E. B. McCORMICK.

TORSION DYNAMOMETER.

APPLICATION FILED DEC. 18, 1915.

1,204,292.

Patented Nov. 7, 1916.

2 SHEETS—SHEET 1.

Fig. 1.

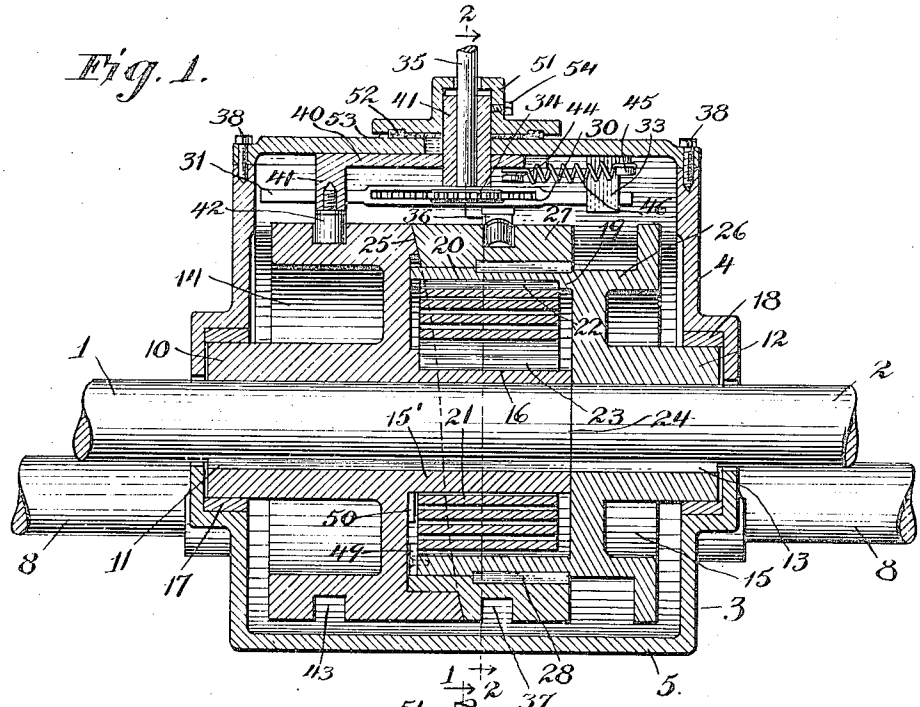
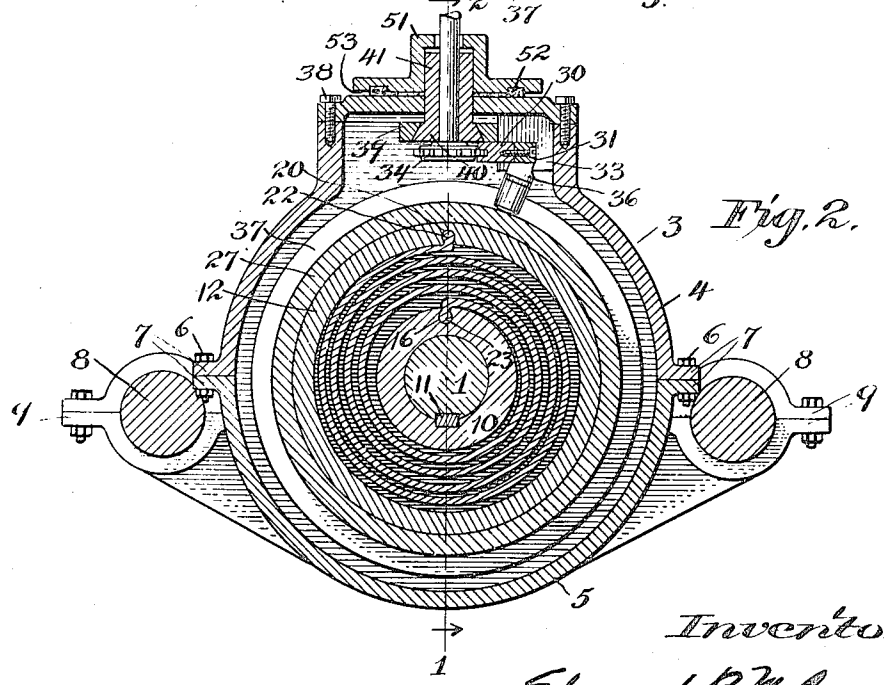


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 4.

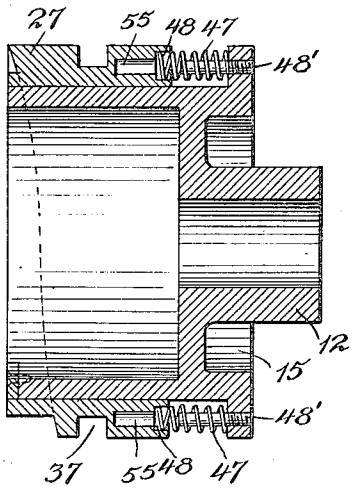


Fig. 5.

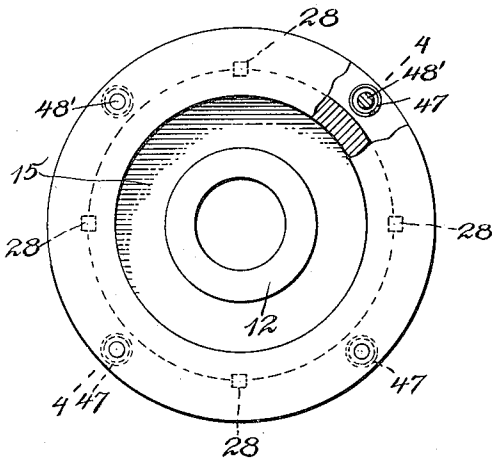


Fig. 3.

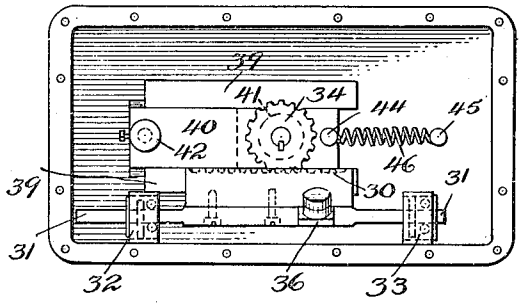
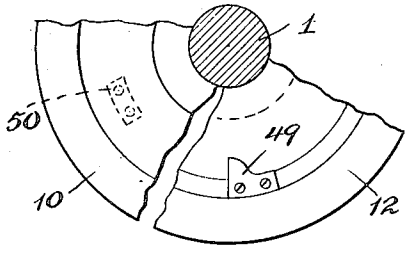


Fig. 6.



Inventor:
Edmund B. McCormick

UNITED STATES PATENT OFFICE.

EDMUND B. McCORMICK, OF MANHATTAN, KANSAS.

TORSION-DYNAMOMETER.

1,204,292. Specification of Letters Patent. Patented Nov. 7, 1916.

Application filed December 18, 1915. Serial No. 67,633.

(DEDICATED TO THE PUBLIC.)

To all whom it may concern:

Be it known that I, EDMUND B. McCORMICK, a citizen of the United States of America, and an employee of the Department of Agriculture of the said United States, and a resident of the town of Manhattan, county of Riley, State of Kansas, (whose post-office address is Washington, District of Columbia,) have invented new and useful Improvements in Torsion-Dynamometers.

This application is made under the act of March 3, 1883, chapter 143 (22 Stat., 625), and the invention herein described and claimed may be used by the Government of the United States or any of its officers or employees in the prosecution of work for the Government, or any person in the United States, without payment to me of any royalty thereon.

This invention relates to dynamometers of the torsion type.

An object of the invention is the provision of a dynamometer that shall be compact and accurate in its indications.

A further object of the invention is the provision of a dynamometer capable of producing a record having a fixed point of departure.

A further object of the invention to which the above named objects are tributary is the provision of a dynamometer that shall be adapted to be applied to the driving shaft of an automobile and connect with a recorder carried on the automobile body.

For a complete understanding of the invention attention is called to the following description when read in connection with the drawings accompanying and forming part of this specification in which like reference characters refer to like parts and in which:

Figure 1 is a vertical longitudinal section, taken on line 1—1, Fig. 2; Fig. 2 is a vertical transverse section taken on line 2—2, Fig. 1. Fig. 3 is an inverted plan view of the cover of the device showing the rack and pinion carried thereby; Fig. 4 is a section on line 4—4, Fig. 5; Fig. 5 is an end view of the driven hub and the cam sleeve removed from the rest of the device; and Fig. 6 is a view with parts broken away showing stops.

The device is designed to be applied to any driving shaft where it is possible to divide the shaft. The power is transmitted through a spiral spring the amount of "give" of which is measured and having been previously calibrated will give readings in foot pounds.

In the drawings 1 represents the driving and 2 the driven portion of the shaft the power transmitted by which is to be measured. The device is inclosed in a casing, 3, divided into upper and lower halves, 4 and 5, clamped together by bolts, 6, passing through flanges, 7, on the two halves of the casing. The casing is rigidly supported in any suitable manner, as for instance by rods, 8, 8, to which the casing is clamped by means of the clamps, 9, 9, the lower half of which may be cast integral with the casing.

Keyed to the driving portion of the shaft, 1, is hub, 10, by means of key, 11, and to the driven portion of the shaft is hub, 12, by means of key, 13. Hub, 10, is cored out as at 14 and hub, 12, as at 15 for reduction of mass. Hub, 10, has a projecting portion, 15′, which is provided with a longitudinal interiorly enlarged slot, 16. Hub, 12, has the projecting portion, 19, provided with slot, 20, similar to slot, 16. Spring, 21, is provided with enlarged extremities, 22, 23 which engage slots, 16 and 20. The propeller shaft, 1, 2, is divided at 24. Casing, 5, carries bearings, 17, 18, within which hubs, 10 and 12, rotate. It follows from the structure thus far described that when shaft 1 is driven and shaft 2 resists being driven, spring 21 will be wound up to an extent sufficient to transmit the power required to overcome the resistance of shaft 2. The amount of winding of the spring will be directly proportional to the power transmitted. For measuring the amount of the winding of this spring, hub 10 is provided with a spiral cam surface, indicated at 25. The periphery of hub 12 has a reduced portion indicated at 26. Sliding upon this reduced portion is a cam sleeve, 27, which cam sleeve is provided with a spiral cam upon its edge, which is the complement of cam 25. These spiral cams have a progression of 180 degrees and, as the relative position of hubs 10 and 12 are changed by rotation, cam sleeve 27 will be caused to slide endwise upon hub 12. Sleeve 27 is caused

to rotate with hub 12 by feather keys 28 being free to slide lengthwise thereon.

In order to measure the amount of endwise movement of sleeve 27, rack 30, carried upon longitudinal sliding shaft 31, sliding in bearings in studs, 32, 33, projecting from the cover of the casing is provided. Coacting with rack 30 is pinion 34, the rotation of which is transmitted to shaft 35, which shaft may be connected with any suitable recorder to produce a record of its rotation. Rack bar 31 carries a projecting stud, 36, provided with a roller, which projects into a peripheral channel, 37, formed in cam sleeve, 37. This channel permits cam sleeve, 37, to revolve freely with the driving and driven hubs and the propeller shaft, but any endwise movement of said cam sleeve will produce a corresponding endwise movement in the rack shaft and a corresponding rotation in the recorder shaft.

The cover of the device, an inverted plan view of which is shown in Fig. 3, may be secured to the casing by screws as 38. In order to avoid false indications due to endwise motion of the propeller shaft within the casing, which would result in rotation of the recorder shaft if said shaft were rigid with the casing, the following mechanism is provided: The cover bears ways, 39. Within these ways slides plate 40, which plate carries a bushing, 41, acting as a bearing for shaft 35. To exclude dust from the interior of the casing a dust cap, 51, having a felt washer, 52, seated in a depression in its face, 53, and secured to bushing, 41, as by said screw 54 is provided. Said plate, 40, moreover is provided with a projecting stud, 41, carrying a roller, 42, which roller projects into a peripheral groove, 43, formed in the periphery of hub, 10, secured to a button, 44, upon sliding plate, 40, and also to button, 45, secured to the cover is spiral spring, 46. This spring, acting in tension, keeps roller 42 always drawn in contact with one side of the peripheral groove 43, irrespective of endwise motion of the hub. Since the sleeve 27 also travels with the hubs and carries with it rack bar 31, no motion of rotation of the recorder shaft will result from endwise movement of the device within its casing. Such endwise motion would naturally be expected due to lost motion in bevel gears, which might be used to drive the propeller shaft. In order to keep sleeve 27 always in contact with the spiral cam 25, springs 47, seated in depressions 48 and about studs 48′, shown on Figs. 4 and 5, are provided. Apertures, 55, in the bottoms of depressions 48 allow the entry of studs 48′ upon excessive motion of sleeve 27.

In the event of the transmission of more power than the spring is suited for, the spring would be wound tight upon the shaft. To prevent this action, stops 49, 50 are provided, stop 50 being integral with the inner face of hub 10, and stop 49 being secured to the edge of the projecting portion of hub 12, as indicated in Figs. 1 and 6. Stops 49 and 50 are separated a distance corresponding to the amount of give desired to be allowed for the spring, as shown about 70 degrees.

The operation of the device is believed to be clear from the above description. Power applied to shaft 1 and resisted by shaft 2 will result in a winding up of the spring 21 and consequent relative rotation of hubs 10 and 12. Since sleeve 27 must maintain its relation with sleeve 12 as to rotation, the corresponding portions of the spiral cams will be displaced and sleeve 27 will slide endwise upon hub 12. This endwise motion will be transmitted to rack 30 and cause rotation of pinion 34 and shaft 35, and result in the actuation of any connected recording device.

While the device above described may be used in any location where a shaft may be divided, it has been specially designed for use in measuring power transmitted by the propeller shaft of an automobile for the purpose of measuring the tractive power required upon various road surfaces.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art, without further description, and it will be understood that various changes in the size, shape, proportion, and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

Having thus described my invention, I claim:

1. A torsion dynamometer comprising a divided shaft, a hub attached to one portion of said shaft, and a drum attached to the other portion of said shaft, a spring connecting said hub and drum, a cam surface provided upon the edge of said hub, a cam sleeve overlying said drum coacting with the cam upon said hub and means for indicating the longitudinal motion of said cam sleeve caused by the relative rotation of said hub and drum upon the yielding of said spring.

2. In a device of the class described, a casing, a cover for said casing provided with ways, a torsion dynamometer revolving in bearings in said casing, a rack and pinion indicating mechanism for indicating the power transmitted by said dynamometer, a bushing within which the shaft of said pinion is adapted to revolve, a sliding plate mounted in ways in the cover of said casing, studs upon said plate within which the rack is adapted to slide, means coacting with the

said dynamometer to cause said sliding plate to follow endwise motion of said dynamometer in said casing whereby such endwise motion is prevented from giving false indications of said indicator.

3. In a torsion dynamometer adapted to be applied to a divided shaft, a hub to be applied to the driving portion of said shaft having a projecting portion and a projecting cam surface, a drum to be applied to the driven portion of the shaft overlying said projecting portion and lying within said cam projection, a spring connecting said hub and drum, a sliding cam sleeve carried upon the exterior of said drum and keyed thereto to revolve therewith, said cam sleeve coacting with said surface, springs pressing said cam sleeve against said cam surface, a peripheral channel in said cam sleeve, a longitudinally slidable rack carrying a roller projecting within said peripheral channel, and an indicator pinion coacting with said rack whereby longitudinal motion of the cam sleeve caused by relative rotation of the hub and drum will be indicated by revolution of the indicator pinion.

4. In a torsion dynamometer the combination of a divided shaft, a hub member fixed to one portion of said shaft having a projecting portion, a hub fixed to the other portion of said shaft having a drum member overlying said projecting portion, a cam upon one of said members, means actuated by said cam upon relative motion between said members for indicating torque, a spring lying within said drum and attached to the projecting portion and to the interior of said drum so as to transmit the torque of said shaft, coacting stops upon said hub and drum to prevent excessive stress of said spring.

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

EDMUND B. McCORMICK.

Witnesses:
LAWRENCE L. BEEBE,
A. M. DANIELS.