March 5, 1935. J. Y. TAYLOR 1,993,230

AIR COMPRESSOR

Filed Sept. 25, 1931

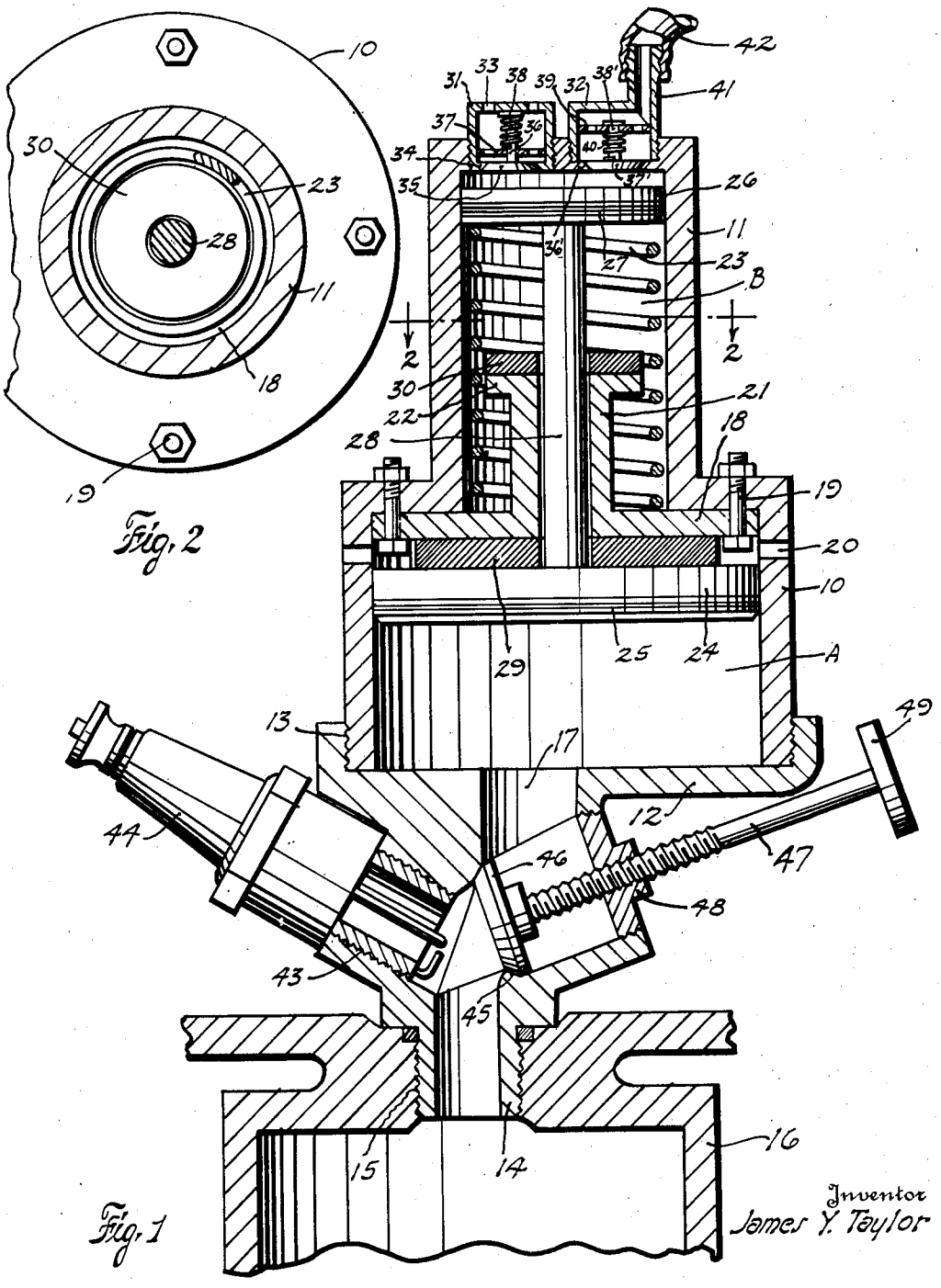

Fig. 2

Fig. 1

Inventor
James Y. Taylor

By Jack A. Schley
Attorney

Patented Mar. 5, 1935 1,993,230

UNITED STATES PATENT OFFICE

1,993,230

AIR COMPRESSOR

James Y. Taylor, Brownwood, Tex., assignor of one-sixth to Oran A. Milam, one-sixth to Robert E. Milam, and one-sixth to Douglas Coalson, Brownwood, Tex.

Application September 25, 1931, Serial No. 565,087

6 Claims. (Cl. 230—50)

This invention relates to new and useful improvements in air compressors.

One object of the invention is to provide an improved air compressor particularly adapted to be attached to one of the cylinders of an internal combustion engine, whereby the reciprocation of the piston in said cylinder may be utilized to operate the compressor.

A particular object of the invention is to provide an air compressor for attachment to the cylinder of an internal combustion engine and including means whereby the intake or suction stroke, as well as the compression stroke, may be utilized in the operation of the compressor, with the result that a much higher compression can be built up than has been heretofore possible.

A further object of the invention is to provide a compressor employing a plurality of pistons and means for cushioning the pistons at the ends of their strokes, thus eliminating undue shock and saving the parts from injury.

Still another object of the invention is to provide a new and novel mounting for the compressor, whereby the usual spark plug may be employed and the compressed gases thus exploded, thereby eliminating the injurious results which would occur if such gases were not ignited, and also whereby the spark plug may be removed or replaced without interfering with the connection of the compressor.

A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawing in which an example of the invention is shown, and wherein:

Figure 1 is a vertical sectional view of an air compressor constructed in accordance with the invention and mounted on the upper end of an engine cylinder, a portion of which is shown in section, and

Figure 2 is a partial horizontal cross-sectional view taken on the line 2—2 of Figure 1.

In the drawing the numeral 10 designates a lower operating or motor cylinder which is surmounted by a smaller compressing cylinder 11. It is obvious that these cylinders may be made in one piece or they may be made separately and suitably connected. The interior of the cylinder 10 constitutes an operating chamber A, while the interior of the cylinder 11 constitutes a compressing chamber B.

In carrying out the invention, the chamber A is connected with the cylinder of the internal combustion engine and for this purpose I have shown a bracket 12 having an internally threaded flange 13 into which the cylinder is screwed and which forms the bottom of the chamber A. The bracket has a reduced screw-threaded nipple 14 screwed into the spark plug opening 15 of the engine cylinder 16. A passage 17 leads through the bracket and forms a communication between the chamber A and the cylinder 16. The details of the bracket and the various ways of mounting the compressor will be hereinafter described.

A circular plate or disk 18 is secured in the top of the chamber A by bolts 19 and immediately below this plate the cylinder is provided with air ports 20. The plate 18 forms a top for the chamber A and a bottom for the chamber B. A sleeve 21 extends from the plate 18 axially into the chamber B and has a flanged top or circular plate 22 at its upper end. A coiled spring 23 mounted in the chamber B surrounds the sleeve and the plate 22 and rests upon the plate 18.

A circular piston 24 provided with rings 25 has a sliding fit in the cylinder 10, and a plunger 26 provided with rings 27 has a sliding fit in the cylinder 11. These plungers are integrally connected by a rod 28 which passes loosely through the sleeve 21 and preferably out of contact therewith. The coiled spring 23 supports the plunger 26 and normally holds the parts elevated.

To cushion the upward stroke of the piston I provide a circular pad 29 on the under side of the plate 18. This pad may be suitably secured to the plate and may be made of rubber, rubber compound, or any other cushioning material suitable for the purpose. On the plate 22, I secure a similar pad 30, in any suitable manner. Upon the up stroke the piston 24 will engage the pad 29 and cushion the piston, as well as prevent the plunger 26 from striking the top of the chamber B. Upon the down stroke of the piston the plunger 26 will strike the pad 30 before the piston strikes the bracket 12, thus cushioning this stroke.

In the top of the cylinder 11, I mount an inlet valve cage 31 and an outlet valve cage 32. These cages are screwed into the top of the cylinder so as to be readily removed. The cage 31 has air inlet ports 33 in its top and a valve seat 34 at its bottom. A downwardly opening valve 35 engages the seat and is provided with a stem 36 extending through a spider 37 within the cage. The stem is suspended on a coiled spring 38, whereby the valve is normally closed. Upon the down stroke of the plunger 26 the valve 35 will be opened and air drawn into the chamber B, but upon the up-

ward stroke of the plunger said valve will be closed.

The cage 32 has a valve seat 36' at its bottom and an upwardly opening valve 37' engaging therein. The valve has a stem 38' passing through a spider 39. The valve is normally held closed by a coiled spring 40 surrounding the stem between the valve and the spider. When the valve 35 is opened the valve 37' is closed and when the valve 35 is forced closed the valve 37' is opened, whereby the air may be expelled from the chamber B. The cage 32 has a nipple 41 and a hose or other conductor 42 may be attached thereto.

The coiled spring 23 forms a very important part of this invention. Upon the down or intake stroke of the engine piston (not shown) in the cylinder 16, the piston 24 in the chamber A will be drawn downward and the spring 23 will be compressed. When the engine piston starts on its upward or compression stroke, the compressed spring 23 will be free to expand and the energy thus stored up will be combined with the force exerted against the piston 24 in elevating the plunger 26. The coiled spring 23 causes the engine piston to do more work or exert a greater force in pulling the piston 24 downwardly, therefore when the spring is released greater compression is built up in the chamber B. The downward suction of the engine piston is exerted against the large piston 24 which has a large area, while the force of the expanding spring is exerted against the small piston 26, which has a small area. This causes the production of a greater pressure in the chamber B. By this means both the intake stroke and the compression stroke of the engine piston are utilized and consequently a much higher pressure can be built up where the spring is used. In pumping up a tire the resistance increases as the pressure in the tire increases and, therefore, the spring expedites the pumping operation and enables the tire to be inflated much quicker because of such spring.

While it would be possible to connect the bracket 12 at any convenient point on the engine cylinder 16, it is most convenient to connect it in the spark plug opening 15; but the invention is not to be so limited. The passage 17 of the bracket is provided with an internally screw-threaded branch 43 and into this the usual spark plug 44 is screwed. By this arrangement the compressed charge will be ignited and all gases burnt in the usual manner. This will prevent unburnt fuel from accumulating in the cylinder 16.

The passage 17 is also formed with a valve seat 45 opposite the spark plug for receiving a valve 46 suitably mounted on the end of a stem 47 having screw-threaded engagement in a box 48. The stem is provided with a hand wheel 49. When it is not desired to use the air compressor the valve 46 is closed against its seat 45, but this does not interfere with the operation of the spark plug 44. Various forms of brackets or mountings may be utilized and the invention is not to be limited to the bracket shown or to the spark plug arrangement.

In using the device, it is mounted on top of the cylinder 16 as is shown in Figure 1. Where it is not desired to use it in connection with a spark plug it can be otherwise connected to the cylinder. Upon the down stroke of the engine piston (not shown) and with the valve 46 open, the suction created by such intake stroke will be sufficient to pull the piston 24 downwardly, whereby the valve 35 will be opened and air drawn into the chamber B. As the pistons 24 and 27 move downwardly, the coil spring 23 will be compressed. The piston 27 will be cushioned at the bottom of its stroke by the pad 30.

Upon the compression or upward stroke of the engine piston sufficient fluid will be forced through the passage 17 to elevate the pistons, and the compressed spring 23 being released will add its energy to this upward stroke, thus making for a more powerful upward stroke. The valve 35 will remain closed, but after sufficient pressure is built up to overcome the tension of the spring 40 the valve 37' will be opened and the air expelled through the cage 32 and nipple 41 into the conductor 42. The pad 29 will cushion the upward stroke of the pistons.

Various changes in the size and shape of the different parts, as well as modifications and alterations, may be made within the scope of the appended claims.

Having illustrated and described a preferred form of the invention, what I claim, is:

1. In an air compressor for internal combustion engines, an operating cylinder, a piston working in the operating cylinder, a compressing cylinder, a plunger working in said compressing cylinder, means for rigidly connecting the piston and the plunger, means for connecting the operating cylinder with the cylinder of a combustion engine, and means connected with the plunger for storing energy upon the intake stroke of the piston of the engine cylinder, said means coacting with the compressor piston on the compression stroke of the piston of the engine to compress air in the compression cylinder.

2. In an air compressor for an internal combustion engine, an operating cylinder, a compression cylinder, a piston in the operating cylinder, a plunger in the compression cylinder, a rod connecting the piston and the plunger, a coiled spring in the compression cylinder supporting the plunger, an air inlet valve in the compression cylinder, an air outlet valve in the compression cylinder, and means connecting the operating cylinder with the cylinder of an internal combustion engine.

3. In an air compressor for an internal combustion engine, an operating cylinder, a compression cylinder, a piston in the operating cylinder, a plunger in the compression cylinder, a rod connecting the piston and the plunger, a coiled spring in the compression cylinder supporting the plunger, an air inlet valve in the compression cylinder, an air outlet valve in the compression cylinder, means connecting the operating cylinder with the cylinder of an internal combustion engine, a cushion member in the operating cylinder in the path of the piston, and a second cushion member in the compression cylinder in the path of the plunger.

4. In an air compressor, a support, an operating cylinder provided with air inlets mounted on said support, a plate secured within the upper end of the operating cylinder, a cushion mounted on the under side of the plate, a reduced compression cylinder extending from the operating cylinder above said plate, a sleeve carried by the plate, a second cushion carried by the sleeve, a piston mounted in the operating cylinder, a plunger mounted in the compression cylinder, a rod connecting the piston and the plunger and extending loosely through the sleeve, an air ad-

mitting valve mounted at the upper end of the compression cylinder, an air outlet valve mounted at the upper end of the compression cylinder, and a coiled spring mounted within the compression cylinder and supporting the plunger.

5. In an air compressor for internal combustion engines, the combination with the operating cylinder of the air compressor, of a bracket having an upstanding annular flange in which the cylinder is secured, the bracket having a vertical passage extending therethrough and communicating with the cylinder, the bracket having a branch extending from said passage for receiving a spark plug so as to expose the electrodes thereof in said passage, the passage having a valve seat between the branch and the cylinder, a valve mounted in the bracket for engaging said valve seat for closing said passage, and a screw-threaded shank mounted on the lower end of the bracket.

6. In an air compressor, a pair of cylinders one mounted above the other, air compressing elements working in said cylinders, an upright bracket supporting the cylinders in an upright position on top of an engine cylinder, said bracket having a passage therethrough leading to the bottom cylinder, a spark plug removably mounted in the side of the bracket and having its electrodes exposed in the passage thereof, a valve in the passage of the bracket between the spark plug and the cylinder having its stem extending through the other side of the bracket, and a nipple on the bracket below the spark plug for connection in the spark plug opening of an engine cylinder.

JAMES Y. TAYLOR.