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W. F. LLOYD.

ENGINE INDICATOR.

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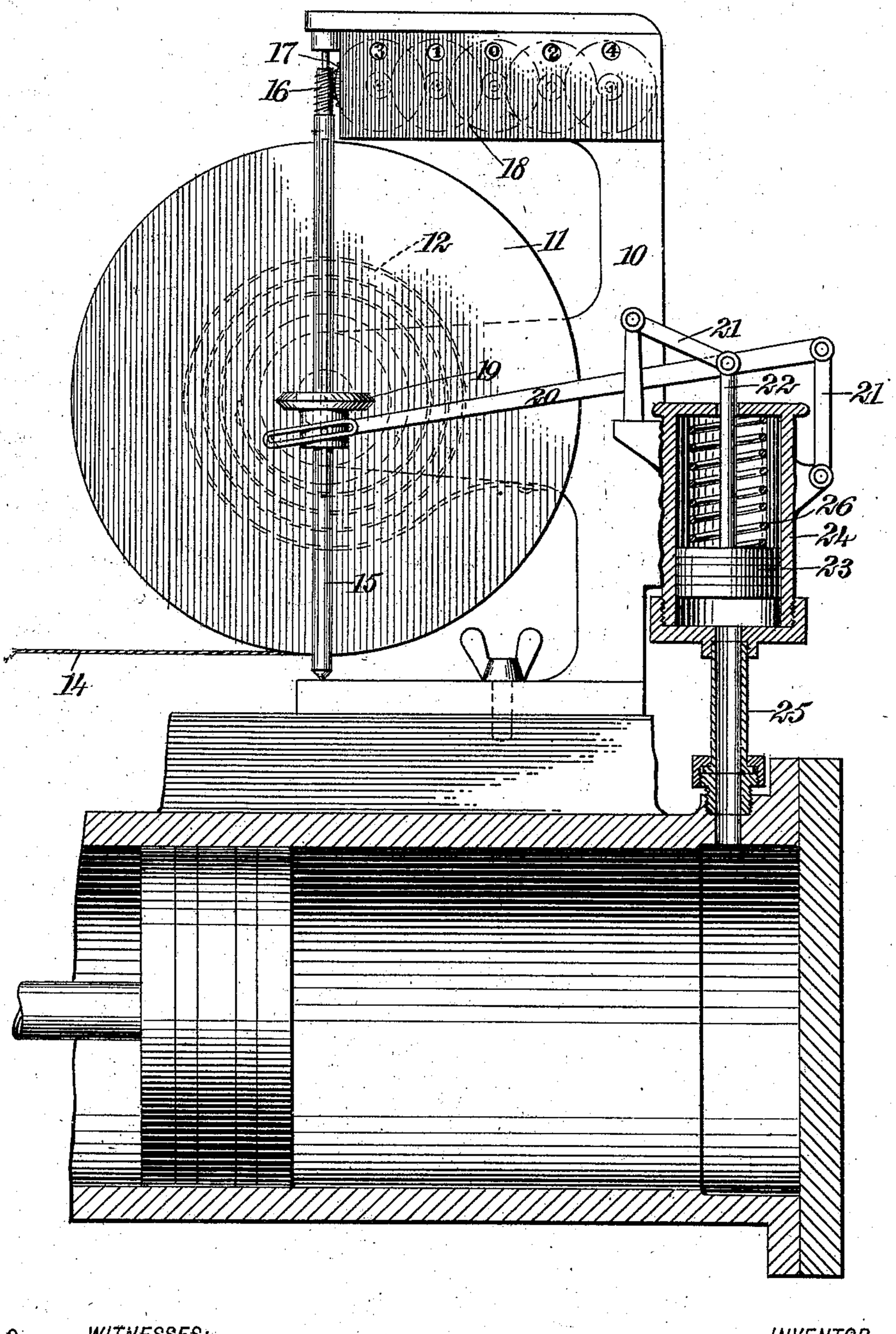

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ENGINE-INDICATOR.

No. 814,971. Specification of Letters Patent. Patented March 13, 1906.

Application filed September 21, 1905. Serial No. 279,461.

To all whom it may concern:

Be it known that I, WILLIAM FOLWELL LLOYD, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and Improved Engine-Indicator, of which the following is a full, clear, and exact description.

The object of my invention is to provide a device by means of which the actual horse-power hours delivered by steam or other engines may be easily and reliably ascertained without necessitating taking an indicator-card and estimating the power therefrom. In attaining this end I provide an instrument adapted to be attached to the engine and by which a reading is attained accounting for the stroke, piston speed, or number of revolutions and the pressure, so that by multiplying this reading by the diameter of the cylinder in inches the actual horse-power hours delivered may be ascertained.

The invention resides in certain special features of structure and combinations of parts, which will be fully set forth hereinafter and particularly pointed out in the claims.

Reference is had to the accompanying drawing, which illustrates as an example a sectional elevation of the preferred form of my invention applied to a steam-engine cylinder.

In practice two of the instruments are used on each double-acting cylinder.

10 indicates a bracket-frame or other support which should be attached to the cylinder or mounted adjacent thereto. On the bracket 10 a friction-disk 11 is mounted to rotate freely. To this disk a spring, such as 12, (indicated by broken lines in the drawing,) should be applied to cause the disk to rotate in one direction, and the disk is caused to rotate in the other direction in unison with the working stroke of the engine by a cord 14, attached to the disk and to the cross-head of the engine or by any other reliable means. Extending diametrically across the face of the disk 11 is a rotatable shaft 15, on which is a worm 16, engaging a worm-wheel 17, forming part of a consecutive counter 18, which may be of any desired form, which is sustained on the bracket 10. By this means the counter 18 is driven from the shaft 15, and the arrangement is such that the counter may be driven in either direction, thus increasing or reducing its reading. Splined on the shaft 15 is a friction-gear 19, which is engaged with the face of the disk 11 and is movable over the same to one or the other side of the center thereof. Said gear 19 has connection with the free end of an arm 20, which is hung by a linkage 21 and connected with the rod 22 of a piston 23. The piston 23 operates in a cylinder 24 and has its lower side exposed to the working pressure of the engine-cylinder through a connection 25. On the opposite or upper side of the piston 23 a spring 26 bears to return the piston against said working pressure. The pressure in the working cylinder moves the arm 20, and in this way the gear 19 is shifted across the face of the disk 11, driving the former at a speed and in the direction corresponding to its position on the disk. It therefore follows that upon the operation of the engine the disk 11 is given a back-and-forth rotation through the cord 14 and spring 12 corresponding to the length of stroke and piston speed and that this is communicated to the counter 18 under the control, however, of the working pressure. Hence a reading may be taken from the counter which when multiplied by the diameter of the working cylinder in inches will find the actual horse-power hours delivered during the period that the apparatus has been in operation. During the working stroke the gear 19, under the working pressure in the cylinder, will rise or move outward across the face of the disk 11, imparting a positive operation to the counter. Upon the exhaust the relieved pressure in the cylinder 24 will allow the gear 19 to return to the zero position, (shown in the drawing,) and movement will not be communicated by the counter. If compression exists in the engine-cylinder, the complete return of the gear 19 will be prevented, thus reducing the reading of this counter and taking the compression into the result. Similarly, if the engine be working with a condenser the partial vacuum produced will cause the gear 19 to pass to the opposite side of the center of the disk 11 during the return of the disk under the spring 12, and the benefit of the vacuum

will be recorded by the counter. It will thus appear that the reading on the counter accurately reflects all of the conditions necessary to a computation of the horse-power excepting the diameter of the cylinder, so that by multiplying this factor, as hereinbefore explained, a complete and accurate result is attained.

Having thus described the preferred embodiment of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An engine-indicator having a counter, a disk driven in unison with the piston speed of the engine, a shaft extending across the face of the disk and having connection with the counter, a shiftable connection between the shaft and the face of the disk, and means controlled by the working pressure of the engine for shifting the connection.

2. An engine-indicator having a counter, a gear-disk, means for oscillating the same in unison with the stroke and speed of the engine, a shaft extending across the face of the gear-disk and having connection with the counter, a gear splined on the shaft engaged with the gear-disk, and means for shifting the second gear, said means being controlled by the working pressure of the engine.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM FOLWELL LLOYD.

Witnesses:

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