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COMBINATION INTAKE AND EXHAUST VALVE FOR FOUR CYCLE ENGINES

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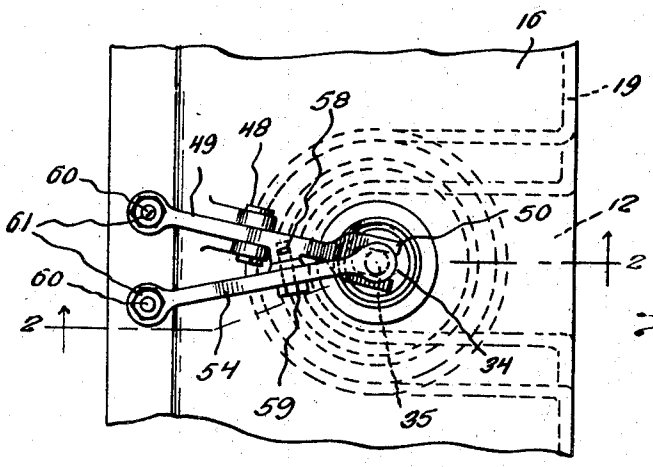

Fig. 1.

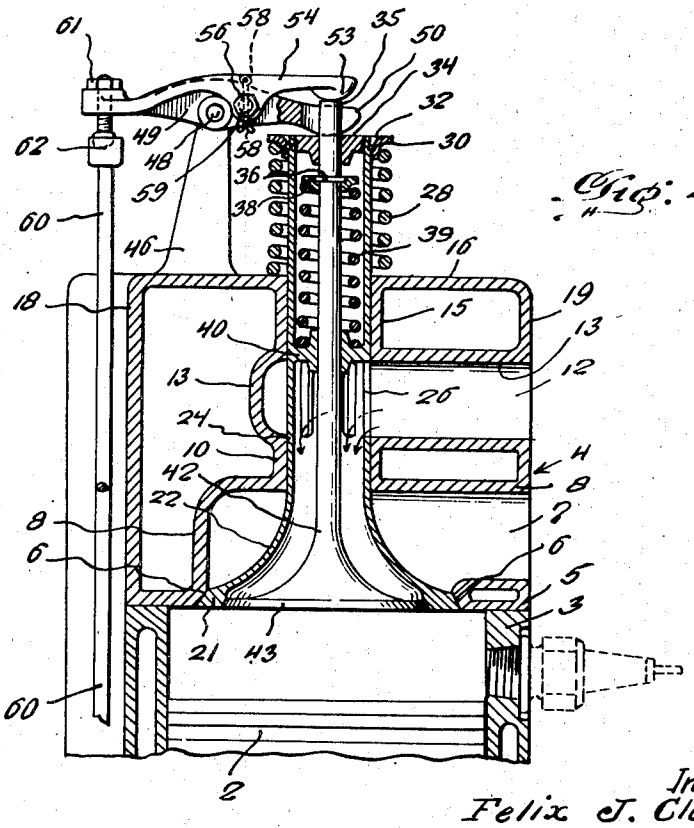

Fig. 2.

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COMBINATION INTAKE AND EXHAUST VALVE FOR FOUR-CYCLE ENGINES

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1 Claim. (Cl. 123—79)

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This instant invention relates to improvements in the intake and exhaust valve mechanism of internal combustion engines of four strokes in a cycle.

The main object of the invention is the provision of a mechanism of the class described and comprising intake and exhaust valves in telescoped relation and of larger than usual size without the necessity of enlarging the combustion chamber.

Another object of the invention is to provide such a valve mechanism in which the intake valve is within the exhaust valve with the result that the latter is cooled by the entering fuel gases and therefore does not expand as much thermally as the exhaust valves of the prior art. The larger size of the exhaust valve permits a quicker escape of the exhaust gases which results in an increase in speed and power without an increase in the consumption of fuel.

With these and other objects in view the invention consists in the novelty of construction, combination and arrangement of parts specifically hereinafter described and claimed in the appended claim.

For a complete understanding of the invention the description should be read in connection with the accompanying drawing wherein:

Figure 1 is a top plan view of a fragment of an internal combustion engine embodying the preferred form of my invention;

Figure 2 is a transverse section on line 2—2 of Figure 1.

Referring to drawing (Fig. 2) numeral 2 denotes a piston slidable within a cylinder 3 formed in a cylinder block and having spaced walls for a water jacket and closed at the top by a head block 4. The same has in its bottom wall 5 a frusto-conical valve seat opening 6 communicating with the inner portion of a laterally extending exhaust port 7 within an interior wall 8.

In the upper intermediate part of this wall is an opening bounded by the lower end of an upwardly extending cylindrical wall 10 enclosing a space which is in communication with the inlet port 12 bounded by a wall 13. The same extends substantially outwardly of the cylindrical wall 10 for a purpose which will become clear as the description proceeds. The upper and inner part of wall 13 has an opening registering with the opening in its lower and inner part which latter opening forms the communication between the inlet port and the space enclosed by the cylindrical wall 10. The upper opening in wall 13 establishes communication between the inlet port and the space

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surrounded by a second cylindrical wall 15 aligned with the wall 10 and integral at its upper end with an exterior top wall 16. The same is joined at its left-hand end to a side wall 18 and at its right-hand end to a side wall 19 with openings for the inlet and exhaust ports. The space between walls 4, 8, 10, 13, 15, 16, 18 and 19 serves as a water jacket.

During the intake stroke of the piston the frusto-conical opening 6 of the exhaust port is occupied by the correspondingly shaped rim 21 at the lower end of the substantially bell-shaped section 22 of the exhaust valve body which section merges at its upper end into the lower end of a cylindrical section 24. The bell section of the exhaust valve is spaced from the wall 8 of the exhaust port while the cylindrical valve section has a close fit within the cylindrical walls 10 and 15.

The intermediate part of the cylindrical exhaust valve section is aligned with the inlet port and is surrounded by the fuel gases which enter through elongated slits 26 into the interior of the exhaust valve. The valve section 24 extends through and above the top wall 16 of the head block and is partly surrounded by a compressive spring 28 seated with its lower end upon said wall and bearing with its upper end against the lower substantially conical washer 30 which is held on the top end of the exhaust valve section 24 by a spring ring 32 seated in a groove formed upon the exterior of said section.

The upper end part of the cylindrical exhaust valve section 24 is interiorly threaded for engagement by an annular valve rod guide 34 in which the rod 35 of the intake valve is guided. Transversely of the valve rod 35 is disposed a pin or key 36 which functions as a holding means of a washer 38. A spring 39 bears with its upper end against the lower surface of washer 38, encircles the rod 35 and bears with its lower end against a spring abutment 40 integral or secured to the inside of the cylindrical exhaust valve section 24 above the intake slits 26. This abutment also functions as a guide for the intermediate part of valve rod 35 which extends coaxially through the valve section 24 and forms therewith a space for the fuel gases entering through said slits and carries at its lower end a bell-shaped portion 42 including a frusto-conical bottom part 43 fitting into a corresponding opening in the rim 21 of the exhaust valve.

The exhaust valve spring 28 must be stronger than the intake valve spring 39 so that when the intake valve spring 39 is compressed by the in-

take rocker arm 54, this will not open the exhaust valve.

A spark plug 45 is screwed into the solid upper wall of the piston.

A bracket 46 rises from the top wall of the head block and has upper bifurcated ends provided with registering holes for a fulcrum pin 48 on which a lever 49 is fulcrumed. The right-hand arm of the same has a claw-shaped end 50 the claws of which are disposed on opposite sides of the intake valve rod and have cam surfaces on their lower sides. These cam surfaces engage the valve rod guide screwed into the upper end of the cylindrical exhaust valve section to force said valve from its seat 6 and simultaneously depress the intake valve without moving it from its seat.

The latter valve may be actuated by the engagement of a cam 53 on the lower side of the inner end of a lever 54 with the upper end of the inlet valve rod. This lever is fulcrumed intermediate its ends upon a bolt 56 which is inserted with one end into a socket in the lever 49 and located to the right of the fulcrum bracket 46. The bolt is held in the socket against turning by a cotter key 58 and carries upon its free end a nut 59.

The outer or left-hand ends of the valve levers 49, 54 are provided with screw holes each receiving the upper end of a push rod 60. Each push rod has a nut 61 at its upper end and above its cooperating lever and a ball-and-socket joint 62 below the same. The lower ends of these push rods are actuated by a timing gear mechanism (not shown).

During the intake stroke of the piston the intake valve is depressed and opened by clockwise turning of lever 54 and a charge of fuel admitted to the cylinder. The charge is exploded by the spark plug and during the ensuing scavenging stroke of the piston the exhaust valve and intake valves are depressed and the former moved from its seat so that the exhaust gases can escape while the intake valve remains on its seat owing to the fact that the intake valve spring 39 is seated on the exhaust valve. The cam on lever 54 follows the rod of the intake valve rod as a result of the fact that such lever is fulcrumed on the lever 49 and to the right of the fixed fulcrum 46 therefor.

The fuel gases in the space between the interior of the bell-shaped exhaust portion and the correspondingly shaped intake valve section cool these parts. The springs and valve operating levers are located at a distance from the passages through which the exhaust gases pass.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limited sense.

What I claim is:

In a combination intake and exhaust valve for internal combustion engines, the combination, which comprises an engine head having a vertically disposed valve chamber extending therethrough with separated intake and exhaust laterally disposed openings communicating therewith, an exhaust valve having a tubular sleeve slidable in said valve chamber with a horizontally disposed bearing partition intermediate the ends thereof and radially disposed openings in the wall thereof below said partition, said tubular valve sleeve having a peripheral flange around the extending outer end, a compression spring around said tubular valve sleeve positioned between the peripheral flange and surface of the engine head, an intake valve having a stem slidably mounted in the sleeve extending through a bearing in the partition thereof, a collar on said valve stem spaced from the partition, a compression spring around said valve stem between the collar thereon and the horizontally disposed partition, a rocker arm pivotally mounted on the engine head positioned to actuate said exhaust valve, said rocker arm having a yoke at the end with arms thereof straddling the stem of the intake valve, and a rocker arm pivotally mounted on the rocker arm of the exhaust valve engaging the end of the stem of the intake valve for actuating said intake valve.

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