(No Model.) 3 Sheets—Sheet 1.

A. B. FERDINAND.

TELEPHONE OR ANALOGOUS ELECTRIC SYSTEM.

No. 397,176. Patented Feb. 5, 1889.

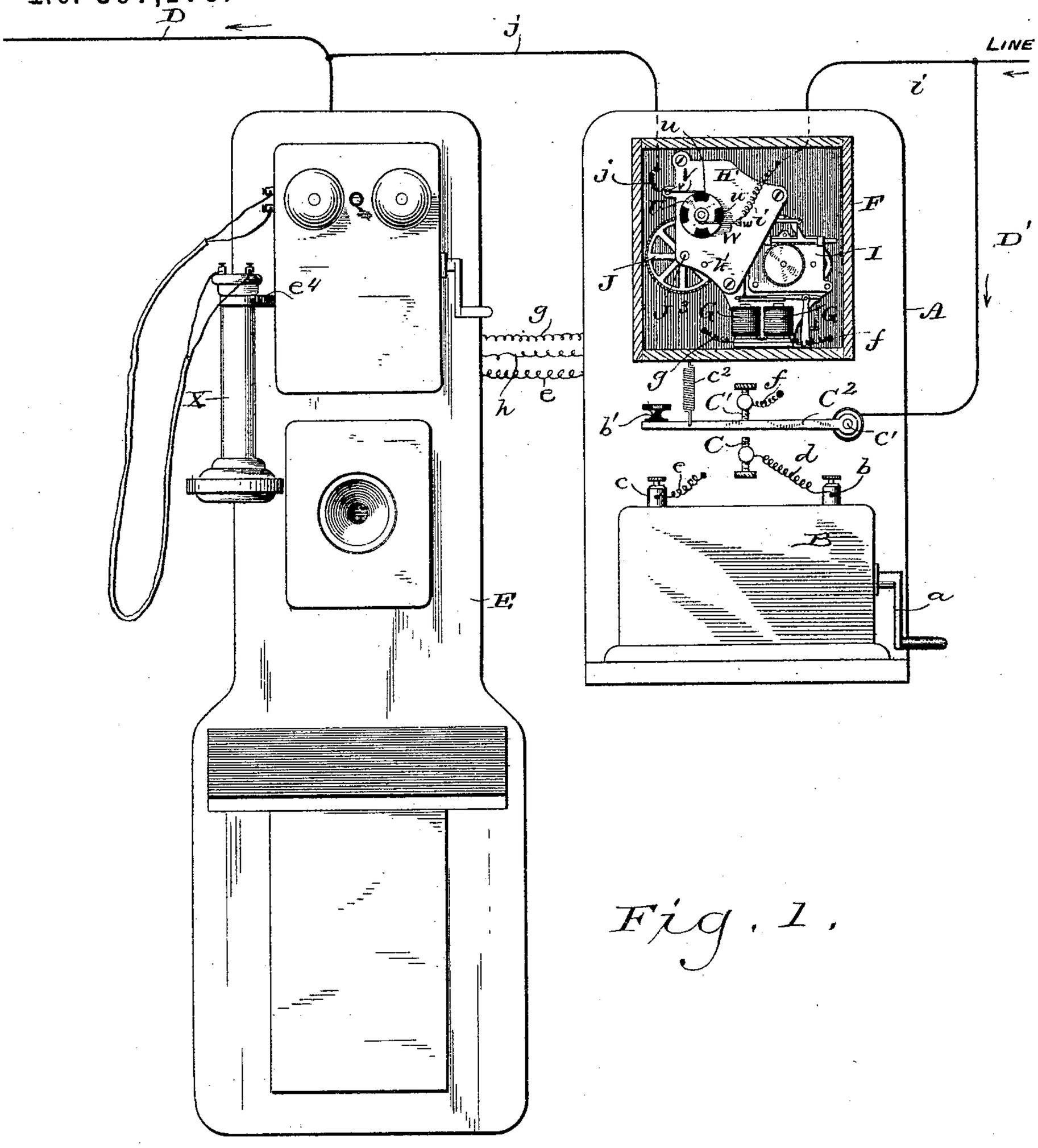

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

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TELEPHONE OR ANALOGOUS ELECTRIC SYSTEM.

No. 397,176. Patented Feb. 5, 1889.

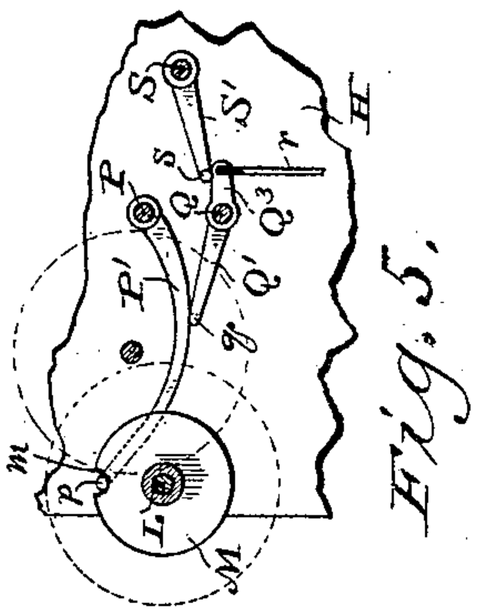

Fig. 5.

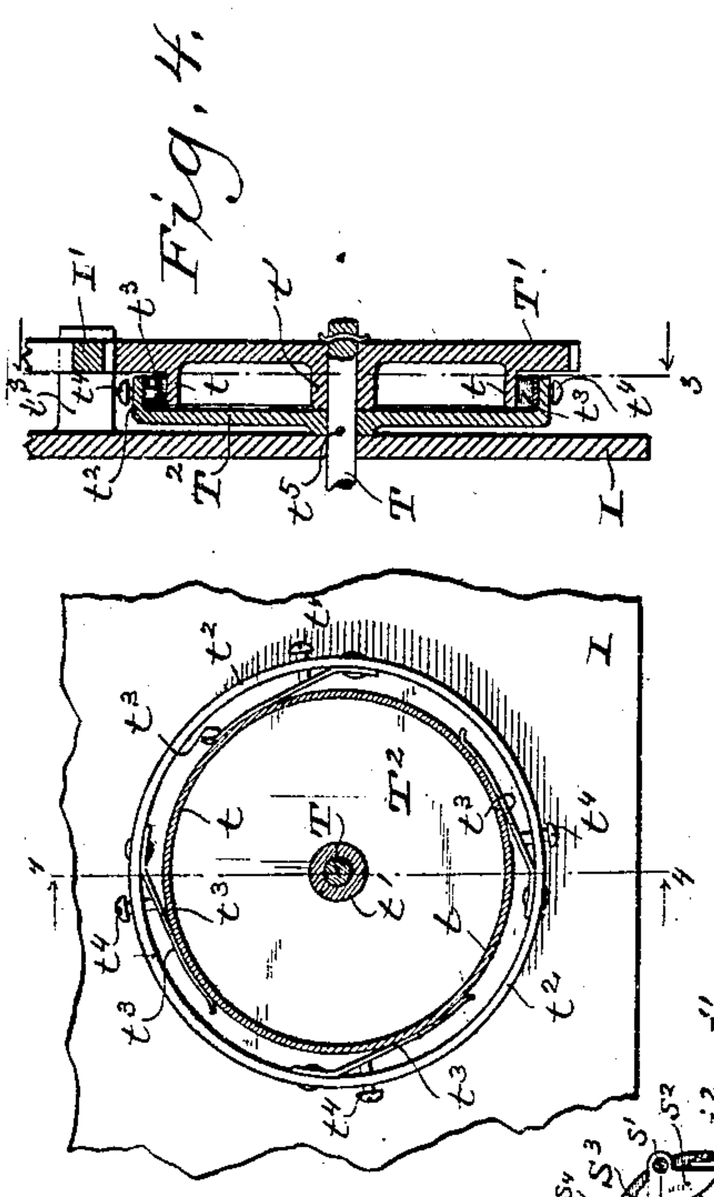

Fig. 4.

Fig. 3.

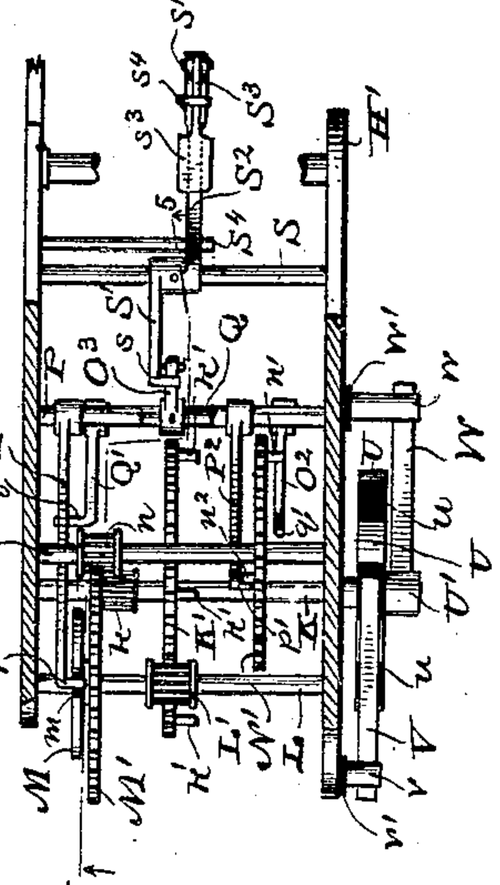

Fig. 6.

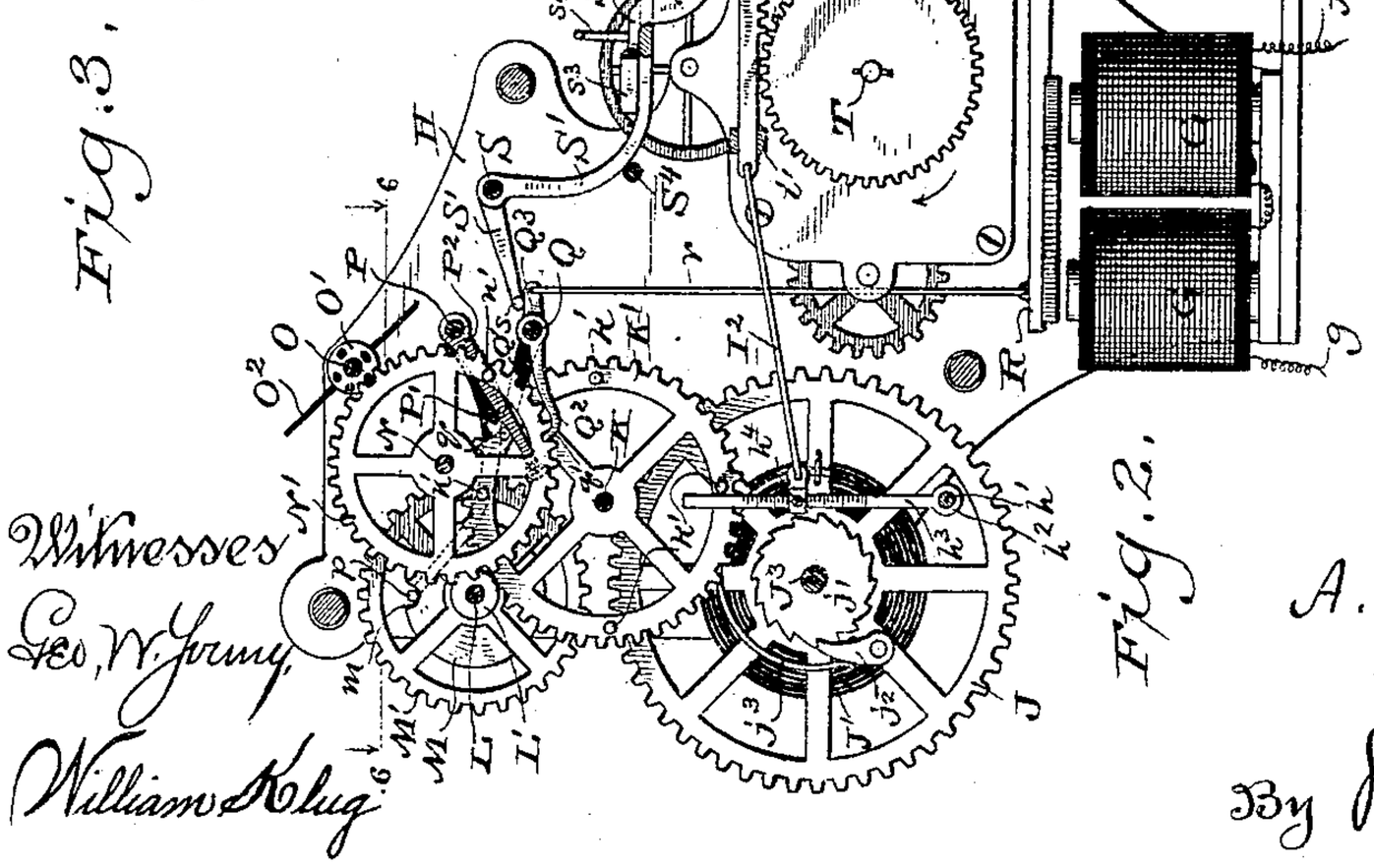

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

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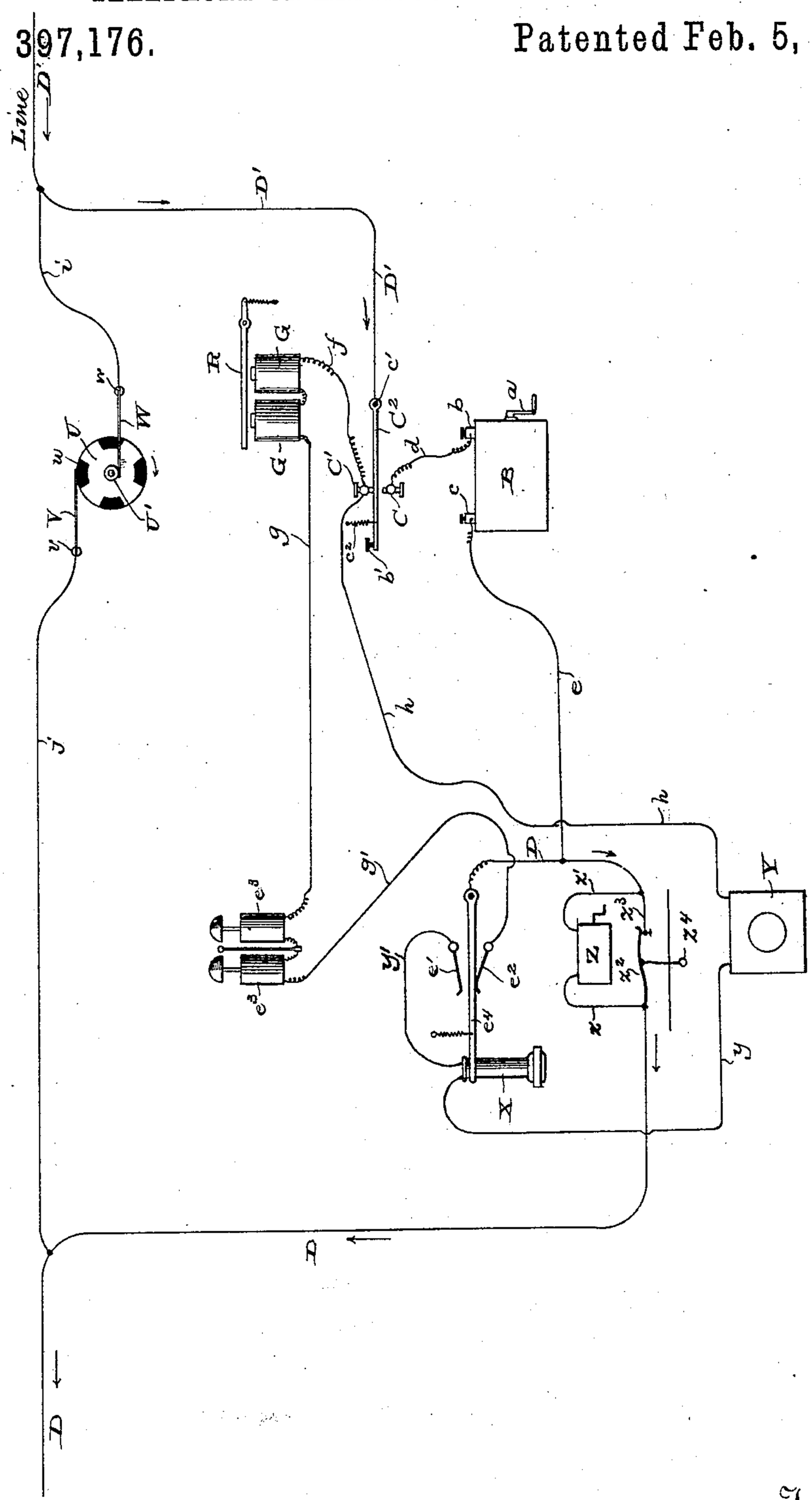
Fig. 4.



Witnesses
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William Klug

Inventor
A. B. Ferdinand
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Attorneys

UNITED STATES PATENT OFFICE.

ANTHONY B. FERDINAND, OF OSHKOSH, WISCONSIN.

TELEPHONE OR ANALOGOUS ELECTRIC SYSTEM.

SPECIFICATION forming part of Letters Patent No. 397,176, dated February 5, 1889.

Application filed October 8, 1888. Serial No. 287,472. (No model.)

To all whom it may concern:

Be it known that I, ANTHONY B. FERDINAND, of Oshkosh, in the county of Winnebago, and in the State of Wisconsin, have invented certain new and useful Improvements in Telephone or Analogous Electric Systems; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to telephone or analogous electric systems, whereby any instrument or station on a line may be cut out when desired for a given length of time and automatically restored to place, with the resistance of said instrument or station practically eliminated during the period of cutting out, all as will be more fully set forth hereinafter, and pointed out in the claims.

In the drawings, Figure 1 is a front elevation of my device electrically connected to a telephone. Fig. 2 is an elevation of the principal mechanical elements of my device with one of the front plates and its front attachments removed. Fig. 3 is a detail section on the line 3 3 of Fig. 4. Fig. 4 is a detail section on the line 4 4 of Fig. 3. Fig. 5 is a detail section taken on line 5 5 of Fig. 6. Fig. 6 is a detail section on the line 6 6 of Fig. 2. Fig. 7 is a diagram view illustrating the use of my device and indicating the various circuits.

A is the back board of my device carrying a small dynamo or generator, B, which may be a hand-generator with crank *a*, as shown, or a series of batteries, so long as the same will generate a strong current of electricity greater than the ordinary currents used to operate the telephones on the line. This generator B has two binding-posts, *b c*, the former being connected by wire *d* to a contact-point, C, on the back board, A, while the post *c* is connected by a wire, *e*, to that portion D of the main line which goes out from the instrument E or station. Above the contact-point C, just described, is another contact-point, C′, from which a wire, *f*, runs to the electro-magnets G, from which a wire, *g*, runs to the ringer-coils e^3 of the magnets on the telephone E, and from said ringer-coils e^3 a wire, *g′*, runs to the contact-spring e^2 of the telephone, below the telephone-switch e^4, which latter is connected to the said portion D of the main line, and above this telephone-switch e^4 (in the arrangement shown in the diagram, Fig. 7) is the other contact-spring, *e′*, connected by wire *y′*, hand-telephone X, wire *y*, microphone Y, and wire *h* to the before-named contact-point C′.

Between the contact-points C and C′ there is located a switch, C^2, pivoted at *c′* to the back board, A, and which is normally held in contact with the contact-point C′ by means of a spring, c^2, the free end of the switch C^2 having a thumb-piece, *b′*, by means of which it may be pressed down away from contact with the point C′ and into contact with the point C, when desired, and said switch C^2 is connected directly to the portion D′ of the main wire which enters the instrument or station.

F is a box or casing supported on the back board, A, and containing the principal mechanical elements of my device, (shown in detail in Figs. 2 to 6,) as well as the electro-magnets G, hereinbefore named.

H is the rear plate of my clock mechanism, and I is the front plate of my time-clock, which latter is of ordinary construction, except in the attachments and connections hereinafter set forth.

H′ is the front plate, which protects the wheels and attachments at the left-hand side of my device, and this plate and its front attachments are removed in Fig. 2 to show the construction and arrangement of the parts behind it, which parts bear a general resemblance to the striking mechanism of a clock, and like such include a train of gear-wheels, a mainspring and its wheel, and a fan.

J is the mainspring-wheel, and J′ the mainspring, *j′* the ratchet on said wheel, j^2 the pawl, and j^3 the pawl-spring, said wheel J being mounted on the shaft J^3, which is the winding-shaft of this part of the mechanism, all as shown in Figs. 1 and 2, but not seen in Fig. 6, which latter shows shaft K having pinion *k*, which is in mesh with the teeth of said wheel J, and which shaft also carries toothed wheel K′, having four pins, *k′*, projecting laterally from near its circumference at equal distances apart. Above and to the left of this shaft K is shown another shaft, L, provided with a pinion, L′, in mesh with the teeth of the wheel K′, and also bearing a toothed wheel, M′, and beyond this a plain wheel, M,

having a notch, *m*, in its periphery. Above and to the right of shaft L is another shaft, N, having a pinion, *n*, in mesh with the teeth on wheel M′, and bearing a toothed wheel, N′, whose rim bears a pin, *n′*, on one side, and another, n^2, on the other side, both projecting laterally. Above and to the right of the shaft N is another shaft, O, having a pinion, O′, in mesh with the wheel N′, and beyond this a fan, O^2.

P is the rock-shaft journaled in the plates H H′ and carrying near its rear end a curved lever, P′, having a lug, bend, or pin, *p*, at its free end adapted to engage with the notch *m* in the wheel M on shaft L, and near its front end this shaft P carries a shorter straight lever, P^2, having an arm or lug, *p′*, at its free end for engagement with the pin n^2 on the rear side of the wheel N′. A short distance below the rock-shaft P is another rock-shaft, Q, similarly journaled and carrying three levers, the rear one, Q′, having an arm, *q*, at its free end adapted to bear up against the under side of the described curved lever P′ and at the proper time lift said lever P′ free from engagement with the notch *m* in the wheel M, while near its front end this rock-shaft Q carries another lever, Q^2, having an upwardly-bent end, *q′*, for engagement at the proper time with the pin *n′*, which projects from the front side of the rim of the wheel N′, as hereinafter described, and about midway between the levers Q′ and Q^2 the rock-shaft Q carries another lever, Q^3, projecting in a contrary direction from said other levers and carrying at its free end a rod, wire, cord or chain, *r*, to whose lower end is connected an armature-lever, R, of soft iron, located, as shown, just above the electro-magnets G G and within their field of attraction, which armature-lever is pivoted in the frame R′ and adjusted in the required normal position away from the magnets by means of the spring *r′*, extending from the short arm R^2 of the armature-lever to a screw, r^2, in the upright arm of the frame R′, while another adjusting-screw, r^3, passes up through a lug, r^4, on said arm and bears against the under side of said short arm R^2, so that a turn of the screw r^2 will either relax or tighten the spring *r′*, while a turn of the screw r^4 will increase or lessen the space between the electro-magnets and the armature. I have shown the armature as a plate secured to the lower side of its lever; but the whole lever may be of soft iron, if preferred.

S is another rock-shaft located to the right of the shafts P and Q, and this shaft S carries a lever, S′, whose end *s* bears upon the lever Q^3, which connects with the armature-lever, and a curved lever, S^2, projects from this shaft S in the opposite direction from lever S′, and is preferably forked at its free end, to which is pivoted at *s′* an arm, S^3, having a depending latch, s^2, (preferably projecting through the fork described,) and weighted, as shown at s^3, at its free end; or in place of said weight, or in addition thereto, a rod or wire, s^4, may project up from near the end of the lever S^2 and be bent over, so as to limit the upward movement of the arm S^3, and the drop of lever S^2 is limited by a pin, S^4, on plate H.

Back of the plate I, Fig. 2, is an ordinary clock mechanism, the parts of which showing in the drawings not being lettered, as there is no peculiarity about their construction. The dial and hands of this clock ave removed, and on the hour-hand shaft T there is mounted a toothed wheel, T′, capable of independent rotation on said shaft, and having a rear-extending circular flange, *t*, and rear hub, *t′*, and back of this, and between it and the plate I, is a friction-disk, T^2, rigidly secured to shaft T, as by pin t^5, and having a forwardly-extending circular flange, t^2, on its periphery of greater diameter than the just-named flange *t* of the wheel T′, and to the inner side of this flange t^2 there are secured a series of springs, t^3 t^3, whose free ends bear against the flange *t* of the wheel T′, and the pressure or tension of these springs is regulated by the set-screws t^4 t^4, passing through said flange t^2 and bearing against said springs t^3.

The plate I is provided with guides or loops *i′ i′* for the reception of a rack-bar, I′, having a series of teeth on its under side designed to mesh with those on the wheel T′, and on its upper side a tongue, i^2, for engagement with the latch s^2 above it.

From the rear side of the front plate, H′, there projects a stud, *h′*, at the point indicated in Fig. 1, and this stud is fitted with a sleeve, h^2, from which rises a rod or bar, h^3, which extends up high enough to come in the path of the pins *k′* on the wheel K′ above and be moved thereby at the proper times, the sleeve h^2 acting as a rock-shaft and the bar h^3 having suitable graduations marked thereon for the correct vertical adjustment of the loop h^4, which is connected by link I^2 with the end of the rack-bar I′.

The shaft K already named projects through the front plate, H′, and there receives the commutator U, having on its periphery sections of insulating material, *u u*, alternating with the plain surfaces of the metal of which the commutator is composed, there being shown in this instance four of these insulating-sections, though the number would depend upon the size and arrangement of the device.

Projecting from the front plate, H′, and properly insulated therefrom at *v′*, is a post, *v*, bearing a contact-spring, V, whose free end bears upon the periphery of the commutator, and *w* is another post projecting from the front plate, H′, (and similarly insulated therefrom at *w′*,) and bearing a contact spring, W, whose free end bears upon the metallic hub U′ of the commutator. From the post *v* a wire, *j*, runs to the portion D of the main line, and from the post *w* a wire *i* runs to the portion D′ of said main line.

The operation of my device is as follows: Suppose there are a number (as ten) of sta-

tions or telephones on a line and No. 2 wishes to talk with No. 5. No. 2 turns the magneto-crank of his telephone or station and rings the signal necessary to call No. 5, and No. 5 answers the signal by ringing back, and then takes down his hand-telephone X from the telephone-switch e^1, which breaks the connection at contact-spring e^2 (and consequently breaks the connection with the electro-magnets G of No. 5's device, which were in circuit with said contact-spring e^2, as shown by Fig. 7) and makes contact with contact-spring e' of his magneto-bell, and connection by wires y' y h, contact-point C', and switch C^2 with the portion D' of the main line which runs into No. 5's instrument. Then No. 2 presses down on the thumb-piece b' of this switch C^2 and forces the latter down on the contact-point C, thereby breaking connection at the contact-point C' between the main line and his electro-magnets G and making connection between his generator B and the portion D' of the main line, (through switch C^2, contact-point C, and wire d,) and similar connection between said generator B and the portion D of the main line (through wire e) simultaneously, and while No. 2 is thus holding down his switch C^2 in contact with contact-point C, as described, he turns the crank a or otherwise generates a strong current of electricity from his generator B, which passes along the entire main line D and D' and energizes the electro-magnets G on all the stations (except Nos. 2 and 5) sufficiently to draw down their armature-levers R, which are held up by the springs r' with sufficient resistance to overcome the attraction of any weaker current of electricity than that generated by the generator B.

I have already described how the connection with the electro-magnets G of No. 5 has been broken; and hence it is obvious that this strong current from No. 2's generator cannot affect them, and the connection with the electro-magnets G of No. 2 has been broken, as described, and hence this strong current will only affect the electro-magnets G of those instruments or stations which it is desired to cut out, (in this instance Nos. 1, 3, 4, 6, 7, 8, 9, and 10.)

I will now describe how the instruments of the last-named "numbers" are affected. As the magnets G are energized by the strong current from generator B, the armature-lever R is drawn down, and with it the rod or other connection, r, attached to lever Q^3 on rock-shaft Q, thereby raising lever Q' on same rock-shaft up against lever P', and raising the latter on its rock-shaft P, so as to lift its bent end or pin p out of the notch m in the wheel M, while at the same time this motion of the rock-shaft P raises its other lever, P^2, thereby releasing pin n^2 on the wheel N' from contact with the end p' of said lever P^2, and thus (as the spring J' is understood to be always kept wound) permitting said wheel N' to revolve and setting the train of mechanism all in motion simultaneously therewith, which motion will continue until the wheel M has made one entire revolution, when the pin p at end of lever P' will again drop into the notch m, which lowers the lever P^2 again into the path of the pin n^2 on the wheel N', and said wheel N' is so timed that said pin n^2 will always be at the same point of its travel at the completion of every revolution of the wheel M, and hence in contact with the end p' of lever P^2. While the said wheel M is making one revolution the wheel K' makes one-eighth of a revolution, and one of the pins k' on said wheel K', which at the commencement of motion is in close proximity to the bar h^3, is thus moved against this bar and pushes it over on its rock-shaft or bearing h' until the said one-eighth revolution has been accomplished, at which time the said pin k' clears the top of the bar h^3, and this movement of the latter has drawn, through link I^2 on the rack-bar I', until a certain number (depending on the adjustment of the loop h^4 on bar h^3) of the teeth of said rack-bar are caught in mesh with the teeth on the wheel T', which wheel (by reason of its clock being kept wound) is understood to be always normally revolving in the direction of the arrow shown on the clock-plate I; but being held to the shaft T only by the friction of the springs t^3 against the wheel-flange t, as hereinbefore explained, the said wheel T' is readily reversed when the rack-bar I' is drawn back, as just described, and as said rack-bar is being thus drawn back by the action of the pin k' of wheel K' against the bar h^3, linked to said rack-bar I', as stated, the tongue i^2, which projects up from said rack-bar, bears against the vertical edge of the latch s^2, and thereby raises said latch and the latch-arm S^3, pivoted to the end of the lever S^2, and passes by said latch, which latter drops back to position by gravity, ready to be acted upon, as hereinafter described, in the return movement of the rack-bar I'. The wheel K', whose one-eighth revolution has just been described, is mounted, as stated, on the shaft K, which carries the commutator U, whose periphery, as will be remembered, is in this instance divided into eight alternate divisions of metal and insulating material, the latter marked u and the former being continuous with the metal of the body and hub U' of the said commutator, and as the commutator is fast on the shaft K it follows that when the wheel K', also fast on said shaft, makes the described one-eighth revolution the commutator will do the same, and thereby change from its normal position (shown in Fig. 7, where the contact-spring V, whose post v is insulated, rests on one of the insulated divisions u of the commutator) and move one-eighth of its revolution in the direction of the arrow, so that the end of this contact-spring V will then rest on the metal of the commutator, and as the other contact-spring, W, presses against the metallic hub of the same there will be a direct

short circuit on the main line, (from the portion D′ through wire *i*, contact-spring W, commutator U′ U, contact-spring V, and wire *j* to the portion D,) so that the electric current passes along the main line without entering the telephones or stations thus cut out and escapes the resistance which would otherwise be caused thereby.

I have shown and described how the various specified telephones or stations on the main line could be automatically cut out and I will next describe how my device automatically restores their circuits to their normal condition. When the said telephones or stations are cut out, it will be remembered that the teeth of the rack-bar I′ are in mesh with those of the wheel T′, and the bar h^3 has been drawn over to the left by the pin k' on wheel K′, and the rack-bar I′ necessarily drawn the same way, with its tongue i^2 on the left-hand side of the latch s^2, or adjacent to the rounded or beveled side of said latch, and the wheel T′ is revolving in the direction indicated by the arrow on plate I. As the tongue i^2 of the rack-bar I′ is drawn by said motion of the wheel T′ to the right, against the said beveled edge of latch s^2, the latter is raised, raising with it the lever S^2, fast on rock-shaft S, and thereby said shaft is turned, and the lever S′, also fast on said shaft, is depressed, bearing down on the lever Q^3, fast on the rock-shaft Q, and turning said shaft, thereby raising the levers Q′ and Q^2, also fast on the said shaft Q. The lever Q′ as it rises lifts the lever P′, fast on the rock-shaft P above, as before described, and frees the end or pin *p* of said lever P′ from the notch *m* in wheel M, and at the same time the lever P^2, also fast (as described hereinbefore) on said shaft P, is lifted free from contact with the pin n^2 on the wheel N′, and this enables the said wheels M and N′ and their connections to begin to revolve, while simultaneous with the raising of the just-described levers the lever Q^2, fast on the shaft Q, has been raised, as stated, so that its bent end q' will lie in the path of rotation of the pin n' on the outside of the said wheel N′, and therefore the described motion of said wheels M and N′ only lasts until the said pin n' comes against the said end q' of the lever Q^2, (which would be after about the one-sixth revolution of the wheel N′ in the illustration given,) at which time the pin or end *p* of lever P′ is resting on the periphery of the wheel M at some distance from the notch *m*, and the pin n^2 on the wheel N′ is also some distance from the pin or end p' of the lever P^2, and the parts remain in this position until the wheel T′ has drawn the rack-bar I′ along far enough for its tongue i^2 to pass under and beyond the point of the latch, when the latter and its lever S^2 will drop back to the position shown in Fig. 2, and this causes the lever S′ to rise and release the pressure on lever Q^3, whereupon lever Q′ and Q^2 also drop by gravity, and the wheels M and N′ resume their movement, which is continued until the notch *m* in the former wheel comes under the pin or end *p* of lever P′, when the said pin or end falls into the said notch, and the lever P′ drops, thereby turning the rock-shaft P and lowering the lever P^2 simultaneously, the pin or end p' of said lever P^2 thereby again coming against the pin n^2 on the inside of the wheel N′, and this movement of the wheel N′ is accompanied by corresponding motion of the connecting-gearing, (pinion *n* on the shaft N of said wheel N′, wheel M′, and pinion L′ on shaft L, and wheel K′ on shaft K,) and as shaft K turns the commutator U on said shaft turns with it, bringing one of the insulated divisions *u* under the end of the contact-spring V, (which was previously resting on one of the metal divisions of the commutator-periphery,) and thus the short circuit previously described, of which said contact-spring V formed a part, is broken, and the electric current on the main line must now pass through the circuit which includes the electro-magnets G.

In the diagram view, Fig. 7, I have shown the magneto-generator Z, its wires *z z′*, connecting with the portion D of the main line, and a shunting device, z^2, z^3, and z^4, merely that there might be no question of the operative features of my device; but all this is so well understood by those familiar with the art that I do not deem any extended description thereof necessary. Though especially described with reference to telephone systems, it will be understood that my invention is adapted equally well for use of a telegraph system—for instance, when it may be advisable for any reason to cut out an instrument or station at any time.

Another use of my invention would be in electric, fire, or police alarm systems for cutting out any particular alarm or station in the one instance or any particular light or lamp in the other instance.

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

1. In a telephone or analogous electric system, the combination, with the main line and instruments or stations thereon, of supplemental generators adapted to be electrically connected to said main line and generating stronger currents than those which operate the instruments, electro-magnets, and armatures attracted thereby under the action of a current from one of said supplemental generators, and mechanism connected to said armatures and adapted for automatically cutting out the instruments or stations on the line other than those which are to communicate with each other and eliminating their resistance, substantially as set forth.

2. In a telephone or analogous electric system, the combination, with the main line and instruments or stations thereon, of supplemental generators adapted to be electrically connected to said main line, and generating stronger currents than those which operate

the instruments, electro-magnets, and armatures attracted thereby under the action of a current from one of said supplemental generators, and mechanism connected to said armatures and adapted for automatically cutting out for a predetermined time the instruments or stations on the line other than those which are to communicate with each other, and automatically restoring their circuits to their normal condition at the expiration of said period, substantially as set forth.

3. In a telephone or analogous electric system, the combination, with the main line and instruments or stations thereon, of a supplemental generator adapted to be electrically connected to said main line and capable of generating a current of electricity greater than the ordinary currents used to operate the instruments on said line, electro-magnets normally electrically connected to said main line and the instruments thereon, and armatures within the field of attraction of said electro-magnets only when the latter are acted upon by the said strong current, mechanism mechanically connected to said armatures for automatically cutting out said instruments and bearing a device for making a shorter and more direct temporary circuit on the main line at any point where an instrument is cut out, practically free from resistance at such point, suitable switches and electric circuits and other mechanism mechanically connected to the last-named mechanism, for restoring the normal circuits at such point or points at the expiration of a predetermined time, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand, at Milwaukee, in the county of Milwaukee and State of Wisconsin, in the presence of two witnesses.

ANTHONY B. FERDINAND.

Witnesses:

H. G. UNDERWOOD,

WILLIAM KLUG.