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A. G. SCHOLES & G. GIBSON.

WATER INJECTOR FOR INTERNAL COMBUSTION ENGINES.

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FIG. 1.

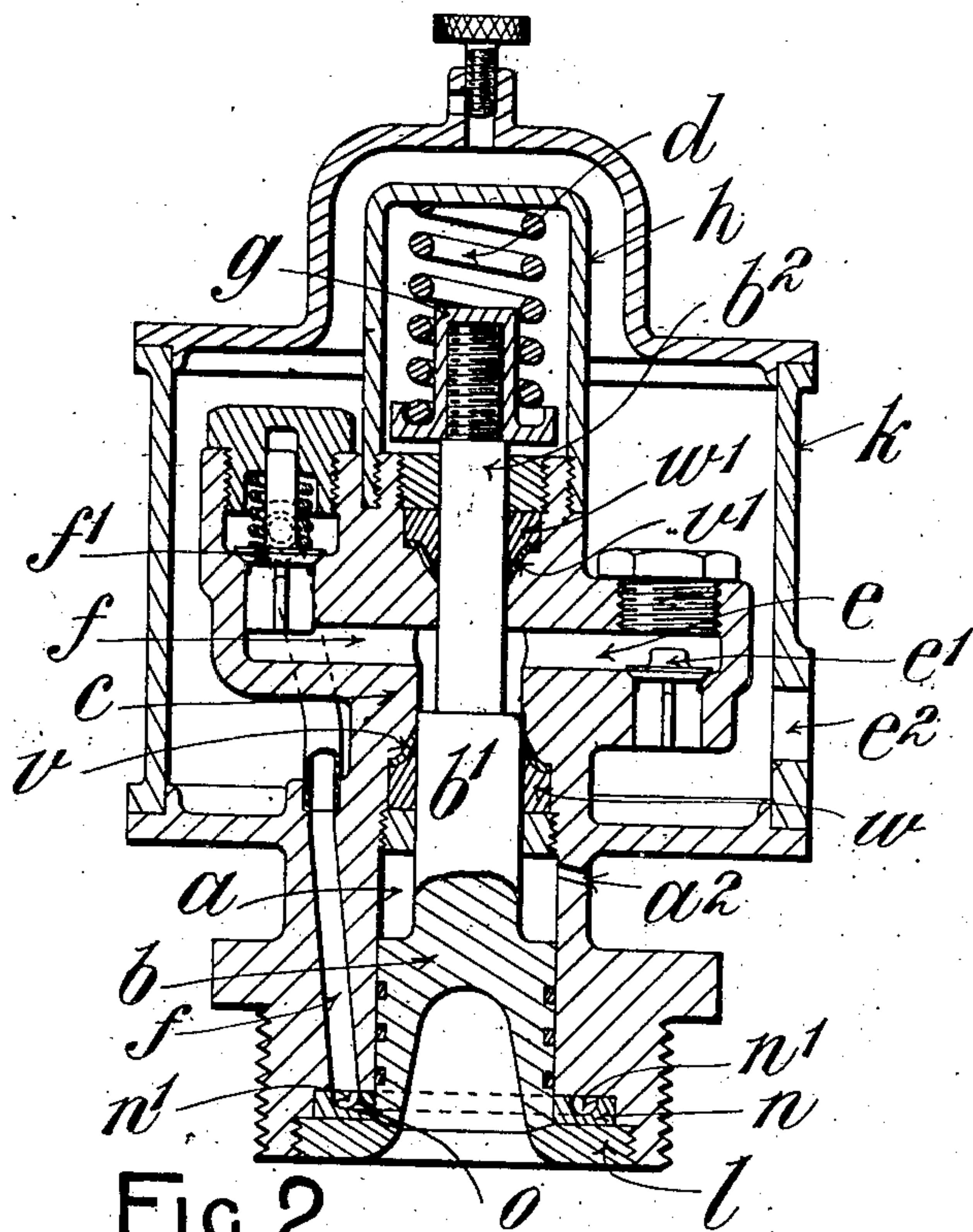
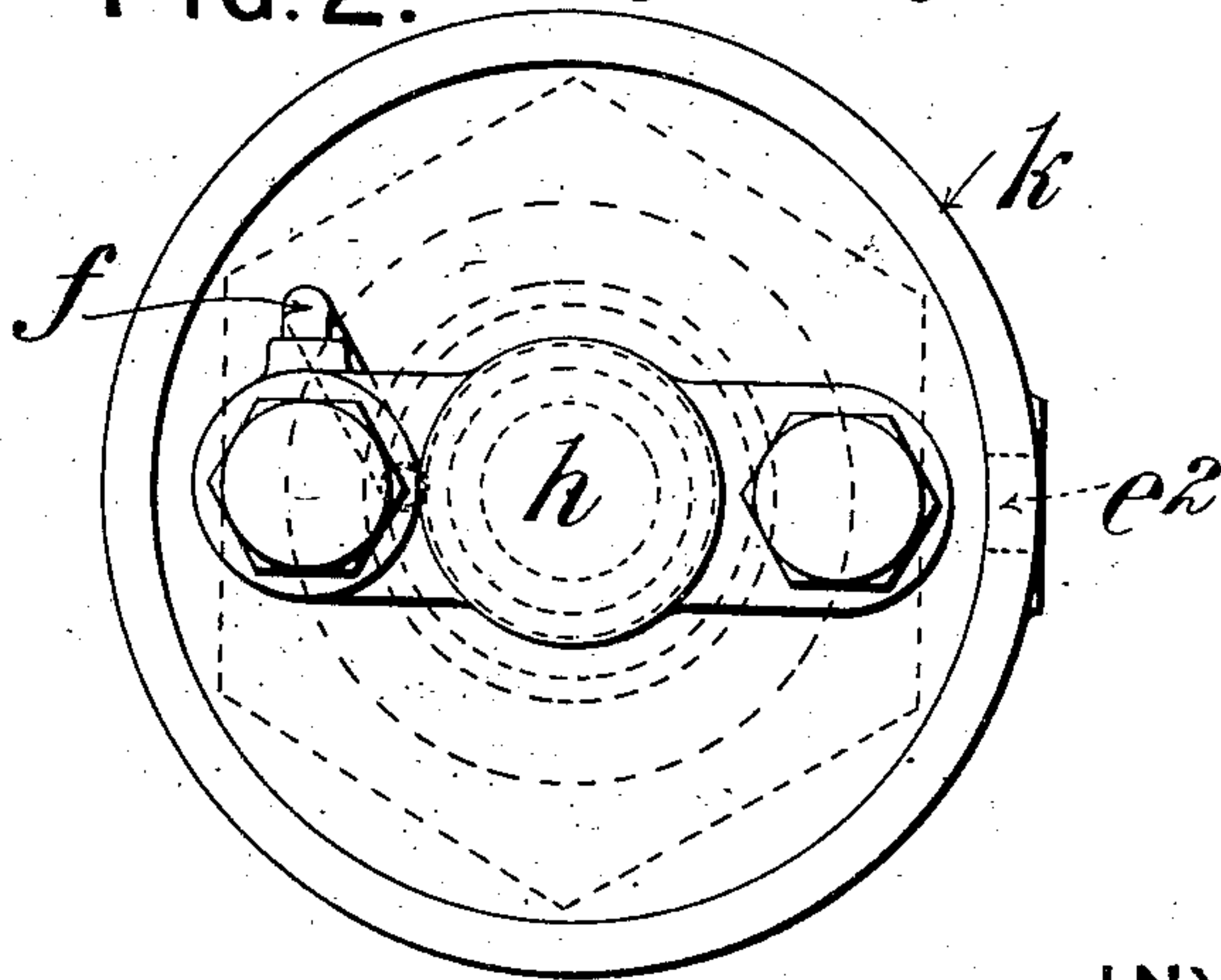


FIG. 2.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

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## WATER-INJECTOR FOR INTERNAL-COMBUSTION ENGINES.

No. 891,638.

Specification of Letters Patent.

Patented June 23, 1908.

Application filed January 18, 1908. Serial No. 411,539.

*To all whom it may concern:*

Be it known that we, ALFRED GEORGE SCHOLLES, engineer, a subject of the King of Great Britain and Ireland, residing at 41 Gordon road, Ilford, in the county of Essex, England, and GEORGE GIBSON, engineer, a subject of the King of Great Britain and Ireland, residing at 25 New street, in the city and county of Westminster, England, have invented a new and useful Improvement in Water-Injectors for Internal-Combustion Engines, of which the following is a full and complete specification.

This invention relates to that type of water injector for internal combustion engines consisting of a small direct-acting pump the piston of which receives motion for its working stroke from the explosive effort in the working cylinder of the engine so that the water is injected into the cylinder immediately after the commencement of the working stroke of the engine, and it consists essentially in making the delivery port in the cylinder of the pump as near to its open end as possible so that said port is closed by the piston operating the pump when said piston is at the end of its return stroke, the object being to prevent the water remaining in the delivery port or passage being sucked into the working cylinder of the engine during the suction stroke of the piston thereof which is an inherent fault in water injectors of this type, which fault is generally intensified by reason of the length of the delivery port or passage. It has been suggested that this defect can be remedied by the use of a non-return valve at the end of the delivery port or passage but the heat is so intense that such a valve will not work reliably in such a position.

The invention also consists in certain details of construction hereinafter specified which have for their objects enabling the direction in which the water is injected into the cylinder to be varied as desired, to simplify the construction, and to increase the life of the working parts more particularly the spring employed for effecting the return stroke of the working piston.

In the accompanying drawing, Figure 1 is a view in sectional elevation, and Fig. 2 is a view in plan with top of casing removed.

In both views similar parts are marked with like letters of reference.

The apparatus consists essentially of a cylinder *a* open at one end, a piston *b* working in said cylinder, an extension *b*<sup>1</sup> of said piston forming a ram which works in a second cylinder *c*, a spring *d* acting on the piston *b* to effect its return stroke, an inlet port or passage *e* leading into the head of the cylinder *c* fitted with a non-return valve *e*<sup>1</sup>, an outlet port or passage *f* leading from said cylinder *c* fitted with a non-return valve *f*<sup>1</sup>, the said outlet terminating in the cylinder *a* at or near the open end thereof in such a position that it is closed by the piston *b* when it is at the end of its return stroke at the open end of said cylinder.

In the preferred construction which is that illustrated in the accompanying drawing the spring *d* is located outside the cylinders in order that the high temperature of the piston *b* may not be imparted to it in order that its temper may not be impaired. The spring acts on the piston *b* through an extension *b*<sup>2</sup> of the ram *b*<sup>1</sup> (which projects through the head of the cylinder *c*) through a collar *g* screwed or otherwise fixed on said extension and operates against the upper end of a cap *h* screwed or otherwise fixed to the cylinder head. The cylinders and the valve boxes are preferably formed in one piece as shown, a suitable packing *v* and packing ring *w* being employed between the two cylinders and a suitable packing *v*<sup>1</sup> and packing ring *w*<sup>1</sup> being employed where the extension *b*<sup>2</sup> passes through the cylinder head. The valve boxes are preferably inclosed in a casing *k* which is constructed and arranged to operate as a water jacket in which construction the inlet port *e* opens into said chamber and said chamber is provided with an inlet *e*<sup>2</sup> for the supply of water. The open end of the cylinder *a* is partially closed by a ring *l* which operates as a stop for the piston to bear against. The strength of the spring *d* is such that the pressure on the piston *b* during the compression stroke of the engine will not lift said piston and will therefore not cause the injector to function. In the cylinder *a* is a small hole *a*<sup>2</sup> the function of which is to prevent the accumulation of any pressure behind the piston *b*.



The cylinder *a* is threaded externally or otherwise adapted to be fixed in the wall of the cylinder of the motor so that it is open to the combustion chamber thereof. In an engine such as is used in motor road vehicles a convenient place for the insertion of the apparatus would be one of the holes above the valves which are usually closed by screw plugs.

10 To enable the jet of water produced by the apparatus to be directed in any direction—which is especially useful in applying the apparatus to the engines of motor road vehicles—the outlet of the delivery port or passage *f* leads into an annular channel at the 15 open end of the cylinder *a*. This channel is conveniently formed by a ring *n* having a groove *n*<sup>1</sup> in one of its faces being fitted in a recess in the open end of the cylinder *a* and kept in place therein by the ring *l*. The inner edge of the ring *n* is provided with one or more holes *o* communicating with the annular groove or channel *n*<sup>1</sup> so that by rotating 20 the ring *n* the said hole or holes may be placed in any desired position in the circumference of the cylinder *a*.

What we claim, and desire to secure by Letters Patent is:—

1. An apparatus for injecting water into 30 the cylinder of an internal combustion engine operated by the force of the explosion in said cylinder, comprising a cylinder open to the working cylinder of the engine, a piston working in said cylinder, a small force pump 35 the ram of which is operated by said piston, suction and delivery ports for the pump fitted with non-return valves, the outlet of the delivery port terminating in the cylinder of the apparatus at or near the open end 40 thereof so that said outlet is closed by the piston of the apparatus when said piston is at the end of its stroke at the open end of the said cylinder, as set forth.

2. In an apparatus for injecting water into 45 the cylinder of an internal combustion engine, the combination of an open-ended cylinder in connection with the cylinder of the motor, a piston working in said cylinder, a spring pressing the piston towards the open end of 50 said cylinder the strength of the spring being such that the piston will not be moved during the compression stroke of the engine, a ram operated by said piston, a pump cylinder in which said ram works, an inlet or suction 55 port or passage for said pump cylinder, a non-return valve in said suction port or passage, a delivery port or passage leading from the pump cylinder into the cylinder of the apparatus in such a position that the outlet 60 of said port or passage is closed by the piston when it is at the end of its return stroke in said cylinder, and a non-return valve in said delivery port or passage, as set forth.

3. In an apparatus for injecting water into the cylinder of an internal combustion engine, 65 the combination of an open-ended cylinder in connection with the cylinder of the motor, a piston working in said cylinder, a spring operating to press the piston towards the open end of the cylinder and retain it in said 70 position at all times except during the working stroke of the engine, an annular ring in the open end of the cylinder for retaining the piston in said cylinder, a ram operated by said piston, a pump cylinder in which said 75 ram works, an inlet or suction port or passage for said pump cylinder, a non-return valve in said suction port or passage, a delivery port or passage leading from the pump cylinder into the cylinder of the apparatus in such 80 a position that the outlet of said port or passage is closed by the piston when it is at the end of its return stroke in said cylinder, and a non-return valve in said delivery port or passage, as set forth. 85

4. In an apparatus for injecting water into the cylinder of an internal combustion engine, the combination of an open-ended cylinder 90 in connection with the cylinder of the motor, a piston working in said cylinder, a spring operating to press the piston towards the open end of the cylinder and retain it in said position at all times except during the working stroke of the engine, the said spring being 95 located outside the cylinders, an annular ring in the open end of the cylinder for retaining the piston in said cylinder, a ram operated by said piston, a pump cylinder in which said ram works, packing between the two 100 cylinders, an inlet or suction port or passage for said pump cylinder, a non-return valve in said suction port or passage, a delivery port or passage leading from the pump cylinder into the cylinder of the apparatus in such 105 a position that the outlet of said port or passage is closed by the piston when it is at the end of its return stroke in said cylinder, and a non-return valve in said delivery port or passage, as set forth.

5. In an apparatus for injecting water into 110 the cylinder of an internal combustion engine, the combination of an open-ended cylinder in connection with the cylinder of the motor, a piston working in said cylinder, a spring 115 located outside said cylinders and operating to press the piston towards the open end of the cylinder and retain it in said position at all times except during the working stroke of the engine, an annular ring in the open end 120 of the cylinder for retaining the piston in said cylinder, a ram operated by said piston, a pump cylinder in which said ram works, an inlet or suction port or passage for said pump cylinder, a non-return valve in said suction port or passage, a delivery port 125 or passage leading from the pump cylinder

into the cylinder of the apparatus in such a position that the outlet of said port or passage is closed by the piston when it is at the end of its return stroke in said cylinder, a  
5 non-return valve in said delivery port or passage, and a water jacket surrounding the cylinders and valve boxes, as set forth.

In testimony whereof we have hereunto

signed our names in the presence of two subscribing witnesses.

ALFRED GEORGE SCHOLES.  
GEORGE GIBSON.

Witnesses:

A. MILLWARD FLACK,  
G. V. SYMES.