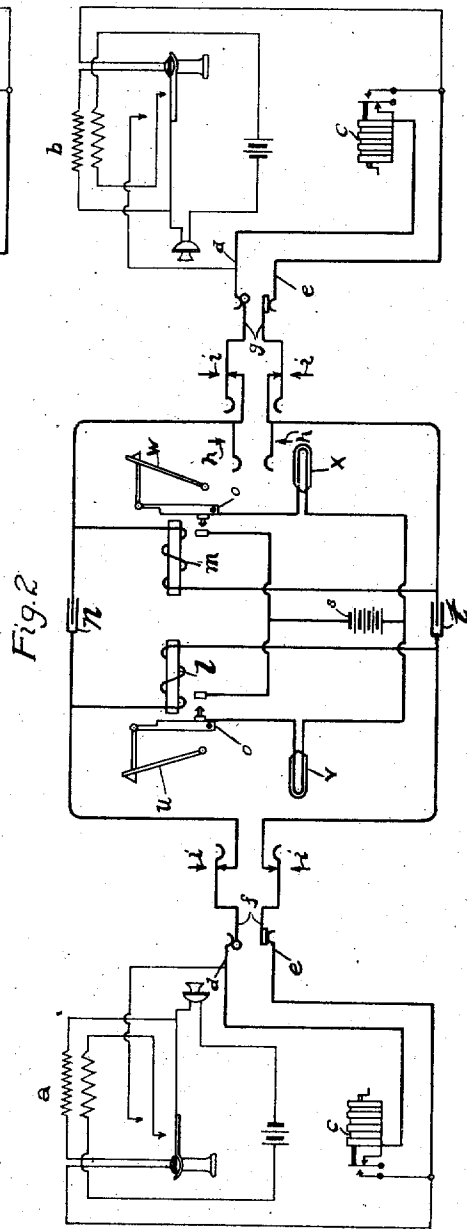
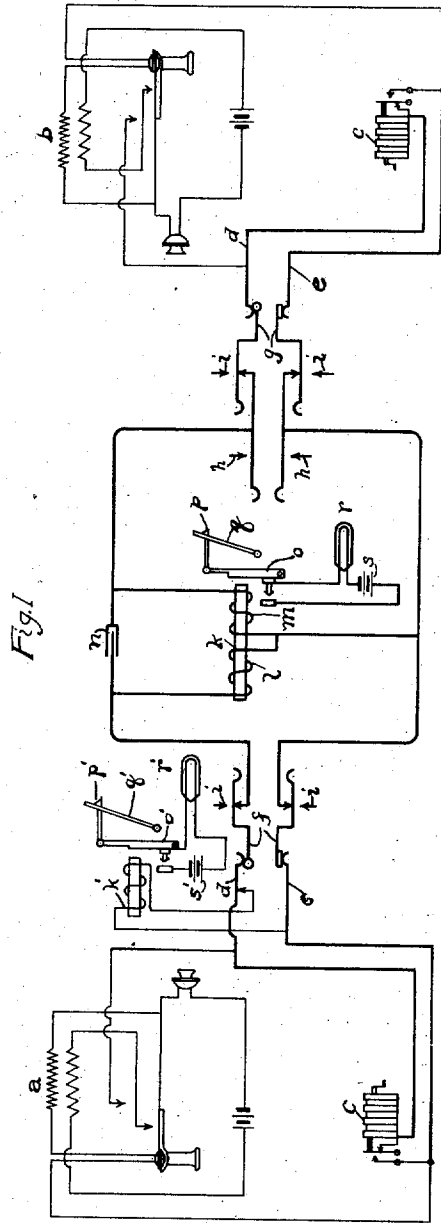


W. A. FRICKE.
TELEPHONE EXCHANGE SYSTEM.
APPLICATION FILED APR. 11, 1908.

987,128.

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WITNESSES:

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TELEPHONE-EXCHANGE SYSTEM.

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To all whom it may concern:

Be it known that I, WILLIAM A. FRICKE, 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-Exchange Systems, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to that class of telephone exchange systems in which manually operated generators are employed at the subscribers' stations for the purpose of effecting signals at the exchange. As is well known, hand-operated magneto generators are most usually employed for this purpose at the subscribers' stations, though I do not wish to be limited in all embodiments of my invention to the use of magneto generators. In other words, therefore, my invention relates to that class of telephone exchange systems in which manually operated generators are employed at subscribers' stations for the purpose of impressing wave form current upon the subscribers' lines for the purpose of intermittently operating signal devices at the exchange.

The primary object of my invention is to provide signaling mechanism at the exchange whose operation is controlled by wave form current impressed upon the telephone lines at subscribers' stations and which signaling apparatus is adapted either to present to the operator a call or disconnect signal, according to the prime function of the signal device, or to indicate that a subscriber desires the attention of the operator. In common battery practice the call and supervisory signaling lamps through the relay mechanism associated therewith, are each adapted to the double purpose of indicating to the operator that subscribers are through conversation or desire a connection, according to the prime function of the lamp, or that a subscriber desires the attention of an operator after having effected the initial presentation of a signal. In magneto switch-board telephony, however, as hitherto practiced, the clearing-out signal devices were in the form of electro-magnets having shutters, which, when released, served to indicate to the operator that the conversation

between connected lines was finished, this signaling device being incapable of conveying to the operator that her attention was desired by a subscriber.

Generally speaking, my invention resides in equipping a clearing-out signaling device or a line signaling device in a magneto switch-board with apparatus whereby such signaling device may not only fulfil its prime function, but may also serve to indicate to the operator that her attention is desired by a subscriber who happens to be operating the manually actuated current generator at his station.

I will explain my invention more fully by reference to the accompanying drawing, showing the preferred embodiment thereof, in which—

Figure 1 diagrammatically indicates so much of a magneto switch-board telephone exchange system as is necessary to an understanding of my invention, the cord circuit illustrated in this figure including single supervisory apparatus. Fig. 2 illustrates a system similar to Fig. 1, with the exception that the cord circuit illustrated in Fig. 2 includes double supervisory signal apparatus.

Like parts are indicated by similar characters of reference throughout both figures.

I have indicated at each of the sub-stations *a* *b* in the systems illustrated in Figs. 1 and 2, one of many types of apparatus which include one of many types of manually operated current generating devices adapted to impress wave form current upon the subscribers' telephone lines, and it will, therefore, be unnecessary for me to describe in detail the apparatus shown at these sub-stations, it being sufficient to understand that a manually operated generator, such as the generator *c*, is adapted to impress wave form current of suitable character, preferably alternating current, upon the corresponding telephone line whose limbs terminate in springs *d* and *e* of line jacks. I have diagrammatically illustrated a cord circuit for each of the two systems shown, each cord circuit including an answering plug *f* and a connecting plug *g* provided with tip and sleeve contacts, shown respectively in engagement with the associate jack springs *d* and *e*. I have indicated the terminals *h* of an operator's telephone set and the terminals *i* of a ringing generator whose association

with the cord circuit apparatus is well understood by those skilled in the art, on which account it is unnecessary to make further mention thereof.

5 Referring now more particularly to the system shown in Fig. 1, I have illustrated an electro-magnet k having a core common to two windings l and m , one terminal of each of these windings being shown in connection with the sleeve strand of the cord circuit and with each other, while the other terminals of these windings, although in conductive relation with the tip strand of the cord circuit, are separated directly from each other by means of a condenser n , of small capacity for reasons well known. This condenser n is preferably of small capacity, in consequence of which it will be more transparent to voice currents (which are of very high frequency) than to signaling currents (which are of very low frequency as compared with voice currents). The condenser n , for purposes of signaling, thus serves to limit the association of the coil l to the answering end of the cord circuit and the association of the coil m to the connecting end of the cord circuit, whereby the coil l is alone within the control of the generator c of the calling subscriber and the coil m is alone within the control of the generator c of the called subscriber. The condenser n , of course, serves to complete the telephonic continuity of the tip strand, so that the voice currents do not have to thread the coils l and m . While I thus provide the electro-magnet k with the independently controlled coils l and m , I do not wish to be limited to a system in which the disconnect electro-magnet does not have all of its winding within the control of both of the subscribers. The core of the electro-magnet k has an armature o that may be provided with an armature lever p for normally upholding a shutter q but adapted to release said shutter when either coil of the electro-magnet is energized, whereby either subscriber may effect a set clearing-out signal. After a subscriber has operated his generator c , assuming the cord circuit to be connected with said subscriber's line, the shutter q in any event is released, thereby conveying to the operator a signal that ordinarily would be interpreted in the operation of magneto switch-boards, as a clearing-out signal. By means of my invention if the signaling subscriber did not intend to convey a disconnect signal, or while intending to convey such signal so far as his connection with another subscriber was concerned, desired also the attention of the operator, such subscriber would continue the operation of his generator, thereby causing the armature o of the magnet k to vibrate, whereby the operation of the supplemental signal device r would be effected, this sup-

plemental signal device being provided to perform the function that the signal device q is not capable of performing, namely, of conveying to the operator the intelligence that a subscriber desires her attention. This signal device is desirably in the form of a small incandescent lamp included in normally open circuit with a battery s , the circuit for said battery and lamp including terminals that are controlled by the armature o and are normally separated thereby, these terminals being brought together each time the armature is attracted through the influence of the wave form current impressed upon one or the other of the coils l and m ; thus the supplemental signal device r is performing its function only when a generator c is in operation. I have shown in association with the telephone line extending to the subscriber's station a , a line electro-magnet k^1 adapted to be operated by the generator before the cord circuit is connected with the line. This magnet k^1 is in many respects similar to the magnet k in its associations, the magnet k^1 having elements o^1 p^1 and q^1 that are similar to the elements o p q previously described, the function of the element q^1 , however, being to indicate to the operator that a connection is desired. The line magnet is also associated with a supplemental signal r^1 included in circuit with a battery s , the circuit including the elements r^1 and s^1 being normally open at the armature of the magnet k^1 but being closed upon each energization of the magnet k^1 , due to the intermittent impulses of current impressed upon the magnet k^1 by the calling generator c . If the operator fails to respond to the line signal occasioned by the falling shutter q^1 , the calling subscriber, by manipulating his generator c , will cause the signal device r^1 to operate, thereby again to invite the operator's attention to the fact that he desires a connection, the line signal device q^1 being incapable of performing this latter function. I have not indicated the line signal apparatus k^1 in association with any other of the lines illustrated, as this would not be necessary to an understanding of my invention.

The apparatus illustrated in Fig. 2 is in the main similar to the apparatus illustrated in Fig. 1, and similar parts are given similar characters of reference. The coils l and m in Fig. 2 are provided upon independent cores and two of the terminals are separated by a condenser n , while the remaining two terminals of these coils, instead of being directly united as is the case in Fig. 1, are separated by a condenser t , of small capacity for reasons well known, these condensers n and t being preferably of small capacity for the same reasons as outlined above in connection with condenser n of Fig. 1. The electro-magnet including the coil l , has con-

trol of a clearing-out signal device *u* and supplemental signal device *v* that have association with said electro-magnet similar to the association of the elements *q* and *r* with the electro-magnet *k*, though in the system of Fig. 2, as has been intimated, the signal devices *u* and *v* are alone operated by the calling subscriber. The electro-magnet including the coil *m* has associated therewith signal devices *w* and *x* that are similar in office and association to the signal devices *u* and *v*, with the exception that these devices *w* and *x* are alone within the control of the called subscriber.

While I have herein shown and particularly described the preferred embodiment of my invention, I do not wish to be limited to the precise arrangement shown, as changes may readily be made without departing from the spirit of my invention, but,

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

1. A telephone exchange system including subscribers' lines extending from sub-stations to an exchange, cord circuits at the exchange for connecting subscribers in conversation, manually operated means at the sub-stations for impressing wave form current upon the telephone lines, two supervisory clearing-out apparatuses, one limited to operative association with one end of the cord circuit and the other limited to operative association with the other end of the cord circuit, whereby one apparatus is within the control of the calling subscriber and the other is within the control of the called subscriber, each of said apparatuses including an electro-magnet adapted to be energized by said wave form current, a signal element adapted for operation by said electro-magnet and, when operated, to assume a set display condition, a supplemental signal device, and a circuit therefor, said supplemental signal device being normally excluded from its circuit by said electro-magnet and being included in said circuit by said electro-magnet when energized.

2. A telephone exchange system including subscribers' lines extending from sub-stations to an exchange, cord circuits at the exchange for connecting subscribers in conversation, manually operated means at the sub-stations for impressing wave form current upon the telephone lines, two supervisory clearing-out apparatuses, one limited to operative association with one end of the cord circuit and the other limited to operative association with the other end of the cord circuit, whereby one apparatus is within the control of the calling subscriber and the other is within the control of the called subscriber, each of said apparatuses including an electro-magnet adapted to be energized by said wave form current, a signal element

adapted for operation by said electro-magnet and, when operated, to assume a set display condition, and a supplemental signal element normally inert but brought into action by the electro-magnet when energized.

3. A telephone exchange system including subscribers' lines extending from sub-stations to an exchange, cord circuits at the exchange for connecting subscribers in conversation, manually operated means at the sub-stations for impressing wave form current upon the telephone lines, clearing-out signal apparatus in association with said cord circuits including an electro-magnet adapted to be energized by said wave form current, a signal element adapted for operation by said electro-magnet and, when operated, to assume a set display condition, a supplemental signal device, and a circuit therefor, said supplemental signal device being inert when the electromagnet is de-energized but brought into and maintained in action by the electromagnet only when energized.

4. A telephone exchange system including subscribers' lines extending from sub-stations to an exchange, cord circuits at the exchange for connecting subscribers in conversation, manually operated means at the sub-stations for impressing wave form current upon the telephone lines, clearing-out signal apparatus in association with said cord circuits including an electro-magnet adapted to be energized by said wave form current, a signal element adapted for operation by said electro-magnet and, when operated, to assume a set display condition, and a supplemental signal element being inert when the electromagnet is deenergized but brought into and maintained in action by the electro-magnet only when energized.

5. A telephone exchange system including a subscribers' line extending from sub-stations to an exchange, means at the exchange for connecting subscribers in conversation, manually operated means at the sub-stations for impressing wave form current upon the telephone lines, a signal apparatus at the exchange including an electro-magnet adapted to be energized by said wave form current, a signal element adapted for operation by said electro-magnet and, when operated, to assume a set display condition, a supplemental signal device, and a circuit therefor, said supplemental signal device being inert when the electromagnet is deenergized but brought into and maintained in action by the electromagnet only when energized.

6. A telephone exchange system including a subscribers' line extending from sub-stations to an exchange, means at the exchange for connecting subscribers in conversation, manually operated means at the sub-stations

for impressing wave form current upon the telephone lines, a signal apparatus at the exchange including an electro-magnet adapted to be energized by said wave form
5 current, a signal element adapted for operation by said electro-magnet and, when operated, to assume a set display condition, and a supplemental signal element being inert when the electromagnet is deenergized but

brought into and maintained in action by 10 the electro-magnet only when energized.

In witness whereof, I hereunto subscribe my name this first day of April A. D., 1908.

WILLIAM A. FRICKE.

Witnesses:

G. L. CRAGG,

L. G. STROH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
