

No. 751,037.

PATENTED FEB. 2, 1904.

P. F. C. WILLCOX.
VALVE GEAR FOR ENGINES.
APPLICATION FILED JUNE 23, 1903.

NO MODEL.

2 SHEETS—SHEET 1.

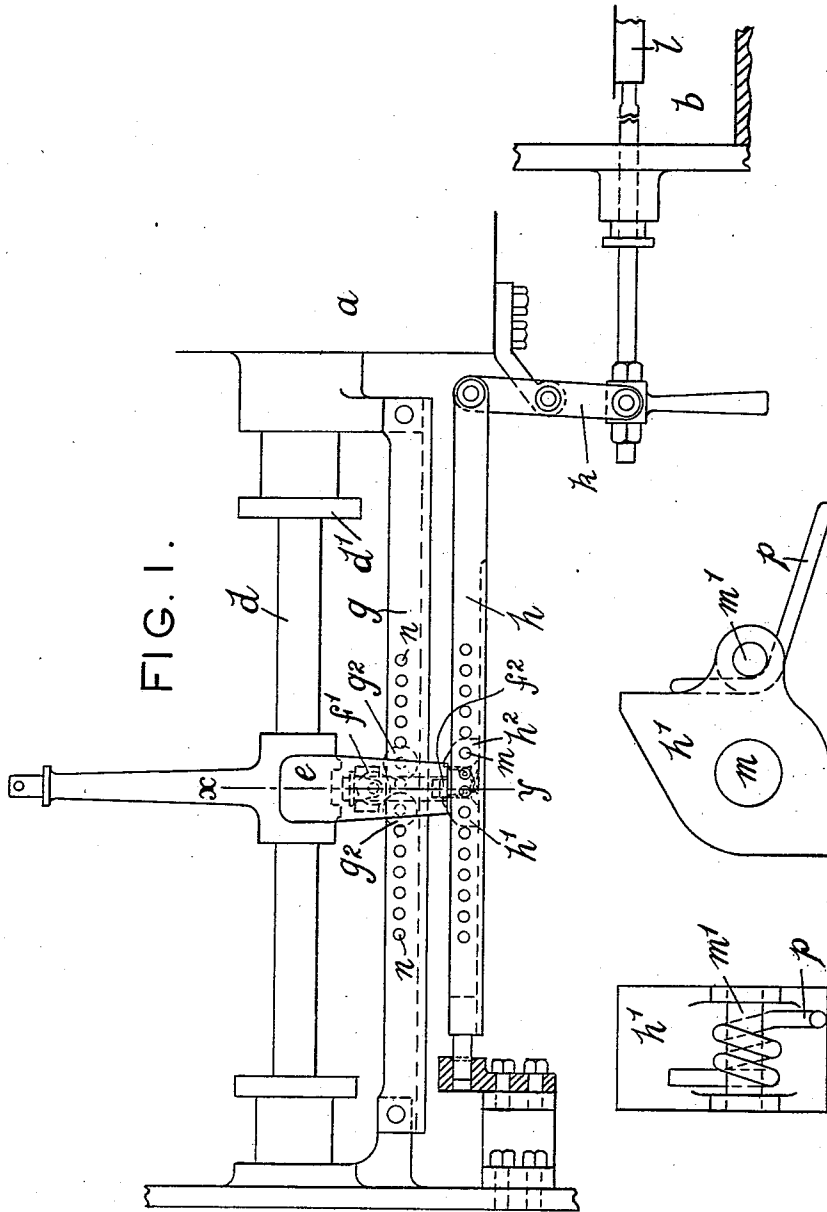


FIG. 1.

FIG. 2.

WITNESSES

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BY *Richard L. ...*
ATTORNEYS

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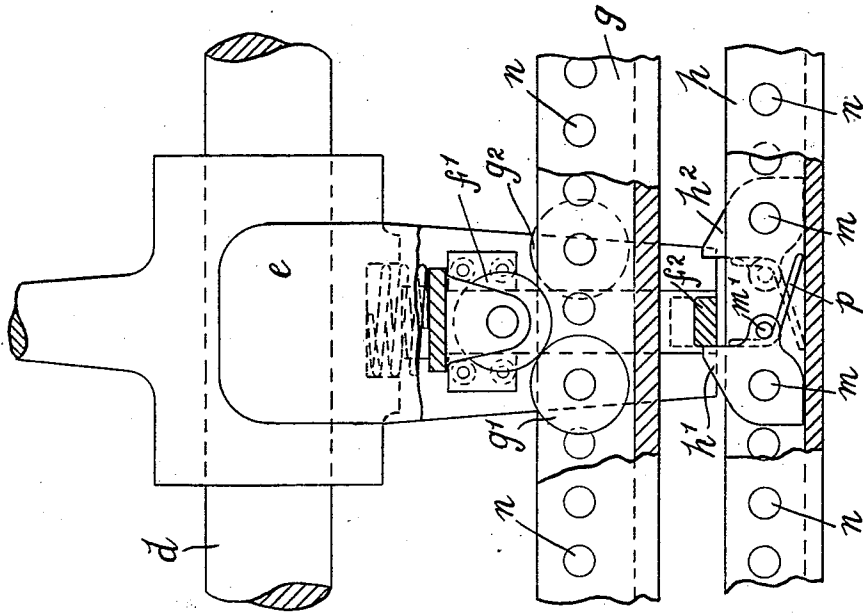


FIG. 4.

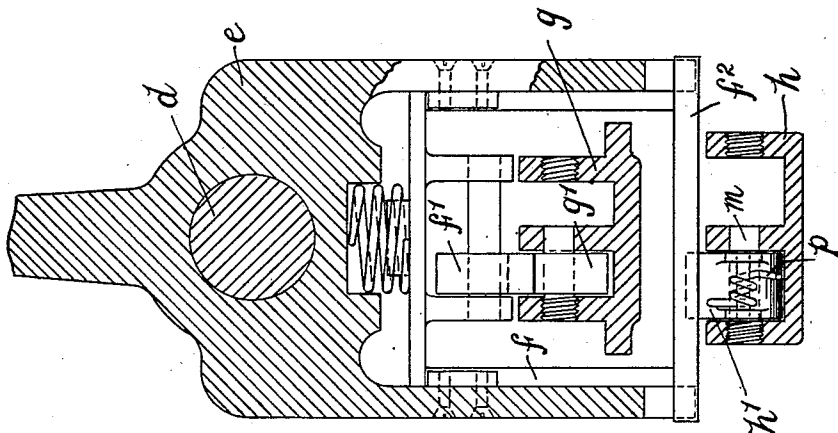


FIG. 3.

WITNESSES

Tom Kuchue
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INVENTOR

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BY *[Signature]*

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UNITED STATES PATENT OFFICE.

PERCY FRANCIS CAMERON WILLCOX, OF SUNDERLAND, ENGLAND.

VALVE-GEAR FOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 751,037, dated February 2, 1904.

Application filed June 23, 1903. Serial No. 162,801. (No model.)

To all whom it may concern:

Be it known that I, PERCY FRANCIS CAMERON WILLCOX, a subject of the King of Great Britain and Ireland, residing at Sunderland, in the county of Durham, England, have invented a certain new and useful Improved Valve-Gear for Direct-Acting Reciprocating Engines, of which the following is a specification.

This invention relates to means for the operation and control of a valve for direct-acting reciprocating engines or for such motors as have no fly-wheel and no continuous rotary movement in their action. It is designed to operate the steam-admission valve by a quick and rapid terminable motion at any part of the stroke of the reciprocating piston to enable the valve to operate as an auxiliary expansion-valve or by a duplication of such rapid terminable movement to operate a primary valve to both admit the motive steam or fluid and to cut off such supply at any desired fraction of the stroke.

In direct-acting steam-pumps of the type referred to in which the main valve is operated by steam-pressure, by tappets, or by other known device it is not usual for such valve to have either a supplementary expansion-valve or to be so operated that the main valve after its first opening for admission of the motive pressure can be again closed before the end of the piston-stroke. It is to effect this purpose that the following apparatus has been devised.

Figure 1 is a general plan as applied to a direct-acting steam-pump. Fig. 2 is an enlarged detail of the cam-tappets. Fig. 3 is an enlarged cross-section through the cross-head and bars on the line *xy*. Fig. 4 is an enlarged elevation, partly broken, of the same details as in Fig. 3.

a is the steam-engine, with steam-chest *b*, containing a valve or valves for the admission and control of the steam or other device operated by the steam-piston, the power being communicated by the piston-rod *d*, passing through the glands *d'*. Upon such piston-rod *d* is, as is usual, a cross-head *e*, such cross-head being already frequently utilized for the movement, by tappets, links, or levers, of the primary valve controlling the admission of the steam to the motor-cylinder and effecting the

reversal of the steam-piston in manner well known. To effect the present purpose, such cross-head *e* is provided with a spring-pressed tongue *f*, embracing a fixed bar *g* and a sliding tappet-bar *h* and having side rollers *f'* and a stirrup-piece *f''*, of which the rollers *f'* ride over rollers *g'* *g''* on the fixed bar *g*, and the stirrup-piece *f''* is adapted to engage with tappet-detents *h'* *h''* on the bar *h* as the cross-head *e* reciprocates with the main piston-rod *d*.

The sliding tappet-bar *h* is connected by a rocking lever *k* or otherwise with a valve of the steam-motor, such as an expansion-valve *l* on the back of a primary sliding D-valve, and thus acting as an expansion-valve to it in a well-known manner.

The tappet-bar *h* is divided by a central rib into two trough-compartments, in each of which is a cam-shaped detent *h'* and *h''*, respectively, revoluble upon a central screw-pin *m*, which may be removed and replaced, with the tappet on it, in any of the various holes *n* in the sides of the tappet-bar. Thus the tappet *h'* *h''* can be set at any distance apart and in any position relatively to one another and to the length of the tappet-bar that may be desired.

The tappets are so shaped with a double nose that one forms a butt-hinge on the bottom of the trough of the tappet-bar, while the other nose projects upward above the top level of the bar with a vertical face in one direction and an inclined face in the other direction. A spring *p* is fitted about an auxiliary pin *m'* to cause the tappet always normally to return to the above-described position.

As the stirrup-piece *f''* of the spring-tongue *f* of the cross-head *e* travels over the surface of the tappet-bar *h* it will press down one of the tappets, but engage with the upright vertical face of the other, and thus move the tappet-bar *h* and the valve *l*, causing a rapid cut-off of steam at any point of the stroke of the motor-piston. As, however, the movement required for this valve *l* is small—i. e., only a small fraction of the movement of the cross-head *e*—the stirrup-piece *f''* must be promptly disengaged from the tappet *h'*. This is done by the cross-roller *f'* riding over a roller *g'* in the fixed bar *g*, which is also divided with an

adjustable roller in each half. The spring-tongue f and stirrup-piece f^2 are thus lifted from engagement with the tappet-detent h' . On the return stroke h' is depressed and h^2 is engaged, when the stirrup-piece is lifted by the other roller, g^2 .

By the use of more tappets upon the tappet-bar, with corresponding rollers upon the roller-bar, various successive movements of any desired length can be given to the steam-control valve as desired and at any part of the stroke of the motor-piston.

Having now described this invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination with a cross-head upon the piston-rod of a direct-acting reciprocating motor, of a spring-pressed tongue on said cross-head; a sliding rod connected to a steam-control valve of the said motor; tappets adjustable as to position on said sliding rod adapted in one direction to slip under, and in the other direction to engage with, the said spring-pressed tongue; and means whereby the spring-pressed tongue is lifted from engagement with the said tappets at any desired point.

2. In combination, a cross-head upon the piston-rod of a direct-acting reciprocating motor; a spring-pressed forked tongue on said cross-head; two rollers, on the said fork; a stirrup cross-piece closing the fork; a sliding rod connected to a steam-control valve of the said motor; tappets adjustable as to position on the said sliding rod, adapted in one direction to slip under, and in the other direction to engage with, the cross-piece of the said spring-pressed tongue; and means whereby the spring-pressed tongue is lifted from engagement with the said tappets at any desired point.

3. In combination, a cross-head upon the piston-rod of a direct-acting reciprocating motor; a spring-pressed tongue on the said cross-head; a double-troughed sliding rod connected to a steam-control valve of the said motor;

cam-shaped tappets with two noses mounted on pin-axles one in each division of said trough sliding rod, one of said tappets being adapted to engage the cross-piece of the spring-pressed tongue in either direction; various holes in said sliding rod to admit alteration of the position of the said tappets; and means whereby the spring-pressed tongue is lifted from engagement with the said tappets at any desired point.

4. In combination, a cross-head upon the piston-rod of a direct-acting reciprocating motor; a spring-pressed tongue on the said cross-head; a double-troughed sliding rod connected to a steam-control valve of the said motor; cam-shaped tappets with two noses, mounted on pin-axles one in each division of said trough sliding rod; a spring fitted to each cam-tappet producing normal position with one nose down as a butt-hinge, and the other nose up above the edge of the said sliding rod, one tappet being adapted to engage the said spring-tongue in either direction; and means whereby the spring-pressed tongue is lifted from engagement with the said tappets at any desired point.

5. In combination, a cross-head upon the piston-rod of a direct-acting reciprocating motor; a spring-pressed tongue on the said cross-head; adjustable tappets upon a sliding rod connected to the steam-control valve of the said motor; rollers upon the said spring-pressed tongue; a fixed bar carrying rollers adjustable as to position and situated in the path of the said rollers upon the spring-pressed tongue, adapted so as to disengage the said spring-pressed tongue from the said tappets at any desired point.

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

PERCY FRANCIS CAMERON WILLCOX.

Witnesses:

FRANK ANISWORTH WILLCOX,
JOHN TAYLOR.