W. W. DEAN.

POLE CHANGER.

APPLICATION FILED DEC. 27, 1910.

1,043,906.

Patented Nov. 12, 1912.

2 SHEETS—SHEET 1.

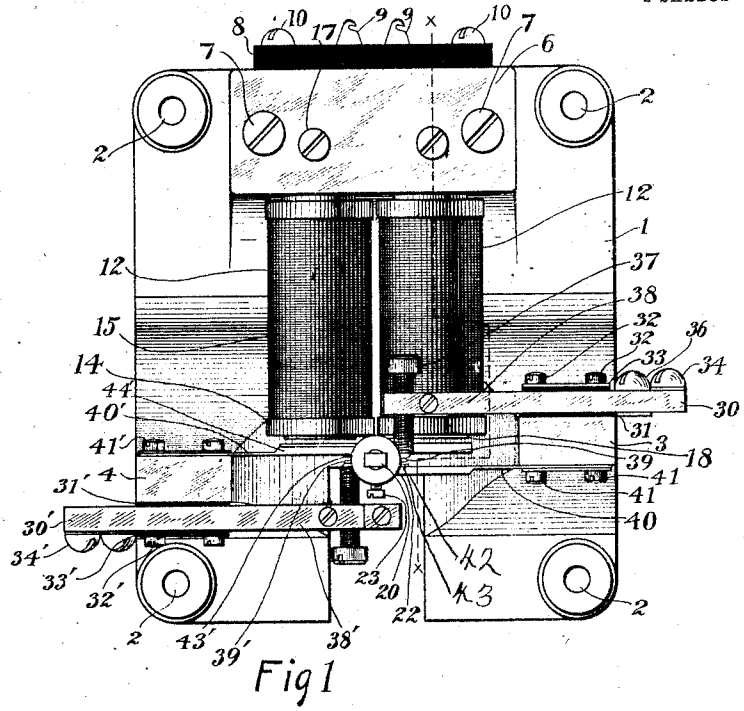

Fig 1

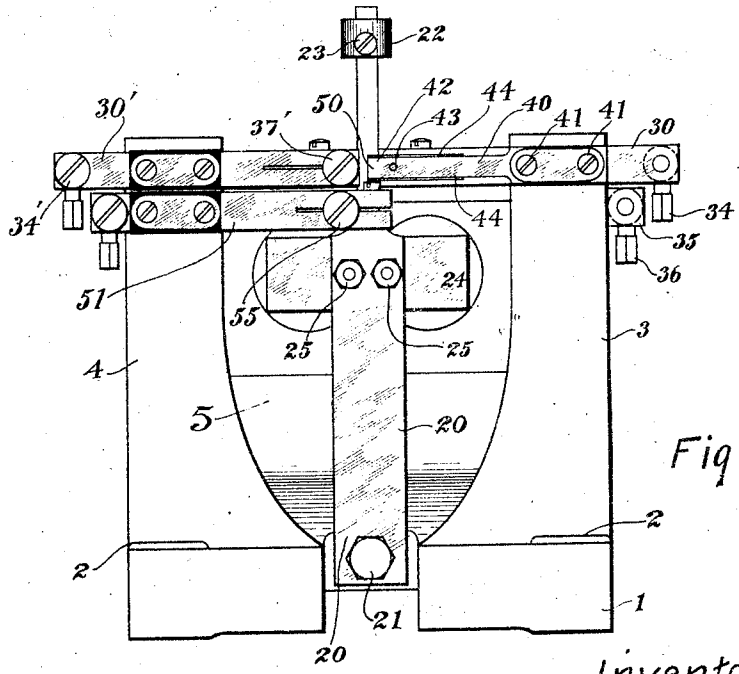

Fig 2

Witnesses
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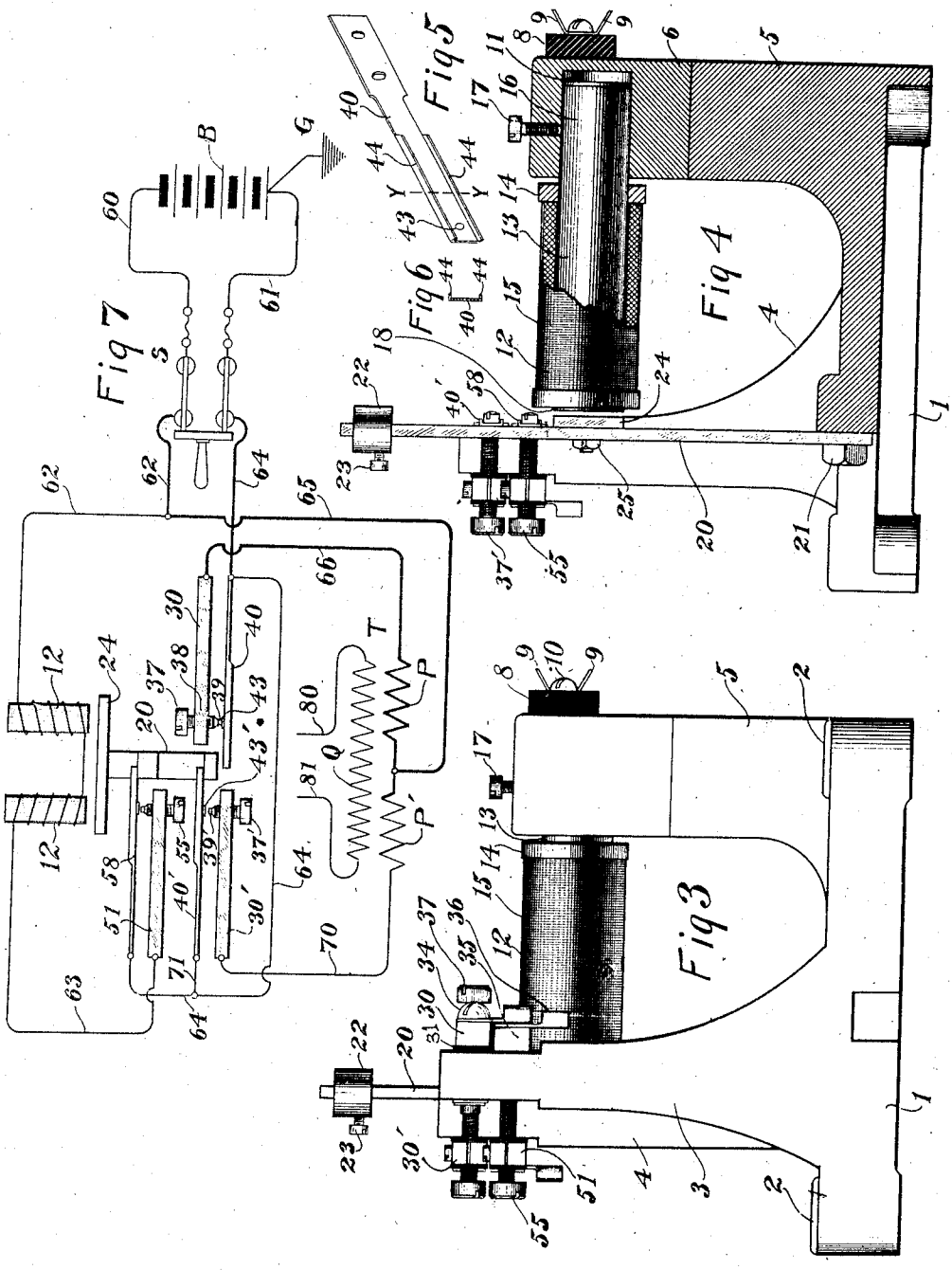

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UNITED STATES PATENT OFFICE.

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POLE-CHANGER.

1,043,906. Specification of Letters Patent. Patented Nov. 12, 1912.

Application filed December 27, 1910. Serial No. 599,521.

To all whom it may concern:

Be it known that I, WILLIAM W. DEAN, a citizen of the United States, residing at Elyria, in the county of Lorain and State of Ohio, have invented certain new and useful Improvements in Pole-Changers; and I do hereby declare the following to be a full, clear, and exact description of my invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to that class of pole changers which are adapted to be used in harmonic party line signaling. In this class of work, several signals are placed upon the same line. These signals are to be selected and operated by current from current generating means in such a way as to operate a single signal and in no way disturb the other signals upon the line. The particular kind of party line for which my pole changer is designed to be associated, employs tuned signals which are adjusted to vibrate at a certain frequency, the frequency of each reed differing from that of the other reeds upon the line. Alternating currents of frequencies corresponding to that of the individual reeds are placed upon the line for the purpose of selectively operating such reeds. When this system of selective signaling was first instituted, alternators were employed for the purpose of generating the operating current. These alternators required sources of power to drive them so that they could not be used in small towns where such sources of power were not available and where party line work in the telephone business was especially desirable. To meet this demand, pole changers which could produce such a current as would operate these signals were designed. The pole changers of the art which were employed to operate individual bells were found ill adapted and practically unfit to produce a current of such uniformity with regard to frequency of current as was necessary to select and operate the frequency signals. In commercial work, these signals are employed on roughly constructed lines under all sorts of weather and conditions, with all sorts of people, for year after year, and special pole changers to perform the functions described were found to be necessary. Although the differences between the pole changers of the prior art and these specially designed pole changers have been slight, those slight changes have determined a success where the old pole changers were failures.

My invention relates to a class of pole changers which are employed in this particular class of work and the object of my invention is the improvement of such pole changers.

I aim to produce an instrument more simple, both in construction and operation, reducing the cost of production and of maintenance, and an instrument which will produce a more evenly curved wave, such that interference between the signaling will be less frequent. I aim to lessen the burden upon the source of current and to lengthen the period during which the instrument will work without the attention of the trouble-man.

Other objects of my invention will be apparent from the particular description.

Hitherto, one of the contacts employed in this class of pole changers has been carried by a vibrating member. This makes it necessary to connect the sources of current through a member, one end of which is stationary and the other vibrating. There is always a joint between the vibrating member and the means which connects it to the base which forms some resistance to the current. This resistance naturally varies with the condition of the joint. When one of the contacts is thus carried by the vibrating member, which is a flexible reed vibrating with a fundamental and several harmonics or vibrations of less amplitude than the fundamental, the contacts in coming together will not strike with a positive blow, but owing to the harmonics and other causes, the engagement will be of a vibratory nature. I avoid these objectionable features by mounting both the contacts upon a stationary member, and operating the switch formed thereby, by the vibrating member which is independent of the contacts. The contacts which control the circuit of the motor are mounted upon the stationary member in normally closed relation so that immediately the switch is closed, the system will begin to operate without it being necessary to start the reed with the hand. These contacts are likewise mounted independently

of the reed avoiding the objections cited. The reed is operated by a motor magnet and in order to keep the reed vibrating at just the proper frequency, it is necessary to adjust this motor magnet in the beginning such that the magnet will occupy different positions for different instruments, allowing for the variation in the personal characteristics of the different reeds. As these characteristics change, it is necessary to adjust the normal air gap between the reed and magnet from time to time. To accomplish this, I make these magnets adjustable and further, make them individually adjustable. In pole changers of this character which have heretofore been built, the structure has not been such that the magnets could be readily removed from the frame without disturbing the adjustments of the contacts or other parts of the pole changer. As it is necessary from time to time to remove a coil or core, and as it is exceedingly inconvenient to disturb the adjustment of the contacts, this feature of my invention is of considerable importance.

Inasmuch as in the system which I use, I employ a split primary transformer with a circuit for each half of the primary, which is controlled by the pole changer, I employ two switches to be operated by the vibrating reed. These switches are operated alternately and in order to accomplish this, the reed is placed between the switches. Since in the device shown in the drawing the contacts of these switches are supported from the base by supports, it is convenient to stagger these supports so that the contacts when attached thereto readily fall on either side of the vibratory reed. One of the contacts of each switch is carried by a flexible member which has its own period of vibration and which is apt when it strikes the associate contact to strike with a vibratory contacting blow. To prevent this, I stiffen the part of the flexible member which carries the contact so that all the flexing is in another portion of this member. This likewise insures a positive break when the springs are separated, as the power which separates them is applied to another part of the flexible member, and were the part which carries the contact allowed to flex the contacts would be separated in much the same way that two sheets of paper which are held together by soft mucilage are when pulled apart. In my pole changer, the closing of the switch is made by the resiliency of the flexible member itself and the separation is caused by the vibratory reed. This insures a sharp and positive break without the employment of special means. To accomplish this in many of the pole changers of the prior art, a backing member associated with the spring is employed. It will thus be seen that a positive engagement of the contacts is insured, owing to the elasticity of the spring and a positive break insured owing to the vibratory member, the stiffening of the spring aiding both engagement and disengagement.

My invention will be best understood by reference to the following description when taken in connection with the accompanying illustrations showing one specific embodiment thereof, while the scope will be more particularly pointed out in the appended claims.

Figure 1 is a plan view of the pole changer. Fig. 2 is a front elevation of this instrument. Fig. 3 is a side elevation. Fig. 4 is a section through the line X—X of Fig. 1. Fig. 5 is a perspective view of the flexible contact carrying member. Fig. 6 is a section taken through line Y—Y of Fig. 5. Fig. 7 is a diagrammatic view of the instrument and a circuit with which it may be employed. This view is not actually representative of the mechanism as employed in the form of the invention as illustrated in the other figures, but shows certain parts displaced.

Referring now to the drawings, 1 is the base of my pole changer. Each corner of the base is pierced at 2. Screws or other fastening means (not shown) may be employed in connection with these openings to attach the base to a table or other support. Supports 3 and 4 are mounted upon the base in staggered relation to each other, the support 4 being farther forward than the support 3. A third support 5 rises from the rear of the base. The support 5 carries a holding member 6 which is removably fastened thereto. The member 6 is removably mounted upon the support 5 in order that it may be removed therefrom when it is desired to change or to adjust the magnets. Screws 7 are employed for this purpose in the form shown. An insulating member 8 carrying contacts 9 is fastened to the holding member by suitable fastening means, such as screws 10 and insulates the contacts from the other parts of the instrument. The holding member is bored out at 11.

The motor magnets are shown at 12. These magnets consist of a core 13, a spool 14 mounted on the core and windings 15 mounted on the spool. The core 13 projects at one end beyond the spool as shown at 16. This projection 16 is adapted to be inserted in the opening 11 of the holding member and held there by a set screw 17. The magnet, as will readily be seen is adjustable in the opening 11 and is carried by the holding member 6. The screws 7 may be removed and the holding member taken away with the magnets carried thereby without disturbing the other parts of the apparatus. The other end of the core, which I will call the operating end, because it is this end

which acts directly upon the armature, is shown at 18.

A vibratory member which consists of a tuned reed adapted to vibrate at a certain predetermined frequency, is shown at 20. This is fastened to the base by a screw 21, preferably between the two supports 3 and 4 and substantially in a plane with the opposite faces of the supports. The upper part of this reed is cut away and a weight 22 adjustably mounted thereon and held in position by a set screw 23. The rate of vibration of the reed may be changed by adjusting this weight up and down the reed. This reed carries an armature 24 which is fastened thereto by convenient fastening means, such as bolts 25. This armature, as will be seen, is mounted in such a position as to be directly in front of the operating ends of the motor magnets.

The support 3 carries a contact carrying member 30 which is insulated therefrom by insulation 31. This member is fastened to the support by convenient fastening means, such as screws 32, the said screws being insulated therefrom by a layer of insulation 33 and bushings (not shown). This member carries a terminal 34. At 35 is shown a second member which carries a terminal 36. This second member is grounded on the frame. The first member extends beyond the support 3, as shown at 38 and a contact 39 is adjustably carried upon the end of a screw 37 mounted in the free end 38 of this member. On the opposite side of the support 3, a flexible member 40 is attached by screws 41. I may attach this by any convenient means and support it from the base by any suitable means. This member is attached in such a way that the end 42 of the spring is free. This end carries a contact 43 adapted to coöperate with the contact 39, the two forming an electric switch. A portion of the free part of this flexible member is stiffened. In the particular form shown, I fold over the edges of the spring as shown at 44, until these edges are substantially at angles to the main part of the spring. This prevents the stiffened portion of the spring from bending. The support 4 carries a member 30′ similar to the member 30, which is insulated from said supports by insulation 31′ and which is fastened thereto by screws 32′ insulated therefrom by insulation 33′ and bushings (not shown). This member carries a terminal 34′ and the free end 38′ carries a contact 39′ which is mounted upon an adjustable screw 37′ carried by the end 38′. A spring 40′ is mounted upon the support and attached thereto by screws 41′. The member 40′ carries a contact 43′ upon the free end of the spring and the edges of the spring are folded over at 44′. The contacts 39 and 43 and the contacts 39′ and 43′ are in the normal or inoperative position of the instrument, slightly separated. The flexible members project as shown at 50, beyond the position of the contact 43. The apparatus is so arranged that the vibratory member 20 projects upward between these two members and is so positioned that when vibrated it strikes the extended ends 50 of these members flexing the same so that upon the return of the vibratory member the contacts engage. The natural rate of the frequencies of the parts is such that the vibratory member returns and strikes the end 50 of the spring contacts.

The motor contacts are carried by the support 4. 51 is a member carrying the adjustable contact and is very similar in construction and arrangement to the other contacts described. A flexible member similar to that shown at 40 is employed and these contacts are normally in engagement so that the instrument may be started without flexing the vibratory member with the hand. This member carries an adjustable screw 55 which coöperates with a contact carried by the spring 58.

Referring now to Fig. 7, I have shown the switch 39′—43′ and the switch 55—58 which controls the motor circuit in the same horizontal plane in order to get them on the drawing. Normally, these are mounted in the same vertical plane as will be apparent from the other figures. In order to succeed in showing the device in diagrammatic form, it has been necessary to show a special member 20, which represents the reed, but which is shaped very differently therefrom. The source of current is shown at B. One pole of this source is grounded at G. A conductor 60 connects one pole to one side of a switch S. A second conductor 61 connects the other pole to the other side of the switch. One side of the switch S is connected by a conductor 62 to the motor magnet 12. A conductor 63 connects the other side of the motor magnet to the contact 55. The contact 58 is connected by a conductor 64 to the other side of the switch. A conductor 65 leads from the conductor 62 to one pole of one of the primaries P of the transformer T. The other terminal of this transformer is connected by conductor 66, to the contact carrying member 30. The flexible member 40 which carries the contact adapted to coöperate with a contact carried by the member 30 is connected through the conductor 64 to the other side of the switch. One pole of the other primary P′ is connected by a conductor 70 to the contact carrying member 30′. The flexible member 40′ is connected by a conductor 71 to the conductor 64, but the other terminal of the primary P′ is connected by conductors 65 and 62 to the switch S. The secondary Q of the transformer T is connected by the conductors 80 and 81 to

the electroresponsive devices which are not shown here.

The operation of my device is as follows: When the switch S is open, the motor contacts carried by 56 and 58 are closed, the other two switches being open. When the switch S is thrown, the motor magnets 12 are energized over the following circuit: B—60—one side of S—62—12—63—51—55—58—64—S—61 and back to battery, this will energize the motor magnets 12 which will attract the armature 24, flexing the vibratory reed 20, interrupting the circuit just described at 55—58 and pulling back the spring 40. The break of the circuit will deenergize the motor magnets, such that the reed 20 will make its rectrograde movement, allowing the spring 58 to engage the contact 55 and the spring 40′ to cause the contact 43′ to engage the contact 39′. The spring 40 will also be flexed. The closing of switch 43′—39′ will complete the following circuit: battery B—60—S—62—65—P′—70—30′—37′—39′—43′—40′—71—64—S—61 back to battery B. An impulse of current will flow through this circuit and a current will be induced thereby in the secondary Q. The switch 56—58 being again closed, the magnets will again attract the reed causing the same to move forward again. On this forward movement, the circuit through the primary P′, just described, will be interrupted and the switch 39—43 will be closed completing the following circuit through the primary P: battery B—60—S—62—65—P—66—30—37—39—43—40—64—S—61 to battery B. Impulses of current flowing through this circuit will induce current in the secondary as above described. This movement of the reed will again interrupt the motor circuit and the reed will make its rectrograde movement, opening the switch 43—39 and permitting the closing of the other two. This cycle will be continued and at each period of vibration each one of the switches will be opened and closed, the parts being so adjusted that the reed 20 will vibrate at a natural and predetermined rate. The current induced in the secondary will be an alternating current of even curve which will be of a steady predetermined frequency.

To further illustrate the use of this instrument, I will add that a number of these instruments are associated together and each adapted to place a current of a particular frequency upon the line conductors 80 and 81.

It will be readily seen that I may employ a single motor magnet 12 to operate my device; that I may support the contacts from the base by other means than those illustrated and that other numerous and extensive departures from the form and details of the apparatus here shown may be made without departing from the spirit of this invention, the same being herein shown solely for the purpose of illustrating one specific embodiment thereof.

I claim—

1. In a pole changer, the combination of a base, a contact supported rigid with said base, a flexible spring attached by a rigid connection with said base, a contact carried thereby and adapted to engage and disengage said first named contact, said contacts being normally separated constituting a normally open electrical switch, a vibratory member adapted to engage said flexible spring at each period of vibration to operate said switch and a motor magnet controlling said member.

2. In a device of the class described, the combination of a base, a holding member removably mounted on said base, a motor magnet removably carried by said holding member, including a magnet core and magnet coil, means for attaching said holding member to said base, a vibratory member adapted to be operated by said motor magnet and electrical contacts supported from said base adapted to be operated by said vibratory member.

3. In a pole changer, the combination of a base, a plurality of sets of contacts, supports for supporting said sets of contacts from said base, said supports being set in staggered relation to each other on said base, a vibratory member mounted on said base between said supports and adapted to operate said contacts when vibrated and a motor magnet for vibrating said vibratory member.

4. In a pole changer, the combination of a base, a plurality of supports mounted in staggered relation to each other on said base, a set of contacts carried by each support, a flexible spring mounted on each of said supports and carrying one of said contacts, a vibratory member mounted between said flexible springs and when vibrated adapted to engage each spring to operate said sets of contacts and a motor magnet for vibrating said member.

5. In a pole changer, the combination of a base, a contact supported thereby, a second contact supported by said base, said contacts constituting an electric switch, a flexible member carrying said second contact, means for connecting said member to said base, a part of said flexible member being free, a portion of the free part of said flexible member being stiffened, said contact carried on the stiffened portion, a vibratory tuned reed mounted on said base adapted when vibrated to move said second named contact away from the first and a motor magnet to vibrate said reed.

6. In a pole changer, the combination of a base, contact supports on said base set in staggered relation to each other, a vibratory

member mounted on said base between said supports and adapted to operate said contacts when vibrated and a motor magnet for vibrating said vibratory member.

7. In a pole changer, the combination of a base, a contact supported thereby, a second contact supported by said base, said contacts constituting an electric switch, a flexible member carrying said second contact, means for connecting said member to said base, a part of said flexible member being free, a portion of the free part of said flexible member having its edges turned up at an angle to stiffen that portion, said contact carried on said stiffened portion, a vibratory tuned reed mounted on said base, adapted when vibrated to move said second named contact away from the first and a motor magnet to vibrate said reed.

In testimony whereof, I affix my signature in the presence of two witnesses.

WILLIAM W. DEAN.

Witnesses:
F. O. RICHEY,
A. D. T. LIBBY.