

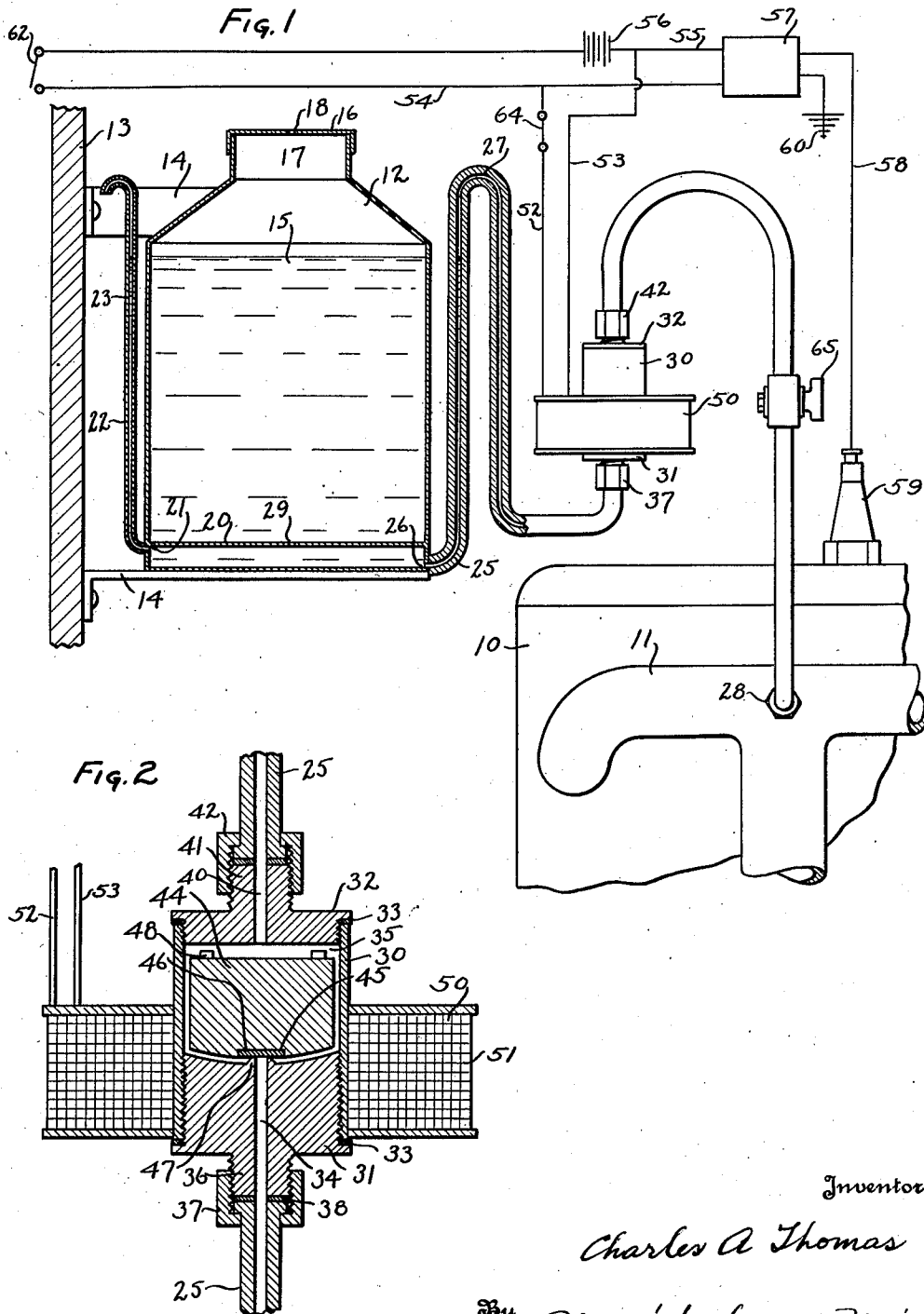
June 16, 1931.

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1,810,193

INTERNAL COMBUSTION ENGINE

Filed April 22, 1929



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INTERNAL COMBUSTION ENGINE

Application filed April 22, 1929. Serial No. 357,087.

This invention relates to internal combustion engines, particularly automotive engines, and to the prevention of accumulations of objectionable carbon deposits within the cylinders of such engines.

One of the principal objects of the invention is to provide means automatically operable upon the manual actuation of a control member of the engine for introducing from time to time controlled quantities of carbon remover fluid into the cylinders of the engine.

Another object of the invention is to provide in vehicles propelled by internal combustion engines, apparatus which is simple and inexpensive in construction, is highly effective in operation, and which automatically and intermittently functions to introduce a controlled quantity of chemical into the cylinders of the engine upon the necessary manual actuation of a part used in controlling the vehicle.

Still another object of the invention is to provide a novel and superior method of treating engine cylinders with carbon remover fluid to maintain the engine at all times free from objectionable carbon deposits.

Other objects and advantages of the invention will be apparent from the following description, accompanying drawings and appended claims.

In the drawings in which like characters of reference designate like parts throughout the several views thereof—

Fig. 1 is an elevational view, partially diagrammatic, of apparatus constructed in accordance with this invention, parts being broken away and in section to illustrate the construction thereof; and

Fig. 2 is a vertical sectional view through a detail of construction.

The drawings, in which is disclosed a preferred embodiment of the invention, illustrate an internal combustion engine 10 having an intake manifold 11 mounted upon a suitable frame or chassis (not shown), which may be the chassis of an automobile. Supported adjacent the engine 10 in any suitable manner is a supply container 12 adapted

to hold the chemical to be injected into the cylinders of the engine 10. As shown, the container is mounted upon the front side of the dash 13 by suitable brackets 14 bolted to the dash. Container 12 comprises a can or tank of relatively large volume for holding a considerable supply of carbon remover liquid indicated at 15, and has a removable cover 16 for a filling opening 17, the cover having a vent 18.

Mounted within the bottom of container 12 is a secondary or feeding container 20 of relatively small volume, comprising a section of tubing mounted transversely across the bottom of the container, the ends of the tubing being soldered to the opposite side walls of the supply container. Communicating with the upper portion of the space within the interior of the tubing 20 through an orifice 21 in the wall of container 12 is a vent tube 22, comprising a copper rod having a small bore 23 approximately a thirty-second of an inch in diameter. Vent tube 22 extends up and opens to atmosphere above the level of liquid within container 12. At the opposite side, a supply pipe or tube 25 is connected to container 12 so as to be in communication with a port 26 opening through the wall of the container into the lower portion of the space within the interior of tubing 20, forming an outlet for feeding container 20. Tubing 25 is also constructed of a copper rod having a small bore 27, and is of such configuration as to extend up above the level of liquid within container 12 to a reverse bend, then leading to the intake manifold 11 into which it is tapped as indicated at 28. The space within feeding container 20 communicates with the space within supply container 12 through a restricted orifice 29, so that gravity flow from container 12 into tubing 20 is materially less than the normal rate of outflow from this tubing to the engine cylinders.

Mounted within supply pipe 25 is an electrically operated valve, shown in detail in Fig. 2. This valve comprises a cylindrical casing 30 threadedly receiving at opposite ends plugs 31 and 32, suitable sealing

washers 33 being positioned between the casing and plugs. Plug 31 is formed with a longitudinal bore 34 extending from the interior valve chamber 35 to the exterior of the plug through a threaded nipple 36 which receives a coupling member 37 serving to attach an end of supply pipe 25 to the valve casing. A suitable washer 38 is positioned between the supply pipe and nipple 36 to provide a fluid tight joint.

Plug 32 is provided with a longitudinal bore 40 and with a threaded nipple 41 receiving a coupling member 42 for attaching another portion of supply pipe 25 to this end of the valve casing in fluid tight relation. Mounted within valve chamber 35 is a weighted cylindrical valve member 44 necessarily formed of magnetic material such as iron. Valve 44 is formed at its lower end with a circular groove 45 receiving a washer 46 adapted to engage an upstanding valve seat 47 formed at the upper end of plug 31 about bore 34. The upper end of valve 44 is provided with spacing lugs 48 to hold the valve away from the wall of plug 32 to permit flow of fluid through the casing. Surrounding casing 30 is an electromagnetic coil 50 having a winding 51 so positioned as to set up an electromagnetic field when energized serving to hold valve 44 upon its seat, the valve functioning as an armature. Leads 52 and 53 of coil 51 are connected to a suitable electrical circuit of the engine or vehicle.

As shown, leads 52 and 53 are connected respectively to wires 54 and 55 of the primary of the ignition circuit of the engine containing storage battery 56 and transformer 57. The secondary of the ignition circuit is connected by lead 58 to spark plug 59 for firing the charge in the engine cylinder, the other side of the secondary being grounded at 60. Within the ignition circuit is the usual manually controlled switch lever 62 mounted on the rear side of dash 13 for convenient manipulation by the operator of the vehicle for controlling the running or stopping of the engine 10 in the usual manner. A switch 64 is provided in the parallel circuit leading to coil 51, and a manually controlled shut-off valve 65 is positioned within supply pipe 25.

In operation, assuming the parts to be in the positions shown in the drawing, the operator starts the engine 10 by closing ignition switch 62 and stepping on the starter (not shown) in the usual manner. When the ignition circuit is closed, current is supplied from battery 53 through the ignition circuit and also through the parallel circuit including coil 51, switch 64 being closed. The electromagnetic field serves to hold armature valve 44 upon its seat with sufficient force to overcome the pull of the sub-atmospheric pressure existing within the in-

take manifold and supply pipe 25 due to the operation of the engine. During non-use of the machine, or during operation when the ignition circuit is closed, and no carbon remover is being supplied to the cylinder of the engine, feeding container 20 gradually fills with a charge of liquid. The volume of liquid within tubing 20 together with the practically negligible volume within bores 23 and 27 of pipes 22 and 25 respectively, which fill to substantially the level of liquid within container 12, is so regulated by the construction of these parts as to provide for the accumulation of a predetermined small quantity of liquid therein.

When the engine is stopped upon the opening of ignition switch 62, the inertia of the moving parts of the engine will cause it to turn over several times after the switch 62 is opened. The resulting suction serves to pull valve 44 from its seat and the controlled accumulation of carbon remover is rapidly withdrawn from feeding container 20 through supply pipe 25 and fed to the cylinders of the engine. The engine normally turning over several times after the ignition switch is opened serves to substantially drain feeding container 20 and supply this controlled volume of liquid to the cylinders, but such turning over of the engine is not sufficient to result in any material loss of liquid through the exhaust after it is introduced into the cylinders. The size of the port or restricted orifice 29 is such that practically a negligible flow takes place therethrough during this period of introduction of the accumulation into the cylinders, so that a desired controlled volume of carbon remover is injected.

In the practice heretofore used, introduction of carbon remover has been carried out at stated intervals, such as about every 500 miles, using a sufficient quantity of carbon remover to effectively loosen the accumulation of deposits which have formed within the cylinders during the intervening period. It is found in actual practice that an operator is apt to omit having this done at proper intervals, and will often run a car for much longer periods even though the car is not operating at its highest efficiency. In accordance with the present invention, the human element of the operator of an engine or an engine driven vehicle is eliminated as a factor in the successful use and application of carbon remover fluid, and controlled small amounts of such fluid are automatically injected into the cylinders upon the occurrence of movements which the operator must make in operating the engine or driving the car. The injection is carried out intermittently and at frequent intervals as the engine is stopped, so that the fluid is given an op-

portunity to effect its solvent action during the period of non-use of the engine, and so that accumulation of objectionable amounts of carbon deposits is prevented. Due to the frequent intervals of injection, only small amounts of fluid need be introduced upon each application so that a supply container may be provided on the vehicle which will hold a sufficient volume for normal operation over a considerable period of time. While the volume of liquid introduced may be varied within considerable limits, depending upon the operation and requirements of the machine, very satisfactory results have been secured by the introduction of about 5 to 15 c.c. upon each application.

As soon as the suction existing within the supply pipe 25 fails upon the stopping of the engine, further flow from feeding container 20 is prevented, due to the elevation of the reverse bend in supply pipe 25 above the normal liquid level within container 12. As a further precaution, the construction of valve 44 is such that as soon as the engine has ceased to turn over and the suction fails within pipe 25, the weight of valve 44 causes it to seat by gravity to effectively seal the supply pipe. During this interim liquid gradually flows from supply container 12 into feeding container 20 through the restricted orifices 29, so that another accumulation or charge is supplied thereto for a subsequent application. To restart the engine, ignition switch 62 is closed and valve 44 is then held upon its seat. The loosened deposits within the cylinders are blown out through the exhaust as the engine is started.

If the customary operation of the vehicle results in unusually frequent starting and stopping of the engine, the parallel circuit of coil 51 may be disconnected from the ignition circuit by opening switch 64 to throw this automatic injecting mechanism out of operation from time to time as desired. When this is done, valve 65 within supply pipe 25 is closed to prevent the suction from being effective upon valve 44 and the liquid containers.

While the method herein described, and the form of apparatus for carrying this method into effect, constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to this precise method and form of apparatus, and that changes may be made in either without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. Apparatus of the character described, comprising in combination, an internal combustion engine having a cylinder, an electrical circuit for said engine, a switch within said electrical circuit, and means operatively

associated with said electrical circuit and switch for automatically introducing chemical into the cylinder of said engine upon the opening of said switch to break the electrical circuit.

2. Apparatus of the character described, comprising in combination, an internal combustion engine having a cylinder, an ignition circuit controlling the firing of the charge within said cylinder, an ignition switch for opening and closing said ignition circuit, and means operatively associated with said ignition circuit and switch for automatically introducing a chemical into the cylinder of said engine upon the opening of said ignition switch to stop the engine.

3. Apparatus of the character described comprising in combination, an internal combustion engine having a cylinder, a member for stopping the normal operation of said engine, a container for chemical, means for introducing chemical from said container into said cylinder, and means operatively connected with said member and automatically brought into operation upon the actuation of said member for the injection into said cylinder of a predetermined amount of chemical less than the entire amount of chemical within said container.

4. Apparatus of the character described, comprising in combination, an internal combustion engine having a cylinder, a supply container for liquid, a feeding container having a predetermined volume, means for introducing liquid from said feeding container into the said cylinder to substantially empty the feeding container, and a supply connection having a restricted orifice between the supply container and the feeding container to prevent substantial flow therebetween during the period of emptying of the feeding container.

5. In apparatus of the character described, a supply container for liquid, a vent therefor, a feeding container of predetermined volume, a vent for said feeding container extending above the normal liquid level in said supply container, an outlet for said feeding container, and a gravity connection between said supply container and said feeding container including a restricted orifice to limit the flow from the supply container to the feeding container to a rate substantially less than the normal rate of outflow from the feeding container.

6. In apparatus of the character described, a supply container for liquid, a vent therefor, a member positioned within and adjacent the lower portion of said supply container forming a feeding container of predetermined volume, a vent for the interior of said member extending above the normal liquid level in said supply container, an outlet for draining the space within said feed-

ing container, said member having an orifice of restricted size providing communication between the interior of said supply container and the interior of said member to supply liquid thereto at a rate substantially less than the normal rate of outflow from such member.

7. Apparatus of the character described, comprising in combination, an engine having a cylinder, a container for liquid, a supply pipe for feeding liquid from said container to said cylinder, a valve within said supply pipe, means automatically operable during the normal running of said engine for maintaining said valve closed, and means for automatically opening said valve to permit the supply of liquid from said container to said cylinder upon the stopping of the engine.

8. Apparatus of the character described, comprising in combination, an internal combustion engine having a cylinder, an ignition circuit for said engine, a container for liquid, a supply pipe for feeding liquid from said container to said cylinder, an electrically operable valve within said supply pipe, and an electric circuit for said valve connected to said ignition circuit, the construction being such that said valve is held closed when the ignition circuit is closed, said valve automatically opening as the ignition circuit is broken under the action of suction within said supply pipe resulting from the turning over of the engine by the inertia of the moving parts after the ignition circuit is broken.

9. Apparatus of the character described, comprising in combination, an internal combustion engine having a cylinder, an ignition circuit for said engine, a container for liquid, a supply pipe for feeding liquid from said container to said cylinder, an electrically operable valve within said supply pipe, and an electric circuit for said valve connected to said ignition circuit, the construction being such that said valve is held closed when the ignition circuit is closed, said valve automatically opening as the ignition circuit is broken under the action of suction within said supply pipe resulting from the turning over of the engine by the inertia of the moving parts after the ignition circuit is broken, said valve then being closed upon the stopping of the moving parts of the engine and the failure of suction within said supply pipe.

10. Apparatus of the character described, comprising in combination, an internal combustion engine having a cylinder, a container for liquid, a supply pipe for feeding liquid from said container to said cylinder, an ignition circuit for said engine, an ignition switch for manually opening and closing said ignition circuit, an electrically operated valve within said supply pipe, an

electrical circuit for said valve connected in parallel with said ignition circuit, a separate switch for opening said valve circuit without opening said ignition circuit, and a manually operable valve within said supply pipe.

11. Apparatus of the character described, comprising in combination, an internal combustion engine having a cylinder, a container for carbon remover liquid, a supply pipe leading from said container to said cylinder, means operable for maintaining said supply pipe closed during the normal running of said engine, a member for stopping said engine, and means automatically operable upon the actuation of said member to stop the engine to permit opening of said closing means to feed carbon remover liquid to the cylinder as the engine is stopped.

12. Apparatus of the character described, comprising in combination, an internal combustion engine having a cylinder, an intake manifold for said engine, a container for carbon remover liquid, a supply pipe leading from said container to said intake manifold, an ignition circuit for said engine, means for maintaining said supply pipe closed during the normal running of said engine, and means automatically operable upon the opening of said ignition circuit to permit the opening of said closing means in the supply pipe to feed carbon remover liquid to said intake manifold and cylinder as the engine is stopped.

13. For use with an internal combustion engine having a cylinder, and a member for stopping the normal operation of said engine; means for automatically introducing into said cylinder a predetermined amount of carbon remover, and means adapted to be operatively interconnected with said member and said introducing means and constructed to be brought into operation upon the actuation of said member to automatically effect the introduction into the cylinder of a predetermined amount of carbon remover as the engine is stopped.

14. In the operation of an internal combustion engine having a cylinder, the method which comprises intermittently introducing into the cylinder a predetermined small quantity of carbon remover at controlled intervals as the engine is stopped, to thereby maintain the cylinder free from objectionable carbon deposits.

15. Apparatus of the character described adapted for use with an internal combustion engine having a cylinder, and a member for stopping the normal operation of said engine; a container for chemical, a connection for introducing said chemical into said cylinder, means for controlling flow of chemical through said connection, and mechanism for automatically actuating said flow controlling means upon the operation

of said member to stop the engine to cause the introduction of chemical into said cylinder.

16. Apparatus of the character described adapted for use with an internal combustion engine having a cylinder, and a member for stopping the normal operation of said engine; a container for chemical, a connection for introducing said chemical into said cylinder, a valve for said connection, said valve being closed during the normal operation of said engine, and means adapted to operatively interconnect said member with said valve to be actuated, upon the operation of said member to stop the engine, to automatically open said valve for the introduction of chemical through said connection into said cylinder.

In testimony whereof I hereto affix my signature.

CHARLES A. THOMAS.