L. IVERSEN.

VALVE FOR BLOWING ENGINES.

APPLICATION FILED DEC. 30, 1910.

1,012,359.

Patented Dec. 19, 1911.

2 SHEETS—SHEET 1.

FIG.1.

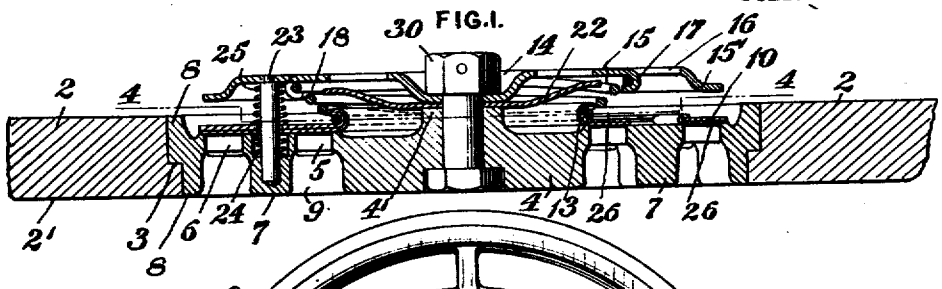


FIG.2.

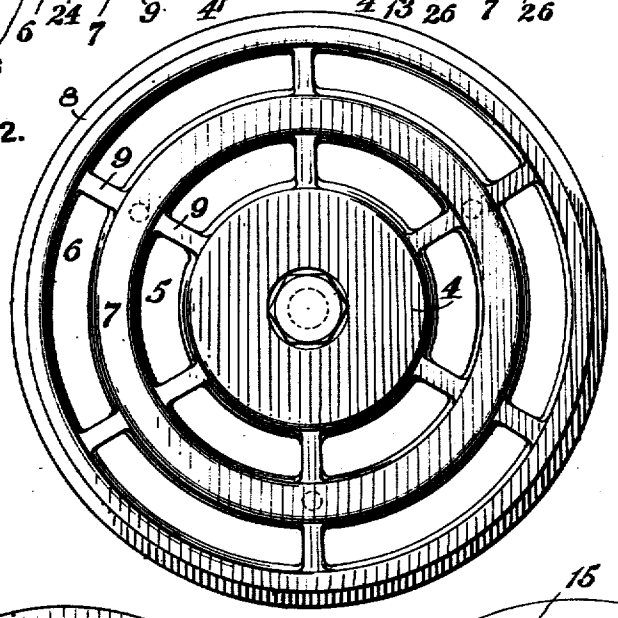


FIG.3.

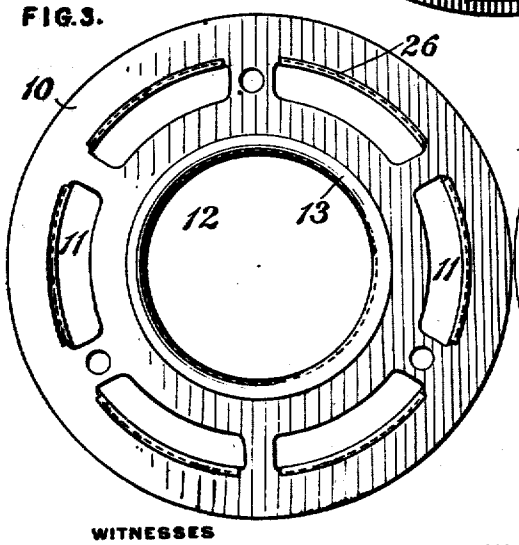
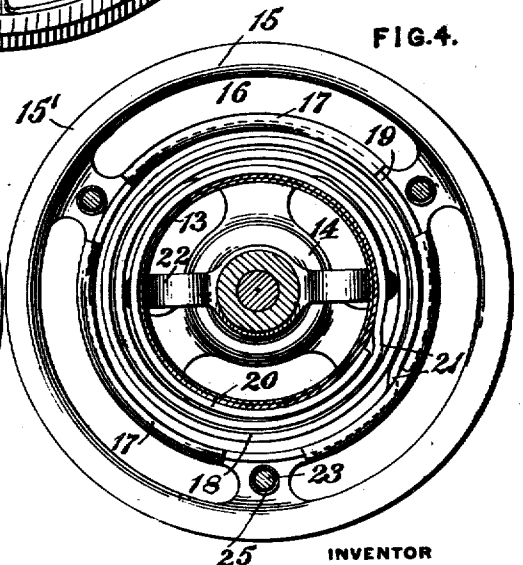


FIG.4.



WITNESSES

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FIG.9.

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2 SHEETS—SHEET 2.

FIG.5.

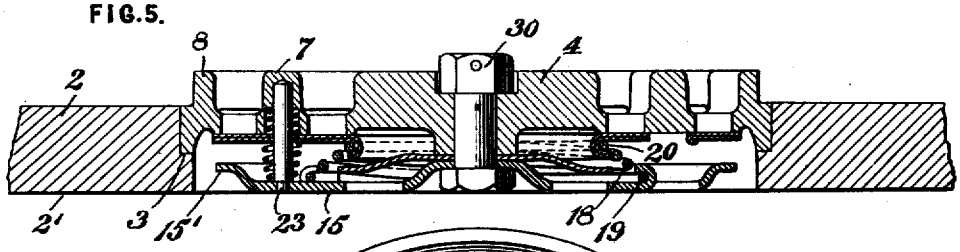


FIG.6.

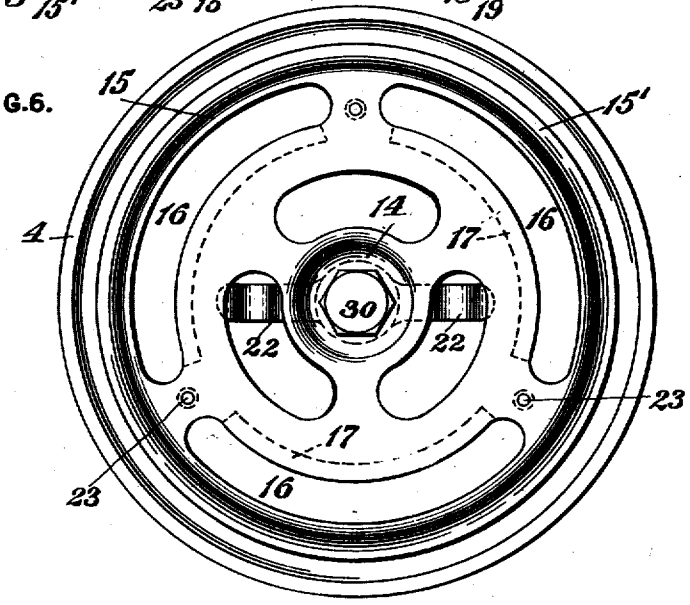


FIG.7.

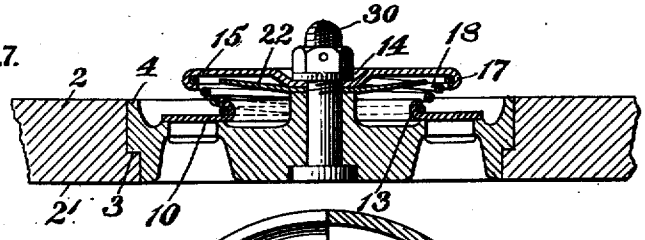
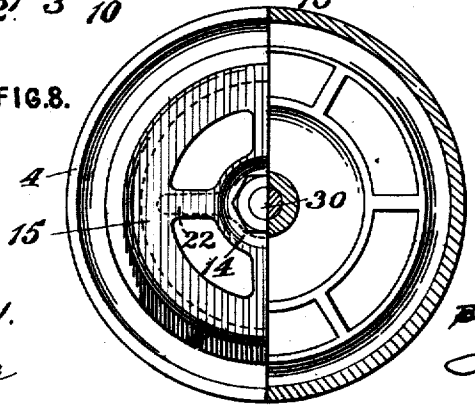


FIG.8.



WITNESSES

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UNITED STATES PATENT OFFICE.

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VALVE FOR BLOWING-ENGINES.

1,012,359. Specification of Letters Patent. Patented Dec. 19, 1911.

Application filed December 30, 1910. Serial No. 600,140.

To all whom it may concern:

Be it known that I, LORENZ IVERSEN, a resident of West Homestead, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Valves for Blowing-Engines, &c., of which the following is a specification.

The primary object of this invention is to provide a sensitive and highly efficient spring-supported valve for blowing engines, compressors, etc., in which friction is avoided, and in which the valve-supporting spring element is serviceable for an indefinite period without wear or danger of breaking down.

A further object is to provide improved means for cushioning the valve at it approaches the opening and closing limits of its movement.

Still another object is to simplify and thereby minimize the cost as well as danger of derangement.

A further purpose is to provide a construction that may be used interchangeably for inlet and outlet purposes by simply reversing its position in the head or other cylinder wall.

The invention consists in the novel features of construction, and combination of parts, hereinafter fully described and claimed and illustrated by the accompanying drawings, wherein—

Figure 1 is a vertical cross-section of the improved valve mechanism mounted for outlet duty. Fig. 2 is an inverted plan of the ported valve seat. Fig. 3 is a top plan of the plate valve. Fig. 4 is a sectional plan, inverted, on line 4—4 of Fig. 1. Fig. 5 is a vertical section similar to Fig. 1, with the valve mechanism in inverted position for duty as an inlet valve, and Fig. 6 is a top plan of the same. Fig. 7 is a vertical section of an arrangement of my improved valve mechanism without some of the attachments shown in Figs. 1 and 5, and Fig. 8 illustrates the construction of Fig. 7 partly in top plan and partly in sectional plan. Fig. 9 is a detail of the valve-supporting spring.

Referring to the drawings, 2 is a portion of the head or other wall-part of the cylinder of a blowing engine, compressor, etc., which is formed with a series of annular openings each shouldered circumferentially at 3 to form an abutment for the similarly shouldered valve seat or body 4. In the adaptations of Figs. 1, 2 and 5, the body is formed with two annular series of ports 5 and 6, one within the other, with the separating rib 7 and the outer rim portion 8 connected to the central body portion by the radial ribs or webs 9. The top surface of the body adjacent ports 5 and 6 is faced to receive the plate valve 10. The valve is cut out at 11 where it covers annular rib 7 to increase the air passage area when the valve is open. The center of the plate valve is cut away to form circular opening 12, with the edge of the metal curled or bent to form the annular hook-like flange 13.

Body 4 is formed with central hub-like projection 4′ which provides a seat for the central depressed portion 14 of the annular stop and spring holder 15, secured thereto by bolt 30, the holder being thus spaced away from the valve seat, with the valve located and operating in such space. Holder 15 is flanged peripherally at 15′ to form a stop for limiting the opening movement of the valve. Inwardly from flange 15′ the holder is slotted annularly at 16, with the edges of the slots turned to form hook-like flanges 17. The diameter of the circle of flanges 17 is somewhat larger than that of flange 13 of the valve. Interposed between the valve and part 15 is the tapered spiral spring 18, having its larger end-convolution 19 confined in hooks 17, while the opposite and smaller end convolution 20 is confined in flange 13 of the valve. The spring is preferably so shaped that its end convolutions are parallel, as shown in Fig. 9, and lie in these flanges, the coil being offset abruptly at 21 where it merges into the intermediate convolutions. With the valve thus mounted its entire weight is carried by spring 18 and it is also guided by the spring, there being no fixed guides for the development of friction and on which the valve may stick. If desired, a leaf-spring 22 may be positioned to cushion the valve before it strikes stop 15′.

Body 4 and spring holder 15 may be connected by posts 23 which confine cushioning springs 24 and 25 at opposite sides of the valve for further relieving it from shock in its reverse movements. It will be understood, however, that the posts and their springs may be omitted, for instance as shown in Figs. 7 and 8, without in any way detracting from or modifying the principle of operation underlying the spring-

carried and spring-guided valve. The openings through the valve for the posts are preferably larger than the latter so that they need not necessarily perform any valve-guiding function, though if desired they may be so utilized in valves of large size.

Liner plates 26 may be applied to the seating face of the plate valve, the edges of such liners being flanged to embrace the edges of the main valve, as shown.

With the valve-carrying spring 18 tapered, its convolutions nest one within the other as the valve opens so that it stiffens and the spring-pressure increases as the valve opens, due to the successive convolutions, beginning with the largest, engaging plate 15 and becoming inactive. The result is that the valve when seated has the benefit of all the convolutions and is quite sensitive and opens quickly, and as the spring is stiffest when the valve is fully open or nearly so it closes promptly when free to do so, the closing movement beginning before all of the air has passed. When it is remembered that these valves operate fully in a fraction of a second of time, the utility of the arrangement will be appreciated, the pressure which resists opening rising rapidly with the opening movement and falling as rapidly as the valve closes. Furthermore, the tapered spring is much more compact and requires less room than a cylindrical coil, and with its end convolutions parallel the pressure is the same on all portions of the valve so that there is no tipping or twisting tendency.

A distinctive feature of the invention is the facility with which the valve mechanism may be used interchangeably for inlet and outlet purposes, as is clearly shown in Figs. 1 and 5. In both uses, the cylinder head or other wall part provides the necessary abutment for the valve seat, in the case of the outlet valve, Fig. 1, the shoulder on the periphery thereof seating against shoulder 3, while when the valve is reversed, as in Fig. 5, rim 8 bears on said shoulder. In each instance, the entire valve mechanism does not project beyond the lower or inner plane 2′ of wall 2, and if that wall is a cylinder head none of the piston space is occupied by any part of the valve mechanism.

The entire device is of the simplest possible construction. The valve proper and the combined stop and spring holder are each cut and pressed from plate metal, no machining being necessary. The improved construction affords maximum port with minimum cylinder clearance.

I claim:—

1. In a valve for blowing engines, the combination of a valve seat, a valve-seating spring, a holder for the spring, and a plate valve formed with struck-up portions bent over and confining the spring.

2. In a valve for a blowing engine, the combination of a valve seat, a valve-seating coiled spring, a holder for the spring spaced from the valve seat, a plate valve operative between and unguided by either the holder or seat, the valve having struck-up portions bent over and confining an end convolution of the spring.

3. In a valve for blowing engines, the combination of a valve seat, a valve seating coiled spring, a holder for the spring, and a plate valve operative between the holder and seat with a passage formed through the valve, the valve having a struck-up portion which is bent over and confines an end convolution of the spring.

4. The combination of a valve seat, a valve formed of a single piece of plate metal having a struck-up spring-confining portion, a spring holder, and a coiled spring confined by the holder and bearing against the valve with an end convolution of the spring secured to the valve by the struck-up portion of the latter.

5. In a blowing engine, the combination of a valve seat, a plate valve having an edge struck-up and bent to confine a spring convolution, a spring holder spaced from the valve seat and having a portion turned oppositely to the struck-up edge of the valve, and a coiled spring having its opposite end convolutions confined respectively in the oppositely turned portions of the valve and holder.

6. The combination of a valve seat having a plurality of series of ports, a valve covering all the series, the valve being ported intermediate the portions thereof which cover the seat ports, and a valve supporting and valve guiding coiled spring holding the valve normally seated.

7. The combination of a valve seat having two circular series of ports—one within and spaced from the other, a valve of ring form covering both series, the valve being ported annularly intermediate the portions thereof which cover the seat ports, and a valve supporting and valve guiding coiled spring holding the valve normally seated.

8. The combination of a valve seat, a valve, an abutment, and a coiled spring interposed between the abutment and the valve and having end convolutions which are parallel with the surfaces of the abutment and valve which they engage, said end convolutions having offsets where they merge into the intermediate convolutions.

9. The combination of a valve seat, a valve, an abutment, and a coiled spring interposed between the abutment and the valve and having end convolutions which are parallel with each other and with the surfaces of the abutment and valve which they

engage, said end convolutions having offsets where they merge into the intermediate convolutions.

10. The combination of a valve shaped to immovably confine the flat end convolution of a coiled spring, a spring holder shaped to immovably confine the flat end-convolution of a coiled spring, and a coiled spring having flat end convolutions which are parallel with each other and which are immovably held by the holder and valve respectively.

11. The combination of a valve seat, a valve, a spring holder, a coiled spring held in position by the holder, and a valve supported and guided wholly by the coiled spring, said spring having flat end convolutions which are immovably secured to the holder and valve respectively.

12. The combination of a valve seat, a plate valve formed to provide lips which are bent over and confine a spring, and a spring for the valve secured thereto by said lips.

13. The combination of a valve seat, a plate valve of ring form having its inner and outer peripheries spaced from fixed parts with the valve wholly supported and guided by a coiled spring, the valve formed to provide lips which are bent over and confine a spring, and a spring for the valve secured thereto by said lips.

14. The combination of a valve seat, a plate valve cut to form lips which are bent over and confine a spring, a plate metal spring holder cut to form lips which are bent over and confine a spring, and a coiled spring interposed between the holder and valve with its opposite end convolutions confined by said bent lips.

15. The combination of a valve seat, a plate valve having struck-up portions, and a single tapered coiled valve-carrying and valve-guiding spring supported adjacent to the valve and secured thereto by the struck-up portions of the valve.

16. The combination of a valve seat, a valve having struck-up portions, a spring-holding device spaced from the seat, and a single tapered coiled valve-supporting and valve-guiding spring held by said device and bearing on the valve and secured thereto by the struck-up portions of the valve.

17. The combination of a valve seat, a valve, a holding device spaced from the seat, a coiled spring in said space and secured to and supporting the valve, and supplemental valve cushioning springs.

18. The combination of a valve seat, a valve, a coiled spring supported concentrically with the valve and bearing thereon, stop means for limiting the opening movement of the valve, and spring cushioning means normally out of engagement with the valve but engaged by the latter before it engages the stop means.

19. The combination of a valve seat, a valve, a coiled spring supported concentrically with the valve and secured thereto and supporting the valve, and supplemental cushioning springs at opposite sides of the valve for cushioning its opening and closing movements.

20. The combination of a valve seat, a valve formed with apertures, a valve stop spaced from the seat, posts extending from the seat to the stop through the valve apertures, and cushioning springs on the posts at opposite sides of the valve.

21. The combination of a valve seat, a plate valve formed with a central annular opening with the edge of the metal of said opening bent to confine a spring, and a coiled spring supported centrally of the valve and secured to the bent edge thereof.

22. The combination of a valve seat, a plate valve formed with a central annular opening with the edge of the metal at said opening bent to confine a spring, a liner for the seating face of the valve having a bent edge complementary with and engaging the bent edge of the valve, and a coiled spring supported centrally of the valve and secured to the bent edge thereof.

23. The combination of a cylinder wall having an annular opening, a valve seat adapted to fit in reverse positions in the opening, a valve movably mounted on the seat, and means for securing the valve seat in the wall opening in either of its reverse positions without projecting any portion of the valve mechanism beyond the inner plane of said wall.

24. The combination of a cylinder wall having an annular peripherally shouldered opening, an annular valve seat, a valve movably mounted on the seat at one side thereof, the valve seat having two peripheral surfaces adapted to bear interchangeably on the shoulder of said wall opening, said two surfaces and the said shoulder being so spaced and located that no part of the valve or seat project beyond the plane of the inner face of the said wall.

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

LORENZ IVERSEN.

Witnesses:
J. M. NESBIT,
F. E. GAITHER.