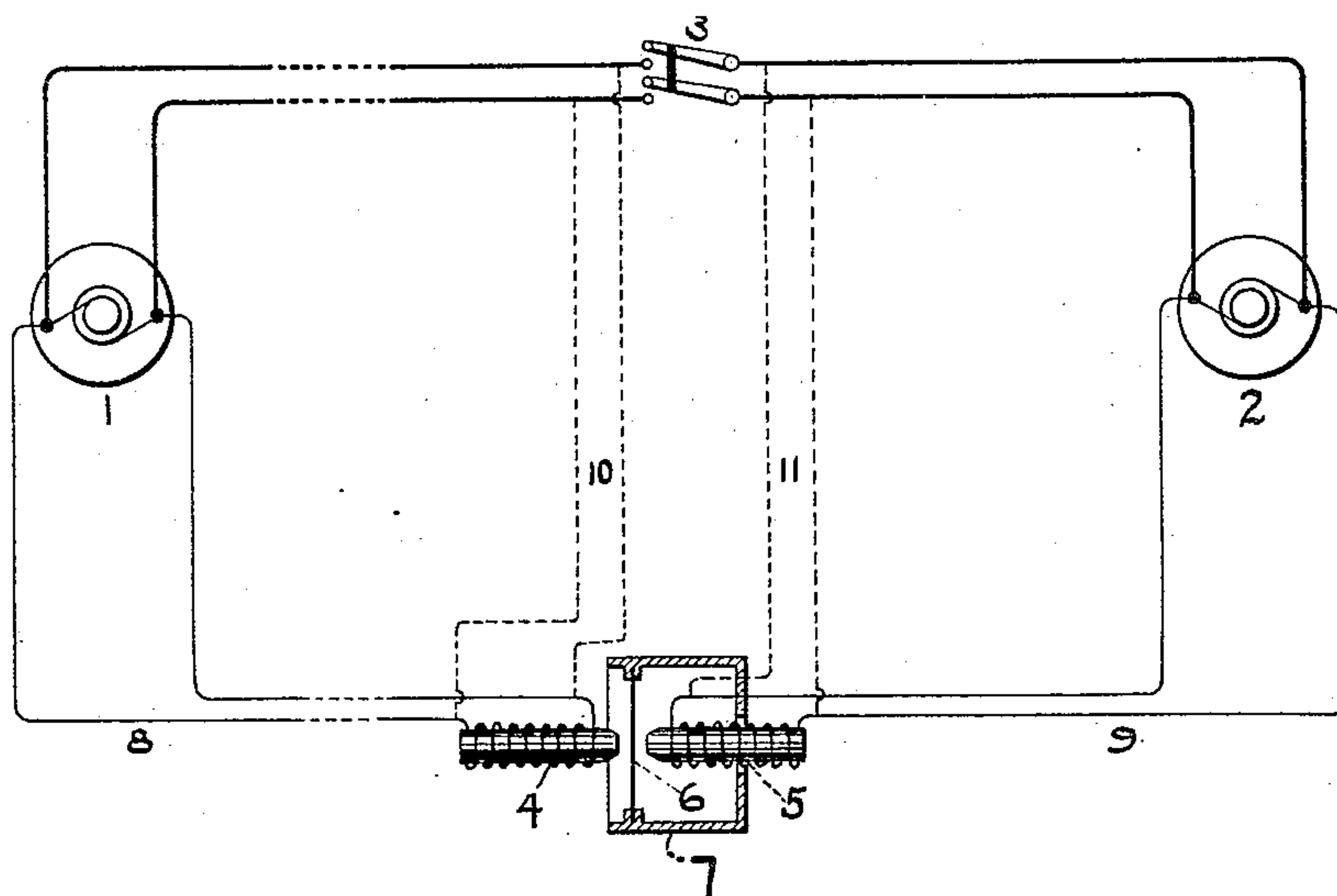


(No Model.)

R. D. MERSHON.  
AUDIBLE SYNCHRONISM INDICATOR.

No. 529,398.

Patented Nov. 20, 1894.



WITNESSES:

*George Brown Jr.*  
*Douglas E. Turner*

INVENTOR,

*Ralph D. Mershon*  
BY *Jerry and Mack Kaye*  
ATTORNEYS.

# UNITED STATES PATENT OFFICE.

RALPH D. MERSHON, OF PITTSBURG, PENNSYLVANIA.

## AUDIBLE SYNCHRONISM-INDICATOR.

SPECIFICATION forming part of Letters Patent No. 529,398, dated November 20, 1894.

Application filed April 27, 1894. Serial No. 509,222. (No model.)

*To all whom it may concern:*

Be it known that I, RALPH D. MERSHON, a citizen of the United States, residing in Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Audible Synchronism-Indicators or Synchrophones, (Case No. 590,) of which the following is a specification.

My invention relates to a method and means whereby alternating current motors or generators may be synchronized before connecting them in circuit with each other.

The object of my invention is the provision of a form of synchronizing device or synchronism indicator, which shall appeal to the ear of the operator, so that his eyes need not be removed from his switches at any time, and so that the indicator may be placed in any desired situation with respect to the motors or generators to be synchronized and to the switch whereby they are thrown in circuit.

My invention depends upon the opposing effect of two magnetic poles upon a diaphragm, said magnetic poles being created by currents generated by the electromotive forces across the terminals of the machine to be synchronized.

My invention is illustrated in the accompanying drawing which shows diagrammatically the relation of the magnetic fields to the diaphragm and the circuits from the machines.

The machines to be synchronized may be two generators or a generator and a motor, and this synchronizing may be for various purposes. In any event each machine to be synchronized is driven by some external force and therefore produces potential across the mains from the machine. The problem is to get the two machines into what is known as synchronism, or to make them revolve at approximately the same rate of speed, and to cause the occurrence of maximum potential to be simultaneous in the two circuits.

In the drawing, 1 and 2 represent the two machines to be synchronized. These may be in the same station, when the circuits shown in full lines will be appropriate for the operation of the synchronizer; or one machine may be at a considerable distance from the other, as when synchronous motors far from the source of current are to be brought up to

synchronism. In this latter case the circuits shown in dotted lines and derived from each side of the switch 3 will be appropriately employed, as it would not be convenient to carry an extra circuit from the distant generator. It will, of course, be understood that the dotted line circuits are equally appropriate to the first case above-mentioned.

In the practice of my invention I employ two magnetic poles, as for instance, those produced by the cores 4 and 5. Subject to the influence of both poles and equally affected by each is the vibrating polarized diaphragm 6, which, for the purpose of increasing the sound, I prefer to place on or in a sounding box 7. This diaphragm may be constructed in any manner well known to the telephone art, the polarity lying across the diaphragm. The cores 4 and 5 are surrounded by coils which are in circuit with the fine wire circuits 8 and 9 respectively or with the dotted line circuits 10 and 11, as above stated. In operation of these devices, the motor or generator 2 to be brought into synchronism with the machine already running will produce alternating electromotive force at the terminals of the coil 5, which may be represented by a wave having a certain relation to the electromotive force wave produced by the machines, both as to height of wave and as to frequency of vibration. Supposing the height of the waves, or in other words, the maximum electromotive force, to be the same in the two circuits, the occurrence of synchronism will be indicated by one of two conditions in the diaphragm depending upon the connection of the coil 5 in one or the other relation with the terminals of the machine 2. The relation which should exist between the circuits of the two machines at the moment when the switch 3 is thrown is that of exact opposition between the respective electromotive forces, and at the same time the frequency of the alternations must be the same or very nearly the same in the two circuits. It will thus be seen that this required condition will produce either a continuous series of opposed magnetic actions due to the two cores 4 and 5, in which case there will be no mechanical movement of the diaphragm 6; or, if the connections of the terminals of the coil 5 to the circuit of the machine 2 are reversed, there will



be a succession of coincident magnetic actions due to these two cores. In the latter case the diaphragm will be strongly vibrated by the influence of the magnetic action and the maximum of sound due to the vibration of the diaphragm will be the result. It will thus be seen that the operator who desires to throw the switch at the moment of synchronism has only to wait for the instant of silence or for the instant of maximum sound of the diaphragm 6, according as the connections of the circuit 11 are made in one way or the other with the circuit from the machine 2.

Where the maximum potential across the mains from the machine 2 is not equal to that from the machine 1, or in other words where the waves representing the electromotive forces of the two machines have different heights, the operator will throw the switch 3 on the occurrence of minimum sound produced by the diaphragm instead of on the occurrence of silence, since the opposing actions of the two cores 4 and 5 will never in this case be quite equal and therefore some vibration of the diaphragm will always occur.

It should be stated here that the absence of sound recurs at regular intervals intervening between an increase or decrease of sound forming what may be called a beat. These beats occur at progressively greater intervals of time as the machine comes into synchronism and the moment of silence or maximum sound which is chosen for throwing the switch should be when these beats are at their slowest.

I am aware of the existence of a form of indicator wherein a single diaphragm is subjected to the action of one magnetic motor pole produced by the resultant action of two interfering magnetic fields each of which is

connected with one of the machines to be synchronized. I therefore do not claim this invention, but desire to call attention to the fact that the invention described herein differs therefrom in that my present invention depends upon the mechanical interference of two distinct magnetic poles as distinguished from the magnetic interference of two fields in the production of one motor pole.

I have not elaborated any particular details in the description and illustration of my invention herein, and do not desire to be understood as confining myself to the precise construction as illustrated and described herein.

What I claim is—

1. The method of indicating the occurrence of synchronism between two circuits which consists in converting the electric vibrations in the two circuits into corresponding magnetic vibrations, thereby producing two distinct magnetic poles and subjecting a polarized body, capable of vibration, to the action of said poles, substantially as described.

2. In a synchronism indicator, a polarized diaphragm, a magnetic core or cores presenting two poles thereto and two coils connected with the terminals of the machines to be synchronized, each of said coils producing one of the actuating poles, substantially as described.

In testimony whereof I have hereunto subscribed my name this 11th day of April, A. D. 1894.

R. D. MERSHON.

Witnesses:

JAMES WM. SMITH,  
HAROLD S. MACKAYE.