

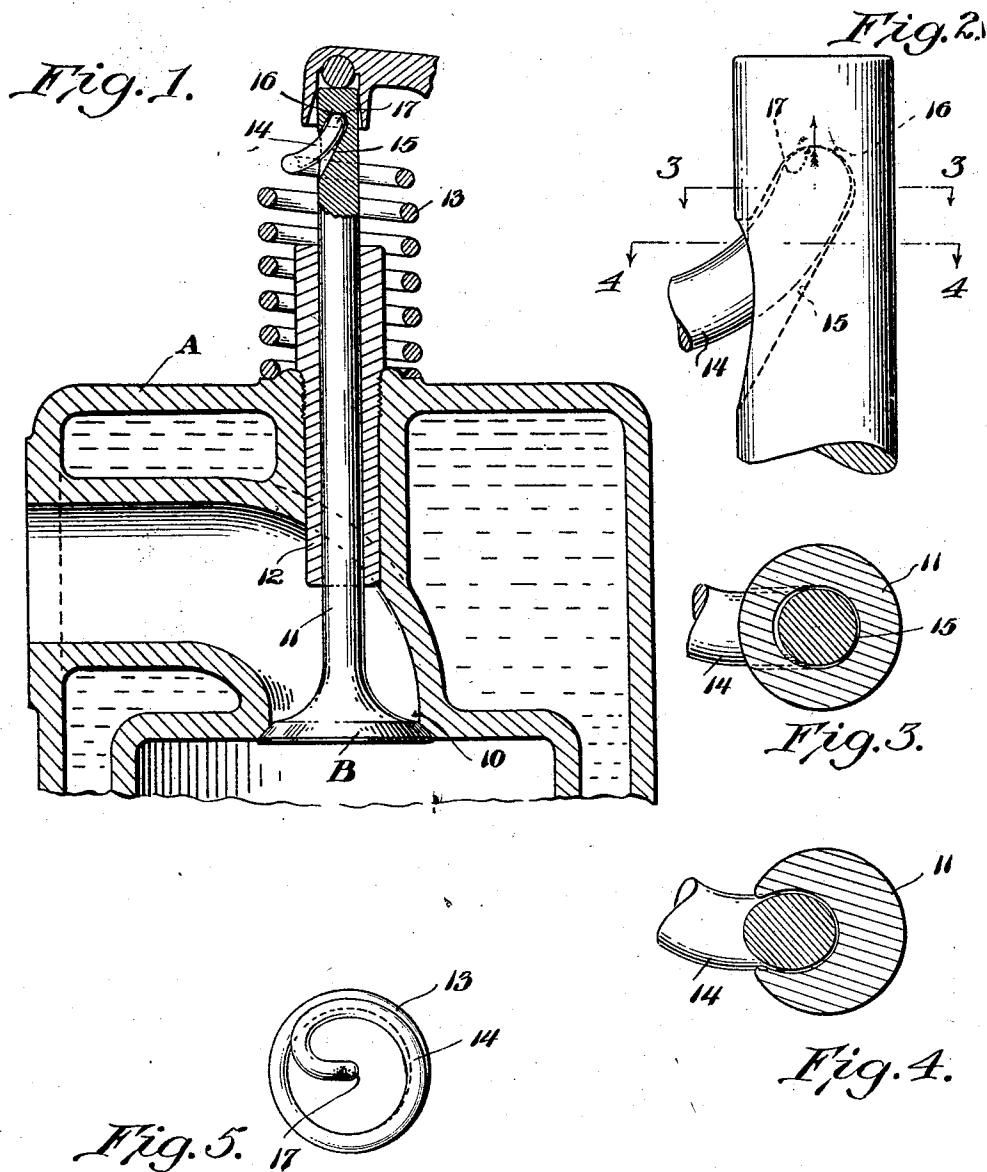
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VALVE SPRING CONNECTION

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VALVE-SPRING CONNECTION

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My invention relates to valve structures and particularly those of the "poppet" type extensively employed in internal combustion engines.

As is well known such valve structure employs a spring constantly urging the valve to closed position and it is the main purpose of my present invention to directly and detachably interengage the spring with the stem of the valve to thereby reduce the number of parts now required in such structures and at the same time to so effect the interengagement between the valve stem and spring that the valve closing force of the latter is utilized to maintain the assembly between the spring and valve, and at the same time permit the disassembly of such parts to be easily and simply accomplished. Other purposes and advantages of my invention will be hereinafter pointed out.

I will describe my invention as applied to the poppet valve of an internal combustion engine, but it will be apparent that the same can be employed in any poppet valve structure regardless of the nature of the device with which said structure is associated and that the same is susceptible to changes and variations by the exercise of only ordinary mechanical skill and without departing from the scope thereof.

In the drawings chosen to illustrate my invention, the scope whereof is set forth in the appended claims:

Figure 1 is a vertical section of the upper end of a cylinder of an internal combustion engine showing a poppet valve in accordance with my invention in association therewith;

Figure 2, an enlarged detail view of the connection between the valve stem and valve spring;

Figure 3, a section on the line 3—3 of Figure 2;

Figure 4, a section on the line 4—4 of Figure 2; and

Figure 5, a detail view looking toward the upper end of the spring.

Referring in detail to the drawing A indicates generally a cylinder head of an internal combustion engine having a port 10 controlled by a poppet valve B. This valve

embodies the usual stem 11 slidably mounted in a bearing 12 fixed in the upper end of the head A and whereby the valve B is movable by reciprocation to open and close the port 10 as is well understood. A coil spring 13 surrounds the stem 11 and has its lower end seated against the head A and from which latter it reacts to constantly urge the valve B to closed position as will hereinafter appear. The upper end of the spring 13 is reduced in radius and finally shaped to provide an upwardly inclined portion 14 which engages in a correspondingly inclined laterally opening hole or pocket 15 formed in the stem 11. The free end of the portion 14 presses against the bottom of the hole or pocket 15 to urge the valve B closed, it being of course understood that the spring 13 is under compression when assembled as shown in Figure 1. The cross dimension of the pocket 15 is slightly greater than the cross dimension of the portion 14 of the spring and the bottom of said pocket is in the form of a spherical dish 16 which is contacted by a spherical free end 17 of the portion 14 to provide a joint between the spring 13 and stem 11 permitting universal movement of the spring subject to the limitation imposed by the side wall of the pocket. The bottom 16 of the pocket 15 is positioned in the longitudinal axis of the stem 11 whereby the spring 13 exerts its force against a central spot of the stem and longitudinally of the latter.

The construction heretofore described is easily assembled and disassembled. To assemble, it is only necessary to hold valve B to its seat, place the spring 13 around the stem with the end portion 14 facing the mouth of the pocket 15. The spring is then compressed with any suitable tool until the free end of the portion 14 registers with the mouth of the pocket. The pressure on the spring is thereupon released when the portion 14 will automatically enter the pocket as the spring expands. To disassemble, the spring 13 is compressed and during such compression the portion 14 is automatically removed from the pocket 15. When such removal is complete the spring is manipulated to shift the portion 14 to one side of the

mouth of the pocket and then permitted to expand, the portion 14 being held out of the plane of the pocket until said portion moves above the mouth of the pocket.

5 My valve structure hereinbefore described possesses many advantages, some of which are as follows:

(a) The spring and valve stem maintain their own cooperative assembly without the
10 employment of any additional parts.

(b) The type of connection between the spring and stem is such that if the spring tends to produce a lateral resultant and thus cause undue friction between one side of the
15 stem and its bearing, such tendency can be easily eliminated by bending the end 14 in a direction opposite to such lateral resultant a sufficient amount to neutralize such tendency.

(c) The usual spring cap and spring cap retaining pin are dispensed with.

(d) The mass that has to be moved by the spring is lightened and the valve therefore
20 operated at a higher rate of speed.

25 I claim:

1. In a valve structure, a poppet valve including a stem having an inclined pocket therein, and a spring urging the valve to closed position and having one end thereof
30 projecting into said inclined pocket.

2. In a valve structure, a poppet valve including a stem having a laterally opening pocket therein whose entrance and bottom are respectively positioned at different locations along the stem, and a spring normally
35 contacting with the stem at the bottom of the pocket only and exerting a force against said bottom longitudinally of the stem to urge the valve in one direction.

3. In a valve structure, a poppet valve including a stem having a laterally opening pocket therein whose bottom is located in the axis of the stem and whose entrance and bottom are respectively positioned at different
40 locations along the stem, and a spring normally contacting with the stem at the bottom of the pocket only and exerting a force against said bottom longitudinally of the stem to urge the valve in one direction.

4. In a valve structure, a poppet valve including a stem having a laterally opening pocket therein whose entrance and bottom are respectively positioned at different locations along the stem, and a spring normally
45 contacting with the stem at the bottom of the pocket only and exerting a force against said bottom longitudinally of the stem to urge the valve in one direction, the contacting portions of the spring and stem being shaped to provide a ball and socket joint permitting
50 limited universal movement of the spring.

5. In a valve structure, a poppet valve including a stem having a laterally opening pocket therein inclined to the axis of the stem,
55 and a spring normally contacting with the

bottom of the pocket only and exerting a force against said bottom longitudinally of the stem to urge the valve in one direction.

6. In a valve structure, a poppet valve including a stem having a laterally opening
60 pocket therein inclined to and having its bottom located in the axis of the stem, and a spring normally contacting with the bottom of the pocket only and exerting a force longitudinally of the stem to urge the valve
65 in one direction.

7. In a valve structure, a fixed member, a poppet valve including a stem slidably mounted in the fixed member, said stem having a laterally opening pocket therein whose
70 entrance and bottom are positioned at different locations along the stem, and a coiled spring surrounding the stem with one end engaging the fixed member and its other end engaged in the pocket and contacting only
75 with the bottom thereof, said spring exerting a force longitudinally of the stem and against said pocket bottom to urge the valve in one direction.

8. In a valve structure, a fixed member, a
80 poppet valve including a stem slidably mounted in the fixed member, said stem having a laterally opening pocket therein whose entrance and bottom are positioned at different locations along the stem, and a coiled spring surrounding the stem with one end in
85 engagement with the fixed member and its other end engaged in and contacting with the bottom of said pocket, said pocket bottom and the last named end of the spring being
90 both located in the axis of the stem and substantially in the axis of the spring.

9. In a valve structure, a poppet valve including a stem having a laterally opening pocket therein inclined to the axis of the stem,
95 and a spring having one end engaged in said pocket and exerting a force constantly urging the said end thereof into the pocket to maintain the assembly between the valve and spring and to urge the valve in one direction.
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10. In a valve structure, a poppet valve including a stem, a spring for urging said valve to closed position, and a direct inter-fitting connection between one end of the
105 spring and the stem which includes surfaces on both the stem and spring inclined to the direction of the force of the spring and preventing lateral displacement of said spring end with respect to the stem.

In testimony whereof I hereunto affix my
110 signature.

DORSEY F. ASBURY.

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