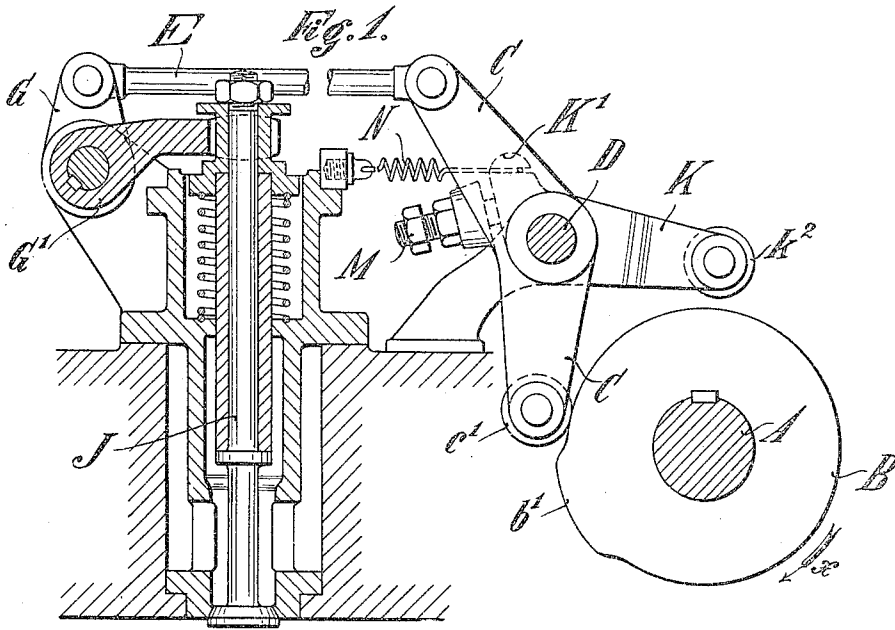
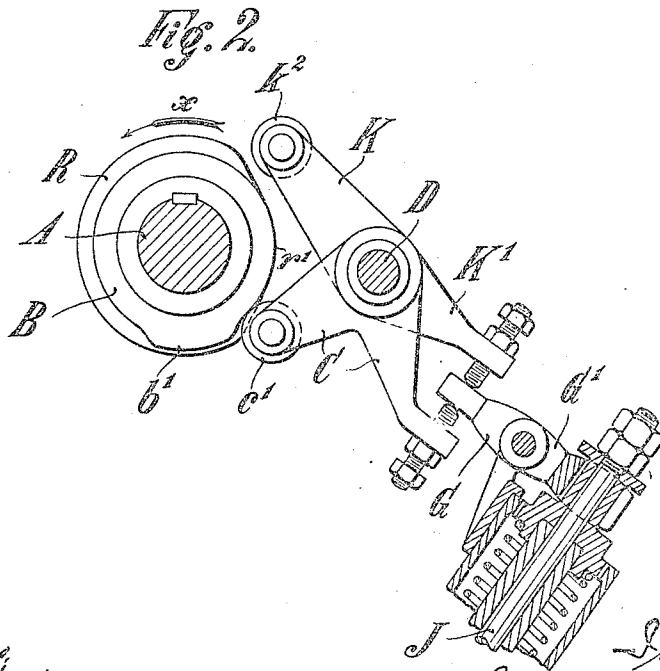


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CAM CONTROL FOR VALVES OF INTERNAL COMBUSTION ENGINES.
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Patented Dec. 14, 1915.



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UNITED STATES PATENT-OFFICE

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CAM CONTROL FOR VALVES OF INTERNAL-COMBUSTION ENGINES.

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Specification of Letters Patent.

Patented Dec. 14, 1915.

Application filed November 11, 1912. Serial No. 730,736.

To all whom it may concern:

Be it known that I, ERNST HERKT, a citizen of the German Empire, residing at Kiel, Germany, have invented certain new and useful Improvements in Cam Controls for Valves of Internal-Combustion Engines, of which the following is a specification.

The opening of the valves of internal combustion engines is usually accomplished through a cam shaft acting through the medium of a controlling lever and driven by the crank shaft, while the closing of the valves, in most instances, is effected by springs. Should binding occur from any cause, in a valve controlled in such a manner, it may happen that the force of the valve-spring is not sufficient to overcome the hindrance and again close the valve. Such an arrest of the valve will in every case result in disturbing the operation of the engine and may, when, for example, it occurs with the pressure air inlet valve, lead to serious injury of the cylinder. That is to say, if an inlet valve opening toward the interior of the cylinder should, in consequence of binding, remain open too long, too much pressure air will flow into the cylinder. At the upward movement of the piston, the valve will be forced closed by the pressure of compression overcoming the resistance, with consequent raising of the pressure of compression which may result in fracture of the cylinder.

The object of the present invention is to avoid this evil.

In the accompanying drawings, the subject matter of the invention is shown by way of example, in two embodiments, in use in connection with the pressure air inlet valve.

Figure 1 shows a side view of the controlling means, together with a section through the valve mounting; and Fig. 2 is a similar view of a somewhat different embodiment of the controlling means.

Referring first to the embodiment illustrated in Fig. 1, A designates the controlling shaft, B the intake cam disk with the controlling cam b^1 , C the controlling lever, which is swingingly mounted upon the axis D, and carries the controlling roller c^1 . A draw-rod E and an angle lever G, G^1 serve to transmit the movement of the controlling lever C to the spindle J of the intake valve, which is provided with known equipment.

According to the present invention there

is provided upon the shaft D, an auxiliary controlling lever K, K^1 whose longer bent arm K carries a controlling roller k^2 lying within reach of the cam disk B, while its shorter arm K^1 engages a spring N whose other end is secured to the valve mounting. By means of this spring, the arm K^1 will be pressed continuously against an abutment M, located upon the controlling lever and constructed in the form of a set screw, which is so disposed that with the intake valve closed, the controlling roller k^2 of the auxiliary lever K K^1 lies just outside of the path of the cam b^1 . The method of operation of this arrangement is as follows:—If the cam disk B is rotated in the direction of the indicated arrow α , the cam b^1 impinges against the roller c^1 of the controlling lever C and imparts to it a turning movement through which the valve, by means of the connections E, G, G^1 , will be opened. In this turning movement, the auxiliary lever K will be carried with the controlling lever C, through the medium of the abutment M and in the same direction and through the same angle, so that the controlling roller k^2 of the auxiliary lever will arrive in the path of the cam b^1 . If, after the controlling roller c^1 has passed beyond the cam b^1 , the valve closes automatically under the pressure of the valve spring, the connections G, G^1 , E and the controlling lever C return as also does the auxiliary lever K, K^1 , to their original positions. The cam b^1 then passes over the controlling roller k^2 of the auxiliary lever, without exerting any effect upon it. If, however, the valve, for any reason should remain open, the cam b^1 , in the further turning of the controller shaft A, impinges against the controlling roller k^2 and thereby rotates the auxiliary lever K, K^1 back to its starting position. But through means of the abutment M, the controlling lever C will be forced to partake of this backward turning so that the controlling roller c^1 also returns to its position of rest and simultaneously effects a forcible closing of the intake valve.

In the embodiment according to Fig. 2, there is provided upon the controlling shaft A, in addition to the valve disk B, which cooperates with the controlling lever C, also an auxiliary cam disk R for the auxiliary controlling lever K, K^1 . This auxiliary cam disk has a recess r^1 corresponding to the ele-

vation of the controlling cam b^1 , with which the controlling roller k^2 of the auxiliary lever, coöperates when the valve is opened, while, when the valve is closed, the controlling roller k^2 rolls off upon the cylindrical portion of the auxiliary cam disk R. The movement of both controlling levers C and K, K^1 , which are mounted loosely upon the axis D, is transmitted through the medium of a two-armed intermediate lever G, G^1 , to the valve spindle J.

The opening of the intake valve is caused, as in the first described illustrative embodiment, by the cam disk B and the levers C and G, G^1 , as soon as the controlling roller c^1 runs upon the cam b^1 . The auxiliary controlling lever K, K^1 is hereby swung through the arm G of the intermediate lever C, and the controlling roller k^2 enters the recess r^1 of the auxiliary cam disk R. If now the valve, in consequence of a binding, should remain open, the roller k^2 , after a further rotation of the shaft A, in the direction of the arrow x again runs upon the full rim of the auxiliary cam disk R and thereby forcibly directs the auxiliary controlling lever K, K^1 , the lever C and the valve spindle J, back to the closing position.

I claim:—

1. A cam control for the normally closed valve of an internal combustion engine comprising a cam, a main controlling lever, and an auxiliary controlling lever partaking of the movement of the main controlling lever and having an end which enters the path of the cam when the valve remains open and is moved by said cam and caused to close the valve.

2. A cam control for the normally closed valve of an internal combustion engine comprising a cam shaft, a main controlling lever actuated by said cam shaft and an auxiliary controlling lever partaking of the movement of the main controlling lever and having an end projecting into the path of a cam on the cam shaft when the valve is open, but mov-

ing out of the path of the cam when the valve is closed.

3. In combination with the normally closed valve of an internal combustion engine, a main controlling lever, connections through which said main controlling lever is adapted to move the valve in the closing as well as the opening direction.

4. A valve control having a rocking lever engaging the valve spindle, said spindle tending to close the valve; a bell crank lever, positive connections between said two levers, a revolving cam constructed to contact with the free arm of said bell crank lever actuating it to open the valve, and means for continually holding said free arm in contact with said cam, said means comprising an auxiliary lever positively connected with said bell crank lever and projecting into the path of said cam while the valve stands open; said auxiliary and bell crank levers coöperating for positively opening and closing the valve.

5. A valve control having a rocking lever engaging the valve spindle, said spindle tending to close the valve; a bell crank lever, positive connections between said two levers, a revolving cam constructed to contact with the free arm of said bell crank lever actuating it to open the valve, a trailing arm having positive connection with said bell crank lever and constructed to be actuated by said cam to compel the bell crank to close the valve and means for adjusting the relative angular position between said bell crank and said trailing arm, said trailing arm and said cam coöperating to hold the free arm of the bell crank lever continuously in contact with said cam, causing positive opening and closing of the valve.

In testimony whereof I have affixed my signature in presence of two witnesses.

ERNST HERKT.

Witnesses:

JULIUS ROJSKE,
MAX KAHVA.