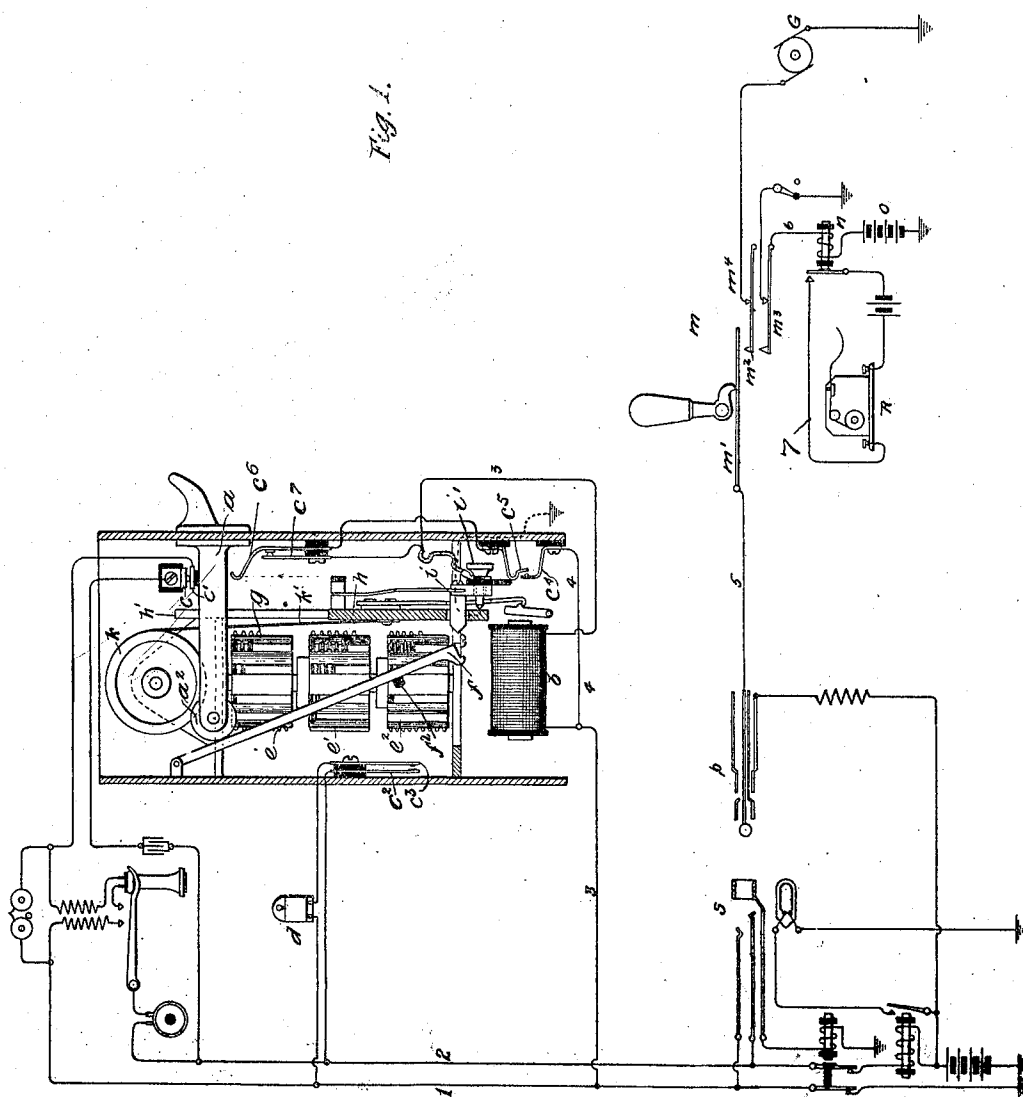


No. 837,951.

PATENTED DEC. 11, 1906.

J. J. O'CONNELL.
TELEPHONE CALL REGISTER.
APPLICATION FILED JULY 19, 1902.

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

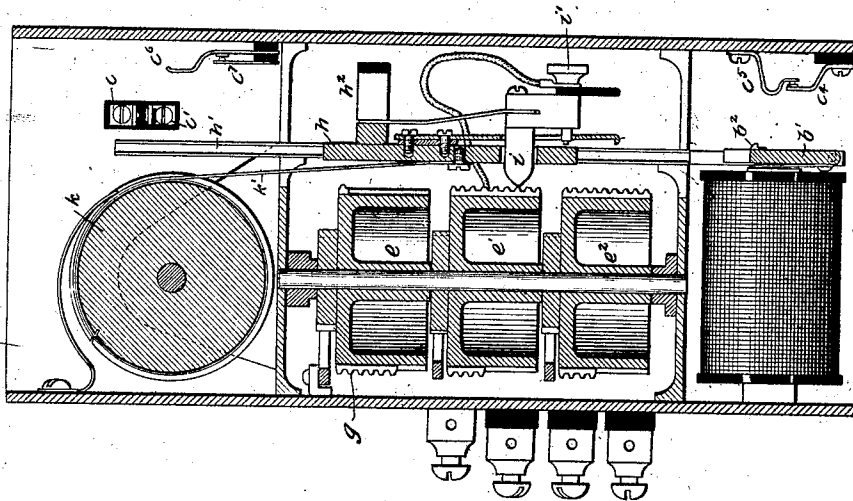


Fig. 3.

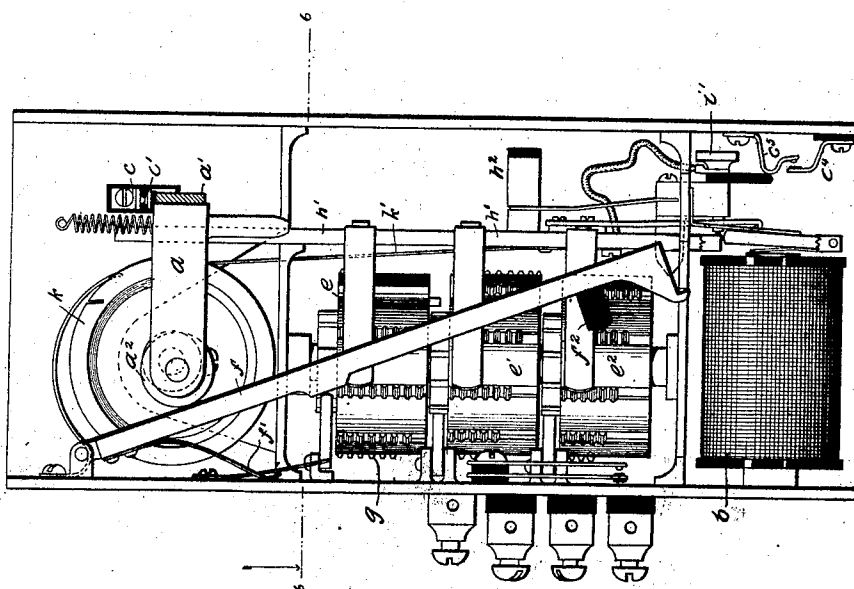


Fig. 2.

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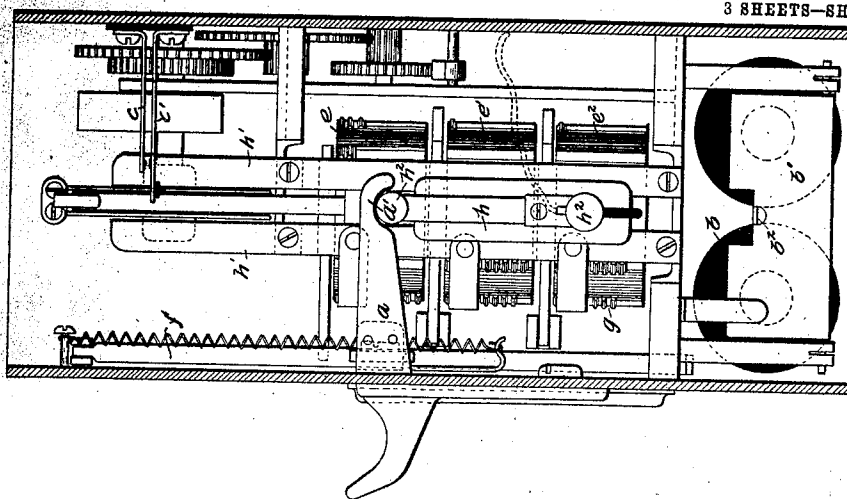


Fig. 5.

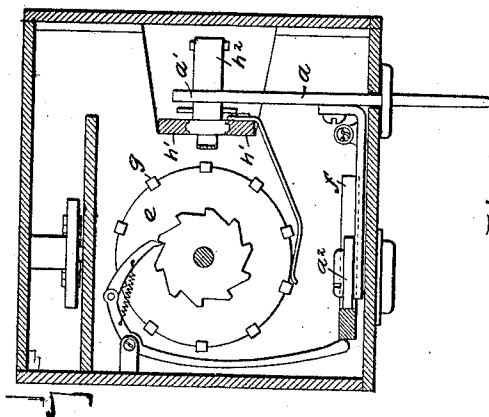


Fig. 6.

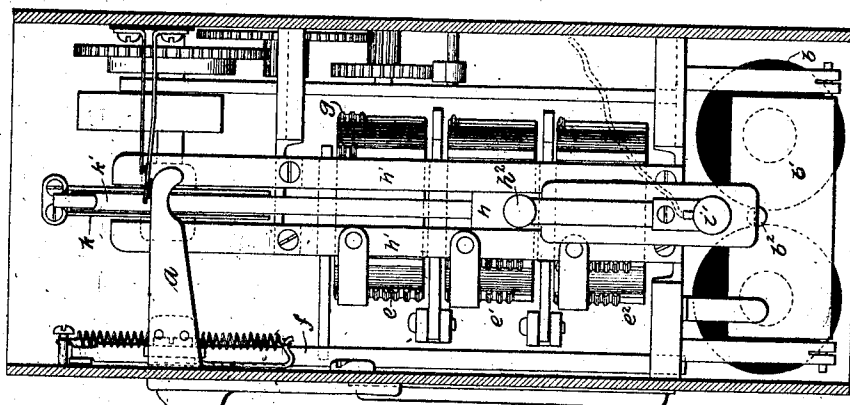


Fig. 4.

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UNITED STATES PATENT OFFICE.

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TELEPHONE CALL-REGISTER.

No. 837,951.

Specification of Letters Patent.

Patented Dec. 11, 1906.

Application filed July 19, 1902. Serial No. 118,164.

To all whom it may concern:

Be it known that I, JOSEPH J. O'CONNELL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Telephone Call-Registers, (Case No. 8,) of which the following is a full, clear, concise, and exact description.

My invention relates to an automatic register system especially adapted for telephone-exchanges, the object being in general to provide improved apparatus whereby the total number of calls registered upon a subscriber's service-meter at a substation may be quickly and automatically read when desired at the central office.

In accordance with my invention a counting-train is provided at the substation to register each connection up to any desired number. The counting-train may be composed of a series of wheels or cylinders suitably geared together, one wheel counting units, another tens, and so on, and each wheel of this counting-train may cooperate with a traveling transmitter mechanism, which is connected to control a circuit containing an indicating or recording device. When the transmitting mechanism is set in operation, the number registered by the counting-train is transmitted over the circuit and read or recorded at the distant station. For example, if five hundred and forty-seven calls have been registered on the counting-train the transmitter might produce in the circuit first five variations or signal impulses, then after a short interval four, and after another interval seven, the device in the circuit at the distant point being responsive to each vibration or impulse. The counting-train may be arranged to be advanced step by step by a suitable lever to be actuated manually by the subscriber when each connection is had or each call made, and the transmitter mechanism is preferably set in the act of registering the first (or any) call and released or put in operation through the agency of an electromagnet controlled from the central office, so that a reading may be had at any time after the first call without requiring the assistance of the subscriber.

A feature of my invention of considerable value is the construction by which the operation of the transmitter is made independent of the movement of the counting device or

call-register, so that repeated readings may be taken without changing the condition of the call-register. A defect in former systems has been that in transmitting the number of calls registered at the substation the counting-wheel was set back to zero, and if the line or recording mechanism were out of order or the signals not detected for any reason the record of calls was entirely lost. A further objection to prior systems has been that a separate impulse or signal had to be transmitted for every call registered, so that the correct transmission of large numbers was attended by considerable difficulty.

I will describe my invention more particularly by reference to the accompanying drawings, and the features or combinations which I regard as novel will be set forth in the appended claims.

Figure 1 is a diagram illustrating a subscriber's telephone-line extending from a substation to the usual connection-terminal or spring-jack and line-signaling apparatus at a central office, the substation being equipped with my improved call-register and the central office with means for taking the reading thereof. Fig. 2 is an elevation of the registering device at the substation. Fig. 3 is a vertical sectional view thereof. Fig. 4 is an elevation at right angles to Fig. 3. Fig. 5 is a similar view showing the manual actuating-lever in its depressed position. Fig. 6 is a cross-sectional view on line 6 6 of Fig. 2.

The same characters of reference designate the same parts wherever they are shown.

The telephone-line extends in two limbs from the usual substation-telephone set to a spring-jack terminal and line-signaling apparatus at a central office. The equipment shown is such as is well known in the art as that of the central battery relay-switchboard system and needs no detailed description.

The substation is provided with a service-meter or connection-register which is designed for manual operation, the actuating slide-bar *a* thereof being adapted to be pulled down by the subscriber to register the connection. The time when this act is to be performed depends upon the policy of the telephone company. In some exchanges a charge is made for each call that is answered by the central-office operator. In others the charge will be made only when the desired connection is obtained or when the called

party answers. In the system shown the operator may require the subscriber to actuate his service-meter before the desired connection is completed and is assured of his compliance by hearing in her telephone the characteristic sound of a buzzer, which can only be produced by the operation of the service-meter.

The service-meter proper—that is, the counting device upon which each connection is registered by the pulling down of the actuating slide-bar *a*—comprises a train of three counting wheels or cylinders *e e' e²*, arranged to be rotated step by step, ten steps being necessary to a complete rotation of each cylinder. The cylinders *e* and *e'* are connected by pin-and-ratchet movements in a well-known manner with cylinders *e'* and *e²*, respectively, so that when one cylinder completes a revolution the next cylinder will be advanced one step—that is, one-tenth of a revolution. A pivoted actuating-lever *f* is connected by a pawl and ratchet to rotate the cylinder *e* through one step for each complete oscillation of the lever. The manually-operated slide-bar *a* is provided with a roller *a²*, which engages the lever *f* to move the same and actuate the counting-train when the slide-bar is pulled down. As the slide-bar returns the lever *f* is moved back by a spring *f'*, completing its oscillation. Two contacts *c c'*, controlling the telephone-circuit, are controlled by the slide-bar *a*. These contacts are normally closed together to complete the telephone-circuit, but are separated from one another to open the circuit when the slide-bar is moved down in making a registration. The buzzer *d* is included in a bridge of the line conductors 1 2, controlled by normally separated contact-springs *c² c³*. When the actuating-lever *f* of the counting-train reaches the limit of its movement in registering a call, a stud *f²*, carried thereby, strikes the spring *c²* and moves it into contact with spring *c³*, thus closing the bridge containing the buzzer and so transmitting a signal over the line to indicate the operation of the counting-train. The pulling down of slide-bar *a*, besides advancing the counting-train, serves also to set a transmitter mechanism with which said counting-train coöperates and of which it, in effect, forms a part. Each of the cylinders *e e' e²* of the counting-train is provided with a series of ten ribs *g*, which extend longitudinally, as shown, all except one being toothed. One rib has one tooth, the next two teeth, the next three, and so on, the ninth having nine teeth and the tenth being simply a blank of the same thickness as the toothed bars.

A traveling transmitter-carriage *h* is arranged to slide longitudinally in suitable guides *h' h'* along the three cylinders of the counting-train to take the reading thereof. Said carriage is provided with a spring-

mounted movable contact-arm *i*, which is adapted to engage the toothed ribs *g* of the three cylinders which are aligned under the path of the carriage, the particular rib of a given cylinder which is engaged being of course dependent upon the position to which that cylinder has been rotated. In the normal or initial positions of the cylinders the three blank ribs would be aligned in the path of the carriage. The arm *i* carries an insulated contact-stud *i'*, which forms the terminal of wire 3 and normally rests in contact with its anvil, which is mounted directly upon the grounded metallic framework of the carriage *h*. When the carriage is moved along the guideway, the arm *i* as it passes over a tooth upon one of the ribs *g* is raised and the contact of stud *i'* with its anvil is broken, thus interrupting the circuit controlled by said contact. The carriage *h* is connected by a metal ribbon *k'* with a drum-wheel *k*, which is arranged to be rotated by a spring-driven gear-train, so that the carriage is automatically returned to the upper end of its journey when released after having been pulled to the lower end. To set the carriage, it is provided with a projecting pin *h²*, which is positioned to be engaged by a hook *a'*, carried by the slide-bar *a*, so that when the slide-bar is pulled down to effect a registration upon the counting-train the transmitter-carriage *h* is also carried down, winding up the spring which is attached to the drum-wheel *k*, and thus setting the transmitter mechanism. At the lower end of its journey the transmitter-carriage *h* is held by a detent *b²*, carried by the armature *b'* of a magnet *b*. This magnet is included in a conductor 3, extending from the limb 1 of the telephone-line to the contact-stud *i'*, and thence to earth through the framework of the apparatus. A shunt 4 is provided around the magnet controlled by the contacts *c⁴ c⁵* and *c⁶ c⁷*, interposed serially in said shunt. When the carriage is at the upper end of its journey, the stud *h²* opens contacts *c⁶ c⁷*, and when at the bottom the contacts *c⁴ c⁵* are opened; but while the carriage is making its journey the shunt is closed, so that the resistance of the magnet *b*, which may be two thousand ohms, is removed from the circuit.

At the central office the operator who is to take the readings of the subscribers' service-meters is provided with a special plug *p*, adapted for insertion in the spring-jack *s* of any line and having a key *m* associated therewith, which is arranged to complete the circuit through a source of current and a responsive device. The key *m* has three switch-springs *m' m² m³*. Spring *m'* is connected by conductor 5 with the tip of the plug *p*, and spring *m³* is connected to earth by wire 6, which includes a battery *o* and relay *n*. The switch-spring *m²* is normally in contact with an anvil *m⁴*, which is connected to a grounded

generator G, suitable for exciting the magnet *b*. When the key *m* is depressed, the switch-spring *m'* is first brought into contact with spring *m²*, throwing current from generator G to line, and then as the spring moves on it carries spring *m²* away from the anvil *m⁴* and over against spring *m³*, so establishing the circuit of battery *o* through the relay *n* and out over the limb 1 of the subscriber's line, which is controlled at contact *i'*. The relay *n* controls a local circuit, including a recorder R, which may be an ordinary fire-alarm-telegraph register.

The operation of the system is briefly as follows: For each use of the telephone the subscriber is required to pull down the actuating slide-bar *a* of his service-meter. The first movement sets the transmitter-carriage *h* and registers the connection upon the counting-train. Subsequent actuations of the slide-bar *a* simply actuate the counting-train, the transmitter remaining set until released. Whenever it is desired to take the reading of the subscriber's register, the operator inserts the special plug *p* in the spring-jack *s* of the line in question and depresses the key *m*. The first movement of this key connects the generator G with the line long enough to energize magnet *b* and release the transmitter-carriage *h*, and then cuts off the generator, leaving a circuit of battery *o* through relay *n* to the conductor 1 of the line and through branch 3, controlled by contact *i'* to earth. The magnet *b* is shunted by conductor 4 at contacts *c⁶ c⁷* as soon as the transmitter-carriage begins its journey. As the contact-arm *i* travels over the toothed ribs *g* the circuit is alternately broken and made at contact *i'*, thus "ticking off" the reading of the counting-train. Thus if five hundred and seven calls had been made up to the time the reading was taken the contact-arm would find in its path first the five-toothed rib of cylinder *e²* next the long blank rib of cylinder *e'*, and finally the seven-toothed rib of cylinder *e*. Thus the ground-circuit would be first interrupted five times, then closed for an interval as the contact-arm was passing from one cylinder to another, then opened for a long space as the contact-arm passed over the blank rib of cylinder *e'*, then closed for another interval as the contact-arm passed from cylinder *e'* to cylinder *e*, then interrupted seven times as the contact-arm passed over the seven-toothed rib of cylinder *e*, and finally closed again as the transmitter reached the end of its journey. Each time the circuit is opened the relay *n* responds by closing its local circuit 7, which includes the recorder R, so that the reading of the subscriber's register is thus automatically taken and recorded without requiring any assistance from him. It is to be noted, furthermore, that the condition of the subscriber's register or toll-counter has not been changed by taking the

reading thereof—that is, it has not been set back to zero. Taking the reading at the central office does not, therefore, involve the destruction of the record already made at the subscriber's station.

Having thus described my invention, I claim as new, and desire to secure by Letters Patent, the following:

1. The combination with a traveling transmitter mechanism, of a counting-train comprising rotatable cylinders having teeth adapted to be introduced successively into the path of said transmitter mechanism and cooperating therewith, and a circuit including a responsive device controlled by said transmitter mechanism, whereby the number registered upon the train of counting-cylinders is transmitted to said responsive device, as described.

2. The combination with a counting-train *e e' e²* and a lever for actuating the same, of a transmitter-arm controlling a signal-circuit and mechanism for moving the said arm along the counting-train, and portions *g g* carried by the counting-train adapted to be engaged by said arm to determine the signal transmitted, whereby the reading of said counting-train may be taken at a distant point, as set forth.

3. The combination with a telephone-line, of a connection-register at the substation thereof comprising a train of counting-cylinders *e e' e²*, each of said cylinders having teeth thereon for indicating the number registered, an actuating-lever for the counting-train, a traveling transmitter-arm adapted to move over the teeth of said cylinders and to cooperate therewith in the control of the circuit, means for setting the transmitter-arm at one end of its journey in the actuation of the counting-train, a spring-driven gear-train for moving the transmitter-arm, a detent adapted to hold the transmitter-arm against movement by said gear-train, a releasing-magnet *b* in the circuit controlled by said transmitter-arm, adapted when excited to bring about the release of the arm, a key at a distant station controlling the circuit, a source of special current G for energizing the releasing-magnet temporarily applied to the circuit by said key, and another source of current *o* and a responsive device subsequently connected in the circuit by said key, whereby the reading of the counting-train may be taken by actuating said key.

4. In combination, a series of tally-wheels each provided with a circumferential series of contact-surfaces representing characters, a traverser relatively movable across said wheels, an electric circuit including said traverser, means operating to make and break said circuit each time said traverser passes over one of said contact-surfaces, means for stepping the tally-wheels forward, and means for actuating the traverser.

5. In combination, a series of tally-wheels each provided with a circumferentially-disposed series of contact-surfaces corresponding to the digits and arranged in groups, each group extending longitudinally of the series of wheels, transfer mechanism for properly actuating each tally-wheel except the first from the next of lower order, a ratchet mechanism for stepping forward the units-tally wheel, an electrical signaling device operatively connected with said ratchet mechanism and whereby a signal is given each time the ratchet mechanism is operated, a traversing contact device guided to reciprocate across the face of said series of tally-wheels to take a tactual reading from the contact-surfaces thereof, and an electric circuit operatively connected with said traversing device and alternately opened and closed during the traverse of the latter a number of times equal to the number of units in the several groups in longitudinal alinement at the time of reading.

6. In a recording device for measured telephone service, the combination with a register at the substation comprising a train of counting-cylinders, each of said cylinders having teeth thereon for indicating the number registered, an actuating-lever for said counting-train and a transmitting device adapted to travel over the teeth of said cylinders in a direction parallel to the axes of said cylinders, an electrically-actuated recording

device at the central office, electrical connections between the recorder and the register, and means actuated solely from the central office for bringing said transmitting device into operation; whereby the number indicated on the register may be recorded at the central office without resetting the register.

7. A recording apparatus for measured telephone service comprising a registering device at the subscriber's telephone by which the subscriber's calls are severally registered at the time the said calls are made, an electrically-actuated recording device at the central office and electrical connections between said registering and recording devices which are actuated solely at the central office to record at the recording device all the calls indicated by the said registering device, said registering device comprising a train of counting-cylinders, each of said cylinders having teeth thereon for indicating the number registered, an actuating-lever for the counting-train, and a traveling transmitter adapted to move over the teeth of said cylinders and cooperate therewith in the control of the electrical connections, substantially as described.

In witness whereof I hereunto subscribe my name this 19th day of June, A. D. 1902.

JOSEPH J. O'CONNELL.

Witnesses:

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W. N. LEACH.