I. D. FELLOWS.

CHRONOMETER CONTROLLED SIGNALING DEVICE FOR TELEPHONE EXCHANGE SYSTEMS.

APPLICATION FILED FEB. 25, 1911.

1,049,568.

Patented Jan. 7, 1913.

2 SHEETS—SHEET 1.

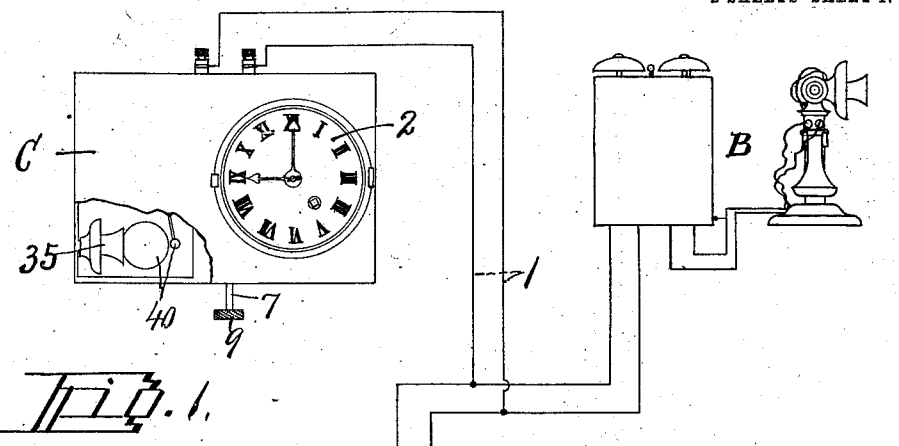


Fig. 1.

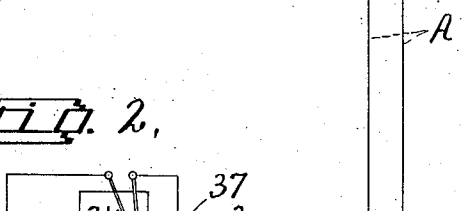


Fig. 2.

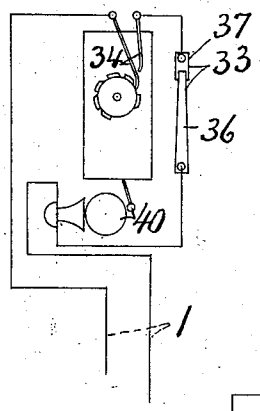
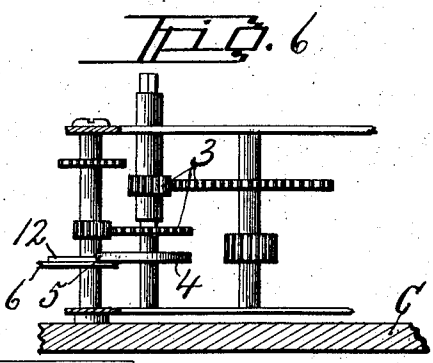
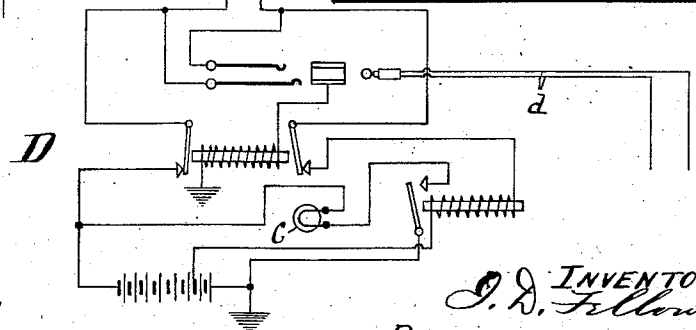


Fig. 6.





WITNESSES.

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Fig. 3.

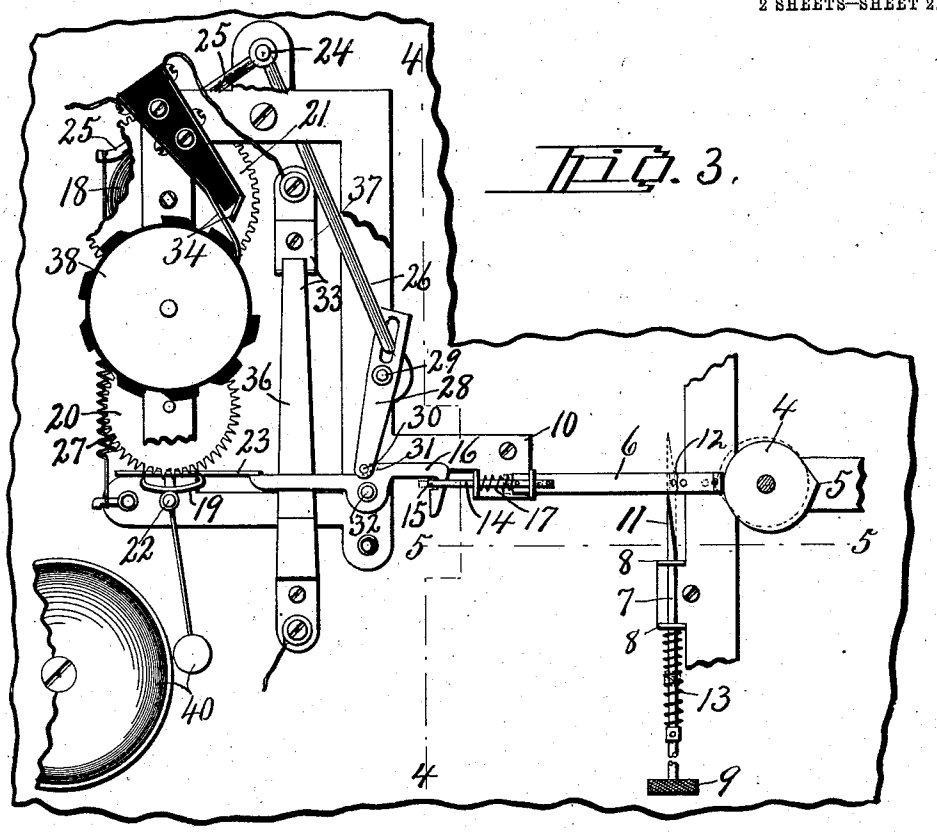


Fig. 4.

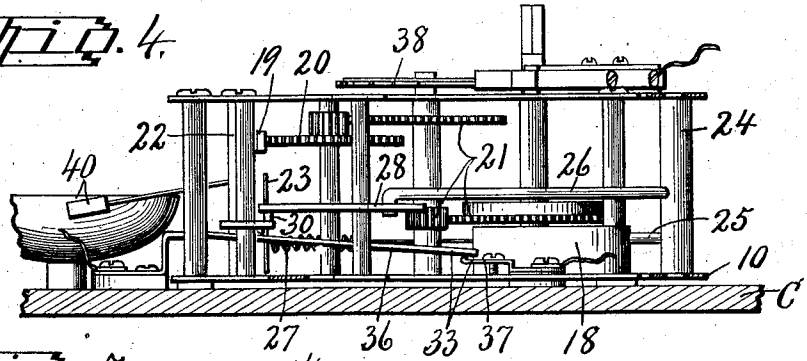
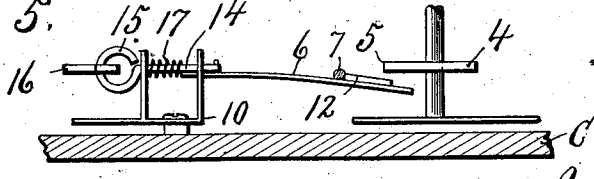


Fig. 5.



WITNESSES

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UNITED STATES PATENT OFFICE.

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CHRONOMETER-CONTROLLED SIGNALING DEVICE FOR TELEPHONE-EXCHANGE SYSTEMS.

1,049,568. Specification of Letters Patent. Patented Jan. 7, 1913.

Application filed February 25, 1911. Serial No. 610,769.

To all whom it may concern:

Be it known that I, IRVING D. FELLOWS, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Chronometer-Controlled Signaling Devices for Telephone-Exchange Systems, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to certain improvements in chronometer controlled signals for telephone exchange systems and in some respects it is similar to the apparatus forming the subject matter of my pending application #610,770 filed Feb. 25, 1911, in which any subscriber may at will cause the operation of the signals at the central station over that particular line independently of the subscriber's telephone.

The main object of my present invention is to provide means whereby the same signals may be automatically operated over any subscriber's line in case of the inability or neglect of the subscriber or authorized attendant to prevent such operation at the proper time. In other words, I have sought to provide banks, factories and similar telephone subscribers with simple means for sending in an emergency alarm at the central office in case the watchman or other attendant fails from any cause to make the usual round of inspection at regular predetermined intervals of time at which time he is required to be present at the instrument to prevent its automatic action so that if for any reason he should fail to perform this simple operation, an emergency call would be automatically sent in to the central office for police service to immediately ascertain the reason for such failure.

Other objects and uses will be brought out in the following description.

In the drawings—Figure 1 is a diagrammatic view of a subscriber's station, line circuit and part of a central exchange system showing the chronometer controlled signaling apparatus as electrically connected across the line circuit. Fig. 2 is a diagrammatic view of the electrical parts of the signal controlling apparatus shown in Fig. 1. Fig. 3 is an enlarged top plan of the signal controlling mechanism constituting the main features of my invention taken in connection with the line circuit. Fig. 4 is a sectional view of the same apparatus taken on line 4—4 Fig. 3. Fig. 5 is a detail sectional view of the manually operating means for breaking the connection between the chronometer controlled actuator and signal operating mechanism taken on line 5—5 Fig. 3. Fig. 6 is an enlarged elevation of a portion of the clock train showing its connection with the actuator which controls the signaling apparatus.

This apparatus is adapted to be used more particularly in connection with a telephone subscriber's circuit as —A— connecting the subscriber's telephone instruments —B— with a central station —D— in which is located the call lamp signal —*c*— and cord circuit —*d*—, the electrical parts of the apparatus being connected by wires —1— across the main line circuit —A— in proximity to the subscriber's telephone instruments —B— but between said instruments and central station so as not to interfere in any way with the free operation of the telephone system in the usual manner and at the same time permitting the same signals at the central station to be utilized for emergency calls as will be hereinafter more fully described.

The operation of the signaling apparatus is chronometer controlled and for this purpose I have shown an ordinary clock having the usual dial —2— and clock train —3— which serves the double purpose of indicating the time and is also utilized to operate a rotary cam —4— constituting the primary actuator for the signaling apparatus. This cam or actuator —4— is preferably secured to one of the spindles of the clock train —3—, as for example, the minute spindle so as to make one complete revolution each hour and in the present instance it is shown as provided with a single cam tooth —5— whereby the signal controlling apparatus will be set in motion at the end of such hour unless prevented from doing so by the mechanism which forms a part of the subject matter of my present invention. It is evident, however, that this rotary actuator —4— may be connected to any other part of the clock train so as to make one revolution at any other predetermined interval of time or it may be provided with any number of cam teeth —5— spaced equi-distant apart

circumferentially so as to cause the operation of the signal controlling apparatus at shorter intervals of time, as for example, if four of these cam teeth were employed spaced in the manner mentioned, the signal controlling apparatus would be brought into action at each quarter hour.

In large factories, mercantile houses, banks and other places where it is customary to employ night and day watchmen as a precaution against burglaries and other malicious interference with the general conduct of the business, the watchman is often required to make the rounds of inspection of the building at regular predetermined intervals of time and the apparatus forming the subject matter of my present invention is designed not only to protect the owners of the building or business interests against unreliable watchmen but also to protect the watchmen against malicious interference with their regular duties of inspection by automatically and quickly causing the emergency alarm to be sent in to the central station for transmission to the police station for police service to ascertain the cause of the inspector's inability to attend to such duties. In order that these objects may be carried out, one or more of these instruments or apparatus may be placed in different parts of the building as may be required by the magnitude of the business and one of the duties of the inspector or watchman is to visit such parts of the building at regular predetermined intervals and at the proper time operate a part of such instrument which will prevent the operation of the signal by the action of the chronometer. For this purpose I have provided a movable connection as —6— between the actuator —5— and signal controlling apparatus hereinafter described so that the connection between the actuator and such apparatus may be easily and quickly broken at the proper time or just before the point of the cam tooth —5— is in position for transmitting motion to the apparatus through the medium of the connection —6—. The means herein shown for breaking this connection or throwing the connection —6— from its operative position consists of a push rod —7— guided in suitable bearings —8— and having its outer end extending to the outside of an inclosing case —C— for the clock and other apparatus and provided with a hand piece —9— which is always accessible, the remaining parts of the push rod being concealed within the case.

The connection —6— preferably consists of a spring arm having one end slidably interlocked with a part of a main supporting frame —10— for endwise movement thereon and its other end movable axially of and normally in the same plane as the actuator —4— in close relation to its periphery so as to be operated endwise by contact of the cam tooth —5— therewith.

The inspector's duty is to be present to operate the plunger —7— just before the cam tooth —5— assumes a position to operate the sliding connection —6— and for this purpose the inner end —11— of the plunger is tapered or wedge-shape to ride against and depress the spring arm —6— from its normal position and also to engage a shoulder —12— thereon to assure the return of the spring arm endwise. This operation allows the cam tooth to override upon and to hold the adjacent end of the spring arm depressed while passing across the same, thereby allowing the retraction of the plunger by a spring —13— and permitting the inspector to continue his round of inspection without further delay, the spring —6— returning to its normal position as soon as the cam tooth —5— is moved out of alinement therewith. This connection or bar —6— constitutes what may be termed a locking bolt for normally locking the motor-actuated signal-controlling apparatus from movement and for this purpose is provided with an extension —14— having a loop —15— normally interlocking with an oscillatory locking dog —16—, said extension —14— and bar —16— being held in their locking position by a comparatively light coil spring —17— as clearly shown in Figs. 3 and 5.

The signal controlling apparatus is actuated by a spring motor —18— which is governed by an escapement —19— acting upon an escapement wheel —20— which is connected to the motor by a suitable gear train —21—, the escapement pawl being mounted upon a rocking spindle —22— to which is secured an oscillatory fan blade —23— for additionally governing the action of the motor. This fan blade, which may be also termed a rock arm, and one end of the oscillatory locking member —16— travel in intersecting paths and are therefore adapted to engage one with the other so that when the pawl —16— is disengaged from the locking bolt —14—, it will be oscillated by the fan blade or rock arm —23—, while on the other hand if the pawl —16— is interlocked with the bolt —14— or otherwise held from oscillatory movement, it will act as a stop to retard the action of the motor and other mechanisms controlled thereby.

The pawl —16— is automatically or gradually forced into interlocking engagement with the locking bolt —14— by suitable connections with the motor after the latter is wholly or partially run down or uncoiled, and for this purpose I provide a rock shaft or spindle —24— with a pair of radially projecting arms —25— and —26— one of

which as the arm —25— is spring tensioned against the periphery of the outer helix of the coil by a comparatively light spring —27— while the other arm —26— is slidably engaged with one end of a lever —28— as best seen in Figs. 3 and 4. This lever —28— is fulcrumed at —29— to the main supporting frame —10— and is provided with a shoulder —30— adapted to engage a coating shoulder —31— on the pawl —16— near its pivot as —32— as the coiled spring —18— expands in the operation of the mechanism connected thereto, thereby forcing the pawl —16— into interlocking engagement with the locking bolt —14— to stop further operation of the motor until released by the operation of the locking bolt —14— through the medium of the actuating cam —4—.

The end of the pawl —16— which contacts with the governing blade or arm —23— is also utilized when released by the shaft or the lock bolt —14— from its locking position to operate a normally open circuit closer —33— which together with an additional circuit closer —34— and subscriber's transmitter —35— are connected in series to the main line circuit —A— through the medium of the wires —1— as shown diagrammatically in Fig. 2.

The circuit closer —33— is provided with a spring contact arm —36— having at least a portion thereof disposed in an inclined plane in close proximity to and adapted to contact with the underside of the adjacent portion of the pawl —16— so that when said pawl is oscillated in one direction by the governing blade —23—, it will ride up the incline of and depress the arm —36— into contact with its coacting terminal as —37—, thereby closing this portion of the circuit. The other circuit closer —34— is also normally open but is intermittingly closed by a toothed wheel —38— which is secured to one of the spindles of the clock train —21— as best seen in Figs. 3 and 4.

The teeth of the wheel —38— may be arranged in groups or sets of different numbers each as for example, two, three and four or any other numbers which preferably increase in a direction opposite to that of the direction of rotation, each group being spaced apart from those of the next adjacent group a distance somewhat greater than the gap between the teeth of each group, thereby impressing corresponding pulsations upon the line with definite pauses between each number of pulsations. The current impulses thus impressed upon the line energizes one or more of the signal lamps at the central station to produce corresponding flashes which are readily distinguished by the operator as an emergency call for police protection which is immediately transmitted by such operator to the police station. It is to be understood, however, that this emergency call is only produced by neglect or failure of the inspector to perform his necessary duty in breaking the connection between the actuator —4— and signal controlling apparatus at the proper time.

Associated with and in close proximity to the mouth of the transmitter —35— is a sound producing device consisting, in this instance, of a bell —40— having a vibratory hammer connected to the rock shaft or spindle of the escapement pawl —19— so as to vibrate therewith for producing a ringing sound which is transmitted over the subscriber's line circuit through the transmitter —35— and to the receiver of the central operator or to that of the police station or other subscriber which may be in listening communication with the calling subscriber's instruments. This bell is preferably incased in the same housing with the clock mechanism and other parts of the apparatus where it is protected from dust and other foreign matter which might interfere with the operation of such mechanism and at the same time muffling or confining the sound within the box and rendering its transmission more effective through the transmitter and line circuit.

The spring motor —18— is shown in Fig. 3 as unwound or expanded sufficiently to force the lever —28— to its locking position against the shoulder —31— of the locking member —16— in which position the locking member —16— is held by the locking bolt —14— as long as the inspector performs regularly the operation of breaking the connection between the actuator —4— and sliding bar —6— by forcing the latter out of the path of movement of the cam tooth —5— through the operation of the plunger —7— at the proper time.

Assuming now that the spring motor —18— has been wound up and thereby contracted in order to place it in condition for operating the apparatus, thus allowing the arm —25— to be drawn toward the axis of the motor by the spring —27—, the other arm —26— will be simultaneously shifted outwardly to rock the lever —28— from its locking position by moving the pin —30— away from the shoulder —31—, whereupon the locking lever —16— will be free to operate when released by the locking bolt —14—. Now, if for any reason the inspector should fail to operate the plunger —7— to force the free end of the spring arm —6— from its operative position while the cam tooth —5— is passing the adjacent end of said spring arm, the latter will be operated endwise against the action of the spring —17— to force the locking bolt —14— from holding engagement with the lever —16—, thereby freeing the lever —16— and permitting the action of the motor —18— by

which operation the locking lever —16— is forced from its locking position by the vibratory action of the fan blade or escapement arm —23—. As soon as the lever —16— is shifted from its locking position by the arm —23—, its inner end is forced against the inclined surface of the terminal —36—, thereby contacting said terminal with the terminal —37— to close this portion of the calling circuit and at the same time the toothed wheel begins to rotate to cause its teeth to ride against and intermittingly close the circuit closer —34—, thus impressing current impulses upon the subscriber's line circuit and through the central signal lamp —*c*— to indicate to the central operator that this subscriber needs police service, which information is immediately transmitted by said operator to the police station so that the police may immediately call at this subscriber's station to ascertain the cause of the alarm.

While the flash signals are being sent in through the lamp —*c*—, audible signals are simultaneously sent in to the central operator's receiver by means of the bell —40— and transmitter —35— or if the police office is placed in communication with that particular subscriber's station, these audible signals may also be heard through the receiver at the police station.

The motor —18— will continue to operate the apparatus to send in the lamp and bell signals until it has unwound or spent its force or rather until it has operated the arms —25— and —26— by its expansion sufficiently to return the locking lever —28— to its locking position against the shoulder —31—, thereby forcing the lever —16— into interlocking engagement with the locking bolt —14— and also into holding engagement with the fan blade or arm —23— to stop further action of the motor.

It is now clear from the foregoing description that the operation of sending in the signals to the central station is entirely automatic and will continue until the action of the motor is automatically stopped by its own expansion through the medium of the locking levers —28— and —16— coacting with the escapement arm —23— and also that when the lever —16— is thus forced to its locking position, it is automatically held in such position until again released by the action of the clock controlled actuator —4—.

If for any reason the spring —17— should fail to return the locking member —6— to its normal position for contact with the periphery of the actuator —4—, its return may be positively effected by the operation of the tapering end of the push rod —7— which rides against the shoulder —12— and at the same time depresses the adjacent end of the spring.

What I claim is:

1. In combination with a normally open subscriber's line circuit of a telephone exchange system, a branch circuit connected across the line circuit, a normally open electric switch connected in the branch circuit, a circuit closer connected to the branch circuit, a motor and means actuated thereby for operating the circuit closer intermittingly to impress current impulses upon the line circuit when the switch is closed, means normally holding the motor against action, and clock actuating means for releasing the holding means, said holding means having a movable member actuated by the motor when released for closing the switch.

2. In combination with a normally open subscriber's line circuit of a telephone exchange system, a branch circuit connected across the line circuit and having a normally open electric switch therein, a circuit closer connected to the branch circuit, a spring motor and means actuated thereby for operating the circuit closer to impress current impulses on the line when the switch is closed, means normally holding the motor against action, clock actuated means for releasing the holding means and permitting the action of the motor, said holding means having a portion thereof operated by the motor to close the switch, and means actuated by the motor for restoring the holding means to its normal position for stopping the motor.

3. In combination with a subscriber's line circuit of a telephone exchange system, a branch circuit connected across the line circuit, a transmitter connected to the branch circuit, a spring motor, means normally holding the motor against action, clock actuated means for releasing the holding means and permitting the action of the motor, and a sound producing device actuated by the motor for operating the transmitter.

4. In combination with a subscriber's line circuit of a telephone exchange system, a branch circuit connected across the line circuit and having a normally open self-opening switch therein, a circuit closer connected to the branch circuit, a spring motor and means actuated thereby for operating the circuit closer, holding means normally preventing the operation of the motor and including a movable member, and clock actuated means for releasing the holding means to permit the operation of the motor, said movable member being actuated by the motor to close the switch.

5. In combination with a subscriber's line circuit of a telephone exchange system, a branch circuit connected across the line circuit and having a normally open self-opening switch therein, a circuit closer connected to the branch circuit, a spring motor

and means actuated thereby for operating the circuit closer, holding means normally preventing the operation of the motor and including a movable member, clock actuated means for releasing the holding means to permit the operation of the motor, said movable member being actuated by the motor to close the switch, and means actuated by the motor spring for restoring the holding means to its normal position.

6. In combination with a normally open subscriber's line circuit of a telephone exchange system, a branch circuit connected across the line circuit, a circuit closer connected in the branch circuit, a self-acting motor for operating the circuit closer, a governor controlling the speed of the motor, a holding device coacting with the governor to normally hold the motor against action, a chronometer and means actuated thereby for releasing the holding device at regular predetermined intervals.

7. In combination with a normally open subscriber's line circuit of a telephone exchange system, a branch circuit connected across the line circuit, a circuit closer connected in the branch circuit, a self-acting motor for operating the circuit closer, a governor controlling the speed of the motor, a holding device coacting with the governor to normally hold the motor against action, a chronometer and means actuated thereby for releasing the holding device at regular predetermined intervals, and means actuated by the motor for restoring the holding device to its holding position.

8. In combination with a normally open subscriber's line circuit of a telephone exchange system, a branch circuit connected across the line circuit, a circuit closer connected in the branch circuit, a self-acting motor for operating the circuit closer, a governor controlling the speed of the motor, a holding device coacting with the governor to normally hold the motor against action, a chronometer and means actuated thereby for releasing the holding device at regular predetermined intervals, means actuated by the motor for restoring the holding device to its holding position, and means operable at will for displacing a part of the chronometer actuated means to prevent the release of the holding device by the chronometer.

9. In a chronometer controlled signaling device for telephone exchange systems, in combination with a subscriber's line circuit, a branch circuit connected across the line circuit, a circuit closer, an electric switch, and a telephone transmitter all connected in the branch circuit, a self-acting spring motor, and means actuated thereby for operating the circuit closer, means including a movable detent for normally holding the motor against action, a clock actuated cam for releasing the holding means, means operable at will for displacing the part of the holding means which is adapted to be engaged by the cam to prevent the release of the motor holding means by said cam, and a sound producing device actuated by the motor when the holding means is released for operating the transmitter.

10. In a chronometer controlled signaling device for telephone exchange systems, in combination with a subscriber's line circuit, a branch circuit connected across the line circuit, a circuit closer, an electric switch, and a telephone transmitter all connected in the branch circuit, a self-acting spring motor, and means actuated thereby for operating the circuit closer, means including a movable detent for normally holding the motor against action, a clock actuated cam for releasing the holding means, means operable at will for displacing the part of the holding means which is adapted to be engaged by the cam to prevent the release of the motor holding means by said cam, a sound producing device actuated by the motor when the holding means is released for operating the transmitter, and means actuated by the motor spring during the operation of the motor for restoring the holding means to its holding position.

In witness whereof I have hereunto set my hand on this 11th day of February 1911.

IRVING D. FELLOWS.

Witnesses:

H. E. CHASE,

E. F. SPEARING.