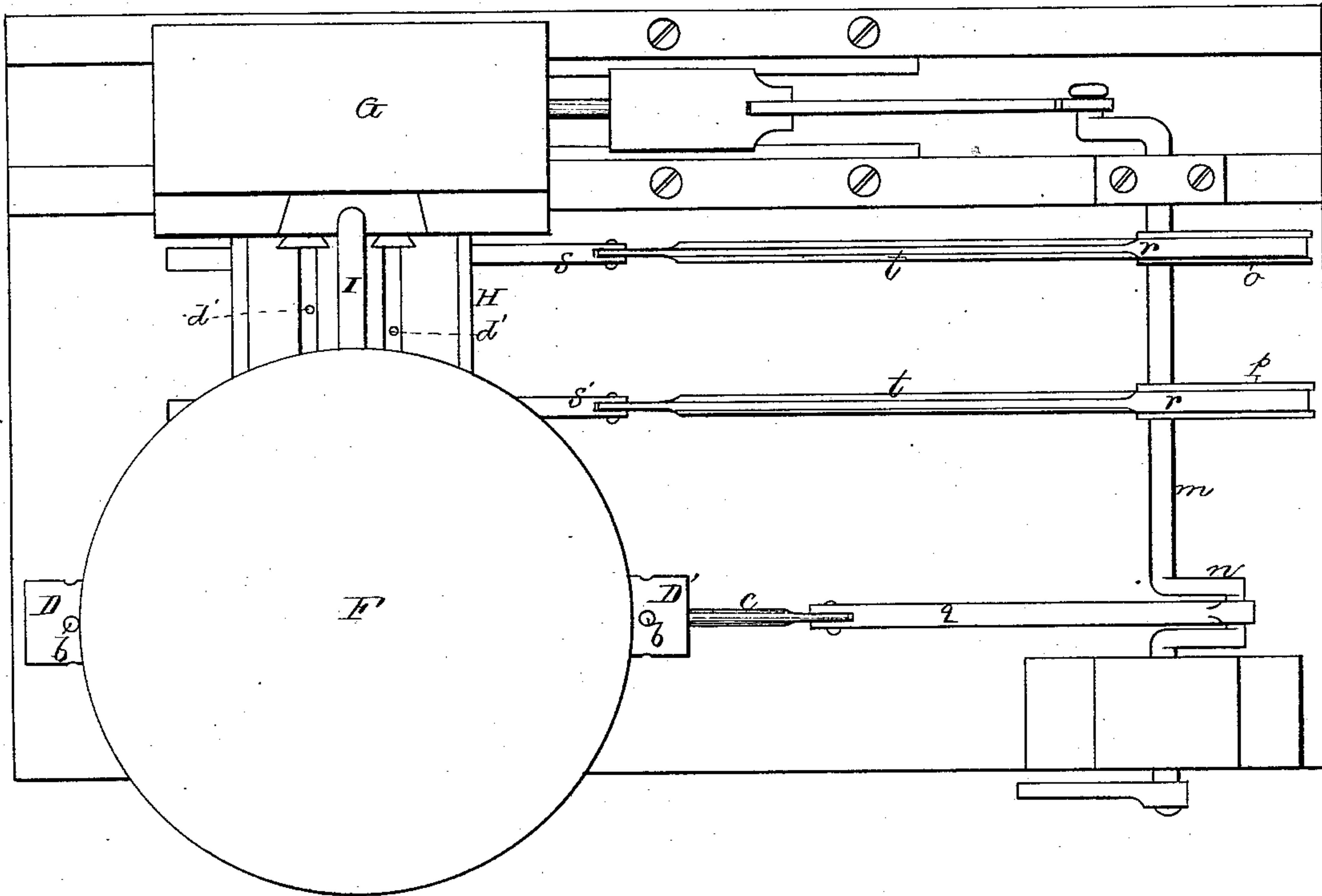


**J. TAGGART.**  
**Air and Gas Engines.**

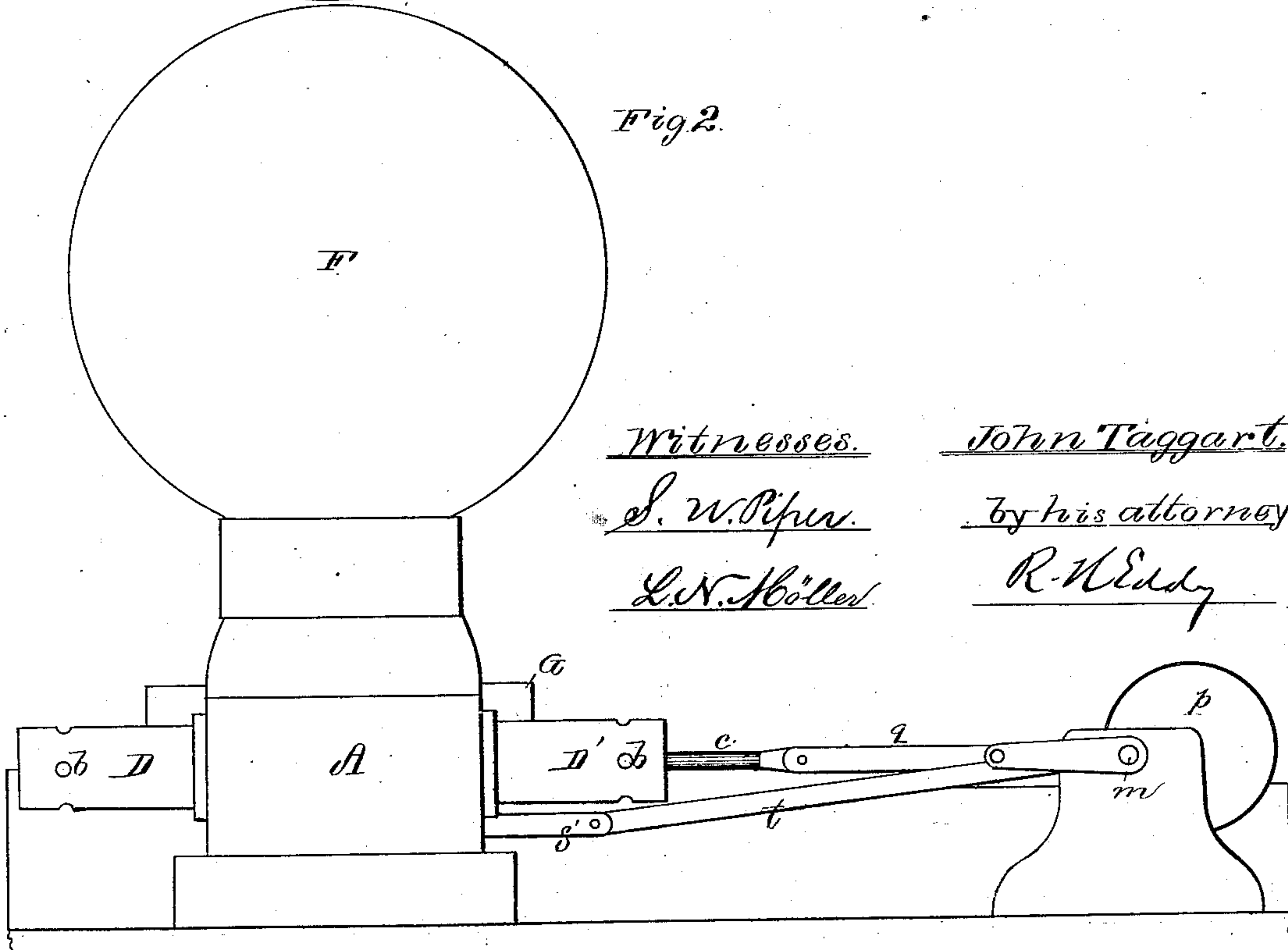
No. 161,454.

Patented March 30, 1875.

*Fig. 1.*



*Fig. 2.*



Witnesses.

S. W. Piper.

L. N. Hölter.

John Taggart.

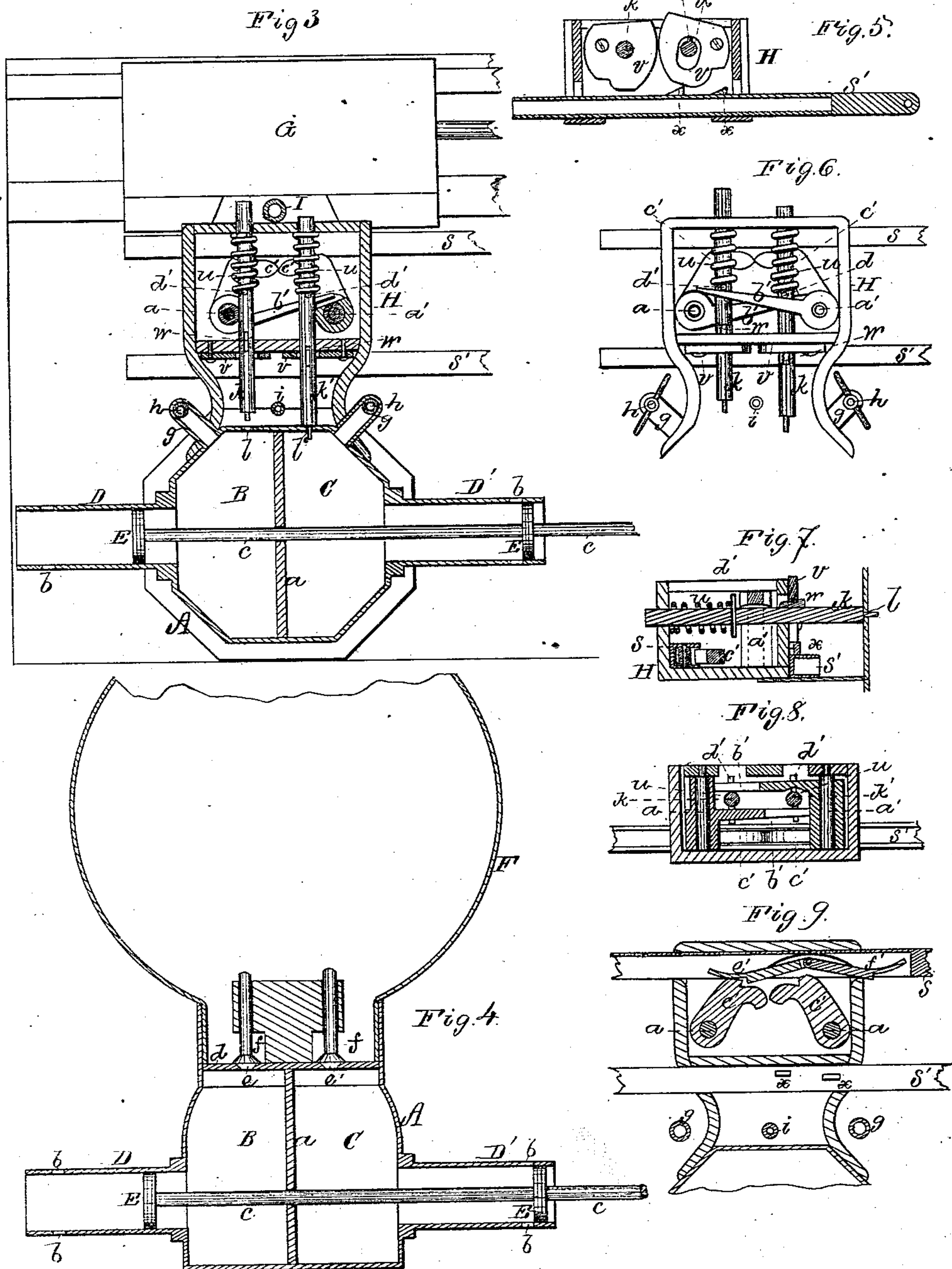
by his attorney

R. W. Eddy

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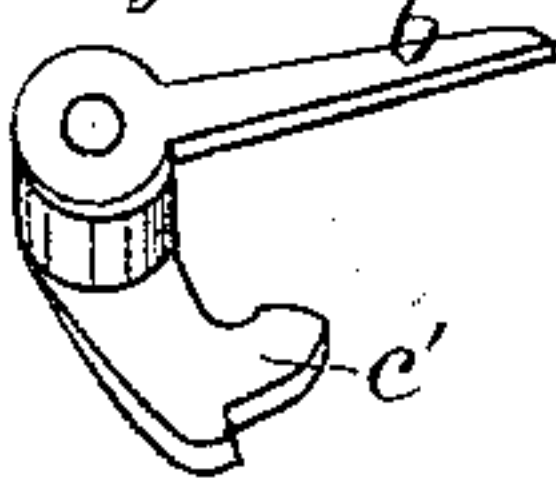


Witnesses.

S. W. Piper

L. N. Hölter

Fig. 10.



John Taggart

by his attorney.

R. W. Eddy



# UNITED STATES PATENT OFFICE.

JOHN TAGGART, OF BOSTON, MASSACHUSETTS.

## IMPROVEMENT IN AIR AND GAS ENGINES.

Specification forming part of Letters Patent No. 161,454, dated March 30, 1875; application filed October 28, 1874.

*To all whom it may concern:*

Be it known that I, JOHN TAGGART, of Boston, of the county of Suffolk and State of Massachusetts, have invented a new and useful Air and Gas Engine; and do hereby declare the same to be fully described in the following specification and represented in the accompanying drawings, of which—

Figure 1 is a top view, and Fig. 2 a front elevation, of it. Fig. 3 is a horizontal section taken through its cylinder, piston, and explosive chambers. Fig. 4 is a vertical section of its force-reservoir.

In such drawings, A denotes a box, divided crosswise by a vertical partition, *a*, into two explosive chambers, B C, from which there are projected, in opposite directions and in a straight line with each other, two tubes, D D'. One of these tubes opens into one and the other into the other of said chambers, and each tube has one or more openings, *b*, made laterally into it near its outer end. A rod, *c*, runs axially through the two tubes, and also through the partition *a*, and has fixed on it two piston-heads, E E', all being as shown. This rod, with its heads, I term the "double-headed piston." Placed immediately over the explosive chambers B C is the conservator or force-reservoir F, which is a strong spherical or other proper-shaped air-tight vessel. Through the floor or bottom *d* of said reservoir F are two openings, *e e'*, leading from the vessel into the two explosive chambers, each of such openings being provided with a valve, *f*, to open upward. Near each explosive chamber is a gas conduit or pipe, *g*, provided with a cock, *h*, by which communication may be opened and closed with the chamber. Between the said gas-pipes is another gas-pipe, provided with a tip or burner, *i*, for spreading the flame of gas against the exploders. These exploders are shown at *k k'* as consisting of two slide-rods, each having a small piece of platina wire extended from its end next the explosive chambers, there being through the sides of the said chambers small holes *l l'*, to receive such wires or allow them to enter the chambers. There is applied to such exploders mechanism for alternately moving them out and in, and retaining them out for the flame of the burner *i* to heat them, all of which mechanism is herein-

after described. An engine, (shown at G,) like a steam-engine cylinder, valve-chest, valve, and piston, is arranged near the exploder-case H, and is to be worked by the force of the expansive gas generated or held in the conservator or force-reservoir F. To this end a pipe, I, leads from the conservator to the valve-chest of the engine. The driving-shaft *m* of the engine is provided with a bell-crank, *n*, and two eccentrics, *o p*, such bell-crank being coupled with the double-headed piston by a connecting-rod, *q*. Each eccentric *o p* has a collar, *r*, such collars being connected with two parallel slides, *s s'*, by rods *t t*, jointed to said slides. The said slides go and slide freely through the expander-case H.

Fig. 5 is a vertical section of the slide *s'*, or that one next to the explosive chambers, such section representing the mechanism above such slide. Fig. 6 is a top view of the mechanism of the exploder-case. Figs. 7 and 8 are transverse sections, and Fig. 9 a horizontal section, of such case and mechanism.

Each exploder has applied to it a bevel-spring, *u*, to impel it forward. It also has a gravitating-latch, *v*, pivoted to or applied to the front of the case, and to operate with a projection or catch, *w*, extending up from the exploder. On the exploder being forced back far enough the latch will drop in front of the catch and hold the exploder back against the recoil power of its spring. To force the latch upward at the proper time, in order to allow the spring to suddenly force the exploder forward, there is a small tripper or cam, *x*, that projects up from the slide *s'*. While the slide is being moved in one direction the cam *x* will force up one latch, and next will force up the other while the slide is being moved in the opposite way.

The mechanism for alternately retracting the exploders may be thus explained: In the case H are two vertical shafts, *a' a'*, each being provided with an arm, *b'*, and a notched foot, *c'*. One of such levers, with its arm and foot, is shown in perspective view in Fig. 10. The arms bear against studs *d'*, projecting from the exploders. The notched parts *c' c'* operate with two springs or elastic triggers, *e' f'*, carried by the slide *s*, the same being as shown in the drawings. During the reciprocating



eating rectilinear movements of the slide these triggers alternately catch into the notches of the feet  $c' c'$ , and move them so as to cause the exploders to be alternately retracted, each spring being forced out of the notch of the foot by the pressure of the foot against the spring while the two are in movement.

The action of the engine may be thus described: While the double-headed piston is being moved in either direction it, in approaching one of the sets of holes  $b$ , will create a practical vacuum in the explosive chamber next to it, which will cause or admit a quantity of gas (hydrogen, for instance) from the gas-pipe to flow into the said explosive chamber. As soon as the head of the piston may pass beyond the said hole or holes  $b$ , air will be drawn through such holes into their tube, and will mix with the gas. During the next movement of the said piston the ingress of air will be cut off as soon as the piston-head may have passed the hole or set of holes  $b$ . At this movement, or immediately after, an exploder, carrying the red-hot platina wire, will be drawn forward and made to introduce the wire into the explosion-chamber, so as to fire the charge of gas and air, and cause it to explode. The force of the explosion will open the valve over the chamber, and cause the resulting gaseous product

to pass up into the conservator. Gas and air will thus be drawn into and fired in the explosion-chambers alternately, the force generated by the explosions being stored in the conservator to be used in operating the engine. The valves of the gas-pipes are to be worked at the proper times, either by hand or automatically.

I claim—

1. The air and gas engine, substantially as described, composed of the double-headed piston  $c E E'$ , the two explosion-chambers  $B C$ , the perforated tubes  $D D'$ , the conservator  $F$ , and its valves  $f f$ , and the two exploders  $k k'$ , provided with mechanism for operating them alternately, as set forth, all being combined and arranged and provided with gas-inducts and platina wires, essentially as explained.

2. The combination or mechanism, substantially as described, for actuating the exploders, such consisting of the springs  $u u$ , shafts  $a' a'$ , arms  $b' b'$ , studs  $d' d'$ , feet  $c' c'$ , gravitating-latches  $v v$ , catches  $w w$ , and the slides  $s s'$ , provided with the tripper  $x$  and the triggers  $e' f'$ , all arranged together and with the case  $H$ , as set forth.

JOHN TAGGART.

Witnesses:

JNO. F. WOOD,  
J. R. SNOW.