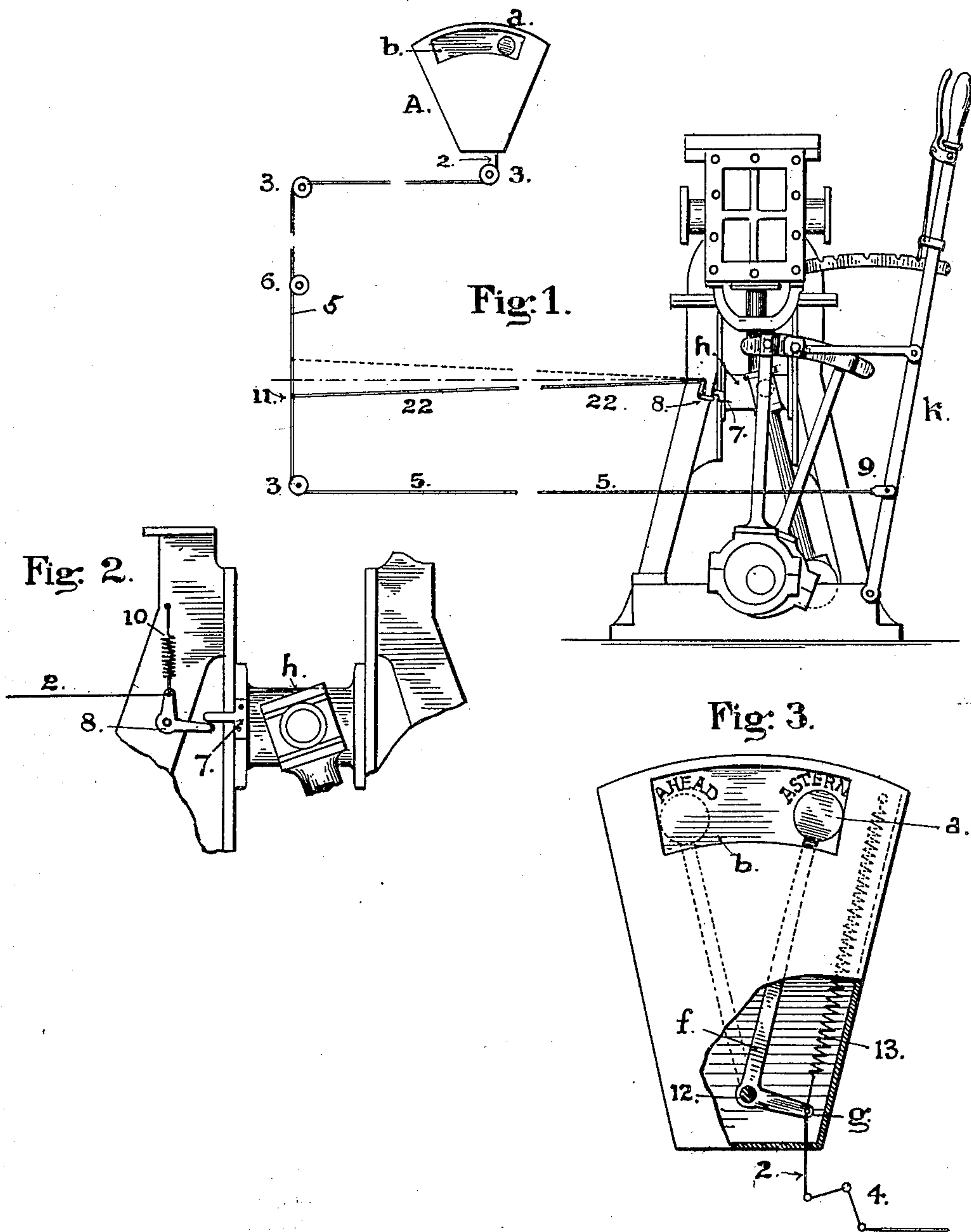


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W. S. RUSH.  
MOTION INDICATOR FOR ENGINES.  
APPLICATION FILED AUG. 2, 1906.



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# UNITED STATES PATENT OFFICE.

WALTER S. RUSH, OF SAN FRANCISCO, CALIFORNIA.

## MOTION-INDICATOR FOR ENGINES.

No. 885,527.

Specification of Letters Patent.

Patented April 21, 1908.

Application filed August 2, 1906. Serial No. 328,970.

*To all whom it may concern:*

Be it known that I, WALTER S. RUSH, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented new and useful Improvements in Motion-Indicators for Engines, of which the following is a specification.

This invention has for its object to provide a device or apparatus to indicate the movement and the direction of rotation of a shaft or other moving part to which motion is imparted from an engine or motor.

It is intended more particularly for use in connection with the engine of a ship or vessel, in which it is applied and adapted to indicate in the engine-room, the pilot house, or in one or more convenient locations in the vessel both the speed and the changes in the motion of the propeller-shaft, and also the changes in the direction of the motion, at all times.

The invention is applicable as well to other situations wherein the direction of rotation of a revolving shaft, the conditions of speed under which it is traveling, and its intervals of no motion as well, are to be indicated at one point, or at several different points of observation.

To such end and object my invention consists in an indicating device of novel character or construction, and means for operating the same from some continuously moving part of an engine, such as the piston-actuated cross-head, if the engine be of the reciprocating kind, or from some part or mechanism of the engine that changes its position with the changes made in the direction of rotation of the engine, such as the reversing-lever, or some other part of the reversing-gear.

The invention includes, also, novel means for operating the indicating device directly from a moving shaft to which rotary motion is imparted by an engine or motor.

The novel parts and features, and the manner in which I proceed to construct and apply the same in the production of a device for the purposes of my invention, are explained at length in the following description, reference being had therein to the accompanying drawings forming part thereof.

Figure 1 of the drawings represents an indicating device embodying my said invention, and the manner of operating the same

from the cross-head and the reversing-lever in a reciprocating engine of well-known construction. Fig. 2 is an elevation in detail, and on an enlarged scale, of parts or mechanism on the engine through which the reciprocating movements of the cross-head produce vibratory motion of the indicator. Fig. 3 is a front-elevation of the indicator, showing the front of the case broken away in front.

The indicating device comprises a case *A* having an opening *b* in its face, and a disk *a* on one end of a staff *f* that is arranged to swing in an arc behind the sight-opening *b*. The staff is mounted on a center of oscillation 12, and is formed or provided with a short lever or arm *g* from which a cord or wire 2 constituting part of a train of mechanical connecting devices, is carried through the case to the outside. The connecting devices referred to operate to transmit motion from the engine or motor to the indicator, as will be described. The direction of the wire is changed by means of sheaves 3, or bell-cranks 4, or both, to carry it in the required direction from the indicator to the engine.

I have illustrated in Figs. 1 and 2 one way in which vibratory motion of the indicator *a* is produced from the reciprocations of the cross-head of an upright engine, and in which also the position of the indicator in the case is changed with the changes that take place from time to time in the direction of rotation of the engine-shaft. In this construction the wire 5 is connected directly to the reversing-lever *k* of the valve-gear in such manner that the wire is put under greater tension when the lever is set over to the right, and is slackened when the lever is moved in the opposite direction. A coiled spring 13 attached to the arm *g* of the oscillating staff *f*, and to a fixed point in the case, acts on the staff in opposition to the tension on the wire, with the effect to set the indicator *a* over to the left side of the opening *b* as often as the wire is slackened. In either position, whether set to the right or the left, the indicator is kept in a state of vibration when the engine is moving, and is stationary in the opening when the engine is at rest; so that by virtue of the position it assumes the indicator *a* shows the direction in which the engine or the driven-shaft is traveling; and by its vibratory motion, the indicator exhibits in a visible form the condition or character of the



motion, whether slow or fast. The indicator *a* also shows by its motion whether the engine be in motion or at rest at any time.

The vibratory motion is produced by placing a bell-crank 8 on the frame of the engine on one side of the cross-head *h*, and in such close relation to the cross-head guide that the horizontal member of the bell-crank projects in the path of a finger 7 fixed on the cross-head *h*, and will be struck and moved by that part 7 as the cross-head travels up and down. A wire 22 attached to the upright member of the bell-crank is connected to the wire 5 at a point 11 between a sheave 6 and the sheave 3 below that point; the wire 22 being stretched under a sufficient degree of tension to produce short pulls or periods of alternating and relatively heavy tension and light tension upon the wire 5, as the finger 7 passes across the end of the bell-crank 8. This movement of the wire 5 is transmitted to the indicator *a*, causing it to move with short vibrations through the strain or tension thrown on the wire, between the two points 3 and 6 before mentioned. This is a simple and effective manner of producing the desired vibratory motion in the indicator *a*, and also of setting the indicator *a* in different positions in the case to indicate a change in the direction of travel.

The words "Ahead" and "Astern" placed on the front of the case over the opening, or on a dial behind the opening, as seen in Fig. 3 enable the position of the vibratory arm to be easily read by any one.

As constructed and applied in the manner above described, the part *a* of this indicator is kept in a state of vibration by the reciprocating movements of the finger 7 across the end of the bell-crank 8 during the time the engine is working. And in addition to this motion it will be seen that the arm or vibratory part is shifted from one side to the other of the sight-opening whenever the direction of the motion is changed at the engine, thereby indicating by the position of the vibratory arm under the words "Ahead" or "Astern" the general direction in which the vessel is being driven.

The mode herein described of producing vibratory movements of the indicator and of changing the position of that part without affecting its vibratory motion, is well adapted to engines of the reciprocating type in which connection can readily be made with the reversing-gear lever, or with some part of the engine that necessarily changes its position with every change made in the direction of travel of the engine.

The mechanism to which my invention relates is, as described, adapted to indicate the movements of a piece of mechanism, and, merely for the purposes of illustrating one form of the invention, I have, in this case, chosen to show a visual indicator. There-

fore, when I refer herein to a motion indicator, particularly in the claims hereof, I desire to be understood as applying that term in a broad sense.

It will be seen that the connections described, impart to the indicator two sets of movements; first, shift movements, or changes in the working position of the motion indicator, these consisting of relatively long movements or shifts that serve to indicate changes in the direction of motion, or in the setting of controlling parts of the apparatus to cause changes in the direction of motion; and, secondly, vibrations, or relatively short movements, that are entirely independent of the shift movements just referred to, which vibrations serve to indicate revolutions, reciprocations, or other movements of parts by which the speed of the mechanism is indicated.

Where, in the specification and claims of this case, I speak of shifting the motion indicator, I refer to the relatively long movements that are imparted thereto to indicate motion-direction; and, where I speak of vibrating it, I refer to the relatively short movements that are imparted thereto to represent revolutions or reciprocations indicative of speed.

I do not, in this application, claim a motion indicator for an engine having means for imparting shift movements thereto to indicate direction, and to impart vibratory movements independent of the shift movements to indicate the speed at which the engine may be moving; nor a motion indicator for an engine or motor adapted to be shifted to indicate direction of movement, a spring for moving or shifting the indicator in one direction, and connections with a moving part of the engine or motor for shifting it in the opposite direction, as such subject matter is illustrated, described and claimed by me in my application Ser. No. 370,874, filed April 29, 1907.

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

1. The combination with a shaft and an engine for driving it, having a part that moves according to the speed of the shaft, and another part that changes its position with each change taking place in the direction of the shaft, of a vibratory motion indicator for the engine, and mechanical connecting means through which motion is imparted to the indicator, having two engine connections, one leading to the said part that moves according to the speed of the shaft and arranged to impart to the indicator short vibrations in consonance with the revolutions of the shaft, and the other leading to the part that changes its position when the direction of rotation of the shaft is changed and arranged to shift the indicator when such changes are made, substantially as set forth.



2. The combination with a shaft and an engine for driving it, having a part that moves according to the speed of the engine, and mechanism controlling the direction of rotation of the shaft, of a vibratory indicator for the engine, and means through which motion is imparted to the indicator, connected to the said mechanism for controlling the direction of the shaft and arranged to shift the indicator relative to a sight opening, and a second connection with the said part that moves according to the speed of the shaft arranged to impart to the indicator short vibrations in consonance with the revolutions of the engine driven shaft, substantially as set forth.

3. The combination with a shaft and an engine for driving it, having a part that moves in consonance with the rotations of the said shaft and another part that changes its position as the direction of rotation of the shaft changes, a single line of connections leading from the indicator through which motion is imparted thereto, the said line branching and having one branch connected with the said part of the engine that moves in consonance with the speed of the shaft through which short vibratory motions are imparted to the indicator, and another branch leading to the part of the engine that changes its position with the change in the direction of the shaft through which the indicator is shifted when the said part is moved, substantially as set forth.

4. The combination with a shaft and an engine for driving it, having a part that moves in consonance with the speed of the shaft and another part that changes its posi-

tion with each change in the direction of the shaft, a vibratory indicator, connections through which the indicator is moved, having one branch connected with the said part of the engine that moves in consonance with the speed of the shaft and another branch connected with the said part that changes its position when the direction of rotation of the shaft changes, and means for maintaining the said connections from the indicator to the different parts of the engine under working tension, substantially as set forth.

5. In a mechanism for indicating the working of an engine, the combination with an engine adapted to drive a shaft, having mechanism for controlling the direction of rotation of the shaft, of a vibratory motion indicator, a tappet or contact device arranged to be operated by a moving part of the engine when driven, and connections, leading respectively from the said tappet device and the said mechanism for controlling the direction of rotation of the shaft, for moving the indicator, the connections leading from the tappet being arranged to impart vibratory motions to the indicator and those leading from the motion-control devices being arranged to shift the working position of the indicator, substantially as set forth.

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

WALTER S. RUSH.

Witnesses:

W. M. BARR,  
O. J. HUDSON.