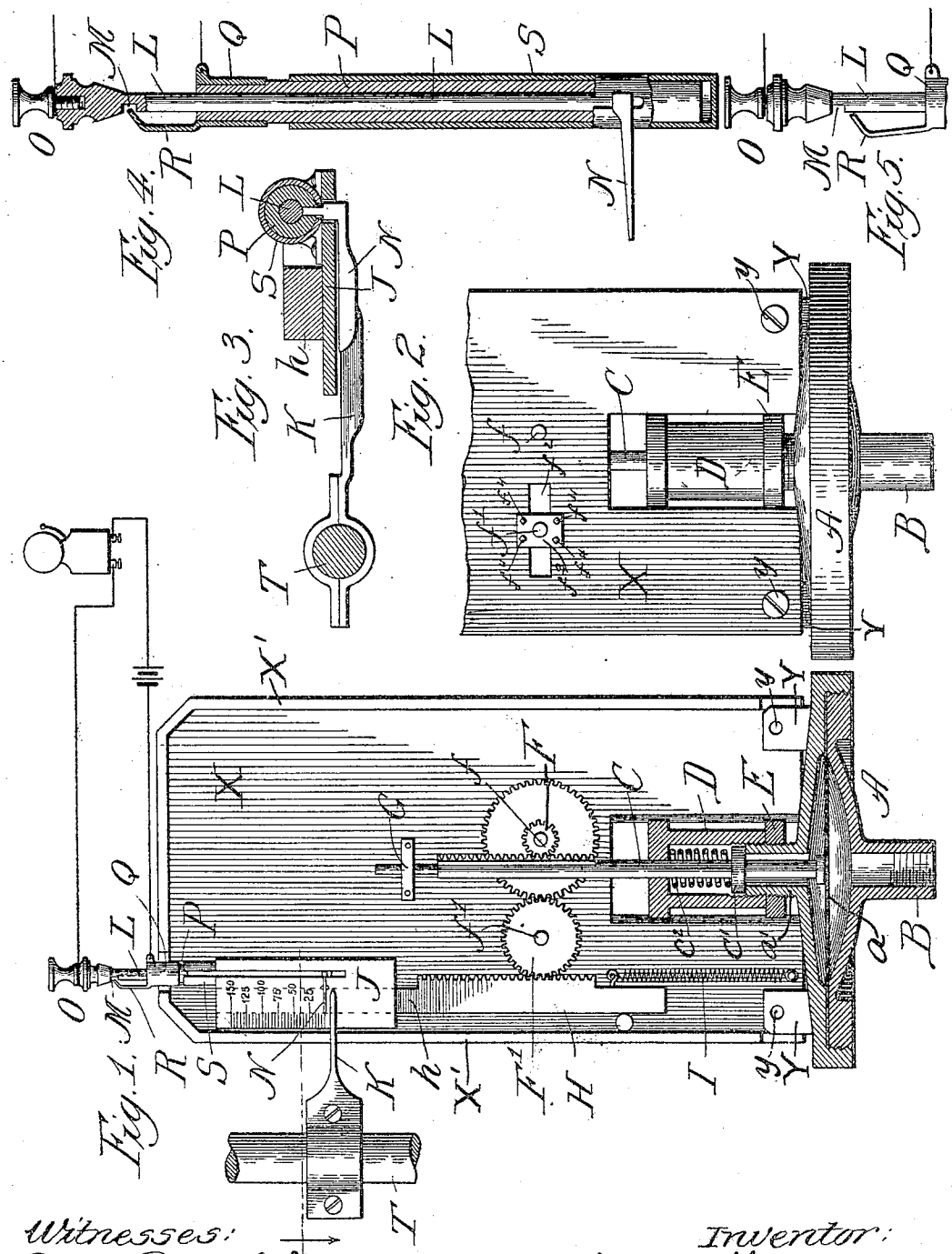
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J. F. SHREFFLER.

HORSE POWER INDICATOR AND ENGINE OVERLOAD ALARM.

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# UNITED STATES PATENT OFFICE.

JOHN F. SHREFFLER, OF CHICAGO, ILLINOIS.

## HORSE-POWER INDICATOR AND ENGINE-OVERLOAD ALARM.

No. 816,686. Specification of Letters Patent. Patented April 3, 1906.

Application filed November 28, 1904. Serial No. 234,585.

*To all whom it may concern:*

Be it known that I, JOHN F. SHREFFLER, a citizen of the United States, residing at 376 South Campbell avenue, Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Horse-Power Indicators and Engine-Overload Alarms, of which the following is a specification.

The object of my improvement is to provide means to give a true and constant indication or reading of the theoretical horse-power exerted by the engine.

A further object of the invention is to provide means whereby an alarm will be given when the maximum theoretical horse-power desired to be exerted by the engine is reached.

I attain this object by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a sectional elevation of the entire mechanism as constructed with my improvement incorporated. Fig. 2 is a front elevation. Fig. 3 is a plan section of the indicating and contact fingers and connected parts. Fig. 4 is an elevation in section of the electrical contact device, showing the circuit open; and Fig. 5 is an elevation of said electrical contact device, showing the circuit closed.

Similar letters refer to similar parts in each view.

X is the frame of the device and may consist of a plate having a rim X′ integral therewith, to which rim a front plate may be attached, if desired. Plate X is rigidly secured to the diaphragm-shell A, as by screws or rivets *y*, extending through such back plate and into the projections Y. Projections Y may be integral with the back plate of diaphragm-shell A.

The diaphragm-shell A contains a diaphragm-plate *a* of known construction connected with the steam-inlet B, said inlet being attached to a steam-generator in the usual manner.

*a′* is a screw-threaded hollow projection on the back of the diaphragm-shell A.

C is a rod.

C′ is a ring or disk rigidly secured on rod C to rest on the projection *a′* when such rod C is in its adjusted position, with not more than the determined constant pressure on diaphragm *a* and no pressure indicated by the apparatus, and $C^2$ is a spring tending to hold rod C in position, with the ring or disk C′ in contact with the projection *a′*. One of the ends of the rod C enters the diaphragm-shell A at its center and rests firmly against the center of the inclosed diaphragm-plate *a*, by means of which contact with the diaphragm-plate the rod C is moved longitudinally in one direction by the movement of the diaphragm-plate *a* against the pressure of the spring $C^2$ and is moved back to its initial position by such spring $C^2$ in unison with the movement of the diaphragm as such diaphragm vacillates or moves as the pressure of the steam varies.

D is a gland preferably attached to shell A by screw-threads in the lower end thereof fitting over the screw-threads on the projection *a′* of such diaphragm-shell A. By attaching gland D to shell A in the manner described an adjustment of such gland is readily made to vary the tension of spring $C^2$, inclosed therein. Spring $C^2$ rests upon a shoulder (formed by ring or disk C′) on the rod C near its juncture with diaphragm-shell A, as shown and is locked in position by means of the lock-nut E when the proper adjustment of said spring is secured. The purpose of the inclosed spring is to regulate the movement of the rod C.

A double gear F is pivoted at *f* to the back plate *x* or frame of the mechanism, the teeth of the smaller wheel of such double gear F engaging with the teeth of the rack-bar on the rod C, as shown, the extension of the rod C passing through an eye G near the end of the rod, as shown. The teeth of the larger wheel of the double gear F engage the teeth of gear F′, adjustably pivoted at *f′*, as shown. The adjustability of the pivot *f′* is obtained by making the slot $f^2$, Fig. 2, in the back plate X and mounting the pivot *f′* on the base $f^3$, such base $f^3$ being laterally movable in the slot $f^2$.

$f^4$ represents screws or bolts by means of which base $f^3$ is secured in an adjusted position.

Rack-bar H engages the teeth of the gear F′, said rack-bar having attached to it at one of its ends a spring I, which spring is fastened at the other end to the back plate or stationary frame X of the mechanism, as shown. The purpose of the spring I is to take up the "backlash" or lost motion that may be present. The rack-bar H at its end *h* is attached to the graduated scale J and overload-contacts (L and R, hereinafter described) and moves said scale and contacts as the steam-

pressure varies, thus securing a compensating movement of the graduated scale and contacts as the steam-pressure varies and making the index-finger K, which derives its movement along the scale from the valve-stem of the engine to which it is attached, a true indicator of the theoretical horse-power exerted by the engine at any given time.

The object of the adjustable bearing or pivot *f'* is to admit the substitution of gears of different sizes to correspond with the various designs of engines to which the device may be attached.

The letter T in Figs. 1 and 3 represents the valve-stem of the engine to which the index-finger K is attached.

The overload-contacts shown in Fig. 4 are constructed as follows: L is a metal electrode or rod with a recess or notch at M and a binding-post O of known construction near and at one end, to which post one side of the electric circuit is attached, and at the other end of rod L is the contact-finger N. The rod L is inclosed by a slotted tube P, constructed of gutta-percha or other non-conducting material. Tube P is provided with a metal ring Q, carrying a binding-post of known construction and a brush or contact R, below and disconnected with which metal ring said tube P is inclosed by a metal tube S, which is fastened rigidly to the back of the slotted horse-power scale-plate J of the indicator, as shown.

The dial is standardized by the use of a steam-indicator to determine the horse-power the engine is developing. When the maximum horse-power is determined, the alarm device is adjusted by placing the brush R just over the notch M and not touching the rod L. Tube P, with the inclosed rod L, is pulled out or pushed in the tube S until the contact-finger N is at the point on the scale indicating the maximum load of the engine and just beyond the movement of the index-finger K. Should the engine exceed the predetermined load limit, the finger K will strike the contact-finger N, causing the notch M in the rod L to move out from under the brush R, closing the circuit and causing the bell in the circuit to ring, thus giving alarm whenever an excess of power is exerted by the engine.

In many engines the valve mechanism is so constructed that with the steam-pressure constant a varying movement is obtained therein corresponding with the variation of the load on the engine. This variation is obtained in engines of the Corliss type by the reach-rod. Such reach-rod while normally at rest is moved by a variation of the load, the steam-pressure remaining constant. When the device is attached to a Corliss engine, the index-finger K is attached to the reach-rod. When used on an engine with a throttling-governor, it is attached to the governor valve-stem, and when used on a locomotive, automatic or marine engine, said index-finger is attached to the valve-stem.

Engines of the character to which this device is designed to be attached are constructed with a device attached thereto operating in conjunction with the load and by means of which the varying loads on the engine, within determined limits, will not affect the speed of the engine. Such device is by me termed the "governing" device of the engine. In general the index-finger K is to be connected to the governing device of the engine and the diaphram *a* is to be placed in connection with the source of steam-supply of the engine. When attached in any of the last above-described ways to the several engines named, the finger K will be moved when a variation of the load on the engine causes a variation of the movement of the valve mechanism, and when such movement is caused by the increase of load the finger K will be forced against the finger N. Continued variation of the load produces continued movement of such finger K, and the finger N and rod L will be moved thereby to obtain the closing of the alarm-circuit by contacts R and M and the alarm will be given. This alarm is thus made in the last above-described action while the diaphram *a* remains stationary, together with the rod C, train of wheels F and F', and rack H. An increase of steam-pressure in an engine above the normal pressure thereof correspondingly diminishes the travel of the valve-stem or its equivalent mechanism. Such increase in pressure on diaphragm *a* (in contact with rod C) forces the diaphragm back against the resilience of spring $C^2$ and moves rod C longitudinally in unison with such movement and (by means of rod C, the connecting-gears F F', and rack-bar H) correspondingly moves the scale-plate J and the attached contact-finger N to maintain the same relative position between such contact-finger N and the finger K as when the steam-pressure is normal. Thus whenever the travel of the valve-stem or its equivalent mechanism is diminished and whenever the reach-rod of an engine or its equivalent mechanism is moved by increase of steam-pressure my device operates to sound the alarm in case of excess of load on the engine in the same manner as when the steam-pressure remains constant.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of a chamber provided with a communicating passage to the steam-supply of an engine, a movable wall to such chamber, a longitudinally-movable rod in contact at one end with the movable wall, an adjustable spring in connection with said rod, an adjustable gland attached to the wall of the chamber, such gland inclosing said spring and said rod, a lock-nut to hold the gland in

position, an electric circuit, a graduated scale-plate and an index-finger thereto, electrical contacts connected with such graduated scale-plate, a connection between said longitudinally-movable rod and said graduated scale-plate, said index-finger attached to the governing device of the engine, substantially as described and shown.

2. The combination, in a horse-power indicator and engine-overload alarm, of a movable graduated scale-plate, an electric contact-piece mounted on the scale-plate to move therewith and movable thereover, an electric circuit, such electric contact-piece forming an element in such circuit, and an index-finger movable to contact with the electric contact-piece and move such contact-piece to close the circuit, and a connection between the index-finger and the governing device of an engine.

3. The combination of a longitudinally-movable rod, an adjustable spring, a movable abutment, the movable rod, the spring and the movable abutment related to vary the tension of the spring on the rod, means to lock the movable abutment in an adjusted position, a movable diaphragm in contact with one end of the rod, a diaphragm-chamber and a passage-way for steam communicating with the source of steam-supply of an engine and with the diaphragm-chamber to continuously obtain variable pressure on the rod against the resiliency of the spring, such variation in pressure corresponding with the varying pressure of the steam-supply of the engine, substantially as described and shown.

4. The combination of a base and a movable scale-plate on the base with a movable abutment mounted on the scale-plate to move therewith and movable thereover, means to move the scale-plate, an additional movable abutment, a connection between such additional movable abutment and the valve mechanism of an engine, such additional movable abutment arranged to move the movable abutment relative to the scale-plate.

5. The combination of a base and a movable scale-plate on the base with an abutment mounted on the scale-plate to move therewith and movable thereover, an additional abutment movable over the scale-plate, a connection between such additional abutment and the governing device of an engine, steam-actuated mechanism, a connection between such mechanism and the scale-plate, and means to supply steam, the pressure whereof corresponds with the pressure of the steam in the engine, to actuate such mechanism.

6. The combination of a base, a slotted scale-plate movably mounted on the base, an index-finger extending through the slot and movable with the scale-plate and movable thereover, an additional index-finger movable relative to the first-named index-finger, means to move the slotted scale-plate, and means to move the last-named index-finger to contact with the first-named index-finger and move the same relative to the scale-plate.

7. The combination of insulating material, a metal rod longitudinally mounted on such insulating material, an index-finger on the rod, an electric contact-piece adjustably mounted adjacent to the rod, a scale-plate adjacent to the index-finger, an electric generator, an electric signal and electric conductors connecting the contact-piece, the generator, the signal and the longitudinally-movable rod, substantially as described.

8. The combination in an engine provided with a governing device, of a graduated movable scale, a projection arranged to travel over the face of the scale, an electric circuit, an electric generator, contact-pieces, and a signal device in said circuit, an index-finger on the scale and movable thereover said projection arranged to strike the index-finger and close the circuit by the travel thereof beyond a predetermined maximum, means to adjust the graduated movable scale and index-finger thereon in accordance with different steam-pressures; all combined substantially as shown and described.

9. In an engine provided with a governing device, the combination of a graduated movable scale, a projection arranged to travel over the face of the scale, an electric circuit, an electric generator, contact-pieces, an index-finger and a signal device in said circuit, means to adjust said index-finger, said projection arranged to strike the index-finger and close the circuit by the travel thereof beyond a predetermined maximum, means to adjust the instrument in accordance with different steam-pressures, and a connection between such means and said scale; substantially as shown and described.

10. In combination with an engine provided with a source of steam-supply, a diaphragm, a casing in which the diaphragm is placed, such casing provided with a diaphragm-chamber, means to yieldingly maintain the diaphragm in a determined position and to resist movement thereof by pressure of steam thereon in the diaphragm-chamber, such resistance to the movement of the diaphragm increasing as the movement of the diaphragm increases, a passage-way connecting the diaphragm-chamber with the steam-generator, a movable abutment, a connection between the movable abutment and the diaphragm, an electric circuit provided with an electric signal and with an electric switch, a connection between the movable abutment and the switch, an additional movable abutment arranged to coact with the first-named movable abutment and a connection between

the additional movable abutment and the governing device of the engine, substantially as described.

11. In an engine provided with a source of steam-supply the combination of a diaphragm, a casing in which the diaphragm is placed, such casing provided with a diaphragm-chamber, means to yieldingly maintain the diaphragm in a determined position and to increasingly resist increased movement thereof by pressure of steam thereon in the diaphragm-chamber, a passage-way connecting the diaphragm-chamber with the steam-generator, a combined movable abutment and index, a connection between the combined movable abutment and index and the diaphragm, an electric circuit provided with an electric signal and with an electric switch, a connection between the combined movable abutment and index and the switch, an additional movable abutment arranged to coact with the first-named movable abutment and the connection between the additional movable abutment and the governing device of the engine, substantially as described.

12. The combination of a diaphragm-shell, a diaphragm in the shell, such shell provided with a diaphragm-chamber and with a communicating passage-way therefrom to the source of steam-supply of an engine, means to resist movement of the diaphragm by the steam and to yieldingly maintain the diaphragm in a determined position, a longitudinally-movable rod, a connection between the rod and the diaphragm, a movable graduated scale-plate provided with a finger, and a connection between said scale-plate and the longitudinally-movable rod and a movable abutment actuated by the valve mechanism of an engine and arranged to coöperate with the finger; substantially as shown and described.

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

JOHN F. SHREFFLER.

Witnesses:
WALTER L. EULASS,
LYLE D. TAYLOR.