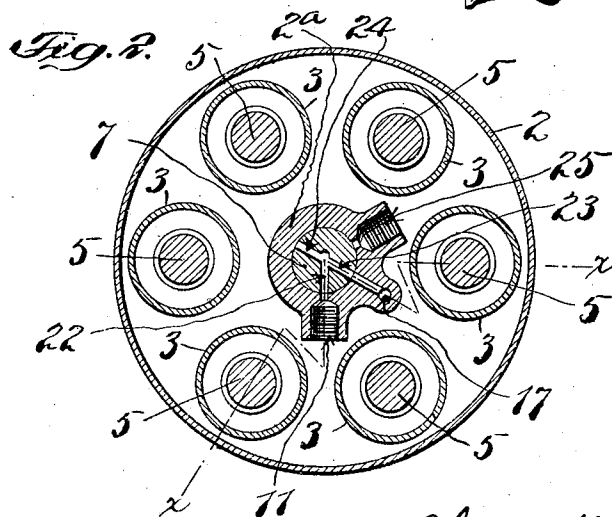
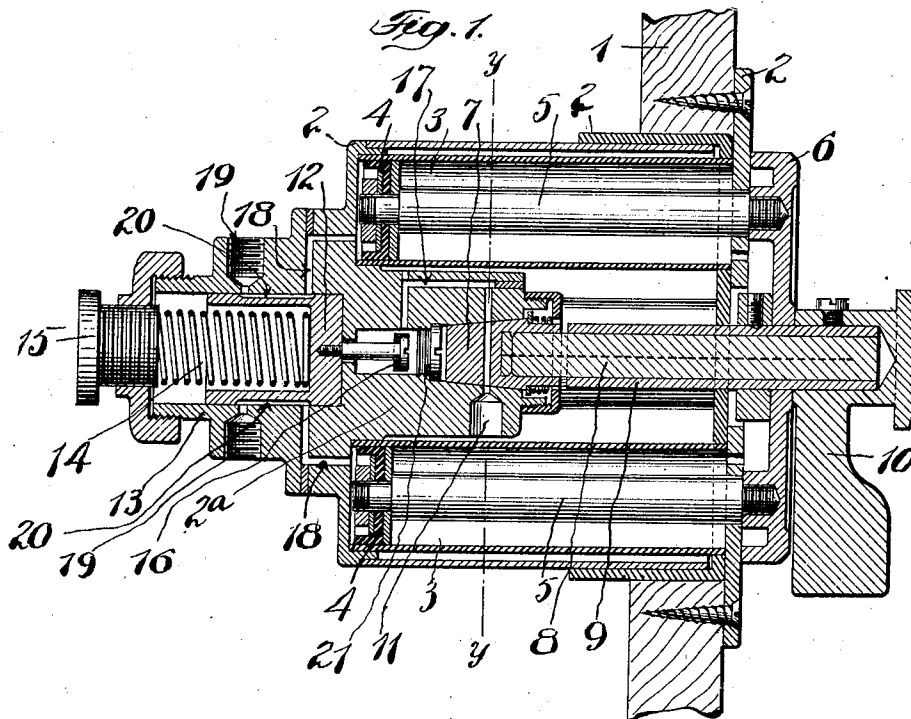


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GAS ENGINE STARTER.
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UNITED STATES PATENT OFFICE.

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GAS-ENGINE STARTER.

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To all whom it may concern:

Be it known that I, CHARLES H. CUNO, a citizen of the United States, residing at Meriden, New Haven county, State of Connecticut, have invented certain new and useful Improvements in Gas-Engine Starters, of which the following is a full, clear, and exact description.

This invention relates to an improved so-called gas engine "starter" in which a suitable fuel gas is measured off and distributed to engine cylinders whereby said gas may be ignited for the purpose of starting the engine.

The object of the present invention is to simplify and render very reliable and durable the various parts of the mechanism, the arrangement also being such that gas supply under very low pressure may be availed of so that in the event of using acetylene, for example, which is vended in storage tanks, it is possible to use the acetylene found in the storage tank even though said tank has been nearly exhausted. These and other advantages will be apparent to the mechanic skilled in this art from a reading of the following description and an examination of the accompanying drawings, in which:

Figure 1 is an irregular sectional view taken substantially on the line $x-x$ of Fig. 2. Fig. 2 is a sectional view on the line $y-y$ of Fig. 1.

In the drawings I have shown my invention of a form adapted to a six-cylinder engine, although it is apparent that said apparatus may be adapted to an engine having any number of cylinders.

1 represents a main support upon which the apparatus may be mounted.

2 represents a main frame which is arranged to be secured in any suitable way to the support 1.

3—3 are what I will term distributing cylinders, which are carried by the main frame 2, and from which gas is forced to the several cylinders of the engine with which the apparatus is associated.

4—4 are pistons in the cylinders 3—3.

5—5 are piston rods carried by the pistons 4—4. Each piston rod, in the preferred form, is rigidly secured at one end to its

respective piston, and at the other end, to a movable head 6 located at the outer end of the apparatus.

7 is a valve, in this instance located in a relatively heavy central casting 2^a preferably integral or rigid with the frame 2. This valve is held to its seat in any suitable manner and is provided with a telescopic stem comprising a central section 8 and an outside section 9. The outside section 9 projects out through the head 6 and is connected with a handle 10. The sections 8—9 of the valve stem are suitably held against independent rotation so that when the handle 10 is turned, a corresponding movement will be imparted to the valve 7. By this arrangement, when the head 6 moves out with the pistons 4 and the rods 5, the handle 10 will move out with said head 6, the telescopic valve stem permitting this movement.

11 is a gas inlet controlled by the valve 7, said inlet 11 being connected with any suitable source of gas supply, said gas supply being forced into the aforesaid apparatus through the passage 11 when the valve 7 stands in the proper position. Between the valve 7 and the distributing cylinders 3 I provide a suitable measuring apparatus whereby predetermined quantities of gas may be admitted to said distributing cylinders. In the preferred form of construction, this measuring mechanism comprises a piston 12 slidable in a cylinder 13, said piston 12 being moved in one direction by a spring 14 which may be varied in tension in any suitable manner, as by an adjustable base 15. The piston 12 normally stands in the position shown in Fig. 1 and carries a valve 16 which controls a passage leading into the cylinder 13 at the end of the piston 12 opposite the spring 14. When the piston 12 and valve 16 stand as shown in Fig. 1, the last mentioned passage is open. Said passage is shown by the clearance around the stem of the valve 16. The valve 16 moves freely in a space provided in the block 2^a.

17 is a passage, one end of which communicates with the valve 7, the other end communicating with the space in the block 2^a in which the valve 16 moves.

18 is a passage which connects the side of

the cylinder 13 with the lower end of a distributing cylinder 3. Each distributing cylinder 3 should be provided with a passage 18.

19—19 are distributing outlets which lead to the several gas engine cylinders, these distributing outlets tapping into the side walls of the cylinder 13. The piston 12 is provided with passages 20—20 which connect the passages 18 with the distributing outlets 19 when the piston 12 stands in the position shown in Fig. 1.

21 is a partition between the valve seat for the valve 7 and the space in which the valve 16 moves, said partition being preferably removable in this instance to facilitate manufacture and to also facilitate assembling of the parts and to afford access thereto for the purposes of repair. By having this partition, it is obvious that no gas pressure can ever get under the valve 7 tending to unseat the same.

With the foregoing description of the construction, the following operation will be readily understood: To operate the mechanism, and starting from the position shown in Fig. 1, the handle 10 is grasped and the valve 7 is turned in a direction to put the gas inlet 11 into communication with the cylinder 13; hence, gas forced through the passage 11 passes directly into the cylinder 13, forcing back the piston 12 against the pressure of the spring 14. As soon as the piston has been forced back so that its end will clear the passages 18, the intruding gas will then flow through the passages 18 into the distributing cylinders 3, forcing back the pistons 4, whereupon the head 6 will move out until the pistons reach the limit of their outward movement. Gas will continue to flow in until the desired pressure of gas (and hence the desired volume) has been forced into the distributing cylinders. This is determined by the tension of the spring 14. When the pressure of the gas in the distributing cylinders 3 has reached the intended limit, any additional pressure will force the piston 12 farther in and will thereby close the entrance passage into said cylinder through the medium of valve 16. In ordinary practice when this condition has been obtained, the valve 7 would be closed by the handle 10, whereupon the gas supply would be cut off and the space above piston 12 vented whereupon, of course, the piston 12 would then return to its normal position shown in Fig. 1, putting the interior of the then charged distributing cylinders in communication with the distributing outlets 19 leading to the several cylinders of the engine. The operator will then press in on the projected parts by pressing against the hub of the handle 10. This will cause the pistons 4 to advance, thereby forcing the gas in the

distributing cylinders into the gas engine cylinders, charging the same ready for starting. By eliminating springs in the distributing cylinders, but very little pressure of gas is required to charge or store the same. By preference the passages in the valve 7 should be such as shown in Fig. 2 wherein branches 22—23 are employed to put the inlet 11 in communication with the passage 17. There is also by preference a branch 24. These branches are arranged at suitable angles for the intended work. 25 is an outlet which may lead to the ordinary gas inlet pipe of a gas engine. By the arrangement of the branches in the valve 7 shown in the drawings, these branches may cooperate as follows: As shown in Fig. 2, the inlet 11 is in direct communication with the passage 17 to permit gas to be introduced into the distributing cylinders through the measuring cylinder. If the valve 7 is given a partial turn in a counterclockwise direction, the gas supply is cut off. If it is given a further turn in the same direction, the branch 24 may be put in communication with the inlet 11 and the branch 22 may be put in communication with the outlet 25 so that the gas supply may be passed directly from the source of supply to the ordinary gas inlet pipe of the engine for the purpose of running the engine as long as desired after initial starting upon the stored gas supply, thus enabling the engine to be warmed up preparatory to being run normally.

It should, of course, be understood that I have described my invention in its preferred form, but that I realize various modifications in structure and arrangement of parts may be resorted to without departure from the spirit or scope of the invention.

The foregoing construction has the following conspicuous advantage: If it should be found that the gas stored in the engine cylinders is too rich, the operator may draw back the head 6 and piston so as to fill the distributing cylinders with air, which may be pumped into the engine cylinders by simply pushing the said parts forward again. Enough air will leak by the piston packings in the distributing cylinders to permit the filling of the same in this manner.

What I claim is:

1. In a gas engine starter, a distributing cylinder, a movable piston therein arranged for manual operation in one direction, a valved gas inlet passage leading to the distributing cylinder, and an automatic pressure-controlled means in said passage arranged to close said passage when the pressure of gas in said passage exceeds the resistance of said means, said distributing cylinder having a distributing passage for delivering the gas contained therein to a gas engine cylinder, and a manually-controllable

valve for the gas inlet arranged in the passage between the automatic pressure-controlled means and the source of gas supply.

2. In a gas engine starter, a distributing cylinder, a movable piston therein arranged for manual operation in one direction, a valved gas inlet passage leading to the distributing cylinder, and an automatic pressure-controlled means in said passage arranged to close said passage when the pressure of gas in said passage exceeds the resistance of said means, said distributing cylinder having a distributing passage for delivering the gas contained therein to a gas engine cylinder, said distributing passage being also controlled by said automatic pressure-controlled means.

3. In a gas engine starter, a distributing cylinder, a movable piston therein arranged for manual operation in one direction, a valved gas inlet passage leading to the distributing cylinder, an automatic pressure-controlled means in said passage arranged to close said passage when the pressure of gas in said passage exceeds the resistance of said means, said distributing cylinder having a distributing passage for delivering the gas contained therein to a gas engine cylinder, and means for varying the effective pressure of said automatic pressure-controlled valve, and a manually-controllable valve for the gas inlet arranged in the passage between the automatic pressure-controlled means and the source of gas supply.

4. In a gas engine starter, a distributing cylinder having a gas inlet passage leading into one end of the same, a manually movable piston in said distributing cylinder, a manually controllable valve in said passage, an automatic valve for said passage in addition to said manually controllable valve, means for normally moving the automatic valve in a direction to open said passage comprising a piston, a cylinder containing said piston, and means operating against said piston to press it into the valve opening position, the pressure of gas moving the piston and its valve in a direction to close said valve and closing said valve when said pressure exceeds the pressure on the piston tending to open the same, said distributing cylinder having a distributing passage for delivering the gas to a gas engine, said distributing passage being controlled by the last mentioned piston, whereby said passage will be open when said piston is in one position and closed when said piston is in another position.

5. In a gas engine starter, a distributing cylinder, a movable piston arranged for manual operation in one direction, a valved gas inlet passage leading to said distributing cylinder, a normally open automatic pressure-controlled means for said passage

arranged to close said passage when the pressure of gas therein exceeds the resistance of said means, said distributing cylinder having a distributing passage for delivering gas contained therein to a gas engine cylinder, and a manually controllable valve for the gas inlet arranged in the passage between the automatic pressure-controlled means and the source of gas supply.

6. In a gas engine starter, a distributing cylinder, a valved gas inlet passage leading into said distributing cylinder, a valve for said passage, a piston in the distributing cylinder, an outwardly projecting piston rod, a valve stem connected to said valve, the outer end of said stem being movable outwardly, a movable head for the other ends of said piston rod and valve stem, and an operating handle at the outer extremity of the valve stem and outside of said head, whereby said valve may be operated at all positions of said head.

7. In a gas engine starter, a plurality of distributing cylinders, a valved gas inlet leading to one end of each of said cylinders, a manually movable piston in each of said cylinders, a manually controllable valve for said gas inlet passage, a normally open automatic valve for said passage, and pressure-controlled means coacting with said valve and normally operating to hold the same open, said pressure-controlled means being in communication with the inlet passage whereby the pressure of gas entering operates to move said means in a direction to close said automatic valve.

8. In a gas engine starter, a plurality of distributing cylinders, a valved gas inlet leading to one end of each of said cylinders, a manually movable piston in each of said cylinders, a manually controllable valve for said gas inlet passage, a normally open automatic valve for said passage, pressure-controlled means coacting with said valve and normally operating to hold the same open, said pressure-controlled means being in communication with the inlet passage whereby the pressure of gas entering operates to move said means in a direction to close said automatic valve, and a gas distributing passage leading from each of said distributing cylinders for delivering gas to a gas engine cylinder.

9. In a gas engine starter, a plurality of distributing cylinders, a valved gas inlet leading to one end of each of said cylinders, a manually movable piston in each of said cylinders, a manually controllable valve for said gas inlet passage, a normally open automatic valve for said passage, pressure-controlled means coacting with said valve and normally operating to hold the same open, said pressure-controlled means being in communication with the inlet passage

whereby the pressure of gas entering operates to move said means in a direction to close said automatic valve, and a gas distributing passage leading from each of said
5 distributing cylinders for delivering gas to a gas engine cylinder, each of said distribut-

ing passages being also controlled by said pressure-controlled means.

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