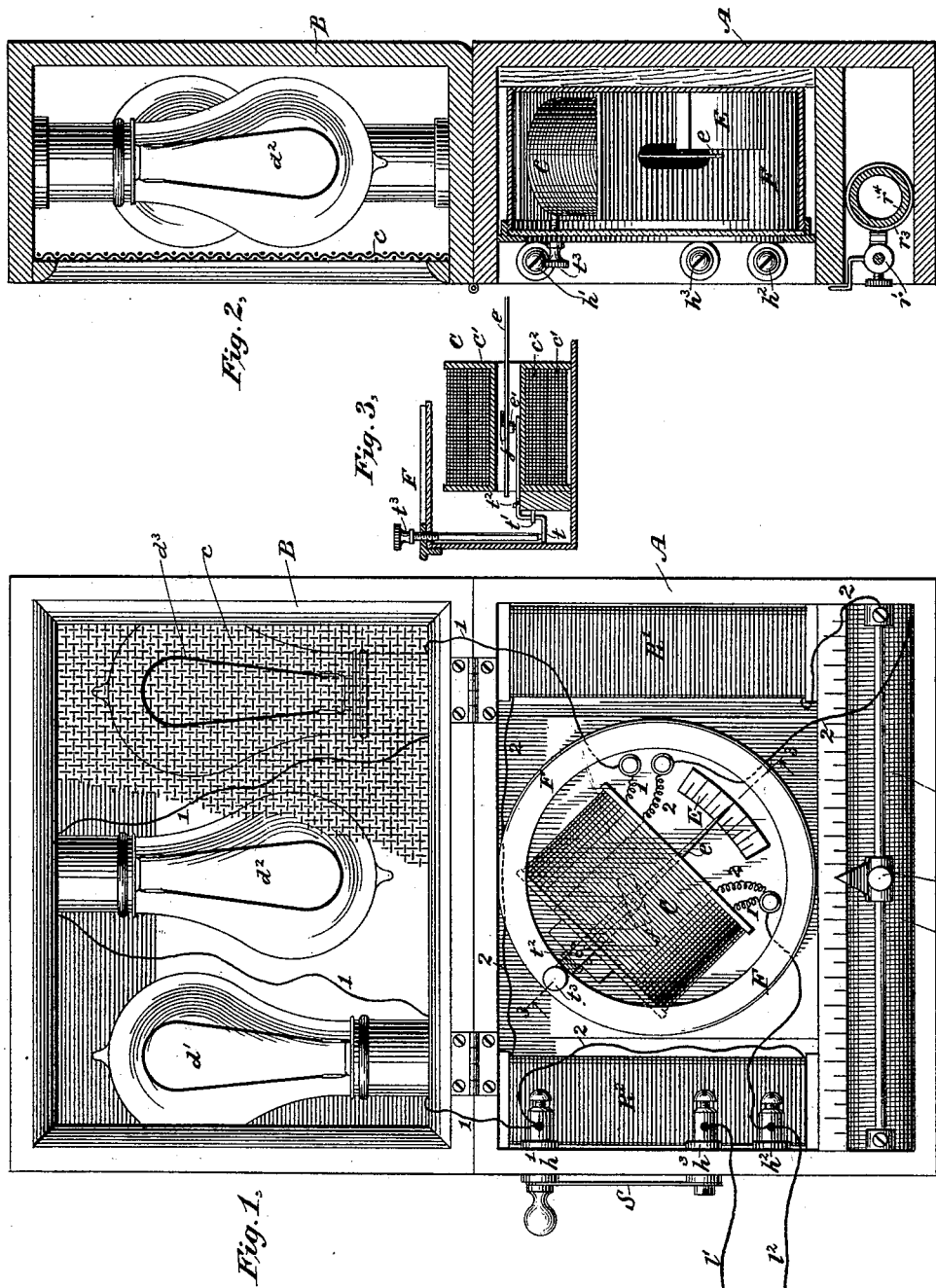


(No Model.)

P. LANGE.
GALVANOMETER.

No. 386,992.

Patented July 31, 1888.



Witnesses,

Geo. W. Brook
Edward Thorpe.

Inventor,

Philip Lange.

By his Attorneys

Pope Edgcomb & Ferry.

UNITED STATES PATENT OFFICE.

PHILIP LANGE, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE WEST-
INGHOUSE ELECTRIC COMPANY, OF SAME PLACE.

GALVANOMETER.

SPECIFICATION forming part of Letters Patent No. 386,992, dated July 31, 1888.

Application filed October 29, 1887. Serial No. 253,722. (No model.)

To all whom it may concern:

Be it known that I, PHILIP LANGE, a subject of the Emperor of Germany, residing in Pittsburg, in the county of Allegheny, in the State of Pennsylvania, have invented certain new and useful Improvements in Electric Me-
5 ters, of which the following is a specification.

The invention relates to the class of apparatus employed for measuring electric currents; and the object of the invention is to provide
10 convenient and efficient portable apparatus for noting the changes in the current supplied to and traversing an electric circuit, so that it may be readily maintained approximately
15 constant.

In the accompanying drawings, Figure 1 is a plan of an apparatus or instrument involving the features of the invention, and Fig. 2 is a cross-section. Fig. 3 illustrates certain details.

Referring to the figures, A represents the case for containing the apparatus, and it is provided with a cover, B.

The general plan of the invention is to cause a variation or disturbance in the balance of
25 two branches of a conductor connected across the supply-conductors by means of a variation in the relative resistances caused in two different conducting bodies by the heating effects of electric currents of different electro-motive
30 forces. The conductor l' l'' leads from the binding post h' to the binding-post h'' , being divided into the branches 1 and 2. The connections are preferably made through a switch, S, from a binding-post, h^3 , to the post h' . The
35 branch 1 includes three electric lamps, d' d'' d^3 . These are, for convenience, placed in the cover B of the box, which may be thrown back, as shown in the drawings, when the apparatus is in use.

The lamps are covered by a wire gauze or net-work, e , which prevents them from being broken by accident, or in case they are broken prevents the pieces from falling into the box and injuring the apparatus, at the same time
45 affording sufficient ventilation.

In the box A there is contained a differential coil, C, wound upon a spool, C' , within which a needle, e , is suspended upon a compass-cap, e' . An armature, f , and a scale, E, are pro-

vided for this needle. The conductor 1 leads
50 through one of the coils, c' , and the lamps d' d'' d^3 . The other branch, 2, includes the remaining coils, c'' , and includes two artificial resistance-coils, R' R^2 , placed in the bottom of the box. These may be covered by a wire-gauze similar
55 to that in the top of the box. The conductor leading from these resistances passes to an adjustable resistance, r^3 , extending along the front portion of the box. A sliding contact, r' , running upon a rod, r^2 , is employed for determining the amount of resistance r^3 which
60 shall be inserted. The resistance r^3 consists, preferably, of resistance-wire wound spirally upon a non-conducting rod, r^4 , and an index, p , extending above a scale, p' , serves to show
65 the amount of resistance in circuit. The coils C, needle e , and scale E are carried in a case, F, which is movable in a rotary direction to adjust the device to act in any desired position with reference to the magnetic poles of
70 the earth.

It is the design of the invention that when the system is operating with its normal load the current traversing the two branches 1 and 2 shall balance. When, however, a variation
75 occurs by reason of an increase or decrease in the load in the outside circuit, the change which will occur in the current traversing the lines 1 and 2 will disturb the balance of the resistances, and thus more current will traverse the
80 conductor 1 than the conductor 2, or vice versa. The needle e will therefore be deflected by reason of the differential action of the coils c' c'' . By then adjusting the supply to the new requirements of the system the needle will be
85 caused to return to its normal position.

This instrument is especially intended as a portable volt-meter, and it is desired that convenient means be employed for raising the needle e so that it will not be free to swing
90 during transportation. For this purpose a lever, t , which passes through a bracket, t' , and is pivoted upon an axis, t'' , passes beneath the needle e . A set-screw, t^3 , pressing upon the lower end of this lever, normally serves to
95 hold it in its required position; but when it is desired to lift the needle the screw may be turned down against the lever t , thereby rais-

ing the needle against the upper surface of the aperture in the spool C'.

I claim as my invention—

A portable electric meter consisting of the
5 combination of a divided circuit, one branch
containing carbon resistances and the other a
metallic resistance, an indicating-needle operated by the currents traversing the two
branches, a containing-box having a lid in
10 which the carbon-resistances are placed while
the metallic resistance is in the other portion
of the box, an adjustable resistance in series

with said metallic resistance placed in the front of the box, consisting of a coil of wire with a contact movable along its length, and a 15 gauze protection for the carbon resistances, substantially as described.

In testimony whereof I have hereunto subscribed my name this 4th day of November, A. D. 1886.

PHILIP LANGE.

Witnesses:

CHARLES A. TERRY,
J. G. BACKOFEN.