

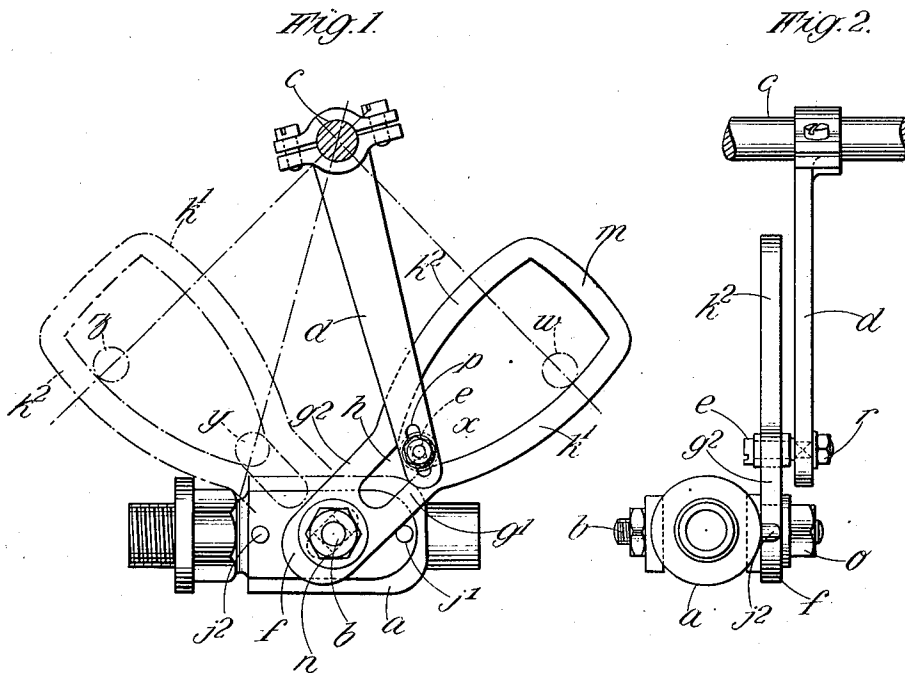
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EXTRA AIR VALVE FOR INTERNAL COMBUSTION ENGINES

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EXTRA AIR VALVE FOR INTERNAL-COMBUSTION ENGINES.

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This invention relates to an improvement in or modification of the invention claimed in the specification of my Patent No. 1,553,668 of September 15, 1925, for enabling the admission of "extra air" to the intake of an internal-combustion engine (such for example as that of a motor car) to be regulated automatically as required in accordance with the advance or retardation of the ignition. The arrangement described in the specification referred to comprises an arm upon the ignition-control rod, and a lever constantly tending under spring-action to open the extra air admission valve; the arrangement, relative proportions and paths of said arm and lever being such that whereas no extra air is admitted so long as the ignition remains at zero, nor does any admission of extra air take place during the advance of the point of ignition from zero to half advance, extra air is admitted in a progressively increasing proportion from nil to a maximum in accordance with the gradual advance of the point of ignition from half advance to normal full advance, whilst such maximum admission of extra air is maintained during any further advance of the ignition to its earliest point, and conversely as the ignition is retarded.

The present invention, while directed to secure the results just mentioned, has for its immediate object to enable spring-action to be dispensed with for the purpose of actuating the extra air admission valve, and to render positive the connection between the arm on the ignition-control rod and the lever whereby said valve is opened and closed, so that accidental reversal of the position of the movable element of the valve cannot result from jarring, vibration, or other extraneous force to which it may be subjected.

According to the present invention the arm on the ignition-control rod, during that middle portion of its total movement which is comprised between the positions corresponding respectively with half advance and normal full advance, causes by positive mechanical action the lever which actuates the displaceable element of the extra air admission valve to move from the position corresponding with full closure to that corresponding with full opening of the valve or vice versa (in accordance with the direction of the motion) and during those two extreme portions of its total movement which are comprised between the positions

corresponding, on the one hand with half advance and zero advance, and on the other hand with normal full advance and fully advanced ignition, as the case may be, said arm prevents, also by positive mechanical action, reverse movement of said lever from the fully open or fully closed position, to which ever of such positions that lever has last been brought. For this purpose the lever whereby the control of the valve is effected may be in the form of a cam adapted to impart motion to the displaceable element of the valve and engaged by the arm upon the ignition-control rod, while, as in the example illustrated and described in my Patent No. 1,553,668, said lever and arm may be movable angularly about axes substantially parallel with one another.

One form of the invention is illustrated by way of example in the accompanying drawings as applied to an extra air admission valve constituted by a rotary plug tap. Figure 1 shows the improvement in side elevation and Figure 2 is an end elevation.

In the example illustrated, the valve-plug is to be understood as passing through an arc of substantially 90 degrees in moving from the fully closed to the fully open position or vice versa; whilst the ignition-control rod, whereof the axis is substantially parallel to that of the valve-plug, is to be understood as having a total normal angular movement of substantially 90 degrees between the positions corresponding respectively with zero advance and fully advanced ignition, this total angle being made up of three substantially equal arcs whereof the middle arc is comprised between the positions corresponding with half ignition and normal full ignition, the one extreme arc is comprised between the positions corresponding with half advance and zero advance, and the other extreme arc is comprised between the positions corresponding with normal full advance and fully advanced ignition.

Referring to the drawings, *a* is the body of a rotary plug-tap serving as the extra air admission valve of an internal-combustion engine, the axis of the rotary plug *b* of this valve extending substantially parallel to the axis of the rotary ignition-control rod *c*, which rod has fast upon it a radial arm *d* carrying a crank-pin *e*. Angular movement of the arm *d* through its total normal range has for effect to carry the crank-pin *e* through an arc of 90 degrees,

that is to say from the position w which corresponds to the fullest advance of ignition, through an arc of 30 degrees to the position x which corresponds to normal full advance, thence through an arc of 30 degrees to the position y which corresponds to half advance, and thence through an arc of 30 degrees to the position z which corresponds to zero position, and vice versa.

- 10 The crank-pin e engages a bifurcated cam-lever f fast upon the rotary plug b and presenting between its limbs g' , g'' , towards the axis of the plug, a parallel-sided radial cam-slot h of such length as to co-
- 15 operate positively with the crank-pin e during movement of the latter in either direction through its arc of 30 degrees between the positions x and y , between which two positions the movement of the crank-
- 20 pin e causes the lever f to move in a corresponding direction through its total arc of 90 degrees between the positions corresponding to complete opening and complete closure of the valve, these two extreme angular
- 25 positions of the valve-plug b being preferably determined by stops, such as j' , j'' for example.

Beyond that end of the cam-slot h which is remote from the axis of the valve-plug b , the limbs g' , g'' of the bifurcated lever f are extended as at k' , k'' , these extensions being outwardly curved in opposite directions symmetrically and that limb-extensions k' or k'' which, according as the crank-pin e occupies the position x or the position y , is the more remote from the axis of the control-rod c , being curved concentrically with said axis. The result is that during movement of the crank-pin e between the positions x and w , or between the positions y and z , not only is no movement imparted by the crank-pin to the lever f , but the latter is prevented positively from moving reversely so as to close the valve when once opened or to open it when once closed.

In order to afford scope for adjustment, the curved portions k' , k'' of the limbs of the bifurcated lever f are preferably made of such length as to extend, as indicated, beyond the position w or z of the crank-pin e when the lever f is in the corresponding position, and for the sake of greater strength the extremities of these limbs may, if desired, be united by a cross-bar m as indicated in Figure 1. Moreover, in order to allow of adjustment of the entire lever f radially of the axis of the valve-plug b , the lever may be slotted as at n to engage over a squared portion of the plug b , the adjustment being secured by means of a nut o upon the threaded extremity of the plug.

The crank-pin e , which is preferably provided with an antifriction roller, is adjustable radially of the axis of the ignition-control rod c , for which purpose the crank-

pin may be constituted by a shouldered stud having a reduced shank-portion which fits in a radial slot p in the arm d and is secured therein by means of a nut r on the threaded extremity of the shank. The arm d itself is preferably adjustable angularly about the axis of the rod c .

I claim:—

1. In an internal combustion engine, means for controlling the admission of "extra air" to the intake in accordance with the advance of the point of ignition, comprising a valve for regulating such admission, a manually-operable rod for controlling the advance of the ignition, a lever for actuating said valve, and an arm on said ignition-control rod adapted to maintain constant engagement with said lever for positively holding the latter in predetermined positions and moving it in opening and closing said valve, the arrangement being such that (a) all those positions of said arm which denote progressive advance of the point of ignition from "zero advance" to "half advance" correspond with that position of said lever which denotes full closure of the valve; that (b) those positions of said arm which successively denote progressive advances of the point of ignition from "half advance" to "normal full advance", correspond with progressive movements of said lever from the position denoting full closure to the position denoting full opening of the valve; and that (c) all those positions of said arm which denote progressive advances of the point of ignition from "normal full advance" to "maximum advance", correspond with that position of said lever which denotes full opening of the valve.

2. In an internal combustion engine as claimed in claim 1, means for controlling the admission of "extra air" to the intake, wherein the lever for actuating the air-admission valve is bifurcated in a plane parallel to the plane of movement of the arm on the ignition-control rod, said arm being cranked to engage the respective limbs of the lever alternately in accordance with the direction of movement of the arm and lever.

3. In an internal combustion engine as claimed in claim 1, means for controlling the admission of "extra air" to the intake, wherein the arm on the ignition-control rod is adapted to move angularly about the axis of said rod and carries a crank-pin, and the lever for actuating the air-admission valve being bifurcated in a plane parallel to the plane of movement of said arm; said lever presenting between its limbs, towards its axis of movement, a parallel-sided slot for engagement by said crank-pin, while beyond that end of the slot which is remote from said axis the limbs of the lever are outwardly curved symmetrically in opposite directions about centres which respectively

coincide with the axis of the ignition-control rod when the lever is in its extreme angular positions.

4. For use in an internal-combustion engine, an extra air admission valve having a rotary spindle, means for preventing angular movement of said spindle beyond the positions corresponding respectively with the fully closed and fully open positions of the valve, an ignition-control rod whereof the axis extends parallel with that of the valve-spindle, an arm on the ignition-control rod, a cam-lever on the valve-spindle having two limbs extending in the plane of rotation thereof, and a crank pin on said arm adapt-

ed to engage the mutually-opposed inner edges of said limbs; said inner edges, throughout that portion of their length which is nearest the valve-spindle, being parallel to one another at opposite sides of a radius from the axis of the valve-spindle and at such distance apart as just to admit the crank-pin between them, and, throughout the remainder of their length, being concavely curved respectively to radii struck from the axis of the ignition-control rod when the cam-lever occupies its corresponding limit positions, substantially as described.

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