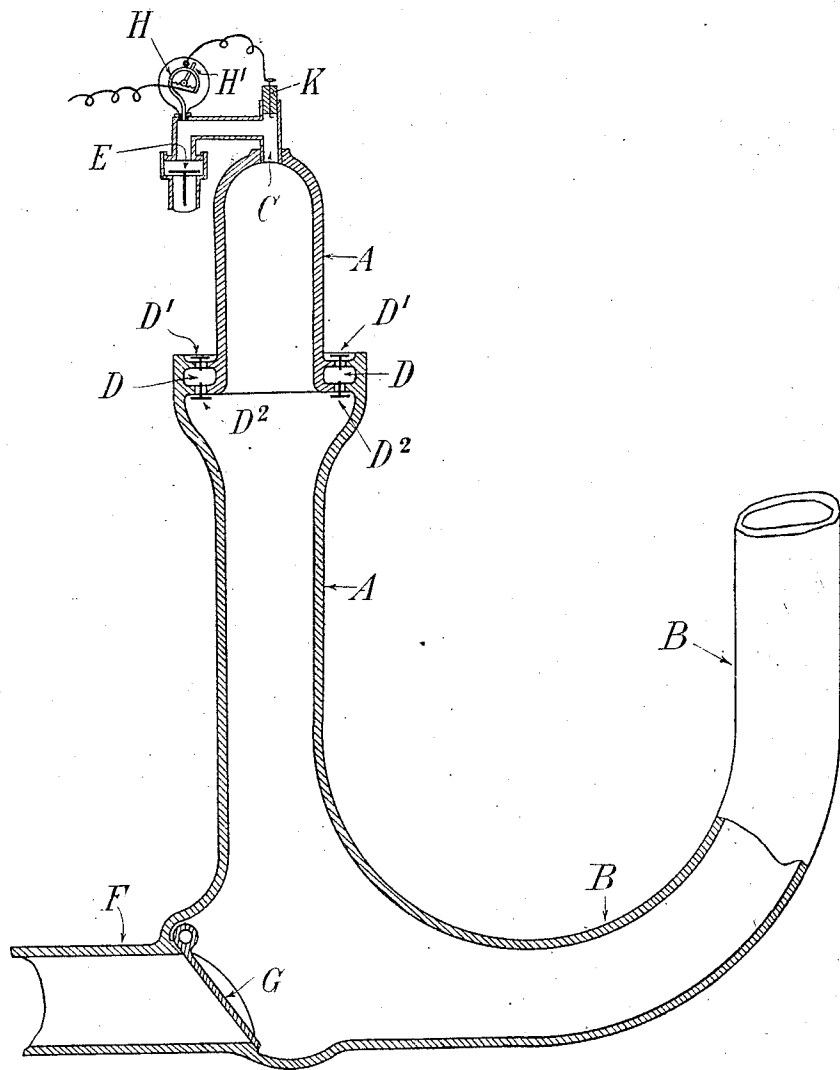


E. B. BADCOCK.
INTERNAL COMBUSTION LIQUID PUMP.
APPLICATION FILED MAY 16, 1911.

1,029,039.

Patented June 11, 1912.



Witnesses.

J. Manning
M. McLaughlin

Inventor.

Edward Baynes Badcock
By J. Walter Fowler
Atty.

UNITED STATES PATENT OFFICE.

EDWARD BAYNES BADCOCK, OF LONDON, ENGLAND.

INTERNAL-COMBUSTION LIQUID-PUMP.

1,029,039.

Specification of Letters Patent.

Patented June 11, 1912.

Application filed May 16, 1911. Serial No. 627,544.

To all whom it may concern:

Be it known that I, EDWARD BAYNES BADCOCK, a subject of the King of Great Britain and Ireland, residing at 7 Pembridge Crescent, London, England, have invented new and useful Improvements in or Connected with Internal-Combustion Liquid-Pumps, of which the following is a specification.

This invention relates to the production of an improved type of internal combustion liquid pump operating on a propulsive and a reactionary stroke cycle.

According to this invention the propulsive stroke, which is produced by the ignition of a charge of combustible mixture acting on the liquid (hereinafter referred to as water) which is impelled and caused to acquire momentum, comprises an initial pressure portion and a completing inductive portion, in the inductive portion of which an inflow of water is induced through a suction way, and the entry of a fresh charge of mixture is induced through an admission port, and in the reactionary stroke following the propulsive stroke the waste products of combustion are caused to be discharged and the fresh charge, if required, to be compressed prior to its ignition for a continuance of the cycle of action. One method of carrying this cycle of action into practice, is to make provision whereby, in the inductive portion of the propulsive stroke, a fresh charge of mixture is caused to be induced and admitted into an area of the pump disposed above an exhaust below which the products of the ignited charge are swept, the exhaust being furnished with closure means adapted to maintain it in a closed condition against the entry of air while the pressure in the pump during the propulsive stroke is above or below the external or atmospheric pressure, and in the reactionary stroke to permit the free escape of the waste products through the exhaust until the closure means are acted upon by the impact of the returning water, the exhaust being maintained closed during the completion of the reactionary stroke, which, if required, may be utilized to compress the charge contained within the area disposed above the exhaust.

An example of construction according to this invention will now be described with reference to the accompanying drawing which shows a pump in vertical section.

In the form of construction illustrated a pump cylinder A is provided having an

open base formed with a foot extension B and having a covering head formed with an admission port C. At a position at a distance from the head of the cylinder and from the base thereof an exhaust is provided, consisting of a series of, say, four exhaust ports D, two of which are only seen in the section. The admission port C is furnished with a valve E tending to close against internal pressure and free to open under the influence of suction of any required degree. Each exhaust port D is fitted with an upper valve D¹ and a lower valve D² adapted to assume seated positions, one which excludes escape when the internal pressure rises materially above the external or atmospheric pressure, and the other which excludes entry under external pressure while permitting escape under internal pressure above but approximating to the external or atmospheric.

The foot extension B consists of a tubular member carried upward to prevent a column of water, and a water suction way F is arranged as a branch to the foot extension B, disposed beyond the region to which the base of the column of water is projected at the end of the propulsive stroke, and this branch, constituting the suction way F, may be set so as to approximate in direction to the direction of the foot extension B. To check any return flow the water suction way F may be furnished with appropriate means, for example, as shown by being fitted with a non-return valve G. Ignition of the charges may be effected by means controlled by the variations of pressure generated in the pump, a method which has previously been proposed for controlling ignition in internal combustion pumps, for example, as indicated in the drawing, a curved, or other suitably formed, tube H is provided at the head of the cylinder, and adapted to be temporarily deformed by the internal pressure produced on the reactionary stroke so as to cause a movement to be imparted to its free end and move a contact arm H¹ adapted to establish an electrical circuit comprising an ignition plug K fitted in communication with the head of the cylinder.

In the action of a pump of the foregoing construction, the initial portion of the propulsive stroke is made under the influence of the pressure generated by the ignited charge, and in the inductive portion thereof, which is produced by the momentum which

the water acquires in conjunction with the reduction of pressure due to the contraction of the products of combustion on cooling, a new charge of mixture is induced to enter the head of the cylinder A and an inflow of water is drawn in through the water suction way F, and as the propulsive stroke changes from its pressure to its inductive condition, when the internal pressure approximates to atmospheric, the lower valves D² of the exhaust ports D automatically drop while the upper valves D¹ are seated to prevent the entry of air. In the initial portion of the reactionary stroke, the upper valves D¹ of the exhaust ports D offer little resistance to the expulsion of the waste products of combustion, and this condition is maintained until the returning water reaches the exhaust when it closes the ports by impact with the lower valves D², after which the further return of the water past the exhaust ports D acts to compress the fresh charge entrapped in the head of the cylinder preliminary to ignition, which is automatically effected by the rise of pressure produced.

I claim:

1. In an internal combustion pump having a cylinder formed with a covering head, an admission way for the entry of water furnished with means to check return flow, and a foot extension in which water makes an outward movement and afterward an inward movement, the combination of means for effecting ignition when the head of the cylinder is charged with combustible mixture prior to the water making its outward movement under the influence of the charge when exploded, a connection at the head of the cylinder fitted with means to permit a new charge to enter by induction into the head of the cylinder above the waste products of combustion of the ignited charge, as the water moves outward when the pressure within the head of the cylinder has fallen below atmospheric, the said means closing the connection as the water completes its outward movement, an exhaust disposed at a distance below the head of the cylinder furnished with means permitting the waste products of combustion to escape under the influence of the water making its inward movement, the said means closing the exhaust when the water reaches the level thereof, for the purposes set forth.

2. In an internal combustion pump having a cylinder formed with a covering head, an admission way near the base of the cylinder for the entry of water furnished with means to check return flow, and an upwardly directed foot extension extending from the base of the cylinder in which water makes an outward movement and afterward an inward movement, the combination of means

for effecting ignition when the head of the cylinder is charged with combustible mixture prior to the water making its outward movement under the influence of the charge when exploded, a connection at the head of the cylinder fitted with a valve to permit a new charge to enter by induction into the head of the cylinder above the waste products of combustion of the ignited charge as the water moves outward when the pressure within the head of the cylinder has fallen below atmospheric, the valve closing the connection as the water completes its outward movement, an exhaust disposed at a distance below the head of the cylinder and from the base thereof, furnished with means permitting the waste products of combustion to escape under the influence of the water making its inward movement, the said means closing the exhaust when the water reaches the level thereof, for the purposes set forth.

3. In an internal combustion pump having a cylinder formed with a covering head, a suction way near the base of the cylinder for the entry of water furnished with means to check return flow, and an upwardly directed foot extension extending from the base of the cylinder in which water makes an outward movement and afterward an inward movement, the combination of means for effecting ignition when the head of the cylinder is charged with combustible mixture prior to the water making its outward movement under the influence of the charge when exploded, a connection at the head of the cylinder fitted with an admission valve to permit a new charge to enter by induction into the head of the cylinder above the waste products of combustion of the ignited charge as the water moves outward when the pressure within the head of the cylinder has fallen below atmospheric, the admission valve closing the connection as the water completes its outward movement, an exhaust port disposed at a distance below the head of the cylinder and from the base thereof, furnished with upper and lower valves for excluding escape when the internal pressure rises materially above the external pressure and excluding entry under external pressure while the water moves outward, and permitting the waste products of combustion to escape under the influence of the water making its inward movement, the lower valves closing the exhaust when the water reaches the level thereof, for the purposes set forth.

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD BAYNES COCK.

Witnesses:

WALTER J. SKERTEN,

T. J. OSMAN.