, make contact and armature of relay P3, conductor 1 of cable 788, armature 789 and break contact of relay LC1, conductor 2 of cable 788, armature 413 and make contact of relay S2, armature 446 and break contact of relay RT, armature 445 and make contact of relay RT1, conductor 3 of cable 436 and thence to the winding of relay A4.

The operation of regenerator RGR3 applies battery to conductor U4 of cable 512, resistance 513, conductor 2 of cable 801, armature 896 and make contact of relay LOD, conductor 5 of cable 801, conductor 15 of cable 518, armature 685 and break contact of relay RT, conductor 16 of cable 499, armature 804 and make contact of relay LODT, conductor 3 of cable 898, contacts of switch 408 and relay STKT 823, conductor 3 of cable 899 and thence to the winding of the units indicator H.

The operation of regenerator RGR4 at the armature 687 of relay A4 applies battery to conductor F4 of cable 512, resistance 513, conductor 3 of cable 801, armature 902 and make contact of relay LOD, armature 695 and make contact of relay LODT, conductor 4 of cable 898, contacts of switch 408 and relay STKT 823, conductor 4 of cable 899 and thence to the winding of the fractions indicator H. Thus, the impulses received over the tens channel cause the operation of relay P2, regenerator RGR3 and units indicator H and the impulses received over the units channel cause the operation of relay P3, regenerator RGR4 and the fractions indicator H. The final or last-of-day prices are thus posted on the indicators G and H.

Posting nominal price

When the market activity has been insufficient to create a price for a commodity within a certain period of time, a quotation for the commodity is established by a committee on the Commodities Exchange. Such a quotation is referred to as a nominal quotation and is posted on the indicators designated NOM, Fig. 4H.

When posting a nominal price for the commodity wheat, for example, the stock designation number 623 is employed thereby causing relay H6, Fig. 4C, to operate and select the item 823 by means of armature 504 of relay H6 which, it will be recalled, is electrically connected to the corresponding armature of relays H7 and H8.

The range switch RA is set to its position 7 and the rewrite key RW is operated thereby causing the operation of relays RW and RW1. With the range switch set on position 7 the relay UN, Fig. 4C, operates and connects battery to conductor 9 of cable 634, conductor 9 of cable 795, armature 794 and make contact of relay RW1, conductor 1 of cable 893, winding of relay NOM, conductor 819, armature 820 and make contact of relay TSFR, and thence to ground causing relay NOM to operate and lock by way of its armature 903 to battery on conductor 11 of cable 788.

The operation of relay P1 in response to the restoration impulses causes regenerator RGR1 to operate and establish operating circuits for regenerators RGR2, RGR3 and RGR4 which operate to transmit the restoration impulses to the

nominal indicators T, U and F respectively. The operation of relays P2, P3 and P4 in response to the tens, units and fractions price digits respectively received over the lines 400 and 401 cause the operation of regenerators RGR2, RGR3 and RGR4 to transmit the price digits to the indicators T, U and F respectively of the nominal range. The operating circuit for the nominal indicator T follows: Battery at armature 688 and make contact of regenerator RGR2, conductor T4 of cable 788, armature 800 and break contact of relay RT2, conductor 4 of cable 796, resistance 513, conductor 1 of cable 801, armature 904 and make contact of relay NOM, armature 802 and break contact of relay LODT, conductor 18 of cable 803, conductor 18 of cable 507, contacts of switch 408 and relay STK 823, conductor 905 and thence to the winding of the tens indicator of nominal range.

The operation of regenerator RGR3 applies battery to conductor U4 of cable 512, resistance 513, conductor 2 of cable 801, armature 906 and make contact of relay NOM, conductor 5 of cable 801, conductor 15 of cable 518, armature 685 and break contact of relay RT, conductor 16 of cable 499, armature 804 and break contact of relay LODT, conductor 3 of cable 846, armature 847 and break contact of relay TSFR, conductor 2 of cable 846, conductor 19 of cable 803, conductor 19 of cable 507, contacts of switch 408 and relay STK 823, conductor 907 and thence to the winding of the units indicator for the nominal range.

The operation of regenerator RGR4 applies battery to conductor F4 of cable 512, resistance 513, conductor 3 of cable 801, armature 908 and make contact of relay NOM, armature 835 and break contact of relay LODT, conductor 4 of cable 846, armature 850 and break contact of relay TSFR, conductor 1 of cable 846, conductor 20 of cable 803, conductor 20 of cable 507, contacts of switch 408 and relay STK 823, conductor 909 and thence to the winding of the fractions indicator for the nominal range.

As heretofore stated, other types of transmitters may be employed with the system of the present invention, as for example, the transmitting and retransmitting apparatus of my Patent No. 2,248,822, issued July 8, 1941, for Signalling systems, certain modifications being required to adapt the retransmitting apparatus thereof for use with the receiving mechanism of Figs. 4A to 4I whereby all of the specific functions of the receiving apparatus may be made effective. These minor modifications are shown in detail on Fig. 5 of the drawings, only as much of the retransmitting apparatus being shown as is necessary for a complete understanding of the operation of the modified retransmitter.

Referring now to Fig. 5 of the drawings, the transmitting apparatus of Figs. 1A and 1B of my aforesaid application are represented diagrammatically by the rectangle designated T. It will, of course, be understood that the transmitter T transmits positive and negative signals over the line L in permutation code in accordance with the selection, price and range codes of Figs. 6, 7 and 8, these signals being received by the line relay LR of the retransmitting apparatus which operates to move its armature into engagement with its contacts M or S in accordance with the polarity of the signal received.

When a start signal is received over the line L, relay LR moves its armature into engagement with the contact S thereof thereby setting the receiving distributor RD into operation. As the brush RB1 thereof passes over segments 1 to 32 of the receiving ring RR2, the signals corresponding to the hundreds, tens and units digits of the item designation number, range and price of the item are received, the multiplex or rewrite signals, as the case may be, being received during the time that the brush is passing over segments 13 to 17. The hundreds digit of the item designation is stored in the relays IHS1 to IHS4 which are operated in permutation code in accordance with the value of the digit. In a similar manner the fractions portion of the price is stored in the relays FP6 to FP8.

When an item, such as wheat for example, is to be selected for trend posting the relays IHS4 are operated to select the digit 8, relays IHS1, IHS3 and IHS4 are unoperated and relay IHS2 is operated in accordance with the permutation code employed for selecting the digit 8, Fig. 6. The contacts and interconnecting circuits thereof of relays IHS1 to IHS4 are represented diagrammatically by the triangle HD.

The operation of relays IHS1 to IHS4 in the manner described applied battery through their contacts to selection lead 8, winding of the resetting impulse control relay IC, conductor 923 and thence to segment 20 of ring TR1 of the transmitting distributor TD1. The engagement of this segment by the brush TB, applies ground to one end of the winding 1 of relay IC, causing relay IC to operate and lock by way of its winding 2, contact and armature 924 to ground at the break contact and armature 308 of the release relay RL5. The operation of relay IC at its armature 925 interrupts the circuit between the fractions pulse cutoff relay FPC and the contacts of the fractions storage relays FP6 to FP8 and connects the winding of relay FPC by way of conductor 926 to segment 41 of ring TR1.

When brush TB engages segment 40 of ring TR3, the ninth negative impulse is transmitted over the fractions channel for resetting the storage indicators and transferring the prices stored therein to the trend indicators. This circuit includes grounded segment of ring TR4, brush TB, segment 40 of ring TR3, conductor 927, armature 234 and break contact of relay FPC, make contact and armature 233 of relay USC, conductor 928, winding of transmitting relay S4 to battery, thereby causing relay S4 to operate and transmit a negative impulse over line R2. When brush TB engages segment 41 of ring TR1 ground is applied to conductor 926, make contact and armature 925 of relay IC and thence to the winding of the fractions price cut-off relay FPC, causing relay FPC to operate and at its armature 234 interrupt the circuit to the winding of relay S4, thereby causing relay S4 to release after nine impulses have been transmitted over the fractions channel regardless of the setting of the fractions price storage relays FP6, FP7 and FP8. The subsequent operation of relay RL5 removes ground from armature 924 of relay IC thereby causing relay IC to release.

When a rewrite signal is received over the line L, relays MX1, MX2, MX3 and MX5 are unoperated and relay MX4 is operated thereby closing a circuit from grounded armature 929 and break contact of relay MX1, armature 931 and break contact of relay MX2, armature 932 and break contact of relay MX3, armature 933 and make contact of relay MX4, armature 934 and break contact of relay MX5, conductor 935, winding of range shift relay RAS and thence to battery, causing relay RAS to operate and

lock by way of its armature 936, break contact and armature 937 of relay RUL to ground. When brush TB engages segment 46 of ring TR3, ground is applied to conductor 938, armature 939 and make contact of relay RAS and thence to the winding of relay S3, causing relay S3 to operate and transmit a negative impulse over line R1 during the time that relay LC1, Fig. 4G, is operated thereby to cause the operation of relays RW and RW1 of the receiving apparatus. This signal, it will be recalled, controls the selection of one of the ten ranges of Fig. 8 instead of one of the ranges of Fig. 7, by the operation of relays RW and RW1.

As brush TB engages segment 3 of ring TR2 during the succeeding revolution of the distributor TD1, ground is applied by way of conductor 941 to the winding of relay RUL from whence the circuit is continued by way of armature 942 and make contact of relay RAS to battery thereby causing relay RUL to operate and at its armature 937 remove ground from the locking circuit of relay RAS. Relay RAS releases and removes battery from the winding of relay RUL which releases.

Although a complete system for stock and commodity quotations has been described in Figs. 1 to 15 including transmitting apparatus controlled by keyboards, and a complete receiving mechanism comprising a distributor, regenerator units, storage relays, item selecting mechanism, price selector and display board, it will be understood that each of these units is capable of use independently and in combination with other units or other systems and is particularly adaptable to systems for posting information relating to airway traffic, announcement or bulletin information other than market quotation services.

Also, the illustrated form of transmitter shown in Figs. 1 and 2 may be replaced by other transmitters suitable for the purpose for sending the signals to the receiving apparatus shown in Figs. 4A to 4I. For example, a transmitter such as shown in my Patent No. 2,248,822, may be employed to transmit the signals to the receiving apparatus instead of the transmitter of Figs. 1 and 2.

A suitable arrangement for adapting my invention to a system for posting information relative to airway traffic for example, is shown on Fig. 12 of the drawings, which shows a duplex system of transmission of the impulses representing item selection and numerical signals over two channels of communication, although it will be understood that a single channel only may be employed for this purpose. The selector and control apparatus of Fig. 12 is shown in diagrammatic form on Figs. 4A to 4I of the drawings and controls the operation of a flight progress board on which is posted information representing the altitude and time of aircraft passing over each of two markers, the information thus posted being individual to each flight.

The specific arrangement of the flight progress board of Fig. 12 comprises groups of indicators for posting the flight number, altitude, and time of passage of the aircraft over each of two markers and groups of indicators for identifying the altitude and time indicators with the associated flight number. The order of arrival at destination of the flight appearing on the board is indicated by a series of numerals disposed adjacent to the flight numbers, the numeral 1, for example, indicating that the flight number associated with this numeral is the first to arrive at destination, the remaining numerals indicating the order of arrival of the remaining flights associated with the respective numerals.

Each flight number is posted by a group of two indicators. In a similar manner the altitude is posed by two indicators, an altitude of 5500 feet, for example, would be posted by the digits 55. Two groups of indicators are employed for posting the time, each group comprising two indicators. The time 12.15, for example, would be posted by selecting the hour group of indicators and posting the digits 12 thereon and selecting the minutes group of indicators and posting the digits 15 thereon. The groups of altitude and time indicators are associated with a marker, there being two markers illustrated on the flight progress board of Fig. 12, although it will be understood that additional markers may be posted by increasing the number of groups of altitude and time indicators.

Each of the groups of indicators 6, corresponding to the flight number, altitude and time respectively, is associated with a three digit item selection number for selecting the indicators for operation. The flight number indicators of the last-to-arrive flight would be selected by the item designation number 833, for example, the altitude indicators of marker 1 by the number 834, the hour and minute indicators of the time of marker 1 by the numbers 835 and 836 respectively.

In a similar manner the altitude indicators of marker 2 would be selected by item designation number 837 and the time indicators by the item numbers 838 and 839 corresponding to the hours and minutes respectively.

The reception of selection signals representative of the item designation number 833, when accompanied by a range signal which includes the last range selection, causes the operation of an item selection relay associated with the flight number indicators of arrival 6, whereby these indicators are actuated to settings in accordance with the flight number signals received. Associated with each of the groups of indicators of the flight progress board is a group of storage indicators, Fig. 4I, whereby the flight number previously set up on the flight number indicators 6 is automatically transferred to the flight number indicators 5 in response to signals for the operation of the flight number indicators 6, the flight numbers of arrivals 2, 3, 4 and 5 being automatically transferred to arrivals 1, 2, 3 and 4 respectively.

In a similar manner signals representing the item number 834 accompanied by a range signal including the last range selection cause the operation of altitude indicators 6 of marker 1 and the transfer of altitudes posted on altitude indicators 2 to 6 of marker 1 to altitude indicators 1 to 5. The reception of signals corresponding to the time information of marker 1 when accompanied by last range signals causes the time indicators 6 to be actuated to their new settings and the time posted on the time indicators 2 to 6 to be transferred to the time indicators 1 to 5. The indicators of marker 2 operate in the manner of the indicators of marker 1 and are selected for operation by their respective item designation numbers.

Any of the indicators 1 to 6 may be selected for operation without affecting the settings of any of the other indicators in the manner of indicators A to F, Fig. 4I. For example, if it is de-

sired to repost the information in regard to arrival or group 5, the three digit item selection designation number, such as 833 hereinbefore referred to, is transmitted, accompanied by the range signal B—RW, Fig. 15, this signal being transmitted with the key RW operated and the RA switch on terminal 9 when the transmitter of Figs. 1 and 2 is employed. If the transmitter of Fig. 5 is employed, the range keys YCL (H) and RR are operated to send the range signal B—RW, Figs. 7 and 8. Either of the foregoing operations will effect selection of the flight number indicators in the group 5, which indicators may then be reset without resetting or affecting the indicators of the remaining groups. If it is desired to change the posted altitude of group 5, for example, with respect to marker 1, the item selection number 834 is transmitted, accompanied by the B—RW range signal referred to hereinbefore. Similarly, if the time with respect to marker 1 of group 5 is to be changed, the item selection numbers 835 and 836 are transmitted in succession, each being accompanied by the range signal B—RW. The altitude and time of group 5 with respect to marker 2 may similarly be changed, by transmitting suitable item designation numbers, such as has hereinbefore been set forth.

In a similar manner any information with regard to indicator groups 1, 2, 3 and 4 may be changed at will without affecting the remaining information posted, the range signal C—RW effecting selection of the indicators associated with group 4; the range signal D—RW selecting the indicators associated with group 3; the range signal E—RW selecting the indicators associated with group 2; and the range signal F—RW effecting selection of the indicators associated with group 1.

Any of the groups of indicators associated with any of the arrival numbers, or all of the indicators associated with a particular arrival number, may be restored to their blank settings by effecting selection of the particular arrival number and then the desired group or groups of indicators associated with such arrival number, and the indicators will automatically be restored to blank positions by sending the selection and restoration signals, unaccompanied by any resetting signals. If desired, the indicators of the entire board may be restored to their blank positions by transmitting the wipeout range signals successively, accompanied by the proper item designation numbers 833 to 839, and unaccompanied by indicator resetting signals, which causes the indicators to be normalized in vertical groups, as has hereinbefore been explained with respect to normalizing the trend indicators A to F, Fig. 4I of the drawings.

When the flight posted as arrival 1 has been completed, the information posted on the indicators of group 1 may be deleted, and the remaining flights shifted upward to post them in accordance with their changed status. This may be accomplished, for example, by transmitting signals to select and restore the indicators of group 6, these signals each being accompanied by a range signal which includes the last range selection. Upon selection of the indicators of group 6, the flights are automatically shifted upward irrespective of whether new information is to be posted on the indicators of group 6.

The system of Fig. 12 thus provides an arrangement whereby the flight last to arrive may be posted by electrical indicators on a flight progress board and the flights in prior order of arrival are shifted to new positions automatically in response to the posting of this flight information. Also, as stated, means are provided for selecting the indicators associated with any flight for operation and changing their settings in any desired manner without affecting the settings of other indicators of the board.

For purposes of illustration this invention has been described in connection with a stock and commodity quotation system and a system for disseminating information in regard to aircraft or other carriers, but it is obviously not so limited, being adapted for use in various other systems for the dissemination of information. Also, the embodiment of the invention may take other specific forms without a departure from the spirit or principles herein described. The present embodiment is, therefore, illustrative and not restrictive, the scope of the invention being indicated by the appended claims, rather than by the foregoing description, and all changes within the meaning and range of equivalency of the claims are intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. In a system for posting information in regard to a plurality of different items of information, receiving apparatus comprising a display board having a group of posting devices positioned adjacent to each other, each of the posting devices of said group being adapted to post a different item of information, means for transmitting signals representative of said items of information for selecting and operating said posting devices, the receiving apparatus having means responsive to said signals for causing an item of information to be posted on a selected one of said posting devices and storage means and means responsive to subsequent signals received from the transmitting means for transferring to said storage means the information posted on said one of the posting devices and then transferring said information from said storage means to another of the posting devices in said group.

2. In a system for posting information concerning a plurality of items, a source of posting signals including a special signal, a series of indicators disposed adjacent to one another for concurrently displaying items of information in accordance with the posting signals received, each indicator having a plurality of posting positions and a released position, a set of storage devices, each having a plurality of storing positions and a released position, means for transferring the items of information from said indicators to the storage devices, means for thereafter transferring the information stored in the storage devices to others of the indicators, and means responsive to said special signal for causing the indicators and storage devices to release the items of information set up therein by said posting signals and assume their released positions.

3. In a system of the character disclosed, the combination of a first indicator having a home position and a plurality of moved positions, a source of indicator actuation and restoration impulses, a channel of communication interconnecting said first indicator with said source, storage means, a second indicator having a home position and a plurality of moved positions, switching means for connecting said first indicator to the storage means while the first

indicator is actuated to its home position by restoration impulses received over the channel for storing the setting of said first indicator in the storage means and for thereafter connecting said storage means to the second indicator while the first indicator is being actuated to a desired moved position by actuating impulses received from said source, impulse generating means, and means for bringing said impulse generating means into operative relationship with said second indicator and said storage means whereby the storage in the setting stored means is transferred to said second indicator.

4. In a system for disseminating information regarding a plurality of items, receiving means comprising a series of posting devices disposed in adjacent relationship for concurrently displaying a series of characters representative of successive items of information to be posted, said series of devices being individual to each of the items, means for selecting any of the series of devices for operation, storage means common to all the series of devices, means effective when a series of devices has been selected for operatively associating said selected devices with said storage means, means for transferring the settings of the series of the selected devices to said storage means, and means for transferring the settings stored in the storage means to the series of devices whereby the item information is displayed by each of the devices in the same series relationship on others of the devices than from which it was originally posted.

5. In a system of posting information in regard to the characteristics of an item, means for transmitting signals comprising restoration and actuation impulses, receiving means, a channel of communication interconnecting said receiving means and the transmitting means, said receiving means comprising a plurality of indicator devices each having a blank position and a plurality of moved positions for concurrently posting the different item characteristics received, storage means for storing the settings of certain of the indicating devices as the devices are restored to their blank positions by said restoration impulses, switching means, and means controlled by said storage means and said switching means for causing the settings of each of the devices stored in the storage means to be transferred to others of the devices as the actuation impulses are received whereby the devices are actuated to their moved positions to post the item characteristics.

6. In an announcing system of the character disclosed, means for transmitting signals comprising item selection impulses and announcement posting impulses, a receiving station comprising a group of devices disposed adjacent to one another in serial order and individual to each item for posting the announcements received from said transmitting means, storage means including a set of complementary indicators common to all of the groups of devices, means controlled by said item selection impulses for selecting one of said groups of devices for operation, means for operatively associating the set of complementary indicators with the selected group of devices, means for transferring the announcements from the selected devices to the complementary indicators, and means controlled by said transmitting means for transfering the announcements from said complementary indicators to all but the last device of the group in the same serial order as originally posted.

7. In a quotation board system, a display device for posting a number of quotations in consecutive order and embodying, in combination, means including a set of indicator units disposed adjacent to one another for displaying any of the numerals 1 to 9 and 0 to represent the quantity value of the quotations, means associated with each indicator for actuating the same in response to signal impulses, means for controlling said actuating means to cause the indicators to be restored to unison position, means effective as the indicators are restored to unison position for storing the settings of the indicators, and means controlled by said storing means for causing the settings of the indicators to be concurrently posted in consecutive order on adjacent ones of said indicators to indicate the trend of the market.

8. A system for posting information regarding a plurality of items, comprising an announcing board having a plurality of groups of electro-responsive indicators, said groups being arranged in serial order and each assignable at different times to different ones of said items, each group of indicators including an indicator actuatable to different positional settings for posting the designation of the item and other indicators selectively actuatable to different positional settings for posting information in regard to said item, means for selectively setting any of said item designation posting indicators to designate a given item, a source of posting signals comprising item selection and item information in regard to said items, means responsive to said selection signals for selecting one of said groups of indicators having an item designation setting corresponding to the item concerning which information is to be transmitted, means controlled by said item information signals for actuating the indicators of the selected group for posting the information represented thereby, and means responsive to selection signals for selecting a predetermined one of said groups of indicators and operative automatically to transfer the item designation and item information posted thereon to another of said groups of indicators in the serial order and to actuate said another group to settings for posting the transferred item designation and item information.

9. A system for posting information regarding a plurality of items, comprising an announcing board having a plurality of groups of electro-responsive indicators, said groups being arranged in serial order and each assignable at different times to different ones of said items, each group of indicators including an indicator actuatable to different positional settings for posting the designation of the item and other indicators selectively actuatable to different positional settings for posting information in regard to said item, means including a keyset for generating signals and means responsive to said signals for selectively setting any of said item designation posting indicators to designate a given item, a source of posting signals comprising item selection and item information in regard to said items, means responsive to said selection signals for selecting one of said groups of indicators having an item designation indicator with a setting corresponding to the item concerning which information is to be transmitted, means controlled by said item information signals for post-

ing the information represented thereby on the selected group of indicators, and means responsive to selection signals for selecting a predetermined one of said groups of indicators and operative automatically to transfer the item designation and item information posted thereon to another of said groups of indicators in the serial order and to actuate said another group to settings for posting the transferred item designation and item information.

10. A system for posting information regarding a plurality of items, comprising an announcing board having a plurality of groups of electro-responsive indicators assignable at different times to different ones of said items, each group of indicators including an indicator actuatable to different positional settings for posting the designation of the item and other indicators selectively actuatable to different positional settings for posting information in regard to said item, said groups of indicators being disposed in serial order, means for selectively setting any of said item designation posting indicators to designate a given item, a source of posting signals comprising item selection and item information in regard to said items, means responsive to said selection signals for selecting one of said groups of indicators having an item designation setting corresponding to said item concerning which information is to be transmitted, means controlled by said item information signals for actuating the indicators of the selected group for posting the information represented thereby, and means responsive to selection signals for selecting a predetermined one of said groups of indicators and operative automatically to transfer the item designation and item information posted thereon to another of said groups of indicators in the serial order and to actuate said another group to settings for posting the transferred item designation and item information.

11. A system for posting information regarding the movements of aircraft, comprising an announcing board having a plurality of electro-responsive posting devices arranged in serial order and each assignable at different times to different flights respectively of said aircraft, each posting device including a group of indicators respectively actuatable to different positional settings for posting flight designation and flight information corresponding to the associated aircraft while in flight, means for setting any of said flight designation indicators to designate a given flight, a source of posting signals comprising flight selection and flight information in regard to said aircraft, means responsive to said selection signals for selecting one of said groups of indicators having a flight designation setting corresponding to said flight concerning which information is to be transmitted, means controlled by said flight information signals for posting the information represented thereby on the selected posting device, and means responsive to selection signals for selecting a predetermined one of said groups of indicators and operative automatically to transfer the item designation and item information posted thereon to another of said groups of indicators in the serial order and to actuate said another group to settings for posting the transferred item designation and item information.

12. A system for posting information regarding the movements of aircraft, comprising an announcing board having a plurality of electro-responsive posting devices arranged in serial order and each assignable at different times to different flights respectively of said aircraft, said posting devices being arranged in groups classified in regard to markers traversed by the aircraft in flight, each posting device including a group of indicators respectively actuatable to different positional settings for posting flight designation and flight information corresponding to the associated aircraft, means for setting any of said flight designation posting indicators to designate a given flight, a source of posting signals comprising flight selection and flight and marker information in regard to each of said aircraft, means responsive to said flight selection and marker information signals for selecting a particular marker group of posting devices and a particular group of indicators within said marker group having a flight designation setting corresponding to said flight concerning which information signals are to be transmitted, means controlled by said flight information signals for posting the information represented thereby on the selected posting device, and means responsive to selection signals for selecting a predetermined one of said groups of indicators and operative automatically to transfer the item designation and item information posted thereon to another of said groups of indicators in the serial order and to actuate said another group to settings for posting the transferred item designation and item information.

13. In a system of the character disclosed, a flight announcing board comprising a plurality of groups of devices, each group being adapted to post information relative to the control of one of the flights of aircraft, each of said groups of devices being disposed in serial order in accordance with one of the characteristics posted by said devices, a keyset having keys corresponding respectively to each of said groups of devices, selection means controlled by a setting of the keys of said keyset for selecting a first group of posting devices for operation in accordance with the setting of said keyset, and means controlled by said setting of the keyset and automatically operable after said first group of posting devices has been selected for selecting a second group of posting devices under control of said setting of the keyset for subsequent operation of said second group of posting devices.

14. In a system for posting information relative to the movements of aircraft, a flight progress announcing board comprising a plurality of groups of posting devices disposed adjacent to one another in serial order, said posting devices being associated with different flights of aircraft respectively, a keyset including a first group of keys for selecting any of said devices for operation, impulse means including distributor structure for actuating the selected device to post the information set up on said keyset, means including a second group of keys for selecting another of said devices for operation, means jointly controlled by the settings of said first and second groups of keys for causing said distributor to pass through a predetermined number of cycles of operation, and means controlled by said distributor for operatively connecting the selected devices to said impulse means in succession whereby the selected devices are successively actuated to post the desired information.

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