

W. A. LEGGO.

Propulsion by Gas Explosions.

No. 138,665.

Patented May 6, 1873.

FIG. 1.

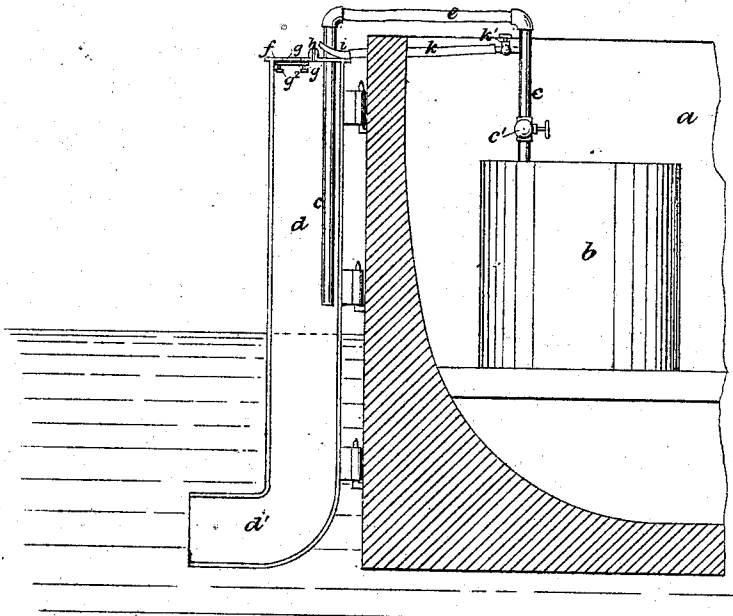


FIG. 2.

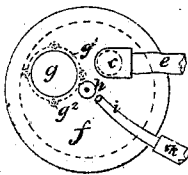


FIG. 3.

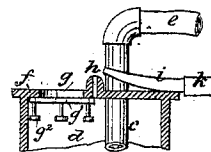
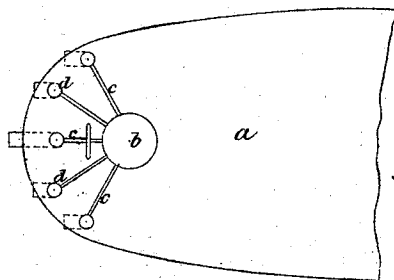


FIG. 4.



Witnesses

A. B. Muir  
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# UNITED STATES PATENT OFFICE.

WILLIAM A. LEGGO, OF MONTREAL, CANADA.

## IMPROVEMENT IN PROPULSION BY GAS EXPLOSIONS.

Specification forming part of Letters Patent No. **138,665**, dated May 6, 1873; application filed August 22, 1871.

*To all whom it may concern:*

Be it known that I, WILLIAM AUGUSTUS LEGGO, of the city of Montreal, in the district of Montreal, in the Province of Quebec, Canada, gentleman, have discovered a new and useful "Art of Propelling Vessels and Driving Machinery by Gas Explosions as a Motor, with apparatus for carrying same into effect;" and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawing, where—

Figure 1 represents a view of apparatus as applied to a vessel. Fig. 2 represents a plan of top of apparatus. Fig. 3 represents a section of top of apparatus. Fig. 4 represents a plan of part of a vessel with apparatus attached.

This discovery has reference to the use of the explosive nature of hydrogen when combined, in certain proportions, with oxygen, and brought in contact with fire, as a motive power for propelling vessels and driving machinery. I have discovered the means of bringing under control and utilizing this explosive power, rendering what has been heretofore considered only a useless and dangerous property a valuable, economical, and safe motor. For this purpose I employ the oxygen of atmospheric air, mixed in constant proportions with a steady stream of hydrogen gas introduced into a chamber, cylinder, tube, or any convenient and suitable receptacle, and there caused to explode by ignition from a jet of lighted gas, electric spark, or any other means, the explosions being powerful, more or less frequent, as may be desired, and quite under control.

The appliances for rendering available as motive power the force of these explosions will vary in almost every class of machines to which the force is applied; but in the drawing an apparatus is shown for utilizing it for propelling a vessel.

Similar letters of reference show like parts.

In Fig. 1, *a* shows the after part of any vessel, near the stern of which, or in any convenient place, is situated the gasometer *b*, of any suitable size for producing the amount of gas required. The hydrogen gas used may be generated in any way known to chemists; but is

procured, preferably, from acidulated water and zinc, the oxygen of the water attaching itself to the zinc, and freeing the hydrogen, which fills the gasometer in a very short space of time. This gas, so made, is conveyed from the gasometer by a pipe, *c*, the supply being controlled by a cock, *c'*, the half of the pipe *c* which enters the exploding-chamber *d* being connected with the other half by any suitable flexible tube, *e*, so as to avoid any escape of gas whichever way the exploding-chamber *d* (in this case shown to act as a rudder) may be turned. The exploding-chamber *d* is a cylinder of iron, or any suitable metal, attached to the stern-post of the vessel in the same way that a rudder is; and, at its lower end, turned in a quadrant curve, as shown at *d'*, the gas-pipe *c* being carried down inside *d* to within a short distance of the water-line. In the top *f* of the chamber is an aperture, *g*, as shown, for the admission of atmospheric air to the chamber, having a cover, *g'*, on the inside, secured on guides *g''*. A small aperture or touch-hole, *h*, is also formed in *f* for the ignition of the gas, which is performed by means of a jet of burning gas springing from a gas-burner, *i*, secured as shown, and connected, by a flexible tube, *k*, with the main gas-pipe *c*, the supply being regulated by a cock, *k'*.

The method in which this apparatus acts in the propulsion of vessels is as follows: The hydrogen gas arising from the gasometer passes through the flexible tube *e* and pipe *c* into the chamber *d* at a little distance above the water-line, or some point in the lower part of the chamber, thence mixing gradually with the atmospheric air introduced by the aperture *g*—the cover *g'* having dropped as far as allowed by the guides *g''*—it rises till, at the touch-hole *h*, it comes in contact with the flame from the gas-burner *i*, when explosion takes place, the water being driven violently back, and the boat or vessel thus forced forward. The cover *g'* is driven up against the top *f*, thus stopping up entirely the aperture *g*, and concentrating the force of the explosion on the water. Directly this has occurred the cover *g'* falls again, and the atmospheric air rushes in to fill up the vacuum caused by the explosion, the hydrogen gas pouring through the pipe *c* from the gasometer until the explosive

mixture reaches the touch-hole *h*, when the explosion again takes place.

A cap may be placed over the gas-jet *i* to prevent any possibility of its being blown out.

The explosions occur at regular intervals, their frequency being determined by the quantity of gas supplied. Should it be found necessary any suitable number of pipes may be placed, as shown in Fig. 4, in any convenient position with relation to a vessel, arranged so as not to interfere with each other, and connected with one or more gasometers, as found requisite.

It will be seen that this discovery affords these advantages over any other motive power for propelling vessels: Economy, the first cost of this apparatus being a mere trifle, and the expense of running such a machine being very small; simplicity, since there are no parts which can get out of order; and, being self-acting, it requires no constant supervision, and allows far more space for the stowage of cargo. It is especially suited for canal-boats, as, the volume of water being driven directly aft, no injury can be caused to the banks by "wash."

In applying this discovery to the purpose of driving machinery the exploding-chamber may be the cylinder, and the piston be acted upon by

the force of the explosion, and then connected, in any ordinary manner, with machinery to give rotary or other motion, as may be desired.

Although hydrogen gas is here specified, any other gas having explosive properties may be used.

Having thus described the nature of my discovery, and pointed out one or two of the ways in which it may be brought into practical use, what I claim as my invention, and wish secured by Letters Patent, is—

The new and useful art of propelling vessels and driving machinery by gas-explosions as a motor, with apparatus for carrying the same into effect, as follows: The novel combination and arrangement of the chamber *d*, connected with gasometer *b* by a flexible or other tube, *c*, and provided with valve *g*<sup>1</sup> and touch-hole *h* and gas-jet *i*, or their equivalents, working in combination with any vessel, *a*, substantially as and for the purpose set forth.

Montreal, 7th day of August, A. D. 1871.

W. A. LEGGO.

Witnesses:

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FRAS. HY. REYNOLDS.