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VALVE OPERATING MECHANISM

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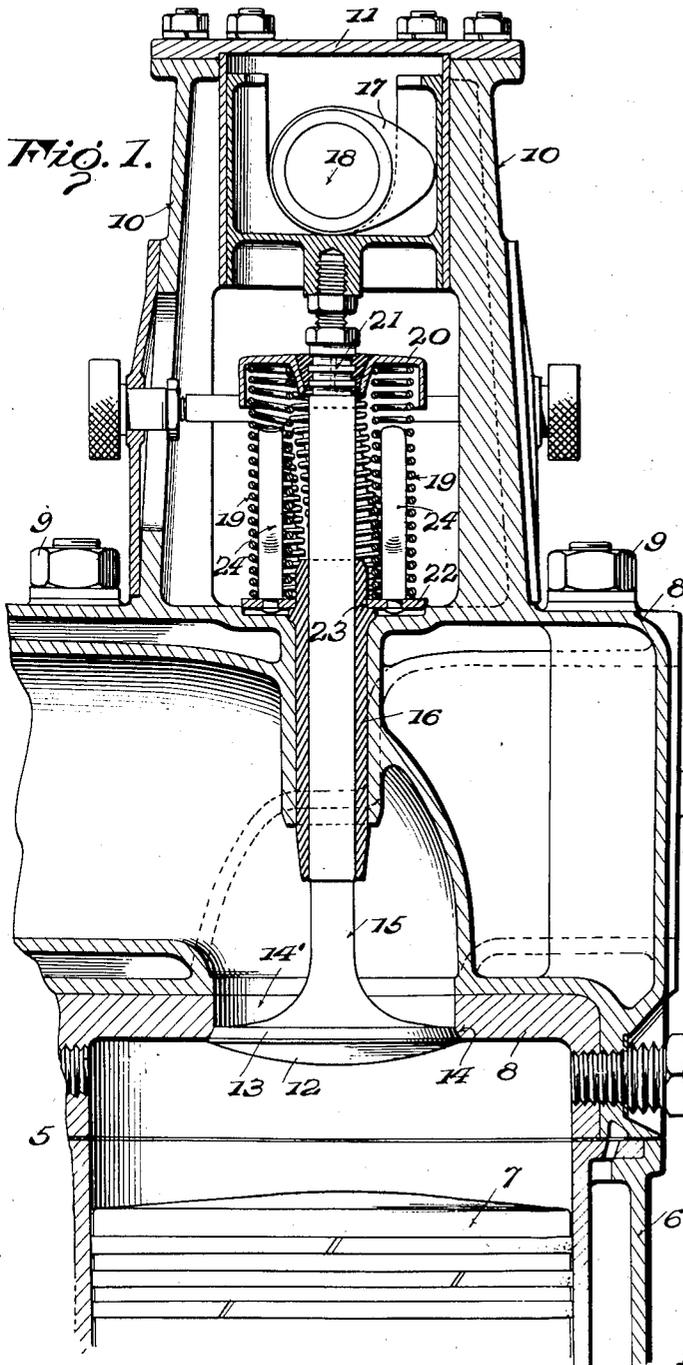


Fig. 2.

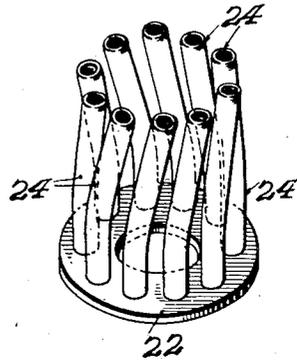
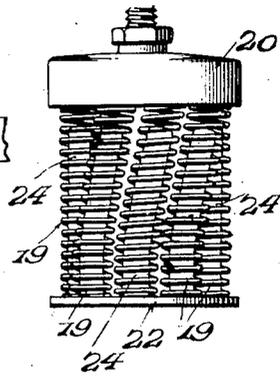


Fig. 3.



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VALVE-OPERATING MECHANISM.

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This invention relates to valve operating mechanism, and more particularly to mechanism for operating the valves of internal combustion engines or the like.

5 It has heretofore been proposed to provide valve operating mechanism for internal combustion engines wherein the valve is opened by a cam or the like and closed by a single spring surrounding the valve stem. It has
10 further been proposed, in order to more accurately seat the valve, to provide devices independent of the cam and spring for rotating the valve during operation of the same. Constructions such as above referred to,
15 however, have certain defects and disadvantages in that breaking of the valve spring or "setting" of the same causes failure of the valve operation and this, together with frequent failure of the valve rotating devices
20 to function properly, necessitates frequent repairs to or replacement of parts with the resulting decreased efficiency of the engine and increased cost of its maintenance.

The principal objects of this invention are
25 to provide a valve operating mechanism which overcomes the above-mentioned defects and disadvantages; which embodies a plurality of valve closing springs also serving to rotate the valve and thus produce better
30 seating of the same; which enables the valve spring load to be evenly distributed about the valve stem, while at the same time insuring rotation and closing of the valve at proper intervals; which affords frequencies
35 of the valve springs greater than the period of the engine, and guide means retaining the springs in position to rotate the valve; and which is an efficient, inexpensive and expeditious valve operating mechanism for internal combustion engines or the like.
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In order to more clearly understand this invention, reference may be had to the accompanying drawing which illustrates one embodiment of the inventive idea and wherein—
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Fig. 1 is a vertical section through a portion of an internal combustion engine, showing one embodiment of the present invention installed therewith;

50 Fig. 2 is a detail perspective view of guide means for the valve rotating and closing springs; and

Fig. 3 is a view similar to Fig. 2, showing the valve rotating and closing springs

mounted on their guiding and retaining means. 55

Referring to the drawing, wherein like reference numerals designate like parts throughout the several views, 5 indicates broadly an internal combustion engine having a cylinder 6 in which a piston 7 operates, and 8 indicates the cylinder head bolted or otherwise suitably secured at 9 on the upper end of the cylinder 6. The upper portion of the cylinder head has secured or integrally formed thereon opposed walls 10, 10
65 which, together with a removable cover 11 and the top of the cylinder head, form a housing for enclosing the valve operating mechanism to be hereinafter described. The valve, indicated at 12, is provided with an annular beveled surface 13 which engages an annular seat 14 beveled to fit the valve surface 13 and formed on the margin of an exhaust or other port 14' for the cylinder 6. 75
The valve 12 is further provided with a stem 15 which passes upwardly into the valve operating mechanism housing through a stationary valve guide 16 which also extends into said housing and is fitted in an opening formed in the cylinder head co-axially with the port 14'. A cam 17 or other suitable device engages the upper end of the valve stem and serves to open the valve at predetermined intervals during the operation of the engine. Said cam is fixed or formed on a cam shaft 18 journaled in any suitable manner on the upper part of the engine and driven in the usual or any desired way from the engine crank-shaft (not shown). 90

The valve opening and closing mechanism, as above stated, is disposed in the housing therefor at the upper part of the engine and, in accordance with the present invention, the valve closing mechanism is constituted by a plurality of springs 19, 19, disposed about the valve stem or axis of the valve and arranged so that they rotate as well as close the valve. The valve springs 19, 19 are relatively small as compared with the single valve-closing spring heretofore employed and, in addition to providing a more even distribution of the spring load on the valve stem, the springs 19, 19 may be coiled and constructed of untreated materials, so that the frequency of the springs is greater than the period of the engine at all speeds, and "setting" of the springs with attendant failure thereof thus
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avoided. In order to produce rotation of the valve as well as closing of the same, the springs 19, 19 are disposed in inclined positions about the axis of the valve, and as here-
 5 in shown the inclined springs 19, 19 are preferably arranged in an annular series surrounding the valve stem 15 and confined between a cup-shaped abutment 20 fixed on the movable valve stem at 21 and an abutment
 10 22 fixed on the stationary valve guide at 23. The abutments 20 and 22 are preferably arranged on the valve stem and valve guide concentrically thereof, and in accordance with the present invention, guide means are
 15 provided for retaining the springs 19, 19 in their inclined position between the abutments 20 and 22.

The guide means for the springs 19, 19 may be of any suitable construction, but, as
 20 herein shown, said means is preferably constituted by a plurality of inclined stationary guide pins 24, 24 on which the springs 19, 19 are mounted. The pins 24, 24 are disposed about the axis of the valve and, as
 25 herein shown, are riveted or otherwise suitably secured to the stationary abutment 22 so as to surround the valve stem 15. Any desired number of inclined guide pins and
 30 springs may be employed, but the same are preferably spaced closely together so as to provide an annular series of pins and springs surrounding the valve stem or axis of the valve and acting to rotate the valve during operation of the same. The springs
 35 19, 19 are preferably of greater length than the pins 24, 24 which support and anchor the same, and said springs as a unit have a twisting effect imparted thereto when the valve is operated which, together with frictional or other suitable engagement of the
 40 springs with the abutment 20, rotates the valve stem 15 and the valve 12.

The inclined pins 24, 24 are each preferably curved or bent to some extent so as to
 45 produce a spiral or helical formation thereof about the valve stem or axis of the valve, and this curving or bending of each of the pins 24, 24 produces a corresponding curvature of the springs 19, 19 so that the latter
 50 as a unit form in effect a composite annular spiral or helical spring structure which surrounds the valve stem or axis of the valve with the spring elements of said structure disposed in closely spaced relation
 55 on the periphery thereof and having an increased twisting effect imparted thereto during operation of the valve.

From the foregoing, it will appear that as
 60 the high part of the cam 14 engages the valve stem 15 to open the valve, the springs 19, 19 exert a torque on the valve stem thus rotating the stem and the valve to insure perfect seating of the latter in the continuous operation of the engine. It will further
 65 appear that, in addition to rotating and

closing the valve, the springs 19, 19 divide the load evenly about the axis of the valve, and that if one or more of these springs should become broken, the operation of the engine would not be materially affected. 70
 Moreover, the valve being both rotated and closed by the springs 19, 19, the necessity for independent valve rotating devices is avoided, while at the same time frequent failure of the valve operating mechanism is
 75 eliminated with the attendant increased efficiency of the engine. While the guide pins 24, 24 and valve rotating and closing springs 19, 19 are disclosed herein as having a curved or spiral inclination, it is to be expressly understood that pins and springs having a straight inclination may be provided and that the term "inclined" as employed in the specification and claims is, therefore, intended to cover any form of inclination of the pins or springs, or both, which will produce rotation of the valve. It will therefore appear that the accompanying drawing is for purposes of illustration only and that the invention may be embodied in a variety of mechanical expressions within the scope of the appended claims. 90

What is claimed is:—

1. In mechanism of the character described, the combination with a valve, of a plurality of valve rotating and operating spring disposed about the axis of the valve. 95

2. In mechanism of the character described, the combination with a valve, of a plurality of inclined valve rotating and operating springs disposed in an annular series around the axis of the valve. 100

3. In mechanism of the character described, the combination with a valve, of a plurality of valve operating springs disposed about the axis of the valve, and inclined means retaining said springs in position to rotate the valve. 105

4. In mechanism of the character described, the combination with a valve, of an annular series of valve operating springs surrounding the valve stem, and a plurality of inclined stationary guide devices retaining said springs in position to rotate the valve. 110

5. In mechanism of the character described, the combination with a valve, of a plurality of valve rotating and operating springs, and a plurality of inclined guide pins retaining said springs in an annular series surrounding the stem of the valve. 115

6. In a valve operating mechanism, means for opening the valve, and a plurality of valve rotating and closing springs disposed about the axis of the valve. 120

7. In a valve operating mechanism, means for opening the valve, and an annular series of valve rotating and closing springs surrounding the axis of the valve. 125

8. In a valve operating mechanism, means 130

for opening the valve, and a plurality of inclined valve closing springs disposed about the axis of the valve and adapted to rotate the same.

5 9. In a valve operating mechanism, means for opening the valve, a plurality of valve rotating and closing spring disposed about the axis of the valve, and means retaining said springs in inclined positions.

10 10. In a valve operating mechanism, means for opening the valve, an annular series of valve closing springs surrounding the axis of the valve, and inclined guide means for said springs retaining them in
15 position to rotate the valve.

11. In an internal combustion engine, the combination with a valve and means for opening the same, of a plurality of valve rotating and closing springs disposed about
20 the axis of the valve, and a corresponding number of inclined stationary pins on which said springs are mounted and retained in position to rotate the valve.

12. In an internal combustion engine, the combination with a valve and means for opening the same, of an annular series of valve rotating and closing springs surrounding the axis of the valve, and a plurality of inclined guide pins disposed about
30 said axis and on which the springs are mounted and retained in position to rotate the valve.

13. In a valve operating mechanism for internal combustion engines, means for opening the valve, a plurality of valve rotating and closing springs interposed between the cylinder head and the valve stem and disposed about the latter exteriorly of the same, and means retaining said springs in
40 inclined positions to rotate the valve.

14. In a valve operating mechanism for internal combustion engines, means for opening the valve, an annular series of valve rotating and closing springs interposed between the cylinder head and the valve stem and surrounding the latter, and inclined means retaining said springs in position to rotate the valve.

15. In a valve operating mechanism for internal combustion engines, means for opening the valve, an annular series of valve closing springs interposed between the cylinder head and the valve stem and surrounding the latter, and a plurality of guide
55 pins on which said springs are mounted and retained in inclined positions to rotate the valve.

16. In a valve operating mechanism, means for opening the valve, a pair of spaced abutments mounted one on the valve stem and one on a stationary part adjacent thereto, and a plurality of inclined valve rotating and closing springs interposed between said abutments and disposed about
65 the valve stem exteriorly of the same,

17. In a valve operating mechanism, means for opening the valve, a pair of spaced abutments mounted one on the valve stem and one on a stationary part adjacent thereto, and an annular series of inclined
70 valve rotating and closing springs surrounding the valve stem and interposed between said abutments.

18. In a valve operating mechanism, means for opening the valve, a pair of spaced abutments mounted one on the valve stem and one on a stationary part adjacent thereto, a plurality of valve closing springs interposed between said abutments and disposed about the valve stem exteriorly of the same, and means retaining said springs in inclined positions whereby they are caused to rotate the valve when the same is operated.

19. In a valve operating mechanism, means for opening the valve, a pair of spaced abutments mounted one on the valve stem and one on a stationary part adjacent thereto, an annular series of valve closing springs interposed between said abutments and surrounding the valve stem exteriorly of the same, and inclined guide means retaining said springs in position to rotate the valve when the same is operated.

20. In a valve operating mechanism, means for opening the valve, a pair of spaced abutments mounted one on the valve stem and one on a stationary part adjacent thereto, a plurality of valve closing springs interposed between said abutments and arranged about the valve stem exteriorly of the same, and a plurality of inclined stationary guide pins on which said springs are mounted and retained in position to rotate the valve when the same is operated.

21. In a valve operating mechanism, means for opening the valve, a pair of spaced abutments mounted one on the valve stem and one on a stationary part adjacent thereto, a plurality of valve rotating and closing springs interposed between said abutments, and a plurality of inclined stationary guide pins on which said springs are retained in position about the valve stem exteriorly of the same.

22. In a valve operating mechanism, means for opening the valve, a pair of spaced abutments mounted one on the valve stem and one on a stationary part adjacent thereto, a plurality of valve-closing springs interposed between said abutments, and a plurality of bent stationary guide pins on which said springs are retained in an annular series surrounding the valve stem and adapted to rotate said stem and the valve.

23. In a valve operating mechanism, means for opening the valve, a plurality of inclined stationary guide pins disposed about the valve stem exteriorly of the same, and a plurality of inclined valve rotating
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and closing springs mounted on said guide pins and interposed between the valve stem and a stationary part adjacent thereto.

24. In a valve operating mechanism, means for opening the valve, a pair of spaced abutments mounted one on the valve stem and the other on a stationary part adjacent thereto, a plurality of inclined guide pins secured to one of said abutments and disposed about the valve stem exteriorly of the same, and a plurality of valve rotating and closing springs interposed between said abutments and mounted on the inclined guide pins.

25. In a valve operating mechanism, means for opening the valve, a pair of spaced abutments mounted one on the valve stem and the other on a stationary part adjacent thereto, an annular series of inclined guide pins surrounding the valve stem and secured on one of said abutments, and a corresponding number of valve rotating and closing springs interposed between said abutments and retained in inclined positions on the guide pins.

26. In mechanism of the character described, the combination with a valve, of a plurality of valve rotating and operating springs forming a composite spiral or helical structure surrounding the axis of the valve.

27. In mechanism of the character described, the combination with a valve and means for opening the same, of a plurality of valve rotating and closing springs, and

spiral retaining means for said springs confining them in the form of a composite spiral structure surrounding the axis of the valve.

28. In mechanism of the character described, the combination with a valve, of valve rotating and operating springs, and means disposed spirally about the axis of the valve and on which the springs are retained to form a composite spiral structure having the springs disposed around the periphery thereof.

29. In mechanism of the character described, the combination with a valve, of a plurality of spaced devices disposed spirally about the axis of the valve, and a corresponding number of springs retained on said devices to form a composite spiral valve rotating and operating structure having the springs disposed around the periphery thereof.

30. In mechanism of the character described, the combination with a valve and means for opening the same, of a plurality of stationary spaced pins disposed spirally about the axis of the valve, and a corresponding number of valve rotating and closing springs retained on said pins to form a composite spiral structure having the springs disposed about the periphery thereof.

In testimony whereof I have signed this specification.

LIONEL M. WOOLSON.