

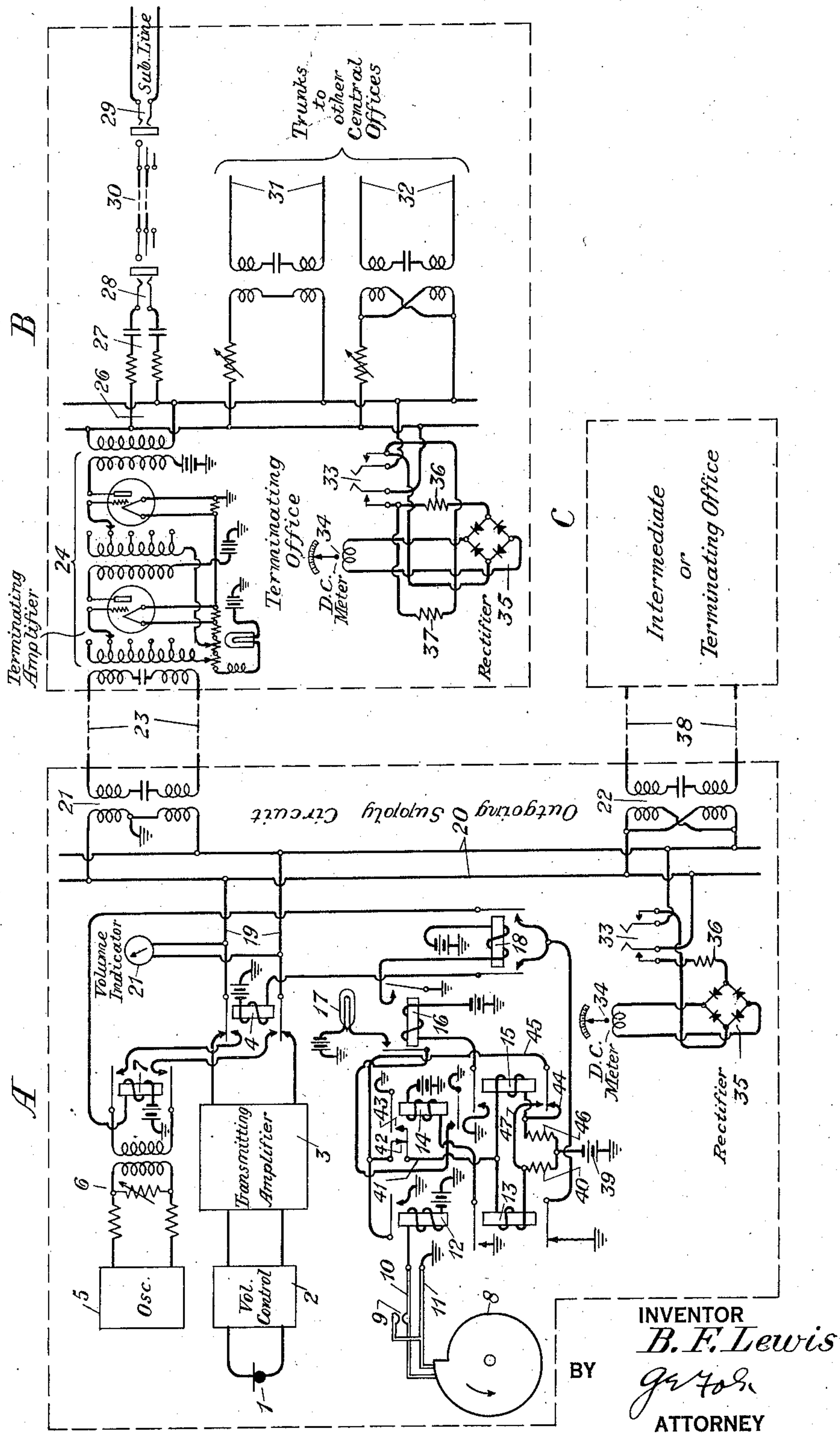
Jan. 21, 1936.

B. F. LEWIS

2,028,289

TIME ANNOUNCEMENT SYSTEM

Filed Aug. 18, 1934



UNITED STATES PATENT OFFICE

2,028,289

TIME ANNOUNCEMENT SYSTEM

Benjamin F. Lewis, Flushing, N. Y., assignor to
American Telephone and Telegraph Company,
a corporation of New York

Application August 18, 1934, Serial No. 740,497

5 Claims. (Cl. 179—175)

This invention relates to time announcement systems and, particularly, to a method and means for making transmission measurements upon such a system during the course of its operation.

5 The time announcement system with which this invention is concerned, is a one-way speech distribution system by which information concerning the time of the day is transmitted from a central bureau to various central offices of a telephone system in order that such time information may be given to subscribers through those offices. Amplifiers are provided in connection with the transmitter at the time bureau and, also, with the various trunk circuits, in order that each subscriber requesting time service will receive such information at the same transmission level as every other subscriber. Since a time announcement system must be in service continuously throughout each day, it is necessary that all transmission tests required to determine its transmission efficiency be made without withdrawing the circuits from service.

One of the objects of this invention is to make transmission tests upon a time announcement system, the tests being characterized by the employment of the signal current, the normal function of which is to indicate the exact second of time, for the further purpose of measuring the transmission level at the output of the several amplifiers associated with such system.

Other objects of this invention will be apparent from the following description when read in connection with the attached drawing showing schematically a time announcement system in which the present invention is embodied.

10 In the drawing, the apparatus and circuits within the dotted lines designated A is located at the time bureau from which information concerning the time of the day is transmitted over a trunk circuit to a central office such as is represented by the apparatus and circuits within the dotted lines designated B, from which the information is distributed either directly to subscribers at that office or over other trunk circuits to distant offices. There may, of course, be a plurality of offices such as B supplied from a single time bureau and connected therewith by transmission lines having amplifiers in order to properly maintain the level of transmission of such information to the subscribers.

15 In making announcements in a system such as that with which this invention is concerned, it is customary for an operator to orally state what the time will be upon the transmission of a given signal representing the exact second of that time.

The transmitter, into which the operator speaks, is represented by 1. That transmitter, which is of the high quality type, is connected to the input of a volume control network 2 which, in turn, is connected to transmitting amplifier 3, the output of which is connected to the normal contacts of the relay 4. The "given signal" referred to above is produced by the oscillator 5 which is connected through the potentiometer 6 to the armatures of the relay 7. The contacts of that relay are connected to the inner contacts of relay 4. The oscillator is designed to generate a pure 800-cycle current but such current cannot be impressed upon the supply circuit unless both relays 4 and 7 are simultaneously operated. The purpose of that provision will be made clear hereinafter. A cam 8 which is operated by a clock mechanism so as to make one revolution per minute has, upon its periphery, eight notches similar to the one represented and so positioned as to effect the closing of the contact 9 every seven and one-half seconds and to maintain such contact closed throughout a period ranging from .4 to .57 seconds. The contact 9 is opened and closed by the movement of the members 10 and 11 and the closing or opening of that contact controls the operation of the relay 12. Relays 13 and 14 operate in sequence after the operation of relay 12 on the odd closure of contact 9, and remain operated until the succeeding even closure. Relay 15 does not operate until relay 12 releases on the odd opening of contact 9 and remains operated until the succeeding even opening of contact 9. Relay 16, which is controlled by relay 15, in turn controls along with relay 14, the lamp 17 which, by its lighting and the extinction of its light, indicates to the operator the beginning and the end of the period during which the oral announcement must be made. Relay 16 also controls relay 18. Relay 18 controls relays 4 and 7 which disconnect the speech transmission branch from the supply circuit and connect thereto the tone transmission branch. Connected across the leads 19 that extend to the supply circuits 20 is a volume indicator 21, which assists the operator in adjusting the amplifier 3 by the volume control network 2. The leads 19 are connected to the outgoing supply circuit 20 to which may be attached a plurality of trunks by means of the repeating coils 21 and 22. Only two trunks have been shown but it is to be understood that any number may be employed within the limits of the amplifier 3.

The trunk 23 extends to the central office B

and is connected thereat to the amplifier 24 by means of the repeating coil 25. While that amplifier may be of any type, the form chosen for describing the present invention is a simplified arrangement of that shown in the copending application of Gannett and Lewis, Serial No. 740,510 filed Aug. 18, 1934. The output of the amplifier 24 is connected across the supply circuit 26 to which are attached a plurality of circuits for the distribution of time information. The circuit 27 terminates in the jack 28 at the switchboard of the central office B and connections to the subscribers' lines, such as 29, may be effected by means of the cord circuits 30. Other circuits, such as 31 and 32, connected to the supply circuit 26, extend to more remote central offices and thus extend the range of distribution of the time information. Also, connected to the supply circuit through the key 33 is a direct current meter 34 having associated therewith a rectifier 35 which may be of any type but preferably is of the copper-oxide type. A resistance 36 is included in series with the meter and there is shunted across the terminals of the measuring circuit a resistance 37.

The trunk 38 may extend to a terminating office or an intermediate office designated C. If a terminating office, it would have thereat apparatus substantially like that shown at central office B. If an intermediate office, it would have a repeater and a plurality of inter-amplifier trunks extending to distant terminating offices. Such intermediate office would also have a transmission level measuring set connected across the supply circuit similar to that shown at office B.

Let it be assumed that the cam 8, rotating in the direction of the arrow, is so positioned that the member 11 has fallen with the arrival of an odd notch and effected the closing of the contact 9. This operates relay 12 and thereupon the circuit is closed through the winding of relay 13, which circuit includes the battery 39, resistance 40, winding of relay 13, conductor 41, contact 42 and the grounded contact of relay 12. The operation of relay 13 causes the operation of relay 14 which, in turn, causes the locking up of relay 13 through contact 43 of relay 14. The operation of relay 13 not only closes its upper contact to put a ground upon relay 14, but also opens its lower contact thereby removing ground from the contacts of relay 18. Relay 15 does not operate at this time because the winding of that relay is shunted by the path that includes conductors 44 and 45 to the grounded contact of relay 12. That situation persists for about .5 second, which is the time required for the cam to move sufficiently to permit the left-hand member 10 to drop and cause the opening of contact 9. This releases relay 12, which in turn, removes the shunt around the winding of relay 15 and permits that relay to be energized by current flowing from the battery 39 through resistance 46, winding of relay 15, conductor 41 and contact 43 to ground. The closing of the upper contact of relay 15 puts a ground upon the circuit that operates relay 16 which, in turn, operates relay 18. The closing of the contacts of relay 18 does not effect the operation of relays 4 and 7, because owing to the continued operation of relay 13, there is no ground upon the circuit that includes the windings of 4 and 7. The operation of relay 16 causes the lighting of the lamp 17, which is a signal to the operator to begin the making of her announcement of the time. This she will do, using a formula such as, "When you hear the

signal, the time will be three, nine and one-half." The making of that oral announcement will consume about seven and one-half seconds, at which time the next succeeding even notch on the periphery of the cam will come under the member 11, causing the closing of the contact 9. This operates relay 12 and puts a ground on conductor 45. Since, at this instant, relay 15 is energized, a circuit is established from battery 39 that includes resistance 40, conductor 41, the lower inner contact of relay 15 and conductor 45 to ground. The path just traced shunts the winding of relay 13 and thereby releases that relay. This releases relay 14 which extinguishes the operator's announcement lamp. The closing of the lower contact of relay 13 puts a ground upon the circuits of windings of relays 4 and 7 and thereby causes the operation of those relays, which disconnects the speech transmission branch from the leads 19 and connects to the latter the tone transmission branch which makes known the exact instant of time mentioned by the operator in her oral announcement. The release of relay 14 sets up a condition such that when member 10 comes to the notch, opening contact 9, relay 15 will be released. The opening of the upper contact of relay 15 releases relay 16 and therefore releases relay 18. The releasing of the latter relay in turn releases relays 4 and 7, thereby disconnecting the tone branch from the leads 19 and restoring the connection of the speech transmission branch. The purpose of relay 7 is to keep the 800-cycle tone away from the speech transmission branch during the making of the oral announcement and thus to prevent misunderstandings that might result from the inductive pick-up of the 800-cycle tone during the making of announcements.

The relays of the time announcement circuit are now in normal, unoperated condition and continue so until the next notch on the periphery of the cam comes under the member 11, whereupon the cycle of operation, hereinbefore described, will be repeated. It will thus be seen that such provides for the making of announcements every fifteen seconds.

When a subscriber dials or gives the operator the number assigned to the time announcement networks the machine switching equipment or the operator will immediately connect the subscriber's line to a set of subscribers' terminals of the time system. The connection will be completely made in the time system only if no announcement is in progress. Otherwise the connection to the output of the terminating amplifier will be kept open until the next seven and one-half seconds interval between announcements. During the waiting period a ringing signal is sent to the subscriber. The details of the accomplishment of this connection synchronism are not important to the invention herein described.

In order to give efficient service by such a time announcement system and to insure the clear reception of time information by every subscriber within the area supplied by the system, it is essential to test the system frequently in order to know whether the transmission levels at various points upon the system are sufficiently high to give satisfactory service. In the making of such tests upon commercial telephone circuits, it is necessary to withdraw the circuit from active service. This may be done because there are generally sufficient spare facilities. Owing to the cost of a time announcement sys-

tem, duplication of its circuits and equipment cannot be justified, so that all tests must be made upon such a system during its period of operation. The measurements are made by an attendant at the time bureau and also at each of the central offices at which the repeaters are located. The determination of the condition of the system, from the transmission standpoint, is made by measuring the magnitude of the relatively short impulse of 800-cycle current that is transmitted each fifteen seconds and which represents the exact instant of time. Each attendant listens in upon the circuit by suitable receiving apparatus (not shown) while the operator is making the time announcement. At the conclusion thereof, the attendants operate the keys and thereby connect the measuring circuit effectively across the output of their respective amplifiers. For example, the operation of the key 33 at office B would connect the measuring apparatus at that office across the output of the repeater 24. Those meters consist of a direct current galvanometer movement with a bridge-type copper-oxide rectifier network which provides full-wave rectification. Series resistance is included to obtain the correct sensitivity and to reduce the effects of temperature variation on rectifier characteristics. Such measuring systems are sufficiently sensitive and fast to allow the making of a measurement of the transmission level of the signal current of extremely short duration. The meter needle will be deflected and will momentarily come to rest at the steady-state position which is then taken as the reading of the meter. Since the time signal may vary from .2 to .8 second, it may be necessary to make several observations to insure that the tone signal is long enough to correctly show the steady-state level. The rectifier type meters are required to have such damping characteristics that steady-state condition can be obtained with a time signal duration of about .4 second.

For a tone signal of proper intensity, the signal voltage across the supply circuit 20 must be about .6 of a volt, which is taken as the reference level for subsequent tests. That voltage is adjusted by means of the potentiometer 6 in the tone transmitting branch. Likewise, the intermediate and terminal amplifiers are adjusted to give the same voltages across every output. In making the tests upon terminal amplifiers, a 10-ohm resistance 37 is connected across the supply circuit 26 by the operation of the key 33. Since the aforescribed tests may be made without causing any interruption or disturbance in the time announcement system, such tests should be made frequently in order to afford a substantially continuous indication of the transmission condition of the system as a whole. Obviously, the method which uses the tone signal current for the determination of the transmission condition is ideal for employment in a time announcement system which, by its very nature, is continuously used throughout the day. While the invention has been described as embodied in a particular form, it is capable of employment in other and different forms without departing from the spirit and scope of the appended claims.

What is claimed is:

1. In a time announcement system characterized by an oral announcement of the time, followed by the transmission of a tone indicating the exact second, the method which consists in

listening in upon the system at various points thereof during the making of the oral announcements, and, at the termination thereof, connecting transmission level measuring apparatus to the system at the said points and noting the level at the said points resulting from the transmission of the signal tone over said system.

2. In a time announcement system characterized by an oral announcement of the time, followed by the transmission of a tone indicating the exact second, the method which consists in listening in upon the system during the making of oral announcements, and, at the termination thereof using the signal tone to measure the transmission efficiency of the said system.

3. In a time announcement system characterized by an oral announcement of the time, followed by the transmission of a tone indicating the exact second, the method which consists in transmitting over said system an oral announcement of what the time will be when a given signal is transmitted over said system, transmitting a signal tone to indicate the exact instance of time announced, determining, by listening, the cessation of said announcement and measuring the amplitude of the signal tone at a given point on the system.

4. In a time announcement system characterized by an oral announcement of the time, followed by the transmission of a tone indicating the exact second, the combination with a transmitting branch including a transmitter, an amplifier and a volume control device connected therewith, a tone circuit including an oscillator and a potentiometer connected therewith, a supply circuit, a transmission line having an amplifier connected therewith, over which the spoken announcement and the signal tone are to be transmitted, the said transmission line being connected to said supply circuit, a switch to connect said transmitting branch and said tone circuit in sequence to said supply circuit, the said switch having a timing device to control the duration of connection of said transmitting branch and said tone circuit to said supply circuit, a transmission indicating device comprising a D. C. meter, a rectifier and a resistance adapted to be connected across said supply circuit whenever said tone is being transmitted to indicate the transmission level of said tone in the supply circuit, and a second indicating device connected across the output of the amplifier in the transmission line and also operable upon the transmission of said tone to indicate the level across said output.

5. In a time announcement system characterized by an oral announcement of the time, followed by the transmission of a tone indicating the exact second, the combination with a transmission line having a repeater connected therewith of a time announcement arrangement comprising a speech transmitting branch including a transmitter and a repeater, a tone transmitting branch including an oscillator and a potentiometer, switching means to connect in sequence and for a predetermined interval each of said branches to said transmission line and means responsive to the current transmitted by said oscillator, during its period of application to said transmission line to indicate the level of transmission at the output of each of said repeaters.

BENJAMIN F. LEWIS.