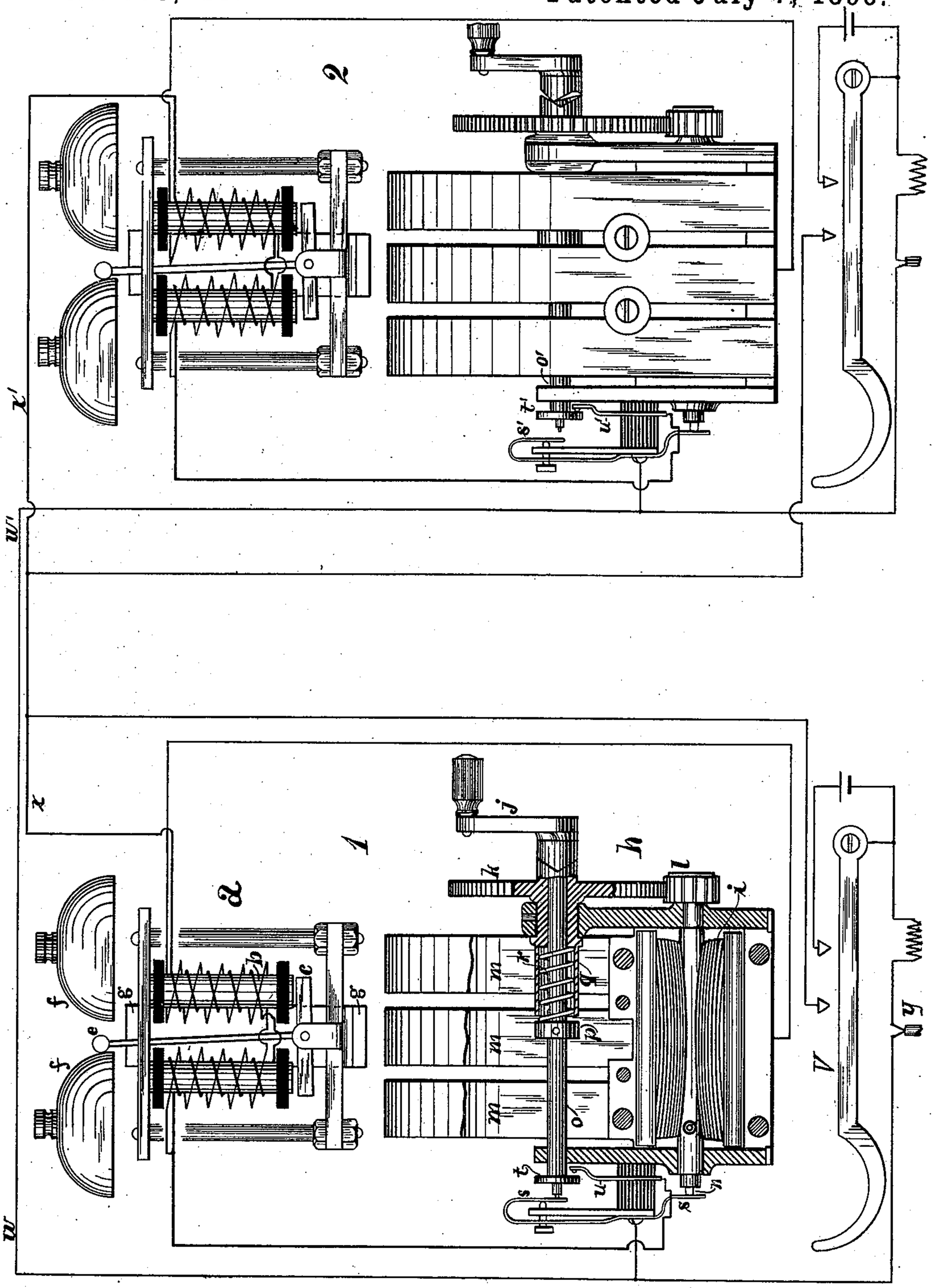
(No Model.)

C. E. SCRIBNER.

BRIDGING BELLS.

No. 563,318. Patented July 7, 1896.



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UNITED STATES PATENT OFFICE.

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BRIDGING BELLS.

SPECIFICATION forming part of Letters Patent No. 563,318, dated July 7, 1896.

Application filed March 6, 1891. Serial No. 383,979. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SCRIBNER, 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 Bridging Bells, (Case No. 254,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to calling apparatus for substations of telephone-exchange systems, and its object is to provide means whereby substations may be connected to one telephone-line, and whereby the efficiency of the calling apparatus placed at these substations may be increased.

My invention relates more specifically to that class of calling apparatus employed in the system known as the "bridging bell" system. In this system several substations are connected to the central exchange by a single line. The call-bells at the various stations are bridged in or placed in parallel circuit between the two line-wires of this line, or, if the system be a grounded system, between the single line-wire and the earth. In order to prevent the talking current from, for example, one extreme station to another connected with it for conversation from being shunted by the coils of the signal-bells of intermediate stations, these coils are wound with many turns of fine wire, so as to present great self induction or retardation to the telephone-currents. These coils are consequently of high resistance.

It is sometimes desirable to have the signal-bell of the calling subscriber ring when a call is sent, in order that the calling subscriber may know that his signaling apparatus is properly in operation. To accomplish this, the calling-generator has sometimes been put in series with the coils of the signal-bell. In this arrangement some of the energy of the calling-generator is wasted in overcoming the resistance of the coils of its own bell. More commonly the calling-generator has been arranged to be also bridged in between the two sides of the line, and hence is in parallel with its own ringer. When in this case the calling-generator is operated, a part of its current is shunted through the coils of its own bell, and, moreover, in this case the bell at the calling-station would still ring when its generator was operated if the line-circuit were open and no call was transmitted.

In my invention I provide upon the cores of the ringer-electromagnets two coils, one of many and the other of relatively few turns, and in connection with the calling-generator I provide contacts and circuit connections, such that when the generator is at rest both coils of the bell are in series, while the coil of the generator is shunted out of circuit, and when the generator is operated, in sending a call, the short circuit is removed from around it, and a path is offered to the current through the short coil alone of the bell at that station to the line. Thus it will be seen a calling-current from an external source, as from a generator operated at another part of the line, will traverse both coils of the ringer, and thus will produce the maximum effect, while to a telephone-current upon the line so great self-induction is offered by the ringer-coils that no appreciable portion of it is shunted through them. At the same time a current from the calling-generator at this station is forced to traverse only the short coil of its own ringer, and hence not much energy is wasted in traversing its own ringer, and none is shunted from the line by its ringer.

My invention will be more readily understood by reference to the accompanying drawing, in which I have shown two stations connected together, each provided with apparatus and circuits in accordance with my invention.

Consider, for example, the apparatus at station 1. (Shown at the left of the drawing.) *a* is a ringer of well-known form. An electromagnet *b* acts upon an armature *c*, which is pivoted at its center and carries a tongue *e*, adapted to strike the gongs *f f*, when the armature is caused to oscillate. The electromagnet and its armature are permanently polarized by the magnet *g*, whereby the ends of armature *c* are unequally attracted by the poles of magnet *b*, when a current is sent through the latter, and thus the armature is caused to oscillate when an alternating current is sent through the coils of the magnet.

The electromagnet *b* is wound with two coils, one a coil of few turns, which is represented in the drawing as a helix of coarse wire closely encircling the core, and another coil of many turns, which is represented as of finer wire, forming a helix of greater diameter. One end of the short coil is connected to one end of the long coil, the connection being so made that when a current flows through both coils in series both coils shall produce magnetization in the same direction. It will be understood that for convenience I regard the two coarse helices on the two limbs of the magnet as the two halves of one coil and the two fine helices on the two limbs as the two halves of one coil.

h is a magneto-generator, also of well-known form, which I have shown partly in vertical section and in its normal or idle position. An armature *i* is adapted to be revolved by means of the crank *j* and driving-wheel *k* and driven wheel *l* in a magnetic field established by the permanent magnets *m m m*. Of the two terminals of the armature-coil one is grounded on the frame of the generator and the other is led to the insulated pin *n*. The crank *j*, and its spindle *o*, to which it is rigidly attached, are not rigidly fastened to the driving-wheel *k*, but are allowed slight longitudinal and slight rotary play. The sleeve of crank *j* ends in a wedge, which enters a corresponding V-shaped groove in the hub of wheel *k*. Thus, since the wheel *k* does not revolve freely on account of armature *i*, when the crank *j* is turned the inclined side of the wedge of its sleeve slides upon the correspondingly-inclined surface of the groove, and the spindle *o* is given a slight longitudinal motion. The motion is limited by the collar *p*, fixed to the spindle *o*, which comes against a tubular prolongation *q* of the hub of wheel *k* when a small rotary motion has been communicated to crank *j*, and thus prevents further independent rotation of the crank. The wedge of crank *j* is normally kept pressed into the groove of hub *k* by the force of the spiral spring *r*, exerted longitudinally against the collar *p* and the hub of wheel *k*.

The end of spindle *o* is provided with a contact, which normally—that is, when no rotative effort is being exerted upon the crank *j*—rests in contact with a spring *s*, whose lower end bears against the pin *n*. The spindle *o* also carries a disk *t*. A contact-spring *u* is so disposed that when the spindle *o* is in its normal position disk *t* shall not touch contact *u*, but when by attempting to rotate the crank *j* the spindle *o* is given a longitudinal motion as described disk *t* comes into contact with spring *u* and bears against it. The usual telephone-switch, which is provided with contacts adapted to close a local battery-circuit through the transmitter and to close a shunt-circuit through the telephone and around the bell when the telephone is removed from the switch-hook, is shown at *v*.

At the right of the drawing I have shown another station 2, similarly equipped with ringer, generator, and switch. The generator at this station is shown in elevation and the crank in its alternate position as in the act of ringing. Thus the end of spindle *o'* is separated from spring *s'* and disk *t'* is closed against spring *u'*. These two stations I have shown connected in metallic circuit by the line-wires *w w' x x'*. It will be understood that my invention may be applied with equally good results to a grounded system. When this is done, I prefer to ground the line *x*.

The circuit connections at station 1, for example, may be readily traced, and are as follows: One line-wire *w* is connected to spring *s*, and through the telephone and secondary of the induction-coil to the pivot of telephone switch-lever *v*. The other line-wire *x* is connected to one end of the short ringer-coil. The connected ends of the long and short coils are connected by wire to contact-spring *u*. The free end of the long coil is connected to the frame of the generator. A branch connection is run from line-wire *x* to a contact, against which the telephone-switch *v* rests when the telephone is off from the hook.

I will now proceed to trace in detail the operation of my invention.

Suppose that subscriber at station 2 is sending a call-signal to station 1. The path of the current may be traced from that end of the armature which is grounded upon the frame at station 2, from frame of generator through disk *t'* and contact *u'* through the short coil of the ringer, over line *x' x* to station 1; then through the short coil of this ringer, returning through the long coils of the same ringer, thence to the frame of generator, through spindle *o* and spring *s*, returning by line-wire *w* to station 2, through spring *s'* to the other end of the generating-armature. Similarly, if subscriber at station 1 should call station 2, by the act of turning the generator at station 1 the long coil of that ringer would be automatically shunted out of the generator-circuit, the current traversing only the short coil of the ringer; but at station 2, that generator being now at rest, the incoming current would have to traverse both coils of that ringer. Thus it will be seen the bell at the calling-station would ring, perhaps somewhat feebly, but strongly enough to assure the calling subscriber that his calling apparatus was in operation, and would oppose but small resistance to the passage of the current, while nearly all the energy of the calling-generator would, neglecting the resistance of the lines, be utilized in operating the bell at the called station. It will appear, however, that, since the short ringer-coil at the calling-station, during the sending of a call, is included in the line in series with the generator, the bell at the calling-station will not ring at all if the line be not complete. Hence the calling subscriber, when his bell does ring, is assured that the call is transmitted.

The connections and operation of the switch

v are well known. The switch-lever, which is normally held in the position shown in the drawing by the weight of the telephone hung thereon, is provided with a spring or other suitable means, whereby it is drawn up against two contacts when the telephone is removed from the switch-hook. When the lever is in the position shown, the circuit of the telephone *y* and the circuit of the local battery are open. When, however, the lever is allowed to rise against the contacts, the circuit of the local battery is completed and the telephone is placed in shunt around the bell in a manner sufficiently obvious.

It is obvious that the specific forms of apparatus shown in the drawing are not necessary to the successful operation of my invention. Details of the generator and of the bell might be altered. For example, the generator might be so arranged as to send a continuous current and a bell provided which should respond to such currents.

Possible modifications of the circuit connections will readily suggest themselves to those skilled in the art. Hence I do not limit myself to the precise apparatus and circuit connections shown.

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

1. In a substation calling apparatus, the combination with a source of electricity, and an electromagnetic ringer located at a substation, said ringer being provided with an electromagnet wound with two coils, of a pair of normally-closed contact-points located at said substation and adapted when closed to complete a short circuit around the source of electricity, and when open to place said source of electricity in series with the bell, and a pair of normally open contact-points located at said substation and adapted when closed to complete a short circuit about one of the coils, substantially as described.

2. In a substation calling apparatus, the combination with an electromagnetic ringer located at a substation and having an electromagnet provided with two coils, of a magneto-generator connected in series with said ringer and located at the same substation, and normally open contact-points adapted to be closed automatically by the rotation of the generator, and when closed to complete a short circuit around one of the ringer-coils, substantially as described.

3. The combination with an electromagnetic ringer located at a substation and having an electromagnet wound with two coils of a magneto-electric generator located at the same substation and provided with normally-closed contacts which, when closed, complete a short circuit around the generator, and adapted to be automatically opened by the rotation of the generator, and with normally open contacts adapted to be closed by the rotation of the generator and, when closed, to complete a short circuit around one of the coils of the ringer, substantially as described.

4. In combination, an electromagnetic ringer located at a substation and having an electromagnet wound with two coils connected in series, a magneto-electric generator located at the same substation and provided with normally-closed contacts which when closed complete a short circuit around the generator, and adapted to be automatically opened by the rotation of the generator, and with normally open contacts adapted to be closed by the rotation of the generator and when closed to complete a short circuit around one of the coils of the ringer, and a telephone-switch provided with contacts and connections whereby when the switch is in one position the circuit of the telephone is left open, and the circuit of a local battery through the transmitter induction-coil is left open, and when the switch is in its alternate position the telephone is placed in shunt relation to the ringer, and the local-battery circuit is closed through the transmitter induction-coil, in the manner and for the purpose specified.

In witness whereof I hereunto subscribe my name this 19th day of February, A. D. 1891.

CHARLES E. SCRIBNER.

Witnesses:
FRANK R. MCBERTY,
ELLA EDLER.