(No Model.)

4 Sheets—Sheet 1.

V. TABULEWITSCH.

PRODUCTION OF ELECTRIC SPARKS FOR SIGNALS OR THEATRICAL EFFECTS.

No. 584,427. Patented June 15, 1897.

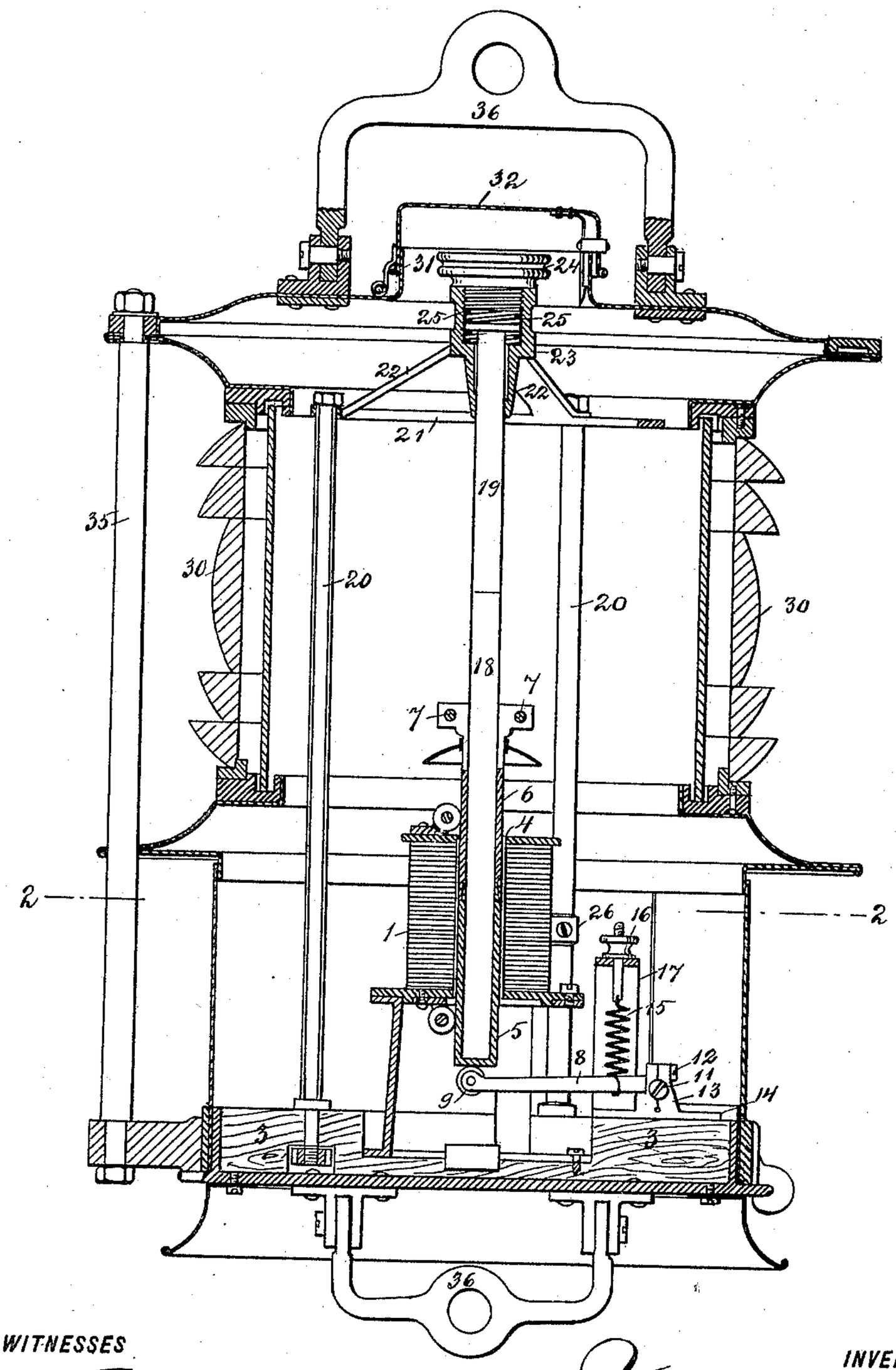

Fig. 1.

WITNESSES

A. Bruestlein

C. Gerstl

INVENTOR

Vladimir Tabulewitsch

BY

Edgar Tate & Co

ATTORNEYS.

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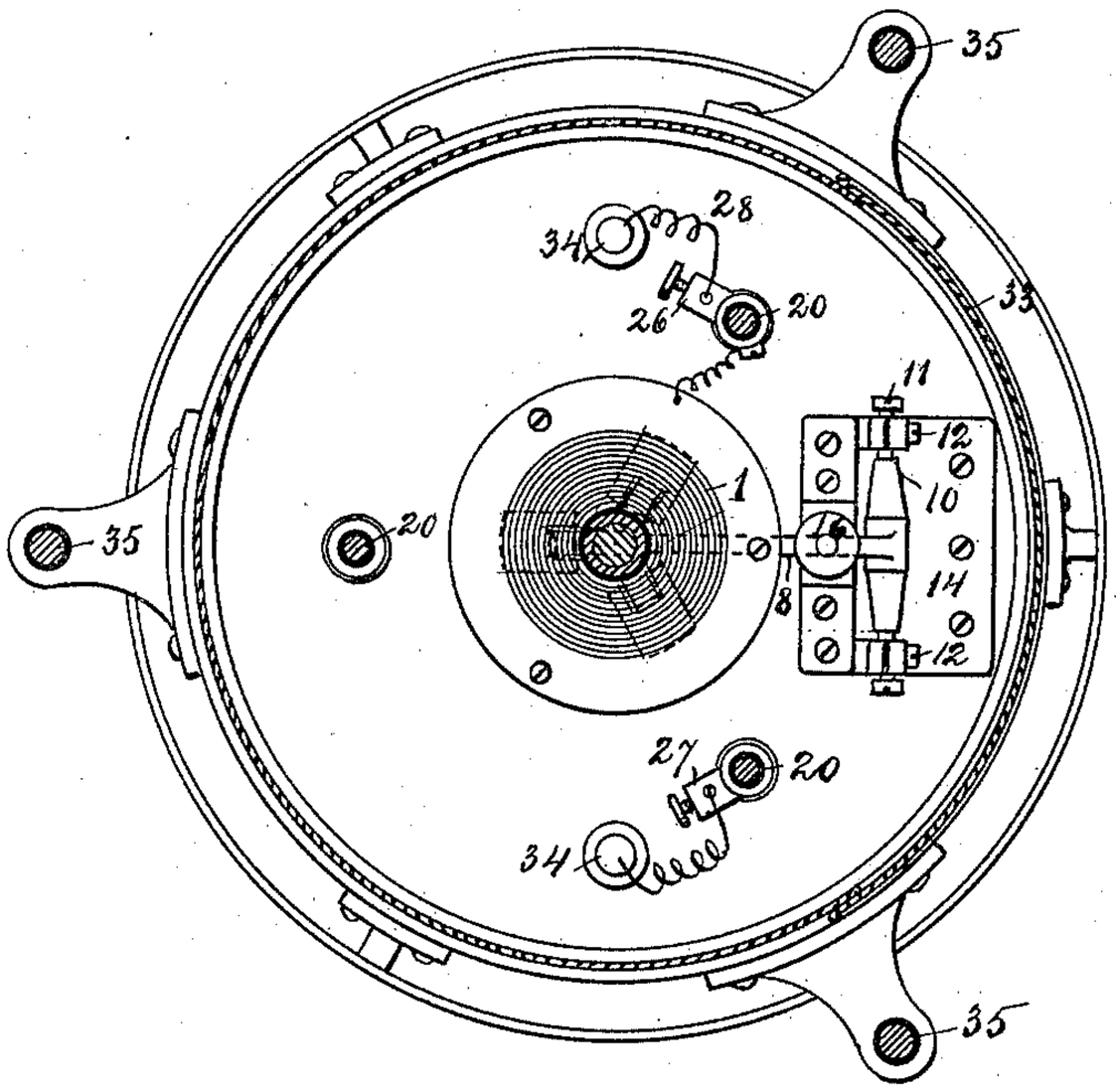

Fig. 2

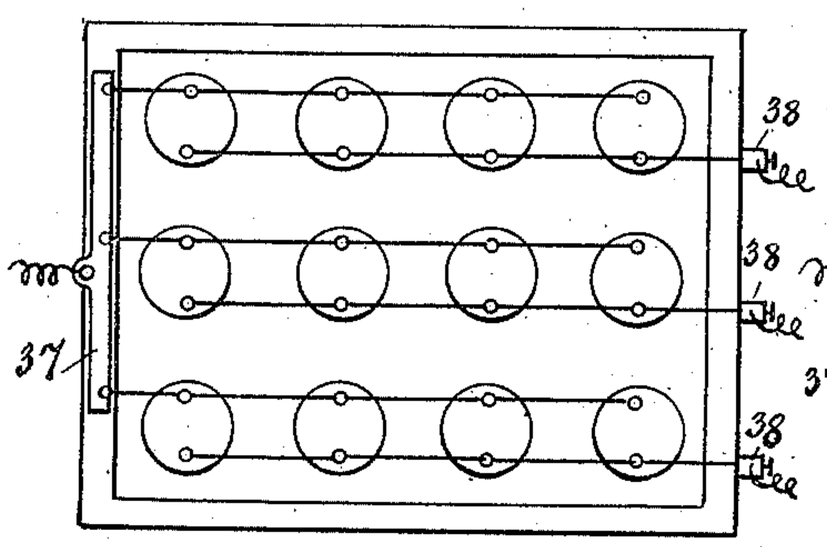

Fig. 3

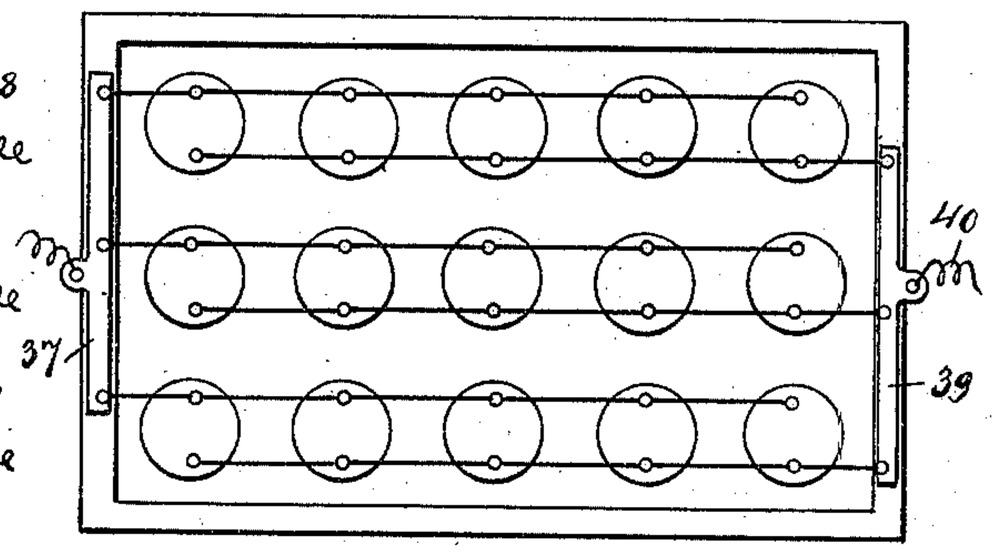

Fig. 4

WITNESSES

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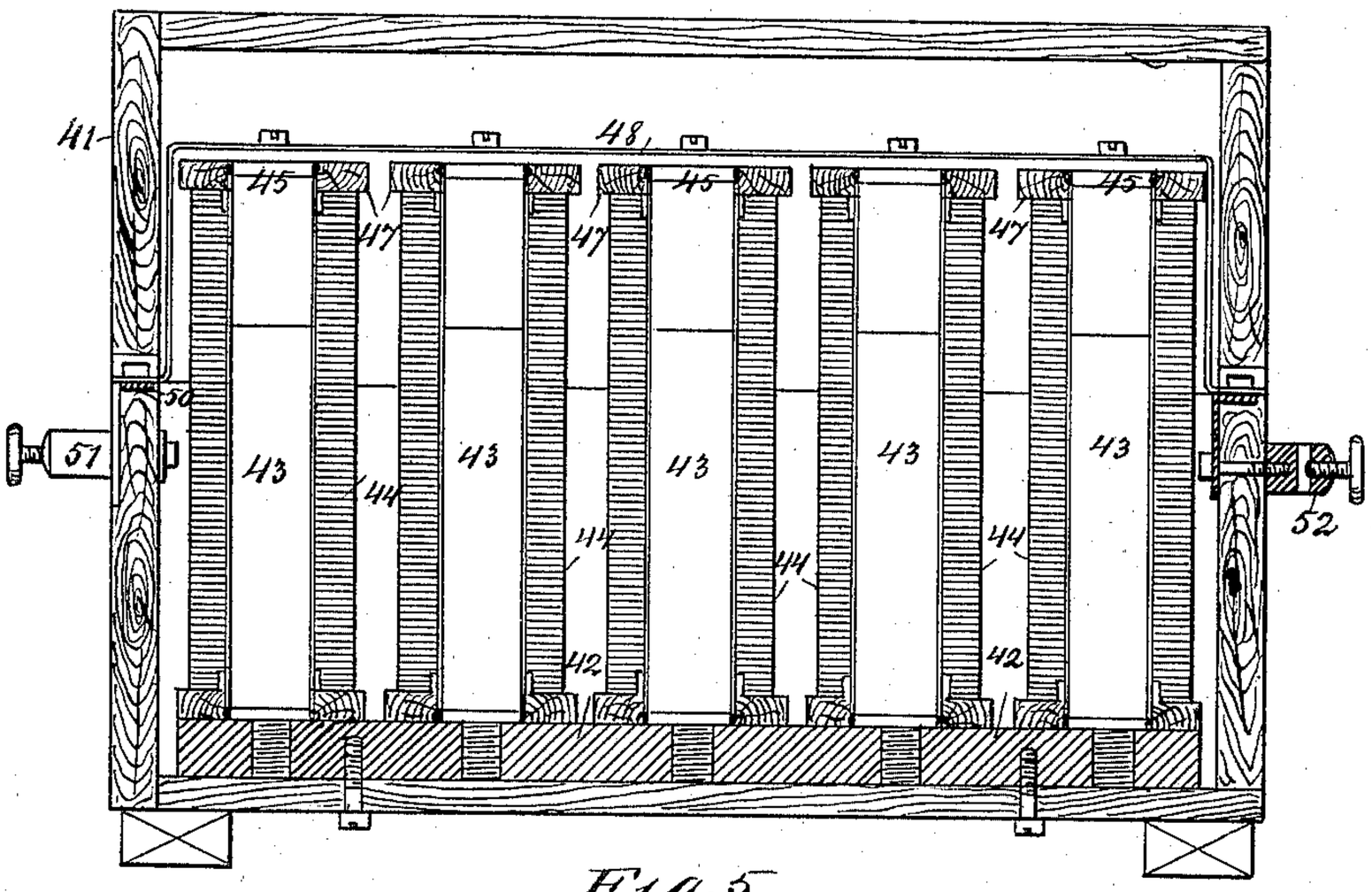

Fig. 5

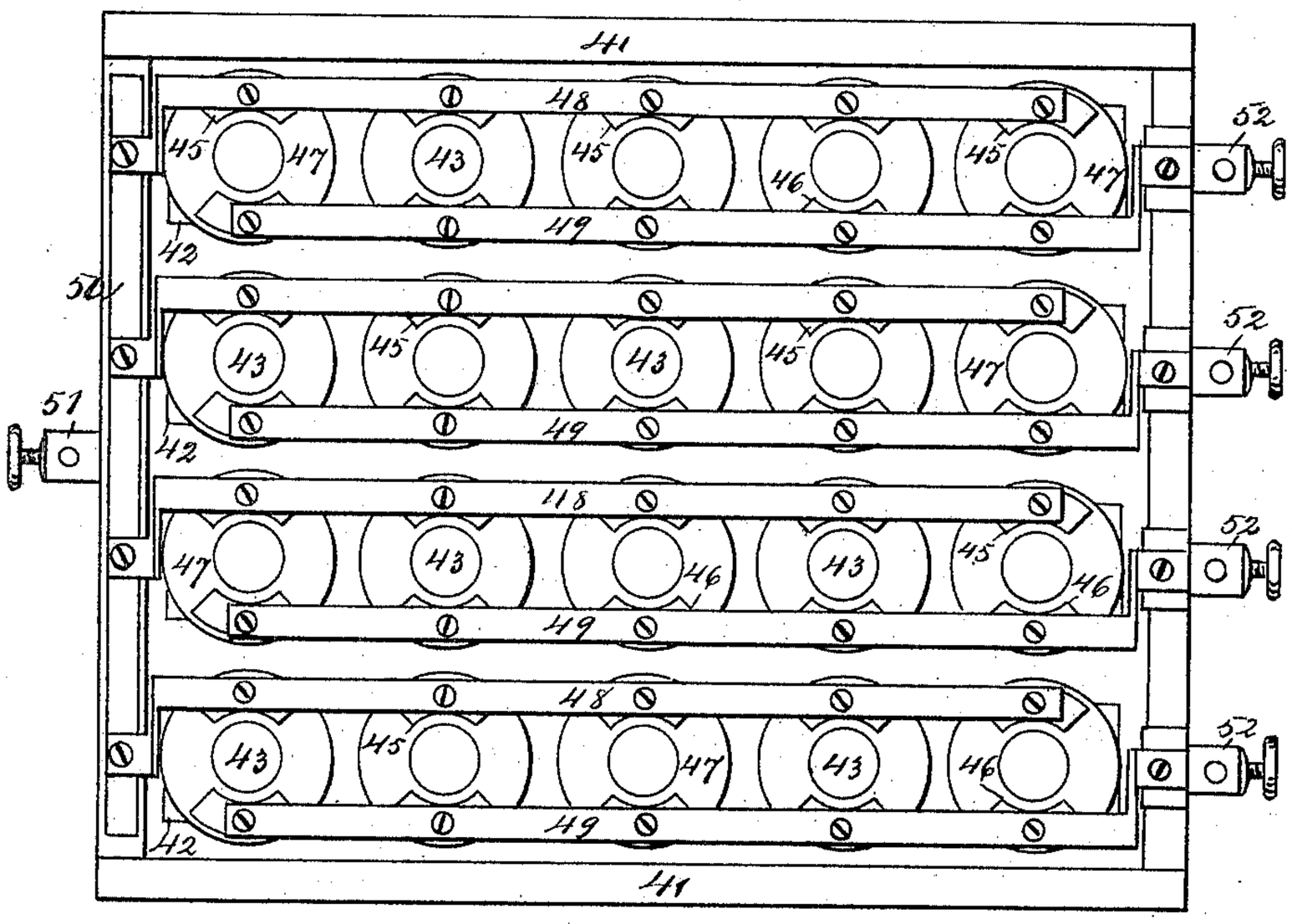

Fig. 6

WITNESSES

C. Gerstenhaber
C. Gerst.

INVENTOR

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(No Model.)

4 Sheets—Sheet 4.

V. TABULEWITSCH.

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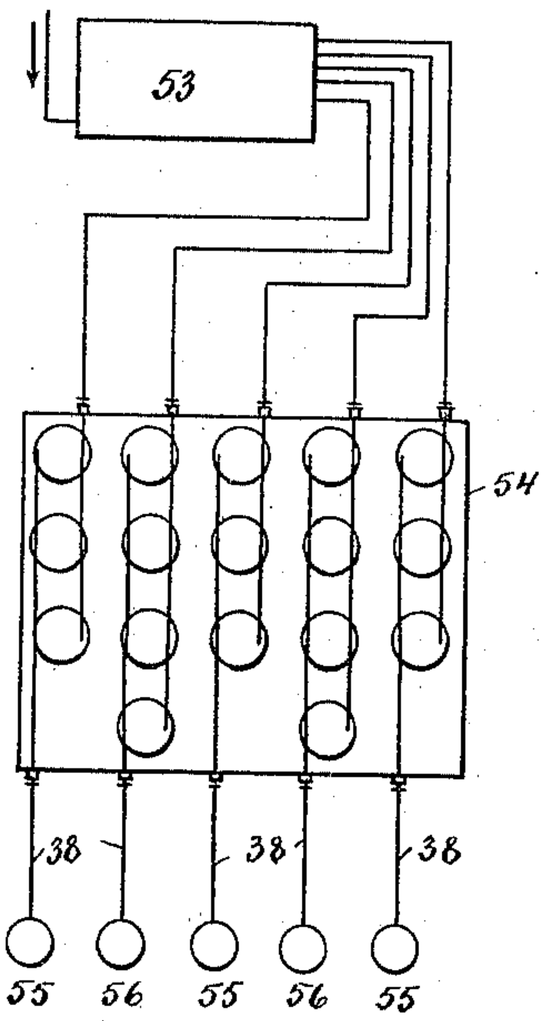

Fig. 7

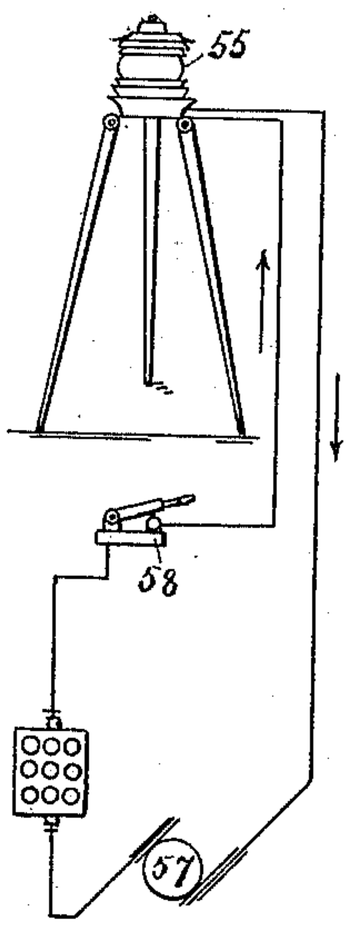

Fig. 8

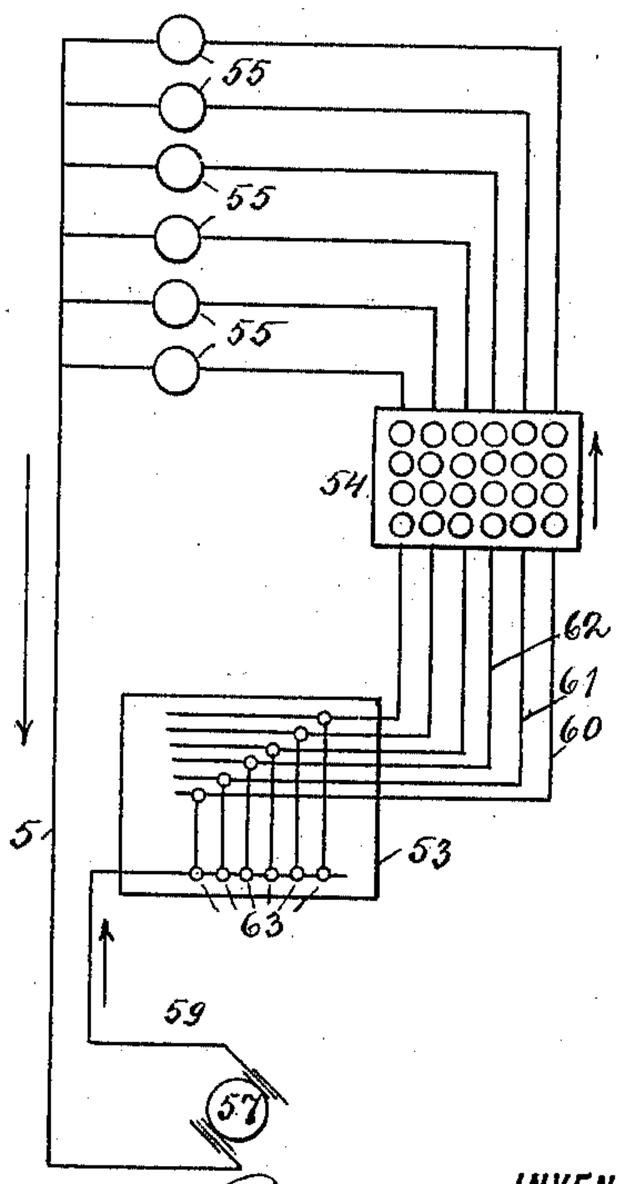

Fig 9

WITNESSES

A. Bergstrom
C. Gerst

INVENTOR

Vladimer Tabulewitsch

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Edgar Tate & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

VLADIMIR TABULEWITSCH, OF ST. PETERSBURG, RUSSIA.

PRODUCTION OF ELECTRIC SPARKS FOR SIGNALS OR THEATRICAL EFFECTS.

SPECIFICATION forming part of Letters Patent No. 584,427, dated June 15, 1897.

Application filed January 16, 1897. Serial No. 619,409. (No model.)

To all whom it may concern:

Be it known that I, VLADIMIR TABULEWITSCH, a subject of the Emperor of Russia, residing at St. Petersburg, Russia, have invented certain new and useful Improvements in the Production of Electric Sparks for Signals, Theatrical Effects, &c., of which the following is a specification.

At the present time there are employed two systems of optical signals—first, by single communicating fires formed by long and short flashing lights following each other in certain number and order, and, second, by multiple fires formed by certain combinations of white and colored fires lighted at the same time. In both systems the chief conditions are that signal-fires should be as brilliant as possible and would be easily distinguished among other fires in the vicinity serving for any other purposes—as, for instance, for lighting, &c. Another condition is that the signal-fires could be instantly lighted and also instantly extinguished. None of the generally-used sources of light possesses the said qualities in a sufficient degree. In fact, the electrical-arc lamps, though they give a very brilliant light, cannot be easily controlled, for they cannot be instantly lighted or shut. The light of incandescent lamps cannot be easily distinguished among other fires in the vicinity, and this light decreases after a certain time, the inner surface of the glass globes being covered by "flowers." The other sources of light are even less satisfactory. In order to obviate the said imperfections, I apply for the purpose specified and like purposes the light of electrical sparks produced by the interruption of an electrical current. The theory and the experiences show that the intensity of the light produced by electrical sparks increases with the self-induction of the conducting-wires. I employ, therefore, a special apparatus that I call "sparks-enforcing" apparatus. This apparatus makes it possible to obtain sparks of a quite determined intensity of light. I have also found that sparks formed between electrodes made of different materials have a different intensity of light. Many experiments have shown that the most brilliant sparks are formed by employing carbon as a positive electrode and steel as the negative one. It is also clear that the intensity of light increases proportionately to the number of sparks that are formed between the electrode in a unit of time.

The invention is fully disclosed in the following specification, of which the accompanying drawings form a part, in which—

Figure 1 is a vertical section of a lamp which forms part of my invention and which is also shown in Fig. 2; Fig. 2, a cross-section of said lamp on the line 2 2 of Fig. 1. Figs. 3 and 4 represent diagrammatic views showing different methods of applying my invention; Figs. 5 and 6, other forms of construction also employed, Fig. 5 being a vertical section of the apparatus, and Fig. 6 a plan view; Fig. 7, a diagrammatic view showing another part of the invention; Fig. 8, a diagrammatic view showing the invention applied to a single lamp, and Fig. 9 a similar view showing a part of the lamp.

The essential part of this lamp, reference being made to Figs. 1 and 2, is the burner or the apparatus for obtaining an uninterrupted series of sparks between the carbon electrode and the steel.

The burner consists of an electromagnetic coil 1, fixed by its lower flange to the base or column 2, which is screwed to an insulated disk 3, fitted into the bottom of the lamp. In the central tube 4 of the coil 1 a holder for the carbon electrode moves freely, formed by a tube the lower end of which is closed. The lower part of the holder 4 is of copper and its upper part of soft iron. The upper end of the iron part of the holder is provided with longitudinal slots for the purpose of firmly catching the carbon and tightening the holder around by screws 7 passing through side lugs provided at the upper end of the carbon-holder. This carbon-holder is supported from below by an oscillating lever 8, provided with a little roller 9 in its free end, the carbon-holder leaning upon said roller. The axle 10 of the lever 8 is pivoted in the center 11, fixed by screws 12 in the supports 13, Fig. 1, said supports being of one piece with a plate 14, secured to the insulated disk 3. The lever 8 is drawn up by a spiral spring 15, one end of which is fixed to the lever 8 and the other end to the regulating-screw 16, said screw being retained in any desirable position on the support 17 by a nut.

The support 17 is fixed on the plate 14, and the carbon-holder is supported by the lever 8 in such a position that its upper iron part enters only a little into the central tube 4 of the coil 1 when the electric current does not pass through said coil, and when the current traverses the coil it draws in the carbon-holder 5, which forces the free end of the lever 8 to recede and against the tension of the spring 15.

Over the carbon rod and in a line with it there is arranged a steel rod. The steel rod is supported by a stand formed by three supports 20, fixed by their lower ends to the insulating-disk 3, fitted into the bottom of the lamp, the upper ends of said support being tied together by a ring 21, in the center of which a hollow boss 23 is fixed on three spiders 22. In this boss is placed the head of the steel rod 19 and retained on its place by a screw 24, screwed into the boss from above. The head of the steel rod is supported in its proper position in the boss 23 from above and from below by spiral springs 25, serving to soften the strokes during the operation of the lamp, as will be described.

For the electrical communication of the lamp with the dynamo-machine two of the supports 20 are provided with fixing-screws 26 and 27, the fixing-screw 26 being insulated from the support 20 and the fixing-screw 27 being in metallic connection with its support 20. To the insulated fixing-screw 26 are fixed the conducting-wire 28 from the anode of the dynamo-electrical machine and also a wire 29, which conducts to the outer end of the coil A, the inner end of the said coil being fixed to the lower flange of the bobbin. In this manner the anode of the dynamo-machine communicates with the coil 1 and therefore with the carbon electrode, the cathode of the machine communicating through the support 20 with the steel electrode of the lamp. As the current passes through the coil 1 it draws in the carbon-holder, so that the contact between the carbon and steel electrodes is interrupted and a brilliant spark appears between them. At the same moment that the electric circuit will be interrupted and the carbon-holder will be pushed up by the spring-lever 8 till the contact between both electrodes is reëstablished then the electric circuit will be closed again, the coil 1 will again separate the electrodes, and a spark will appear, and so on. In this manner an uninterrupted series of brilliant sparks between the two electrodes will be obtained, and it ensues a characteristic scintillation-fire most suitable for the signaling.

The burner in the lamp is protected by a glass 30, which may be of any desired description, a glass of the Fresnel type, as is illustrated on the drawings, or of any other system. In order to make possible the removing of the steel rod 19, the lamp is provided over the boss 23 with a hood 31, having a cover that can be opened. The door 33 allows access to the lower part of the lamp, and in the bottom of the lamp there are apertures 34 with insulating-rings or porcelain fitted in them to let the conducting-wires pass through. The core of the lamp is tied by three bolts 35 and is provided with handles 36 to transport it.

It is evident that the details of the construction of the lamp may be modified without departing from the nature of the invention.

It is to be mentioned that instead of the above-described arrangement of the electrodes an opposite arrangement may be employed, so, for instance, the coil with the carbon electrode may be suspended above and the steel rod may be fixed below. In that case the spring-lever 8 is no more wanted, the carbon rod falling by its own weight on the steel electrode and closing the electric circuit, in consequence of which the coil will again draw in the carbon-holder and interrupt the current, and so on.

If pure coke is used to prepare the carbon electrode, a white light will be obtained. Should it be desirable to change color and the general character of the light, different substances may be added to the coke—as, for instance, salts used in pyrotechny and also magnesium, aluminium, &c.

In order to reinforce the sparks and to render the lamp suitable for signaling at great distances, I use the sparks-enforcing apparatus, that consists of a system of coils mounted on cores of soft iron, said cores being fixed on a common bar, also of soft iron.

Figs. 3 and 4 illustrate, diagrammatically, two modes of communication of such coils with lamps of my invention till the coils are joined in multiple arcs—that is to say, the outer ends of all coils of each series are joined together by a common conductor 48, and in the same manner are joined the inner ends of all coils of each series by another conductor 49. Then all outer ends of the coils communicate with a common metallic bar 37, to which is connected a conducting-wire from the anode of the dynamo-machine, and the inner ends of the coils of each series are connected with a separate wire 38, (each series has its separate wire,) conducting to a corresponding lamp, Fig. 3, or the inner ends of all coils communicate, like the outer ends, with a single bar 39, Fig. 4, from which a wire 40 connects with a single lamp. The first arrangement makes it possible to light many lamps at the same time and is suitable for the system of multiple fires. The other arrangement will be used when signaling by lighting a single lamp a number of times.

Figs. 5 and 6 illustrate a practical construction of the sparks-enforcing apparatus of my invention. Fig. 5 is a vertical section of the apparatus, and Fig. 6 is a plan.

In a wooden box 41 are fixed, at its bottom, bars of soft iron 42, into which are screwed the cores 43, also of soft iron, of the coils. The outer and the inner ends of the wire of these coils are fixed to corresponding metallic

parts 45 and 46, fixed in the upper wooden flanges 47 of the coils. These metallic parts are joined in multiple arcs by copper bars 48 and 49, as shown. All bars 48 communicate with the same metallic bar 50, which has a fixing-screw 51 to fix a conducting-wire coming from the anode of the dynamo-machine. The opposite ends of the bars 49 communicate with separate fixing-screws 52 for the corresponding lamps, (the system of multiple fires,) or these ends communicate with a single bar communicating with a single lamp, (the system of consecutive fires,) Fig. 4.

It is evident that the number of coils in each series may be varied, and even it may be unequal in different series, as shown in Fig. 7, (a diagram,) where 53 is a switchboard or a table for electrical connections of ordinary construction; 54, the sparks-enforcing apparatus of my invention with an unequal number of coils 44 in different series; 38, wires conducting to corresponding lanterns 55 and 56. Such an arrangement can be used in cases where lamps of different colors are employed for the signalment, as the white lanterns 55 do not require as much light for producing the same lighting as, for instance, the red ones 56.

The sparks-enforcing apparatus is placed in the circuit between the dynamo-machine and the lamp, or lamps, if a number of them are used, in which latter case a switchboard or a table of electrical connections must be placed in the circuit between the dynamo-machine and the sparks-enforcing apparatus, (or between the sparks-enforcing apparatus and the lamps.)

Fig. 8 illustrates a diagram of the electrical connection for a single lamp, and Fig. 9 the same for a number of lamps.

57 is the dynamo-machine or an accumulator; 54, the sparks-enforcing apparatus; 58, an apparatus for closing the circuit, (of an ordinary construction.)

55 is the lamp.

In the case a number of lamps be used I place in lieu of the apparatus for closing the circuit 58 a switchboard or a table for electrical connection 53, which when arranged as shown in Fig. 9 is provided with a common conducting-wire 59, communicating with the anode of a dynamo-machine or an accumulator and with separate wires 60, 61, and 62, conducting through the sparks-enforcing apparatus to corresponding lamps 55, from which a common wire conducts to the cathode of the dynamo-machine or accumulator 57. The dynamo-machine can be brought into communication by means of keys on the switchboard with any of the wires 60, 61, and 62, and therefore the lamps can be lighted in any desirable combinations.

It is evident that the number of wires on the switchboard depends on the number of lamps and the required combinations.

It is also easily understood that besides the sparks-enforcing apparatus and the switchboard different apparatus for interrupting the current may be placed in the circuit in order to produce different effects or for any special manipulations used in optical signaling.

It is also to be mentioned that different modifications may be used in the construction of the electrodes of the burner, which modifications will not alter the nature of my invention, so, for instance, the electrodes (of steel and carbon) may be not only round but also prismatic. Equally, a number of burners may be placed in the same lamp in order to obtain a larger spark, and therefore a more brilliant light.

It is to be mentioned also that the power by which the coil draws in the carbon-holder may be regulated in such manner that not only pure sparks will be obtained between the electrodes, but partly a volatile arc. The intensity of the light will be increased in that case, but the electrodes (especially the carbon one) will be burned much sooner.

I claim as my invention—

1. In an electrical signal apparatus, a lamp having an insulated coil secured to the base thereof, a tube having a closed bottom and open top mounted in said coil, and adapted to receive one end of an electrode and secure the same therein by means of clamps, and means for reciprocating said tube, consisting of a core of soft iron, and a spring-operated lever having a roller on its free end which is adapted to bear against the closed end of said tube, said electrode being composed of carbon and the other electrode being composed of steel said steel electrode being provided with means to permit a slight longitudinal movement of the same when the electrodes are brought together.

2. In an electrical signal apparatus, a lamp having an insulated coil secured to the base thereof, a tube having a closed bottom and open top mounted on said coil, and adapted to receive one end of an electrode and secure the same therein by means of clamps, and means for reciprocating said tube, consisting of a core of soft iron and a spring-operated lever having a roller on its free end which is adapted to bear against the closed end of said tube, said electrode being composed of carbon and the other electrode being composed of steel, said steel electrode being provided with means to permit a slight longitudinal movement of the same when the electrodes are brought together, consisting of spiral springs, as set forth.

3. In an electrical signal apparatus, a lamp having an insulated coil secured to the base thereof, a tube having a closed bottom and open top mounted in said coil, and adapted to receive one end of an electrode and secure the same therein by means of clamps, and means for reciprocating said tube, consisting of a core of soft iron, and a spring-operated lever having a roller on its free end which is adapted to bear against the closed end of said tube, said electrode being composed of a composi-

tion of carbon and a suitable metal to produce a colored light, and the other electrode being composed of steel, said steel electrode being provided with means to permit a slight longitudinal movement of the same when the electrodes are brought together, consisting of spiral springs, suitably mounted.

4. In an electrical signal apparatus, a lamp having an insulated coil secured to the base thereof, a tube having a closed bottom and open top mounted in said coil, and adapted to receive one end of an electrode and secure the same therein by means of clamps, and means for reciprocating said tube, consisting of a core of soft iron, and a spring-operated lever having a roller on its free end which is adapted to bear against the closed end of said tube, said electrode being composed of a composition of carbon and a suitable metal to produce a colored light, and the other electrode being composed of steel, said steel electrode being provided with means to permit a slight longitudinal movement of the same when the electrodes are brought together consisting of spiral springs, suitably mounted, said lamp being in electrical connection with a spark-producing apparatus and a spark-enforcing apparatus consisting of series of coils connected in multiple arcs, and put on cores of soft iron, such cores also being connected in multiple arcs with each other.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

VLADIMIR TABULEWITSCH.

Witnesses:

N. TSCHEKALUFF,

Z. BLAU.