(No Model.)

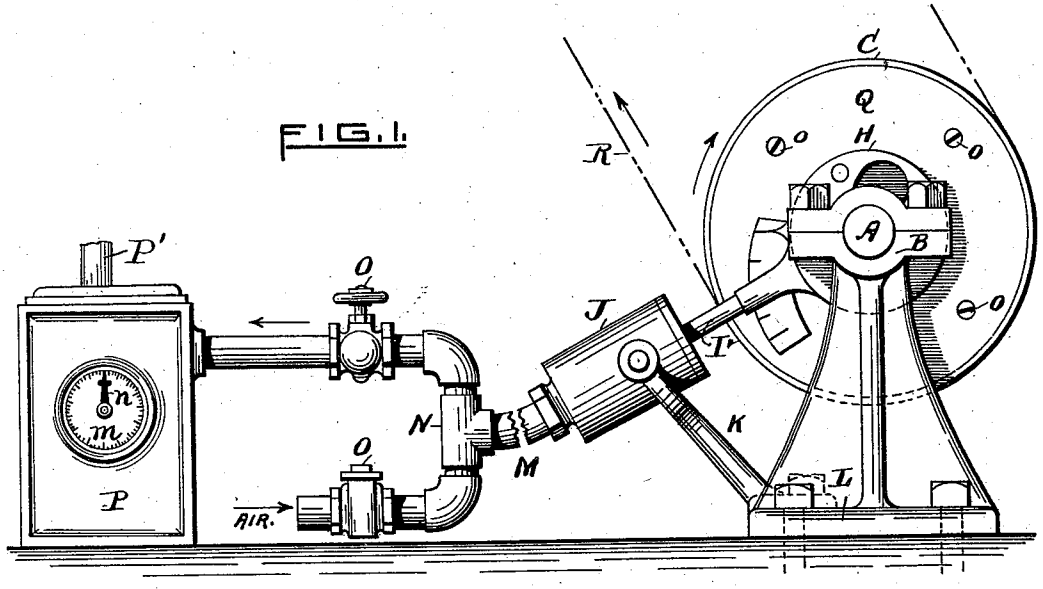
2 Sheets—Sheet 1.

G. W. LEWIN.

DYNAMOMETER.

No. 557,133. Patented Mar. 31, 1896.

FIG. 1.



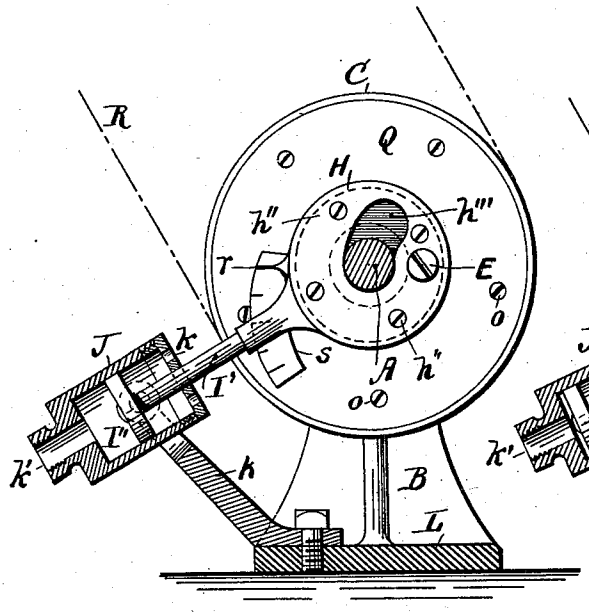


FIG. 2.

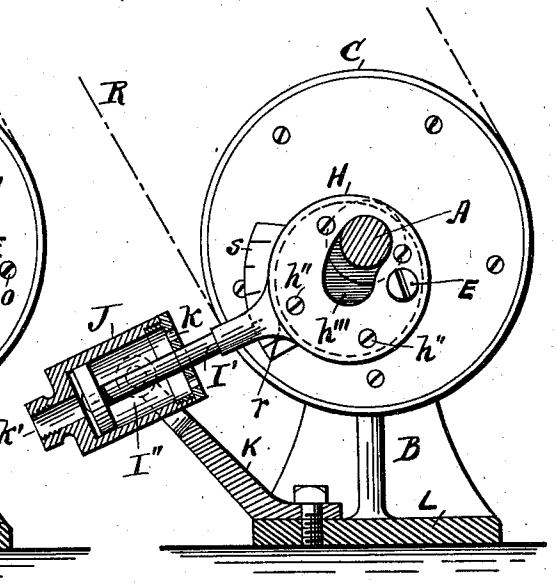


FIG. 3.

WITNESSES.

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(No Model.) 2 Sheets—Sheet 2.

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DYNAMOMETER.

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FIG. 6.

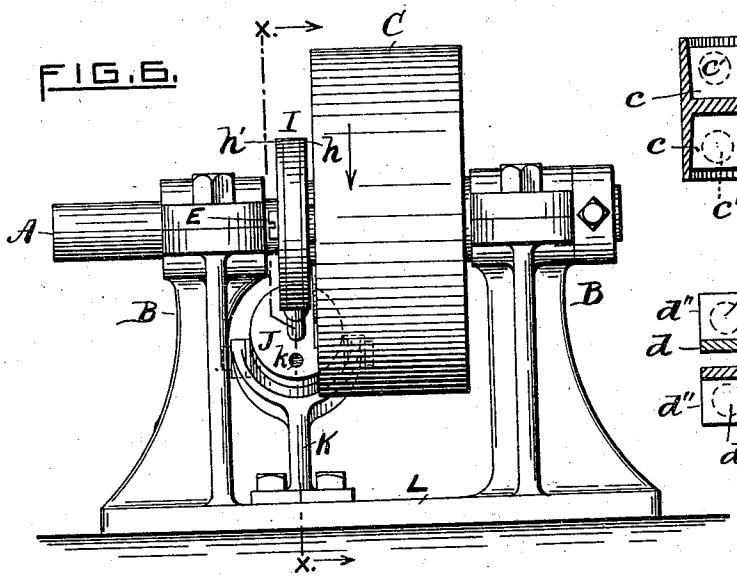
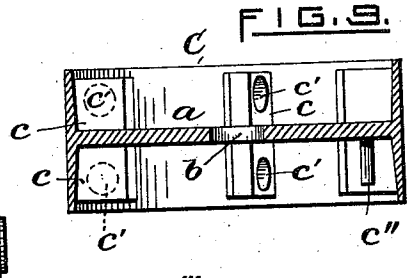


FIG. 9.



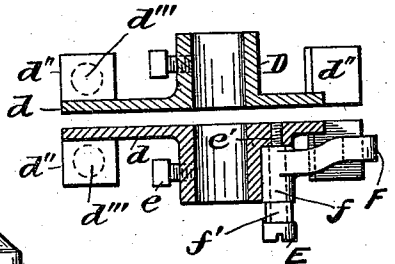


FIG. 10.

FIG. 4.

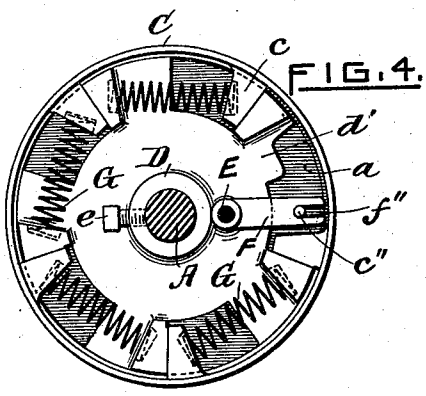


FIG. 5.

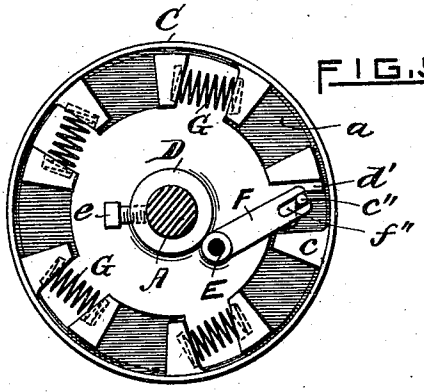


FIG. 7.

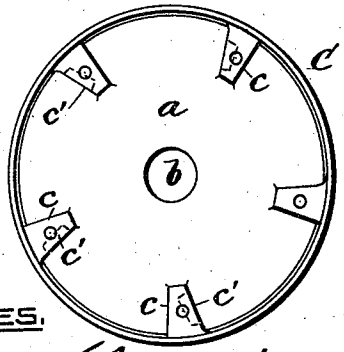
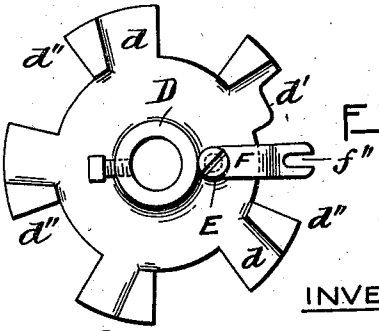


FIG. 8.



WITNESSES.

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UNITED STATES PATENT OFFICE.

GEORGE W. LEWIN, OF FALL RIVER, MASSACHUSETTS.

DYNAMOMETER.

SPECIFICATION forming part of Letters Patent No. 557,133, dated March 31, 1896.

Application filed March 21, 1895. Serial No. 542,631. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. LEWIN, of Fall River, in the county of Bristol, in the State of Massachusetts, have invented a certain new and useful Improvement in Dynamometers; and I declare the following to be a specification thereof, reference being had to the accompanying drawings.

Like letters indicate like parts.

Figure 1 is a side elevation of my invention. Figs. 2 and 3 are side elevations of the same as seen on line *x x* of Fig. 6, showing, respectively, the position of the eccentric and piston at the beginning and end of a piston-stroke. Figs. 4 and 5 show in elevation the pulley, flanged hub, springs, &c., of the interior construction of my device, as seen, respectively, in the normal position and working position of the same. Fig. 6 is a front elevation of my invention. Fig. 7 shows in elevation the interior construction of the pulley. Fig. 8 shows in side elevation one of the flanged hubs and the lever connected therewith. Fig. 9 is a view of the pulley in diametrical section. Fig. 10 shows in diametrical section the pair of flanged hubs and the lever.

My invention is a device to measure and indicate mechanical power; and it consists of the novel construction and combination of the several parts, as hereinafter particularly described, and specifically set forth in the claims.

In the drawings, A is a shaft mounted rotatably in bearings B and turned by a prime motor.

C is a loose driving-pulley, having a broad rim and a diaphragm or web *a*, the latter being provided with a central bore or aperture *b*, by which it is loosely mounted on the shaft A. Lugs *c*, preferably integral with the pulley, are arranged radially upon the web and the interior surface of the rim at equal distances apart. Each lug *c* has a shallow socket *c'* upon one of its radial faces.

D D are flanged hubs with radial equidistant arms *d*, one of which is cut away, as at *d'* in Figs. 4, 5, and 8, and each of said arms *d* has a lug *d''*, which is made with a shallow socket *d'''*, as indicated in dotted lines in Figs. 4 and 5. One of these flanged hubs D is mounted by its tubular bore on the shaft A on each side of and in contact with the web *a* of the pulley C and is secured to the shaft A by the set-screw *e*, or by a key or other desired fastening means. The number of the radial arms *d* of the flanged hubs D should be equal to the number of lugs *c* of the pulley C.

A pin E, mounted by a screw-thread in a boss *e'* of one of the flanged hubs D, serves as a pivot for a lever F, which is mounted at one end on said pin by a tubular portion or sleeve *f*, which portion has at *f'* its exterior surface formed with angular faces. (See Fig. 10.) The lever F at its outer or free end has a slot *f''*, through which extends a stud or pin *c''* from the web *a* of the pulley C. Spiral springs G extend from the lugs *c d''*, respectively, being seated in the sockets *c'* and *d'''*, as shown.

A wheel H, provided with a flange *h*, has a circular plate *h'* fastened thereto by screws *h''*. It has a curved slot *h'''*, whose width is equal to the diameter of the shaft A, which slot at its ends is formed in the same arc as the circumference of said shaft.

In Fig. 2 the wheel H is centered upon the shaft A concentric with the pulley C, while in Fig. 3 said wheel is shown with the outer end of the slot *h'''* upon the shaft A eccentrically with the pulley C. The wheel H is pivotally mounted upon the pin E and has a slightly-oscillating movement on said pin, while, being connected to the flanged hub D by said pin, (which hub is itself fastened to the shaft,) said wheel H normally turns with the shaft and pulley, but is capable also of said independent oscillating movement on said pin. The wheel H, through an angular aperture, (not shown,) receives the angular portion *f'* of the sleeve *f* of the lever F, and so is moved upon the pin E by the action of said lever F.

Upon the periphery of the wheel H, between the flange *h* thereof and the circular plate *h'*, is loosely mounted the ring I of a piston-rod I', and at the end of the piston-rod I' is a piston I'', within a cylinder J. The cylinder J is pivotally mounted by trunnions upon a bifurcated support K, so as to have a slightly-oscillating movement therein. Said support K is fastened to the bed L of the machine. Air-holes *k k* are provided at the inner end of the cylinder J.

A flexible tube M extends from the cylinder J at its front end and is continuous with the opening k' thereof. The tube M enters into the pipe N, which has two branches, each having a check-valve O, one of said branches being open at its end and constituting an inlet-pipe for the entrance of air and the other branch entering a meter P, which has a dial m and index n and is provided with any desired form of outlet P'.

On each side of the pulley C is a face-plate Q to cover and protect the interior mechanism. Said face-plate is secured by screws o, which enter the lugs d'' of the flanged hubs D D.

An index or pointer r extends from the flange h of the wheel H, and an index-plate s is placed on the face-plate Q on that side.

The dotted line R indicates the belt passing around the pulley C.

Having thus described the several parts of my device, I will proceed to explain its operation.

The normal position of the parts is shown in Figs. 2 and 4, in which it is seen that the wheel H is in a position concentric with the pulley C and the spiral springs G are extended. In this position the machine indicates no power and is doing no work; but when work is done and power is expended, which it is desired to measure, the shaft A is turning with a certain power and the belt R has a frictional contact with the pulley C and causes a strain, drag or resistance, which is equivalent to the power to be measured. As the pulley so dragged by the belt is loose upon the shaft A, while the flanged hubs D D are fastened to said shaft and turn therewith, the lugs d'' of the flanged hubs D, which have been in juxtaposition with the lugs c of the pulley C, separate therefrom, because the rotation of the shaft A is in one direction and the movement of the belt R drags the pulley C in the opposite direction. This diverging movement of the adjacent lugs c d'' compresses the springs G, as seen in Fig. 5. The stud-pin c'' of the pulley C, traveling with said pulley in a direction opposite to that of the rotation of the shaft A until the resistance of said springs G is overcome, causes the lever F, which turns upon the pin E extending from the flanged hub D, to move to a greater or less degree, and this movement is communicated to the wheel H, which is also pivotally mounted on the pin E and connected by an angular aperture therein to the angular portion f' of the sleeve f of the lever F. The wheel H is thus thrown out of its former position concentric with the pulley C, and so the angular separation or divergence of the lugs c d'' of the pulley and the flanged hubs respectively results in a more or less eccentricity of the position of the wheel H. (Illustrated in its fullest extent in Fig. 3.) Whenever the wheel H is to any extent eccentric in its position upon the pulley C, the revolution of the pulley and the wheel thereon so eccentrically positioned results in a reciprocating movement of the piston-rod I' by reason of the ring connection I thereof with the wheel H.

The reciprocating movement of the piston and rod are exactly proportionate to the degree of the eccentricity of the position of the wheel H upon the pulley C, and the eccentricity of the position of the wheel H is exactly proportionate to the angular divergence of the lugs c d'' of the pulley C and the flanged hub D, and this divergence is produced by the resistance of the pulley C under the action of the springs G to the shaft A.

The piston I'' and the cylinder J are practically an air-pump. The length of the stroke of the piston-rod I', determined as above described, regulates the quantity of air pumped or passed through the cylinder. This air enters the inlet branch of the pipe N, the valve O thereof allowing the air to enter, but preventing it from being discharged from that branch of the pipe. The air thus sucked into the cylinder by the piston on the inward stroke of the piston-rod is discharged by the piston on the return or outward stroke of the rod and passes through the other branch of the pipe N and the valve O thereof into and through the meter P, and the amount of air thus discharged from the cylinder by the piston is indicated by the index n upon the dial m and thus registers the amount of the power of the resistance of the springs G in the pulley C due to the rotation of said pulley and shaft. The air so entering the meter flows therefrom through any suitable outlet. The air thus pumped through the meter is not compressed, as in a gage, but passes through the meter, which registers the flow or volume of the air so moved. I am therefore enabled by this device to record the amount of power which has been previously used. These springs are made of such tension and are so adjusted that the degree of their compression indicates the horse-power of the pulley and shaft, and this resistance and compression are by the devices described made to result in the movement of a current of air, which is measured and indicated in a meter by a dial and index and thus serves as a medium to register the power expended.

The pointer and index-plate r s serve to indicate the power or the degree of the eccentricity of the wheel H on the pulley C.

By passing one or more screws or bolts through the web a of the pulley and the flanged hubs D D therein the pulley is practically made a solid tight pulley, connected and turning with the shaft A, and may therefore be belted and used like any ordinary pulley.

I claim as a novel and useful invention and desire to secure by Letters Patent—

1. In a dynamometer, the combination of a shaft rotatable by power, with a pulley loosely mounted on the shaft and driven by a

belt and provided with a web and with radially-arranged lugs, a flanged hub secured to and rotatable with the shaft and provided with radial arms, each having a lug, spiral springs extending from the pulley-lugs to the lugs upon the arms of said flanged hub, respectively, a pin extending from the flanged hub, a lever having a sleeve furnished with an angular surface and mounted by said sleeve on said pin, a wheel mounted eccentrically upon said sleeve on the angular surface thereof and having a curved slot to receive said shaft, which slot extends from the center of the wheel toward one side thereof, a pin extending from the web of the pulley at a point near the rim of the pulley and engageable with the outer end of the lever, all operating substantially as and for the purpose specified.

2. The combination of a shaft rotatable by power, with a pulley loosely mounted on the shaft and driven by a belt and provided with a web and with radially-arranged lugs, a flanged hub secured to and rotatable with said shaft and provided with radial arms, each having a lug, spiral springs extending from the pulley-lugs to the lugs on the arms of said flanged hub, respectively, a pin extending from the flanged hub, a lever having a sleeve furnished with an angular surface and mounted by said sleeve on said pin, a wheel mounted eccentrically upon said sleeve on the angular surface thereof and having a curved slot to receive said shaft, which slot extends from the center of the wheel toward one side thereof, a pin extending from the web of the pulley at a point near the rim of the pulley and engageable with the outer end of the lever, a piston-rod having a ring mounted movably upon the rim of said wheel, and provided with a piston, a cylinder properly supported in which said piston is reciprocally movable, a pipe to conduct the air within said cylinder to a meter by the action of the piston and an index and dial in said meter, movable by the air-current so produced, substantially as shown.

3. In a dynamometer, the combination of a pulley made in two parts, one having a circumferential rim to receive a belt and being loosely mounted on a shaft, the other fastened to the shaft, spiral springs connecting said two parts and compressible by the opposite movement of said two parts, a pivotally-mounted eccentric on one of said parts capable of eccentric movement by its connection with the other of said parts of the pulley, a cylinder and air-meter connected therewith and a piston in said cylinder provided with a piston-rod adapted to be reciprocated by the revolution of said eccentric, substantially as set forth.

4. In a dynamometer, the combination of a pulley made in two parts, one having a circumferential rim to receive a belt and being loosely mounted on a shaft, the other fastened to the shaft, spiral springs connecting said two parts and compressible by the opposite movement of said two parts, a pivotally-mounted eccentric on one of said parts capable of eccentric movement by its connection with the other of said parts of the pulley and provided with an indicator, and an index-plate fixed in a position relative to said indicator such as to enable the indicator to show thereon the degree of said eccentric movement, substantially as specified.

GEORGE W. LEWIN.

Witnesses:
ERNEST J. HARRISON,
ROBT. HAMPSON.