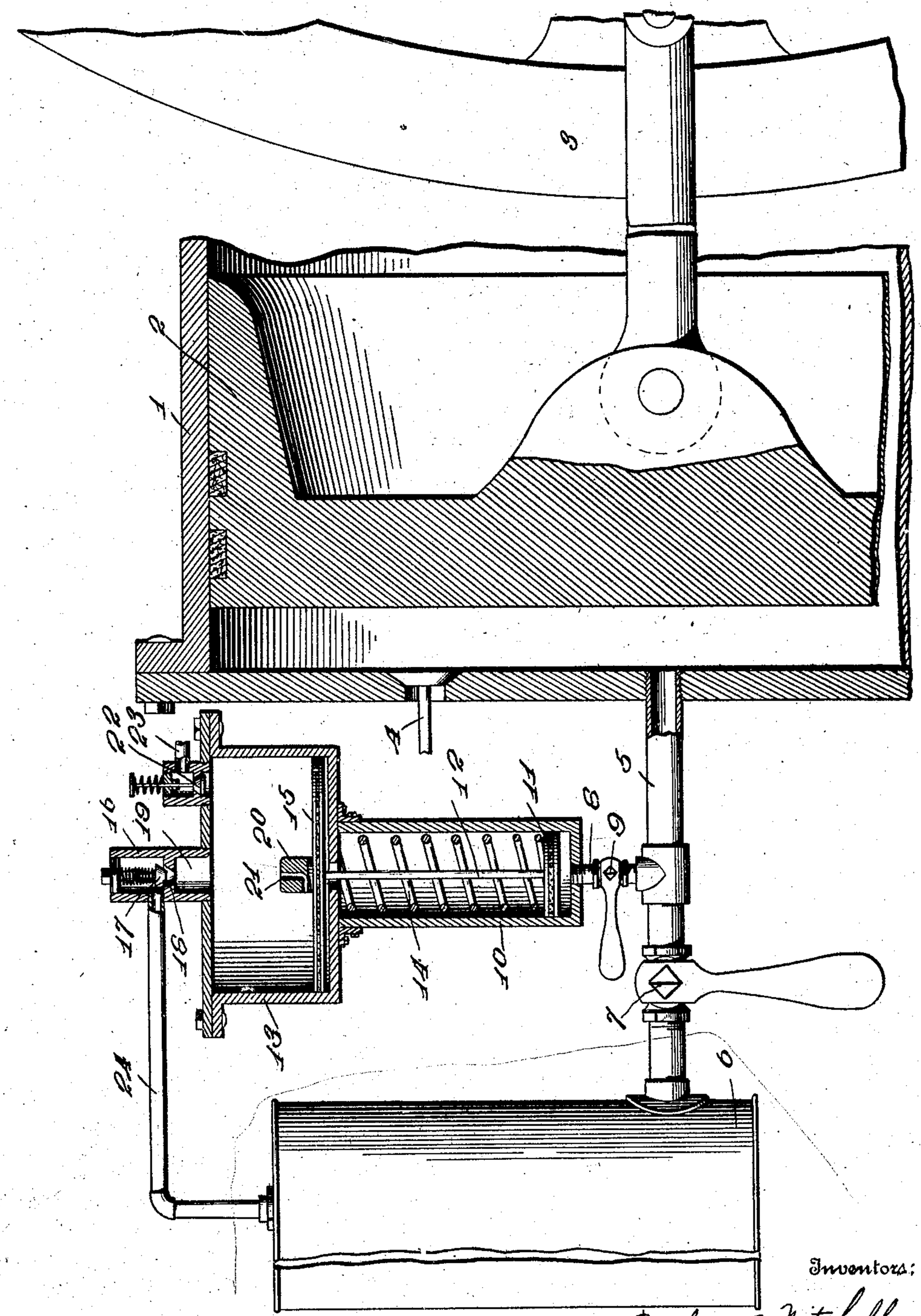
No. 805,981. PATENTED NOV. 28, 1905.

R. A. MITCHELL & L. L. LEWIS.

PUMP ATTACHMENT FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED OCT. 22, 1903.



Witnesses
L. Gerard Handy
Edgar M. Kitchin.

Inventors:
Reuben A. Mitchell
& Lester L. Lewis.
By Mason Fennick & Lawrence
Attorneys.

UNITED STATES PATENT OFFICE.

REUBEN A. MITCHELL AND LESTER L. LEWIS, OF OIL CITY, PENNSYLVANIA.

PUMP ATTACHMENT FOR INTERNAL-COMBUSTION ENGINES.

No. 805,981. Specification of Letters Patent. Patented Nov. 28, 1905.

Application filed October 22, 1903. Serial No. 178,091.

To all whom it may concern:

Be it known that we, REUBEN A. MITCHELL and LESTER L. LEWIS, citizens of the United States, residing at Oil City, in the county of Venango and State of Pennsylvania, have invented certain new and useful Improvements in Pump Attachments for Internal-Combustion Engines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in pumping devices, and more particularly to pumping mechanisms adapted to be connected to an internal-combustion engine.

The object in view is the provision of elements positioned for being actuated by the live pressure of an internal-combustion engine for compressing a charge of air or other gas.

With these and other objects in view the invention comprises the combination, with an internal-combustion engine, of a tube communicating with the explosion end of the cylinder of said engine and a pumping mechanism connected with and receiving its operating power through said tube.

It further comprises certain other novel constructions, combinations, and arrangements of parts, as will be hereinafter fully described and claimed.

In the accompanying drawing, the figure represents a vertical central section taken through a mechanism embodying the features of the present invention, parts being illustrated in elevation.

It is of course well known in the art that the manual starting of a gas-engine is extremely dangerous and many modes of mechanically accomplishing this operation has been suggested, including supplying compressed air for imparting the initial stroke to the piston, and the present invention contemplates the provision of means for compressing air or other gas and storing the same for the use mentioned.

In carrying out this invention we employ the elements disclosed in the accompanying drawing, in which—

1 indicates a cylinder of any common form of gas-engine, and 2 the piston thereof, actuating fly-wheel 3 through a crank-shaft. (Not illustrated.) The cylinder 1 is of course provided with any common and well-known form of intake mechanism (not illustrated) and is provided with an exhaust-valve 4, actuated in any preferred manner for permitting the escape of burnt gases at the time the piston 2 reaches the extreme of its receding stroke.

A tube 5 extends through the head of cylinder 1 into the firing or explosion end thereof, said tube communicating with a storage-tank 6, any suitable valve 7 being interposed in the length of said tube for closing communication between said tank and cylinder. A branch pipe 8 leads from pipe 5 and is controlled by an interposed valve 9, said branch pipe communicating with a cylinder 10, within which is arranged a piston-head 11, secured to a piston 12, extending through the upper end of cylinder 10 into a cylinder 13, preferably of considerable greater diameter than the cylinder 10. A suitable spring 14 is coiled about the piston-rod 12 and presses at one end against the cylinder 10 and at the opposite end against the piston-head 11 for normally retaining said head near that end of cylinder 10 penetrated by the pipe 8. A piston-head 15 fits snugly within the cylinder 13 and is fixed to the upper end of piston-rod 12. The opposite end of cylinder 13 from that penetrated by piston-rod 12 is provided with a housing 16, carrying a check-valve 17 and its seat 18, the said housing being formed with a recess 19 between the said seat and the cylinder 13. Carried centrally by the piston-head 15 is a plug 20, of a diameter equal to the diameter of the recess 19, in line with said recess and adapted when the piston-head is at the uppermost limit of its stroke to fit snugly within said recess. A comparatively small passage 21 extends longitudinally centrally through the plug 20 and is curved outwardly and opens at one side of said plug near the piston 16 for purposes hereinafter mentioned.

An intake check-valve 22 is positioned for supplying the air or the gas through a tube 23 to the cylinder 13, said valve being positioned for opening as the piston 15 drops and closing as said piston rises.

In operation, presuming the tank 6 to be filled with a compressed charge and the piston 2 to be in the position indicated in the draw-

ing, the valve 7 is open and the charge passing from tank 6 through tube 5, entering cylinder 1, will throw the piston 2, and thus start the operation of the engine, the valve 7 being closed as soon as the piston 2 has reached the limit of its receding stroke. After the piston 2 has been started in its movement the operation of the same is continued through the explosion of gaseous charges compressed and ignited within the cylinder 1. The starting of the piston 2 of course exhausts to some degree at least the charge within the tank 6, and in order to recharge said tank the valve 9 is opened, and each time a charge is exploded within the cylinder 1 a portion of the expanding gases will enter the tube 5 and passing through the branch pipe 8 will act against the piston-head 11, throwing the same, with its piston-rod 12, upwardly, and thus lifting piston 15. The outward movement of the piston 15 will compress the air within the cylinder 13 and force the same past the valve 18 through a communicating tube 24 to the tank 6. It will be observed that the expansion of the exploded gases will of course effect a comparatively sudden movement of the piston-head 11, and in order to prevent the piston-head 15 striking against the upper head of the cylinder 13 we have provided the plug 20, which produces an air-cushion by closing to some degree the outlet from said cylinder. As the upper or free end of the plug 20 enters the recess 19, all the air within the cylinder 13 between the piston-head 15 and the upper head of said cylinder must be discharged through the passage 21, and as said passage is restricted the said atmosphere forms an air-cushion for the piston 15. As the piston 15 continues to move upwardly after the plug 20 has entered the recess 19, the air is discharged from cylinder 13 through the passage 21, and when the piston 15 has reached the limit of its upward movement the valve 17 is automatically seated by the action of its spring, and but for the passage 21 the return stroke of the piston 15 would produce a vacuum within the recess 19. The formation of vacuum is avoided by the admission of air through valve 22 and passage 21 to the recess 19, whereby the piston 15 is free to move easily back to its former position ready for a second operation. As the piston 22 continues to operate, the operation of pistons 11 and 15 may be continued until the desired amount of pressure is obtained within the tank 6, when the valve 9 is closed and the operation of the air-compressing pump thereby stopped.

From the foregoing it will be seen that the present improvement is in the nature of an attachment adapted to be applied to any ordinary gas-engine and to receive power through the explosion of the charge within the gas-engine without in any way interfering with the operation of the engine or necessitating any alteration in the construction thereof, so that the present improved pump and attachment may be applied to any of the ordinary gas-engines now in use.

While we have illustrated and described the present improved pump attachment as employed for storing compressed air as a medium of power for starting an engine, we of course do not propose to be limited thereby in the structures hereinafter set forth in the claims to the art stated, said structures being clearly capable of supplying compressed air or other gas for any purpose whatever.

As above intimated, the violent throw of the pump-piston 15 must be cushioned or else the same will partially or completely destroy the head of the pump-cylinder 13, and the required cushion is secured by the employment of the plug 21, which acts to restrict the discharge of compressed air from the pump-cylinder 13, and as the plug 21 enters the recess 19 the degree of resistance of the cushion will increase in a ratio proportionate to the distance and speed of travel of the piston 15 toward the upper end of the cylinder 13. Thus it is seen that the cushioning effect on the piston 15 is graduated and increased toward the termination of the stroke of the piston, and it is to be noted that the cushion is obtained by the restriction of the discharge from the pump-cylinder, which restriction of course may be accomplished in numerous ways, all within the scope of the present invention and differing from the illustrative embodiment indicated in the drawing and above described.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a mechanism of the class described, the combination with a gas-engine, of a cylinder connected to and communicating with the explosion end of the cylinder of said engine, a piston within said first-mentioned cylinder adapted to be actuated by the pressure from the gas-engine cylinder, means actuated by the piston of said first-mentioned cylinder for compressing a charge of air or gas, and means for cushioning the termination of the operation of the compressing means.

2. In a mechanism of the class described, the combination with a gas-engine cylinder and a piston operating therein, of a pump-cylinder, a pump-piston arranged therein independent of the gas-engine piston, means actuated by the explosion of the gaseous charge of the gas-engine for operating said pump-piston, and means for producing a cushioning effect upon the pump-piston as the same approaches the termination of its stroke.

3. In a mechanism of the class described, the combination with a gas-engine cylinder and a piston operating therein, of a pump-cylinder, a pump-piston independent of the gas-engine piston arranged within the pump-cylinder free

for having the full stroke for the entire length of the pump-cylinder, means driven by the explosion of the gaseous charge of the gas-engine cylinder for operating said pump-piston, and means for producing a cushion within the pump-cylinder for retarding the termination of the stroke of said pump-piston.

4. In a mechanism of the class described, the combination with a gas-engine, of a cylinder formed with an apertured recess, a check-valve closing the aperture of said recess, a piston within said cylinder, a plug carried by said piston and adapted to fit within said recess, means for admitting gas to said cylinder, and means actuated by the charge within said gas-engine for reciprocating said piston.

5. In a mechanism of the class described, the combination with a gas-engine of a cylinder formed with a recess in one of its heads, a piston within said cylinder, an intake-valve for said cylinder, a discharge-valve for the cylinder, a plug carried by said cylinder in line with said recess and formed with a passage, and means actuated by the charge within said engine for reciprocating said piston.

6. In a mechanism of the class described, the combination with a gas-engine of a cylinder formed with an apertured recess, a valve normally closing the aperture of said recess, an intake-valve for said cylinder, a piston within the cylinder, a plug projecting from said piston in line with said recess and formed with a restricted passage extending from its free end to one side thereof near said piston, and means actuated by the charge within said engine for reciprocating the piston.

7. In a mechanism of the class described, the combination with a gas-engine cylinder and a piston therefor, of a cylinder spaced from and connected with the cylinder of said gas-engine, an exhaust and an intake-valve for the first-mentioned cylinder, a piston within said last-mentioned cylinder independent of said first-mentioned piston, means actuated by the exploded charge within said gas-engine for reciprocating said piston, and means for producing a cushion for the last-mentioned piston.

8. In a mechanism of the class described, the combination with a gas-engine, of a cylinder communicating therewith, a pumping-piston arranged within said cylinder, and adapted to be actuated by exploded gases supplied through said communication between said cylinder and said gas-engine, and means for producing a cushioning effect upon the pumping-piston at the termination of a pumping stroke thereof.

9. In a mechanism of the class described, the combination with a gas-engine, of a cylinder spaced therefrom, a tube communicating between said cylinder and the explosion end of said gas-engine, a pumping-piston arranged within said cylinder in position for being subjected to and actuated by the charge of live pressure admitted through said tube, and means for producing a cushioning effect upon said piston at the conclusion of a pumping stroke thereof.

10. In a mechanism of the class described, the combination with a gas-engine, of a cylinder spaced therefrom, a tube communicating between said cylinder and the explosion end of said gas-engine, a pumping-piston arranged within the cylinder, in position for being driven by live pressure admitted through said tube, and means for producing a cushion between said piston and the end of said cylinder at the termination of a pumping stroke of the piston.

11. In a mechanism of the class described, the combination with a gas-engine cylinder, and a piston therefor, of a pump-cylinder, a pump-piston arranged within said pump-cylinder independent of said engine-piston and free to move the full length of said pump-cylinder, means actuated by the exploded charge of gas within said engine-cylinder for operating said pump-piston, and means for producing a gaseous cushion between the pump-piston and the pump-cylinder just prior to the termination of the working stroke of the pump-piston.

12. In a mechanism of the class described, the combination with a gas-engine cylinder, and a piston operating therein, of a pump-cylinder, a pump-piston operating therein, means independent of said first-mentioned piston and arranged to be actuated by the exploded charge within said gas-engine cylinder for actuating said pump-piston, and means for producing an increasing, graduated cushion for the termination of the stroke of said pump-piston.

13. In a mechanism of the class described, the combination with a gas-engine of a cylinder formed with a recess in one of its heads, a piston within said cylinder, means actuated by the charge within said engine for reciprocating said piston, an intake-valve and an exhaust-valve for said cylinder, a plug carried by said piston in line with said recess and adapted to enter the same when the piston is at one extreme of its movement, and means for preventing formation of vacuum within said recess.

In testimony whereof we hereunto affix our signatures in presence of two witnesses.

REUBEN A. MITCHELL.
LESTER L. LEWIS.

Witnesses:
JOHN M. MCGILL,
WM. H. WINTERS.