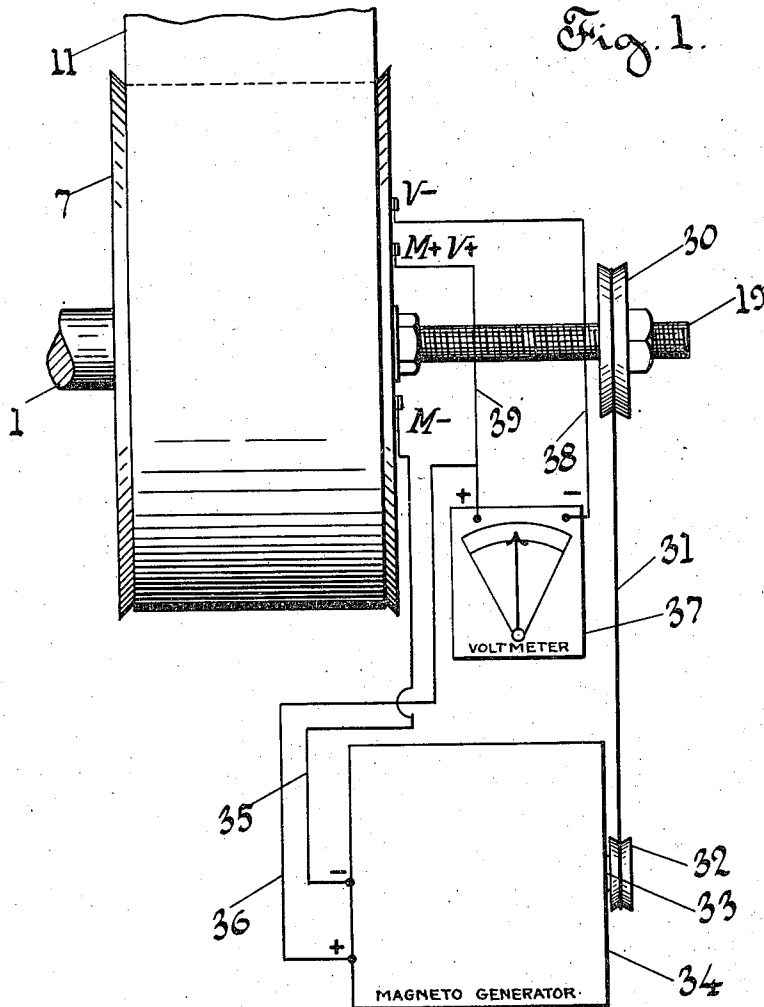


F. D. EVERETT.
TRANSMISSION DYNAMOMETER.
APPLICATION FILED DEC. 13, 1915.

1,212,751.

Patented Jan. 16, 1917.

4 SHEETS—SHEET 1.



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4 SHEETS—SHEET 2.

Fig. 2.

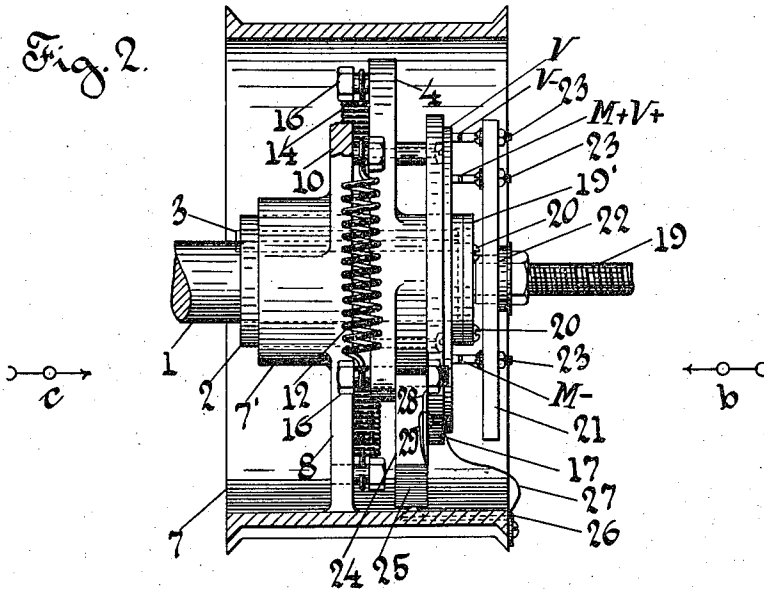
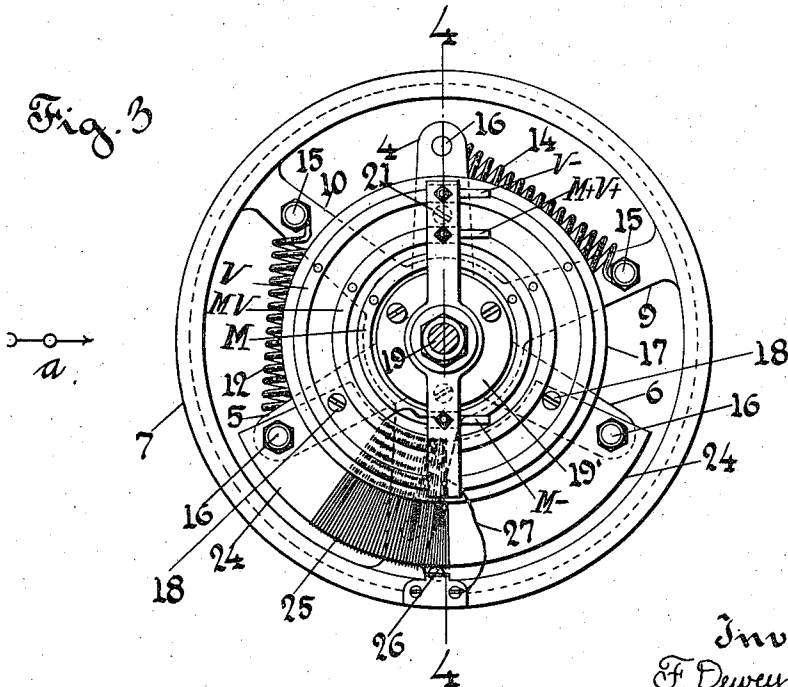


Fig. 3.



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4 SHEETS—SHEET 3.

Fig. 4.

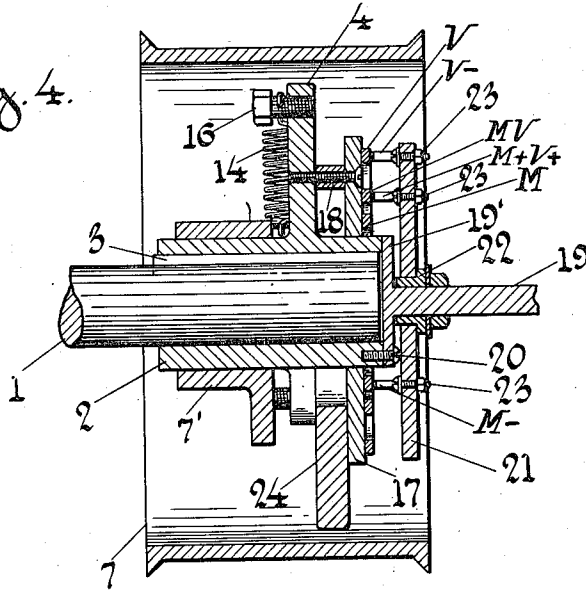
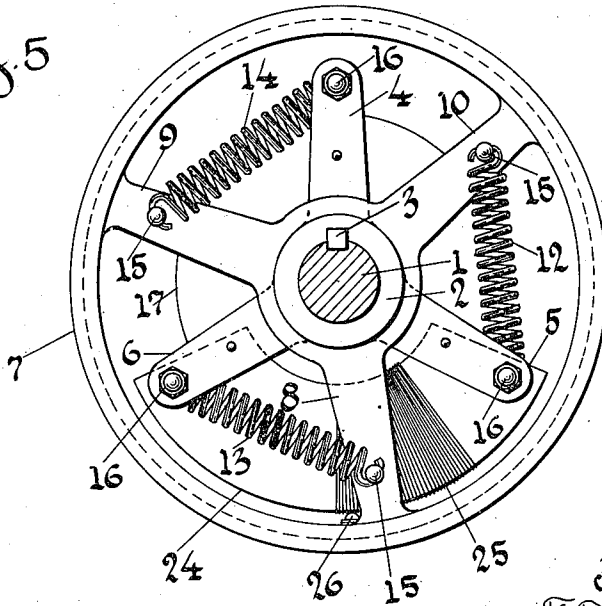


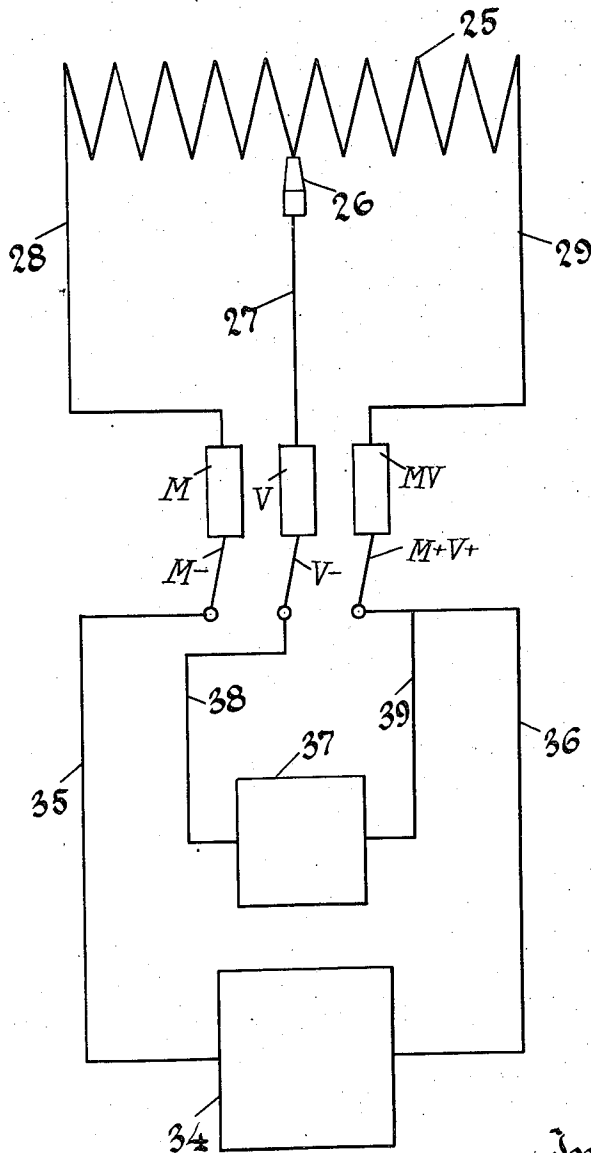
Fig. 5.



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Fig. 6



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UNITED STATES PATENT OFFICE.

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TRANSMISSION-DYNAMOMETER.

1,212,751.

Specification of Letters Patent.

Patented Jan. 16, 1917.

Application filed December 13, 1915. Serial No. 66,431.

To all whom it may concern:

Be it known that I, FRANCIS DEWEY EVERETT, a citizen of the United States, residing at Saranac Lake, in the county of Essex and State of New York, have invented certain new and useful Improvements in Transmission-Dynamometers, of which the following is a specification.

My invention relates to a transmission dynamometer, which is an apparatus for measuring the power transmitted in a shaft, without absorbing any of the power.

The object of my invention is to provide a transmission dynamometer, or apparatus of the type referred to, of simple construction, and effective in operation, to obtain the power transmitted in a shaft, or other equivalent rotary device, and to register the actual power, and not the torque only in the shaft.

My invention consists in certain novel features of construction of my transmission dynamometer as will be hereinafter fully described.

My improvements, as herein described and shown in the drawings, consist of such a system of electrical connections that the apparatus will take account automatically of all variations of speed of rotation of the shaft, thereby making it applicable to variable speed machines.

The apparatus consists of a direct current magneto generator giving a voltage proportional to the speed, driven by the shaft in which the power is to be measured, and means, not new in the art, of producing relative motion between two devices proportional to the torque in said shaft. A fixed resistance coil is located on one side of said devices, and with both terminals connected by insulating conductors, slip rings, and brushes to the terminals of the magneto, thereby forming a closed circuit of constant resistance; a sliding contact bearing on the resistance coil, whose position relative to one end of said coil is dependent upon the relative motion of the two devices first mentioned, and a voltmeter with terminals connected by insulating conductors, slip rings, and brushes to the sliding contact, and to one terminal of said resistance coil, thereby giving readings proportional to the voltage drop in said coil between the sliding contact and the end terminal of the coil; by proper calibration

these readings will give the horsepower transmitted in the shaft.

I have shown in the drawings sufficient parts of a transmission dynamometer, or apparatus embodying my improvements, to enable those skilled in the art to understand the construction and operation thereof.

Referring to the drawings, Figure 1 is a general view of a transmission dynamometer embodying my improvements, and parts connected therewith. Fig. 2 is a side view of the transmission dynamometer shown in Fig. 1, looking in the direction of arrow *a*, Fig. 3, with the pulley rim broken away, to illustrate the parts concealed in Fig. 1. Fig. 3 is an end view of the parts shown in Fig. 2, looking in the direction of arrow *b*, same figure, and showing the complete pulley rim. Fig. 4 is a central vertical section, on line 4, 4, Fig. 3, looking in the direction of arrow *a*, same figure. Fig. 5 is an end view of the parts shown in Fig. 2, looking in the direction of arrow *c*, same figure; the pulley is shown complete in this figure and, Fig. 6 is a diagrammatic view of the electrical connections and other parts of my apparatus.

In the accompanying drawings, 1 is a rotary shaft in which the power is to be measured, 2 is a hub secured to the shaft 1, in this instance by a key 3, see Fig. 4. The hub 2 has in this instance three outwardly extending arms 4, 5, and 6.

Loosely mounted on the hub 2 is the hub 7' of a pulley 7. The pulley rim is connected with the hub 7', in this instance by three arms or spokes 8, 9, and 10, see Fig. 5. The rim of the pulley 7 has in this instance a recessed face, to receive and guide a driving belt 11, see Fig. 1.

There are three helically coiled torsion springs 12, 13, and 14, which are secured respectively at one end to a spoke 8, 9, or 10, by a stud 15, and at their other end to an arm 4, 5, or 6 on the hub 2, by a stud 16, see Fig. 5.

The hub 7' of the pulley 7 is free to rotate about the inner hub 2, except for the springs 12, 13, and 14, and when the pulley 7 is driven, in this instance by the belt 11, the drive is transmitted through the springs 12, 13, and 14, to the inner hub 2, and to the shaft 1.

An insulating disk 17, of fiber or other suitable material, is secured to the arms 4, 116

5, and 6, in this instance by means of screws 18, see Fig. 4. The disk 17 has secured thereto a series of brass slip rings M, MV, and V. A shaft 19, see Fig. 4, has in this instance an annular disk 19' on its inner end, which is secured to the end of the hub 2, in this instance by screws 20, and forms an extension of the shaft 1.

A fiber brush holder 21 is mounted on a collar 22, which is loosely mounted on the shaft 19, see Fig. 4. To the brush holder 21 are secured, in this instance by screws 23, a series of brass brushes V-, M+V+, and M-, which engage the brass slip rings V, MV, and M, respectively.

24 is a segment of insulating material, secured to the arms 5 and 6 on the hub 2, see Fig. 5. The segment 24 has wound thereon a fixed resistance wire coil 25, which is engaged by a brass contact brush 26, see Fig. 3, which is secured to the rim of the pulley 7, and slides along the surface of the resistance coil 25, as the springs 12, 13, and 14 extend. The adjacent turns of the coil 25 are insulated from one another by suitable insulation, but are bare on the outer edge, so that the brush 26 makes a good electrical contact with the coil. The extension of the springs 12, 13, and 14 is proportional to the torque transmitted, and hence the percentage of the total voltage applied to M+ and M-, measured between M+ or V+ and the sliding contact V-, is also proportional to the torque.

The ends of the resistance coil 25 are electrically connected by means of wires 28 and 29, see Fig. 2, to slip rings M, and MV. The contact brush 26 is electrically connected by means of wire 27, see Fig. 2, to the slip ring V. On the shaft 19 is secured, in this instance, a grooved pulley 30, which is connected by a belt 31 with a grooved pulley 32 on the shaft 33 of the magneto 34, see Fig. 1, to drive the magneto from the shaft 19.

A wire connection 35 extends between the minus terminal of the magneto 34, and the contact brush M-, which bears against the slip ring M, see Fig. 1. A wire connection 36 extends between the plus terminal of the magneto, and the contact brush M+V+, which bears against the slip ring MV, see Fig. 1.

The voltmeter 37 has an electrical connection 38 between its minus terminal and the contact brush V-, which engages the slip ring V, and also has an electrical connection 39 between the plus terminal thereof, and the contact brush M+V+, which engages the slip ring MV.

The apparatus is calibrated so that the voltmeter 37 will read directly the horsepower transmitted.

Referring to Fig. 6, it will be seen that the current generated by the rotation of the

magneto generator 34, will take the following course: from one terminal of the magneto generator 34, through the wire 35 to the brush M-, slip ring M, through the wire 28, through the resistance coil 25, through the wire 29, slip ring MV, brush M+V+, and wire 36, back to the magneto generator 34. Thus the voltage generated at the terminals of the magneto generator 34 is consumed by the current flowing through the resistance coil 25. The voltmeter 37 is connected by wire 38, brush V-, slip ring V, and wire 27, to the sliding contact 26, which bears on the resistance coil 25, and also by wire 39, brush M+V+, slip ring MV, and wire 29, to the right hand terminal of the coil 25. Therefore the voltmeter 37 will give readings proportional to the voltage drop in the resistance coil 25, between the terminal connected to the wire 29, and the point where the sliding contact 26 bears upon the coil 25.

It will be understood that the details of construction of my improvements may be varied if desired.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A transmission dynamometer, comprising a direct current magneto generator, a shaft in which the power is to be measured, means for driving said generator from said shaft, means for producing relative motion between two devices connected with said shaft, proportional to the torque in said shaft, and said two devices, and a voltmeter for the reading of the horsepower transmitted, and a resistance coil, and electrical circuits connecting said resistance coil and said magneto generator in series, and connecting said voltmeter, to measure the voltage drop in a variable portion of said resistance coil, by means of a moving contact, whose movement, relative to the resistance coil, is controlled by the two devices above mentioned.

2. A transmission dynamometer, comprising a direct current magneto generator, a shaft in which the power is to be measured, means for driving said generator from said shaft, means for producing relative motion between two devices connected with said shaft, proportional to the torque in said shaft, and said two devices, and a fixed resistance coil, and a contact, forming an electrical connection, whose position on the resistance coil is controlled by the mechanical connection of said contact and said resistance coil to the two devices above mentioned, and a voltmeter for the reading of the horsepower transmitted, and electrical circuits, connecting said resistance coil's terminals to those of said magneto generator, and connecting said voltmeter to a terminal of said resistance coil and to said contact.

3. In a transmission dynamometer, or ap-

paratus for measuring power transmitted in a shaft, a direct current magneto generator, giving a voltage proportional to its speed, and driven from the shaft in which the power is to be measured, and said shaft, and means for driving said generator from said shaft, and mechanical means producing relative motion between two devices on said shaft, proportional to the torque in said shaft, and said two devices, and a fixed resistance coil, attached to one of said two devices, and a contact bearing on said resistance coil and attached to the other of said two devices, and a voltmeter for the reading of the horsepower transmitted, and electrical circuits connecting said resistance coil in a closed loop with the armature of said magneto generator, and connecting said voltmeter in shunt with the variable portion of said resistance coil.

4. A transmission dynamometer, comprising a shaft driven from a pulley, or other source of rotating power, by means of springs, and said springs, a contact, and a resistance coil, mechanically connected, one to said driven shaft, and the other to said

pulley, or other source of rotating power, so that a relative movement is produced between said contact and said resistance coil, depending on the change in said springs, due to the force transmitted through them to said driven shaft, and a direct current magneto generator, whose armature is set in rotation through mechanical connections to the driven shaft, and said connections, and electrical connections between said resistance coil and said magneto generator, forming a closed circuit of fixed resistance, and an electrical measuring instrument, electrically connected between one terminal of the above mentioned resistance coil and the sliding contact, and said electrical connections, said measuring instrument to indicate a value bearing a constant relation to the product of the speed of rotation of the driven shaft, and the torque in said shaft, irrespective of how the speed of one, or the other, or both may vary.

FRANCIS DEWEY EVERETT.

Witnesses:—

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THOMAS E. DALEY.