G. W. BROWN.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED JUNE 13, 1910.

987,852.

Patented Mar. 28, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

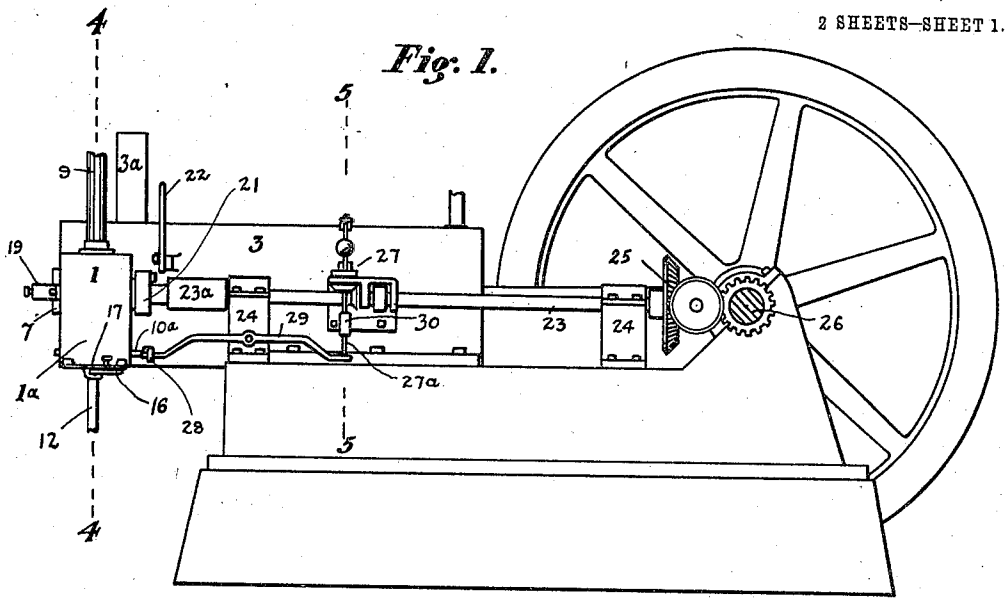


Fig. 2.

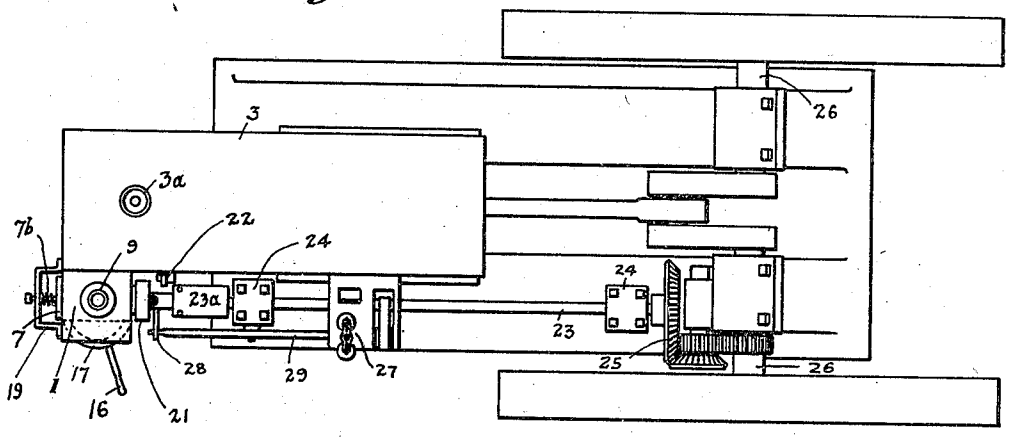


Fig. 7.

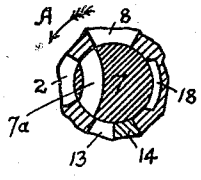


Fig. 8.

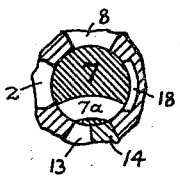


Fig. 9.

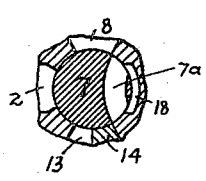
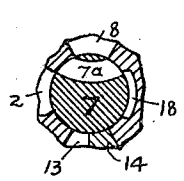


Fig. 10.



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2 SHEETS—SHEET 2.

Fig. 4.

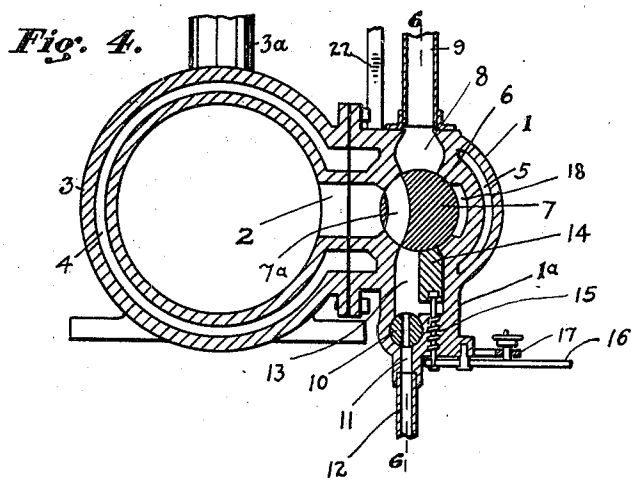


Fig. 5.

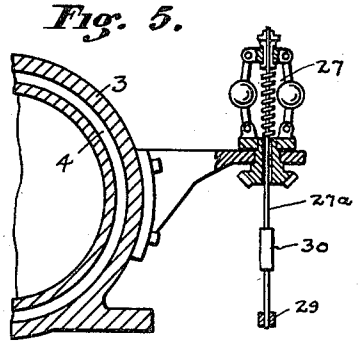


Fig. 3.

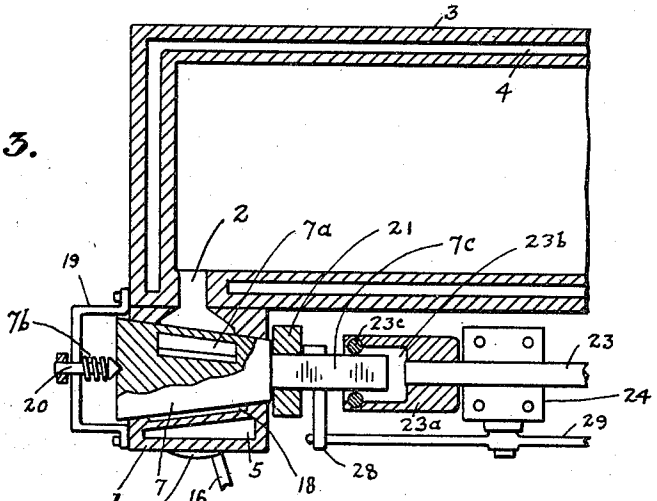
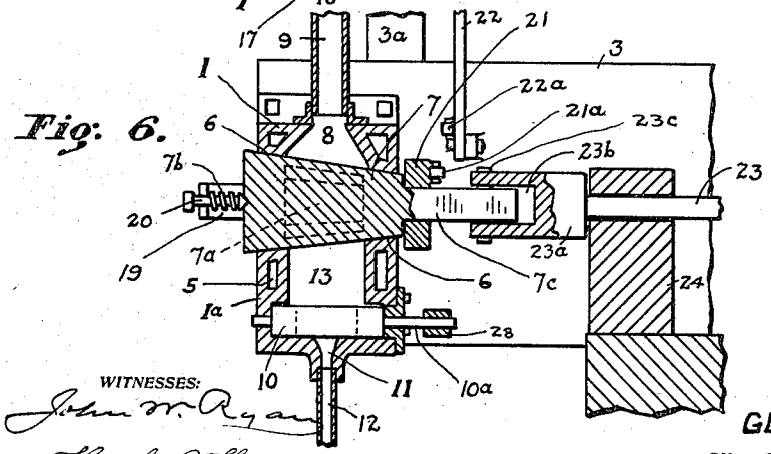


Fig. 6.



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INTERNAL-COMBUSTION ENGINE.

987,852 Specification of Letters Patent. **Patented Mar. 28, 1911.**

Application filed June 13, 1910. Serial No. 566,490.

To all whom it may concern:

Be it known that I, GEORGE W. BROWN, a citizen of the United States, residing in Salamonie township, in the county of Huntington and State of Indiana, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to improvements in internal combustion engines.

The object of my invention is to provide means for controlling and regulating the intake and exhaust of engines of the kind described, which will operate positively, accurately and reliably and with a minimum amount of friction, and which will be durable and not liable to get out of repair and adjustment. A widely accepted means for providing the intake and exhaust, includes a combination of puppet valves and means to open and close same at proper moments. Objections to the use of the puppet valves in engines of this character are that the valve heads rapidly wear out of true contour, and by their consequent failure to completely close the valve openings the performance of the engine is at once adversely affected. Moreover, a considerable portion of the power of the engine is consumed in the operation of such valves. By reason of the faulty operation of such valves, preignition, and irregular exhaust occur, and general derangement and failure of performance of the engine will result.

The more specific objects of my invention are to provide valves and valve gear of such construction and functions, that such valves will operate positively, and at the same time will be capable of easy adjustment and regulation.

To the foregoing ends my invention consists essentially in a valve chest of suitable area and proportions capable of being secured to the cylinder and having a b e from which there leads a port into the cylinder; there being intake and exhaust openings from the said tapered bore, a valve disposed in said bore, and having a port therein, so arranged that by a rotation of the valve there will be caused the intake and exhaust at certain moments, and governor operated means whereby the feed of the fuel may be controlled.

My invention is shown herein in the preferred general form and arrangement of parts for application to use on an engine of the four-cycle type, that is to say—an engine which on the first stroke of the piston receives into the cylinder the combustible fuel, and on its return movement compresses same, ignition and propulsion of the piston occurring at the next forward movement of the piston, and upon the return of the piston there being the exhaust. It is obvious that the valve-chest could be arranged at the end or top of the cylinder as well as at its side, suitable structural changes in the power transmitting connections between the valve and the engine proper, being arranged.

Corresponding parts of my invention are indicated by similar characters of reference throughout the several views in the drawings, in which—

Figure 1 is a side view of an engine of known general construction, and wherein my invention is shown embodied. Fig. 2 is a plan view of Fig. 1. Fig. 3 is a horizontal central sectional view of my invention. Fig. 4 is a vertical transverse sectional view taken on the line 4—4 in Fig. 1. Fig. 5 is a vertical transverse sectional view taken on the line 5—5 in Fig. 1. Fig. 6 is a vertical longitudinal sectional view taken on the line 6—6 in Fig. 4. Figs. 7, 8, 9, and 10 are vertical transverse sectional views showing the valve at different positions.

I provide a valve chest 1 of the general form and structure as shown in the drawings, and which will be secured to and will have communication by the port 2 with the working end of the engine cylinder 3. The water passages 4 of the cylinder will communicate with the similar water passages 5 of the valve chest. This valve chest has the tapered bore 6 which will be closed by the valve 7 of tapered form to properly fit the said bore and of such length that its ends will pro ct slightly beyond the ends of the said valve chest. This valve 7 is provided with the port passage 7^a. Leading out from the bore 6 is the exhaust port 8 at which is connected a proper discharge pipe 9. In the extension 1^a of the valve chest is disposed a cut off valve 10 which will operate to open and close the inlet opening 11. At this inlet opening is the fuel inlet pipe 12 through which is passed the fuel that operates the engine. The bottom of the inlet port 13 is closed by the cut off valve 10, and in the upper and widened portion of

this inlet port which opens into the bore 6, is disposed the valve 14. The thickness of this valve is such that the open portion of the inlet port 13 is the same in width as that of the port passage 7^a of the valve 7. The valve 14 will occupy the normal closed position as shown in Fig. 4 wherein the screw 15 that is retained in a threaded hole therefor in the wall of the valve chest extension, will loosely engage the bottom of the said valve 14. The hand bar 16 having its end fastened to the bottom end of the screw 15 when moved will cause the valve 14 to be lowered or raised. The valve 14 may be sustained at different raised or lowered positions by securing the handle bar 16 at different shifted positions on the arm 17. The function of the recess 18 is to provide a place for lubricant and also to reduce the friction area of the bore 6. The tapered valve 7 will be retained in the bore 6 by the strong coil spring 7^b one end of which will bear against the arm 19 and the other end against the head of a pin 20 which will engage a central depression in the end of the said valve.

3^a designates a suitable ignition means for the cylinder.

With a valve chest and valve of the foregoing construction and arrangement of parts, I am able to obtain by the rotary movement of the valve at a proper speed with reference to the speed of operation of the reciprocatory piston, a positive inlet, cut-off and exhaust, the result being that possibility of pre-ignition is overcome, increased efficiency of the fuel is accomplished, and steady operation of the engine is assured.

Carried by the forward end of the valve 7 is a plate 21 which has a lug 21^a on its side. A hand bar 22 having its end secured loosely to a suitable support adjacent the said plate and provided with a roller 22^a on its side, is so positioned that when drawn down, the plate 21 will be engaged and the valve 7 will be moved longitudinally rearwardly and out of contact with the bore 6. The advantage gained by this arrangement is that by shifting the tapered valve off of its seat the ports may be opened temporarily, so that in the starting of the engine there is a relief and discharge of the cylinder contents and the compression usual in the starting of engines of this character and which causes the engine to "kick back", is avoided.

The stem 7^c of the valve 7 will have connection with the shaft 23. This shaft 23 which is journaled in suitable pillow blocks 24 has such connections, by the bevel gearing 25 operated by the main shaft 26 of the engine, that with each revolution of the said main shaft there will be one half of a revolution of the shaft 23 and valve 7.

A suitable connecting detail between the shaft 23 and the valve 7 is shown in Fig. 3. The stem 7^c of the said valve is angular in cross section and is engaged on its two sides by the rollers 23^c carried at the edges of a suitable central aperture 23^b of the head 23^a that is secured to the end of the shaft. By this arrangement the valve 7 will be moved rotatively by the said shaft 23, but may be shifted longitudinally by the hand bar 22, as herein described.

The function of the governor 27 is to vary the amount of fuel that will pass into the port 13. Carried by the spindle 10^a of the cut off valve 10 is an arm 28.

29 designates a connecting rod having central pivotal connections to the pillow block 24. This connecting rod has its rearward end to engage loosely the end of the arm 28 and its forward end is loosely connected to the stem 27^a of the governor. This rod is so balanced and the adjustment of the cut off valve and the arm 28 are such that the action of the governor will be effective in operating the cut off valve 10 to properly vary the position of same. To effect adjustment of the governor stem with reference to the connecting rod 29, the adjustment sleeve 30 is provided.

When the engine piston is at the limit of its rearward stroke as shown in Fig. 1 and Fig. 2 the valve 7 will be in the position as shown in Fig. 4 and Fig. 7, the port 2 and the inlet port 13 and the exhaust port 8 all being closed, but the cut off valve 10 being open. In the starting operation of the engine at which time a feed of more fuel into the cylinder is desired than when the engine is in the going operation the valve 14 is lowered, the port 13 being thus opened its full width.

With the movement of the piston forwardly the valve 7 will move in the direction indicated by the arrow A which will afford a passageway from the inlet port 13, through 7^a and the port 2 into the cylinder. When the piston will have reached the limit of its forward stroke the valve 7 will be in the position as shown in Fig. 8, the port 2 and the inlet port and the exhaust port being all again closed. With the movement then of the piston to the rearward end of the cylinder occurs the compression of the charge and its ignition at the end of the stroke; the valve 7 keeping the ports all closed as shown in Fig. 9. With the arrival of the piston at the end of the driven stroke, the valve 7 will have passed to the position as shown in Fig. 10. With the starting then of the piston on its rearward stroke, the valve 7 opens a passageway from the port 2 through 7^a and out at the exhaust port 8, the spent products of combustion are forced or exhausted through the exhaust port, and with the arrival of the piston at the rearward end of the cylinder, the valve 7 will have returned to the position as shown in Fig. 7.

The advantages afforded by my invention are obvious. There being no puppet valves there is no necessity for cams, springs or shafts and gearing incident to the operation of such valves. This rotary valve will always be maintained in direct contact with its tapered seat and the natural wear of same will not impair its efficiency in the least. An engine constructed in accordance with my invention is capable of being easily and effectively lubricated and of being easily taken apart and cleaned. There will be no leakage of the fuel and the force exerted by the explosion will be so conserved that its maximum efficiency will be developed. Back firing or pre-ignition will be rendered practically impossible the result being a uniformly regular and dependable performance of the engine. There will be economy in the consumption of the fuel, and accumulation of unconsumed products of combustion in the cylinder and valve chest will be minimized if not entirely overcome.

I am aware that minor changes and modifications may be made in the general form and detailing of the several parts composing my invention, within the scope of same as defined by the appended claims, without in the least departing from the spirit of my invention or sacrificing any of its advantages.

What I claim as my invention and desire to secure by Letters Patent, is—

1. In an internal combustion engine of the kind described, the combination of a cylinder, a valve chest having a bore therein, a port passage from said bore into the cylinder, an exhaust port leading from said bore, a feed port leading into said bore, a valve to rotate in said bore to operate said ports, a cut-off valve in the feed port, a governor to control the operation of the cut-off valve, a secondary valve between the cut-off valve and the rotary valve to vary the width of the feed port at the said bore.

2. In an engine of the kind described, the combination with the cylinder, of a valve chest having a tapered bore therein, a port passage from said bore into the cylinder, an exhaust port leading from said bore, a feed port leading into the said bore, a tapered valve to move rotatively in said bore and having a port passage therein substantially as described, a secondary valve to vary the width of opening of the feed port, gearing between the main shaft of the engine and the said tapered valve to rotate the latter in said bore, a cut-off valve in the feed-port, a governor actuated by the engine to operate the cut-off valve, hand-operated means to move the secondary valve and to retain same at varied positions.

3. In an engine of the kind described, the combination with the cylinder, of a valve chest having a tapered bore therein, a port passage from said bore into the cylinder, an exhaust port leading from said bore, a feed port leading into the said bore, a tapered valve to move rotatively in said bore and having a port passage therein to alternately establish communication between the cylinder port and the feed port and the exhaust port, said valve having a stem projecting from its forward end, resilient means to retain the tapered valve in its said bore, gearing between the engine main shaft and the said valve to rotate the latter, a flexible union between said gearing and the said tapered valve, a hand-lever to move the tapered valve out of contact with its said bore, a cut-off valve in said feed port, a governor to operate said cut-off valve.

4. In an engine of the kind described, the combination with the cylinder, of a valve chest having a tapered bore therein, a port passage from said bore into the cylinder, an exhaust port leading from said bore, a feed port leading into the said bore, a tapered valve to move rotatively in said bore and having a port passage therein substantially as described, said tapered valve having a stem projecting from its forward end, a spring to retain the tapered valve yieldingly in its said bore, gearing operated by the engine to rotate the said valve, a hand lever to move the tapered valve out of contact with the said bore, a cut off valve in said feed port, a governor to operate said cut-off valve, a secondary valve to vary the width of the feed port opening, a hand lever to move said secondary valve.

5. In an engine of the kind described, the combination of a cylinder having a reciprocatory piston, of a rotary valve to operate the feed and exhaust ports for said cylinder, a cut off valve to vary the amount of feed to said rotary valve, a secondary valve between the cut off valve and the rotary valve, to vary the area of the passage way between the cutoff valve and the rotary valve.

6. An attachment for internal combustion engines, comprising a valve chest having a tapered bore, therein, a cylinder port leading therefrom, a feed port leading into said bore, an exhaust port leading out of said bore, a tapered valve having a port passage therein substantially as described and provided with a stem projecting from its forward end and capable of receiving connections from the operative parts of the engine, means to retain the tapered valve yieldingly in the bore of said valve chest, a secondary valve located in and adapted to partially close the feed port at its mouth adjacent the tapered valve, a screw disposed in a threaded bore in the wall of the valve chest and having loose connections with the said secondary valve, a hand bar to move the said screw, means carried by the valve chest and having connections with the said hand bar whereby

the latter may be secured at different adjusted positions.

7. An attachment for internal combustion engines, comprising a valve chest having a tapered bore therein, a cylinder port leading therefrom, a feed port leading into said bore, and exhaust port leading out of said bore, a tapered valve having a port passage therein and provided with a stem projecting from its forward end, a disk-shaped plate carried by said stem and having a lug on its side, a hand bar located near said disk-shaped plate and having a roller on its side to engage the lug when the hand bar is moved past same, power transmitting connections between the engine and said tapered valve to move the latter, a slidable connection between the said tapered valve and the power transmitting connections.

8. An attachment for internal combustion engines, comprising a valve chest having a tapered bore therein, a cylinder port leading therefrom, a feed port leading into said bore, an exhaust port leading out of said bore, a tapered valve having a port passage therein and provided with a stem, a disk shaped plate carried by said stem and having a lug on its side, a hand bar located near said plate and having a roller on its side to engage the lug when the hand bar is moved past same, connections between the engine and said tapered valve to rotate the latter, a slidable connection for said valve stem, a spring to hold the valve in said bore, a cut-off valve in the port that leads into the bore, a governor to control the movement of said cut-off valve.

9. In an attachment for internal combustion engines, the combination of a valve chest adapted to be secured to the cylinder and having a port leading into said cylinder, a tapered rotary valve to operate the feed and exhaust ports for said cylinder, a spring to retain the valve yieldably in operative position, means to move the said tapered valve longitudinally to disengage same from its seat, substantially as described.

10. In an attachment for internal combustion engines, the combination of a valve chest adapted to be secured to the engine cylinder and having a port leading into the said cylinder, a tapered rotary valve to operate the feed and exhaust ports for said cylinder, means to retain the said valve yieldably in operative position, a stem extended from the smaller end of said valve, a plate carried by said stem and having a lug on its side, a hand bar mounted adjacent to said plate and having a roller on its side to engage said lug to move the valve and hold the same out of contact with its seat in said valve chest substantially as described.

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

GEORGE W. BROWN.

Witnesses:
HENRY R. BRINNEMAN,
CHARLES W. CLAMPITT.