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PROVISIONAL SPECIFICATION.

System for the Generation of Electric Currents.

I, CARLOS F. BENITEZ, Civil Engineer, of 141, Ocampo Street, in Guadalajara, Mexico, do hereby declare the nature of this invention to be as follows:—

The invention which forms the object of this Patent of Addition, relates to new improvements in the system for the generation of electric currents, described
5 in the main Patent No. 17,811, filed July 28th, 1914, and in the Patent of Addition No. 5591, filed 14th April, 1915.

The said system may be still further simplified and improved by the addition of batteries of accumulators, which suitably adjusted in conjunction with the
10 said described system, can be charged and discharged alternately, producing furthermore an excess of electrical energy, that can be employed at will, for any purpose outside the automatic operation of the arrangement under description.

In other words, in this arrangement I use synthetically in combination: two
15 groups of accumulators connected in series; two groups of accumulators connected in parallel; both said groups disposed in such way as to utilise the discharge of one of them, for the charging of the other, and *vice versa*; and means for the application of the energy produced by any of the methods described with reference to the English Patents No. 17,811/14 and No. 5591/15, in order to
20 increase the effect of the discharges of each group of accumulators when acting from one to another; and means for reversing the operations of such groups.

Another object of this new arrangement is to provide means for the operation of said system, using low voltages, condensers of small capacities, and greater facilities for starting.

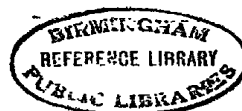
The advantages of such an improvement will be better understood by
25 considering the adjoining drawing, which illustrates one method of carrying out the invention:

In the figures: 1, 2, 3, 4, are batteries of accumulators, that once charged from some exterior electrical source, will maintain their charges indefinitely, in the
30 following manner:

With the connections established as shown in the figure, *i.e.* when accumulators 1—2 are connected in series through switch 5, (switch 6 being opened); the accumulators 3—4 are connected in parallel through switch 7, (switch 8 being opened).

Under these conditions, supposing the four batteries to be alike, if
35 battery 1—2, has been previously charged from some exterior source; when discharging they will have a voltage superior to the counter electromotive force opposed by the batteries 3—4 receiving such discharge. In other words, if by means of the conductor 13 the positive pole 9 of battery 1—2, is connected to the positive poles 10, 32, of batteries 3—4, and both negative poles 11, 12 of both
40 batteries are connected together; an electric current will be established from

[Price 6d.]



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battery 1—2, to batteries 3—4, until the voltages of both batteries are alike. Of course the current furnished by the discharge of battery 1—2 alone, would produce a smaller charge in the batteries 3—4, but that current can be increased by any of the methods already described in the aforesaid Patents No. 17,811/14, and 5591/15, and by these means it is always possible to charge and discharge alternately each battery 1—2 and 3—4, from one to another, keeping constant a predetermined charge, and furthermore producing an excess of electrical energy, that can be employed at will.

With these objects in view, and using as an illustration the arrangement shown in the Sheet 1 (Figure 1) of the Patent of Addition No. 5591/15; the condenser 14 is connected in series in the conductor 13. In the same manner, the primary 15 of an ordinary induction coil provided with an interrupter, is connected by each of its poles 16, 17, to the same wire 13. The secondary of same induction coil is connected by each of its poles 18, 19, to the poles 20 and 21, of the second condenser or battery of condensers 22. These same poles are furthermore connected through the spark gap 23, with the poles 24, 25, of the primary 26, of a high-frequency transformer. The secondary 27 of this same transformer is connected by each of its poles 28, 29, with the poles 16, 17, of the induction coil 15. Finally both poles of condenser 14 are connected to the conductors 30, through which a part of the electrical energy provided by these means, can be shunted and employed at will.

This arrangement being made, the electrical energy stored by the accumulators 1—2, passing through the pole 9, wire 13, primary 15 of the induction coil, pole 10 of the accumulators 4, pole 31 of switch 7, and pole 32 of accumulators 3, will go back through pole 12 to the same battery 1—2.

As a consequence of the passage of this electric current through the primary 15 of said induction coil; high-tension currents will be obtained in its secondary, which being collected by the condenser 22, will finally produce high-frequency currents through the primary and secondary of the high-frequency transformer. On the other hand, inasmuch as the poles 28, 29, of this transformer are connected with the poles 16, 17, of the induction coil, said currents will greatly increase the number of amperes furnished by the accumulators 1—2, and the storage batteries 3—4 receiving thus a proper amount of current can be fully charged by these means. The excess of the electrical energy thus obtained can be shunted through the conductors 30, in order to be employed at will, as has been stated.

Under these conditions, as the voltage in one of the batteries is decreasing, and increasing in the other, after some hours work both voltages become alike, and then it is impossible to produce any movement of electricity from one to the other battery, unless the switches 5, 6—, 7, 8, are operated for that purpose. Speaking in other terms, inasmuch as battery 3—4 is charged, and battery 1—2 is almost discharged, if the functions of said batteries are now reversed, the original conditions can be established once more, and the same operations repeated entirely as before.

In order to attain these results, the switches 5 and 7 that were closed, must now be opened, and the switches 6 and 8 that were opened, must now be closed. That is to say, the batteries 3—4 being thus connected in series, and the batteries 1—2 being connected in parallel, the former conditions are reversed, and a current will be caused now from battery 3—4, to batteries 1—2, through the primary 15 of the induction coil, thus obtaining the same results, as often as these operations are performed.

When the resistance offered to the passage of the electric currents by the primary of the transformer 15 is not high, it is possible to simplify the former arrangement obtaining the high-frequency currents directly from the same induction coil 15, in which case the poles 18, 19 of the secondary of said coil must be connected to the poles 16, 17, of the same said coil, and the second battery of condensers 22 and high frequency transformer 26, 27, can be omitted.

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Under these conditions the breaker or interrupter employed in said induction coil, acts as spark-gap, and the condenser 14 discharges in the form of oscillations through the primary 15 of same coil, thus directly increasing the amount of electrical energy furnished by the accumulators.

Dated this 9th day of October, 1915.

CARLOS F. BENITEZ.

COMPLETE SPECIFICATION.**System for the Generation of Electric Currents.**

I, CARLOS F. BENITEZ, of 141, Ocampo Street, in Guadalajara, Mexico, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The invention which forms the object of this Patent of Addition, relates to new improvements in the system for the generation of electric currents, described in the main Patent No. 17,811 filed on July 28th, 1914, and in the Patent of Addition No. 5591 filed on April 14th, 1915.

The said system may be still further improved by the addition of batteries of accumulators which suitably adjusted in conjunction with the said described methods, can be charged and discharged alternately, and by so doing, an excess of electrical energy that can be employed at will, independently of the automatic operation of the arrangement under description, can be still further obtained.

In other words, in this arrangement I use synthetically in combination: one or more batteries of accumulators already charged by proper means and connected in series; a second battery or batteries of accumulators connected in parallel, series-parallel or in any other manner producing an inferior voltage to that obtained in the first battery or batteries; both said batteries arranged in such a way as to utilise the discharge of the accumulators connected in series, for the charging of the accumulators of the second battery or batteries; and means for generating high frequency currents, through the circuit connecting both batteries of accumulators, in order to increase the energy of the discharges of each of said batteries when acting from one to the other, securing thus the charging of the second group of accumulators, while the first battery is discharging or *vice-versa*, and producing furthermore a surplus of energy that can be employed at will, without impairing the normal running of this described arrangement; and finally means for the application of this extra energy to any outside purpose.

In this manner, the current given by the battery of accumulators connected in series, is increased when discharging by the electrical oscillations produced by proper means in the same said circuit connecting both groups of accumulators, and the second battery connected in parallel can be thus fully charged, while the first battery is discharging. On the other hand, as the number of electrical oscillations per second can be increased at will in the same said circuit, an excess of electrical energy can be obtained by this process, and the surplus of this energy, can be applied to any outside purpose, without impairing the normal running of the process as above stated.

The advantages of such an improvement will be better understood by considering the drawing left with the Provisional Specification and the annexed sheet which illustrate two different methods of carrying out the invention.

In both drawings: 1—2 and 3—4, are batteries of accumulators that once charged from some exterior electrical source, will maintain their charges indefinitely in the following manner:

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With the connections established as shown by both drawings: *i.e.* with the accumulators 1—2 connected in series and the accumulators 3—4 connected in parallel, if battery 1—2 has been previously charged from some exterior source; when discharging it will have a voltage superior to the counter electromotive force opposed by the battery 3—4 receiving such discharge. In other words, if by means of the conductor 13, the positive pole 9 of battery 1—2, is connected to the positive pole 10 of battery 3—4, and both negative poles 11 and 12 of both batteries are connected together, an electric current will be established from battery 1—2 to battery 3—4 until the voltages of both batteries become alike. Obviously the current furnished by the discharge of battery 1—2 alone, would produce a smaller charge in the batteries 3—4, if some extra energy were not added to the normal output of said battery 1—2.

With this object in view any of the known methods for the generation of high-frequency currents, as well as those described in the aforesaid English Patents No. 17,811/14 and 5591/15, can be employed in conjunction with said batteries of accumulators, in order to provide that complementary energy, and in this manner it is always possible to charge and discharge alternately each battery from one to the other, maintaining constant a storage of electricity and producing furthermore an excess of electrical energy.

Another object of this new arrangement is to provide means for the operation of these same said methods described by the afore said English Patents, using low voltages, condensers of small capacities, and greater facilities for starting.

Referring now particularly to the arrangement shown by the drawing left with the Provisional Specification: the primary 15 of an ordinary induction coil, provided with its condenser 14, and a suitable interrupter (not shown in the figure), is connected in series to the above stated batteries 1—2 and 3—4 through the wire 13. The secondary of same induction coil is connected by each of its poles 18, 19, to the poles 20 and 21 of the second condenser or battery of condensers 22. These same poles are further more connected through the spark-gap 23, with the poles 24, 25, of the primary 26 of a high-frequency transformer. The secondary 27 of this same transformer is connected by each of its poles 28, 29, with the poles 16, 17, of the induction coil 15. Finally both poles of condenser 14 are connected to the conductors 30, through which a part of the electrical energy provided by these means, can be shunted and utilised at will.

This arrangement being made, the electrical energy stored by the accumulators 1—2 passing through the pole 9, wire 13, primary 15 of the induction coil, pole 10 of the accumulators 4, pole 32 of the accumulators 3; will go back through pole 12 to the same battery 1—2.

As a consequence of the passage of this electric current through the primary 15 of said induction coil; high tension currents will be obtained in its secondary, which being collected by the condenser 22, will finally produce high-frequency currents through the primary and secondary of the high-frequency transformer. On the other hand, inasmuch as the poles 28, 29, of this transformer are connected with the poles 16, 17, of the induction coil, said currents will greatly increase the energy furnished by the accumulators 1—2, and the storage batteries 3—4 receiving thus a proper amount of current, can be fully charged by these means. The excess of electrical energy thus obtained can be shunted through the conductors 30, in order to be utilised at will, as has been stated.

Under these conditions, as the voltage in one of the batteries is decreasing and increasing on the other, after they have been working some time, their voltages become alike, and then it is impossible to produce any movement of electricity from one to the other, unless their functions are reversed. Speaking in other terms the battery 1—2 connected in series must now be connected in parallel, and *vice-versa* the battery 3—4 connected in parallel must now be connected in series.

With this object in view, and in order to illustrate this particular point, said batteries 1—2 and 3—4, have been connected respectively through the

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switches 5, 6; and 7, 8, in such a manner that by reversing the position of said switches, the connections of said batteries are easily reversed; but in practice far better results can be attained by the use of the commutator shown in the adjoining Sheet No. 2, as will be further explained.

5 By these means the original conditions of voltage can be easily re-established each time that the discharging battery is becoming exhausted, and a reverse current can be obtained through the primary 15 of the induction coil, thus securing the same results as often as these operations are performed.

10 As the resistance offered to the passage of the electric currents by the primary of the transformers is not high, it is possible to simplify the former arrangement obtaining the high-frequency currents directly from the same induction coil 15, in which case the poles 18, 19 of the secondary of said coil must be respectively connected to the poles 16, 17 of the primary of same said coil, and the second battery of condensers 22 and high-frequency transformer 26, 27, can be omitted.

15 Under these conditions the breaker or interrupter employed in said induction coils, acts as spark-gap and the condenser 14 discharges in the form of oscillations through the primary and secondary of same coil, thus directly increasing the amount of electrical energy furnished by the accumulators.

Such arrangement is particularly illustrated in the annexed sheet Fig. 1, in which: each one of the poles of the accumulators composing the batteries 1—2

20 and 3—4, are correspondingly connected to the several poles of a commutator 31.

This commutator as shown by the figure, consists of a rotary cylinder 32, provided with the conductive paths 33, 34, 35, 36, 37, 38, 39, 40, properly isolated and distributed on its surface, in such way, as to connect alternately in

25 series or parallel the different units composing the above mentioned batteries 1—2 and 3—4.

Same cylinder 32 is furthermore provided at one of its ends, with the two conductive paths 41, 42, that can be better seen in the cross sectional view or Figure 2, the same said cylinder passes through a ring 44, fixed to the same base 31

30 of the apparatus, and provided with the contacts 45, 46, 47, 48. On the other hand the pole 45 of this ring is connected to the pole 10 of the battery 3—4, and its pole 46 is connected through the wire 49, to the pole 9 of battery 1—2. Pole 47 is connected through wire 13 to pole 16 of the primary of a transformer, and pole 48, is connected through wire 55, to the back contact stud 50 of an

35 ordinary breaker.

A back wall 51, fixed to the same base of the commutator, is provided with the metallic strips or brushes that can be clearly seen in the figure, in contact with the cylinder 32, and connected respectively to each one of the poles of the accumulators; and finally the rotative shaft of same cylinder is provided with

40 a handle or pulley 52 affording means for the operation of this commutator.

Condenser 14 of the induction coil, is connected as usual by its pole 52 to pole 17 of the primary of same transformer, and its other pole 53 instead of being connected to the back contact stud 50 of the breaker, as is generally the case, is grounded through wire 54, and pole 56 of the commutator.

45 Under these conditions when the circuit is broken by the interrupter, condenser 14 is charged and immediately afterwards discharges *via*: primary 15 of the transformer, secondary of same transformer, wire 55, pole 48, path 41 of the commutator, and battery (3—4) in parallel.

As a consequence of the passage of the electric current produced by this discharge through the primary 15 of the transformer, induced currents are produced

50 in its secondary and one of these currents the inverse passing through pole 19 is immediately utilised for the charging of same said battery in parallel. The direct current that is produced when the discharge of said condenser 14 is finished, passing through pole 18 and entering the primary 15 through pole 16, produces

55 a new charge in the same condenser 14, that again discharges in identical manner, and the same phenomena are reproduced several times in the beats or intervals of breaks and makes produced by the interrupter.

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On the other hand, if the pole 56 of the commutator is not grounded, each time that the condenser 14 receives a new charge, the neutral fluid of its outer coating is influenced through its dielectric and an induced electric current is forced to move *via* wire 54 and pole 56. In other words this extra energy equally increases the normal output of said battery 1—2.

By these means the current given by the accumulators connected in series, is properly increased by the induced currents produced in the secondary of the induction coil, and by the rapid chargings and dischargings of the condenser produced in the above described manner, and the accumulators connected in parallel receiving thus a proper amount of current, can be fully charged while the first battery is discharging. However, as the first battery is discharging its voltage is progressively decreasing, and in order to maintain in the circuit a given current for the charging of the second battery, the resistance of the same said circuit must be accordingly reduced.

In order to attain this result without touching the wiring, the back contact stud 50 of the breaker can be adjusted, in order to secure a proper resistance through the interrupter in accordance with the decreasing voltage, and in this manner it is always possible to maintain a given current in the circuit, until the very last limit of energy in the discharging battery is attained.

Better results in every respect can be still obtained by the use of a closed core type transformer combined with an electrolytic interrupter, since with these interrupters practically there is no lost time in the intervals between breaks and makes, and the resistance of such devices can be easily adjusted at a distance wherever the operator may desire.

Once the limit of energy in the discharging battery is attained, the connections of the accumulators must be reversed, and with this object in view the commutator shown by the figure can be employed, and the cylinder 32 must be revolved until the paths 37, 38, 39, 40, come in contact with the brushes connecting the poles of the accumulators, and the contacts 45, 47, are connected through path 42. By so doing the functions of both said batteries are at once reversed, and the accumulators 3—4 being now connected in series, they will discharge through pole 10, *via*: poles 45, 47, wire 13, primary 15, wire 55, pole 48 (now in connection with pole 46 through path 41), wire 49 and pole 9 of battery 1—2, that is now connected in parallel through paths 39, 40.

In other words the working conditions can be thus completely reversed by the simple operation of the commutator, and a continuous current can be maintained through wire 55, in which the primary 57 of an ordinary transformer, or any other suitable device, can be inserted in series, in order to profit the surplus of the electrical energy thus obtained, without impairing in the least the running of the mechanism.

Obviously means can be disposed in order to obtain an automatic operation of the commutator, from time to time, in accordance with the capacity of the accumulators employed, and in consequence, for a given weight of batteries, greater power can be secured by this process, with smaller capacities, than with the greater units, since the same 4 volts can be obtained from a 60 amp.-hours accumulator, as with a 10 amp.-hours capacity.

I desire also to explain clearly that the arrangements shown are entirely illustratives. That in practice in each case the accumulators composing each battery, can be connected as described or a suitable combination of series-parallel can be arranged in each group, and that the connections of the several apparatus employed can be varied in accordance with the particular conditions of power that must be satisfied.

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

In a system for the generation of electric currents:

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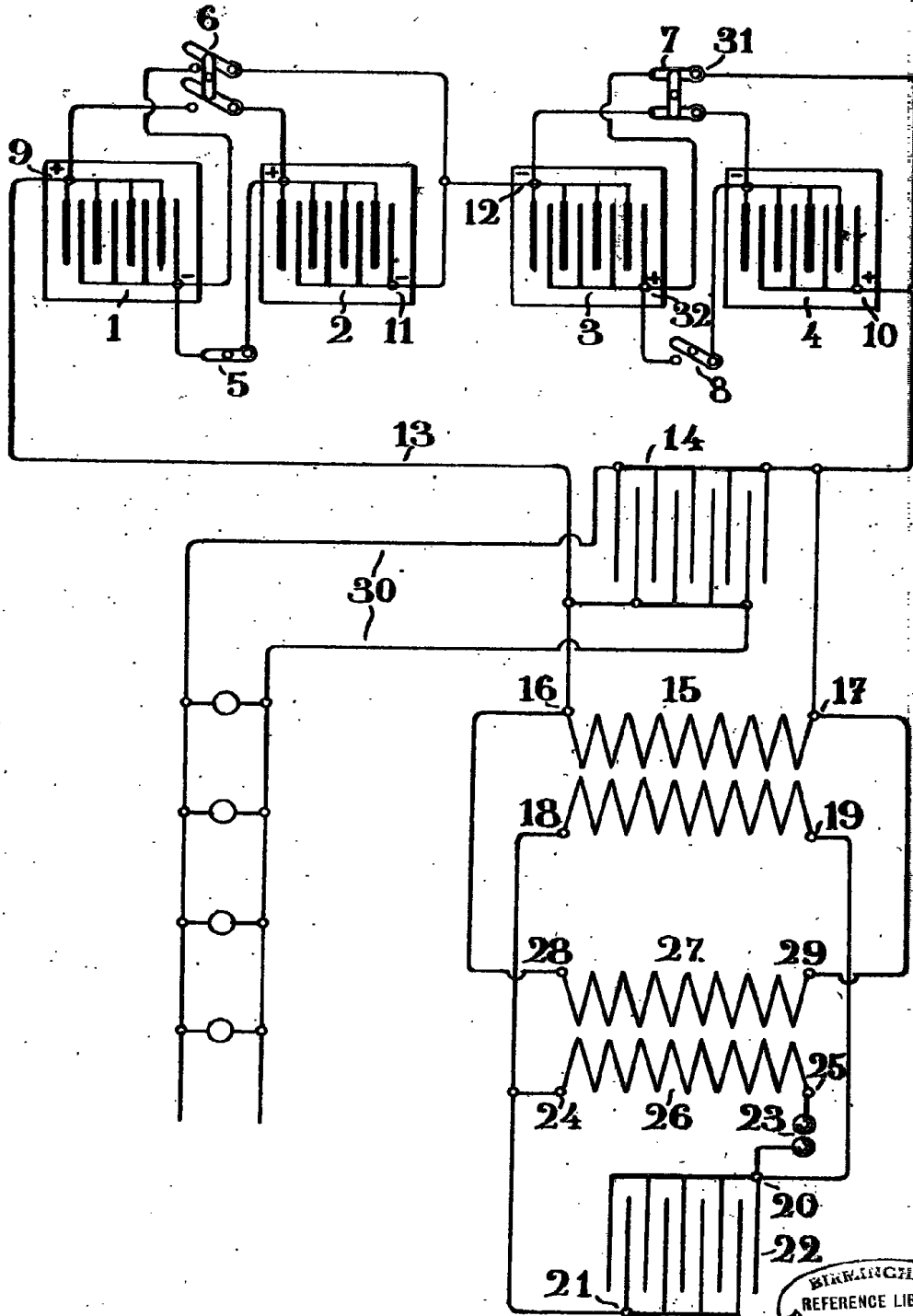
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1. Disposed in combination: One or more batteries of accumulators already charged by proper means, and connected in series; a second battery or batteries of accumulators connected in parallel, series parallel, or in any other manner producing an inferior voltage to that obtained in the first battery or batteries;
5 both said batteries arranged in such a way as to utilise the discharge of the accumulators connected in series for the charging of the second battery or batteries; means for generating high frequency currents through the circuit connecting both batteries of accumulators, in order to increase the energy of the discharges of said batteries, and for utilising part of this energy thus
10 increased in any outside purpose; and means for reversing from time to time the respective connections of such batteries; all substantially as herein described and for the specified objects.

2. Disposed in combination: Mechanisms or apparatus arranged, connected and operating substantially in the manner described, in connection with the
15 appended drawings and for the purposes shown.

Dated the 4th day of February, 1916.

CARLOS F. BENÍTEZ.



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

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Fig. 1

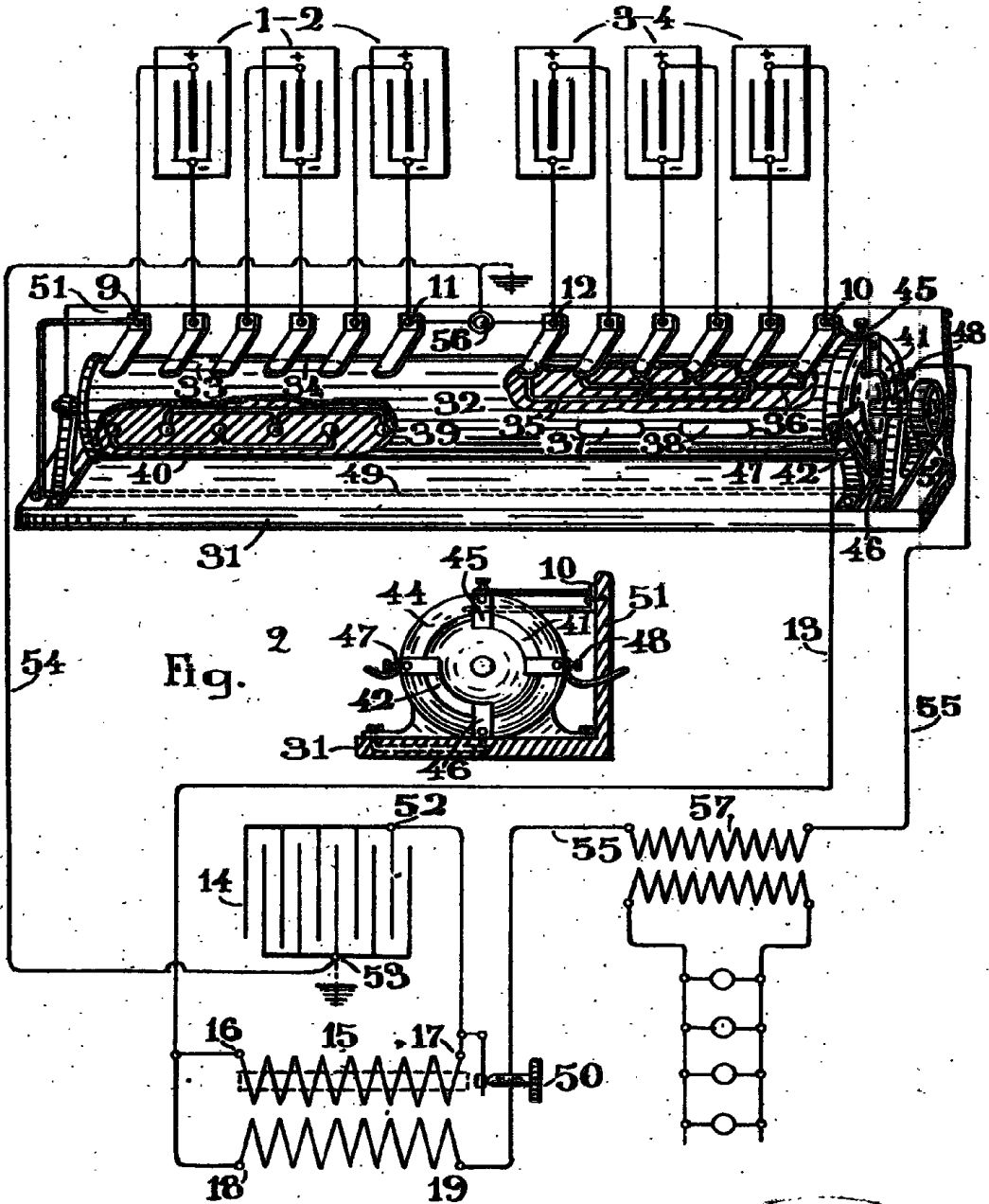


Fig.

