

(No Model.)

2 Sheets—Sheet 1.

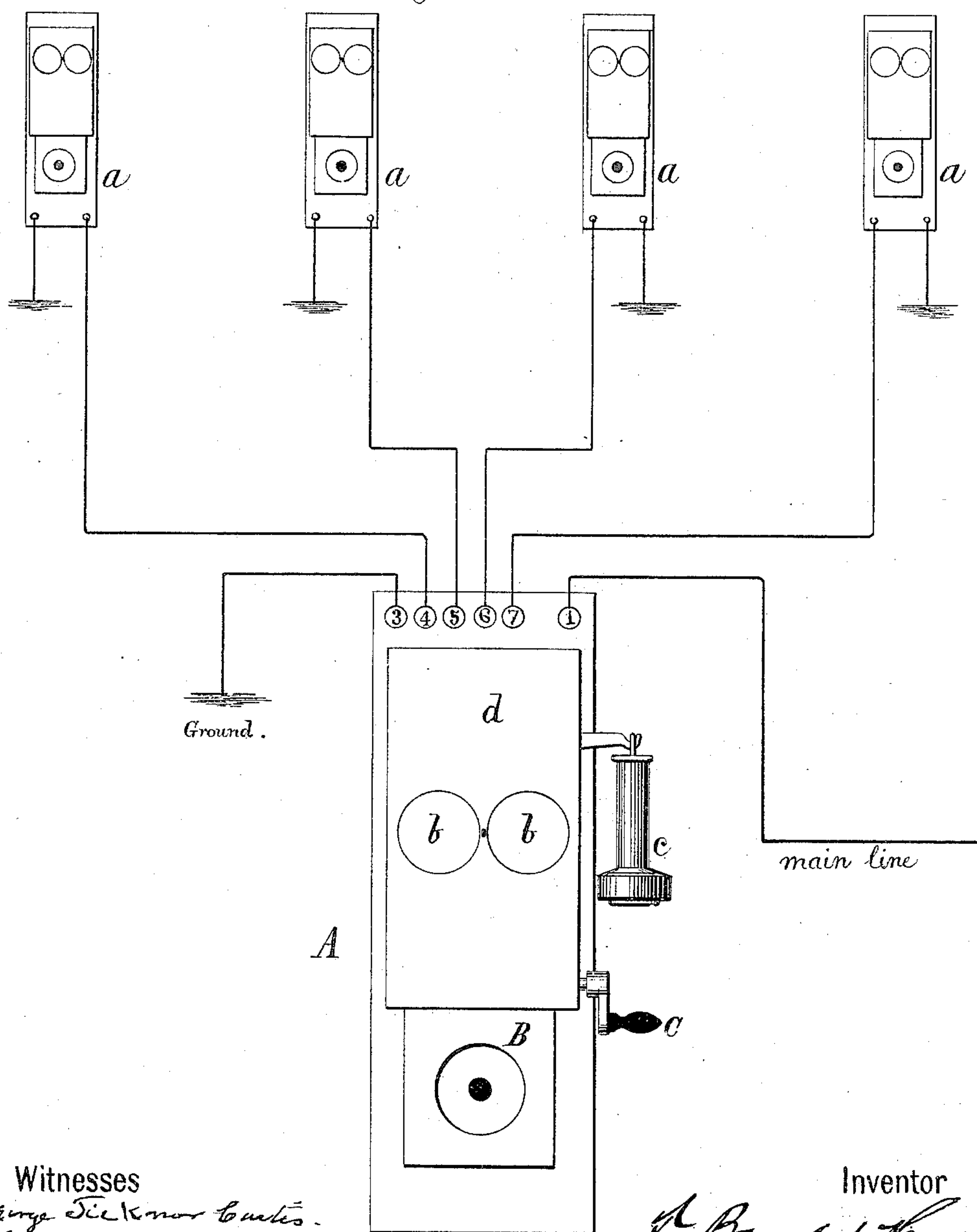
F. B. HERZOG.

TELEPHONE EXCHANGE SYSTEM.

No. 299,070.

Patented May 20, 1884.

*Fig. 1.*



Witnesses  
George Ticknor Curtis.  
G. T. Curtis Jr.

Inventor  
F. B. Herzog  
by Curtis & Crocker  
Attys

(No Model.)

2 Sheets—Sheet 2.

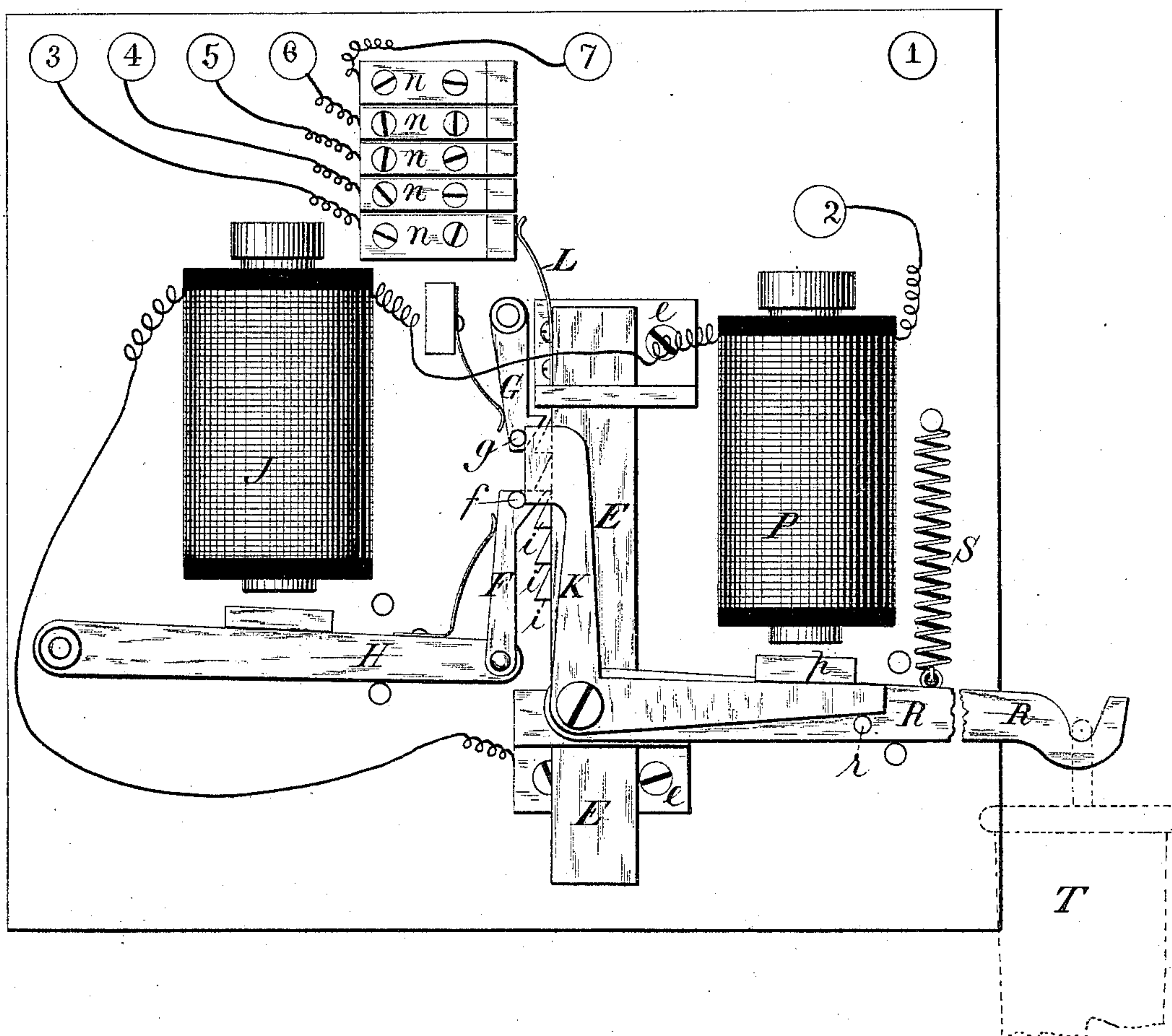
F. B. HERZOG.

TELEPHONE EXCHANGE SYSTEM.

No. 299,070.

Patented May 20, 1884.

Fig. 2.



Witnesses

Geo. S. T. Curtis.  
G. Y. Curtis Jr.

Inventor

F. B. Herzog  
by Curtis & Crocker  
Attys



# UNITED STATES PATENT OFFICE.

F. BENEDICT HERZOG, OF NEW YORK, N. Y.

## TELEPHONE-EXCHANGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 299,070, dated May 20, 1884.

Application filed January 29, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, F. BENEDICT HERZOG, a citizen of the United States, of the city, county, and State of New York, have invented a new and useful Improvement in Telephone-Exchange Systems, of which the following is a specification.

In telephone-exchange systems where a number of would-be subscribers are so situated as to be within easy reach of each other, or within easy reach of an office already provided with telephone-connection to the system—as, for example, would be the case in buildings in which are a number of different offices occupied by persons having no business connection with each other, or in the separate offices of some large business—it is often the case that the occupants of such offices, only wishing to use the telephone occasionally, or for other reasons, are unwilling to pay the full subscription-rent charged by the telephone companies for regular telephone facilities, (which generally comprise a separate circuit and telephone apparatus for each subscriber,) but would be glad to pay only a fractional part of the regular subscription for the privilege of using, in common with a number of other subscribers, what I shall hereinafter call a “common telephone” located somewhere in the same building, or in a place easily accessible therefrom, and connected with the central office of the system in the usual way; but in order to make such a common use of the instrument as convenient and efficient as possible it is extremely desirable that each one of the common subscribers, who would not object to going to the common telephone whenever he himself desires to call up some other person, should have some means of knowing, without having to leave his office and watch the telephone, when he in his turn is called up by any one wishing to converse with him, so that he may then go to the common telephone and answer the call.

To provide such means, and thereby avoid the necessity of having some person constantly watching the common telephone to inform the individual subscribers when they are called, is the general object of my invention.

To this end the main feature of my invention, generally stated, consists in providing

each of such common subscribers' offices with an electrical signaling or calling apparatus for calling up each subscriber, and electrically connecting such apparatus with the main circuit of the common telephone, or with means for operating them directly or indirectly from the central office of the system, so that the central operator there can call up separately any desired one of the common subscribers in his own office, and by that means inform him that he is wanted at the common telephone.

My invention will be understood from the accompanying drawings, in which Figure 1 represents, generally, the common telephone and apparatus and the individual calling devices of several of the common subscribers electrically connected therewith according to my invention. Fig. 2 is a view in elevation of the mechanism I have devised to be placed at the common telephone, and to enable the central operator to call up whichever subscriber he chooses without disturbing the others.

In Fig. 1, A represents the common telephone with its appurtenances. It consists of the usual telephone and signaling or calling apparatus now in common use at subscribers' offices, comprising the call-bells *b b*, the magneto-call C, the transmitting-telephone B, the receiving-telephone *c*, &c. Besides which, there is also placed within the box *d* the switching mechanism shown in Fig. 2. The main line connecting with the main central office of the system is connected to the binding-post 1, from which the circuit leads through the usual automatic switch and calling apparatus in the well-known manner, thence to the binding-post 2, Fig. 2, and thence through the contrivance shown in Fig. 2. Binding-post 3 is connected to ground. Binding-posts 4, 5, 6, and 7 are respectively connected with circuits leading to the calling apparatuses or bells *a a a a*, located in the offices of the respective common subscribers, and constructed to be operated in the same manner as are the bells *b b* of the common telephone.

By means of the switching contrivance shown in Fig. 2, the construction of which I shall presently describe, the central operator can successively connect the main line to the bind-



ing-posts 3, 4, 5, 6, and 7, and thereby either ground this circuit at the common-telephone or connect it to any one of the desired call-bell or local circuits connecting with the subscribers' call-bells *a a a a*. After having put the main circuit in connection with the desired office in this manner, the calling-operator can ring the subscriber's bell in the usual way by the usual pulsatory current, such as that employed to ring the calling apparatus of the common telephone. That one of the common subscribers whose bell has been rung by these means, having thus heard the call, is thereby made aware of the fact that he is wanted at the common telephone, and he can then go there and communicate with the person who wishes to speak to him. According to this plan no apparatus is needed in any of the common subscribers' offices excepting the simplest electric bell, or other call or signal adapted to respond to the current sent over the line from the central office, thereby dispensing with the complicated magneto-call and telephone apparatus with which each subscriber is now provided according to the general practice, and enabling a number of subscribers to be accommodated on a single circuit to the central office, thus avoiding the great expense of a separate circuit to each subscriber, and the great trouble and expense of keeping so many house-top circuits in working order.

Each common subscriber's office might be provided with a telephone to enable him to talk directly with the central office from his own office, and I have, in fact, so represented the subscriber's apparatus in the drawings; but it will readily be seen it is extremely desirable that there should be nothing required at the common subscribers' offices but a simple electric bell or signal of some kind.

The switching contrivance, which is placed within the box *d*, and by which the central operator can connect the main line with any desired subscriber's call-circuit at pleasure, I construct as shown in Fig. 2. *E* is a vertically-sliding metal bar mounted in the fixed guides *e e*, secured to a base, and provided on one side with ratchet-teeth *i i i*, by which it is raised step by step by means of the actuating-pawl *F* and lever *H*, operated by the electro-magnet *J* and the retaining-pawl *G*, the pawls operating to impel the rack step by step in the well-known manner. To the upper end of the bar *E* is attached a spring, *L*, which travels over the ends of the insulated metal blocks *n n n n n*, fixed to the base in the path of the said spring, the space between the blocks being so small that the spring makes electrical connection with the one ahead before breaking connection with the block behind, so that the spring *L* always connects with at least one of the said blocks. The lowest block *n* is connected by a wire, as shown, with the binding-post 3, which, as we have already seen by reference to Fig. 1, is connected with the

ground, and the second, third, fourth, and fifth blocks are respectively connected with binding-posts 4, 5, 6, and 7, to which the call-circuits leading to the common subscribers' offices are respectively connected. It will now be understood that by means of the electro-magnet *J* the bar *E* and spring *L* may be raised step by step, so as to make the spring *L* connect with either the ground or any desired one of the subscribers' circuits. The main-line circuit, which comes in at the binding-post 1, and after passing through the usual automatic switch and the calling apparatus is connected to the binding-post 2, as already explained, next leads through the electro-magnet *P*, thence through the electro-magnet *J*, and thence to the metal guide *e*, which is always in electrical connection with the metal bar *E*, as shown, so that the main-line circuit is either grounded, as indicated in the drawings, or is connected to either one of the subscribers' circuits, depending upon the position of the bar *E*. By sending electrical impulses—that is, by closing and opening the circuit with an ordinary battery on the line—the central operator may raise the bar *E* step by step, and thus switch the main line on any desired subscriber's circuit, in order to call him up.

The object of the electro-magnet *P*, which requires a stronger current to make its armature respond than that used to operate the electro-magnet *J* alone, is to enable the central operator to set back the bar *E* to its lowest point, and thereby ground the line again at the common telephone. This is accomplished by means of the bell-crank *K*, carrying the armature *p*, and pivoted to the fixed guide *e*, which bell-crank, when acted upon by the electro-magnet *P*, engages with two pins, *g* and *f*, projecting from the pawls *G* and *F*, and withdraws the said pawls from the teeth of the bar *E*, and allows it to drop down by its own weight, thus restoring the apparatus to normal condition.

It is also desirable that when a subscriber comes to the common telephone in response to a call the apparatus should be restored to normal condition, so as to ground the line there. To have this accomplished automatically I construct the usual automatic switch, upon which the receiving-telephone is hung, so that when relieved of the weight of the telephone it operates to disengage the pawls from the bar *E*, which then drops to the bottom of its stroke, as before. For this purpose I pivot the automatic switch hook or lever *R*, upon which is hung the telephone *T*, upon the fixed guide *e*, which also forms the pivot for the elbow *K*, and then when the telephone is taken off the hook is drawn up by the spring *S*, and carries with it the elbow *K*, resting on the pin *r*, thereby freeing the bar *E* from the pawls *G* and *F* by the simple removal of the telephone. Thus the mere act of removing the telephone automatically restores the apparatus to normal condition and grounds the line at the common



telephone. This contrivance, of course, does not interfere with the usual function of the automatic switch, although the electrical part of the switching contrivance is not here shown in connection with the hook or lever R, it being very common and well known.

According to the arrangement I have shown and specifically described, the electric call-bells or other signaling devices, whatever kind it is desired to employ, are operated directly on the main telephone-circuit of the common telephone from the central office of the exchange system—that is, the central operator, when he wishes to call up one of the common subscribers, automatically disconnects the line from the ground at the common telephone by means of the automatic switch, and puts it in connection with the branch circuit leading to the proper subscriber's call-bell, and the subscriber's bell is then operated directly by the current he sends over the main line from the central office; but it is not essential to my invention that the call-bells should be worked in this manner. If preferred, they may be rung by a local battery placed at the common-telephone office, and the automatic switching device made simply to connect this local battery successively to the different local call-circuits, in which case the local call-circuits would never be connected with the main line, and the main line could be permanently grounded. In fact, it is immaterial what kind of call-bells or signaling apparatus are employed at the common subscribers' offices in carrying out my invention, or in exactly what manner they are put in operation by the operator at the central office; and I do not limit myself to any particular form of calling apparatus or mode of operating such apparatus.

If desired, the common subscribers' call-bells may all be arranged on a single circuit and operated simultaneously from the central office, instead of each one on a separate branch circuit, and the call may be made by a signal heard by all, but which varies and is recognized by all as being intended only for a particular one; but, as will readily be seen, it is much more desirable that each individual call be made so that it is only heard by the one for whom it is intended, and is neither recognized by nor disturbs any other.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A telephone-exchange system consisting of the following elements: a number of subscribers' telephone-circuits electrically connected with the central office of the system, one of said telephone-circuits being provided with a telephone and calling apparatus for communicating with the central office, which telephone is centrally located, so as to form a common telephone for the general use of a

number of subscribers whose offices are near, electrical signaling or calling apparatus arranged at each of the common subscribers' offices, and electrical connections and means for operating each common subscriber's calling apparatus from the central office, whereby the central operator may call up any desired one of said subscribers in his office.

2. The herein-described common-telephone system, consisting of two main offices electrically connected by a telephone-circuit, and provided with telephone and calling apparatus, whereby each main office may call up and talk with the other, in combination with two or more branch or local offices situated near one of the said main offices, and provided with electric call-bells or signal-receiving apparatus, circuits connecting each of these local electric call-bells or signal-receiving apparatus with the said main office, and mechanism at the latter office whereby an operator at the distant main office may cause an electric current or impulse to be transmitted over any of the branch circuits, so as to operate the calling apparatus of any desired local office at pleasure, substantially as described.

3. The herein-described common-telephone system, consisting of two main offices electrically connected by a telephone-circuit, and provided with telephone and calling apparatus, whereby each main office may call up and talk with the other, in combination with two or more branch or local offices situated near one of the said main offices, and provided with independent electric call-bells or signal-receiving apparatus, a circuit connecting each local call-bell or signal-receiving apparatus with the said main office, and electro-magnetic switching mechanism at the latter office, constructed to be operated by electric currents sent over the main circuit from the distant main office, and to connect the said main circuit with any of said local circuits, respectively, as desired, substantially as described.

4. The combination, with the electro-magnet J, lever H, and step-by-step contrivance E, constructed to be actuated by the said electro-magnet, and set as desired by a predetermined number of electrical impulses, of the lever or hook R, upon which the telephone is hung, said lever being mechanically connected with the said step-by-step contrivance, so as automatically to restore said contrivance to normal condition when the telephone is removed from its hook, substantially as described.

Signed and witnessed this 28th day of January, 1884.

F. BENEDICT HERZOG.

Witnesses:

CHAS. H. DILLEY,  
CHARLES G. CURTIS.