No. 672,287. Patented Apr. 16, 1901.

J. G. PINKERT.

PROPELLING VESSELS.

(Application filed Dec. 23, 1897.)

(No Model.) 3 Sheets—Sheet 1.

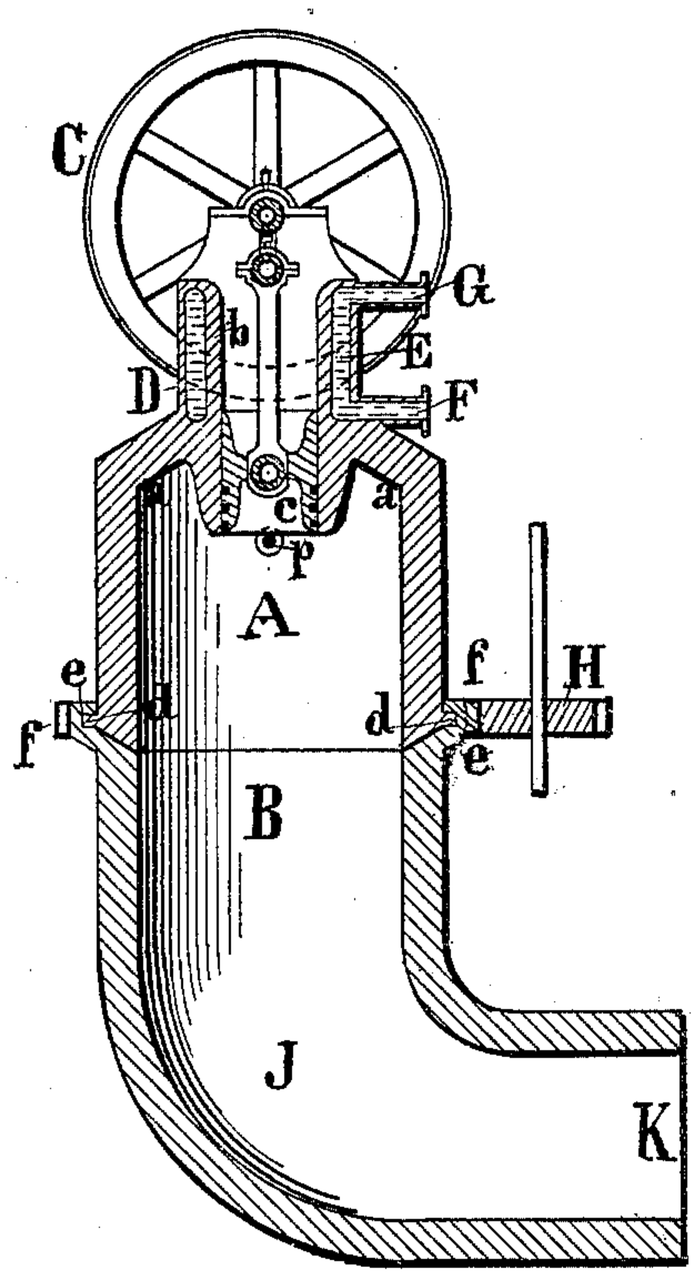


Fig. 1.

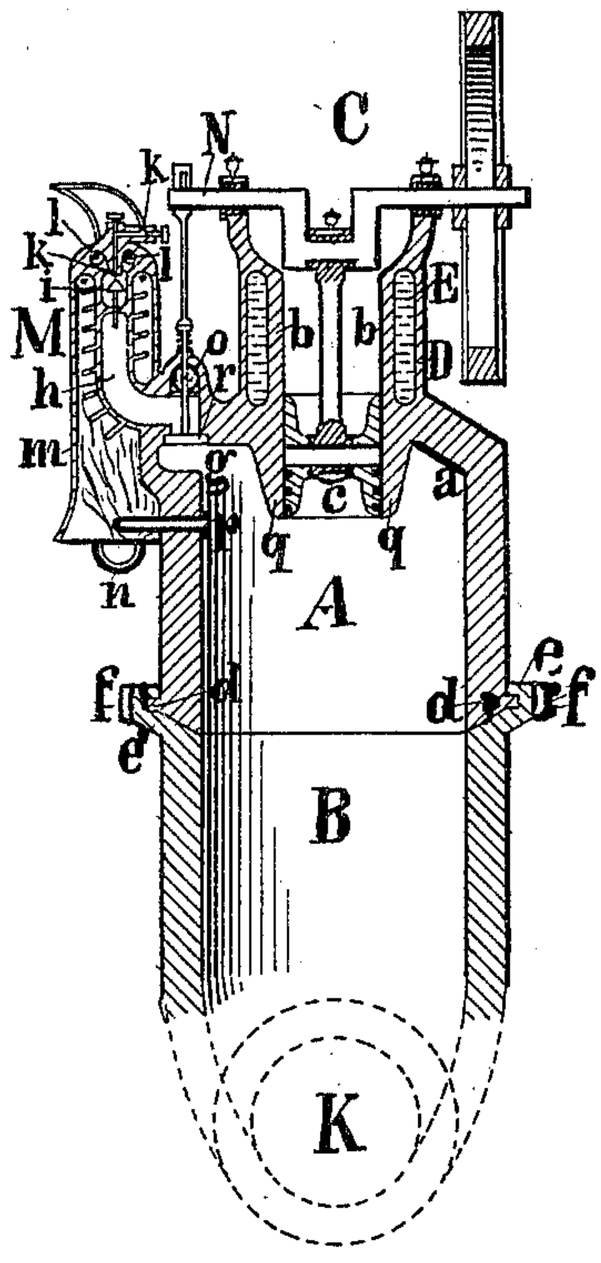


Fig. 2.

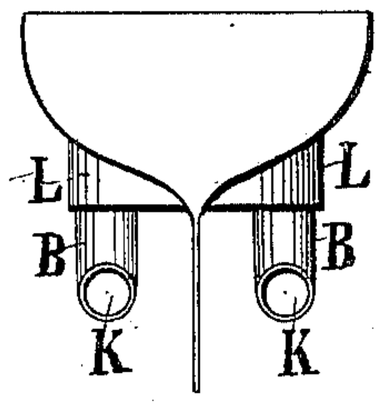


Fig. 3.

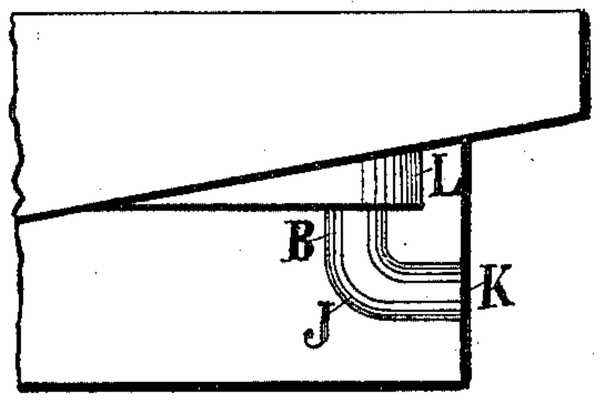


Fig. 4.

Witnesses.
Julius Klutz.
John Lotka

Inventor:
J. G. Pinkert.
By munn & Co
Attorneys.

No. 672,287.

Patented Apr. 16, 1901.

J. G. PINKERT.

PROPELLING VESSELS.

(Application filed Dec. 23, 1897.)

(No Model.)

3 Sheets—Sheet 2.

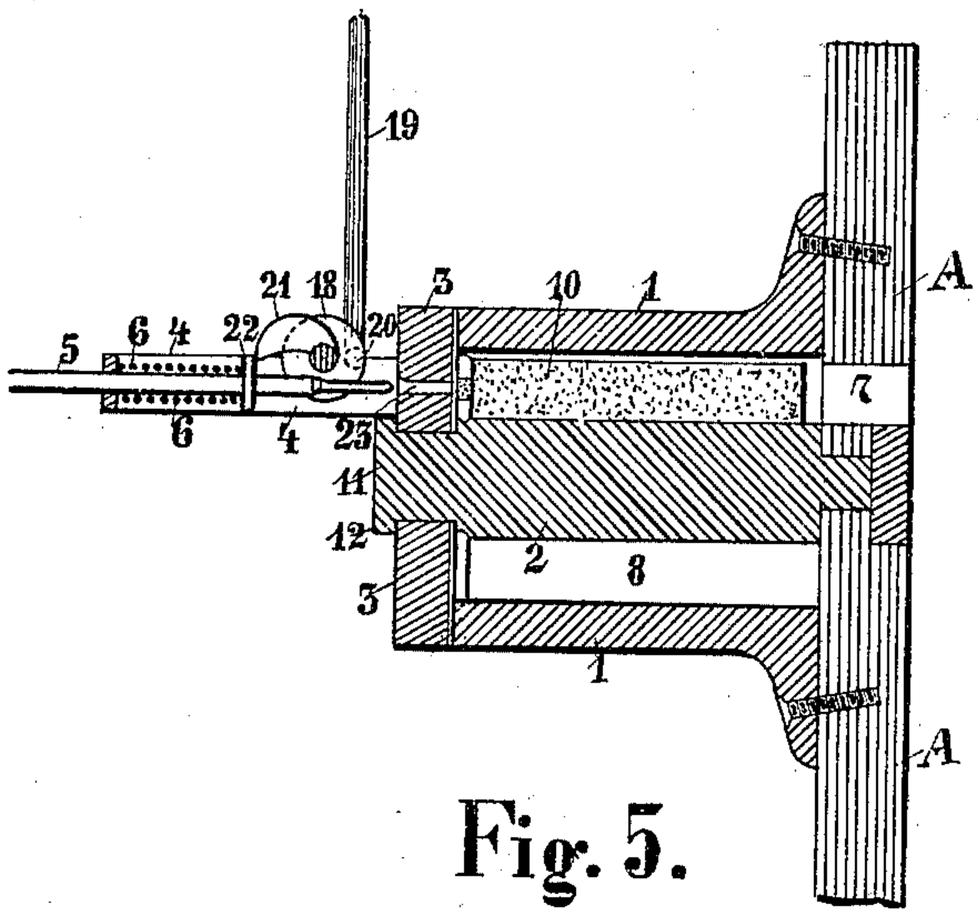


Fig. 5.

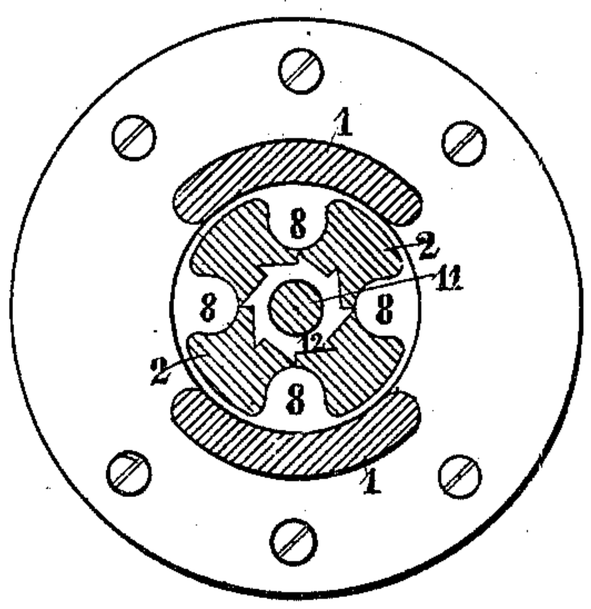


Fig. 6.

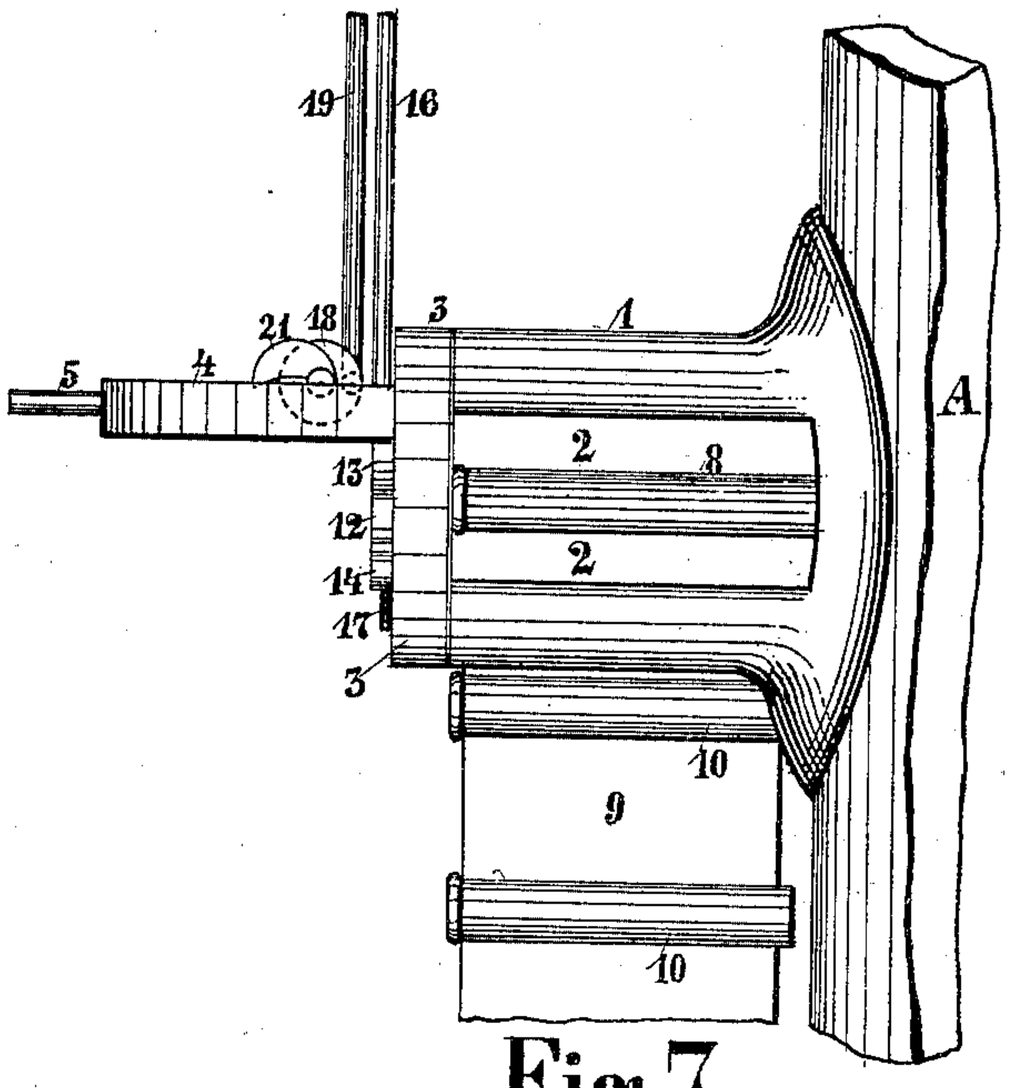


Fig. 7.

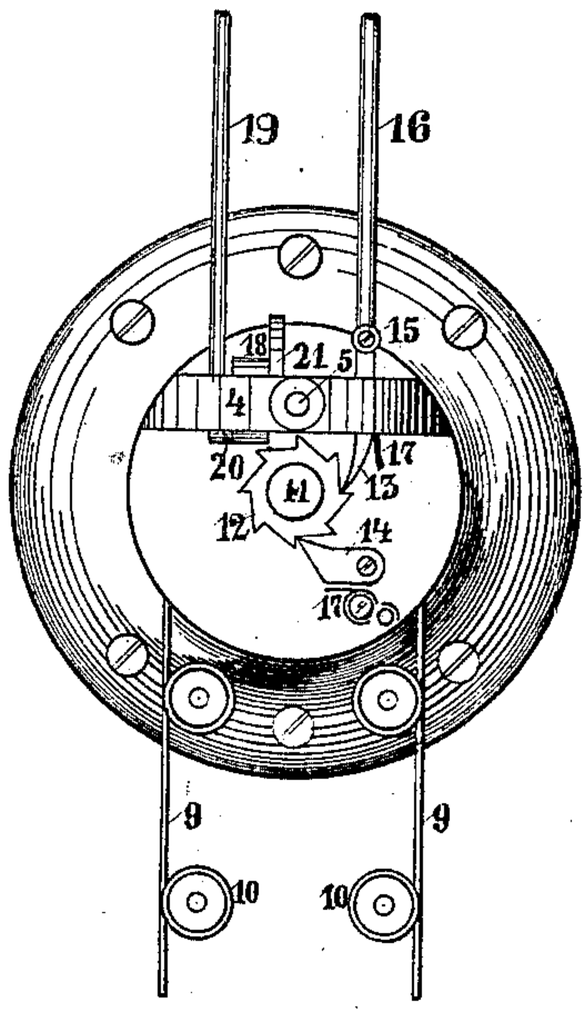


Fig. 8.

Witnesses.
Julius Lutz.
John Lotta

Inventor:
J. G. Pinkert
By munn & Co
Attorneys.

No. 672,287.

Patented Apr. 16, 1901.

J. G. PINKERT.

PROPELLING VESSELS.

(Application filed Dec. 23, 1897.)

(No Model.)

3 Sheets—Sheet 3.

Fig. 9

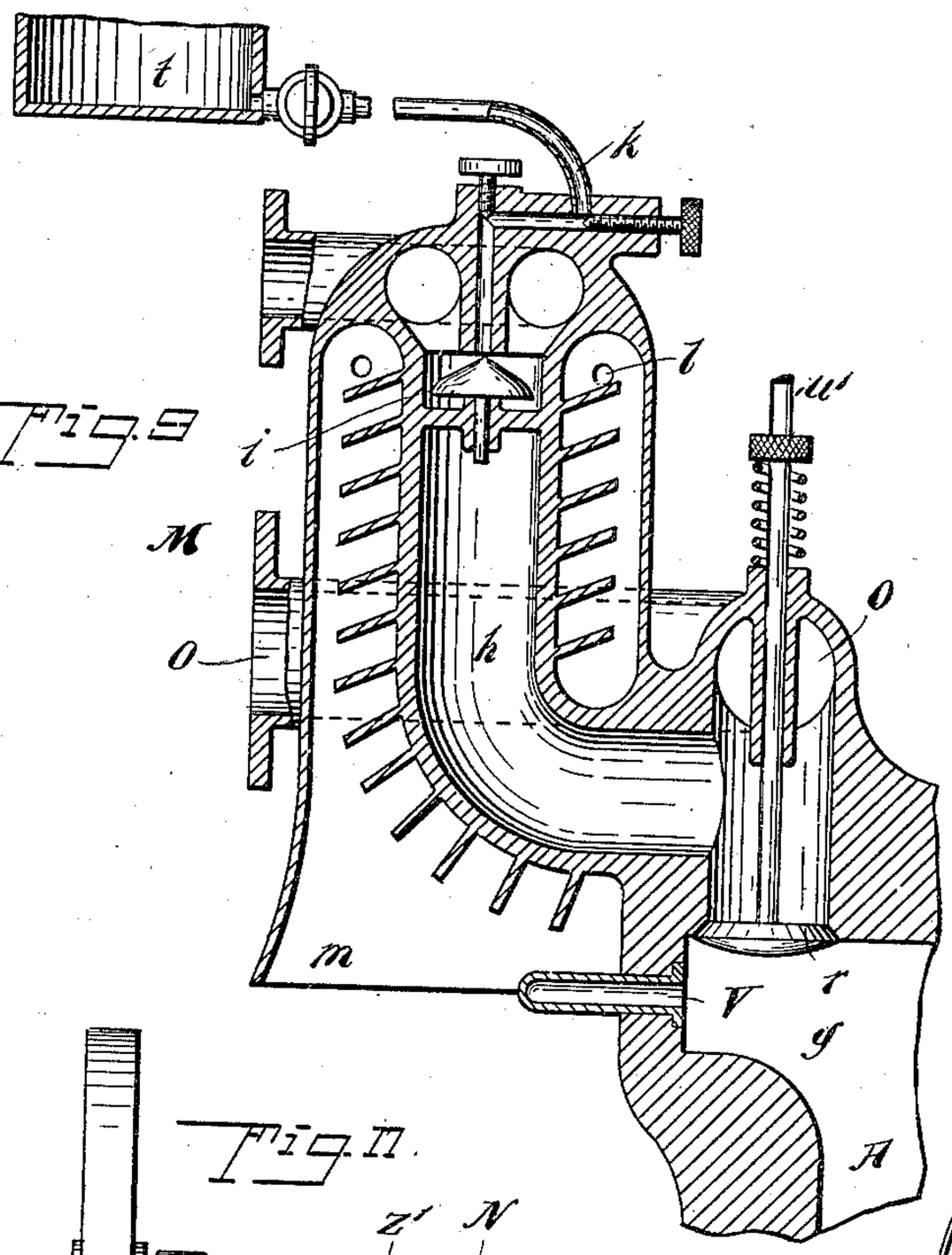


Fig. 10

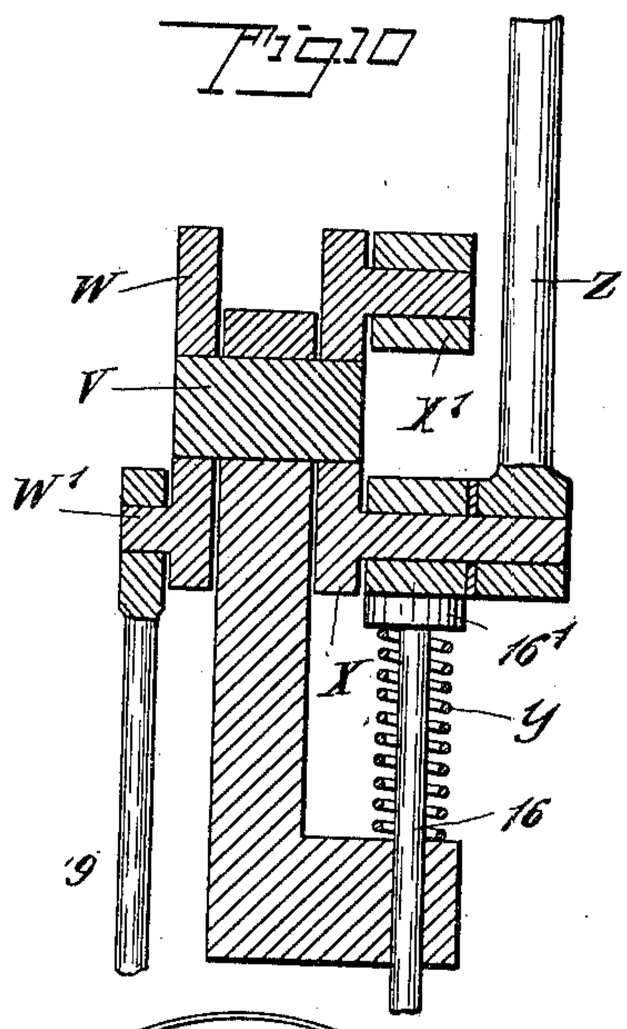


Fig. 11.

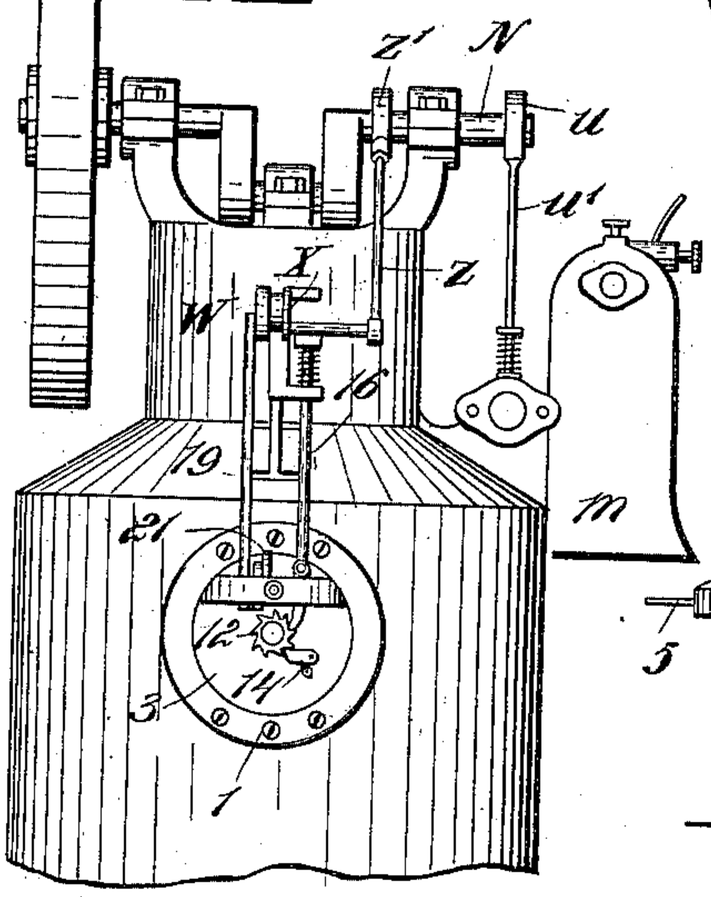
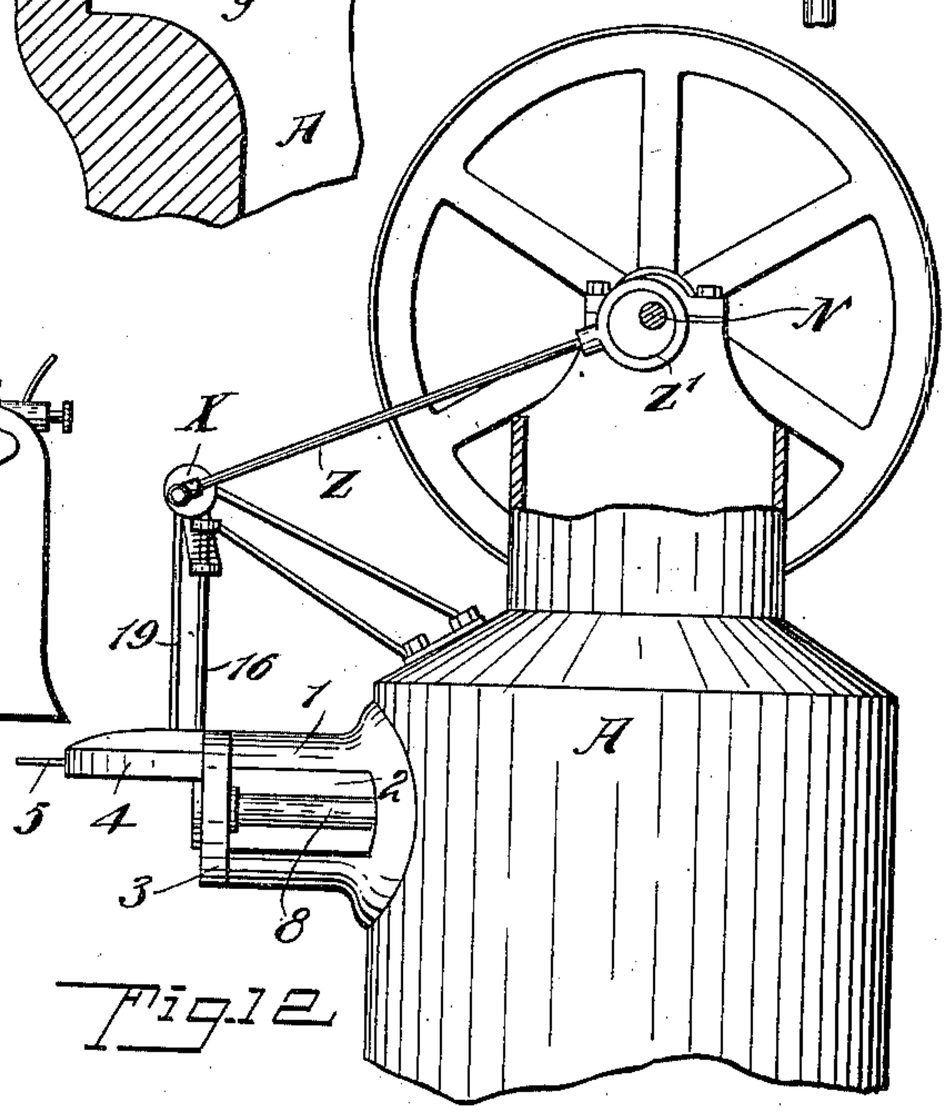


Fig. 12



WITNESSES:

Julius Lutz.

John Lotka

INVENTOR

John G. Pinkert.

BY Munn & Co.

ATTORNEYS

UNITED STATES PATENT OFFICE.

JOHN GEORGE PINKERT, OF HAMBURG, GERMANY.

PROPELLING VESSELS.

SPECIFICATION forming part of Letters Patent No. 672,287, dated April 16, 1901.

Application filed December 23, 1897. Serial No. 663,244. (No model.)

To all whom it may concern:

Be it known that I, JOHN GEORGE PINKERT, a German citizen, and a resident of Hamburg, Germany, have invented a new or Improved Motor for Propelling Vessels, (which has been patented in Germany, No. 94,913, dated September 5, 1895, in England, No. 6,872, dated March 30, 1896, and in France, No. 268,157, dated June 24, 1897,) of which the following is a full, clear, and exact specification.

This invention relates to a new or improved motor, operating by the explosion of combustible material, for the propulsion of all kinds of vessels, in which motor the gaseous products of combustion are made to act directly upon the water to effect the forward movement of the vessel by reaction without the employment of any other propelling means.

The invention is illustrated in the accompanying two sheets of drawings, in which—

Figure 1 is a longitudinal section of the complete motor; Fig. 2, a section taken at right angles to Fig. 1; Fig. 3, a back view of a vessel with motors applied thereto; Fig. 4, a partial side view of same; Fig. 5, a section of the apparatus for loading the motor with explosive material; Figs. 6, 7, and 8, respectively, a cross-section, a side elevation, and a front view of same. Fig. 9 is an enlarged sectional elevation of the vaporizer, and Figs. 10, 11, and 12 are details of a cartridge-firing mechanism which may be employed in my invention.

This motor acts upon the principle of causing the force of the explosion to act direct upon the water in order to obviate the use of the ordinary propelling means—such as screws, paddle-wheels, &c.—and to avoid the loss of power caused by their use. Any suitable explosive may be used in the motor—such as coal-gas, hydrogen gas, gasolene vapor, or gas produced from petroleum, benzin, acetylene, &c.—made explosive by mixing it with air or the like—as also gunpowder, carbonite, melinite, guncotton, &c.—and the method and manner of producing, measuring, mixing, introducing, and igniting the quantity of gas necessary for each explosion can be varied according to the nature of the material employed; but the peculiar propelling-motor—that is to say, the explosion-chamber—and the pivoted discharge-pipe which projects through the ship in the water remain the same, whatever explosive material may be employed.

The motor consists of three principal parts—namely, the explosion-chamber A, the discharge-pipe B, and the regulating or governing motor C.

The explosion-chamber A consists of a cylinder of cast-steel or other suitable material and is made of a diameter suitable for the power required. The said chamber terminates at *a* in a smaller cylinder *b*, which may be arranged vertically or horizontally and must be bored out to enable the piston *c* of the regulating-motor C to move gas-tight within it. The cylinder A is provided at its contracted part *a* with the inlet-passage *g*, through which the explosive mixture produced in the vaporizer M and the necessary air for the explosion pass into the explosion-chamber. The vaporizer M consists, first, of the peculiar vaporizing-body *h*, provided with heating-ribs; secondly, of a movable cone *i*, which forms a back-pressure valve and also serves to spread out the liquid hydrocarbon flowing thereto; thirdly, of a pipe *k*, leading the liquid to be vaporized to the vaporizer—for instance, from a tank *t*—and, fourthly, of the air-openings *l*, arranged around the upper part of the vaporizer. The entire vaporizer is surrounded by the mantle *m*, beneath which is placed the heating-lamp *n*. At the side of the vaporizer is arranged the air-pipe *o*, so placed that the hydrocarbon vapor produced in the vaporizer and mixed with a small quantity of air carries along with it the air entering at *o*, and both enter the explosion-chamber together. Below the vaporizer is placed the exploding-tube *p*, which is heated to a red heat by the lamp *n*. The small cylinder *b* extends into the explosion-chamber A, as shown at *q*, so as to make the said chamber of annular shape at its upper part. The retaining-valve *r* of the mixture-inlet *g* may be arranged to act automatically or to be worked by an eccentric *u* and rod *u'* from the shaft N of the regulating-motor, and the valve *i* for admitting hydrocarbon liquid to the vaporizer may also be operated either from the shaft N or automatically—that is, merely in response to the varying condition of suction

and compression. The cylinder *b* is surrounded with a jacket D, through which cooling-water E is circulated, such water entering through the pipe F and leaving by the pipe G.

The explosion-cylinder A is connected at its lower end with the discharge-pipe B, a gas-tight joint being formed between the two by means of a fillet *d* on the explosion-cylinder A taking into a groove on the discharge-pipe B and retained therein by the annular flange *e*. The joint thus formed is not only gas-tight, but enables the discharge-pipe B to be turned around on the explosion-cylinder A. The annular flange *e* is provided with a toothed rim *f*, the teeth of which gear with those of a toothed wheel H, by rotating which the discharge-pipe B can be turned into any required position. The discharge-pipe B is bent at J, so that the discharge of the gases resulting from the explosion in the explosion-chamber A is forced to take a horizontal direction through the discharge-opening K. The discharge-pipe B is carried through the ship's bottom with a water-tight joint, so that the part K can be rotated outside the vessel, and it should be made so long that the discharge of the gases of explosion always takes place at a proper depth below the surface of the water, dependent upon the size and draft of the vessel. As the discharge-pipe B always passes in a vertical direction through the ship's bottom and the water-tight jointing must stand exactly horizontal to enable the discharge-pipe to be easily turned around, the said discharge-pipe is preferably surrounded with a casing or mantle L, fitted outside the ship. The size and form of this casing must be arranged to suit the form of the ship, and it serves also as a sheath or fender to protect the discharge-pipe B from injury.

The regulating-motor C is constructed like an ordinary gas-engine. It takes no direct part in the propulsion of the ship and only receives so much of the pressure of the explosion as is necessary to keep it in regular motion. It serves only to effect the distribution of the gas and air mixtures, the measurement of the substance to be vaporized, and the opening and closing of the valves necessary for those purposes. The regulating-motor may be arranged vertically or horizontally, according to the character of the space in which the apparatus is placed.

The igniting devices may consist of incandescent tubes, open flames, or electric sparking apparatus, and the explosion can also be effected partly by the compression of the explosive mixture in the vaporizer.

For war vessels and all ships which carry gunpowder or other similar explosives the propelling-motor may be provided with firing apparatus of the kind shown in Figs. 5 to 8, which in all cases renders it possible for a vessel to proceed after the ordinary explosive material, such as vaporized petroleum, &c., has been exhausted. This firing apparatus consists of a case 1, a cartridge-drum 2, a breech-plate 3, a striking-bolt case 4, a striking-bolt 5, and a striking-bolt spring 6. The case 1 is fixed to the wall of the explosion-cylinder A and the latter is provided with an opening 7, the center of which corresponds exactly with the axis of the cartridge to be fired and the size of which must be exactly equal to that of the cartridges to be employed. The cartridge-drum 2 is provided with four or other suitable number of cartridge-chambers 8, which are open at the periphery of the drum and are furnished with rounded edges in order to facilitate the entrance into and exit from the cartridge-chambers of the cartridges 10, which are fastened on a cartridge-belt 9 at distances apart corresponding to the distance apart of the cartridge-chambers of the drum. The axis 11 of the cartridge-drum 2 turns at one end in a bearing in the wall of the explosion-chamber A and at the other end in a bearing in the breech-plate 3. The said axis is provided at its outer end with a ratchet-wheel 12, which is rotated by the pawl 13 and is prevented from turning backward by the retaining-pawl 14. The actuating-pawl 13 is hinged at 15 to a sliding rod 16, and both it and the retaining-pawl 14 are pressed against the ratchet-wheel 12 by springs 17. In the striking-bolt case 4 is pivoted a disk 18, which is rotated by a connecting-rod 19, connected to a crank-pin 20, fixed eccentrically in the disk. To this disk is fixed a tappet 21, which acts upon the shoulder 22 of the striking-bolt 5 and presses the latter so far back at each half-revolution of the disk 18 that the spring 6 is put into sufficient tension to force the striking-bolt 5 forward immediately the shoulder 22 is released by the tappet 21, so that the point of the bolt enters the corresponding hole 23 of the breech-plate 3 and fires the cap of the cartridge 10. Rods 16 and 19 are worked from the shaft N by means of a shaft *v*, carrying a disk *w*, with a crank-pin *w'* engaging the rod 19, and another disk *x*, carrying crank-pins with rollers *x'*, adapted to engage the head 16' at the end of the rod 16, pressed by a spring *y*. With one of the crank-pins of the disk *x* is connected the eccentric-rod *z*, worked from the eccentric *z'* on the shaft N.

The propelling-motor acts as follows: Assuming that the motor is driven by vaporized liquid—such as petroleum, for example—and that the last explosion has driven up the piston *c* of the regulating-motor C, whereby liquid petroleum is pressed through the inlet-pipe *k* and simultaneously air through *l*. The petroleum flows over the cone-valve *i*, thereby forming itself into a thin sheet or film, and the air issuing from *l* strikes this film of petroleum, pulverizes it, and throws the petroleum mist thus formed against the hot walls of the body *h*, whereby the vaporization of the petroleum is effected. In the meantime the inlet-valve *r* has been opened by the rotation of the shaft N and a strong stream of air

comes through the air-inlet *o* and carries the vaporized petroleum mixture with it through the inlet *g* into the explosion-chamber A, whereby the air is mixed with the petroleum-vapor and forms an explosive mixture, which presses the burned gases of the last explosion downward. The annular form of the upper part of the explosion-chamber favors the formation of a powerful vortex, and thereby an intimate mixture of the air and vapor. The return stroke of the piston *c* produces a small excess of pressure in the explosion-chamber, which suffices to force explosive mixture into the red-hot igniting-tube *p*, causing the explosion of the mixture to take place at the moment when the piston *c* has reached its lowest position. The explosion acts as a motive power for the most part downward, as the small cross-section of the cylinder *b* only allows of a correspondingly small exercise of power in an upward direction, and the inlet-valve *r* closes at the moment of explosion, whereupon the whole operation is repeated. The downwardly-acting force of the explosion exerts a powerful pressure or push through the discharge-pipe B and opening K on the water, whereby the forward movement of the ship is effected. As this action is repeated eighty to three hundred times per minute, according to the size of the motor, a similar number of pushes takes effect on the outer water, each of which pushes acts like the stroke of an oar. All other propelling means—such as screws, paddle-wheels, &c.—are thus dispensed with, the forward motion of the vessel being effected solely by the direct pressure of the explosions on the outer water. There should generally be at least two motors in a vessel; but it is immaterial whether they are placed at the bow or at the stern. By the arrangements above described the steering-rudder may be dispensed with, because the steering of the vessel can be effected by using only one of the motors when a slight change of direction is wanted, and when the vessel is required to turn quickly, or within a short distance, one motor can be worked forward and the other sidewise or backward. The effect of the motor on the vessel is always dependent upon the direction toward which the discharge-opening K is set, and as this can be set in any direction by turning the wheel H, or by means of other suitable apparatus, the motor may be made to act in any required direction, even backward if the discharge-opening K be turned around one hundred and eighty degrees, so as to stand in the position directly opposite to that of the normal motion of the vessel. As probably it is not advisable to employ motors of this kind of greater power than one-hundred-horse power each, all vessels which require more than one-hundred-horse power may be fitted with a number of motors, which may be arranged at the sides of the vessel, one behind the other, and as by this sort of arrangement the steering capacity of the vessel may be materially increased it would indeed be possible by such means to turn a vessel on her own center or to press her sidewise out of her normal direction, which capability would be of great importance for avoiding collisions. As the regulating-motor C is in most cases larger than necessary for the mere purpose of regulation, its superfluous power may be utilized for other purposes—such as for the production of electric light, for example.

For war vessels the propelling-motor may be provided with the cartridge-firing apparatus shown in Figs. 5 to 8, as well as with its ordinary apparatus, and the said firing apparatus may be employed when the ordinary driving material is wanting and cannot be obtained. Explosives—such as gunpowder, carbonite, guncotton, &c.—are, however, always available on board war-ships, and in this case can be substituted for the ordinary driving material—such as petroleum, for example. When this firing apparatus is to be put in action, the arrangements for feeding with gas, petroleum, &c., are put out of action; but the air-valve *r* is left in action. Then the bars 16 for the pushing-forward mechanism and 19 for the striking-bolt mechanism are connected with the fly-wheel shaft N, and the cartridge-band 9 is so placed on the cartridge-drum 2 that the first cartridge lies in the left-hand open cartridge-chamber 8. The fly-wheel shaft N is now rotated once, whereby the first cartridge is drawn into the case and exploded, after which the motor goes on working automatically, and it is only necessary to look after the renewal of the cartridge-band when that on the cartridge-drum is exhausted. This cartridge-firing apparatus operates in the following manner: The sliding bar 16 moves forward the ratchet-wheel 12 by one tooth at each revolution of the fly-wheel shaft N by means of the pawl 13, so that after each revolution of the shaft a cartridge is brought between the striking-bolt 5 and the opening 7, whereby the cartridge-band 9 is caused to pass between the upper cover of the case 1 and the cartridge-drum 2. At the same time the disk 18 is caused to make a revolution by means of the connecting-rod 19, whereby the tappet 21 is caused to cock the striking-bolt 5. At the right moment the tappet 21 releases the striking-bolt 5, and the latter is then propelled forward by the spring 6 and effects the firing of the cartridge 10. The air drawn in at each operation through the inlet-passes serves to increase the effect of the explosion, because the gases produced by the explosion and entering through the opening 7 meet with air already compressed, so that those gases are not weakened in their action by having to fill the chamber A before exerting their effect upon the water.

Having now particularly described and as-

certained the nature of this invention and in what manner the same is to be performed, I declare that what I claim is—

1. A propelling device for vessels, comprising a working cylinder open at one end to allow the explosion gases to act on the medium through which the vessel is traveling, a piston movable within the cylinder, and mechanism controlled by said piston, for admitting propelling charges into the cylinder.

2. A propelling device for vessels, comprising a cylinder open at one end to allow the explosion gases to act on the medium through which the vessel travels, a piston at the other end of the cylinder, a rotatable cartridge-drum arranged adjacent to a cylinder-port located between the piston and the open end of the cylinder, the drum being adapted to receive a cartridge-belt, and mechanism operated by the said piston, for moving the drum and exploding the cartridges.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

JOHN GEORGE PINKERT.

Witnesses:

EMIL DE ROI,

CURT ZÜMKAL.