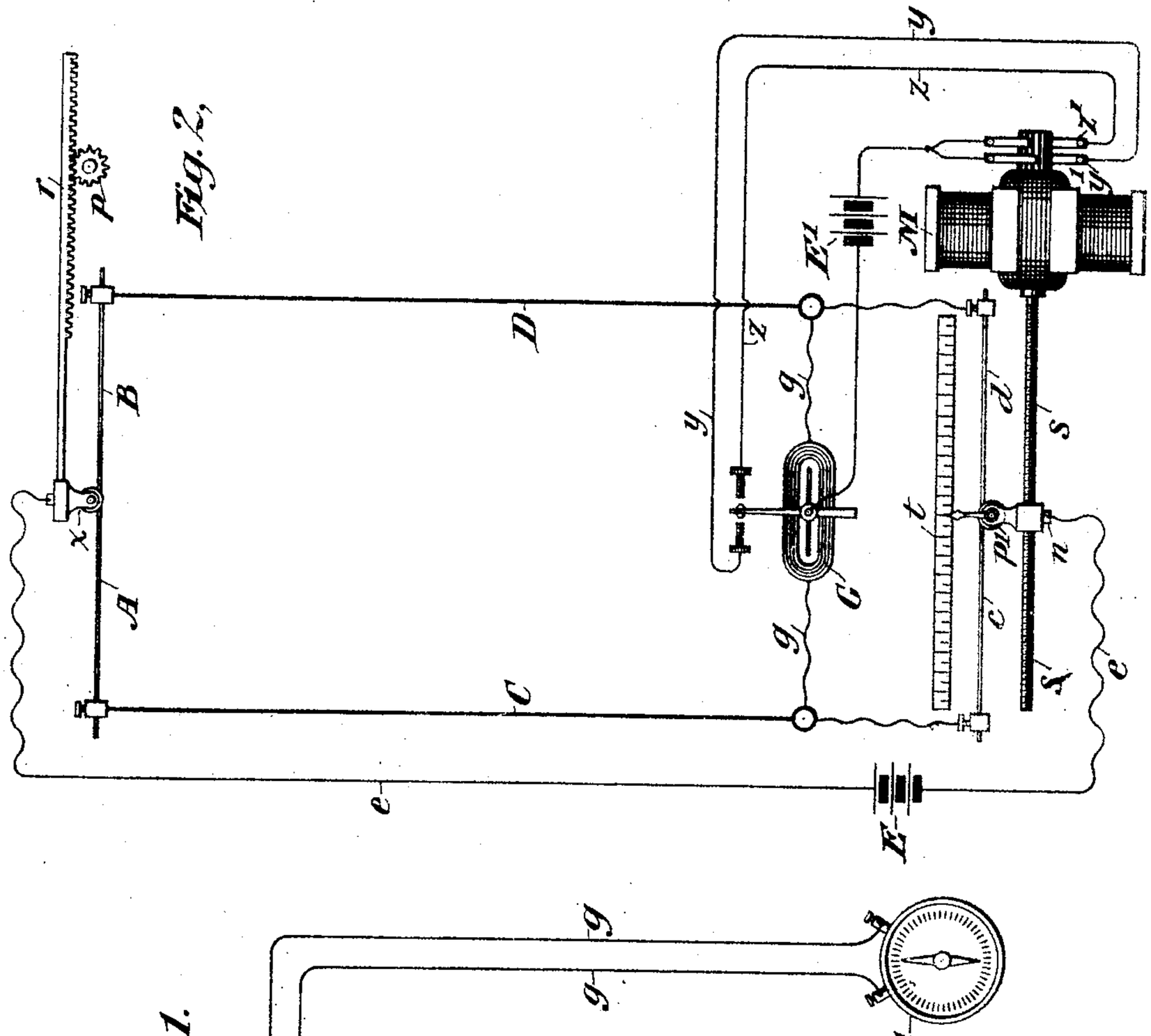
(No Model.)

C. H. HASKINS.

ELECTRIC TELEMETER.

No. 502,399. Patented Aug. 1, 1893.



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ELECTRIC TELEMETER.

SPECIFICATION forming part of Letters Patent No. 502,399, dated August 1, 1893.

Application filed March 9, 1892. Serial No. 424,255. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. HASKINS, a citizen of the United States, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Electric Telemeters, of which the following is a specification.

My invention relates to apparatus employed for indicating at a distant point variations in temperature, pressure, the rate of expenditure of force, and the like, by the agency of electricity.

In the accompanying drawings, Figure 1 is a diagrammatic plan of one form of apparatus embodying my invention and Fig. 2 is a modification of the same.

Referring to Fig. 1, which represents a construction of apparatus especially designed for indicating at a distance the movements of the index of a thermometer, T represents a metallic thermometer of the usual construction provided with an index X adapted to move to and fro over a circular graduated dial, and so adjusted as to correctly indicate the temperature of the locality at any given time.

A B is a wire or strip, of platinum, German-silver or other metal of high specific electrical resistance, its ends being secured in clamps or binding-screws *a b*, which is bent into an arc concentric with the dial over which the index X of the thermometer moves. This may be conveniently effected by sinking it into a shallow circumferential groove formed in a disk of slate, porcelain or other non-conducting material. At the place at which the indications are to be exhibited is fixed another similar metallic wire or strip *c d* the ends of which are secured to clamps *c' d'*. The clamp *a* is joined to the clamp *c'* by a wire or conductor C having an electrical resistance which should be very small in comparison to that of the wires A B and *c d*. The clamps *b* and *d'* are joined by another similar wire or conductor D of equally low resistance.

The metallic index-arm X of the thermometer T carries a movable electric contact *x*, preferably in the form of a small roller of platinum moving along the wire A B, and the wire *c d* is traversed by a similar electrical contact attached to a movable metallic arm X', turning upon a pivot x^2, and provided with a handle x^3, preferably of non-conducting material.

The index X of the thermometer T is electrically joined to the arm X' by a conductor *e e* in which is inserted at some convenient point a battery or other suitable generator of electricity E.

At the place where the indications are to be observed, is placed a galvanometer G of any suitable construction, capable of indicating the presence of an electric current in the wire *g g* in which it is inserted. The terminals of the wires *g g* are electrically connected to the thick wires C D, preferably at the points *a b* as shown in the drawings, though they may be attached at the points *c' d'* or at any intermediate point if desirable especially if the relative resistance of the wires C D is very small.

The system of circuits hereinbefore explained constitutes a species of electrical parallelogram, sometimes termed a "bridge." In the apparatus shown, A and B constitute what are termed the first and second sides of the bridge, and *c c* and *d d*, respectively the third and fourth sides. Hence, from the well-known law of the bridge, it follows that when the electrical resistances of the four sides are in the following ratio: A : B :: C+*c* : D+*d*, no current can pass through the bridge wire *g g*, and hence the galvanoscope G will stand at zero. Now it is obvious that the above mentioned proportion can only exist when the contact *x'* divides the wires *c d* in the same ratio that the contact *x* divides the wire A B. Hence it will be readily seen that a person wishing to ascertain the actual reading of the index X of the thermometer T has only to move the arm X' into such a position upon the dial *t* as will bring the index of the galvanoscope G into a zero position, indicating no current in the wire *g g*, when its reading will correspond with that of the index X.

It is obvious that the movements of any indicator, pressure gage, or other like instrument, may be ascertained in the same manner. It is only necessary to attach the moving portion of the apparatus to a contact *x* in the same way that the index of the thermometer is attached in the present case.

Fig. 2 shows a modification of my invention, in which the movement of the indicating de-

vice is made automatic so as to give the proper indication at any moment by mere inspection. In this case the movement to be indicated acts upon a pinion *p*, which is thereby made to revolve in one direction or the other as the case may be. The conductor A B is in this instance stretched in a straight line and the movable contact *x* is carried back and forth by a rack *r* or other equivalent device. The index-needle of the galvanoscope G plays between two electrical contacts attached to the wires *y* and *z*, which extend to the commutator brushes *y'* and *z'* of an electric motor M. These brushes are so adjusted as to give respectively an advance and retrograde movement to the motor, in a well-known manner, by transmitting current therethrough from a suitable generator as at E'. So long as the electrical balance of the whole system is maintained, the needle of the galvanoscope G will not make contact with either *y* or *z* and the motor E will remain at rest; if the contact *x* is moved in one direction, (say to the left,) the needle of G will be deflected to the left, the circuit of motor M will be closed through wire *y* and the motor M will revolve, turning the screw *s* and carrying the nut *n*, with its attached contact *x'*, to the left along the scale *t*, until its position corresponds to that of the contact *x*, when the electrical equilibrium in the whole system will be restored and the motor will stop, and remain at rest until another change takes place in the position of the contact *x*. If, on the other hand, the contact *x* should be moved from left to right, the same series of operations would necessarily take place in the reverse direction.

Any mechanical motor capable of being controlled by the movement of a galvanoscope needle to move in either direction would answer well as a substitute for an electric motor.

I claim as my invention—

1. In a telemetric apparatus, an electrical balance consisting of four arms and a transverse bridge or indicator circuit, two of said arms being composed in part of line conductors of negligible resistance, for the purpose specified and provided with a movable electric contact at each terminal of the source of electricity; means substantially such as described whereby one of said contacts receives motion from the device whose movement is to be indicated, and means, substantially such as described, whereby the other may be moved correspondingly at the place of observation to restore the equilibrium of the balance as set forth.

2. In a telemetric apparatus, an electrical balance consisting of four arms and a transverse bridge or indicator circuit, two of said arms being composed in part of conductors extending between separate localities, and having an electrical resistance which is negligible in comparison to the resistance of the other conductors of the system, as set forth.

3. In a telemetric apparatus, an electrical balance consisting of four arms and a transverse bridge or indicator circuit, a movable contact for varying the ratio of resistance between two of said arms, which contact receives its motion from the device whose movement is to be indicated; a movable contact for varying the ratio of resistance of the remaining two arms, which receives its motion from a reversible motor, and a galvanoscope in the indicator circuit, whereby the starting, stopping, and direction of motion of said motor are governed or controlled, substantially as set forth.

4. In a telemetric apparatus, the combination of a resistance conductor bisected by a movable electric contact, a traveling nut carrying said contact, and a screw engaging with said nut formed upon a shaft coupled to a reversible motor, substantially as set forth.

In testimony whereof I have hereunto subscribed my name this 7th day of March, A. D. 1892.

CH. H. HASKINS.

Witnesses:
FRANKLIN L. POPE,
CAROLINE E. DAVIDSON.