

Aug. 4, 1931.

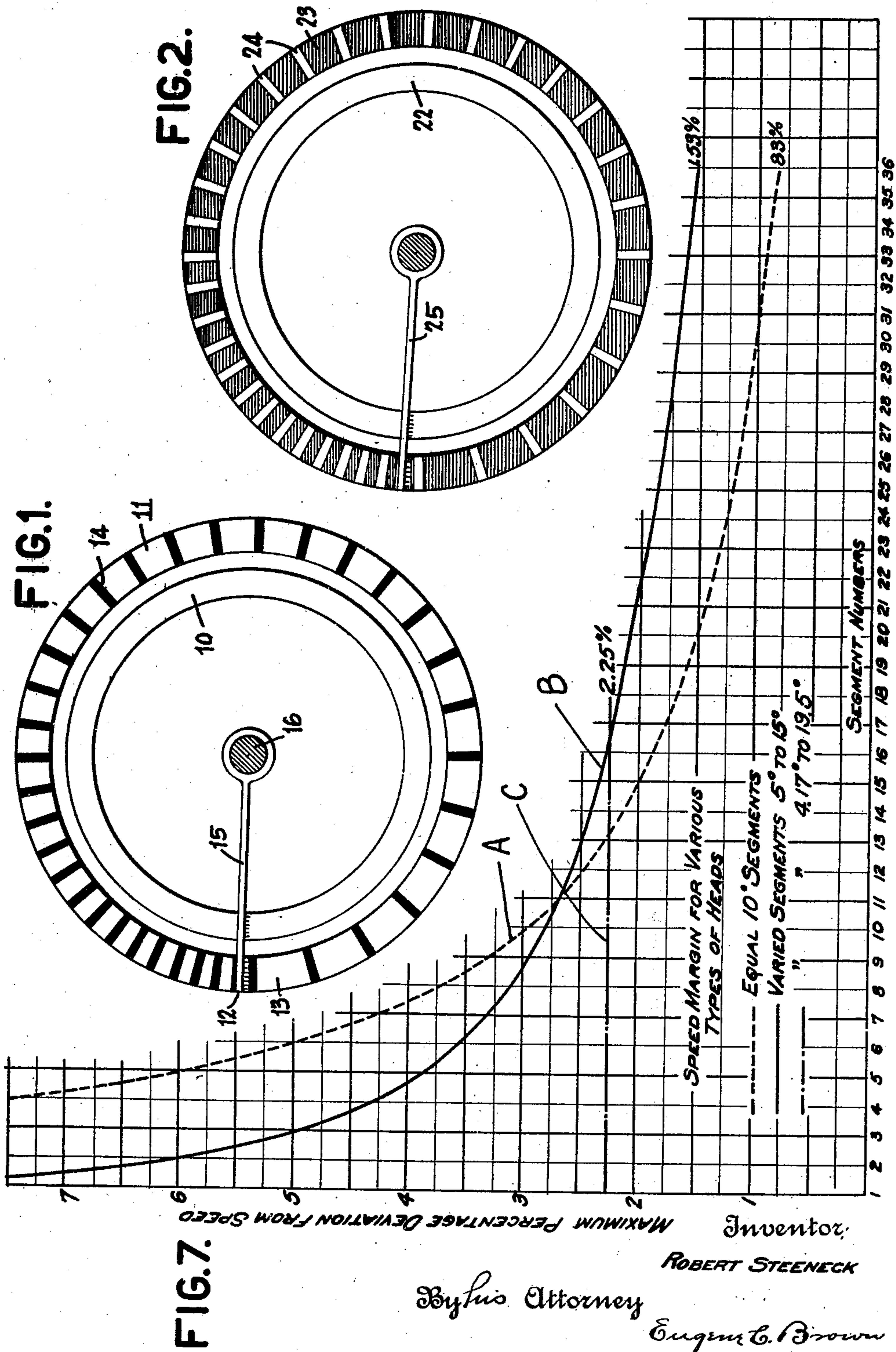
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1,817,717

ROTARY DISTRIBUTOR

Filed March 26, 1930

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

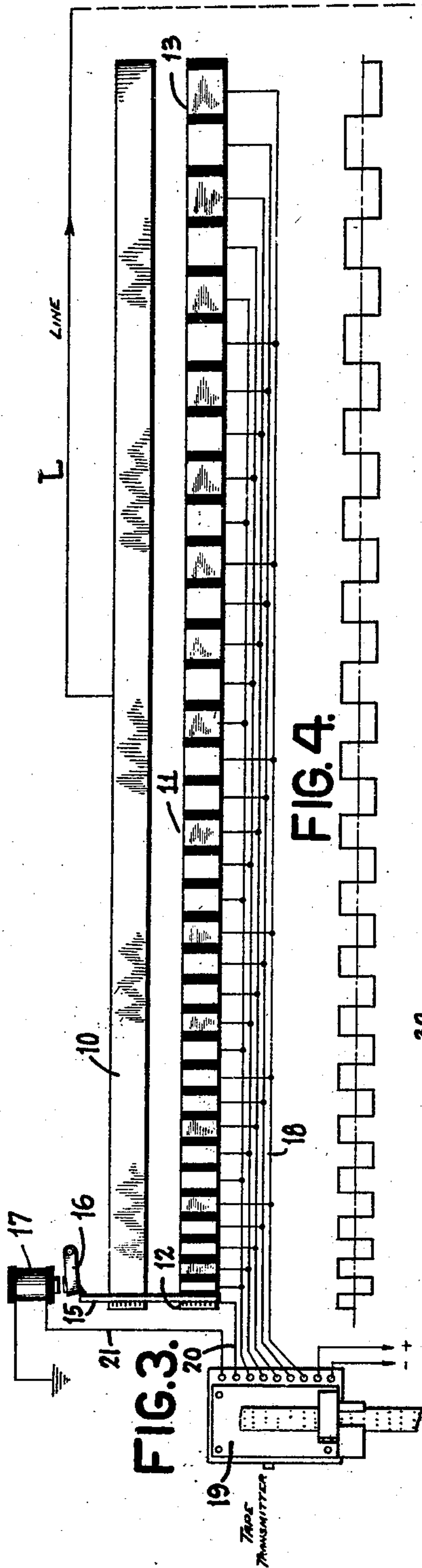


FIG. 4.

FIG. 3.

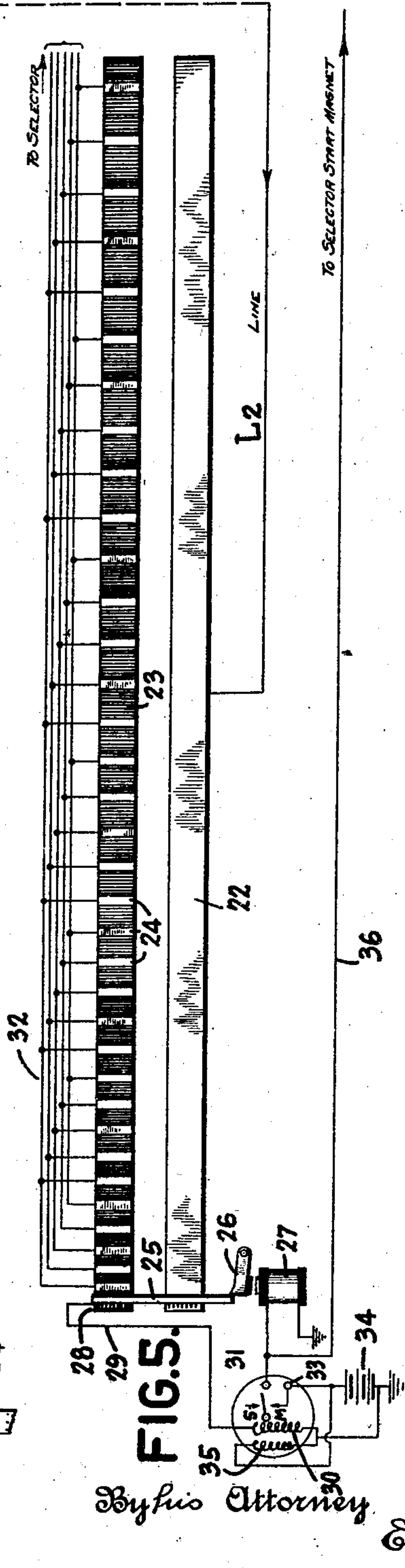


FIG. 6.

FIG. 5.

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ROTARY DISTRIBUTOR

Application filed March 26, 1930. Serial No. 439,140.

This invention relates to a telegraph system and more particularly to a method of and apparatus for the transmission and reception of groups of signals by means of synchronously operating, transmitting and receiving apparatus.

In start-stop systems of telegraphy, the transmitting and receiving apparatus are normally stationary and are set into operation in unison, when it is desired to transmit a particular character or group of characters, by a starting impulse immediately preceding the first intelligence impulse, and after a predetermined number of intelligence impulses have been transmitted, the apparatus is again brought to rest by a stop impulse. The number of intelligence impulses which may be transmitted between a starting and a stopping impulse is determined by the perfection of synchronization of the transmitting and receiving apparatus and as commonly employed, is limited to the number of impulses of the code required to transmit a single character signal, usually five or six impulses.

Since in the start-stop system of transmission the transmitting and receiving apparatus are placed in step with each other at frequent intervals, a relatively wide variation in speed of the transmitting and receiving apparatus is permissible, as compared to multiplex telegraph systems in which the continuously rotating distributors must be maintained in very close synchronism. Therefore, in start-stop systems employing a small number of intelligence impulses intermediate the start and stop impulses, an ordinary electric motor provided with a centrifugal speed regulator, may be employed.

However, in certain instances, in order to increase the rate of transmission, it is desired to transmit a large number of intelligence impulses following each start impulse and preceding each stop impulse. In such cases difficulty has been experienced with the distributing apparatus as heretofore constructed, due to the receiving distributor either advancing or receding relative to the transmitting distributor so that the trans-

mitted signals are not received upon the proper segment of the receiving head.

For instance, in the operation of automatic market quotation boards, by means of signals of the Baudot code type, as described in a copending application of E. R. Wheeler et al, Serial No. 422,148, filed January 20, 1930, and entitled "Stock selecting and indicating system", it is required to transmit from one to three groups of intelligence signals for selecting the particular stock, the quotation of which it is desired to post, then to transmit a single group of impulses to select the range, that is, whether high, low, open, or close, and then to transmit from one to four groups of intelligence impulses to operate one or more of the four indicators associated with the selected stock. Each group of intelligence impulses in this system is preceded and followed by a start or a stop impulse. Therefore, the posting of a single stock may require the transmission of eight groups of intelligence impulses and in addition sixteen impulses, either start or stop, which serve no function other than maintaining proper synchronization of the transmitting and receiving apparatus.

In order to reduce the time of transmission of each quotation, it is proposed to eliminate all but the one stop impulse and one start impulse immediately preceding and following the first and last intelligence impulses required for the entire stock selection and indicator operation. If a six unit code is employed, that is, if each group of intelligence or character selecting signals is composed of six impulses, a total of forty-eight impulses must be transmitted between each start and stop signal. This number may be reduced somewhat under certain conditions of operation.

Rotary transmitters as heretofore constructed have consisted of a number of insulated segments of equal width and the receiving distributor of an equal number of segments of less width, so that if perfect synchronism is obtained, only the midportion of the transmitted impulse is received upon the receiving distributor segment. This permits a certain amount of deviation from speed of

the receiving and transmitting distributors while still permitting a portion of the transmitting impulse to be received upon the proper segment. For instance, if for convenience in designing the distributor head, it is assumed that it consists of thirty-six segments each having a width of 10° and the receiving distributor has thirty-six segments of a width of 4° equally spaced apart by insulation, in order that the last impulse will be received upon the last segment of the receiving distributor it is necessary that a speed variation of not less than about 0.8% be maintained between the receiving and transmitting distributors.

It is difficult, however, to maintain a speed variation of less than 1% in the transmitting and receiving apparatus when operated by means of speed governed motors and in order to provide a margin of safety, the apparatus should be capable of satisfactory operation with a speed variation of at least 1.5%. Under the conditions assumed above, with a speed deviation of 1.5%, only about the first twenty impulses would be properly received upon the segments of the receiving distributor, the last sixteen impulses causing improper operation of the apparatus responding thereto.

It is one of the objects of the present invention, therefore, to produce a method of and apparatus for transmitting a large number of signal impulses without intermediate synchronizing signals, which will permit a relatively large speed deviation of the transmitting and receiving apparatus.

Another object is to provide a transmitting distributor for a start-stop telegraph system in which impulses of increasing period may be transmitted.

A still further object is to provide a transmitter for a start-stop telegraph system in which the successive transmitted signals will be increased in period in proportion to the maximum speed deviation which may occur between the transmitting and receiving distributors.

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

In accordance with my invention I proportion the segments of the transmitting distributor so that the first segment is of a width only slightly greater than that of the receiving distributor segments and I increase the width of the segments of the transmitter, progressively from the first to the last, so that upon each revolution of the distributor brush, a train of impulses of gradually increasing periods are transmitted to the receiving distributor. The receiving distributor is provided with segments of equal width, corresponding in number to those of the transmitting distributor but spaced at progressively

greater distances apart from the first to the last. The increase in width of the successive segments may be in uniform increments or they may increase in geometrical progression, that is, in direct proportion to the advancement or recession of the corresponding segments of the receiving and transmitting distributors, at the maximum allowable speed deviation.

In order that the invention may be more fully understood, reference will be had to the accompanying drawings in which:

Figure 1 is a diagrammatic view of a rotary transmitting distributor embodying my invention;

Figure 2 is a diagrammatic view of a rotary receiving distributor embodying my invention;

Figure 3 shows the segments of the transmitting distributor developed and associated with a tape transmitter;

Figure 4 is a curve showing a form of signals, which may be transmitted with the distributor shown in Figure 1;

Figure 5 shows the segments of the receiving distributor developed;

Figure 6 is a curve showing a form of signals in which the successive impulses increase in geometrical progression; and

Figure 7 shows a number of curves giving the maximum deviation from speed of a distributor having the segments equally spaced, arranged in arithmetical progression and arranged in geometrical progression.

The distributor shown in Figure 1 comprises a continuous or solid ring 10 and a segmented ring 11. The ring 11 is composed of a number of segments, thirty-six in the present case, increasing in width by uniform increments from the first segment 12 to the last segment 13. In the case of a distributor having thirty-six segments I may uniformly increase the width of the segments from 5° for the first segment to 15° for the last segment. The successive segments are separated by insulating material 14 in the usual manner. A brush 15, mounted upon a shaft 16, is arranged to rotate over the segments.

In Figure 3 I have shown the brush 15 as normally held against rotation by a latch 16 controlled by a magnet 17. The solid segment 10 is connected to an outgoing line L.

The first segment 12 is shown as constituting a stop segment upon which the brush 15 normally rests. The remaining thirty-five segments are divided into seven groups of five segments each, for transmitting code combinations of five units or impulses each. The segments of each group are connected in succession to the five conductors forming a group 18 which terminate in any suitable device for setting-up predetermined code combinations on the segments. In the present instance the conductors 18 are connected to the terminals of a tape transmitter 19, as for in-

stance of the general type disclosed in patent to G. R. Benjamin, #1,298,440, granted March 25, 1919, and entitled "Automatic transmitter." The first segment 12, of ring 11, is connected to the tape transmitter by a conductor 20 and the starting magnet 17 is connected to the tape transmitter by a conductor 21.

The arrangement is such that when the tape transmitter is at rest, spacing battery, preferably of positive polarity, is connected to the conductor 20 and thence through the brush 15 and ring 10 to the line L. Upon operation of the tape transmitter, negative or marking battery is applied to the first segment 12 and simultaneously the starting magnet 17 is energized to permit the brush 15 to traverse the rings of the transmitter and thereby transmit a start impulse from the segment 12 followed by seven groups of intelligence impulses in various combinations of marking and spacing signals, from the remaining segments.

The brush is brought to rest at the end of the cycle by engagement with the latch 16, at which time spacing battery is again applied to the segment 12 to transmit a rest or stop signal to the receiving apparatus.

Due to the progressively increasing length of the segments of ring 11 the transmitted signals are of correspondingly progressively increasing periods. In Figure 4 I have shown the manner in which the period of the signals increases, each alternate impulse being shown, for convenience, of opposite polarity.

The receiving distributor which co-operates with the transmitting distributor, as shown in Figure 2, comprises a solid ring 22 and a segmented ring 23. The segmented ring has a number of segments 24 of equal length, corresponding in number to the segments of the transmitting distributor, the receiving segments being spaced apart at progressively greater distances depending upon the rate of increase in width of the transmitting segments. The position of the segments of the receiving distributor is such that if the receiving distributor were superimposed upon the transmitting distributor the segments of the former would be positioned midway of the corresponding segments of the latter.

The receiving distributor is provided with a brush 25 which is arranged to rotate in approximate synchronism with the brush 15 of the transmitting distributor. In Figure 5 the brush 25 is shown held upon the first segment by a latch 26 controlled by a start magnet 27.

The solid ring 22 may be connected to an incoming line L2 and the segments 24 may be connected to any suitable receiving device, adapted to be operated by the received signals as, for instance, the stock selecting and indicator operating mechanism of a market quotation board.

The first or start segment 28 is connected by a conductor 29 to the winding 30 of a polarized relay 31 and the remaining segments are connected in successive groups of five segments each to the conductors 32, which may extend to any suitable decoding or selecting apparatus (not shown).

The tongue of the relay 31 is connected to one terminal of the start magnet 27 the opposite terminal of which is grounded and the marking contact 33 of the relay is connected to a grounded battery 34 so that upon the reception of a marking or start signal over the line L, L2, the start magnet 27 is operated to release the brush 25. A biasing winding 35 restores the tongue of the relay to its spacing contact after the termination of the starting impulse, so as to permit the latch 26 to be positioned in the path of the brush as it completes its cycle. The tongue of the relay 31 may also be connected, as by conductor 36, to the start-stop mechanism of the decoding or selecting device.

In the operation of the system the brushes 15 and 25 are released simultaneously by means of a starting signal and pass over their respective segments in substantial synchronism. If the synchronism is perfect, the brush 25 passes over its segment during the time that the brush 15 is passing over the midportion of the corresponding segment. However, if the receiving distributor is operating slightly faster the brush 25 will engage the segments 24 while the brush 15 is upon the first half of the corresponding segment of the transmitting distributor or if the advance in speed is sufficient the brush 25 may pass off of a particular segment before the brush 15 engages the corresponding segment of the transmitter. In this latter case, improper reception is obtained.

Under certain conditions of operation it has been found that approximately 4° are required for each receiving segment and in such cases, assuming the thirty-six transmitter segments to vary in width from 5° to 15° a deviation of about 1.5% may take place before the last segment of the receiving distributor will be sufficiently out of step with the transmitting distributor to produce faulty reception.

In Figure 7 I have shown a curve A representing the condition when the segments of the transmitting distributor are of equal widths of 10° . The maximum percentage deviation from speed permissible for proper reception upon any segment is indicated by this curve. For instance, it will be noted that in order to properly receive the incoming impulse upon the last or thirty-sixth segment, the deviation of speed must not be greater than about 0.8% and with a speed deviation of 1.5% all of the segments of the transmitting and receiving distributors subsequent to

about the twentieth, would be sufficiently out of step to cause faulty reception.

Curve B illustrates the relation between the individual segments and the speed deviation for the case in which the segments of the transmitting distributor increase in equal amounts from 5° to 15° . In this case it will be noted that even with a speed deviation of 1.5% proper reception is received upon the entire thirty-six segments.

In order to obtain the maximum advantage of the present invention the segments of the transmitting distributor may be increased in geometrical progression, at such rate that the increase in width of each segment corresponds exactly to the extent to which each segment of the receiving distributor advances or recedes with respect to the corresponding segment of the transmitting distributor, at the maximum allowable speed deviation. For instance, if the maximum speed deviation is assumed to be 1% and the width of the segment of the receiving distributor 4° , the first segment of the transmitting distributor must exceed 4° by 1% in each direction, that is, it must be equal to the length of the segment of the receiving distributor plus twice the maximum deviation in travel of the transmitting and receiving brushes while the receiving distributor brush is passing over one segment.

The length S_1 of the first segment may then be determined by the equation $S_1 = s(1 + 2d)$ wherein s is the length of each of the segments of the receiving distributor, and d is the percent maximum allowable deviation in speed of the transmitting and receiving distributors.

The length of any segment S_n may be determined by the usual equations for geometrical progressions in which the first term of the progression is $(1 + 2d)$ and the ratio of the progression is also $(1 + 2d)$. The equation for the length of any segment S_n of the transmitting distributor may be expressed as follows:

$$S_n = s(1 + 2d)^n$$

The length S_n of the distributor ring in degrees up to the end of segment n may be determined by the equation

$$L_n = s \left(\frac{(1 + 2d)^{n+1} - (1 + 2d)}{2d} \right)$$

With a thirty-six segment distributor and allowing 4° for each segment of the receiving head, the minimum width of the first segment is approximately 4.17° and the width of the last segment approximately 19.5° , the maximum deviation from speed being approximately 2.25%, as represented by curve C.

If a maximum speed deviation of 1.5% is assumed it is possible to transmit about forty-four impulses between successive stop signals and properly receive the same upon a receiving head having 4° segments. If a 1%

deviation from speed is permitted the number of impulses may be increased to above fifty.

In Figure 6 I have shown a curve corresponding to that of Figure 4 but in which the successive impulses increase in geometrical progression, the first impulse corresponding to a segment length of 4.17° and the last, to a segment length of about 19.5° .

In place of having the individual segments increase in length progressively, the segments may be arranged in groups, the segments of each successive group being of greater length than those of the preceding groups and in the following claims wherein it is stated that the segments are of progressively increasing length, it is intended to include a construction in which either the successive individual segments or the successive groups of segments are of progressively increasing lengths.

It is obvious that similar results may be obtained by using a transmitting distributor having segments of equal width and operating the brush at a speed which decreases, during each revolution, from the first to the last segment and other similar expedients may be devised. Therefore, I do not desire to be limited to the exact arrangement illustrated and described but desire the same to be considered in an illustrative rather than a limiting sense and I contemplate all such modifications and changes as come within the scope of the following claims.

What I claim is:

1. A rotary distributor comprising a solid ring and a segmented ring, a line wire connected to said solid ring, a signal transmitter associated with said segmented ring, and a brush arranged to bridge said rings, the segments of said segmented ring being of progressively increasing lengths over at least a portion of said ring, and spaced apart equal distances which are short compared with the length of the segments, whereby when said brush traverses said rings signals of progressively increasing periods are transmitted to said line in continuous succession.

2. A rotary distributor for a start-stop system of telegraph transmission comprising a distributor ring having a plurality of segments of increasing lengths in geometric procession and a signal transmitter associated with such segments whereby signals of progressively increasing period may be transmitted.

3. A telegraph transmitting system comprising a rotary transmitter having segments of progressively increasing length, to transmit signals of progressively increasing periods and a rotary distributor operating in approximate synchronism with said transmitter and arranged to receive said signals, said distributor having segments of substantially equal length, spaced apart at progressively increasing distances, whereby exact

synchronization between the transmitter and distributor is not required.

4. A telegraph transmitting system comprising a rotary transmitter having segments of progressively increasing lengths, to transmit signals of progressively increasing periods and a rotary distributor operating in approximate synchronism with said transmitter and arranged to receive said signals, said distributor having segments of substantially equal length, spaced apart at progressively increasing distances, whereby exact synchronization between the transmitter and distributor is not required, and means for stopping said transmitter and distributor and starting them in unison at least once in each revolution thereof.

5. A telegraph transmitting system comprising a transmitter, means for setting-up predetermined signal combinations on said transmitter, means for transmitting said signals with progressively increasing periods, and a receiving distributor operating in approximate synchronism with said transmitter arranged to receive a uniform portion of each of said signals.

6. A telegraph transmitting system comprising a transmitter, means for setting up predetermined signal combinations on said transmitter, means for transmitting said signal combinations with progressively increasing periods, a receiving distributor operating in approximate synchronism with said transmitter arranged to receive said signals, the segments of said distributor being spaced apart at progressively increasing distances corresponding to the increase in period of the signals and means for stopping said transmitter and distributor and starting them in unison after a predetermined number of signals have been transmitted and received.

7. A telegraph transmitting system comprising a transmitting and receiving apparatus adapted to operate in approximate synchronism, means for setting-up signal combinations on said transmitter and means for transmitting said signals with progressively increasing periods, the rate of increase in period of the signals corresponding approximately to the maximum rate of deviation in speed of said transmitting and receiving apparatus.

8. A telegraph transmitting system comprising a rotary transmitter and a rotary receiving distributor arranged to operate in approximate synchronism, said transmitter having segments of progressively increasing length and said distributor having segments of approximately equal lengths spaced apart at progressively increasing distances, the rate of increase in length of the segments of said transmitter and the spacing of the segments of said distributor being in geometrical progression.

9. A telegraph transmitting system com-

prising a rotary transmitter and a rotary receiving distributor arranged to operate in approximate synchronism, said transmitter having segments of progressively increasing length and said distributor having segments of approximately equal lengths spaced apart at progressively increasing distances, the rate of increase in length of the segments of said transmitter and the spacing of the segments of said distributor being in geometrical progression and corresponding approximately to the maximum rate of deviation in speed of said rotary transmitter and distributor.

10. In a telegraph transmitting system a rotary distributor having segments of substantially equal length spaced apart at progressively increasing distances and means for transmitting signals of progressively increasing periods to said distributor.

11. The method of telegraph communication employing telegraph transmitting and receiving apparatus which comprises stopping said transmitting and receiving apparatus and starting the same in unison in predetermined cycles, operating said receiving apparatus in approximate synchronism with said transmitting apparatus, transmitting a succession of telegraph signals of progressively increasing periods during each cycle and receiving a uniform length portion only of each of said signals with said receiving apparatus.

12. A start-stop telegraph system comprising a rotary transmitting distributor and a cooperating rotary receiving distributor arranged to operate in approximate synchronism, one of said distributors having segments of progressively increasing length spaced apart at substantially uniform distances and the other of said distributors having segments of uniform length spaced apart at progressively increasing distances.

In testimony whereof I affix my signature.
ROBERT STEENECK.

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