No. 728,543. PATENTED MAY 19, 1903.

R. D. CHANDLER.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED APR. 5, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig 1

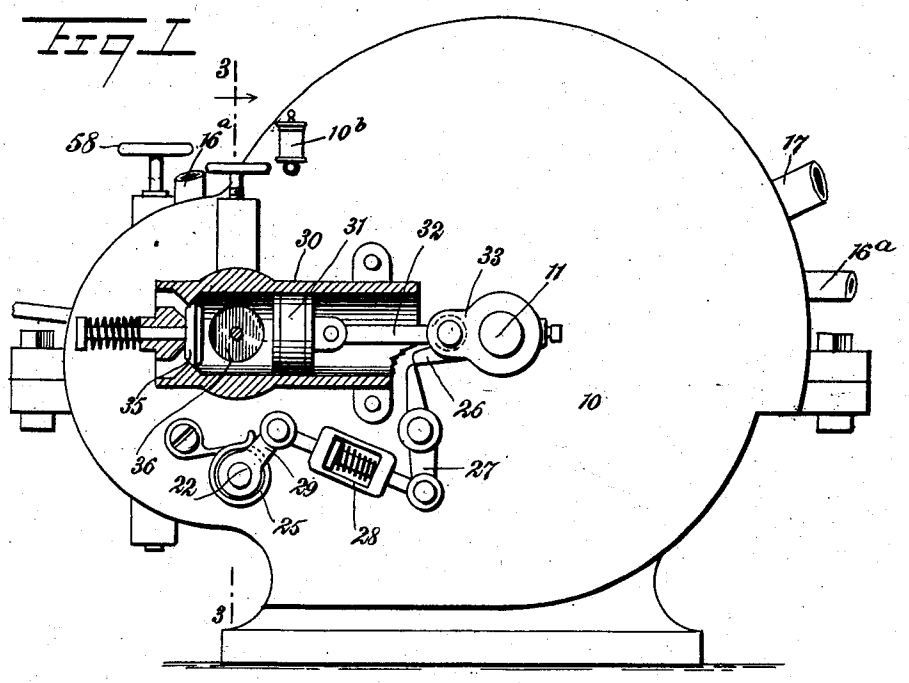
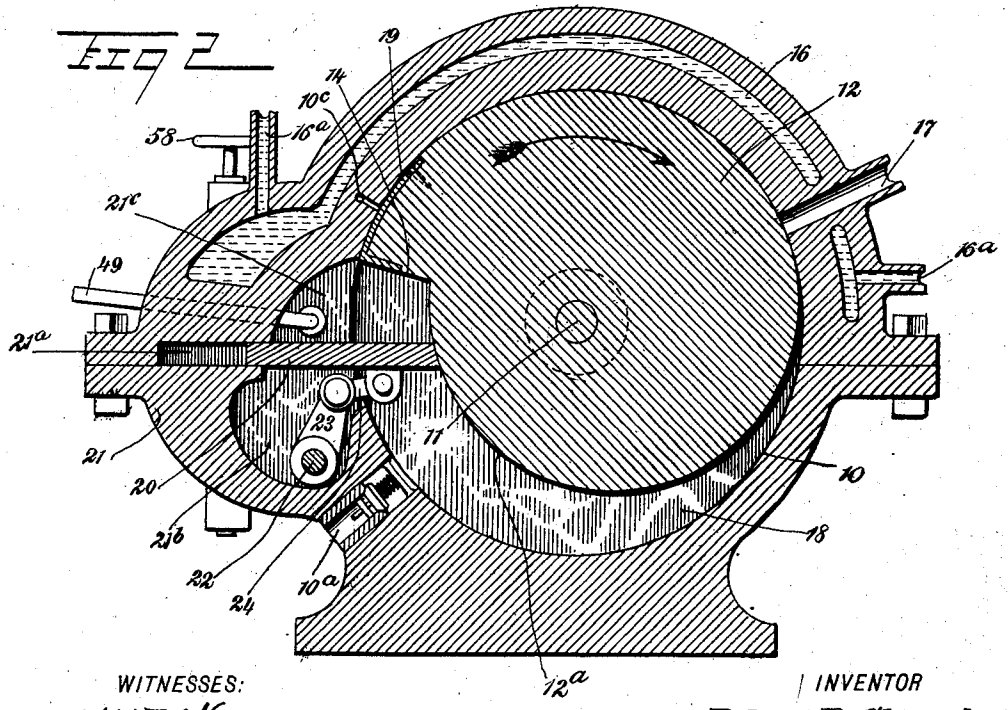


Fig 2



WITNESSES:

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Robert D. Chandler

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig 3

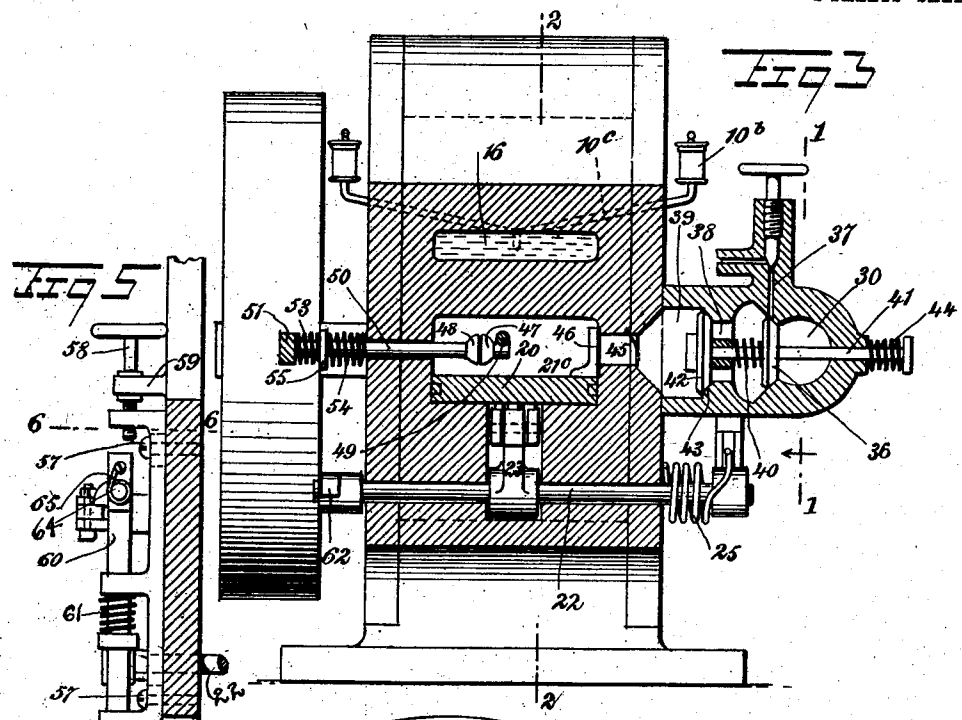


Fig 5

Fig 4

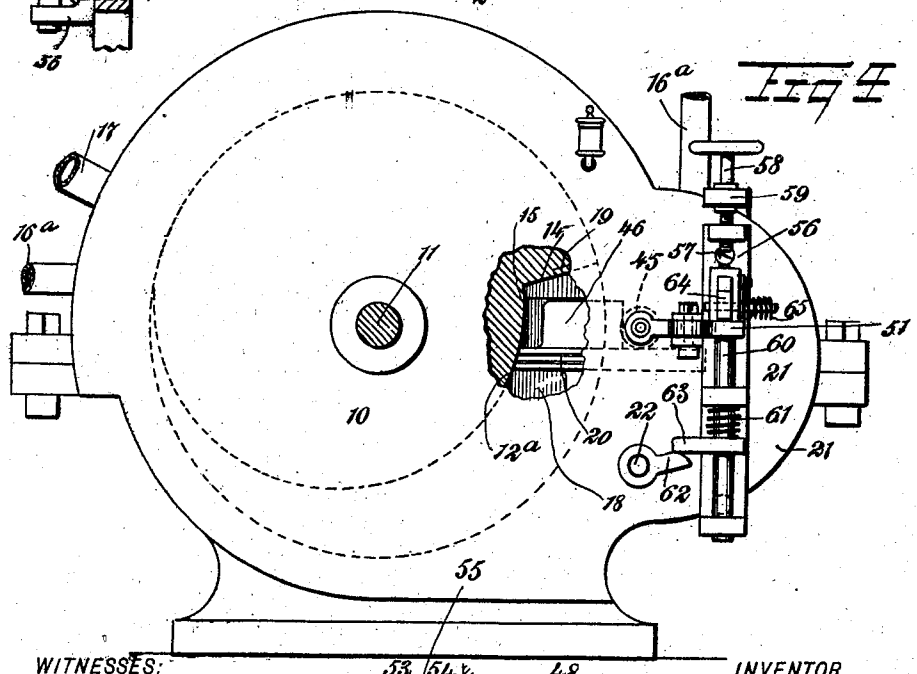
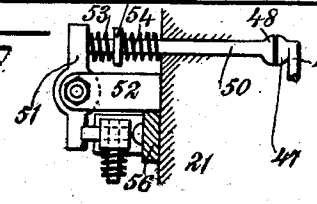


Fig 6



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No. 728,543. Patented May 19, 1903.

UNITED STATES PATENT OFFICE.

ROBERT D. CHANDLER, OF FAIRHAVEN, NEW JERSEY.

INTERNAL-COMBUSTION ENGINE.

SPECIFICATION forming part of Letters Patent No. 728,543, dated May 19, 1903.

Application filed April 5, 1902. Serial No. 101,542. (No model.)

To all whom it may concern:

Be it known that I, ROBERT D. CHANDLER, a citizen of the United States, and a resident of Fairhaven, in the county of Monmouth and State of New Jersey, have invented a new and Improved Internal-Combustion Engine, of which the following is a full, clear, and exact description.

This invention relates to a rotary internal-combustion engine which is useful in all connections to which internal-combustion engines are usually put. It is especially applicable to automobile and marine use, owing to the absence of excessive vibration and also to its compact form. By means of my invention I also avoid the use of heavy balance-wheels incident to engines involving the great negative work entailed in the high compression of the charge, and I utilize the burning gases during the entire period of expansion.

The engine in its form here specifically described imparts one impulse to every revolution of the engine-shaft; but it is obvious that by duplicating the valve devices and explosion-chamber this may be increased to two impulses per revolution.

This specification is an exact description of one example of my invention, while the claims define the actual scope thereof.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a side view of the invention, with parts of the air-compressor in section, on the line 1 1 of Fig. 3. Fig. 2 is a section on the line 2 2 of Fig. 3. Fig. 3 is an elevational view, with parts in section, on the line 3 3 of Fig. 1. Fig. 4 is a view of the side of the engine opposite to that shown in Fig. 1, such view having parts broken away to show the abutment in the cylinder. Fig. 5 is a detail view of the igniter-gear, and Fig. 6 is a sectional plan view thereof looking down from the line 6 6 of Fig. 5.

10 indicates the engine-cylinder, and 11 the engine-shaft, which passes centrally through the cylinder.

12 indicates the piston, part of the periphery of which is concentric to the shaft 11 and the other part of which is eccentric thereto, owing to a chamber 12^a, formed in the periphery of the piston. Said chamber does not extend through the side walls of the piston, these walls being left intact, as indicated at 18. The chamber 12^a terminates at one end in an essentially radial shoulder 14, which constitutes the piston-head.

16 indicates a water-jacket, and 16^a the inlet and outlet pipes thereof.

17 indicates the exhaust-passage passing from the cylinder. Fastened to the periphery of the piston 12 and extending into the cavity 12^a between the walls 18 is a spring packing-plate 19, which projects inward over the shoulder 14 and is loosely engaged with said shoulder. This packing-plate presses yieldingly against the inner wall of the cylinder 10 and serves to make a gas-tight joint at this point. By means of this arrangement the concentric peripheral portion of the piston 12 need not bear tightly against the walls of the cylinder, and thus friction is materially reduced.

20 indicates the abutment, which is mounted in an offset portion 21 of the engine and slides in a cavity 21^a in said offset portion. This abutment is of width sufficient to fit the abutment snugly in the cavity 12^a of the piston between the walls 18.

22 indicates a rock-shaft passing transversely through the engine and having a crank 23, located in a chamber 21^b, formed in the offset 21. This crank 23 is connected by a link 24 with the abutment 20, and 25 (see Figs. 1 and 3) indicates a torsional spring located outside of the cylinder and bearing on the shaft 22 to hold the abutment 20 yieldingly pressed inward. The engine-shaft 11 (see Fig. 1) carries a tappet 26, and this is adapted to periodically strike a lever 27, mounted on the outside of the engine-cylinder 10. The lever 27 is connected by a spring-jointed rod 28 to a crank 29 on the adjacent end of the shaft 22.

30 indicates the air-compressor cylinder, and 31 the piston working therein, which piston is connected by its rod 32 with a crank 33 on the shaft 11, so that by the rotation of this shaft the piston is driven back and forth in the air-compressor cylinder.

35 indicates a spring-seated valve controlling the admission of air into the cylinder 30, and 36 (see Fig. 3) indicates a valve covering

the outlet from the air-compressor cylinder and also covering the inlet 37 of the oil or other hydrocarbon fluid, such oil-inlet extending to the seat of the valve 36, so that when the valve is opened a stream of oil is admitted and is instantly vaporized by a current of air passing the valve.

38 indicates a spider formed or set in the tubular passage 39, leading from the cylinder 30, and 40 indicates a spring bearing between the spider 38 and valve 36 normally to seat the valve. The valve 36 slides loosely on a stem 41, which carries fixedly a valve 42, working against a seat 43, formed at the left-hand side of the spider 38. (See Fig. 3.)

44 indicates a spring bearing against the outer end of the stem 41 and serving normally to seat the valve 42. Now it will be seen that by this arrangement the valves 42 and 36 are independently seated, and the tension of the springs 40 and 44 is such that the valve 36 will open first, and then follows the valve 42. The tubular extension 39 of the air-compressor cylinder 30 leads to a feed-port 45, formed transversely in the cylinder-walls, and when the abutment 20 is moved back this port 45 is closed by a vertically-disposed slide-valve 46, fastened to or formed on the abutment and projecting upward therefrom. When, however, the abutment 20 is moved over to the position shown in Figs. 2 and 4, the port 45 is uncovered by the valve 46. (See the full and dotted lines in Fig. 4.)

In connection with the engine I employ an electric igniter, of which 47 indicates a stationary electrode, and 48 a movable electrode. The stationary electrode is carried on a stem 49, rigidly fastened in the engine-cylinder and projecting through the offset part 21 into the explosion-chamber 21^c, formed therein.

50 indicates the stem of the movable electrode 48, and this stem is engaged by a short horizontally-disposed lever 51, mounted in a bracket 52, carried by the offset portion 21 of the engine-cylinder. (See Fig. 4.)

53 and 54 indicate expansive springs encircling the stem 50 and bearing between an intermediate washer 55 and the cylinder-offset 21 and lever 51, respectively.

56 indicates a frame-plate slidably mounted on the cylinder of the engine by means of fastening-screws 57 or any other desired means, this frame-plate being adjustable through the medium of a screw 58, fitted to turn in a lug 59, projecting from the engine-cylinder. Reciprocating vertically on the frame-plate 56 is a bar 60, which is pressed down by a spring 61, and this bar is adapted to be periodically raised by a tappet 62 on the shaft 22, this tappet being adapted to coact with a toe 63 on the bar. A rocking cam 64 is mounted in the upper portion of the bar and thrown to normal position, as shown in Figs. 4 and 5, by means of a spring 65, and this cam 64 is adapted to engage the lever 51 to rock the same as the cam moves upward. When, however, the cam moves downward, it turns on its pivot against the action of the spring 65 and passes by the lever without actuating the same.

The operation of the invention may be traced as follows: Upon turning over the fly-wheel in the direction of the arrow shown in Fig. 2 the piston 31 of the air-compressor draws in a charge of air and then returns, forcing the same past the valves 36 and 42, thereupon vaporizing the hydrocarbon oil which enters by the feed 37. Simultaneously the tappet 26 striking the lever 27 the shaft 22 is rocked. This rocking movement of the shaft throws the abutment 20 into the position shown in Fig. 2, and the valve 46 passes from the feed-port 45 and permits the explosive charge to enter the chamber 21^c and also to enter the space between the piston-head 14 and the abutment 20. As the shaft 22 rocks in the manner before described the tappet 62 raises the bar 60 and the cam 64 passes under the lever 51, moving said lever so as to throw inward the contact 48 and engage the same with the electrode 47. After this the cam 64 moves upward beyond the lever 51, and the springs 53 and 54 act to withdraw the electrode 48, whereupon as this electrode disengages the electrode 47 an arc is formed, and from the spark thereof the charge is ignited. This charge reacting against the piston-head 14 drives the piston in the direction of the arrow shown, and the expansive action of the gases continues until the piston-head 14 reaches the exhaust-port 17, whereupon the products of combustion are exhausted from the cylinder. The piston continuing this movement repeats the operation above described. It will be observed that after the explosion the abutment 20, acting under the movement of the piston, gradually returns, and the valve 16 finally closes the feed-port 45. The spring 25 acts continuously to throw the abutment 20 inward; but the force of this spring is not sufficient to raise the bar 60. Therefore it is necessary to employ the tappet 26 and its associated parts, so as positively to actuate the igniter. However, after the bar 60 is raised the spring 25 constitutes the sole force whereby the abutment 20 is held against the piston. It will also be observed that the impulse to the engine-shaft may be increased by simply duplicating the vaporizing and igniting means; but the arrangement shown in the drawings is sufficient to illustrate the principle of my invention.

10^a indicates an air-valve to relieve a tendency to vacuum in the cylinder, and 10^b and 10^c indicate, respectively, oil cups and ducts for lubricating the cylinder.

Various changes in the form and details of my invention may be resorted to at will without departing from the spirit of my invention. Hence I consider myself entitled to all forms of the invention as may lie within the intent of my claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. An internal-combustion engine, comprising a cylinder, a rotary piston mounted therein, an air-compressor, walls forming a passage from the air-compressor to the combustion-chamber of the cylinder, an abutment mounted in the cylinder and movable toward and from the piston, a valve carried by the abutment and movable therewith to cut off the communication between the air-compressor and the cylinder, means for periodically actuating the abutment, and means for supplying fuel to the air as it passes from the air-compressor.

2. An internal-combustion engine, comprising the combination of a cylinder, a rotary piston therein, an air-compressor, walls forming a passage from the air-compressor to the combustion-chamber of the cylinder, said walls including fuel-supply devices, a valve commanding said communication, an abutment arranged to move toward and from the piston, a second valve moving in time with the abutment and commanding the communication between the combustion-chamber and the compressor, and means for operating the air-compressor.

3. An internal-combustion engine, comprising the combination of a cylinder, a rotary piston therein, an air-compressor, walls forming a passage from the air-compressor to the combustion-chamber of the cylinder, said walls including fuel-supply devices, a valve commanding said communication, an abutment arranged to move toward and from the piston, a second valve moving in time with the abutment and commanding the communication between the combustion-chamber and the compressor, means for operating the air-compressor, and means for operating the sliding abutment, both of said means being driven from the engine-shaft.

4. An internal-combustion engine, comprising the combination of a cylinder, a rotary piston therein, an air-compressor, walls forming a passage from the air-compressor to the combustion-chamber of the cylinder, said walls including fuel-supply devices, a valve commanding said communication, an abutment arranged to move toward and from the piston, a second valve moving in time with the abutment and commanding the communication between the combustion-chamber and the compressor, means for operating the air-compressor, means for operating the sliding abutment, both of said means being driven from the engine-shaft, and an igniter in connection with the means for operating the abutment.

5. In an internal-combustion engine, the combination with the cylinder and piston, the cylinder having a combustion-chamber therein and a feed-port leading into said combustion-chamber, of an abutment mounted to slide in the combustion-chamber toward and from the piston, means for actuating the abutment, and a valve carried to move with the abutment, said valve covering the feed-port of the combustion-chamber when the abutment is moved forward.

6. In an internal-combustion engine, the combination with the cylinder and piston, the cylinder having a combustion-chamber therein and a feed-port leading into said combustion-chamber, of an abutment mounted to slide in the combustion-chamber toward and from the piston, means for actuating the abutment, a valve carried to move with the abutment, said valve covering the feed-port of the combustion-chamber when the abutment is moved forward, and means driven from the engine-shaft for periodically actuating the abutment.

7. In an internal-combustion engine, the combination with the cylinder and piston, the cylinder having a combustion-chamber therein and a feed-port leading into said combustion-chamber, of an abutment mounted to slide in the combustion-chamber toward and from the piston, means for actuating the abutment, a valve carried to move with the abutment, said valve covering the feed-port of the combustion-chamber when the abutment is moved forward, means driven from the engine-shaft for periodically actuating the abutment, and an igniter operated by said means for operating the abutment.

8. In a rotary engine, the combination with a means for supplying the motive agent, of a cylinder, having an admission-port, a rotary piston, a sliding abutment mounted in the cylinder and coacting with the piston, and a valve mounted on the abutment and moving therewith to cover and uncover the said admission-port.

9. In a rotary engine the combination with a means for supplying the motive agent, of a cylinder having a laterally-opening admission-port, a rotary piston, an abutment mounted to slide toward and from the piston and coacting therewith and a vertically-disposed valve mounted on the abutment to move edgewise in time with the abutment to cover and uncover the said admission-port.

10. In a rotary engine the combination with a means for supplying the motive agent, of a cylinder having a laterally-opening admission-port, a rotary piston, an abutment mounted to slide toward and from the piston and coacting therewith, a vertically-disposed valve mounted to move edgewise in time with the abutment to cover and uncover the said admission-port, the said valve being fastened on one longitudinal side edge of the abutment and bearing its outer face against the adjacent interior wall of the cylinder.

11. In an internal-combustion engine the combination with the means for supplying and igniting the charge, of a cylinder having an offset combustion-chamber with an admission-port opening laterally thereinto, a piston, an abutment mounted in the combustion-

chamber to slide toward and from the piston, and a valve located in the combustion-chamber and mounted on the abutment to move in time therewith to cover or uncover the said admission-port.

12. In a rotary engine the combination of a cylinder having a chambered offset portion communicating with and forming part of the interior of the cylinder, said offset having an admission-port therein, a piston working in the cylinder, an abutment located in the chambered offset and sliding toward and from the piston for the purpose specified, a rock-shaft mounted in the chambered offset portion of the cylinder at one side of the abutment, a connection located in said chamber and extending between the abutment and the rock-shaft to drive the former, means for driving the rock-shaft from the piston, and means for controlling the admission of the motive agent.

13. In a rotary engine the combination of a cylinder having a chambered offset portion communicating with and forming part of the interior of the cylinder, said offset having an admission-port therein, a piston working in the cylinder, an abutment located in the chambered offset and sliding toward and from the piston for the purpose specified, a rock-shaft mounted in the chambered offset portion of the cylinder at one side of the abutment, a connection located in said chamber and extending between the abutment and the rock-shaft to drive the former, means for driving the rock-shaft from the piston, and means for controlling the admission of the motive agent, said means for controlling the motive agent including a slide-valve located in said chamber and moving in time with the abutment to cover and uncover the admission-port.

14. In an internal-combustion engine, the combination with the means for feeding the fuel, of a cylinder having a chambered offset with an admission-port therein, a piston working in the cylinder, an abutment fitted in the chamber of the offset and sliding toward and from the piston, a rock-shaft mounted in the offset, a connection between the rock-shaft and abutment, said connection being located in the said chamber, a valve located in the chamber and sliding with the abutment to cover and uncover the admission-port, an igniter comprising a mobile part driven from the rock-shaft, and means for driving the rock-shaft from the piston.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ROBERT D. CHANDLER.

Witnesses:
JAMES B. WEAVER,
ARTHUR F. SWIFT.