No. 743,958. PATENTED NOV. 10, 1903.

M. E. TURNER.

DYNAMOMETER FOR ELECTRIC CURRENT.

APPLICATION FILED JUNE 18, 1903.

NO MODEL.

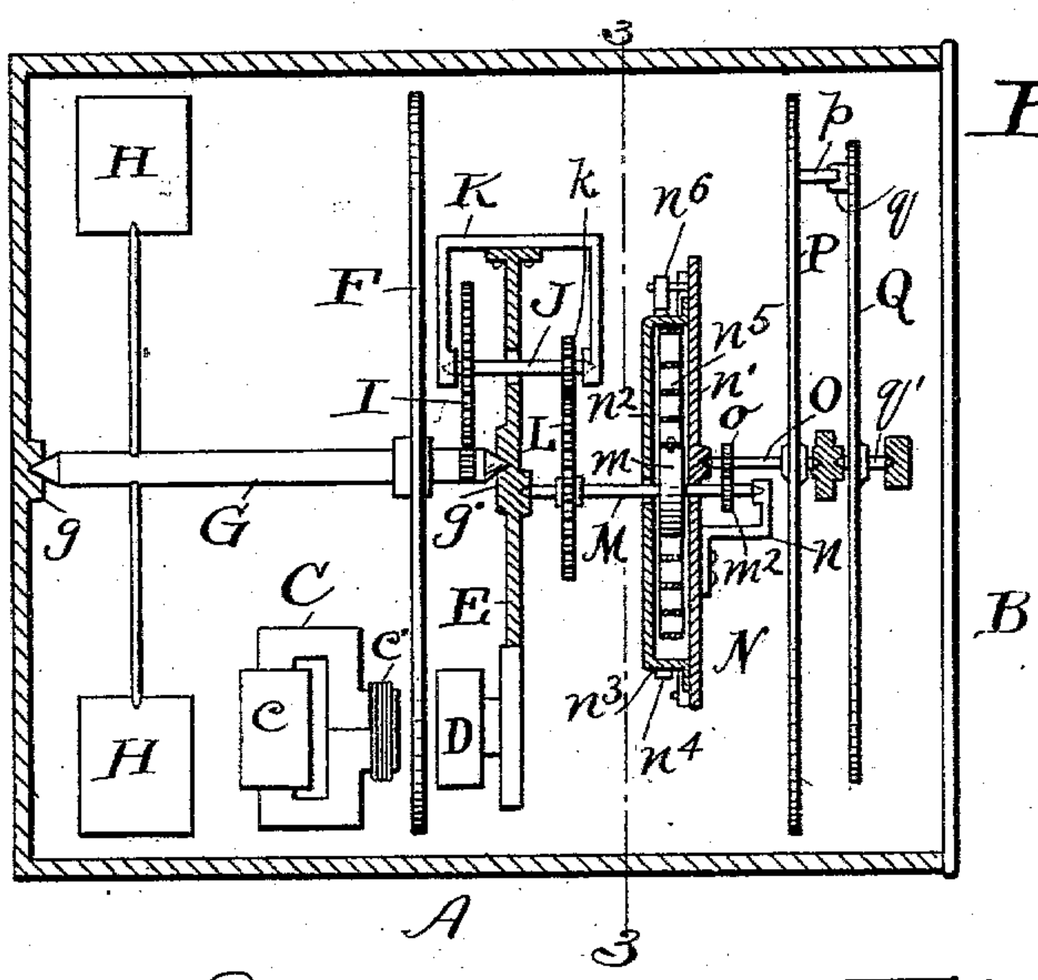


Fig. 1.

Fig. 3.

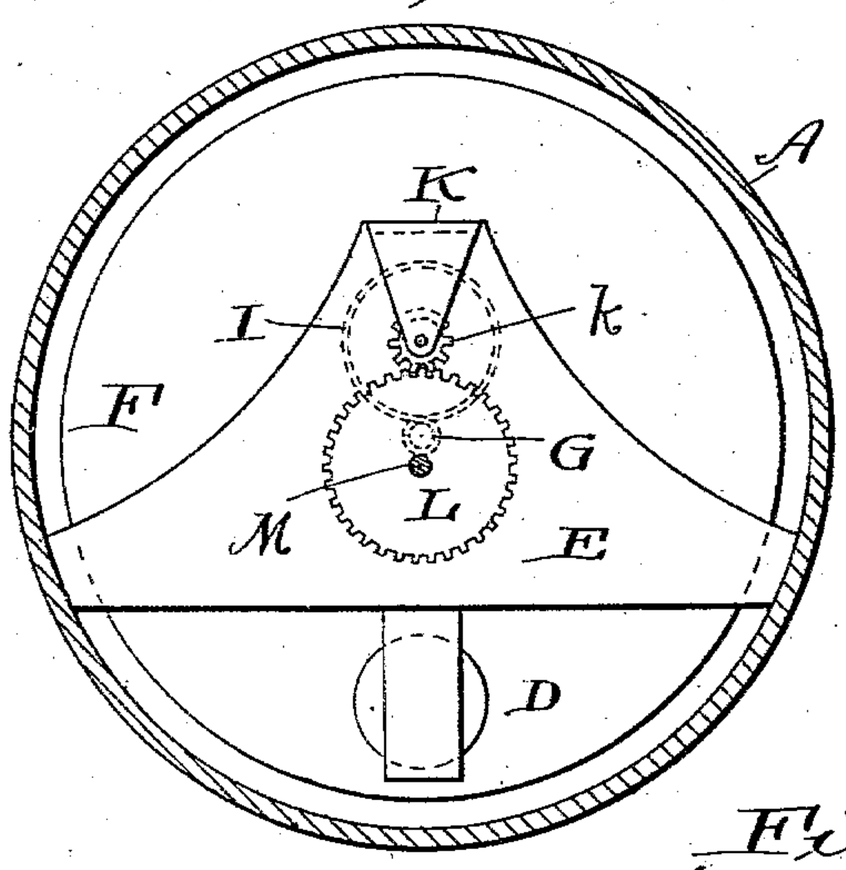


Fig. 2.

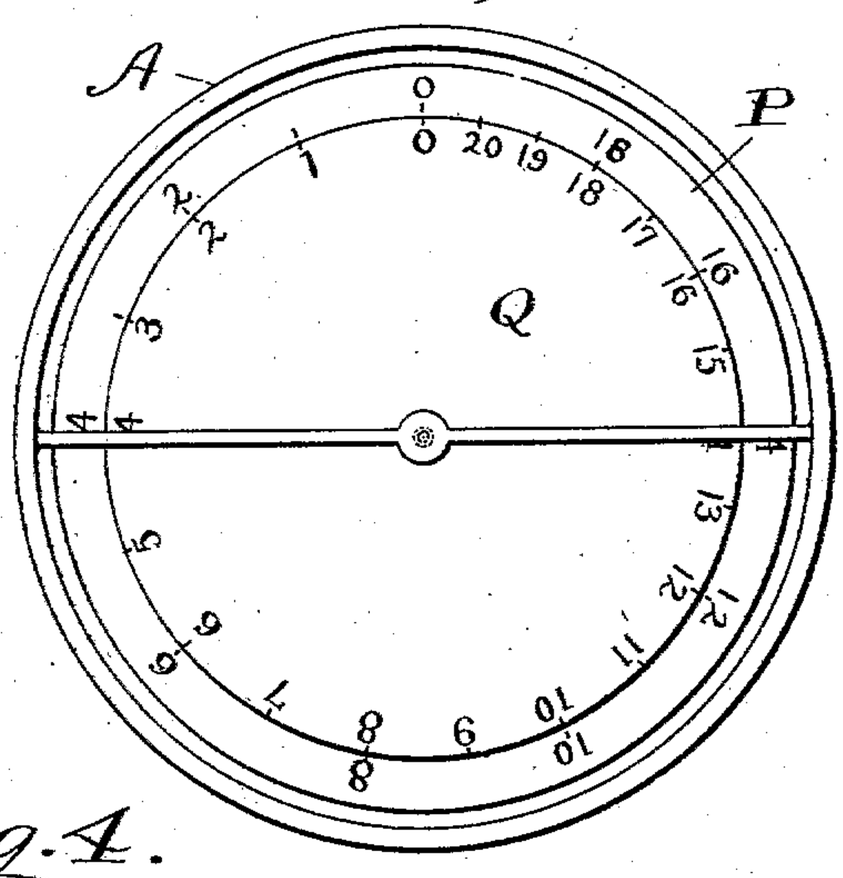
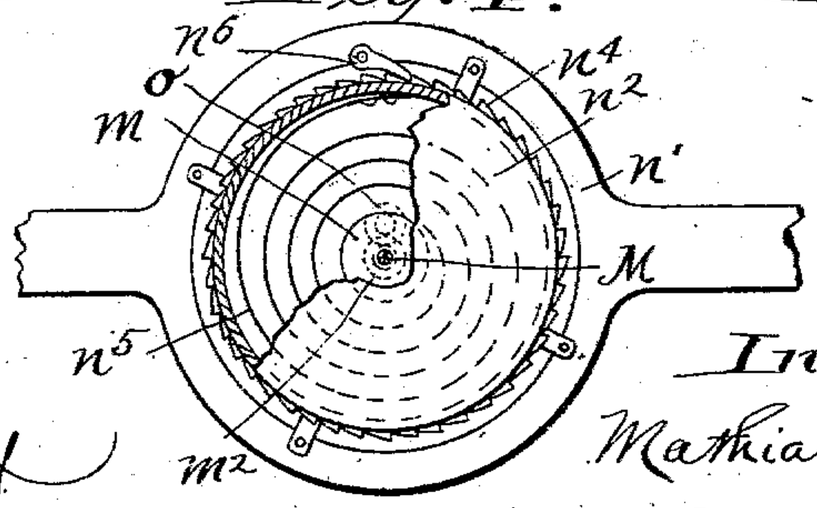


Fig. 4.



Witnesses.
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No. 743,958. Patented November 10, 1903.

UNITED STATES PATENT OFFICE.

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DYNAMOMETER FOR ELECTRIC CURRENT.

SPECIFICATION forming part of Letters Patent No. 743,958, dated November 10, 1903.

Application filed June 18, 1903. Serial No. 162,054. (No model.)

To all whom it may concern:

Be it known that I, MATHIAS E. TURNER, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Dynamometers for Electric Current, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

My invention relates to dynamometers for electric currents, and has for one of its objects the provision of means whereby the units of measure of the current being used at any time may be indicated whenever it is desired to inspect said dynamometer and of means whereby the maximum units of measure of the current used during any desired interval of time—as, for instance, during a month—may be also indicated.

A further object of my invention is the provision in such a dynamometer of means whereby a material period of time must elapse between an increase or decrease in the current being used and the full operation of the current-indicating and maximum-demand members to record the same and the consequent prevention of such members from completely responding to mere temporary fluctuations in the current.

The features which are peculiar to the present invention will be herein clearly described, and definitely set out in their essential combinations in the claims, to which reference is hereby made for a summary of the invention.

Figure 1 represents a longitudinal sectional view through the dynamometer. Fig. 2 represents a front elevation of the same. Fig. 3 represents a transverse section through the same on the line 3 3 of Fig. 1; and Fig. 4 represents a rear elevation of spring-drum, the rear wall of the same being broken away to show the spring and its manner of connection.

Referring to the drawings, A represents a cylindrical casing containing mechanism for accomplishing the results above stated, said casing being shown as horizontally arranged and provided at the front portion thereof with a transparent cover B. Within the casing, at the rear portion thereof, are located a core C, a pressure-coil *c*, and an additional small coil *c'*, which compensates for the power factor caused by the motor-load.

F is a disk, which may be of any suitable material, as copper or aluminium, shown as rigidly mounted on the front portion of a longitudinal shaft G. The rear face of this disk is adjacent to the core C and the coils *c c'*. Adjacent to the opposite face of said disk is the field-coil D, suitably supported, as on the framework E. The coils and disk just described constituting parts of an electric meter well known in the art and in their details forming no part of my invention further description of the same is unnecessary. The shaft G is provided at the rear portion thereof with air-paddles H to retard the rotation of the same. The ends of the shaft are mounted in suitable bearings *g* and *g'*. The front portion of the shaft is provided with gear-teeth meshing with a suitable gear-wheel I, mounted on the rear portion of a short longitudinal shaft J, supported in bearings in a frame K. Near the front end of said shaft J is mounted a small gear-wheel *k*, said wheel meshing with a large gear-wheel L, mounted on a shaft M. This shaft extends through both walls of a spring-drum N, the front end of the shaft being suitably supported, as by a bracket *n*, carried by the front wall of the drum.

The drum consists of a front wall n', a rear wall n^2, and a circumferential wall n^3, extending from the front wall to the rear wall and provided with teeth n^4. Inside the drum the shaft M is provided with a boss *m*, rigid therewith, to which one end of the spring n^5 is secured, the other end of the spring being secured to the circumferential wall of the drum. By means of a pawl n^6, coacting with the teeth on said circumferential wall, the spring may be adjusted to secure the proper relation between the current-indicating dial and the current being used. For instance, as the current is lowered the spring drives the shaft and the reduction-gearing backward until the lessened torque is balanced. If the current be cut off entirely, the spring should when the parts are at rest set the current-indicating dial at zero.

In front of the drum the shaft M is provided with a gear m^2, meshing with a gear *o* on a

shaft O. Rigid with said shaft is a dial P, provided on the front face and near the periphery thereof with a lug p. In front of the current-indicating dial P is the smaller maximum-demand dial Q, having on the rear portion thereof a corresponding lug q. The dial Q is mounted on a short shaft q', shown as extending in alinement with the shaft O. The front face of the dial P is provided, near the periphery thereof, with numerals indicating electrical units of measure. The dial Q is provided, near the periphery thereof, with corresponding numerals for indicating the maximum units of measure of the current used at any time during a given period—as, for instance, during a month.

The rotation of the shaft G is transmitted by means of the reduction-gearing to the dial P, the torque exerted by the shaft being resisted by the spring n^5. The amount of current being used at any particular time may be ascertained by an inspection of said dial P. As this dial rotates under the influence of the current the lug thereon will engage the corresponding lug on the dial Q, and the latter dial will be rotated therewith. Should the amount of current being used decrease, the dial P will begin to rotate in the reverse direction; but the connection between the same and the dial Q being broken the latter dial, being mounted on an independent shaft, will not rotate in the reverse direction, but will remain stationary. At the end of the period of time of which it is desired that this maximum-demand dial shall take account said dial may be set back by hand or in any other convenient manner, as may be desired. By the foregoing operation, as will be readily understood, the dial Q will indicate the maximum units of measure of the current which has been employed at any time during a given period.

The employment of the reduction-gearing and the spring between the shaft G and the dial P renders it necessary that the apparatus should be in use for some material period of time—say five or ten minutes—before said dial may indicate the entire number of units of measure of the current being used at any time and cause the dial Q to indicate the maximum units of measure of the current used during such time.

Should the current temporarily fluctuate, the full amount of such fluctuation will not be indicated. For instance, suppose the current to be suddenly increased. Before the indicating-dial, owing to the interposition of the train of reduction-gearing and the spring between such dial and the shaft G, can fully respond to the rotation of said shaft and indicate the entire number of units of measure of such current and actuate the maximum-demand dial to indicate the maximum units of measure of such current the decrease in the current will cause the spring to operate in the reverse direction to drive such gearing backward and to operate the current-indicating dial in a corresponding direction. A yielding connection is thus formed between the shaft and the current-indicating dial, as well as between such shaft and the maximum-demand dial, and mere temporary fluctuations in the current used will not be indicated.

While I have shown my dynamometer as employed in connection with an alternating current, it is obvious that it may be employed in connection with a direct current by the substitution of a commutating type of motor for an induction type of motor. While an energy or wattmeter type of motor is shown, a type of motor actuated by current alone may be used, in which case the instrument will indicate current only.

Having described my invention, I claim—

1. In a device for measuring electric current, the combination of a shaft adapted to be rotated by said current, a current-indicating member driven from said shaft, and a member for indicating the maximum units of measure of the current used during any desired interval of time adapted to be operated by said first-mentioned member, substantially as described.

2. In a device for measuring electric current, the combination of a shaft adapted to be rotated by said current, a current-indicating member connected by reduction-gearing with said shaft, and a member for indicating the maximum units of measure of the current used during any desired interval of time adapted to be operated by said first-mentioned member, substantially as described.

3. In a device for measuring electric current, the combination of a shaft adapted to be rotated by said current, a current-indicating member driven from said shaft, and a member for indicating the maximum units of measure of the current used during any desired interval of time adapted to be operated by said first-mentioned member when the latter is operated in the direction due to an increase in the current being used, substantially as described.

4. In a device for measuring electric current, the combination, with a shaft adapted to be rotated by the current, of a current-indicating dial driven from said shaft and provided on its face with a lug, and a maximum-demand dial mounted independently of said current-indicating dial and provided with a projection or lug adapted to be engaged by the lug on the current-indicating dial when the latter is rotated in the direction caused by an increase of flow of the current, substantially as described.

5. In a device for measuring electric current, the combination, with a shaft adapted to be rotated by the current, retarding devices and a train of reduction-gearing connected with said shaft, a member for indicating the units of measure of the current being used at any desired time, said member

being connected with the other end of said train of reduction-gearing, and a member for indicating the maximum units of measure of the current used during any desired time interval, said last-mentioned member being actuated by said first-named member, substantially as described.

6. In a device for measuring electric current, the combination, with a geared shaft adapted to be rotated by the current, of a train of reduction-gearing meshing at one end with the gear of said shaft, a current-indicating member for indicating the units of measure of current being used at any time provided with a gear meshing with the gear on the other end of said train of gearing, and a maximum-demand member for indicating the maximum units of current used during any desired time interval, said maximum-demand member being actuated by said current-indicating member only when the latter is operated in the direction due to an increase in the current being used, substantially as described.

7. In a device for measuring electric current, the combination, with a shaft adapted to be rotated by the current, of a dial for indicating the units of measure of the current being used at a particular time, said dial being connected by reduction-gearing with said shaft, a spring interposed between said dial and said shaft and connected to an intermediate shaft of the reduction-gearing to resist the torque of said first-mentioned shaft, a dial for indicating the maximum units of measure of the current used during any desired interval of time, and means carried by said first-mentioned dial adapted to engage said last-mentioned dial to rotate the same only when said first-mentioned dial is being operated in the direction due to an increase in the current, substantially as described.

8. In a device for measuring electric current, the combination, with a shaft adapted to be rotated by the current, of a dial for indicating the units of measure of the current being used at a particular time, said dial being connected by reduction-gearing with said shaft, a spring-drum interposed between said dial and said shaft, a spring in said drum connected to an intermediate shaft of the reduction-gearing to resist the torque of said first-mentioned shaft, means for adjusting the tension of said spring, a dial for indicating the maximum units of measure of the current used during any desired interval of time, and means carried by said first-mentioned dial adapted to engage said last-mentioned dial to rotate the same only when said first-mentioned dial is being operated in the direction due to an increase in the current, substantially as described.

9. In a dynamometer for electric current, the combination of means for indicating the units of measure of the current being used at a particular time, of means for indicating the maximum units of measure of the current used during any desired interval of time, said means being operated by the current-indicating means, and means for preventing the current-indicating means from completely responding to temporary fluctuations in the current, substantially as described.

10. In a dynamometer for electric current, the combination of means operated by the current, of means for indicating the units of measure of the current being used at a particular time, of means for indicating the maximum units of measure of the current used during any desired interval of time, said means being operated by the current-indicating means, and a yielding connection between such current-operated and current-indicating means whereby the current-indicating means is prevented from completely responding to temporary fluctuations in the current, substantially as described.

11. In a dynamometer for electric current, the combination, with a shaft driven by the current, of means for indicating the units of measure of the current being used at a particular time, of means for indicating the maximum units of measure of the current used during any desired interval of time, said means being operated by the current-indicating means, and a yielding connection between said shaft and said current-indicating means whereby the torque of the shaft is resisted and the current-indicating means is prevented from completely responding to temporary fluctuations in the current, substantially as described.

12. In a dynamometer for electric current, the combination, with a shaft operated by the current, of means for indicating the units of measure of the current being used at a particular time, of means for indicating the maximum units of measure of the current used during any desired interval of time, said means being operated by the current-indicating means, of a train of reduction-gearing connected with said shaft, and a yielding connection between said reduction-gearing and said current-indicating means whereby the torque of the shaft is resisted and the current-indicating means is prevented from completely responding to temporary fluctuations in the current, substantially as described.

13. In a dynamometer for electric current, the combination, with a shaft operated by the current, of a rotary dial for indicating the units of measure of the current being used at a particular time, of means for indicating the maximum units of measure of the current used during any desired interval of time, said means being operated by the current-indicating dial, of a reduction-gearing connected with said shaft, and a spring connected to said gearing and to said dial whereby the torque of the shaft is resisted and the current-indicating dial is prevented from completely responding to temporary fluctuations in the current, substantially as described.

14. In a dynamometer for electric current,

the combination, with means for indicating the units of measure of the current being used at any particular time, of means for preventing the current-indicating means from completely responding to temporary fluctuations in the current, substantially as described.

15. In a dynamometer for electric current, the combination, with means for indicating the units of measure of the current being used at any particular time, of means, including a spring, for preventing the indicating means from completely responding to temporary fluctuations in the current, substantially as described.

16. In a dynamometer for electric current, the combination, with means for indicating the units of measure of the current being used at any particular time, of means including a spring and reduction-gearing, for preventing the current-indicating means from completely responding to temporary fluctuations in the current, substantially as described.

17. In a dynamometer for electric current, the combination of means operated by the current, of means for indicating the units of measure of the current being used at any particular time, and a yielding connection between such current-operated and current-indicating means whereby the current-indicating means is prevented from completely responding to temporary fluctuations in the current, substantially as described.

18. In a dynamometer for electric current, the combination of a shaft driven by the current, of means for indicating the units of measure of the current being used at any particular time, and a yielding connection between said shaft and said current-indicating means whereby the torque of the shaft is resisted and the current-indicating means is prevented from completely responding to temporary fluctuations in the current, substantially as described.

19. In a dynamometer for electric current, the combination of a shaft operated by the current, of means for indicating the units of measure of the current being used at any particular time, of a train of reduction-gearing connected with said shaft, and a yielding connection between said reduction-gearing and said current-indicating means whereby the torque of the shaft is resisted and the current-indicating means is prevented from completely responding to temporary fluctuations in the current, substantially as described.

20. In a dynamometer for electric current, the combination, with a shaft operated by the current, of a rotary dial for indicating the units of measure of the current being used at a particular time, of a reduction-gearing connected with said shaft, and a spring interposed between said gearing and said dial whereby the torque of the shaft is resisted and the current-indicating dial is prevented from completely responding to temporary fluctuations in the current, substantially as described.

21. In a dynamometer for electric current, the combination, with means for indicating the maximum units of measure of the current used during any desired interval of time, of means, including a spring, for preventing such indicating means from completely responding to a temporary increase in the current, substantially as described.

22. In a dynamometer for electric current, the combination, with means for indicating the maximum units of measure of the current used during any desired interval of time, of means, including a spring and reduction-gearing, for preventing such indicating means from completely responding to a temporary increase in the current, substantially as described.

23. In a dynamometer for electric current, the combination of a shaft driven by said current, of means for indicating the maximum units of measure of the current used during any desired interval of time, of a reduction-gearing and a spring connecting said shaft and indicating means, whereby the torque of the shaft is resisted and the maximum-current-indicating means is prevented from completely responding to a temporary increase in the current, substantially as described.

24. In a dynamometer for electric current, the combination of a shaft driven by the current, of means for indicating the maximum units of measure of the current used during any desired interval of time, and means interposed between said shaft and said indicating means for resisting the torque of the shaft and preventing the complete response of the indicating means to a temporary increase in the current, substantially as described.

25. In a dynamometer for electric current, the combination of a shaft driven by the current, of means for indicating the maximum units of measure of the current used during any desired interval of time, and a yielding connection between said shaft and said maximum-current-indicating means whereby the torque of the shaft is resisted and the said indicating means is prevented from completely responding to a temporary increase in the current, substantially as described.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

MATHIAS E. TURNER.

Witnesses:
ALBERT H. BATES,
J. B. HULL.