No. 849,570. PATENTED APR. 9, 1907.

G. PINO.

HYDROSCOPE.

APPLICATION FILED SEPT. 23, 1903.

3 SHEETS—SHEET 1.

Fig. 1

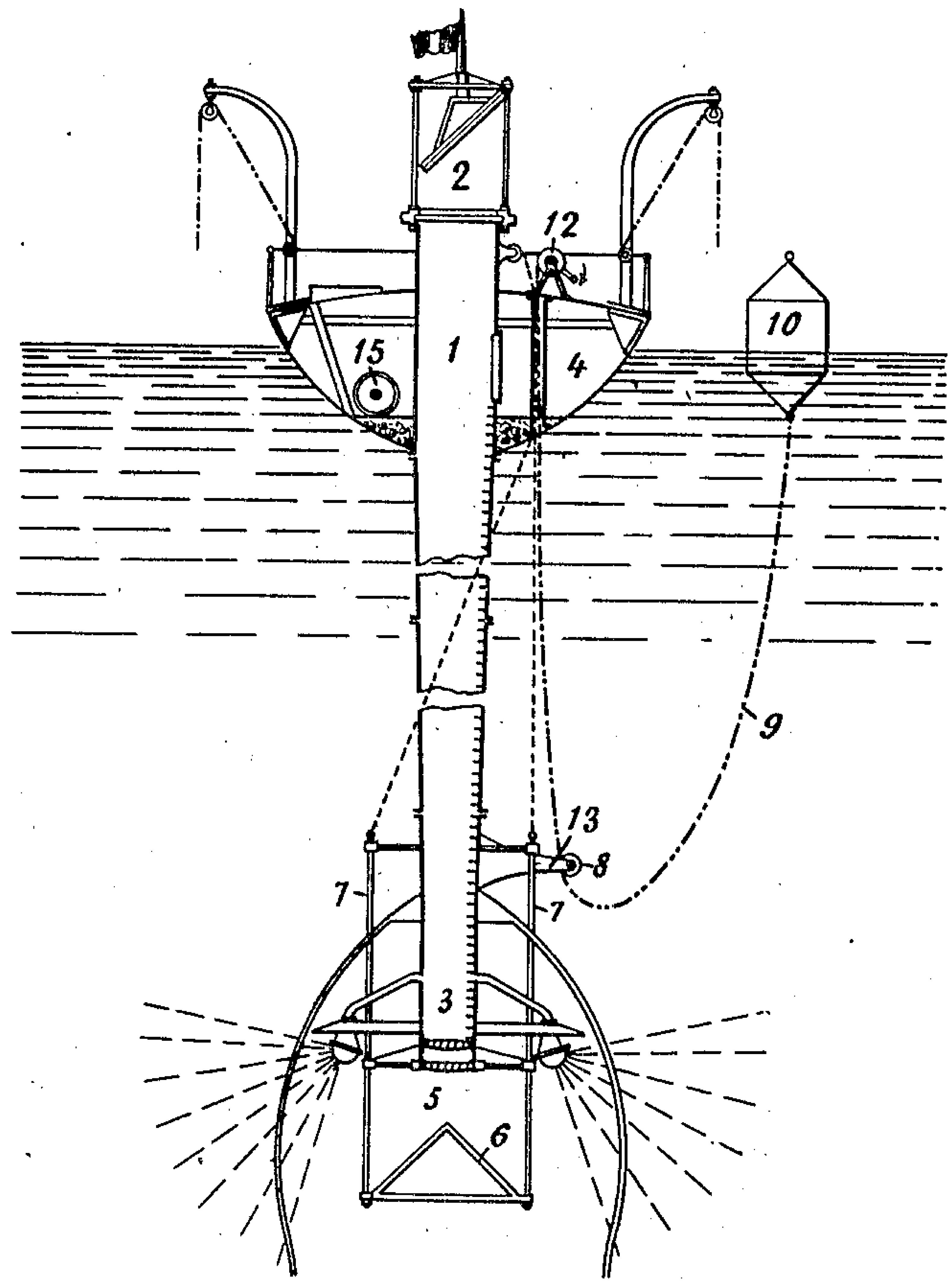
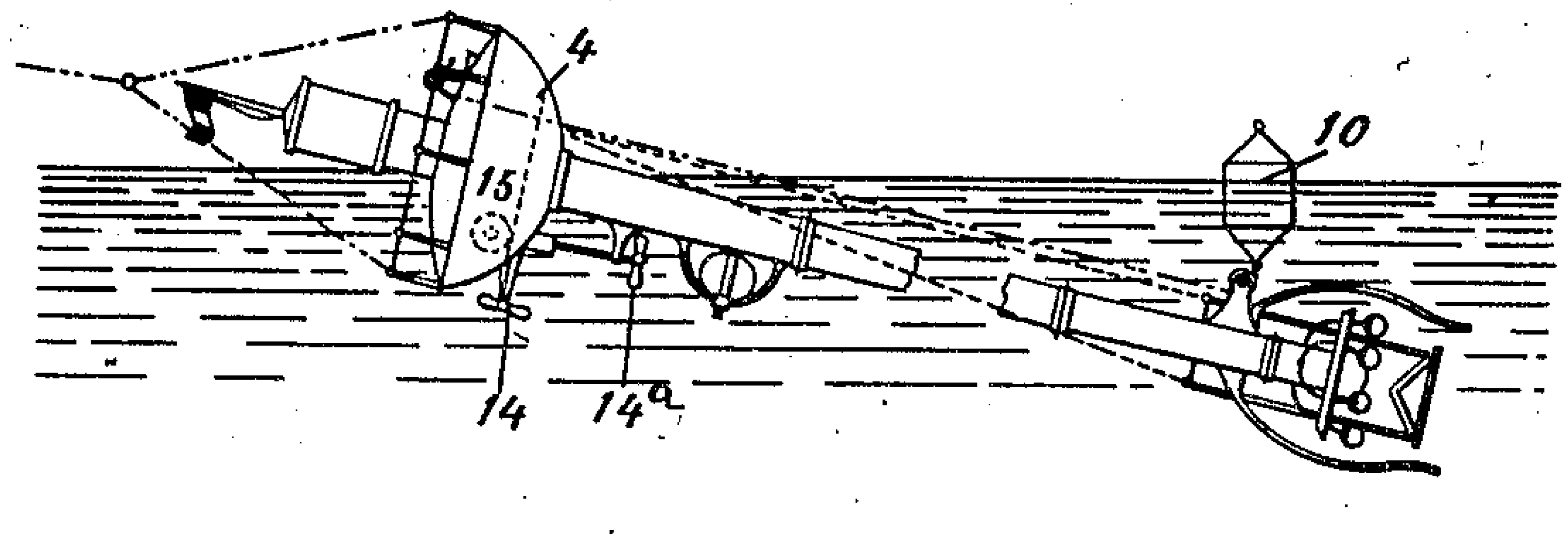


Fig. 2



Witnesses

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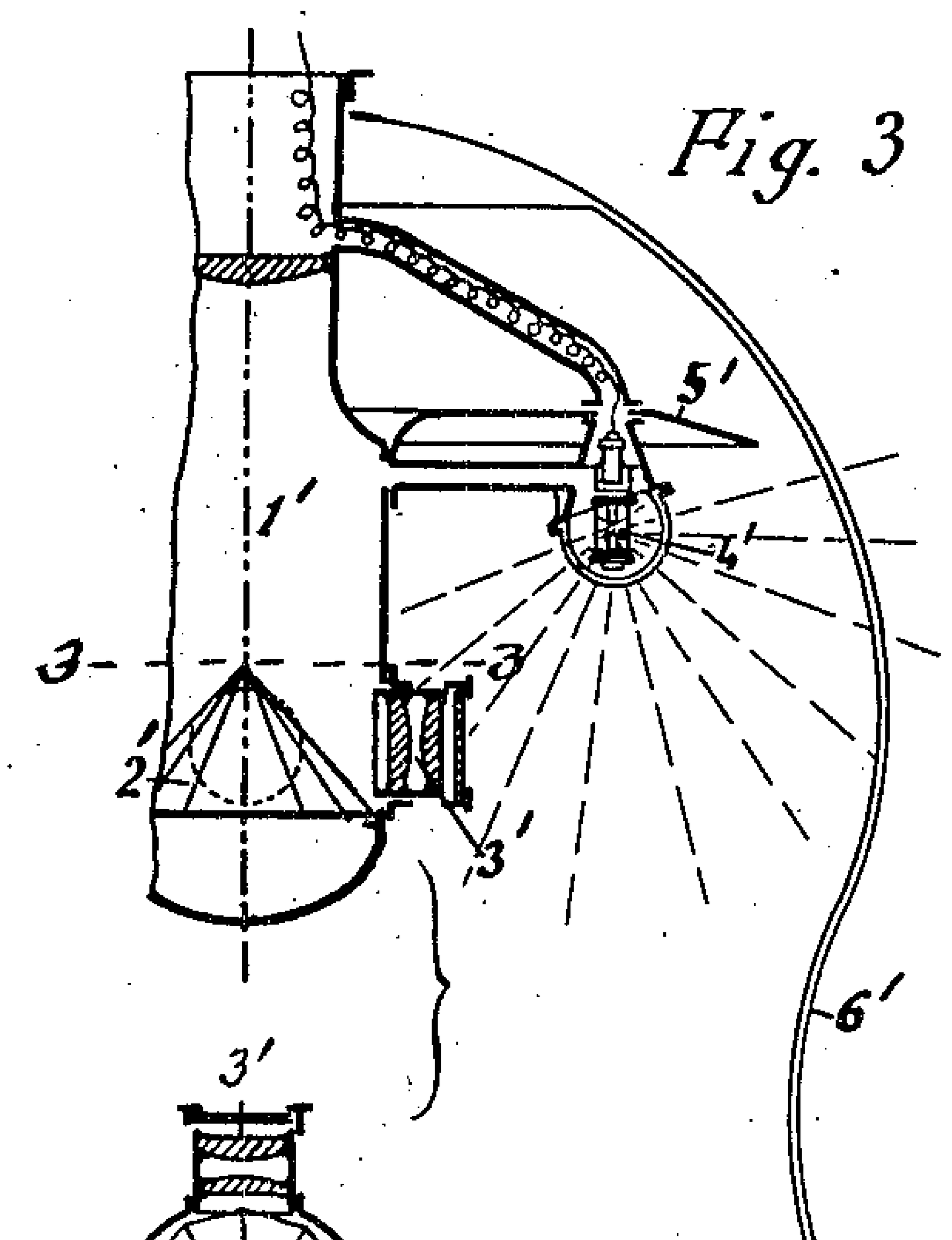
3 SHEETS—SHEET 2.

Fig. 3



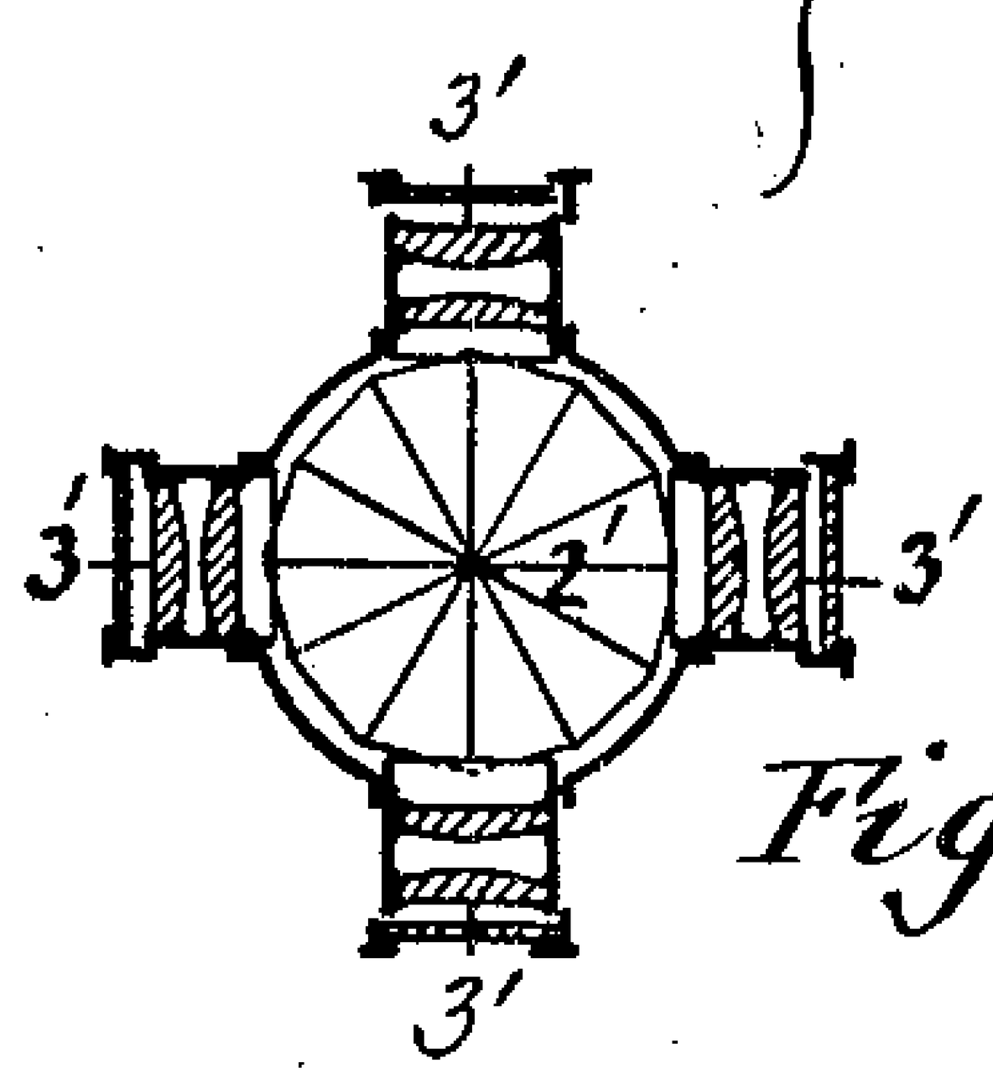


Fig. 3a

Fig. 4

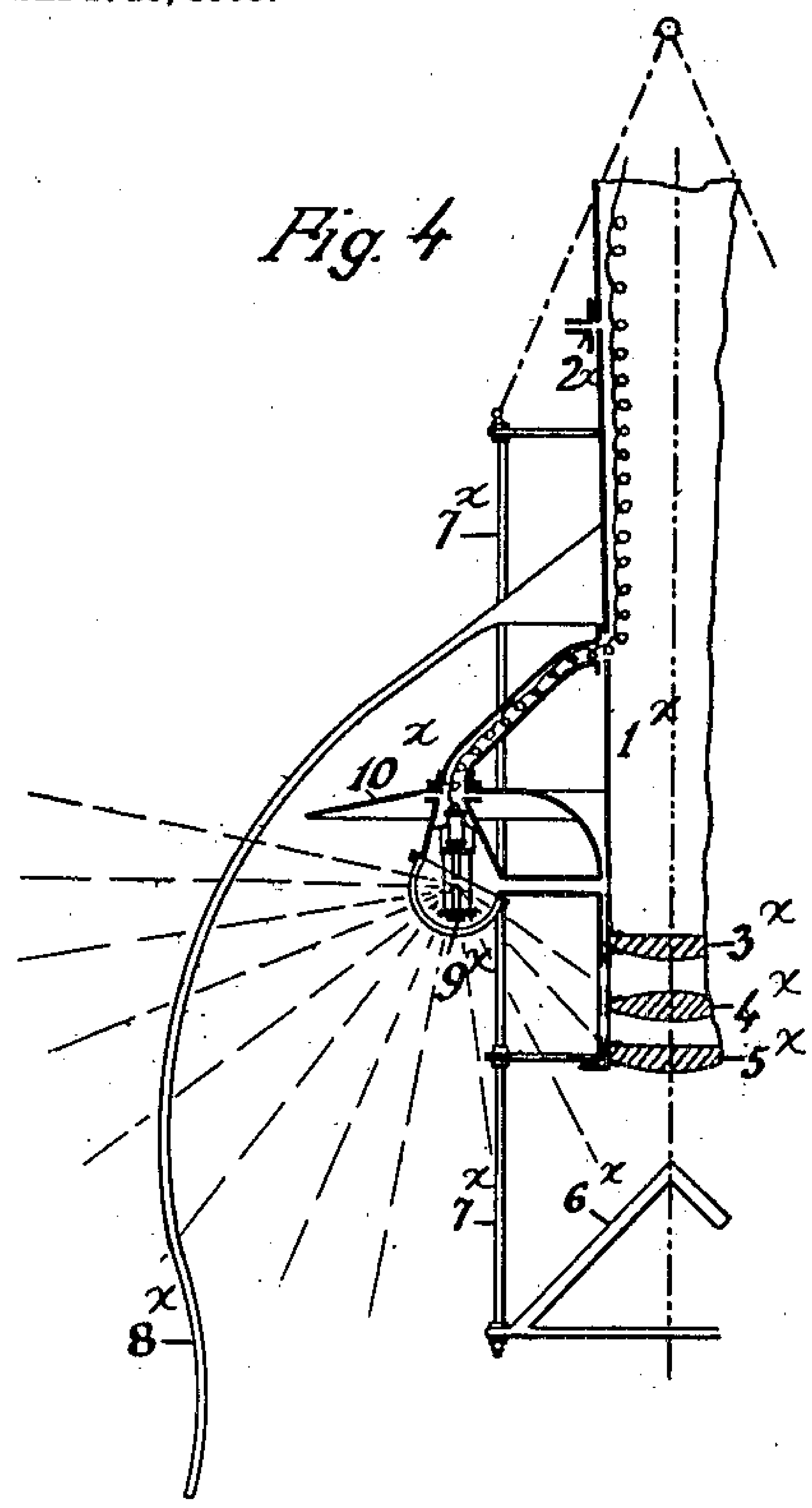
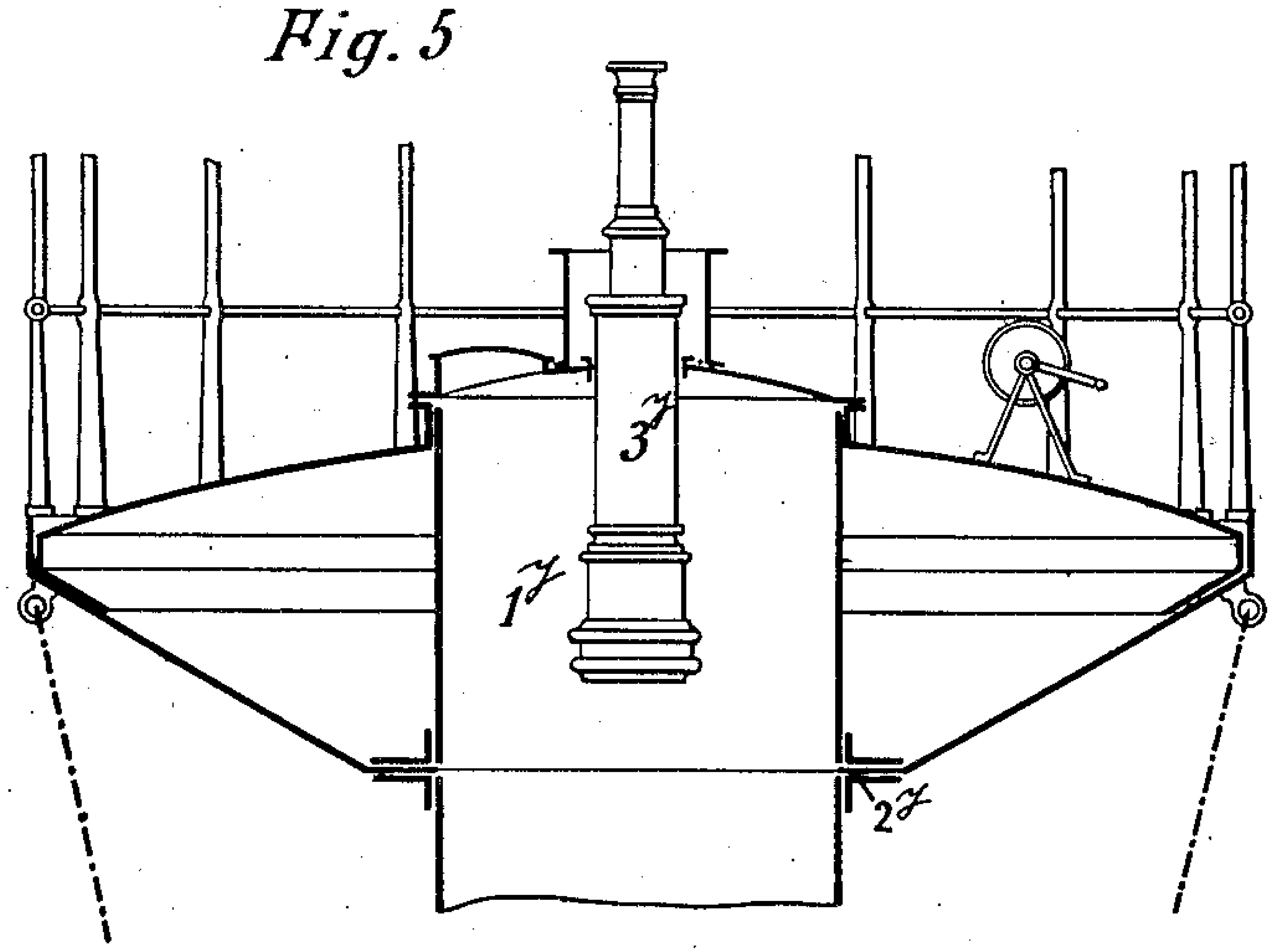


Fig. 5



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3 SHEETS—SHEET 3.

Fig. 7

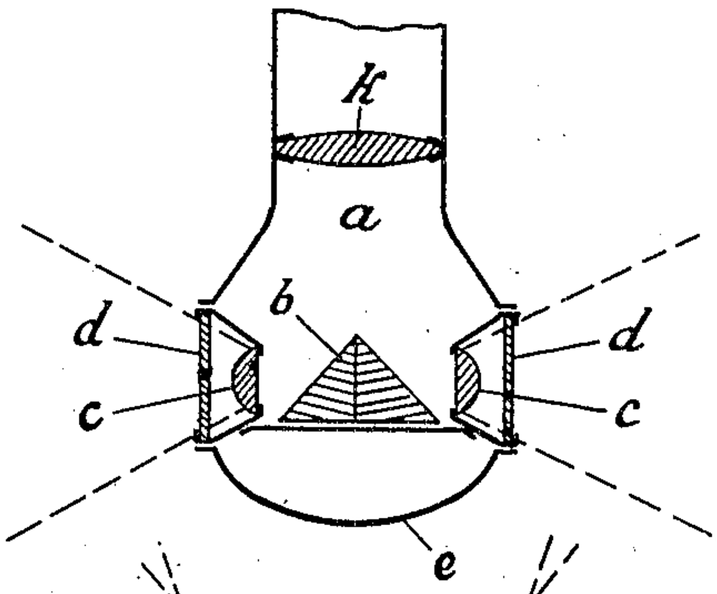


Fig. 8

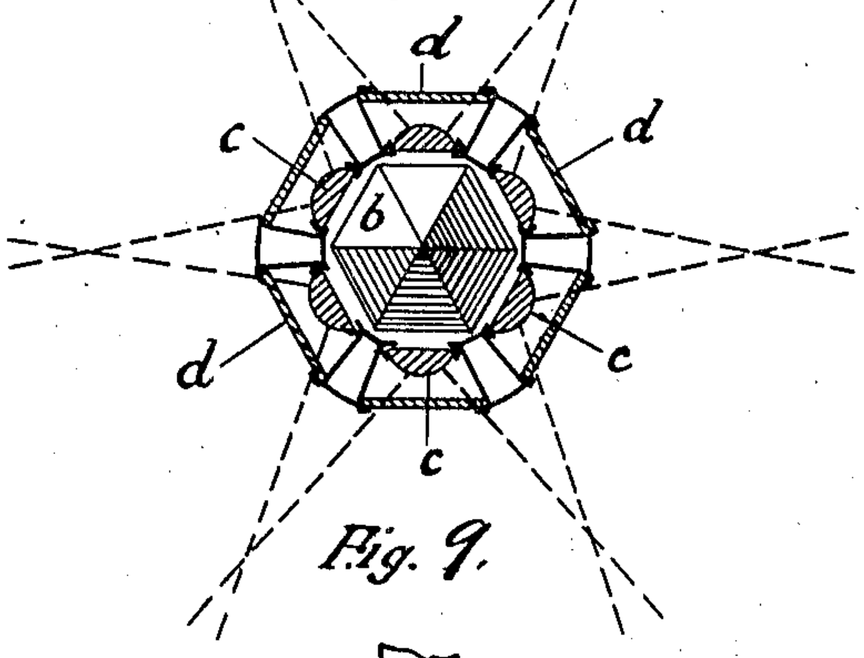


Fig. 9.

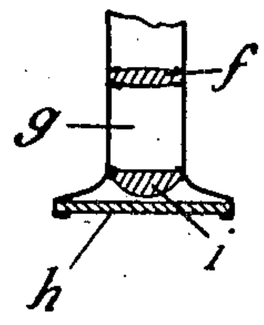
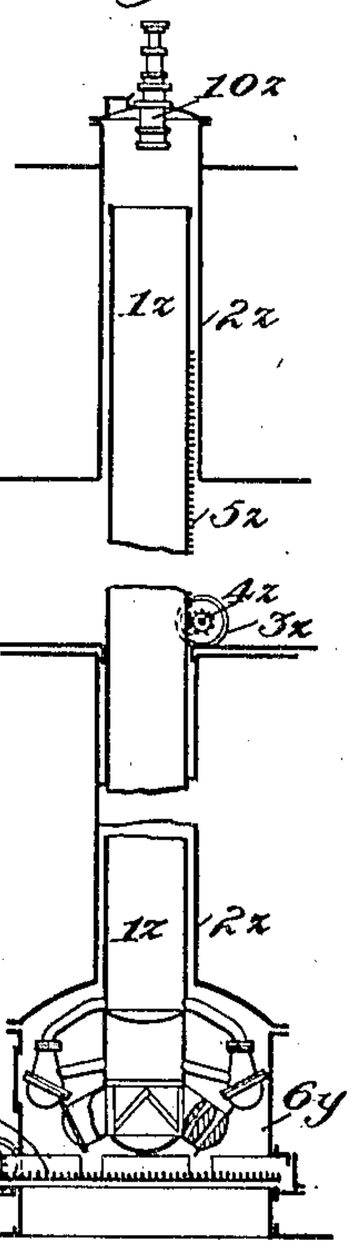


Fig. 6.



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UNITED STATES PATENT OFFICE.

GIUSEPPE PINO, OF GENOA, ITALY.

HYDROSCOPE.

No. 849,570. Specification of Letters Patent. Patented April 9, 1907.

Application filed September 23, 1903. Serial No. 174,338.

To all whom it may concern:

Be it known that I; GIUSEPPE PINO, a subject of the King of Italy, residing at Genoa, Italy, have invented certain new and useful Improvements in Hydroscopes, (for which I have applied for Letters Patent of Italy, July 28, 1903,) of which the following is a specification.

This invention has for its object a hydroscope for exploring and photographing the bottom of the sea from the surface and recovering submerged objects.

I am aware that telescopes already exist for exploring the bottom of the sea; but such apparatus as heretofore constructed are not capable of attaining the objects of this invention—that is to say, of obtaining perfect images of the objects lying on the bottom of the sea. I have therefore constructed a hydroscope of which the following is a clear and complete description and which is shown in the annexed drawings, of which—

Figure 1 shows the hydroscope forming the object of the invention, partly in vertical section, attached to a floating raft or buoy. Fig. 2 shows the apparatus in its position of rest—*i. e.*, in a condition adapted for being moved from one spot to another or for being towed. Fig. 3 is a vertical section of one form of the objective. Fig. 3ª is a horizontal sectional view on line 3 3 of Fig. 3. Fig. 4 is a vertical section of another form of the objective. Fig. 5 is a vertical section of the eyepiece provided with a single telescope. Fig. 6 is a vertical section of the hydroscope arranged upon a vessel, extending and telescoping being obtained by an electrically-worked rack-and-pinion device. Figs. 7 and 8 are a section and a plan view, respectively, of a third form of the objective. Fig. 9 is a vertical section of a fourth modification of the objective.

The hydroscope may be fixed to a ship or be independent—that is to say, adapted to a floating raft or buoy, on which in this case are installed all the appliances necessary for its working.

Referring now to Fig. 1 of the drawings, the hydroscope may be formed of one or more tubes 1, suitably connected one to the other, so as to prevent ingress of water at the joints. The hydroscope is furthermore provided at its lower portion with an objective 3. It is obvious that the hydroscope, either axially arranged on a buoy, Figs. 1, 2, and 5, or placed on a vessel, Fig. 6, must be in every case provided with the necessary devices for extension toward the objects to be surveyed and for telescoping. When the hydroscope is arranged on a buoy 4, in which case it is always arranged axially, Figs. 1 and 5, its ascent and descent is effected by means of a capstan 12 or equivalent appliance on which is wound a cable or chain 9, the other end of which is fixed and supported on an auxiliary buoy 10.

By unwinding the chain 9 from the capstan 12, so as to leave said chain slack, as seen in Fig. 1, the device will assume a vertical position, which is the operative position; but when it is desired to incline the device for any purpose, as for towing, the capstan is turned so as to wind up the chain, and this will of course cause the device to assume an inclined position, as seen in Fig. 2. In the said figure, 13 is a support placed on the lower extremity of the last or extreme element on the pulley on which glides the said chain.

The eyepiece 2 may be provided with lenses, as usual, or with a telescope, as shown in Figs. 5, 6.

The objective 3 is provided with simple lenses or with condensers 5, having two or more lenses, and with a reflector 6, controlled by rods 7, communicating with the platform of the buoy 4 by means of a chain or cable, with the aid of which it may be caused to approach or move away from the condenser. It also may be provided with powerful lighting appliances with reflectors. All the manipulations of the capstan, &c., may be effected by hand or by an electric motor 15. The latter may also work screw-propellers 14 and 14ª for movements of translation, &c., of the hydroscope, Fig. 2. To incline the apparatus as shown in Fig. 2, it is sufficient to turn the capstan 12, Fig. 1, in the direction of the arrow. The cable in winding itself up will be more and more tightened, and as the buoy 10 does not cede the apparatus will be inclined, owing to the action of support 13 and pulley 8.

In the form of objective shown at Fig. 3 the condensers 3′ are arranged radially to tube 1′, which in its lower part is enlarged, so as to receive the polyedric reflecting-conus 2′, composed of four or more faces, adapted to reflect on the eyepiece the images taken up by the different condensers. In the said figure the condensers 3 are four, arranged symmetrically in a horizontal plan; but it is

understood that their number may be increased, and they may be inclined, and that the arrangement and number of the lenses and of the lamps 4′ and their reflectors 5′, as well as the form and number of bars of the protection-cage 6′, may vary according to circumstances.

In the modification of eyepiece, as shown at Fig. 4, 1^x is the tubular portion of the objective. 2^x is the flange or connection of the objective with the hydroscope. 3^x, 4^x, and 5^x are the lenses of the condenser, the number of which may vary according to the circumstances. 6^x is the movable polyedric reflecting-conus, located at the exterior of the tube, but axially with the same. 7^x are the movable rods in communication by ropes or cables with the operator, who thus is capable of raising and lowering the reflecting-conus, so as to bring it at the necessary focal distance from the condenser. 8^x are the bars of the protection-cage. 9^x are the electric lamps; 10^x, the corresponding reflectors.

In the form of the eyepiece of the hydroscope arranged on a buoy, Fig. 5, 1^y is the tube. 2^y is the flange of connection with the elements. 3^y is the telescope proper or any equivalent instrument to approach the objects reflected by the cone. In the said figure the telescope is arranged concentrically to the tube of the objective. As, however, the number of telescopes may be two or more, it is understood that whatever may be their number they will always be arranged eccentrically to the axis and in such a position that the operator will be able to look simultaneously in two of them.

Fig. 6 represents another form of the hydroscope, located in the interior of a vessel to survey vertically the objects placed below the vessel. In this modification when the hydroscope is in its position of rest the objective occupies a kind of chamber 6^y in the hull of the vessel, closed by a rack-actioned door 7^y, which glides between air-tight walls 8^y. The hydroscope, Fig. 6, comprises two tubes telescoping the one within the other. The outer or stationary one, 2^z, bears the telescope eyepiece 10^z, while the movable one, 1^z, bears the objective and is provided with a rack 5^z, operated by a pinion 4^z, keyed, which pinion may be rotated by any suitable means, as an electric motor, for instance. Suppose it is desired to lower the hydroscope in order to approach it to the objects to be examined. The sliding door 7^z is opened, and then the electric motor 3^z is started, which, meshing by a pinion with the rack 5^z, causes the apparatus to descend, while turning the motor in the opposite direction the apparatus, obviously, will be shortened or telescoped.

Figs. 7 and 8 show another constructional form of the objective. The latter consists of a polyedric reflecting-cone placed in the interior of a tube enlarged in its lower portion and is surrounded by a crown of semiconvex lenses independent from each other, each of which corresponds to one face of the said cone. Each lens is protected by a crystal disk tightly fixed on the tube. In the said figures, *a* is the objective proper; *b*, the polyedric reflecting-cone; *c*, a series of semiconvex or bull's-eye lenses arranged radially and each corresponding to one of the faces of the said reflecting-cone. *d* are the protecting-crystals, forming a tight closure. *e* is the bottom of the chamber. *k* is the magnifying-lens.

Fig. 9 shows another simplified constructional form of the objective. In this figure, *g* is the tube; *f*, the magnifying-lens; *i*, the semiconvex or bull's-eye lens, and *h* the crystal ring protecting the lens.

Having now particularly described my said invention and the manner in which the same is to be performed, I claim—

1. In an apparatus of the character described, the combination with a body portion composed of tubular sections secured together, of an eyepiece at one end of the body portion, an objective at the opposite end of the body portion, a floatable body from which the tubular body portion is suspended, a capstan carried by said floatable body, a reflector arranged below the objective, a second floatable body and a chain connecting the latter and the capstan.

2. In an apparatus of the character described, the combination with a body portion composed of tubular sections secured together, of an eyepiece at one end of the body portion, an objective at the opposite end of the body portion, a floatable body from which the tubular body portion is suspended, a reflector arranged below the objective, a second floatable body, a capstan on the first floatable body, a chain connected with said capstan and the said second floatable body, an arm 13 on the tubular body portion, and a pulley on said arm, around which pulley the chain passes.

In witness whereof I have hereunto set my signature in the presence of two witnesses.

GIUSEPPE PINO.

Witnesses:
A. FENARI,
ANGELO BORAGINO.