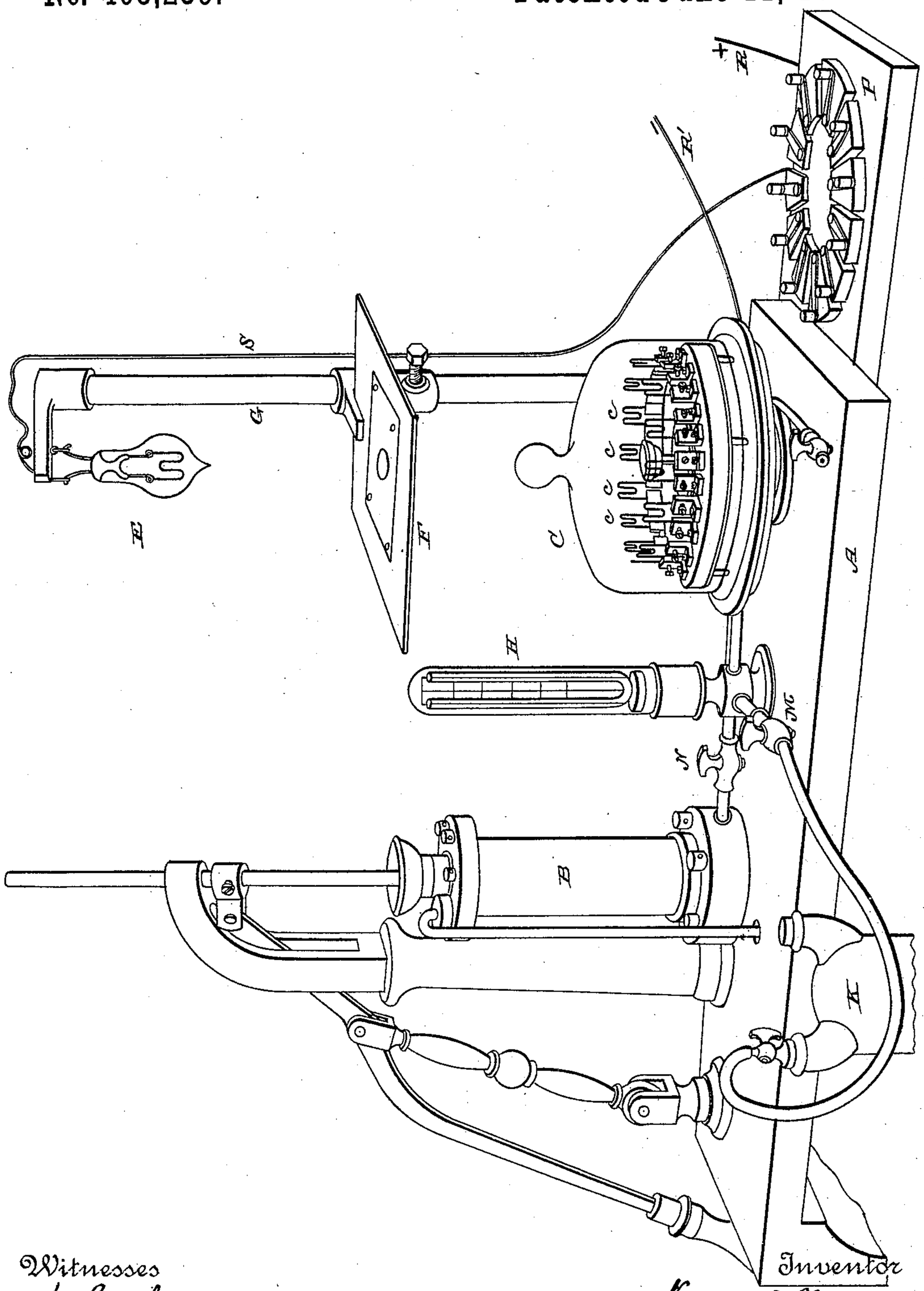
(No Model.)

H. S. MAXIM.

APPARATUS FOR THE MANUFACTURE OF FILAMENTS FOR INCANDESCENT LAMPS.

No. 405,239. Patented June 11, 1889.



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HIRAM S. MAXIM, OF BROOKLYN, NEW YORK.

APPARATUS FOR THE MANUFACTURE OF FILAMENTS FOR INCANDESCENT LAMPS.

SPECIFICATION forming part of Letters Patent No. 405,239, dated June 11, 1889.

Application filed February 21, 1881. Serial No. 26,691. (No model.)

To all whom it may concern:

Be it known that I, HIRAM S. MAXIM, of the city of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Apparatus for the Preparation of Carbons for Electric Lamps, of which the following is a specification.

This invention relates to the mode of preparing carbons for incandescent electric lamps by condensing and building them up by the action of electricity upon a hydrocarbon vapor or other carbonaceous gases that deposit their carbon at high temperatures, as described by me in other applications for Letters Patent heretofore filed by me in the United States Patent Office; and the object of the present invention is to provide an efficient apparatus for the rapid, economical, and accurate accomplishment of this work.

The invention is fully illustrated in the accompanying drawing, showing the apparatus in perspective, in which—

A is a stand of wood, on which the principal parts of the apparatus are mounted.

B is an air-pump, which may be of any ordinary construction suited to the work.

C is a bell-glass receiver, having its lower edge accurately fitted to the metallic plate D, although a rubber or other gasket may be used between the plate and the lip of the receiver.

E is an incandescent electric lamp of standard illuminating-power.

F is an ordinary Bunsen photometer mounted on the upright G midway between the lamp E and the carbons placed within the receiver C.

H is a gage in free communication by a pipe with the receiver.

K is a vessel containing gasoline or some other highly-volatile hydrocarbon and having a connection with the receiver through the tube L. This pipe may be opened and closed by the cock M. The pipe, also, that connects the pump with the gage and the receiver has a cock N, by which it may be opened and closed. Within the receiver there is arranged, on some suitable support electrically connected with the plate D, any convenient number of clips for holding the carbons *c c c*.

P is a switch-board having a switch for each carbon in the receiver and one for the lamp E.

R R′ are the positive and negative wires of the main circuit supplied from any available source of electrical energy. One of these wires leads to the switch-board and the other to the metallic base-plate of the receiver.

The clips in the receiver are arranged in pairs, one clip of each pair being electrically connected through the plate D with one of the main wires of the circuit, and the other clip being insulated from such plate, but electrically connected through a wire leading to the switch-board with the other main wire of the circuit. The carbons to be treated are arranged as shown in the drawing, one carbon to each pair of clips, the carbons being inserted so as to form an electrical connection between the two clips.

Instead of making each carbon-holder of separate clips, it may of course be a single structure of two parts insulated from each other, one of which is connected with one of the main wires of the circuit through the base-plate of the receiver, and the other of which is connected with the other main wire through the switch-board.

It will thus be seen that the several carbons are arranged in parallel series in co-ordinate branches between the main wires of the circuit, and according to the adjustment of the switches at the will of the operator the current can be caused to flow through all the carbons simultaneously or through any specific number less than all. The lamp E is arranged in a similar manner—that is, in a branch between the main wires—the standard G, forming one of the conductors, leading to the lamp and the wire S the other. The carbons to be treated should be of substantially the same size as that of the standard lamp, but of a higher resistance.

The operation is as follows: The air and occluded gases are first to be removed from the receiver as perfectly as practicable, after which, on opening the cock M, the vapor given off from the gasoline in the vessel K will flow into the receiver. When the proper amount has been admitted—an amount corresponding to the pressure of an inch of mer-

cury will suffice—the current is to be sent simultaneously through the carbons and through the lamp. The higher resistance of the carbons will cause them at first to give off a light of less intensity than that of the lamp, but gradually, as the carbonaceous gas in the receiver is decomposed and the carbon-conductors are correspondingly condensed and built up by the fine carbon deposited in and upon them, their resistance falls, and a larger amount of the current passes through them and the light increases. As fast as they are seen to approach the light of the standard lamp, they are to be switched out of circuit, after which by again closing the switches one by one each carbon may be taken up separately and further treated until its light-giving power is made equal to that of the standard.

Instead of arranging the carbon holders or clips and the standard lamp in parallel series, as above described, they may also, without departing from the principle of the invention, be arranged in consecutive series; but in such case each carbon-holder should have a shunt-circuit, so that when any particular carbon is switched out of circuit its shunt will simultaneously be closed and thus permit the free flow of the current to and through the remaining carbons of the series.

In order to aid the eye in making an accurate comparison of the lights, a photometer of any suitable construction may be used. The well-known Bunsen photometer, consisting of a sheet of paper having a spot oiled, suitably mounted midway between the lamp and the carbon to be compared, will be found convenient for this purpose.

By the foregoing means great accuracy of results can be attained and the work can be rapidly done and a corresponding economy effected, since as many carbons can be treated simultaneously as can be grouped under one receiver. The production of the first vacuum is a single operation for all the carbons; so, also, with the introduction of the hydrocarbon gas into the vacuum; and so, likewise, the electric treatment of the carbons, all except the finishing step in the process.

Instead of using a lamp of standard illuminating-power placed in the circuit, as shown in the drawing, the carbons under the receiver may be subjected to the action of a constant or uniform electric current and the changing intensity of light developed in them, as the decomposition of the gas proceeds, be compared with any standard light—as, for example, an ordinary Carcel burner—wholly disconnected with the circuit. This would involve the same general principle as where the standard of comparison is an electric lamp placed in the circuit, in the manner above described, since the uniform current proposed is a current capable of developing a uniform light of given intensity in a standard lamp. In this case, also, the photometer may be used; in fact, it will in this case be specially useful if the standard light with which the carbons are to be compared is of a different intensity from that to which it is sought to bring the carbons.

It is plain that instead of grouping a number of carbons under a common receiver for the purpose of treating them electrically in an attenuated carbonaceous atmosphere, as above set forth, each carbon might be under a separate receiver, the connections with a a common circuit and a common air-pump being preserved; but such a construction of the apparatus would be less convenient than where a common receiver is employed for the several carbons.

What is claimed as new is—

1. In combination with an electric circuit and an air-pump, two or more carbon holders or clips arranged under a common receiver suitably supplied with a hydrocarbon or equivalent gas, substantially as and for the purpose set forth.

2. In combination with an electric circuit and an air-pump, a receiver adapted to be supplied with a hydrocarbon or equivalent gas and containing two or more carbon holders or clips, each of which is provided with a switch controlling its connection with the circuit, substantially as and for the purpose set forth.

3. The combination of an electric circuit, a carbon-holder, a receiver for inclosing such holder and arranged to be provided with an atmosphere of hydrocarbon or equivalent gas for building up the carbon and changing its resistance, a standard light, and a photometer, substantially as and for the purpose set forth.

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Witnesses:

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