W. G. WALKER.

DYNAMOMETER.

APPLICATION FILED JULY 29, 1912.

1,047,347.

Patented Dec. 17, 1912.

FIG. 1.

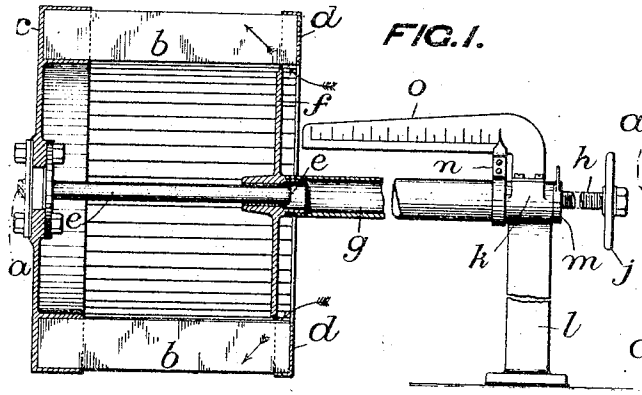


FIG. 2.

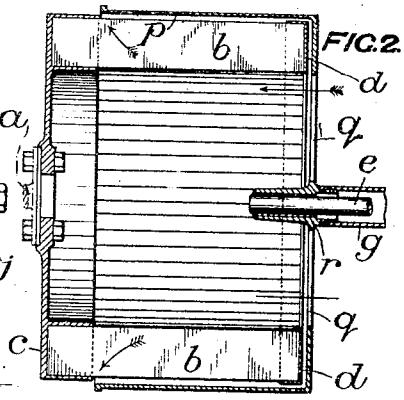
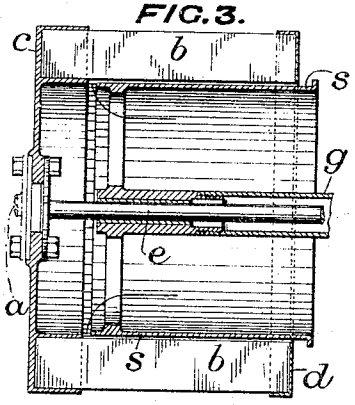


FIG. 3.



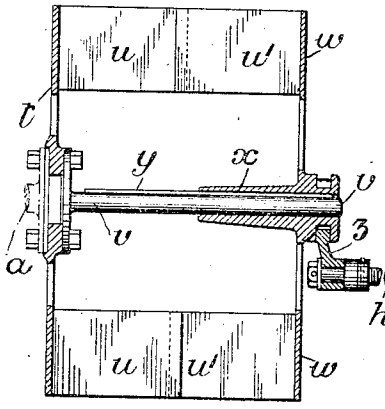


FIG. 4.

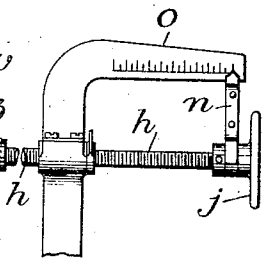


FIG. 5.

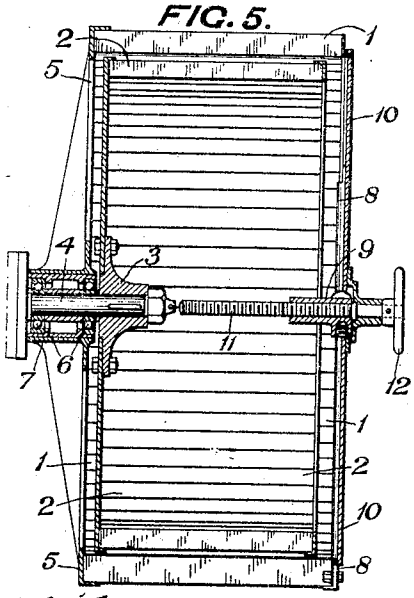
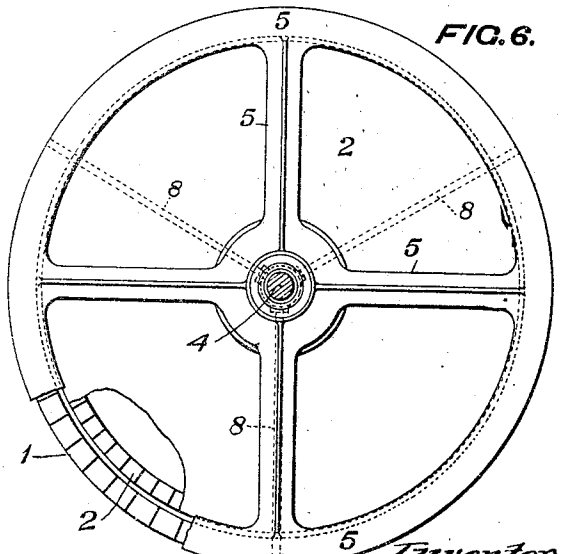


FIG. 6.



Witnesses:

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UNITED STATES PATENT OFFICE.

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DYNAMOMETER.

1,047,347. Specification of Letters Patent. Patented Dec. 17, 1912.

Application filed July 29, 1912. Serial No. 712,095.

To all whom it may concern:

Be it known that I, WILLIAM GEORGE WALKER, a subject of the King of Great Britain residing at 2 Emery Hill street, Westminster, London, S. W., England, have invented certain new and useful Improvements in Dynamometers, of which the following is a specification.

This invention relates to rotary absorption dynamometers of the kind in which the volume of the medium passing through and acting on the dynamometer may be varied while the apparatus is in motion, for the purpose of varying the resistance offered by the dynamometer to the engine under test.

The invention relates essentially to those dynamometers which are adapted to rotate in air, and its principal object is to provide an improved construction of dynamometer of this class whereof the resistance may be varied readily during rotation of the apparatus and in which the amount of such variation and hence the corresponding variation in the load upon the engine under test may be indicated.

The invention has for a further object to provide a readily portable form of dynamometer requiring no extraneous connections for the supply of retarding medium.

The power absorbed depends upon the supply of air to the dynamometer and in order that said supply may be varied, the area of the intake may be regulated by a suitable device, which is connected to an operating means and in this way the volume of air which is led axially to the dynamometer may be regulated as desired.

The dynamometer is so calibrated that given the area of the intake or outlet, as the case may be, and the revolutions per minute, the horse power developed by the motor can be ascertained with ease.

It will be manifest that when the area of the intake is a maximum the dynamometer will be subjected to a maximum resistance, and that as said area is reduced the resistance offered to and consequently the power absorbed by the dynamometer will be decreased correspondingly.

The invention is illustrated, by way of example, in the accompanying drawings.

Figures 1, 2 and 3 each of which is a longitudinal section, show different applications of the invention to a dynamometer of the centrifugal fan type, the indicating mechanism being shown in elevation in Fig. 1 and being omitted altogether in Figs. 2 and 3. Fig. 4 is a vertical section of another construction of dynamometer. Figs. 5 and 6 show in vertical section and end elevation respectively a further construction of dynamometer.

Referring to Fig. 1 *a* is the shaft of an engine to be tested which is coupled directly to the dynamometer.

The dynamometer comprises a centrifugal fan-wheel, *b*—*b* being the blades which are mounted upon a disk *c* and are braced by a ring *d*. The disk *c* is adapted to be coupled to the flanged extremity of the shaft *a* by means of bolts and nuts, and is provided with an axial guide spindle *e*. A regulating disk *f* is adapted to be adjustably moved within and longitudinally of the fan-wheel and to this end the disk *f* is mounted upon a tubular spindle *g* carried by a screw-threaded rod *h* provided with an operating hand-wheel *j* and working in a bearing *k* supported upon a pedestal *l* adapted to be fixed firmly in any suitable position relatively to the dynamometer. A locking nut *m* serves to secure the screw-threaded rod *h* in any position of adjustment. The screw-threaded rod *h* or the tubular spindle *g* is provided with an index or pointer *n* which when the hand wheel *j* is turned to adjust the disk *f* traverses an arm *o* which carries a graduated scale. The regulating disk *f* is formed with a boss having a central aperture to take over the aforesaid guide-spindle *e* which thus supports the disk at any position within the fan-wheel. The power absorbed by the dynamometer varies as the supply of air inhaled by the fan-wheel, and by sliding the regulating disk *f* more or less longitudinally within the fan-wheel the volume of the air supply can be varied. The path of the air supply is indicated by arrows.

In order that the horse power absorbed by the dynamometer for each of a number of predetermined positions of the regulating-disk relatively to the fan-wheel may be ascertained, the apparatus is calibrated. This calibration is effected by coupling the dynamometer to a prime mover of known horse-power and calculating in the known manner the horse-power absorbed by the dynamometer when the disk *f* is in various positions longitudinally of the fan-wheel. For each horse-power absorbed, the position

of the disk *f* is indicated by the position of the pointer *n* with relation to the scale provided upon the arm *o*.

In use the dynamometer is connected to the shaft of the engine to be tested and the disk *f* is positioned within the fan-wheel by loosening the locking nut *m* and turning the hand wheel *j* and hence also the screw-threaded rod *h*. The disk *f* does not rotate with the fan-wheel but is moved axially along the guide spindle *e*, and the greater the extent to which said disk *f* is moved into the fan-wheel the greater is the volume of air supplied and therefore the greater is the resistance offered to and the horse-power absorbed by the dynamometer. Thus, by moving the disk *f* into the various predetermined positions as indicated on the arm *o* each of which corresponds with a known unit of power absorption (or multiple thereof), the different observations necessary to effect the test of the engine may be taken and the results calculated in the usual manner.

It will be noticed that the disk *f* may be moved into or out of the fan-wheel while the latter is rotating at any speed and that therefore the resistance offered to the dynamometer may be varied without necessitating the stoppage of the engine under test.

In Fig. 2 a different construction is shown, and instead of the disk *f*, a regulating casing *p* carried by arms *q*, *q*, upon a boss *r* is employed. This casing *p* is adapted to be positioned over the periphery of the fan wheel by means of a hand wheel and screw-threaded rod as already described, and said casing operates in conjunction with the indicating mechanism also already referred to. By covering or uncovering more or less the periphery of the fan-wheel the volume of air discharged therefrom may be varied.

In Fig. 3 a modified construction somewhat similar to that shown in Fig. 2 is illustrated. Instead of the casing *p* a regulating-cylinder *s* is so mounted as to be moved axially into or out of the interior of the fan-wheel and to so vary the volume of air admitted to the fan-wheel. The method of operating the cylinder is similar to that already described with reference to the disk *f* and the casing *p*.

Fig. 4 shows another construction of dynamometer in which the resistance is obtained by the rotation in air of radially mounted blades or vanes. In order to vary the volume of air acting on the dynamometer the effective areas of these blades are altered.

t is a disk or frame adapted to be attached to the engine shaft *a* and provided with, say, four equally spaced blades *u* at right angles thereto. The frame *t* has further mounted upon it an axial guide spindle *v* upon which is arranged a second disk or frame *w* having equally spaced blades u^1 which correspond in number and arrangement to the blades *u* and overlap the latter. The disk or frame *w* has a boss *x* and is keyed by a feather *y* to the axial guide spindle *v* in such a way as to be rotatable with said spindle and capable of being adjusted longitudinally thereof. In order to adjust the disk or frame *w* axially upon the guide spindle *v* the boss *x* is formed with a circumferentially grooved extremity with which engages a fork *z* which is mounted upon the extremity of the screw-threaded rod of the indicating mechanism. By adjustably moving the disk or frame *w* axially upon the guide spindle *v* toward or from the disk or frame *t* the blades u^1 may be caused to overlap the blades *u* more or less, as the case may be, thus varying the effective area of the said blades and the effective width of the fan as a whole.

In Figs. 5 and 6 two concentric centrifugal fan wheels 1, 2, are shown, of which the inner fan wheel 2 is mounted upon a boss 3 keyed to a shaft 4 which is to be suitably coupled to the shaft of the engine under test. The outer fan wheel 1 is carried upon a spider frame 5 which is mounted by ball bearings 6, 6, upon a sleeve 7 freely embracing the shaft 4. At the front end of the outer fan wheel 1 there are arranged a convenient number of radial rods 8 connected at their outer extremities to the frame of the fan wheel 1 and at their inner extremities to an internally screw-threaded boss 9 coaxial with the fan. A circular disk 10 of a diameter sufficient to close the open end of the outer fan wheel 1 is arranged upon a screw-threaded rod 11 taking into the aforesaid boss 9 and provided at its outer extremity with an operating handwheel 12, by means of which the disk 10 may be adjusted axially to open or close more or less the open end of the fan wheel 1 and thus vary the volume of the supply of air thereto.

In this construction of dynamometer the horsepower is measured by the resisting torque of the outer fan wheel 1. The air which has a rotary motion upon leaving the inner fan wheel 2 re-acts upon the vanes or blades of the outer or suspended fan wheel 1 imparting a torque thereto which may be measured in the known manner by means of a spring balance, or by a weight or lever, or otherwise suitably.

What I claim is:—

A rotary absorption dynamometer comprising a centrifugal fan wheel having transverse non-feathering peripheral blades adapted to be rotated in air, a coupling for connecting said fan wheel at one side thereof to a machine to be tested, an element concentric to, terminating adjacent the circumference of the fan blades as a series, and

movable axially relative to said fan wheel to control the volume of air acting thereupon, said controlling element being operable during the rotation of said fan wheel, means located adjacent the side of the wheel opposite to said coupling to adjust said axially movable element, and means including as companion elements a relatively movable scale and pointer to indicate the power absorbed by said dynamometer, one of the companion elements being connected to said controlling element for movement therewith.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIAM GEORGE WALKER.

Witnesses:
HARRY JOHN STOYDEN,
H. D. JAMESON.