

F. A. T. de BEAUREGARD.
Vapor or Gas-Engine.

No. 213,860.

Patented April 1, 1879.

Fig.1.

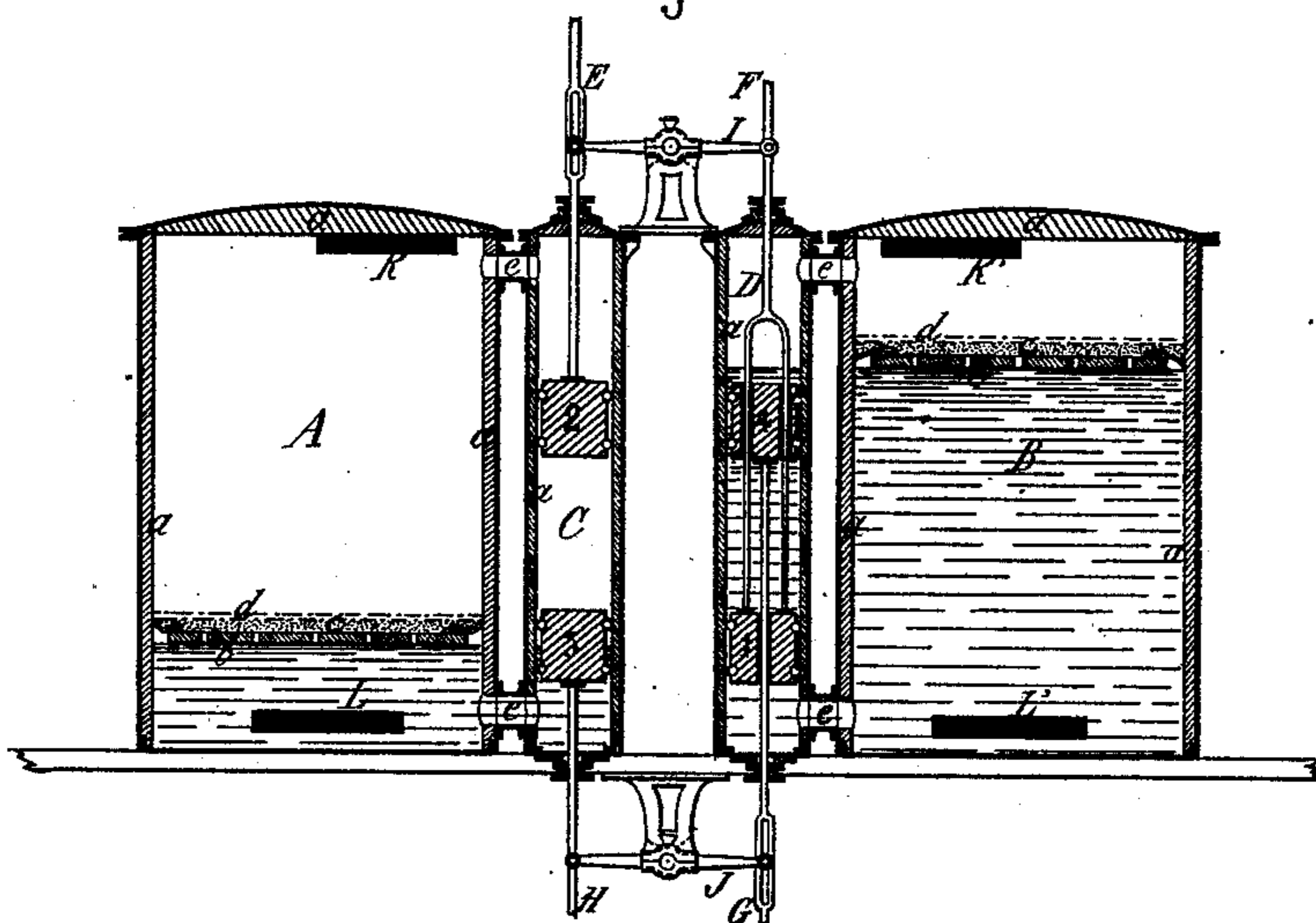


Fig.3.

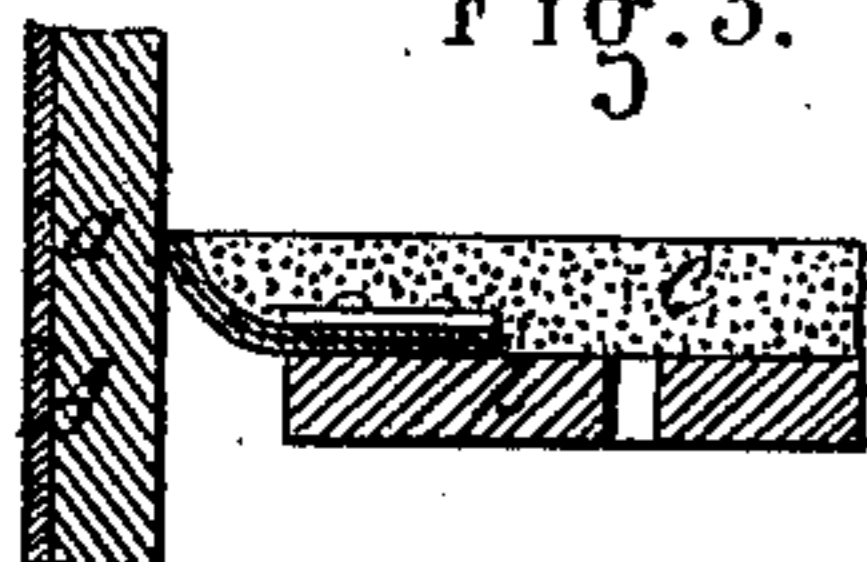


Fig.2.

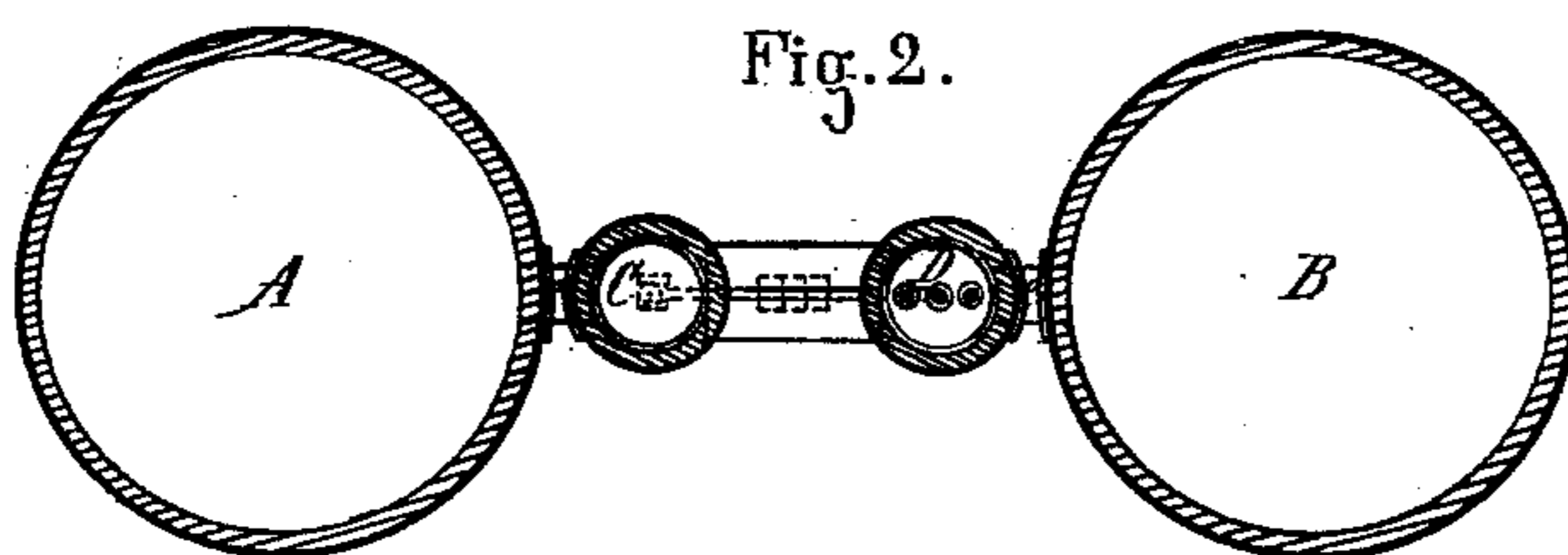


Fig.6.

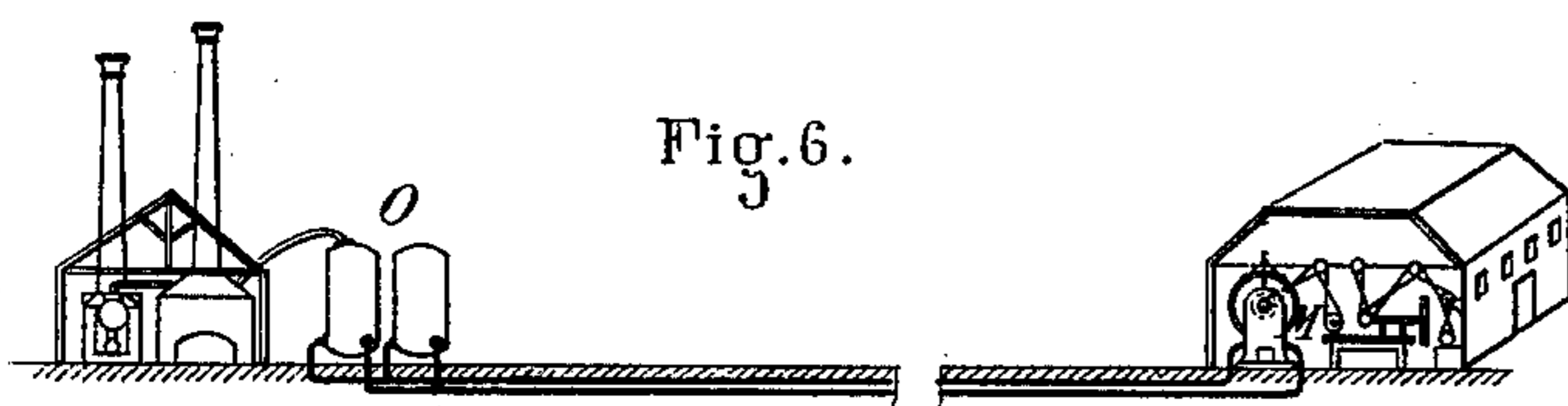


Fig.4.

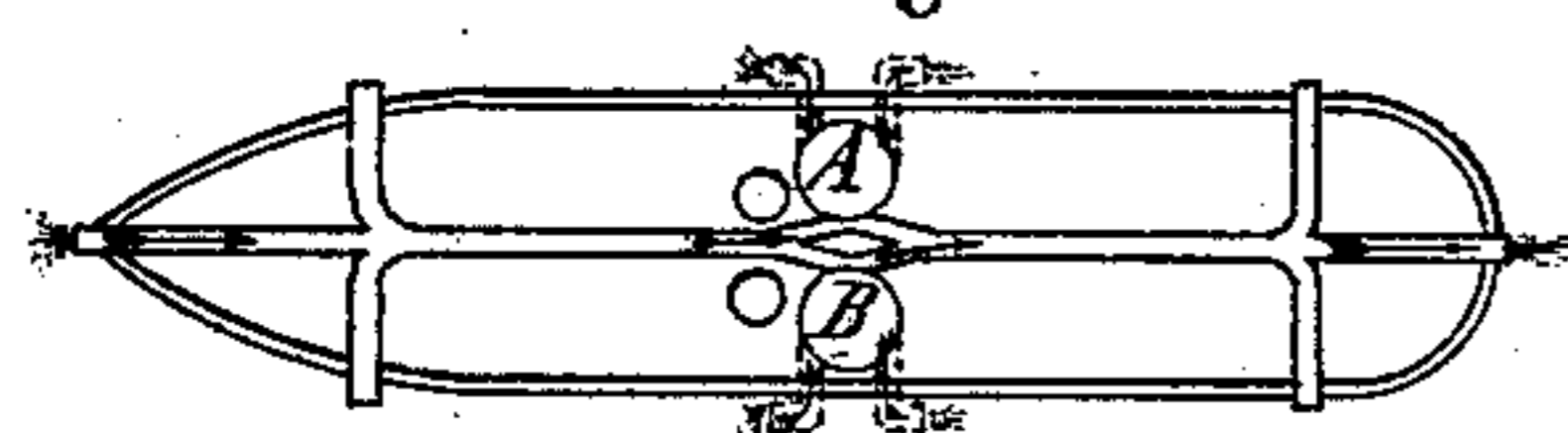
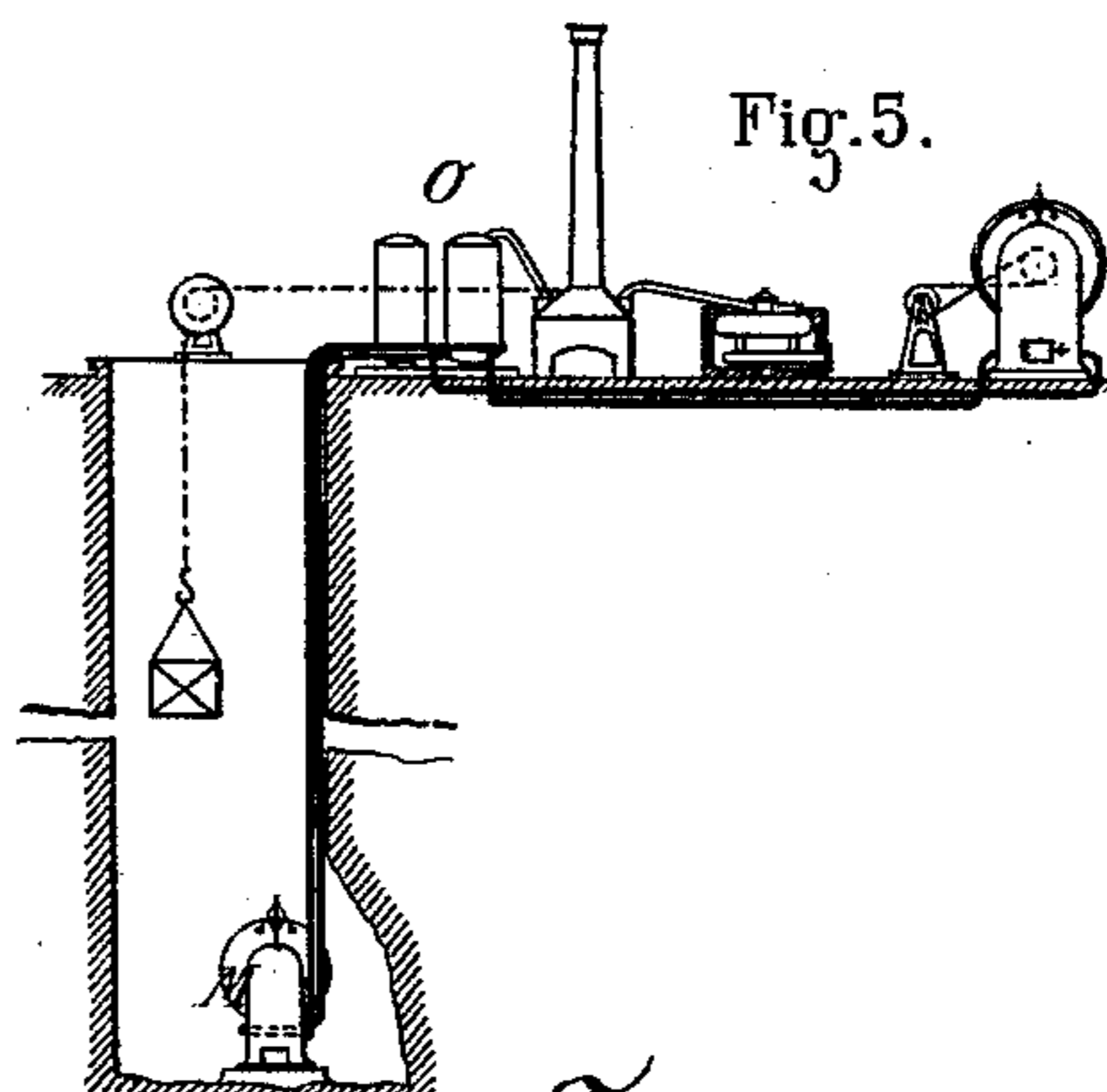


Fig.5.



Witnesses:
J. H. Chubb
Chas. H. Allen

Felix Alexandre Testud de Beauregard
Inventor
By Atty. J. M. E. E. E.

UNITED STATES PATENT OFFICE.

FELIX A. T. DE BEAUREGARD, OF PARIS, FRANCE, ASSIGNOR OF TWO-THIRDS HIS RIGHT TO LEON MATHIEU AND EDMOND EUGÈNE CHAZERET, OF SAME PLACE.

IMPROVEMENT IN VAPOR OR GAS ENGINES.

Specification forming part of Letters Patent No. **213,860**, dated April 1, 1879; application filed December 19, 1877; patented in France, August 6, 1877.

To all whom it may concern:

Be it known that I, FELIX ALEXANDRE TESTUD DE BEAUREGARD, of Paris, France, engineer, have invented Improvements in Vapor or Gas Engines, of which the following is a specification:

The object of this invention is the utilization without intermediate mechanism of the expansive force of gases and vapors.

Attempts have already been made to utilize the live force of a steam-jet, to occasion, for example, the propulsion of a vessel; but, by reason of an immediate condensation arising from the direct contact of the vapor with the water, no benefit was derived either from the weight, the pressure, or the expansion of the vapor.

By my invention all the properties of the vapor are utilized.

To obtain this result I cause the vapor to act upon the water, which plays the part of piston, and the steam I employ at high temperature or superheated. In addition, to avoid as much as possible condensation from contact with the walls, and from direct contact with the water which constitutes the piston, I interpose an isolating-screen between the vapor and the water to be repelled. This screen must comply with the following conditions: it must be elastic to follow the fluctuations of the liquid; it must be less dense than the water, so as not to mix with it; and it must be unalterable by the steam at high temperature.

Fatty bodies comply with all these conditions. I further augment their isolating properties by mixing them with cork-dust.

This isolating-screen may be equally well formed of rigid oak *madriers*, perforated, upon which is extended a layer of cork-dust, forming an isolating-cushion. A thin lamina of air prevents the cork-dust being affected by the influence of the high temperature of the superheated steam.

My invention is susceptible of several applications. It may be utilized, first, to produce directly the propulsion of vessels without engines, wheels, or screws; secondly, to constitute suction and force pumps for drainings,

irrigations, fires, for ships' pumps, and for air-pumps, either vacuum or compression; thirdly, to replace ordinary steam-engines and transport power to great distances.

Figure 1 is a vertical section of two receivers coupled or joined together. Fig. 2 is a horizontal section.

These vessels or receivers A and B, formed of sheet or cast iron, are lined interiorly with oak walls *a*, to prevent loss or waste of heat. In each of the said receivers is a movable isolating-screen, formed of rigid floats *b*, of oak, pierced or perforated to permit the passage of the air interposed between the steam and the cork-dust *c*, which forms an isolating-diaphragm between the cold water and the steam at high temperature.

d, Fig. 1, represents the lamina of air, which is incessantly renewed. This diaphragm is represented in detail at Fig. 3 upon a larger scale. As seen, the floats *b* carry upon their peripheries a ring of leather or other flexible and elastic material destined to form against the walls a completely hermetic joint.

Each of the receivers A and B communicates at top and bottom by conduits *e* with the cylinders C D, in which are metallic counter-weights 1, 2, 3, and 4. By reason of the difference of density of the mediums these counter-weights rise and fall, and communicate their movement to the rods E F G H. These rods are joined together two and two by the levers I and J.

Suppose that the water is repelled or driven down in the receiver A by the forced movement of the diaphragm, and sucked or drawn up in the receiver B by the upward movement of the diaphragm, caused by the vacuum above it, produced as hereinafter described, the counter-weights 3 and 4, jointly with the balance or lever J, become equilibrated in the liquid. The result is, that when one of them becomes uncovered by the descent of the water in its corresponding receiver, it acts upon the balance with the force of its weight.

The water pressed by the steam descends in this receiver till the moment when the counter-weight 3 becomes uncovered and produces its action upon the balance J, which, oscillat-

ing upon its axis, communicates its movement to the rods G and H. The rod H acts then upon a slide-valve, which permits the escape of the steam, which still presses in the receiver A, while the rod G acts upon another slide to admit steam into the receiver B. This receiver is being filled while the receiver A is being emptied. The inverse stage then commences. The liquid is repelled or driven down in the receiver B, and sucked or drawn up in A. This suction is due to the vacuum resulting from the condensation of the steam, the exhaust, of course, closed after the escape of the steam, which may be facilitated or entirely produced without exhaust by an injection of water produced by a special apparatus.

The steam in the receiver B acts with all its pressure until the counter-weight 4, disengaged from the liquid, imparts to the balance or lever J a movement of oscillation inverse to that which it had received from the counter-weight 3. At this moment the rod G has moved the slide and closed the introduction of steam, the expansion takes place, and as soon as the liquid, in descending, uncovers the counter-weight 1, the effects above described recommence in the inverse direction. The balance 1, drawn by this counter-weight 1, oscillates upon its axis, the rod F acts upon the escape-valve in the receiver B, while the rod E opens the induction-valve in the receiver A, so that the counter-weight 2 closes in its turn this slide to produce expansion.

The degree of expansion may be varied at will. For this purpose it will be sufficient to unscrew the nuts which fasten the rods E and G to the levers, and to lower or raise these rods, which are joined to the counter-weights 2 and 4.

I proceed to describe some of the applications of which my invention is susceptible.

Fig. 4 shows its application to the propulsion of ships. I arrange two coupled or united receivers, A and B, which suck at the fore part of the vessel, while they repel at the rear.

By opening at will the steam-induction cock the power of the apparatus is varied gradually, which enables the speed to be varied, as required.

By this invention the manipulations are much simplified. By admitting the water and directing it in a suitable manner, the different movements from "starboard" to "port," and for tacking about, may be effected with the greatest rapidity.

It will be seen that the apparatus described and shown with reference to Figs. 1 and 2 may be utilized as a pump.

Figs. 5 and 6 show the application of the invention to the transmission of motive force at great distances vertically from the bottom of a mine-shaft, and horizontally to a motor at a distance. In all cases it is sufficient to establish between the apparatus (single or double) placed at O and the hydraulic machine M a double line of pipes for the forward and return movement of the water successively drawn or sucked and repelled by the receiver of the apparatus.

I claim as my invention—

The combination of one or more cylinders, A B, constructed to receive steam at one end, and receive and discharge water at the other, combined with a diaphragm constructed to move freely in said cylinder and separate the steam from the water, the cylinders C D, communicating at each end with corresponding ends of the cylinders A B and counter-weights in said cylinders C D, those of one cylinder connected by levers with those of the other, and operating in their respective mediums as the power to open and close the valves of the cylinders A B, substantially as described.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

FX. TESTUD DE BEAUREGARD.

Witnesses:

ARMENGAUD, Jeune,
ROBT. M. HOOPER.