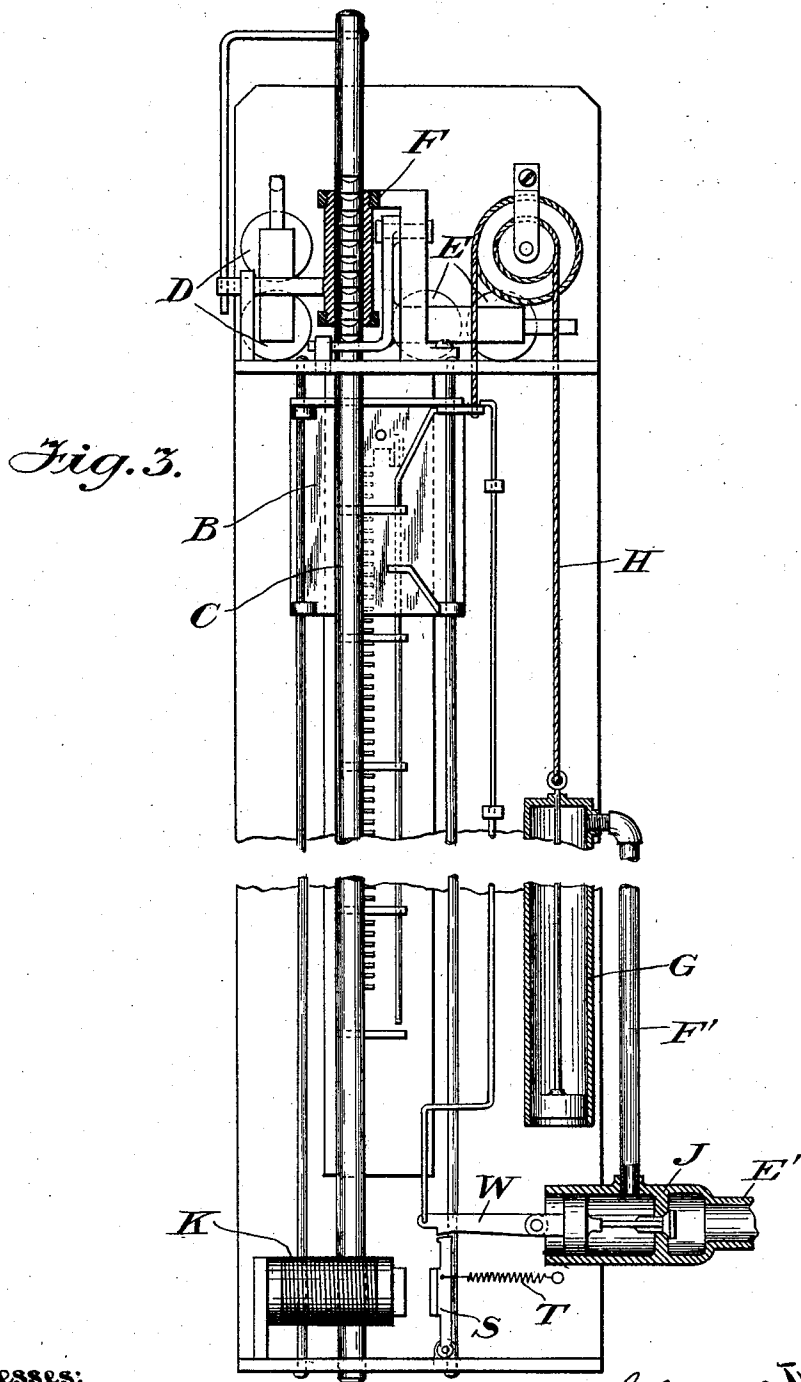


J. J. BROWNRIGG & J. K. NORSTROM.
AUTOMATIC TELEPHONE SYSTEM.

(Application filed Dec. 28, 1900.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses:

O. M. Kernick
C. W. Smith

Inventors,
John J. Brownrigg
John K. Norstrom
By *Maxwell & Barry* Att'ys.

UNITED STATES PATENT OFFICE.

JOHN J. BROWNRIGG AND JOHN K. NORSTROM, OF CHICAGO, ILLINOIS, AS
SIGNORS TO THEMSELVES, JOHN E. NORLING, AND FRANK A. LUND-
QUIST, OF CHICAGO, ILLINOIS, AND PETER O. NORLING, OF GALVA,
ILLINOIS.

AUTOMATIC TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 696,161, dated March 25, 1902.

Application filed December 26, 1900. Serial No. 41,132. (No model.)

To all whom it may concern:

Be it known that we, JOHN J. BROWNRIGG and JOHN K. NORSTROM, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Automatic Telephone Systems, of which the following is a specification.

This invention relates to automatic telephone systems.

The object of the invention is to provide a construction and arrangement for automatic telephone systems which is simple and efficient.

A further object of the invention is to provide means whereby the various switchboards at the central station may be properly actuated automatically by any subscriber to the system, and when actuated the parts return positively and definitely to initial or normal position.

A further object of the invention is to provide a common source of power for the restoration of the parts of the various central-station switches and which can be readily controlled and through which uniform movements of the parts throughout the various switches may be effected and secured.

Other objects of the invention will appear more fully hereinafter.

The invention consists, substantially, in the construction, combination, location, and arrangement, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally pointed out in the appended claims.

Referring to the accompanying drawings, Figure 1 is a view, somewhat in diagram, illustrating a construction and arrangement embodying the principles of our invention. Fig. 2 is a diagram illustrating the electrical action of the apparatus. Fig. 3 is a view, partly in front elevation and partly in vertical section, of a construction of apparatus employed at the central station in connection with the line-wires of a subscriber, showing somewhat more in detail the construction and arrangement of parts for effecting circuit connection automatically from the subscriber's station

to the line-wires of any other subscriber to the system.

In our pending application, Serial No. 37,717, filed November 26, 1900, we have set forth, described, and claimed an automatic telephone apparatus in which circuit connections are completed from any subscriber's station to the line-wires of the other subscribers to the system and wherein such circuit connections are effected automatically by a movable contact operating over the terminal contacts of the line-wires of the various subscribers. In said application we have set forth, described, and claimed an arrangement wherein the movement of said movable contact in one direction is effected by gravity and the movement in the opposite direction being effected positively, the gravity movements of said contact resulting in the completion of the desired circuit connections and the positive or power-actuated movements of said contact accomplishing the restoration of the contact to initial or normal position, electric currents being employed for the purpose merely of controlling such movements and not for the purpose of effecting such movements, the return movement of the movable contact to restore the same to initial or normal position being effected positively, in the particular construction and arrangement disclosed in said application, by means of a plunger operating as a counterweight for the movable contact, said plunger operating in a cylinder and being subjected to the action of a vacuum to effect the desired restoring movements. Provision is also made, as set forth and claimed in said application, for effecting long-feed and in addition short-feed steps or movements of the movable contact in completing circuit connections, the long-feed movements thereof being effected through a rock-shaft carrying stops or pins arranged, when said shaft is rocked, to be alternately brought into supporting relation with respect to a stud or pin or other convenient engaging part of a carrier upon which the contact is mounted. Thus when said rock-shaft is actuated in one direction the carrier is released from one supporting stop or pin on the shaft and is per-

mitted to descend by gravity until it arrives in position to engage and to be supported by the next adjacent pin or support, and when said shaft is rocked in the other direction
 5 said carrier is permitted to descend another step. It is also set forth that the oscillations of said shaft are controlled electrically by means of an electromagnet the circuit of which may be made or broken in any desired
 10 manner and as many times as is necessary to permit the movable contact to move the required number of long-feed steps. It is also set forth that the short-feed or step-by-step movements of the movable contact are effected
 15 by means of a ratchet mechanism through which the rock-shaft is supported and by the actuation of which said shaft is given a step-by-step longitudinal feed, and since the carrier of the movable contact is supported upon
 20 said shaft such step-by-step longitudinal feed imparted to the shaft also imparts a step-by-step movement to the movable contact, the ratchet mechanism being controlled in the movements thereof by an electromagnet
 25 the circuit of which may be made or closed by the subscriber as often as desired to effect the necessary or desired step-by-step feed. In said application is disclosed an arrangement of valve mechanism for controlling
 30 the vacuum through which the movable contact-carrier and the rock-shaft are restored to initial position, said valve mechanism including a valve and a magnet arranged to actuate the valve, the circuit of said magnet
 35 being controllable from the subscriber's station.

In a copending application executed of even date herewith, filed December 26, 1900, and bearing Serial No. 41,133, we have set forth,
 40 described, and claimed certain variations and improvements in the details of construction and arrangement of the apparatus for securing the long-feed and the short or step-by-step
 45 feed movements of the movable contact to effect the desired circuit connections, such movements being effected by gravity and controllable from the subscriber's station and the restoration or return movements of
 50 said parts being effected by air, hydraulic, or other pressure, the supply of such pressure being controllable by a valve, and a magnet is provided for effecting the actuation of said valve.

In an application for patent executed by
 55 us on December 17, 1900, and filed December 26, 1900, Serial No. 41,134, we have set forth and described a calling apparatus for automatic telephone systems adapted for use in
 60 making and breaking the circuits of the magnets which control the long-feed movements of the movable contact and of the magnets which control the short-feed or step-by-step movements of such contact and also the circuit
 65 of the magnet which controls the valve mechanism.

The present invention relates particularly

to automatic telephone systems of the nature set forth in the above-mentioned applications for patents, and has particular reference to the arrangement in a complete system of a
 70 source of power for effecting the restoration of the movable contact and its associated parts to initial or normal position after having been displaced or actuated, whether such
 75 source of power be a vacuum or air, hydraulic, or other pressure.

Referring to the accompanying drawings, A A' A² A³, &c., designate a series of switchboards, one for each subscriber to the system. To each switchboard is led a circuit-terminal
 80 for the line-wire of each of the other subscribers to the system.

B designates a carrier or support for a movable contact arranged to operate over the circuit-terminals of a switchboard. We
 85 have shown a movable contact-carrier and its associated parts applied to only one of the switchboards, the other switchboards shown having such parts omitted; but it is evident that the same construction is to be employed
 90 in each of the switchboards.

C designates the rock-shaft, through which the long-feed and short-feed movements are imparted to the movable contact; D, the magnets for securing the oscillating or rocking
 95 movements of said shaft to permit of the long-feed movements of the movable contact; E, the magnets for imparting the short-feed or step-by-step movements to the shaft C; F, the ratchet mechanism, controlled by magnets
 100 E; G, the cylinder in which operates the piston or counterweight for the contact-carrier B; H, the connection between such piston or counterweight and said carrier; J, the valve-chest for controlling the supply of operating
 105 medium to the cylinder G; K, the magnet for controlling the operation of the valve in the valve-chest.

The construction and arrangement so far set forth and the operation thereof may be
 110 the same as that set forth in the pending application Serial No. 37,717, above mentioned, and is identical with the construction set forth and claimed in our copending application
 115 executed of even date herewith, and in the specific construction and details thereof is not specifically claimed herein, and the operation thereof will be fully understood and
 120 comprehended by persons skilled in the art without further description. The electrical operation, however, is illustrated in diagram
 125 in Fig. 2, wherein L designates a battery, M and N designating circuit-closers. When the circuit-closer M is actuated, circuit is completed from battery L through wire *a*, circuit-closer M, magnet D, wire *b* to battery, thereby
 130 energizing magnet D, and by repeatedly actuating the circuit-closer M to make and break the circuit of magnet D the desired number of times the long-feed gravity movements of carrier B are permitted, as fully set forth in
 our applications above mentioned. By ac-

tuating circuit-closer N circuit is made from battery L through wire *c*; circuit-closer N, magnet E, wire *d* to battery, the making and breaking of the circuit of said magnet E effecting the short-feed or step-by-step gravity movements of the movable contact. The circuit of magnet K may be controlled in any suitable manner. As illustrative of an operative arrangement the circuit-closers M N when closed simultaneously effect the closing of an auxiliary circuit from a battery P through wire *e*, circuit-closing device Q, wire *f*, circuit-closing device R, wire *g*, magnet K, wire *h* to battery P, the circuit-closers Q and R being closed by the closing of the circuits of magnets D E. The closing of the circuit of magnet K effects an actuation of a lever S against the action of a retractile T, and which lever controls the movement of the valve through which the supply of the operating medium to cylinder G is controlled—as, for instance, and by way of illustration, when the circuit of magnet K is completed lever S is attracted thereby against the action of its retractile T, and when the circuit of said magnet is broken the return of said lever under the influence of its retractile engages a hook-latch W, connected to the valve, thereby actuating said valve and opening cylinder G to the influence of the power medium and causing the movable carrier B to be positively and uniformly returned to initial or restored position, the valve being automatically released or actuated when said carrier reaches its normal or returned position—as, for instance, by means of a rod B', suitably connected to latch W and automatically engaged by the carrier when said carrier arrives at its normal or retracted position.

C' designates a reservoir, in which may be maintained a supply of operating medium—such, for instance, as air, gas, hydraulic, or other pressure or a vacuum. Leading from said reservoir is a supply-pipe D', from which is tapped branches E' for each switchboard A A' A² A³, &c., said branch pipes delivering into the valve-chests J. The valve-chests J are in suitable communication in any desired or convenient manner with the cylinders G—as, for instance, by means of the pipes F' in the case where air, gas, hydraulic, or other pressure is employed as the operating medium.

From the foregoing description it will be seen that we provide an exceedingly simple arrangement wherein the movements of the line-wire controlling contact to effect circuit connection from one subscriber's line to the line-wire of any other subscriber to the system are gravity movements and wherein such movable contact is restored to initial or normal position positively and uniformly from a common source of power, each switchboard of the entire system being supplied with the air, gas, hydraulic, or other pressure or op-

erating medium from the same source, and by employing an operating medium of the character and nature referred to we avoid intricate and complex mechanical mechanism and produce an exceedingly simple and inexpensive central-station equipment.

It is obvious that instead of employing a separate switchboard A A' A² A³, &c., for each subscriber one switchboard may be adapted by suitable circuit connections for the use of two or more subscribers to the system; but in practice we prefer to employ a separate switchboard for each subscriber.

Having now set forth the object and nature of our invention and a construction and arrangement embodying the same, what we claim as new and useful and of our joint invention, and desire to secure by Letters Patent of the United States, is—

1. In an automatic telephone system, a plurality of switchboards, a movable contact-carrier for each switchboard, and means for actuating said movable contacts, including a common source of operating medium, a supply-pipe delivering therefrom, and branches tapping said supply-pipe, each branch arranged to supply said medium to a single switchboard, as and for the purpose set forth.

2. In an automatic telephone system, a plurality of switchboards, each including a movable contact, means for independently operating said contacts, a common source of operating medium for each of said switchboards, a branch supply-pipe delivering therefrom to each switchboard, and means for independently controlling the supply of said operating medium in each branch supply-pipe, as and for the purpose set forth.

3. In an automatic telephone system, a plurality of switchboards, a movable contact for each switchboard, and means for actuating the same, said means including a common source of supply of an operating medium, pipes delivering from said common source to each switchboard, as and for the purpose set forth.

4. In an automatic telephone system, a plurality of switchboards, a movable contact for each board, operating mechanism for each contact including a source of pressure common to all of said switchboards, pipes for independently supplying such pressure from said common source to each of said switchboards and means for controlling each supply-pipe, as and for the purpose set forth.

5. In an automatic telephone system, a plurality of switchboards, a movable contact for each board, said contacts being gravity-actuated in one direction, and means for positively restoring said contacts, said means including a source of operating medium common to all of said switchboards, branch supply-pipes delivering therefrom to each switchboard and means for independently controlling the supply of such medium from said

common source to each of said boards through the branch pipes delivering thereto, as and for the purpose set forth.

6. In an automatic telephone system, a plurality of switchboards, a movable contact for each board, said contacts being gravity-actuated for movement in one direction, means for independently controlling the gravity movements of each contact, and means for independently restoring said contacts to initial or normal position, said means including a source of operating medium common to all of the switchboards, and means for independently supplying said operating medium from said common source to each of said switchboards, as and for the purpose set forth.

7. In an automatic telephone system, a plurality of switchboards, a movable contact-carrier for each switchboard, a cylinder and piston associated with each switchboard, connections between said piston and said movable carrier, a source of supply for an operating medium, a supply-pipe delivering therefrom, and branch pipes tapping said supply-pipe and delivering to each cylinder, as and for the purpose set forth.

8. In an automatic telephone system, a plurality of switchboards, each including a movable contact-carrier, means for independently operating each carrier, said means including a cylinder, a source of supply for an operating medium common to all the cylinders, a valve for independently controlling the communication between each cylinder and said

common source of supply, and means for controlling each valve, as and for the purpose set forth. 35

9. In an automatic telephone system, a plurality of switchboards, a movable contact-carrier for each board, a power-cylinder, a piston operating therein for positively moving each carrier in one direction, a source of operating medium common to all of said cylinders, and electrical devices for independently controlling the communication between said common source and each cylinder, as and for the purpose set forth. 40 45

10. In an automatic telephone system, a plurality of switchboards, each provided with a movable contact, each contact being gravity-actuated for movement in one direction, power mechanism for mechanically restoring said contacts to initial position, a common source of power for all the switchboards, a branch supply-pipe delivering from said common source to each of said switchboards and electrical devices for independently controlling said power mechanism for each switchboard, as and for the purpose set forth. 50 55

In witness whereof we have hereunto set our hands, this 20th day of December, 1900, in the presence of the subscribing witnesses. 60

JOHN J. BROWNRIGG.
JOHN K. NORSTROM.

Witnesses:

S. E. DARBY,
E. C. SEMPLE.