(No Model.)

W. MARSHALL.

CONDENSER SWITCH BOARD.

No. 402,027. Patented Apr. 23, 1889.

Fig. 1.

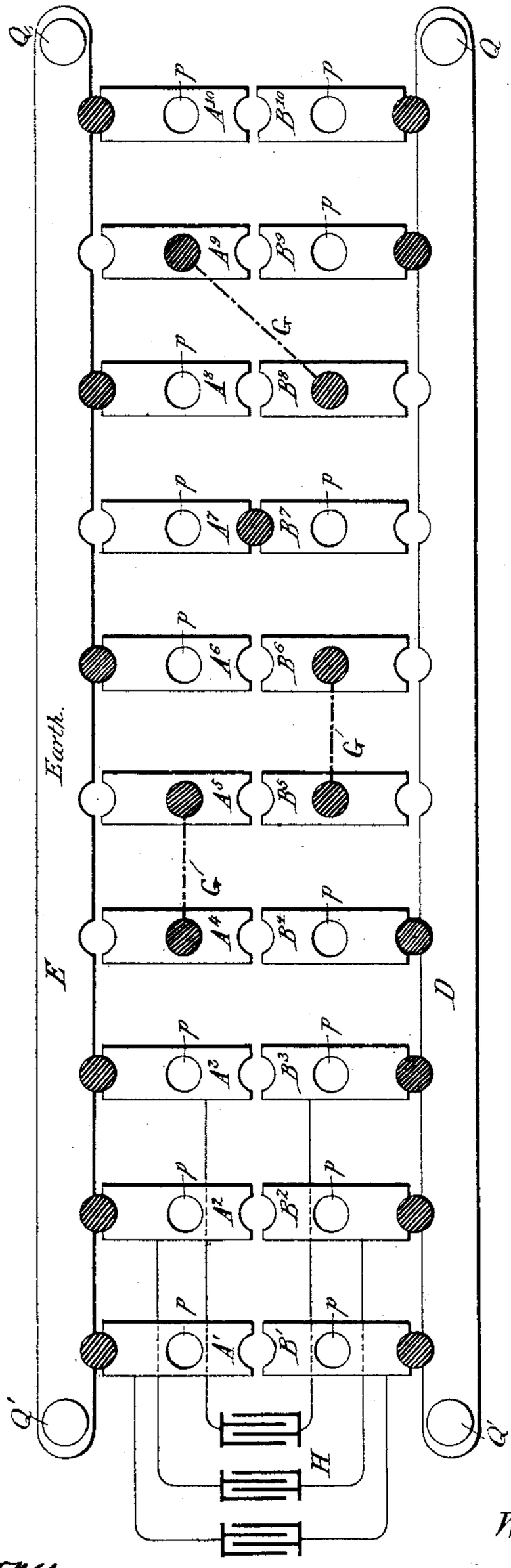
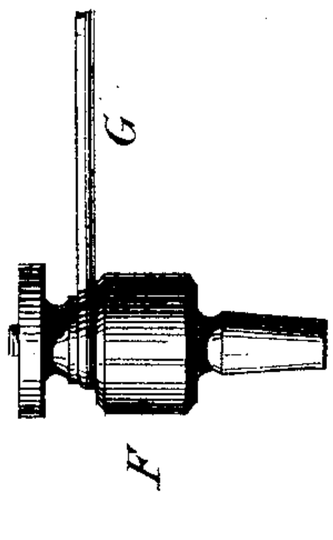


Fig. 2.



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CONDENSER SWITCH-BOARD.

SPECIFICATION forming part of Letters Patent No. 402,027, dated April 23, 1889.

Application filed September 29, 1887. Renewed March 18, 1889. Serial No. 303,819. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM MARSHALL, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Electric Condensers, of which the following is a specification.

My invention relates to condenser switch-boards, by which, from a given sectional condenser or group of condensers, any desired capacity may be obtained; also to a method of connecting condensers to vary the capacity.

In the accompanying drawings, Figure 1 is a plan of my switch-board, and Fig. 2 is a view of a plug therefor.

In the drawings, A′ A^2, &c., are a series of plates connected each to a positive leaf or group of leaves of a condenser, H, and B′ B^2, &c., are a corresponding series of plates connected each to the negative leaf or group of leaves of the condenser.

D and E are two strips adjacent to the two series of plates, respectively, and each plate is adapted to be connected by a plug, F, with its adjacent strip. The strips are provided at each end with binding-posts Q Q and Q′ Q′ for the attachment of line-wires.

Each plate is provided with an independent hole, *p*, for the reception of the plug when not in use or when a wire connection with some other plate is to be made. Any two corresponding plates of the series, as A′ and B′, are also adapted to be connected by the plug, so as to short-circuit the condenser connected therewith. The plug F, by which all the connections are made, is provided with a binding-post at its upper end, adapted to receive the wire G, by which a connection is made to a corresponding plug, as will be hereinafter described.

When a number of condensers are connected in multiple arc, their joint capacity is equal to the sum of their separate capacities. Thus, if each condenser of the ten represented in the switch-board of the drawings should have a capacity of one-tenth microfarad, their joint capacity in multiple arc would be one microfarad. When a number of condensers are connected in series, however, their joint capacity is equal to the reciprocal of the sum of the reciprocal of their respective capacities. Thus the condensers in the conditions assumed would have a joint capacity in series of

$$\frac{1}{\frac{10}{1}+\frac{10}{1}+\frac{10}{1}, \text{ \&c.}}=\frac{1}{100}$$

Therefore the condensers would have a maximum capacity of one microfarad in multiple arc and a minimum capacity of one one-hundredth microfarad in series.

By means of the switch-board just described I am enabled to readily connect a sectional condenser or a number of condensers, so as to get not only the maximum and minimum capacities but any intermediate capacity by a combination of the series and multiple-arc connections. I may also use each section of the condenser separately and for separate purposes by plugging into the holes *p p*, &c., and attaching the terminals of the several separate lines to each pair of plugs, respectively. Furthermore, I can take off from posts Q Q with a portion of the condensers connected up either in series or multiple series, and can then use the remainder or a portion thereof by connecting directly to their plugs and not using posts Q′ Q′.

To illustrate the manner of combining the series and multiple-arc connections, the plates A′, A^2, and A^3 are shown plugged to strip E, and the corresponding plates, B′, B^2, and B^3, to the strip D. The three condensers are thus in multiple arc with a joint capacity of three-tenths microfarad, and it will be readily seen that the whole number can be similarly connected and their maximum capacity obtained—viz., one microfarad. The plates A^8 A^9 and B^8 B^9 are in series, A^8 being plugged to E, B^8 connected to A^9 by wire G, and B^9 plugged to D. Their joint capacity is thus one-twentieth microfarad, and it is apparent that the whole number can be similarly connected and their minimum capacity obtained—viz., one one-hundredth microfarad.

In combining the different methods of connection to obtain the finer graduations of capacity any group may be connected either in multiple arc or in series, and then treated as a single condenser in the calculation. Thus the series group A^8 A^9 B^8 B^9, having a capacity of one-twentieth, may be combined in multiple arc with A^{10} B^{10}, having a capacity of

one-tenth, and their joint capacity will be one-twentieth plus one-tenth, which will equal three-twentieths. The same series group may be combined with the multiple-arc group A′ A^2 A^3 B′ B^2 B^3, having a capacity of three-tenths, and the joint capacity would then be one-twentieth plus three-tenths, equaling seven-twentieths. In like manner any number of sections in series grouping, which tends to minimize the capacity, may be added in multiple to one or more of the normal capacity and the finest graduations obtained. Likewise multiple-arc groups of equal or different capacity may be combined in series in an obvious manner. Thus the positive plates A^4 and A^5 are connected by a wire, G, and the negative plates B^5 and B^6 similarly connected. The group thus formed is then placed in series with A^6 and B^4, which are connected, respectively, to the two strips E and D. Any well-known form of switch may be used in place of plug F, and any section may be short-circuited, as at A^7 B^7.

I make claim to the apparatus only in this application, but reserve the right to claim the method described herein in a separate application.

Having described my invention, I claim—

1. The combination, with the positive leaf or leaves of each one of a series of condensers, of a series of contact-plates connected thereto, respectively, a corresponding series of contact-plates connected to the alternate or negative leaves, respectively, a strip adjacent to each series of plates, and a switch for connecting each plate with its corresponding strip.

2. The combination, in a condenser switch-board, of the positive series of plates A′ A^2, &c., the corresponding series of negative plates, each plate of both series being provided with an independent plug-hole, and plugs adapted to the said holes provided with binding-screws at their upper ends, whereby a wire connection can be made between any two plates.

3. The combination, in a condenser switch-board, of the series of positive plates A′ A^2, &c., the corresponding series of negative plates B′ B^2, &c., the strips D and E, adjacent to the two series, respectively, a plug-connection between each plate and its adjacent strip, and plugs having binding-screws at their upper ends adapted to independent holes in the plates, whereby additional wire connections between the plates may be made.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

WILLIAM MARSHALL.

Witnesses:

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ADOLPH KIENDL.