Dec. 23, 1924. 1,520,552

A. J. ADAMS

MEANS FOR STARTING INTERNAL COMBUSTION ENGINES

Filed March 1, 1921 2 Sheets-Sheet 1

Fig. 1.

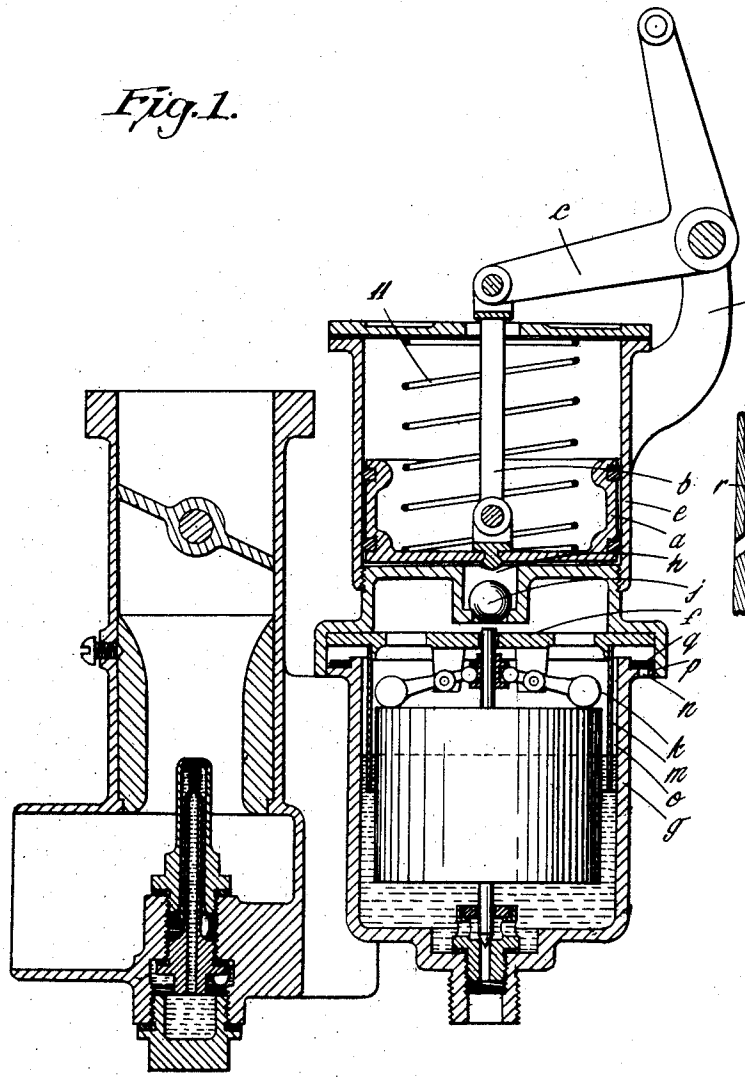
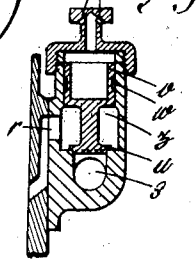


Fig. 2.



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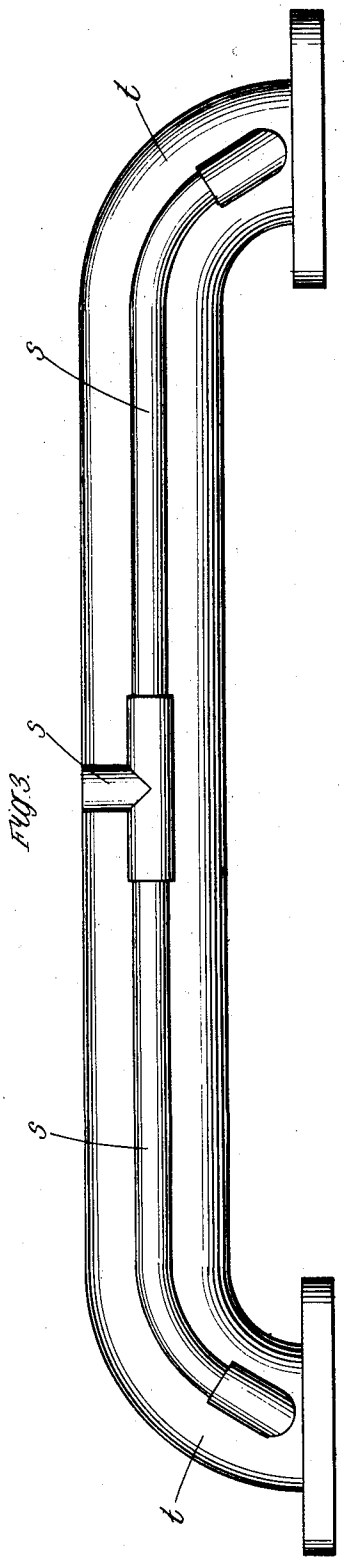


Fig. 3.

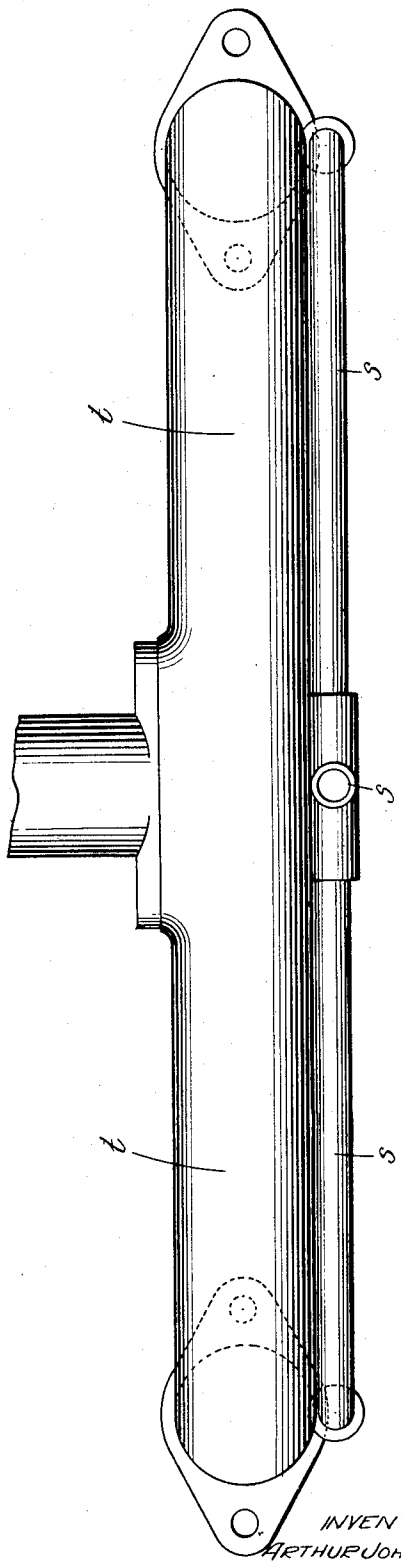


Fig. 4.

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UNITED STATES PATENT OFFICE.

ARTHUR JOHN ADAMS, OF HEYWOOD, NEAR WESTBURY, ENGLAND.

MEANS FOR STARTING INTERNAL-COMBUSTION ENGINES.

Application filed March 1, 1921. Serial No. 448,894.

To all whom it may concern:

Be it known that I, ARTHUR JOHN ADAMS, of The Cottage, Heywood, near Westbury, in the county of Wiltshire, England, a British subject, have invented certain new and useful Improvements in or Relating to Means for Starting Internal-Combustion Engines, of which the following is a specification.

This invention relates to the starting of internal combustion engines having means for priming the engine before rotation of the engine shaft, comprising a pump connected with a hydrocarbon vaporizer and adapted to draw in a supply of hydrocarbon vapor and to deliver it to the inlet pipe or pipes.

The invention is applicable to all internal combustion engines, such, for instance, as the engines of motor vehicles, whether provided with starting apparatus or not, and is especially applicable for use in conjunction with starting apparatus, such as is set forth in the specifications accompanying my applications for British Letters Patent Nos. 151,099 of 1919 and 151,574 of 1920.

According to the present invention the pump is connected with the air space above the liquid in a chamber in which the liquid level is controlled, such as the float chamber of the carburettor, said chamber having a skirt adapted to dip into said liquid and an inlet or inlets for air outside said skirt so that air drawn in through said inlet or inlets is constrained to pass below the bottom of said skirt and through said liquid before it can gain access to said air space.

The accompanying drawings illustrate one form of the invention, Figure 1, being a central sectional elevation of a carburettor, and Figure 2 a fragmentary section in a different radial plane, while Figures 3 and 4 are a side elevation and a plan respectively of an intake manifold.

As shown in Figure 1, a spring pressed trunk piston *a* is adapted to be reciprocated by means of a connecting rod *b*, a bell crank lever *c* pivoted on a bracket *d*, and other conveniently arranged link and lever mechanism, (not shown), in a cylinder *e* mounted on the cover *f* of the float chamber *g* of the carburettor, the cylinder *e* communicating, by a passage *h* at its bottom controlled by a ball valve *j* with the air space *k* above the liquid in the chamber *g*. The cover *f* of the float chamber *g* is provided with an annular flange, or dependant skirt *m* which extends to below the level of the liquid in the chamber *g* and near its top the chamber *g* is provided with a series of air vents *n* adapted to admit air to the annular space *o* between the flange *m* and the wall of the float chamber *g*. This series of air vents *n* is arranged in a circumferential horizontally extending flange *p* and is adapted normally to be closed by a ring *q* lying over the apertures *n*. The cylinder *e* also communicates by way of a valve-controlled passage *r* leading from the bottom thereof, with a vapour feed pipe *s* (Figures 3 and 4) which branches off and opens into the inlet pipes *t* of the engine as near as possible to, and on the inlet sides of, the inlet valves (not shown). The connection of the passage *r* with the cylinder *e* is not shown in Figure 1 as it lies in a different radial plane from that on which the main section is taken, but the connection is shown in Figure 2.

The valve for controlling the outlet passage *r* from the cylinder *e* is formed with a mushroom head *u* and with a cylindrical body *v* of greater diameter than the head *u*, adapted to be reciprocated in a guiding cylinder *w* open to the atmosphere through passages *y*, the guiding cylinder *w* being extended to form a valve chamber *z*, enclosing the mushroom head *u* and a seating for said head. This valve *u*, *v*, is adapted to be raised off its seating by superior pressure within the valve chamber *z* owing to the difference of the areas presented by the head *u* and the end of the cylindrical body *v*.

When the bell crank lever *c* of the trunk piston *a* is rocked on its pivot, the piston *a* is raised against the action of its spring 11 and draws in hydrocarbon vapour through its ball-valve-controlled passage *h*, air entering through the vents *n* by raising the ring *q* lying thereover and entering into the annular space *o* between the depending flange *m* and the wall of the float chamber *g*, and being drawn down through the liquid in said float chamber, and after bubblig up through said liquid being drawn from the space *k* above said liquid through said ball-valve-controlled passage *h*.

While the trunk piston *a* is being raised, the decreased pressure in the valve chamber *z* of the mushroom-headed differential valve *u*, *v* causes said valve to be held down

against its seating, but when the trunk piston *a* is depressed either by its spring 11 or by operation of the bell crank lever *c* the ball-valve *j* closes, the pressure in the differential valve chamber *z* is increased and said differential valve *u*, *v* is raised off its seating, consequently hydrocarbon vapour is forced through the vapour feed pipe *s* into the inlet pipes *t*, near to, and on the inlet sides of the inlet valves, and displaces air from said inlet pipes back through the carburettor. It is important that the vapour feed pipe *s* should connect with the inlet pipes *t* as near as possible to the inlet valves, so that as soon as the crank shaft (not shown) is turned hydrocarbon vapour is drawn into the cylinders (not shown) and the engine starts immediately.

The priming of an engine with hydrocarbon vapour in accordance with this invention is of especial importance in connection with an engine starter as described in the specifications accompanying my applications for British Letters Patent Nos. 151,099 of 1919 and 151,574 of 1920, which is designed to move the engine shaft slowly instead of rapidly as is the more usual practice, and which consequently produces a slow induction stroke until the engine has started. The means for reciprocating the trunk piston *a* of the hydrocarbon vapour pump *a*, *e* may include a rod (not shown) extending through the dashboard of the vehicle and having a lever mounted radially thereon so that by rocking said lever and rod the bell crank lever *c* of the pump *a*, *e* may be rocked through a radial arm on said rod and a link connected with said bell crank lever, and in this case said rod may have mounted thereon a spring contact finger adapted, when the rod is rocked to be brought up against a contact piece in the ignition circuit, so that said circuit is thereby earthed. This arrangement enables the engine to be stopped and ensures that the inlet pipes *t* thereof are charged with hydrocarbon vapour ready to be drawn in as soon as the crank shaft is turned. If the engine is fitted with magneto trip mechanism such for instance as is set forth in the specifications accompanying my applications for British Letters Patent Nos. 151,357 of 1919, 160,559 of 1919, 158,790 of 1920, 158,564 of 1920, or 158,565 of 1920, the rod above mentioned may be provided with a cam adapted to throw into operative position the detent of the trip mechanism, so that the locking of the rod accomplishes the three-fold action of stopping the engine, charging the inlet pipes with hydrocarbon vapour and rendering the trip mechanism ready for operation.

I claim:

1. Means for facilitating the starting of an internal combustion engine having inlet pipes comprising a pump connected with a hydro-carbon vaporizer and adapted to draw in a supply of hydro-carbon vapor and deliver said vapor to said inlet pipes, said vaporizer including a constant level chamber for liquid hydro-carbon, and an air space above the liquid in said chamber, said air space being connected with the pump, a skirt adapted to dip into said liquid, and air inlets for admitting air about the outer side of the skirt, said air being drawn below the bottom of said skirt and through said liquid for gaining access to said air space above the liquid connected with said pump.

2. Means for facilitating the starting of an internal combustion engine, as claimed in claim 1 wherein the passage between the pump and the air space, and the inlet to the chamber are each controlled by a one way valve, substantially as set forth.

3. Means for facilitating the starting of an internal combustion engine, as claimed in claim 1, wherein a delivery pipe from the pump to the inlet pipe or pipes is controlled by a valve having two surfaces of different areas exposed to pressure in the pump and one surface exposed to atmospheric pressure, so that said valve is adapted to be raised off its seating by superior pressure within the pump and to be held down upon its seating by inferior pressure within the pump substantially as set forth.

4. Means for facilitating the starting of an internal combustion engine, as claimed in claim 3, wherein the valve is formed with a mushroom head and with a cylindrical body of greater diameter than said head and adapted to be reciprocated in a guiding cylinder open to the atmosphere, said guiding cylinder being extended to form a valve chamber enclosing said mushroom head, and a seating for said head, substantially as set forth.

ARTHUR JOHN ADAMS.