114,467

PATENT SPECIFICATION

Application Date, Apr. 2, 1917. No. 4758/17.
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PROVISIONAL SPECIFICATION.

Improvements in or relating to Telegraph Systems.

We, JOSEPH ARTHUR LOVEL DEARLOVE, of 4, Great Winchester Street, in the County of London, ALEXANDER DAVIDSON, of Lima, Peru, and NELSON JOSEPH PERRYMAN, of Lima, Peru, Electrical Engineers, do hereby declare the nature of this invention to be as follows:—

This invention relates to telegraph systems.

The chief object of the invention is to provide means for dividing up a signal consisting of a number of dots or dashes received as a single or block signal at one end of a submarine cable or other telegraph line into its constituent dots or dashes as transmitted from the sending end of the line, such a method being referred to as interpolation. In accomplishing this interpolation according to the present invention vibrating relays are employed which are started in operation at the beginning of the reception of a "block" signal and remain vibrating until the end of that signal or while consecutive dots and dashes arrive. The vibrating relay is preferably of the polarised type having differential windings. The fixed contacts or stops of the relay are connected to the terminals of a split battery, the mid-point of the battery being connected to a terminal of each of the operating windings of the relay through an adjustable resistance and a condenser respectively. The tongue of the relay is connected through an adjustable resistance to the junction of the operating coils. The tongue of the relay normally makes contact with one of the fixed contacts of the relay. A control coil is provided which when energised holds the tongue against one of the fixed stops of the relay and prevents the tongue vibrating. When the control coil is deenergised the tongue of the relay vibrates. When the tongue of the relay makes contact with one of the fixed contacts the split battery sends a current through one of the windings of the relay in series with the condenser and through the other winding in series with the resistance. The current in the former winding holds the tongue against its stop but as soon as the condenser is charged the current in the second winding overpowers the effect of the first winding and breaks the contact. This allows the condenser to discharge through both the windings so as to carry the tongue across to the opposite stop. The other half of the split battery then comes into operation and in the same way throws the tongue back again. The rate of vibration of the tongue of the relay can be varied by for example varying the value of the resistance in series with one of the operating windings. The momentary currents through the two contacts of the relay are passed through another repeating relay which

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is thus made to vibrate in step with the vibrating relay. The contacts of the repeating relay are connected either to another cable direct or to a reperforator or direct writer.

The vibrating relay is required to start and stop working, without loss of time, immediately the control circuit is operated. A vibrating relay which depended solely on mechanical resonance would require time to start up and damping or other means would have to be provided to make it "dead beat".

Three vibrating relays as described may be employed to operate respectively for dots, dashes and spaces. The cable relay is connected to a double relay which may be of the post office type and this double relay controls the circuits of the control coils of the vibrating relays. When a dot or series of dots arrive the spacing and dash vibrators are stopped but the dot vibrator is released and makes and breaks contact once for each dot. If a dash or a series of dashes arrive the spacing and dot vibrators are stopped and the dash vibrator is released and makes and breaks contact once for each dash. The vibrating relays control the repeating relays which may transmit the dots and dashes into another cable direct or on to cable transmitting sounders or on to perforating apparatus or to a direct writer as hereinbefore referred to. If it is required to work a perforator it is necessary to distinguish between letter and word spacing and for this purpose the spacing vibrating relay is added. This relay commences to vibrate directly the dots and dashes cease and gives one impulse to the spacing key of the perforator for each centre hole of the transmitting tape during which no signals are sent.

The control coils of the dot and dash relays may be so connected to the double relay that when either of the tongues of this last relay are moved on the reception of a signal either the control coil of the dot or that of the dash relay is deenergised. The controlling coils may be normally energised and the operation of the double relays may serve to short circuit and therefore deenergises the controlling coils.

Instead of employing separate vibrating relays for the dots and dashes one vibrating relay may be employed which controls the circuits of two relays one being a dot and the other a dash relay. With this arrangement a polarised relay is provided the operating windings of which are connected in parallel with a post office relay operated by the cable relay and controlling the circuit of the control coil of the vibrating relay. The windings of the dot and dash relays are connected in series to the fixed contacts of the polarised relay, the junction of the windings being connected through battery and the contacts of a repeating relay operated by the vibrating relay to the tongue of the polarised relay.

The post office relay, energised by the cable relay, may be employed to operate the control winding on the vibrating relay which in turn operates dot and dash relays. The latter relays are provided with control windings, which are operated by the post office relay, and allow the dot and dash relays to vibrate only when a dot or a dash is being received.

The present invention may be employed to facilitate quadruplex working when it is necessary to distinguish between signals of varying amplitude and duration. The invention enables a definite portion of each signal to be picked out so that its amplitude can be determined at, say, the middle of the interval between the beginning and end of each signal. Further, the interpolator enables the duration of a signal that is somewhat too long or too short to be corrected so that the original signals can be accurately reproduced.

Dated this 2nd day of April, 1917.

HASELTINE, LAKE & Co.,
28, Southampton Buildings, London, England, and
55, Liberty Street, New York City, U.S.A.,
Agents for the Applicants.

COMPLETE SPECIFICATION.

Improvements in or relating to Telegraph Systems.

We, JOSEPH ARTHUR LOVEL DEARLOVE, of 4, Great Winchester Street, in the County of London, ALEXANDER DAVIDSON, of Lima, Peru, and NELSON JOSEPH PERRYMAN, of Lima, Peru, Electrical Engineers, do hereby declare the nature of this invention and in what manner the same is to performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to telegraph systems and more particularly to signal receiving or retransmitting apparatus.

The chief object of the invention is to provide means for dividing up a signal consisting of a number of dots or dashes received as a single or block signal at one end of a submarine cable or other telegraph line into its constituent dots or dashes as transmitted from the sending end of the line, such a method being referred to as interpolation.

According to one feature of this invention for the purpose of interpolating dots and dashes a relay is employed which is caused to vibrate automatically by providing it with differential operating windings to which windings battery is simultaneously applied but in which the action of one winding is momentarily varied relatively to that of the other by the provision of a condenser or inductance to diminish the flow of current through one of the windings.

According to another feature of this invention signal receiving or retransmitting apparatus comprises a relay adapted to vibrate automatically to indicate dots and a relay adapted to vibrate automatically to indicate dashes, the relays having auxiliary windings which prevent the first mentioned relay from vibrating unless a dot or series of dots is received and the second relay from vibrating unless a dash or series of dashes is received. Further a third relay may be provided which is adapted to vibrate automatically to indicate spaces. The said relays are preferably caused to vibrate by providing them with differential windings as hereinbefore referred to.

In order that the invention may be clearly understood and readily carried into effect the same will now be more fully described with reference to the accompanying drawings, in which:—

Figures 1, 2 and 3 are diagrams illustrating three arrangements of apparatus and circuits at the receiving end of a cable for interpolation according to this invention.

In the system shown in Figure 1 the signals are received at the receiving end of a submarine cable or other telegraph line on a cable relay A which may be of any suitable type. A cable relay is shown which comprises a tongue which can make contact with two stops to indicate respectively dot and dash signals, the two contacts being connected to the tongue by resistance or spark coils. The cable relay operates a double relay D which may, for example, consist of two relays of the British post office type. The double relay D controls as hereinafter described two vibrating relays V and V^1, the relay V being a relay for the interpolation of dots and the relay V^1 being a relay for the interpolation of dashes. The relays V and V^1 operate respectively two repeating relays P and P^1 which may serve to repeat the dots and dashes into another cable.

Each of the relays V and V^1 is of the polarised type having differential windings 1 and 2. The fixed contacts 3 and 4 with which the tongue 5 of the

relay can make contact are joined to a split battery B, the mid point of this battery being connected, through the operating windings 6 of the associated repeating relay P or P^1 and a resistance R^1, to the operating coil 1 of the relay V and through a condenser K to the winding 2 as shown. The tongue 5 is joined through a resistance R^2 to the junction of the operating coils 1 and 2. Each of the relays V and V^1 is provided with an auxiliary winding or controlling coil 7 which when energised holds the tongue of the relay against vibration and against the contact 4. When the controlling coil is de-energised the relay tongue vibrates as will now be described.

The tongue 5 of the relay V normally rests in contact with one of the stops 4 as just referred to. The tongue 5 on coming into contact with the stop 4 joins the right-hand half of the battery B across the winding 6 of the relay P, the condenser K, the winding 2 of the relay V and resistance R^2 in series. A circuit is also closed from the right-hand half of the battery through winding 6 of relay P, resistance R^1, winding 1, resistance R^2 and tongue 5 and contact 4 of relay V back to the battery. Whilst the condenser K is being charged the winding 2 of the relay V overpowers the winding 1 and maintains the tongue 5 on the contact 4. When the condenser K is charged and if the controlling coil 7 is de-energised the winding 1 overpowers the winding 2 and the tongue 5 breaks contact with the stop 4. The condenser K then discharges through both windings 1 and 2 of relay V and resistance R^1. This causes the tongue 5 to be brought into contact with the stop 3. The left-hand half of the battery B then comes into operation and throws the tongue 5 back into contact with the stop 4. The operations described are repeated, so long as the controlling coil 7 is de-energised, and the repeating relay P is caused to vibrate in step with the relay V. The rate of vibration of the tongue 5 of the relay V can be varied by varying the value of the resistances R^1 or R^2 or of the capacity of the condenser K. The repeating relays P and P^1 are connected to a receiving instrument or to another cable.

The operation of the complete system will now be described. The tongue 8 or other movable member of the relay A on the reception of a dot is thrown in contact with the stop or contact 9 and closes a circuit from battery B^3 through the winding 10 of the double relay D. When a dash is received the tongue 8 of the relay A is thrown in contact with the stop 11 and a circuit is closed through the winding 12 of the relay D. The tongues 13 and 14 which are operated by the coils 10 and 12 normally rest on the contacts 15 and 16 and maintain the controlling coils 7 of the relays V and V^1 energised, the circuit for the coil 7 of relay V being from battery B^3, coil 7, tongue 13, contact 15 back to battery. If a dot or a number of dots either separated or in block form is received, the tongue 13 is pulled up and the controlling coil 7 of the relay V is de-energised. The relay V consequently vibrates and the repeating relay P vibrates in step repeating the dots as originally sent. Similarly if a dash or a series of dashes is received the tongue 14 of the relay D is pulled up and the relays V^1 and P^1 are caused to vibrate. The repeating relays P and P^1 transmit the dots and dashes into another cable direct or on to cable transmitting sounders or to a direct writer.

If it is required to work a perforator it is necessary to distinguish between letter and word spacing and for this purpose a spacing vibrating relay is added. This relay commences to vibrate directly the dots and dashes cease and is timed to give one impulse to the spacing key of the perforator for each centre hole of the transmitting tape during which no signals are sent. One such arrangement is indicated in Figure 2. The cable relay A, double relay D, dot vibrating and repeating relays V and P and dash vibrating and repeating relays V^1 and P^1 are arranged and operate as in the arrangement shown in Figure 1. In addition however there is provided a spacing vibrating relay V^2 and repeating relay P^2 and a relay C for controlling the circuit of the controlling coil 7^2 of the relay V^2. When the relay C is deenergised its tongue 17

is held out of contact with contact 18 and the circuit of the battery B^4 through the controlling coil 7^2 of the relay V^2 is opened thereby permitting the latter relay to vibrate similarly to the relays V or V^1 and so causing the repeating relay P^2 to transmit spacing impulses. If either of the operating windings 19 and 20 are energised the tongue 17 is moved so as to close the circuit of the battery B^4 through the coil 7^2. On the reception of a dot or series of dots the tongue 13 of relay D is pulled up and the relays V and P operate as described in connection with Figure 1. Further a circuit is closed from battery B^2, through conductor 21, operating winding 19 of relay C, conductor 22 back to battery B^2. The relay C therefore closes the circuit of the controlling coil 7^2 of relay V^2 preventing the relay V^2 from vibrating and stopping the spacing impulses. Similarly if a dash or series of dashes is received a circuit is closed through the operating winding 20 of the relay C and the latter being energised the circuit of the controlling winding 7^2 of the relay V^2 is closed. If neither dots nor dashes are received the winding 7^2 is deenergised and the relay V^2 vibrates causing the relay P^2 to vibrate in step. The impulses from the relay P^2 operate the spacing mechanism of the perforator.

Any suitable type of electromagnetically operated or controlled perforator may be employed.

In Figure 3 another method of controlling the spacing vibrating relay is shown. In this figure the cable receiving relay A, dot vibrating and repeating relays V and P and dash vibrating and repeating relays V^1 and P^1 are provided as in Figure 2. Instead however of opening the circuit of the controlling windings of the vibrating relays means are provided for short-circuiting these windings. This is accomplished by providing on the tongues 13 and 14 of the relay D additional contacts 23 and 24 which are insulated from the tongues but connected to the terminals of the coil 7^2 to which a battery B^5 is also connected. When neither a dot nor a dash is being received the contacts 23 and 24 rest on the stops 15 and 16 which are connected together and consequently the coil 7^2 is short circuited. The relay V^2 therefore vibrates causing the repeating relay P^2 to transmit spacing impulses. The controlling windings 7 and 7^1 of the relays V and V^1 have batteries B^6 and B^7 connected to them. If dots are received the winding 7^1 is short-circuited over conductor 25, tongue 13, contact 26 and conductor 27. Similarly if dashes are received the winding 7^1 is short circuited. The movements of either of the tongues 13 or 14 when dots or dashes are received serve also to open the short circuit across the controlling winding 7^2 of the relay V^2 and thereby prevents this relay from transmitting spacing impulses.

Instead of employing condensers K associated with the vibrating relays, the relative action of the windings of the relays may be varied in the required manner by the use of inductance and instead of providing auxiliary or controlling windings to stop the operation of the vibrating relays as required, the circuit through one or both of the operating windings of these relays may be broken.

Instead of employing two separate vibrating relays for dots and dashes respectively a single vibrating relay may be employed which can cause two repeating relays to vibrate, a third relay determining which of the repeating relays is connected in circuit.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. In a telegraph system, the employment for the purpose of interpolating dots and dashes of a relay adapted to vibrate automatically by providing it with differential windings to which windings battery is simultaneously applied but in which the action of one winding is momentarily varied relatively to that of the other by the provision of a condenser or inductance to diminish the current flow through one of the windings.

2. In a telegraph system, signal receiving or retransmitting apparatus comprising a relay adapted to vibrate automatically to indicate dots and a relay adapted to vibrate automatically to indicate dashes, the relays having auxiliary windings which prevent the first mentioned relay from vibrating unless a dot or series of dots is received and the second relay from vibrating unless a dash or series of dashes is received.

3. In a telegraph system, signal receiving or retransmitting apparatus comprising a relay adapted to vibrate automatically to indicate dots, a second relay adapted to vibrate automatically to indicate dashes and a third relay adapted to vibrate automatically to indicate spaces, the relays having auxiliary windings which prevent the first relay from vibrating unless dots are received the second unless dashes are received and the third unless neither dots nor dashes are received.

4. In a telegraph system signal receiving or retransmitting apparatus as claimed in Claim 2 or 3 and in which the relays are caused to vibrate automatically by providing them with differential windings to which windings battery is simultaneously applied but in which the action of one winding is momentarily diminished by capacity or inductance associated with its circuit.

5. A telegraph system comprising receiving or retransmitting apparatus arranged and operating substantially as described or as illustrated in the accompanying drawings.

Dated this 21st day of September, 1917.

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[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

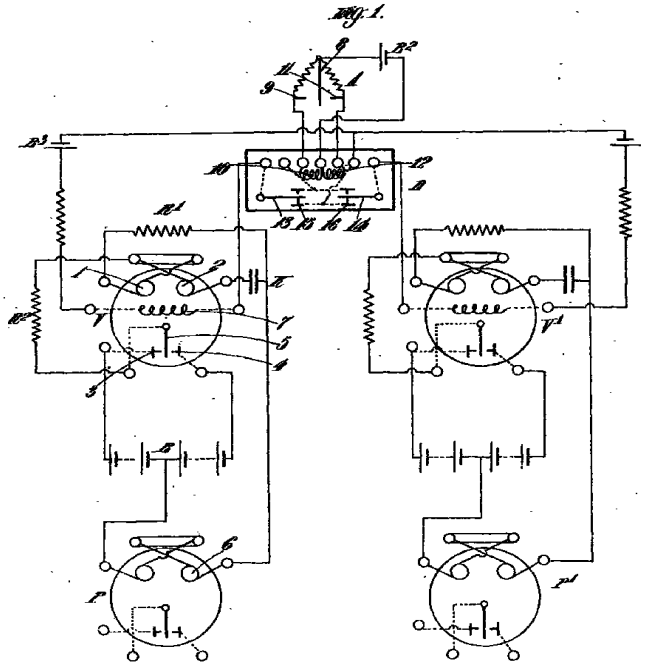

Fig. 2.

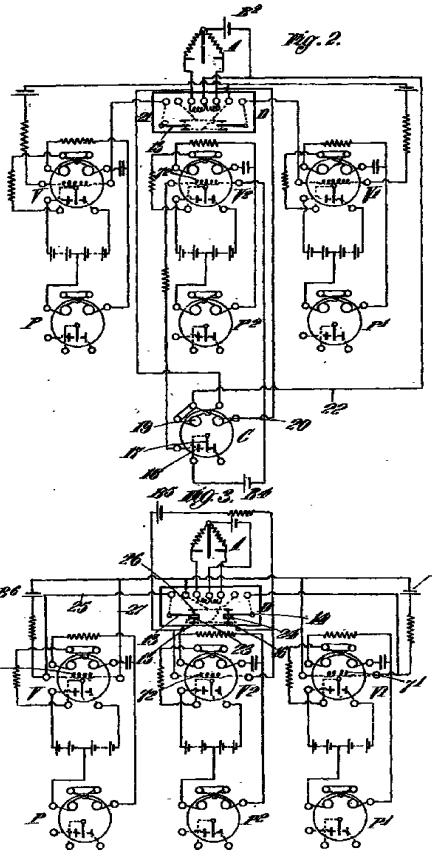

Fig. 3.

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[*This Drawing is a reproduction of the Original on a reduced scale.*]

Fig. 1.

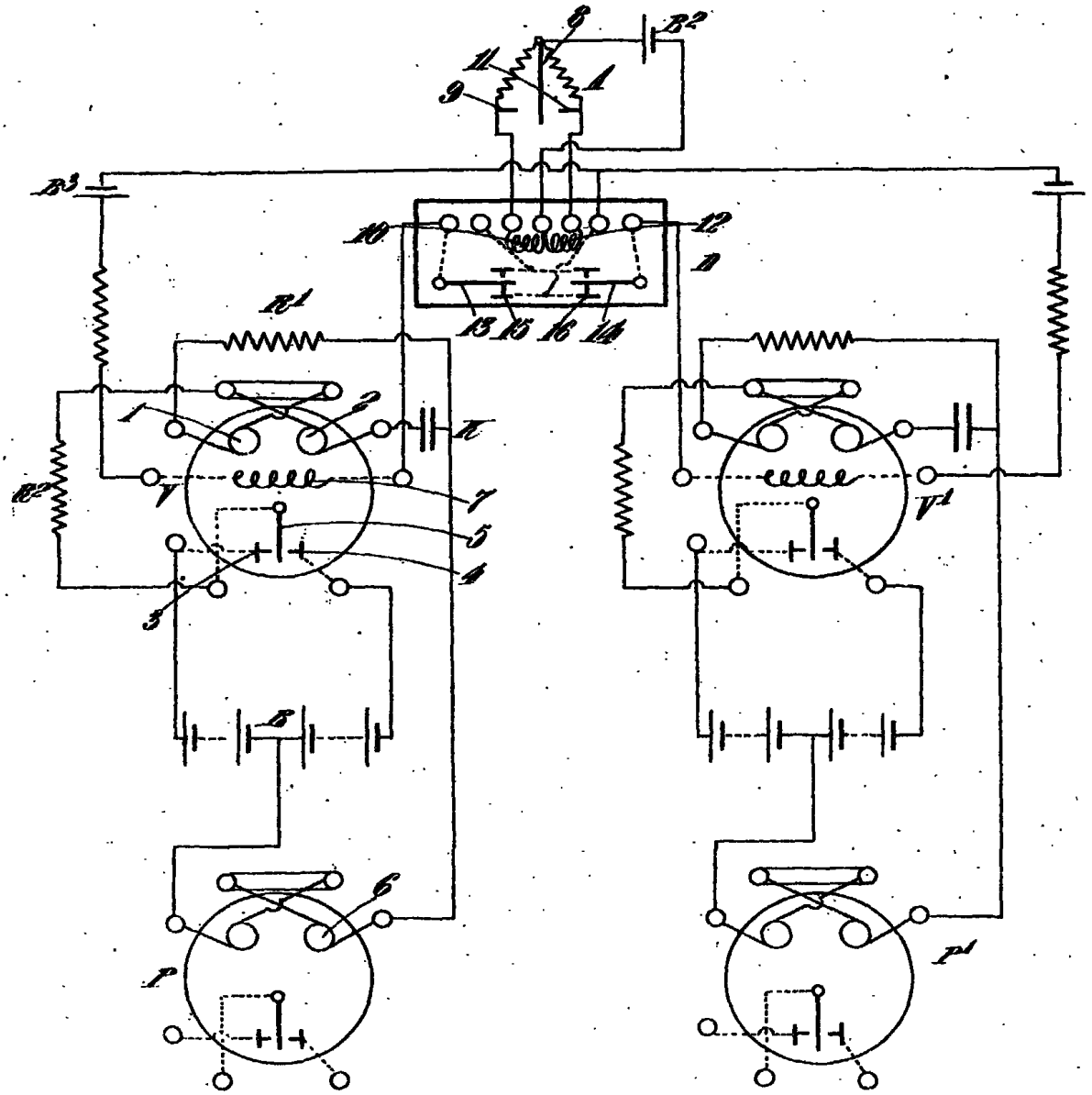


Fig. 2.

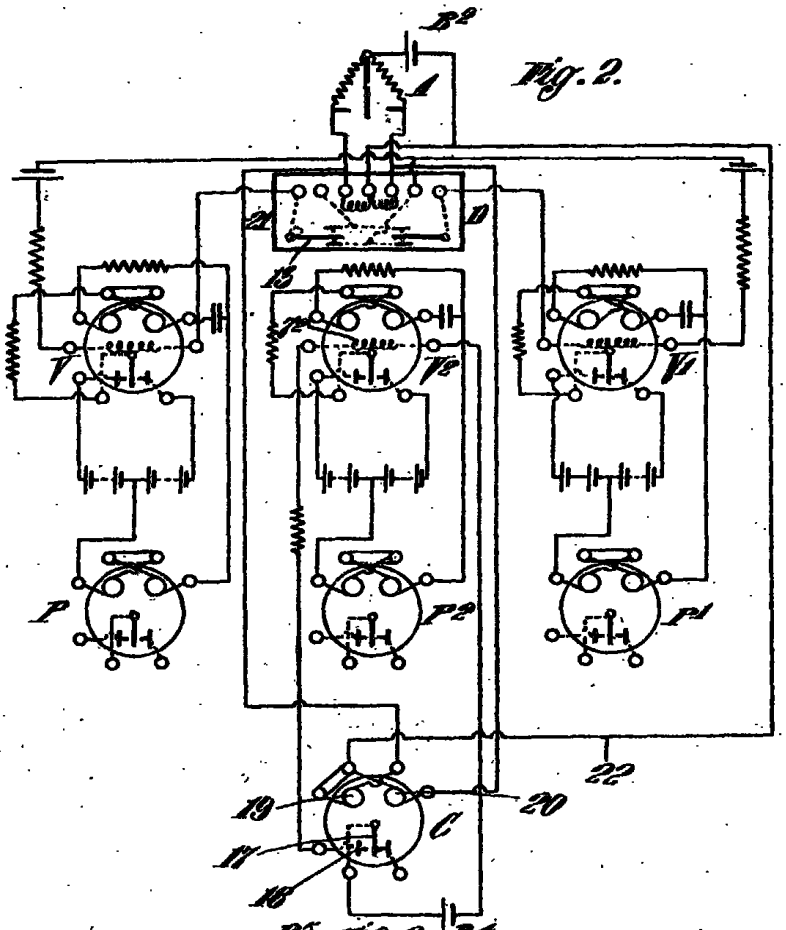
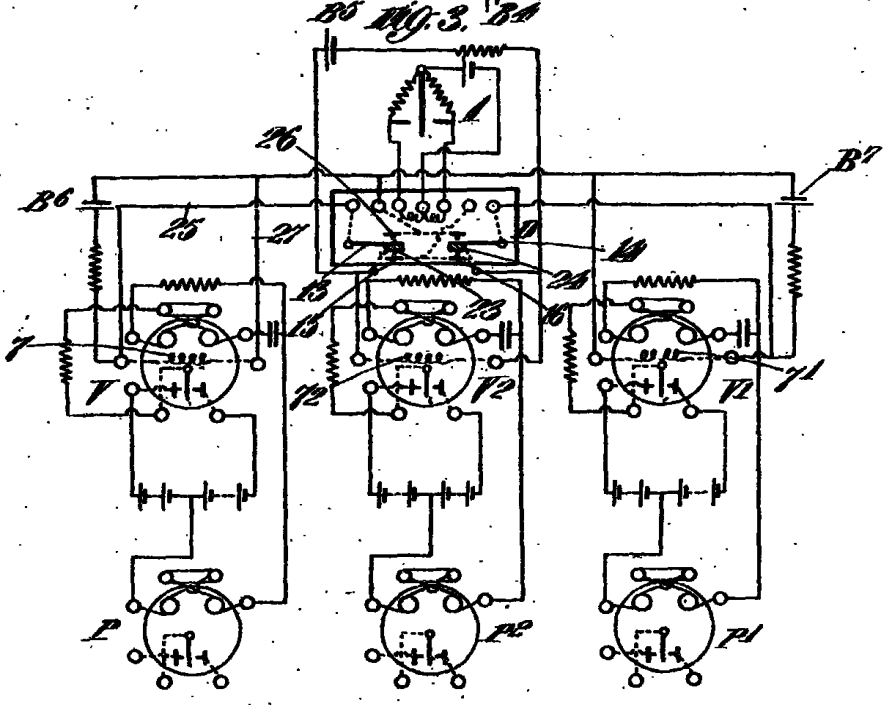


Fig. 3.



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