

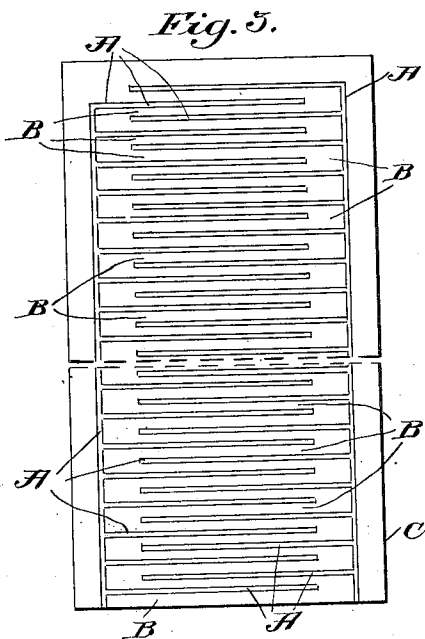
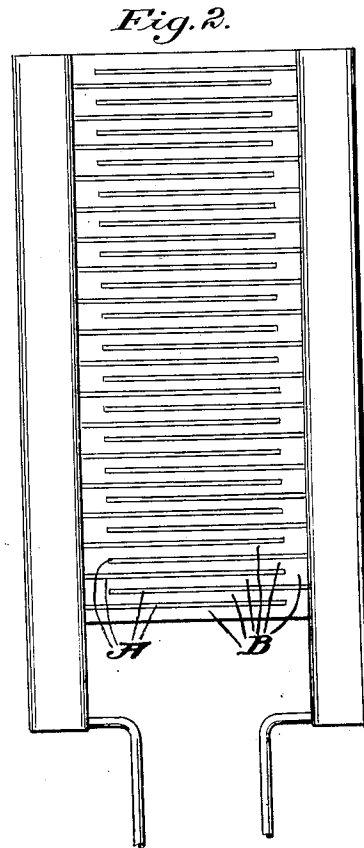
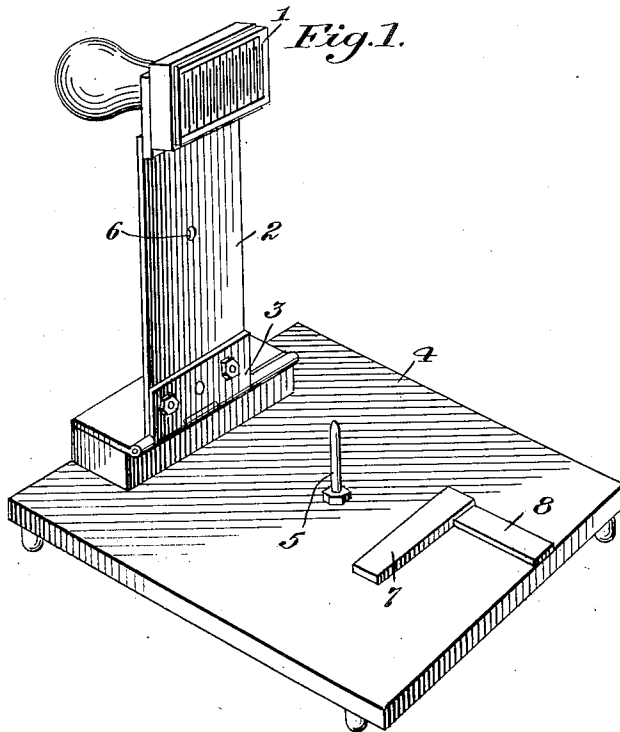
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SELENIUM CELL

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UNITED STATES PATENT OFFICE.

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SELENIUM CELL.

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This invention has reference to improvements in or relating to light-sensitive bridges (commonly called light-sensitive cells), and particularly to those bridges in which selenium is employed as the light-sensitive substance.

Such bridges have been known for many years, and various constructions have been suggested. In the more usual forms wires are wound a very short distance apart on an insulating base to constitute the electrodes and are afterwards coated with the light-sensitive substance, or the base is coated with a substance such as platinum deposited electrolytically, or carbon which substance is then scribed with a line dividing it so as to form electrodes over which the light-sensitive substance is then applied.

All these constructions are known to possess disadvantages which definitely and seriously restrict the scope of their application. The greatest disadvantage is that they break down at a comparatively low voltage, so that it is accepted as a known fact in the scientific world that such bridges cannot be employed with an E. M. F. greater than about 100 volts at most. They are, moreover, inconstant in resistance value and are unstable and unreliable in continuous working.

The failure of these bridges is in most cases due to short-circuiting occurring between the electrodes. This, in the case where wires are used, may be due to elongation and consequent slackness of the wires when they become hot due to high voltage and current, or to the selenium between the wires melting with the heat of the current and allowing the wires to touch. In the type of bridge in which platinum or carbon is deposited upon the insulating base and afterwards scribed with a line to divide it into two electrodes, it is first of all difficult to ensure that no minute particles of conducting material are left in the scribed line to cause short-circuiting and secondly, the subsequent coating of the base with the light-sensitive substance may drag particles of the conductor across the scribed line so as to form a short-circuit between the electrodes. To construct a light-sensitive bridge of consist-

ent values and capable of withstanding high voltages demands the greatest attention to details of construction and neither of the methods described above, nor any others with which I am acquainted, are adapted to allow of sufficient accuracy and detailed care to produce such a bridge.

In the accompanying drawing:

Figure 1 represents a finished selenium cell or bridge produced in accordance with my process;

Figure 2, an acid glass base or insulating material grid plate produced in accordance with my process; and

Figure 3, a grid stamping device preferably employed in the practice of my process.

According to my invention the improvements consist, broadly speaking, in so incorporating the electrodes of a light-sensitive bridge with the material of the base that while free to make surface contact with the light-sensitive substance, they are nevertheless absolutely fixed with relation to the latter and to each other, so that short-circuiting cannot occur and the bridge has a fixed and definite resistance. I prefer to carry out the invention by applying upon a base of electrically non-conducting heat-resisting material having the suitable physical properties as hereinafter described, a metallic conductor in solution, in such a character that the metallic constituent thereof is capable of being deposited by the application of heat, and then by heating to a suitable degree dependent upon the materials employed, to effect the evaporation of the liquid medium of the metallic solution and the "fusing-in" of the metal into the base in a manner which is similar to that employed in the pottery trade for applying gold to earthenware or china. The term "fusing-in" is employed only in this restricted sense and not as involving actual fusion of the material of the base. The application of the metallic solution is preferably effected by means of a stamp and several impressions are usually necessary. The "fusing-in" process may take place at the end of each impression or at the end of a series of impressions. In the latter case, only sufficient heat is applied

after each impression to drive off the volatile medium, this method of procedure being found to save considerable time.

The materials and procedure which I prefer to use in carrying out my invention are as follows:—

A suitable registering stamping device is preferably employed and may be of the construction shown in Figure 3, wherein I 10 is the stamp proper mounted on an arm 2 hinged at 3 to the base 4 which has positioning or registering bars 7 and 8 extending at right angles to each other and against which the corresponding edges of the acid 15 glass blanks or bases C are fitted so as to be imprinted with the interdigitated grids A by the stamp 1, and the arm 2 is formed with a hole 6 fitting over the guide pin 5 extending from the base 4 so as to guard 20 against lost motion in the hinge 3, so that the stamp 1 will always be in proper register to the end that a blank or base C may be fitted into the guide bars 7 and 8, imprinted with the interdigitated grids or 25 combs A, removed, fused, again inserted and again imprinted and this process repeated a number of times with the successive imprints in exact register with, and superposed on the first imprint. Any suitable material may 30 be used for the stamp 1, and a material such as acid glass is used for the base or blank C, and a solution known commercially as silver G, containing gold and/or platinum is employed in forming the grids A, care being 35 taken to see that the surface of the base or blank C to which the metal-containing liquid is to be applied by the stamp 1 is of such suitably receptive character that a clear-cut precisely defined impression will be 40 formed thereon by the stamp 1 as coated with said metal containing liquid.

The lines are so designed and arranged as to form the two electrodes of an electrical bridge, and preferably form a pair of interdigitated combs or grids. There is a complete separation between the electrodes. 45

It is obvious that the lines may be alternately formed upon the plate by use of a stencil or any other means which produces 50 a suitably precise impression.

The glass plate is then fired at a temperature usually in the neighbourhood of 525° centigrade. The temperature, however, will vary with the material employed. It 55 must be sufficient to bring the material of the base into the condition in which the metal of the electrodes will tenaciously adhere to and become substantially incorporated with the material of the base, but 60 must not be so high as to cause the metal to melt.

After cooling has taken place, the stamp is caused to impress a further coating of the metallic solution on the glass plate, the lines 65 of which are superimposed on the existing

lines by the co-operation with the stamp or stencil of a registering holder.

The glass plate is then again fired at a temperature in the neighbourhood of 525° centigrade, or at such temperature as is 70 suitable to the material employed.

The processes described are repeated until the metallic lines forming the electrodes are of such conductance as to suit the requirements of the bridge when completed. 75

The glass plate is now heated to a temperature in the neighbourhood of 200 centigrade and at this temperature the metallic lines and the interstices between them are coated thinly with selenium as indicated at 80 B by any suitable known method.

The selenium is then annealed and the bridge seasoned, in the usual manner.

If desired, the bridge may be mounted in vacuo. 85

In the process described above the number of heatings for "fusing-in" the electrodes may be reduced and consequently the time required for manufacturing of the bridge, by making several applications of the 90 metallic solution between successive firings only sufficient heat being applied after each application to drive off the volatile medium of the metallic solution.

I claim:— 95

1. A method of manufacturing a light-sensitive cell comprising forming electrodes on a base of suitable material by applying to said base a metal-containing liquid medium by means of a stamp of the exact shape of 100 the electrodes subsequently to be produced, evaporating the liquid medium, heating the base to such a temperature as to bring it into a condition in which the electrodes will adhere tenaciously thereto, but without causing 105 the electrodes to melt, and then coating the base and electrodes with a light-sensitive substance.

2. A method of manufacturing a light-sensitive cell comprising stamping a pair of 110 interdigitated grids in the form of thin metal lines in the exact shape in which they are to be used on an acid glass base, said grids being applied by means of a metal-containing liquid medium, evaporating said liquid medium, heating said base to a temperature of 115 525° C. so as to cause said base to adhere tenaciously to said grids, cooling said base, reheating said base to a temperature of about 200° C., applying a layer of selenium to said 120 base and said grids and annealing said selenium.

3. A method of manufacturing a light-sensitive cell comprising stamping on a base of insulating material, in the form of thin 125 lines, a liquid metal containing solution which does not form a selenide, said lines constituting metallic electrodes in the exact shape in which they are subsequently to be used, and subsequently heating said base to 130

a temperature at which it is brought into a condition in which the metal of the solution tenaciously adheres thereto, but without causing said metal to melt.

5 4. A method of manufacturing a light-sensitive cell consisting in forming a pair of interdigitated grid electrodes on a base of insulating material by impressing thereon by means of a stamp a liquid metal containing
10 solution, which does not form a selenide, in a form corresponding with the exact shape of the electrodes to be produced, evaporating the liquid medium of said solution so as to leave metallic conductors, heating said base
15 to a temperature of about 500° C. to cause said conductors to adhere tenaciously thereto, repeating said impressing, evaporating and heating operations a number of times, cooling said base, applying thereto a layer of
20 selenium, and annealing said selenium.

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