E. W. STEVENS.

PROCESS AND APPARATUS FOR SCAVENGING INTERNAL COMBUSTION ENGINES.

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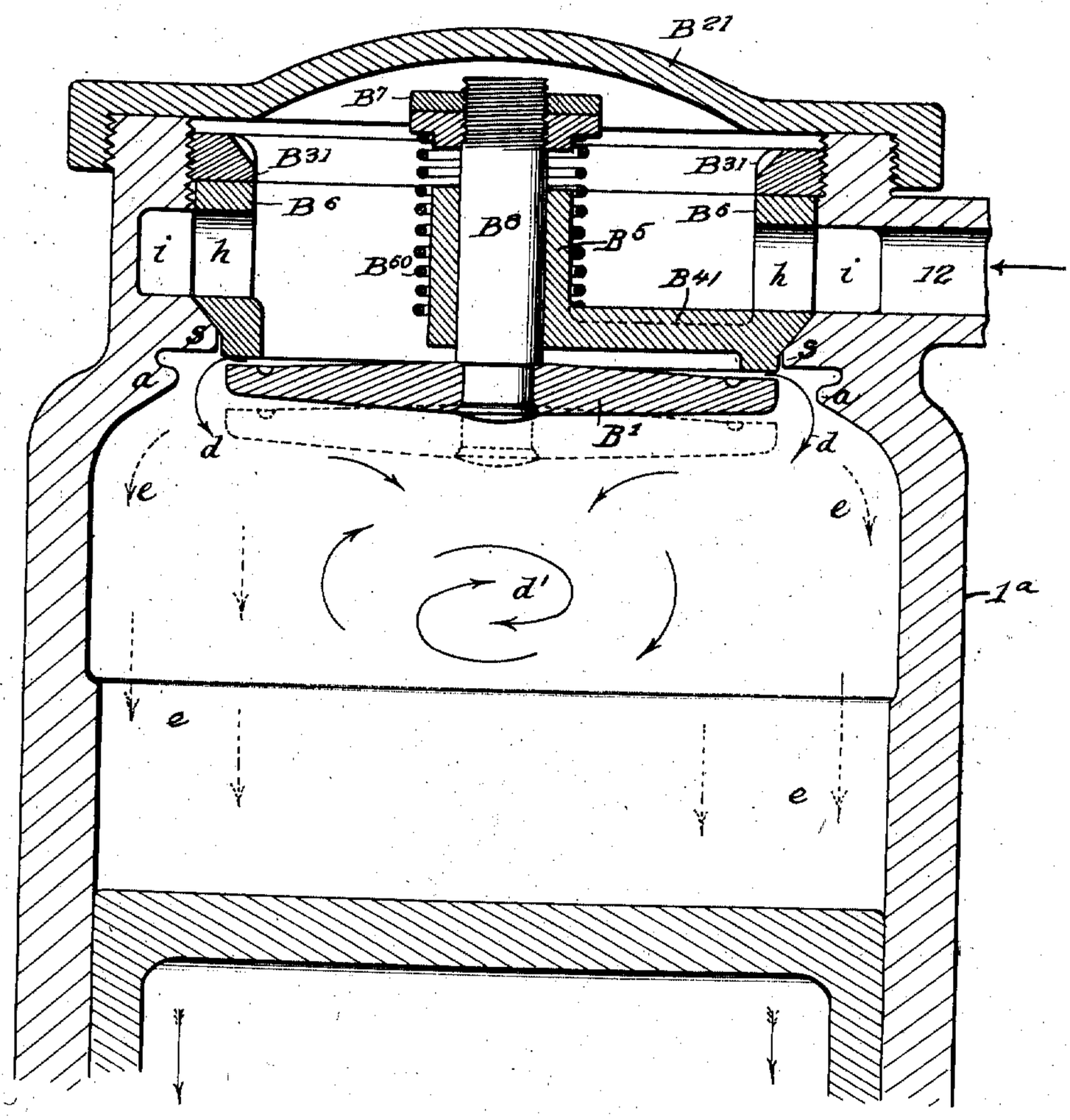
990,604. **Patented Apr. 25, 1911.**



Witnesses

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PROCESS AND APPARATUS FOR SCAVENGING INTERNAL-COMBUSTION ENGINES.

990,604. Specification of Letters Patent. Patented Apr. 25, 1911.

Original application filed July 16, 1909, Serial No. 507,925. Divided and this application filed August 6, 1909. Serial No. 511,532.

To all whom it may concern:

Be it known that I, ELBRIDGE W. STEVENS, a citizen of the United States, residing at Baltimore city, in the State of Maryland, have invented certain new and useful Improvements in Processes and Apparatus for Scavenging Internal-Combustion Engines, of which the following is a specification, the same being a divisional application of my original application filed July 16, 1909, Serial No. 507,925.

In the scavenging of the burned gases from the combustion chamber of internal combustion engines, it is very necessary in securing the highest efficiency of the engine, to completely discharge all the burned gases, or products of combustion, before introducing the next fuel charge, for otherwise the remnants of such gases prevent the proper filling of the combustion chamber with the full volume of the next charge and such remaining spent gases, being inert, dilute the charge and lower its efficiency. In two-cycle engines especially does this difficulty exist, since the conditions of its operation involve either imperfect scavenging on the one hand, or the loss of a considerable part of the combustible fuel charge on the other.

This invention is designed to secure a perfect scavenging of the burned gases, and to that end it embodies a process of scavenging by an introduced volume of air which has two phases of displacement of the gases, one following the other and acting in continued sequence, that is to say, the initial introduction of the air is discharged into a central zone of the combustion chamber and this inflowing stream is immediately afterward diverted into the other or outer concentric zones, to completely sweep out all the burned gases.

This process is carried out in a simple and practical way by an adaptation of the end of the combustion chamber to the opening movement of the air intake valve, as hereinafter more fully described with reference to the drawing, in which, the figure is a vertical section of the top part of a two-cycle gas engine cylinder with a spring-seated intake air valve at the top which opens by suction as air is drawn in to effect the scavenging.

In the drawing a cover B^{21} is screwed to the top of the explosion cylinder 1^a. A ring-shaped valve seat B^6 is detachably held in the top of the explosion cylinder and has a radial projection B^{41} extending to the center and terminating in an upright sleeve B^5. The valve seat has a beveled edge *s* that rests upon a corresponding beveled shoulder on the inner edge of the cylinder and a screw threaded retaining ring B^{31} is screwed into an interior screw thread in the upper end of the cylinder and holds the valve seat B^6 in place.

B^1 is the air inlet valve of large size, nearly filling the upper end of the cylinder. This has a stem B^8 extending up through the sleeve B^5 and is provided with a cap or nut B^7 against which bears a spiral spring B^{60} which holds the valve B^1 up against its seat.

In the interior of the cylinder, at the top and immediately adjacent to the valve seat, is a circular groove or enlargement of the cylinder forming an inwardly projecting circular lip *a* which is concentric with the valve seat and just a little below the same but of larger diameter than the valve.

12 is the pipe through which compressed air enters the cylinder. As the air is forced or sucked in through pipe 12, it passes into an annular channel in the cylinder and through the holes *h* in the valve seat B^6 and forces open the valve B^1. At the first downward movement of this valve, the air issues in a circular radiating sheet into the groove formed above the lip *a* and is immediately deflected inwardly again, by the lip, toward the center, as shown by the full line arrows *d* and the converging currents produce a vortex or whirlwind action at d^1 down through the central zone or core, so to speak, of the cylinder, and as the valve B^1 opens wider to the dotted position, it passes the deflector lip *a*, as shown by the dotted lines, since it is of smaller diameter than said lip and has a range of movement past it, and then the air, without any inward deflection, passes down through the outer zone of the cylinder, as indicated by the dotted arrows *e*, so that the result attained is a complete sweeping out of the whole cross section of the cylinder, by two phases of air currents, first by a central vortex blast, immediately and automatically followed by a change in direction to an enlarged annular zone that makes a perfect cleaning out of the burned gases.

In the construction shown it will be seen

that the first incoming air currents are thrown to the central axial zone by the lip *a* followed by other air currents in an outer annular coaxial zone. I do not confine myself, however, to this order of change, as by certain modifications the first incoming air currents may be air currents along the outer walls of the cylinder followed by a central air current, which would be the reverse of the order described.

I claim:

1. The process of scavenging an internal combustion engine, which consists in introducing into the combustion chamber air currents at points of entry concentric to the axis of the cylinder and following this with other air currents also concentric to the axis of the cylinder but in a different coaxial zone.

2. The process of scavenging an internal combustion engine, which consists in introducing, into the combustion chamber, air currents at points of entry concentric to the axis of the cylinder and diverting these air currents from one zone of the combustion chamber to another concentric zone, to sweep out the entire cross section of the chamber.

3. The process of scavenging an internal combustion engine, which consists in introducing into the central zone of the combustion chamber air currents forming a gyratory vortex and immediately afterward introducing diverging air currents along the inner walls of the cylinder.

4. An internal combustion engine having a convergent neck with a valve seat and inwardly opening valve, said neck being formed with an inwardly projecting annular lip inside the valve seat and said valve being arranged to pass by the said lip to give two directions of incoming air currents.

5. An internal combustion engine having an inwardly opening intake air valve and an annular and concentric air deflector surrounding the same, the intake valve being arranged to pass the deflector on the opening movement.

6. An internal combustion engine having a convergent neck with a valve seat and an inwardly opening valve, said neck being formed with an inwardly projecting annular lip, inside the valve seat and said valve being arranged to pass by the said lip to give two directions of incoming air currents, a cap for closing the neck of the cylinder, a valve seat within the same having a tubular guide to receive the stem of the valve and a spiral spring wrapped around the same and arranged to hold up the valve stem and maintain the valve closed with a yielding pressure.

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

ELBRIDGE W. STEVENS.

Witnesses:
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