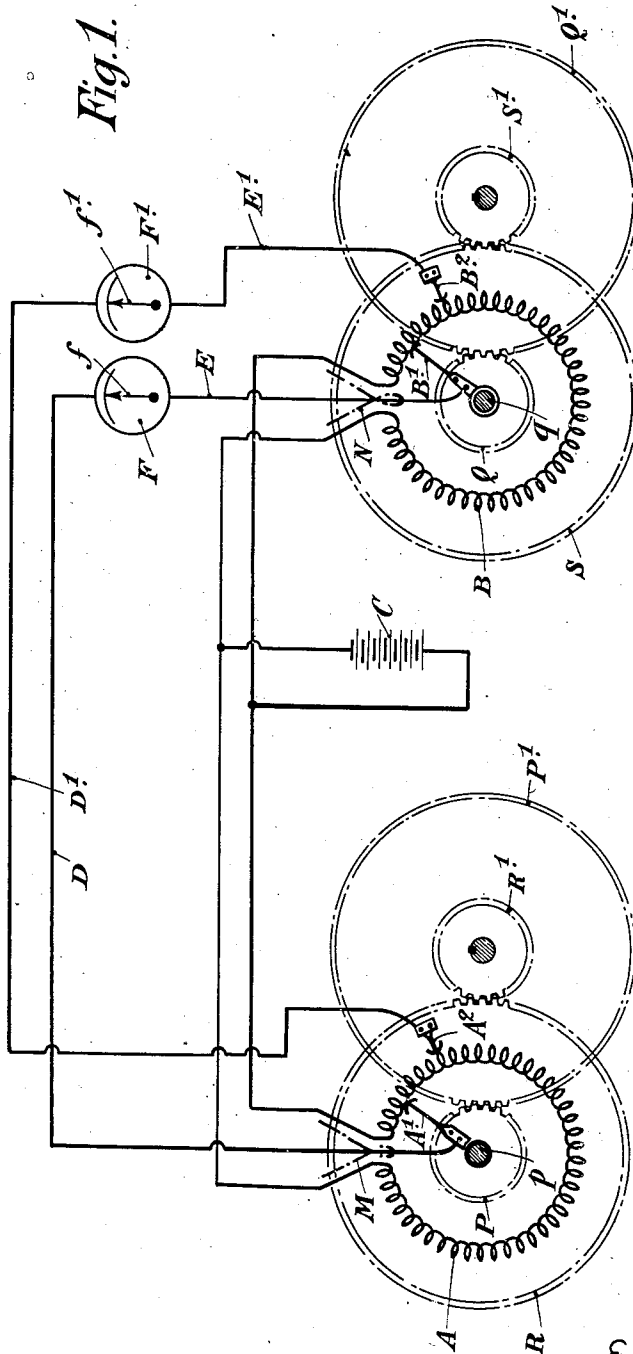


ELECTRIC APPARATUS FOR INDICATING AND REPEATING MOVEMENTS AT A DISTANCE.
APPLICATION FILED JUNE 16, 1919.

1,406,500.

3 SHEETS—SHEET 1.



Inventor: -
Eugene Schneider
By Maurs, Cameron, Lewis & Massie
Attorneys.

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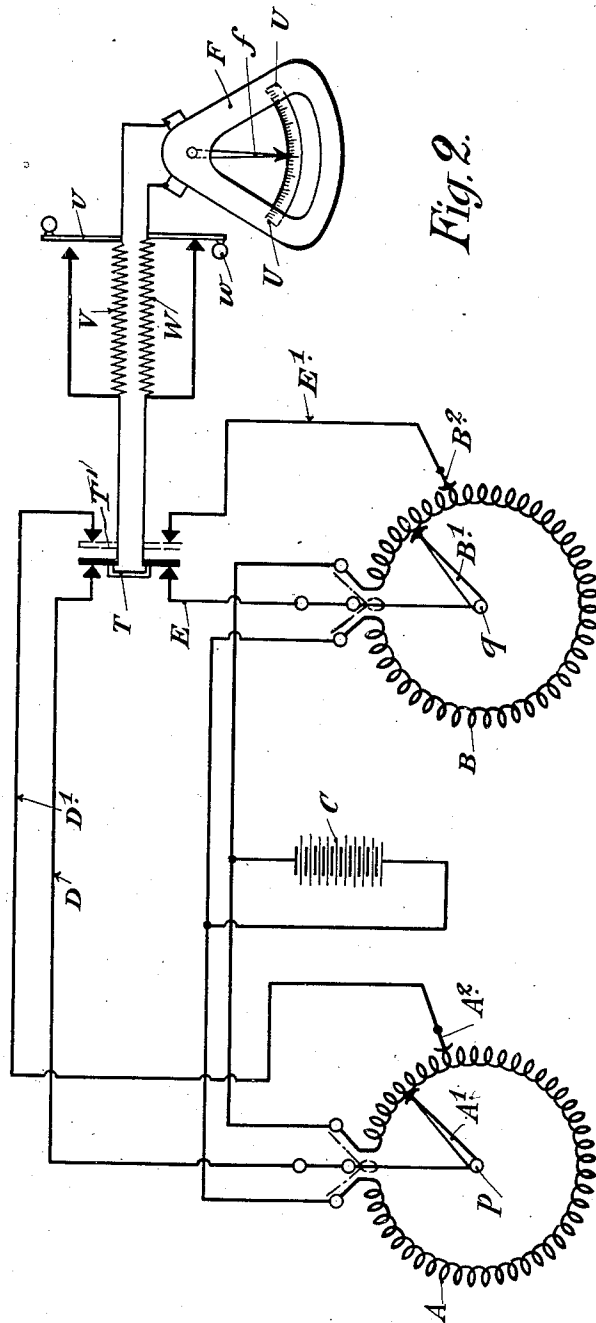


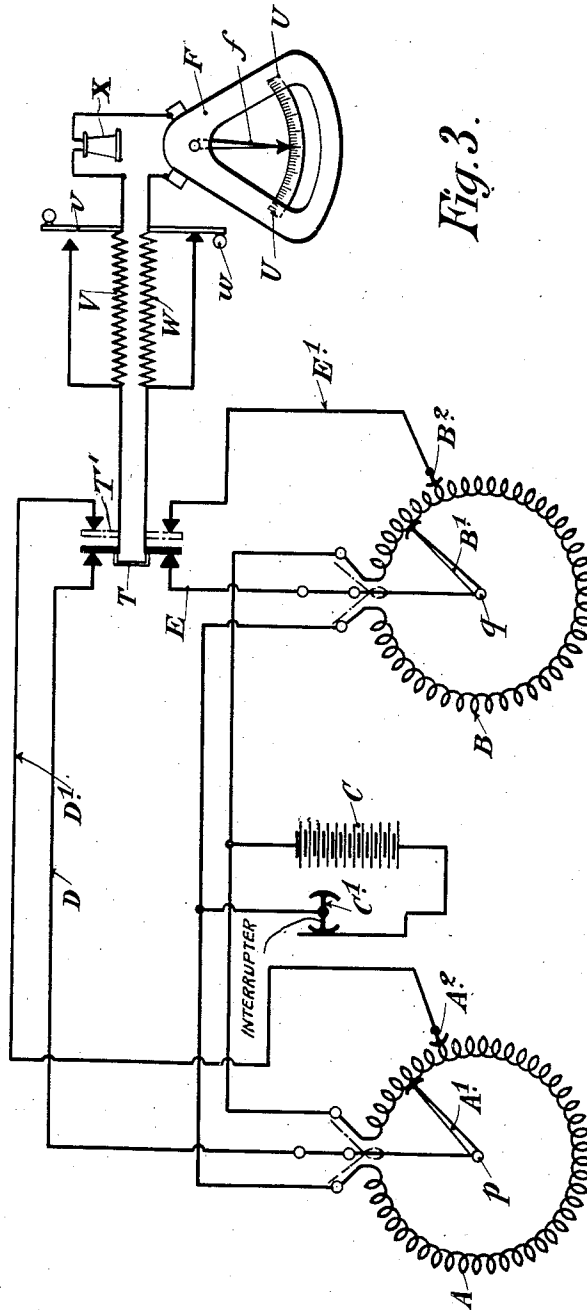
Fig. 2.

Inventor:—
Eugene Schneider
By
Thurs, Cameron, Lewis & Massie,
Attorneys.

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Attorneys.

UNITED STATES PATENT OFFICE.

EUGÈNE SCHNEIDER, OF PARIS, FRANCE, ASSIGNOR TO JOSEPH LOUIS ROUTIN, OF
PARIS, FRANCE.

ELECTRIC APPARATUS FOR INDICATING AND REPEATING MOVEMENTS AT A DISTANCE.

1,406,500.

Specification of Letters Patent. Patented Feb. 14, 1922.

Application filed June 16, 1919. Serial No. 304,653.

To all whom it may concern:

Be it known that I, EUGÈNE SCHNEIDER, a citizen of the Republic of France, and a resident of Paris, France, have invented a new and useful Electric Apparatus for Indicating and Repeating Movements at a Distance, which invention is fully set forth in the following specification.

The present invention relates to improvements in apparatus for indicating and repeating angular movements at a distance, and more particularly to apparatus of the above kind in which the principle of the Wheatstone bridge is employed, the resistances taking the form of annular rings as shown in my British Patent No. 131,635, September 4, 1919.

In apparatus of the above character, the continuous attention of the operator is required to keep in step the transmitting and receiving mechanisms.

The present invention has for its object to provide various improved constructional forms of the invention which will allow the observer in the case of his attention having been withdrawn for a time, first of all to note the difference in step that has occurred between the transmitting mechanism and the receiving mechanism, and then to return the latter into the correct position.

With this object, the main brush and the auxiliary brush of the annular rheostat, instead of being fixed to each other, are movable around a common axis but are connected to each other by a train of gearing in such a manner that the auxiliary brush will make only a fraction of a revolution during the time that the main brush is making a complete revolution. In practice the auxiliary brush will make as a maximum one complete revolution for each revolution of the movable device to be moved.

According to a constructional example the main brushes at the two stations are connected to each other by a circuit including a first voltmeter. The auxiliary brushes are similarly connected by a second circuit including a separate voltmeter. In this case the rheostats have between the ends of the coils only the gap between them that is strictly necessary to assure insulation between the inlet turn and the outlet turn of the coils.

In the accompanying drawings, Fig. 1 is a diagrammatic illustration of the invention.

Fig. 2 is a diagram of a modification;

Fig. 3 is a diagrammatic view showing a further modification.

A and B are the rheostats situated respectively at the transmitting and receiving stations. Each of these rheostats is wound throughout its extent, the ends of the winding being separated from each other by an insulated turn (M and N respectively) hereinafter designated the inactive turn.

Over each of the rheostats there is adapted to move a main brush (A^1 , B^1 respectively) fixed to a pinion (P, Q) loosely revoluble on an axle (p , q). On this same axle there is mounted loosely revoluble a toothed wheel (R, S) fixed to the corresponding auxiliary brush (A^2 , B^2). The wheel R receives its motion from the wheel P through the medium of the wheels (P^1 R^1). The two latter are fixed to each other and are mounted on a fixed axle. Similarly, the wheel S is actuated by the wheel Q and through the medium of two wheels Q^1 , S^1 fixed to each other. The numbers of the teeth of the several pinions and wheels is such that the brushes A^1 , B^1 make one complete revolution, whilst the auxiliary brushes make for instance only a twentieth of a revolution.

This demultiplication corresponds to a maximum demultiplication of 1/20 between the pinions P and Q and the movable devices to be moved. In other words, the apparatus to be displaced, such as canons, telescopes or the like, makes one turn for the maximum demultiplication, while the pinions P, Q make 20 turns.

On the connection D—E between the brushes A^1 and B^1 there is arranged at the receiving station a first voltmeter F. A second voltmeter F^1 is arranged on the connection D^1 — E^1 between the auxiliary brushes A^2 and B^2 .

So long as synchronism exists between the transmitting and receiving stations, the needles of both voltmeters will be at zero.

If by reason of the attention of the observer (charged with observing the needles) having been distracted, an angular difference of position of one or more revolutions

should take place between the main brushes A^1 and B^1 , the needle of the voltmeter F can remain at zero, but the said difference of angular position is nevertheless exposed by the fact that the needle of the voltmeter F^1 has shifted its position.

In order to return the movable device that is to be moved, into its correct position, the observer must first execute a rough manouever by effecting the return of the needle f^1 to zero. When this has been done, and if the needle f is no longer at zero, the observer will complete the manouever by effecting its return. In short, the voltmeter F^1 enables to execute a first rough manouever, the said manouever being completed by observing the voltmeter F .

In the example shown in Fig. 2 each of the main brushes is connected to its auxiliary brush, as in the preceding example, by means of a demultiplying train of gear wheels not shown.

The feature which differentiates this constructional form from the preceding one, is the use of a single voltmeter which by means of a switch T is able to be connected at will either to the circuit of the main brushes or to the circuit of the auxiliary brushes.

In the case of the observer's attention having been distracted, the observer can note a want of synchronism between the two stations by moving the switch T into the position T^1 indicated by dot and dash lines. The voltmeter is then connected to the circuit D^1-E^1 connecting the auxiliary brushes.

The single voltmeter employed in this constructional form, as well as the voltmeter F in the preceding example must be provided with a screen U (Fig. 2) which masks the needle when it arrives at the ends of its path, this being done for the following reasons:—

Each time the brushes A^1 and B^1 are situated in the neighbourhood of the inactive turn (M, N), on passing over said turn, the current will be suddenly reversed in the voltmeter. If the needle f of the voltmeter remained visible, the observer at the receiving station might be led to reverse the direction of rotation of his hand wheel, whereas the operation should continue in the same direction as at the transmitting station. The automatic masking of the needle f at the ends of its path obviates any wrong manouever even in the most complicated case where the reversals of the direction of motion at the transmitting station may be rapid and frequent to either side of the region corresponding to the inactive turn.

In the diagram shown in Fig. 2, V is the usual resistance that is normally included in the circuit of the coil of the voltmeter F . This resistance may, if required, be shunted by operating a push-button v for the pur-

pose of increasing temporarily the sensitiveness of the voltmeter. W is a resistance which is shunted in normal working; it may be brought into operation by way of exception by operating a push-button w for the purpose of diminishing the sensitiveness of the voltmeter in the case where the needle f should be situated behind the screen U at the time when the observer by first operating the switch T , should bring the auxiliary brushes A^2, B^2 into operation.

In case of want of attention by the observer charged with keeping at zero the needle of the single voltmeter or the needles of the two voltmeters at the receiving station, his attention may be attracted by combining an acoustic signal with the apparatus as described.

For instance as shown in the diagram of Fig. 3, a telephonic receiver X may be connected either to the terminals of the voltmeter F , or connected in series to the circuit of the coil of the said voltmeter. Further, the rheostats are fed with a pulsatory current, that is to say, a current having always the same direction but is periodically interrupted. As soon as the current flows in the coil of the voltmeter, or in other words, as soon as the needle is no longer at zero, the vibrations of the diaphragm of the receiver will be produced automatically.

The pulsatory current may be produced either by maintaining a supply of direct current, such as a storage battery C employed with a rotary interrupter C^1 driven by a small electric motor.

What I claim is:

1. Apparatus for indicating and repeating angular movements at a distance comprising a Wheatstone bridge including a source of current and having in one branch of the bridge an annular resistance located at the transmitting station and in the companion branch a similar resistance located at the receiving station, driving contact brushes movable over the station resistances and driven brushes thereat having speed-reducing connections with the driving brushes, and bridge circuits one of which connects the driving brushes and the other connects the driven brushes and indicating means in said circuits.

2. Apparatus for indicating and repeating angular movements at a distance comprising a Wheatstone bridge including a source of current and having in one branch of the bridge an annular resistance located at the transmitting station and in the companion branch a similar resistance located at the receiving station, driving contact brushes movable over the station resistances and driven brushes thereat having speed-reducing connections with the driving brushes, bridge circuits one of which connects the driving brushes and the other connects the driven

brushes, indicating means in said circuits, and switching means for rendering either bridge circuit operative.

3. Apparatus for indicating and repeating angular movements at a distance comprising a Wheatstone bridge including a source of pulsating current and having in one branch of the bridge an annular resistance located at the transmitting station and in the companion branch a similar resistance located at the receiving station, driving contact brushes movable over the station resistances and driven brushes thereat having speed-reducing connections with the driving brushes, bridge circuits one of which connects the driving brushes and the other connects the driven brushes, indicating means including sound-producing means in said circuits, and switching means for rendering either bridge circuit operative.

4. Apparatus for indicating and repeating angular movements at a distance comprising a Wheatstone bridge including a source of current and having in one branch of the bridge an annular resistance located at the transmitting station and in the companion branch a similar resistance located at the receiving station, driving contact brushes movable over the station resistances and driven brushes thereat having speed-reducing connections with the driving brushes, bridge circuits one of which connects the driving brushes and the other connects the driven brushes, voltmeter indicating means for said circuits, and means for masking the voltmeter needle at the ends of its path.

5. An apparatus such as defined in claim 2 wherein said indicating means comprises a voltmeter provided with means for masking the voltmeter needle at the ends of its path.

6. Apparatus for indicating and repeating angular movements at a distance comprising

a Wheatstone bridge including a source of current and having in one branch of the bridge an annular resistance located at the transmitting station and in the companion branch a similar resistance located at the receiving station, driving contact brushes movable over the station resistances and driven brushes thereat having speed-reducing connections with the driving brushes, bridge circuits one of which connects the driving brushes and the other connects the driven brushes, indicating means for said circuits, and means for varying the sensitiveness of said means including resistances in circuit therewith and means for shunting said resistances.

7. Apparatus for indicating and repeating angular movements at a distance comprising a Wheatstone bridge including a source of current and having in one branch of the bridge an annular resistance located at the transmitting station and in the companion branch a similar resistance located at the receiving station, driving contact brushes movable over the station resistances and driven brushes thereat having speed-reducing connections with the driving brushes, bridge circuits one of which connects the driving brushes and the other of which connects the driven brushes, indicating means for said circuits, switching means for rendering either bridge circuit operative, and means for varying the sensitiveness of said indicating means including resistances in circuit therewith and means for shunting said resistances.

In testimony whereof I have signed this specification.

EUGÈNE SCHNEIDER.

Witnesses:

ANDRÉ MOSTICKER,
CHAS. P. PRESSLEY.