W. NERNST.

ELECTRICAL INCANDESCENT LAMP.

APPLICATION FILED OCT. 20, 1897.

906,550. Patented Dec. 15, 1908.

2 SHEETS—SHEET 1.

Fig. 1.

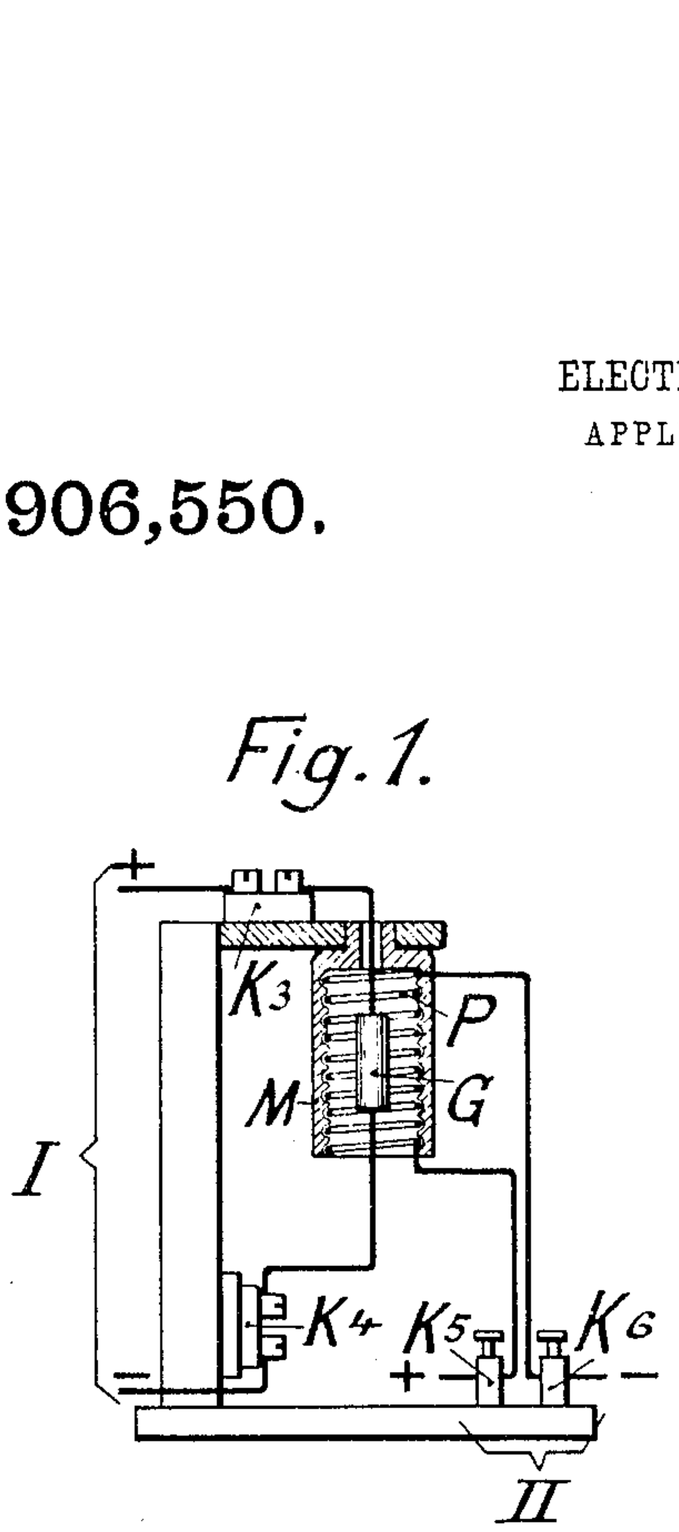

Fig. 2.

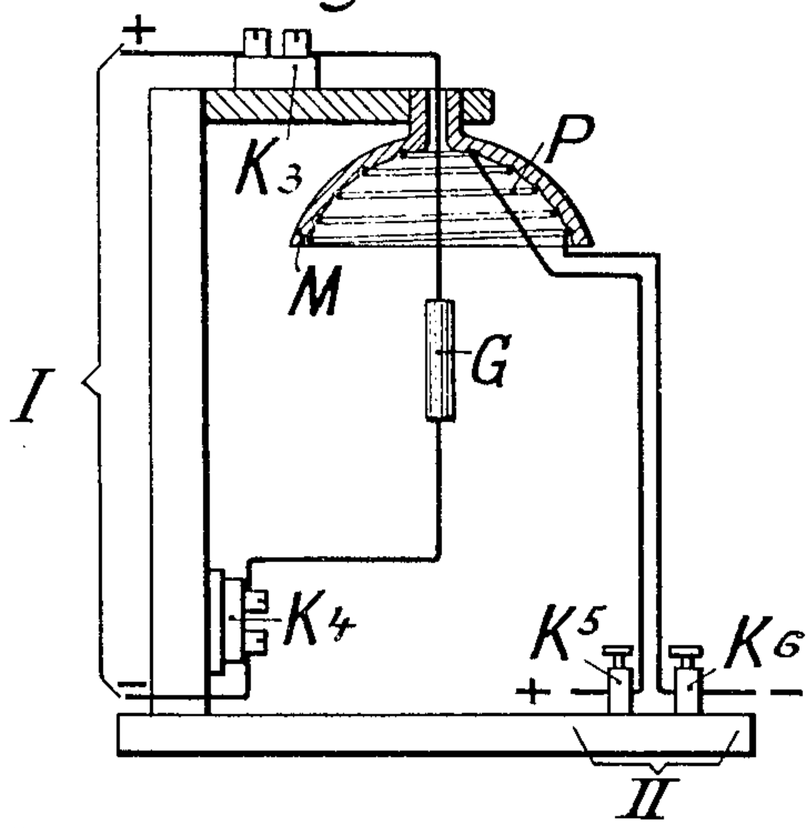

Fig. 3.

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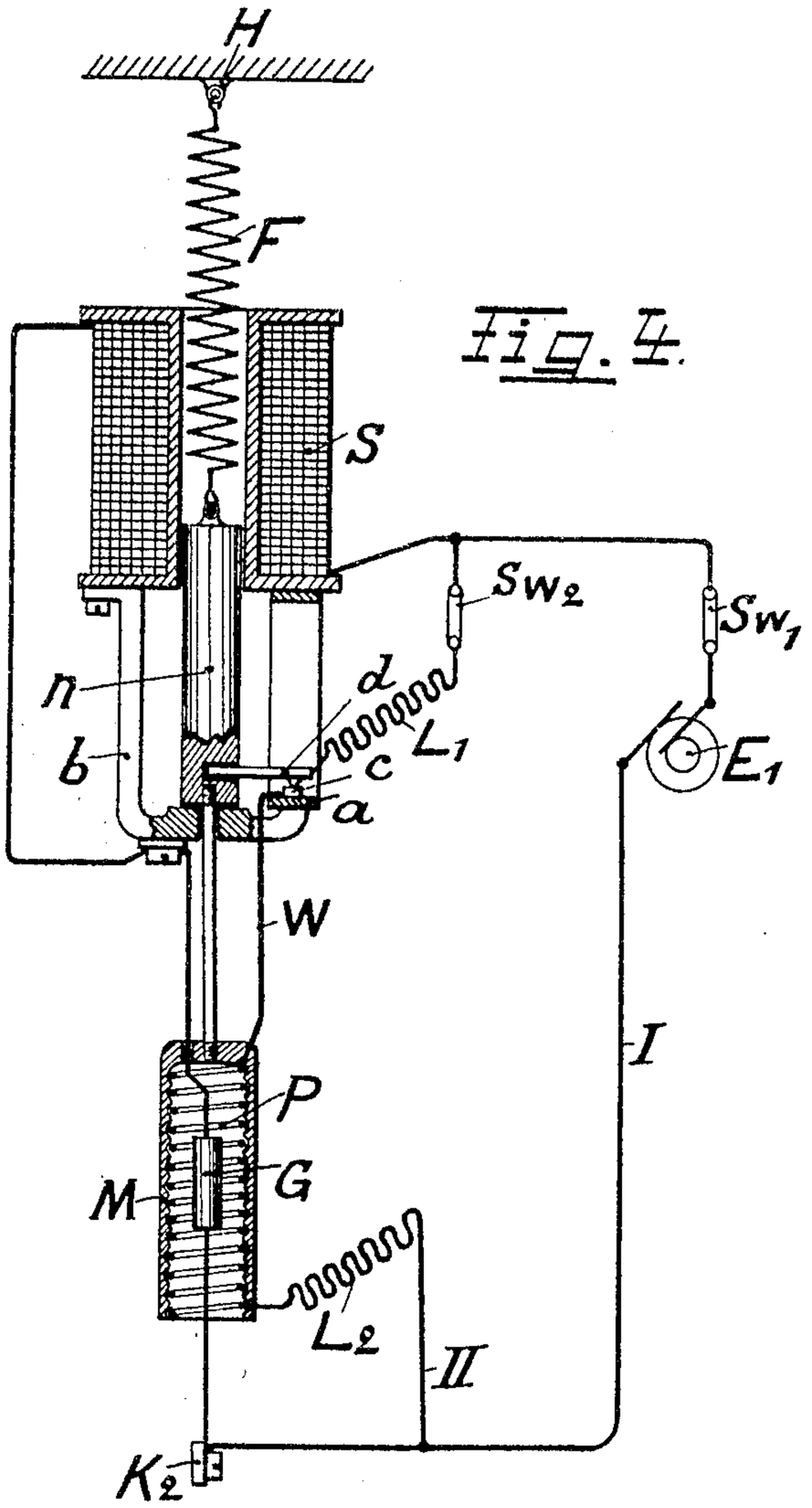
2 SHEETS—SHEET 2.

Fig. 4.



WITNESSES:

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UNITED STATES PATENT OFFICE.

WALTHER NERNST, OF GÖTTINGEN, GERMANY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO NERNST LAMP COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

ELECTRICAL INCANDESCENT LAMP.

No. 906,550. Specification of Letters Patent. Patented Dec. 15, 1908.

Application filed October 20, 1897. Serial No. 655,771.

To all whom it may concern:

Be it known that I, WALTHER NERNST, a subject of the German Emperor, and resident of Göttingen, Germany, have invented certain new and useful Improvements in Electrical Incandescent Lamps, of which the following is a specification.

My invention refers to that class of incandescent lamps the incandescent body of which is not made of a material being a conductor of electricity at the ordinary temperature, but only becoming a conductor when it is heated to a high temperature, such as magnesia, zirconia, lime and other oxids of metals.

The invention consists in an apparatus for establishing in the incandescent body of such lamps the high temperature necessary for transforming it into a conductor of electricity.

Of the accompanying drawings Figure 1 is a diagrammatic view of a lamp constructed according to my invention partly in section, Fig. 2 is a similar view showing a modification of the lamp given in Fig. 1, Fig. 3 is a diagrammatic view of a second modification, and Fig. 4 is a diagrammatic view showing modifications.

The letters of reference designate the same parts in all the figures.

G is the incandescent body corresponding to the carbon filament in the ordinary glow-lamp, but made in this case of an oxid of a metal preferably of magnesia, zirconia or lime.

K_3 K_4 and K_1 K_2 (Fig. 3) are binding posts supposed to be connected with the poles of some source of electricity such as E_1 (Fig. 3) and conducting the current generated to the incandescent body G.

The circuit leading to G is designated by I.

P is a coiled or spiral shaped wire of some heatproof electrically conductive material preferably platina.

M is a sleeve or mantle of heatproof and nonconductive material such as for instance porcelain.

The resistance P is supposed to be inserted in a second circuit II fed by a separate source of electricity E_2 (Fig. 3) or else derived from the main circuit I, as in Fig. 4.

S (Fig. 3) is a coil or solenoid surrounding the lower end of an iron core *n n*, which is suspended from a spring F hung in a fixed part H of the frame of the instrument.

G, Fig. 3, is suspended from *n n*.

K_1 and K_2 are electrically connected by pliable conductors such as copper ribbons L_1, L_2, or the like to K_3 and K_4.

The operation of my lamp is as follows. Both circuits I and II are closed. In the circuit I no current at first can be generated because the body G which is inserted in this circuit acts as an insulator until heated to a high temperature. In circuit II however a current is generated and heats the resistance P. The latter imparts its heat to the sleeve or mantle M and thence by radiation to G. As soon as G thus becomes incandescent, it also becomes a conductor and consequently a current is set up in I which henceforth keeps G glowing. Circuit II can now be interrupted either by hand or by any known automatic means.

In the construction shown in Fig. 1 it is assumed that the sleeve M is made of some transparent material such as for instance glass. In that case although the body G remains covered by the sleeve M, it is not prevented from emitting light.

In the modification shown in Fig. 2 the mantle M is constructed in the shape of a concave mirror, so that it will concentrate the heat rays it emits on the body G which is placed in its focus.

The device shown in Fig. 3 acts in the following manner. As soon as the temperature of G has been sufficiently raised to make it conduct the current generated in E_1, that current passes through K_4, L_2, K_2, G, K_1, L_1, K_3, S and back to E_1. The coil S therefore becomes excited and sucks in the iron core *n n* thereby at the same time lowering the incandescent body G and withdrawing it from the interior of the heating device P M. Evidently the device shown in Fig. 3 could also be so modified that the incandescent body G is fixed and the heating device P M is withdrawn from it automatically as soon as the current in circuit I is set up. This is shown in Fig. 4, the device P M being supported from the core *n* so as to move with it when the core is raised by the combined action of spring F and the coil S and the core drops on the cessation of cur-

rent in coil S, spring F in this case being of insufficient strength to alone support core *n* in its elevated position. In this figure circuit II is a shunt of circuit I, and includes means for automatically making and breaking the shunt, that is circuit II. *a* is a vulcanized fiber or other insulating plate supported on bracket *b* or otherwise. *c* is a contact plate fastened on *a* and connected by a wire W to the upper end of the spiral or coil P. L_1 and L_2 are two pliable conductors for instance copper ribbons the one L_2 being connected to the lower end of the heating coil P the other L^1 being connected to a contact pin *d* fastened in, but insulated from, the iron core *n*. Each circuit I, II is provided with a switch SW_1 SW_2 whereby they can be controlled manually when desired. It will be readily seen, that when the switch SW_1 is closed, a current is set up in circuit II, passing through II, L_2, P, W, *c*, L_1 and SW_2. Thereby the incandescent body G is heated and as soon as it becomes conductive, a current will be set up in I, which at the same time excites the solenoid S, sucks in the core *n* and thereby disengages the contact *c* and automatically interrupts the circuit II.

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:

1. A combined support and heating conductor for use with electric lamps, comprising a heat-proof non-conducting material, a heating conductor arranged upon the inner surface thereof, a coil or solenoid and its armature, one or the other of which is attached to said support, and means for moving the support by the action of a current traversing the solenoid, substantially as described.

2. The combination of a heating conductor, a support therefor of non-conducting material, and an electro-magnetic device for producing an axial movement of the heating device and its support when current traverses the electro-magnetic device.

3. The combination of a source of electric current, an electric heating conductor, a concave support carrying the heating conductor upon its inner surface, and electro-magnetic means for giving an axial movement to the support.

Signed at Berlin, Germany, this 7th day of October 1897.

WALTHER NERNST.

Witnesses:

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