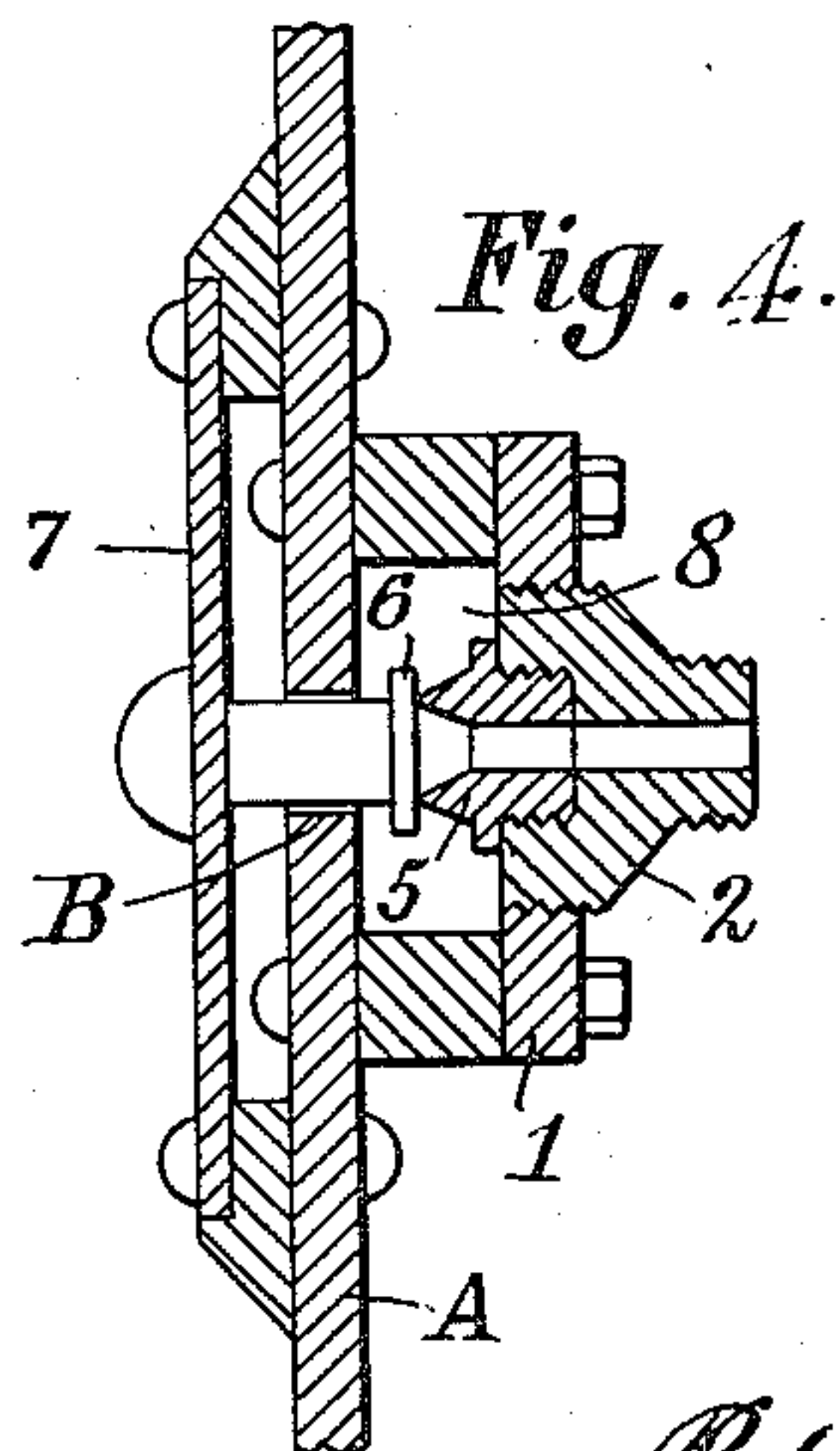
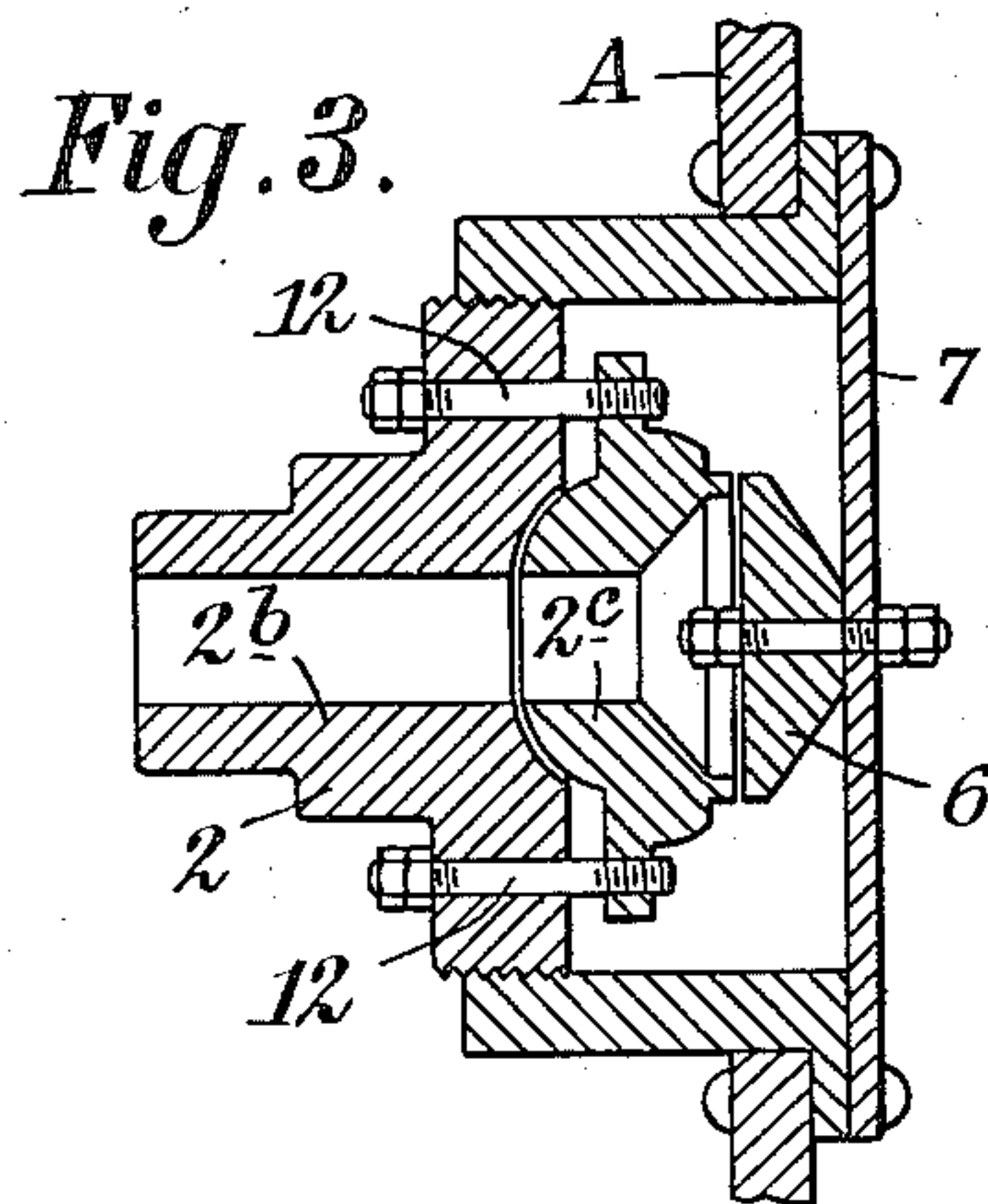
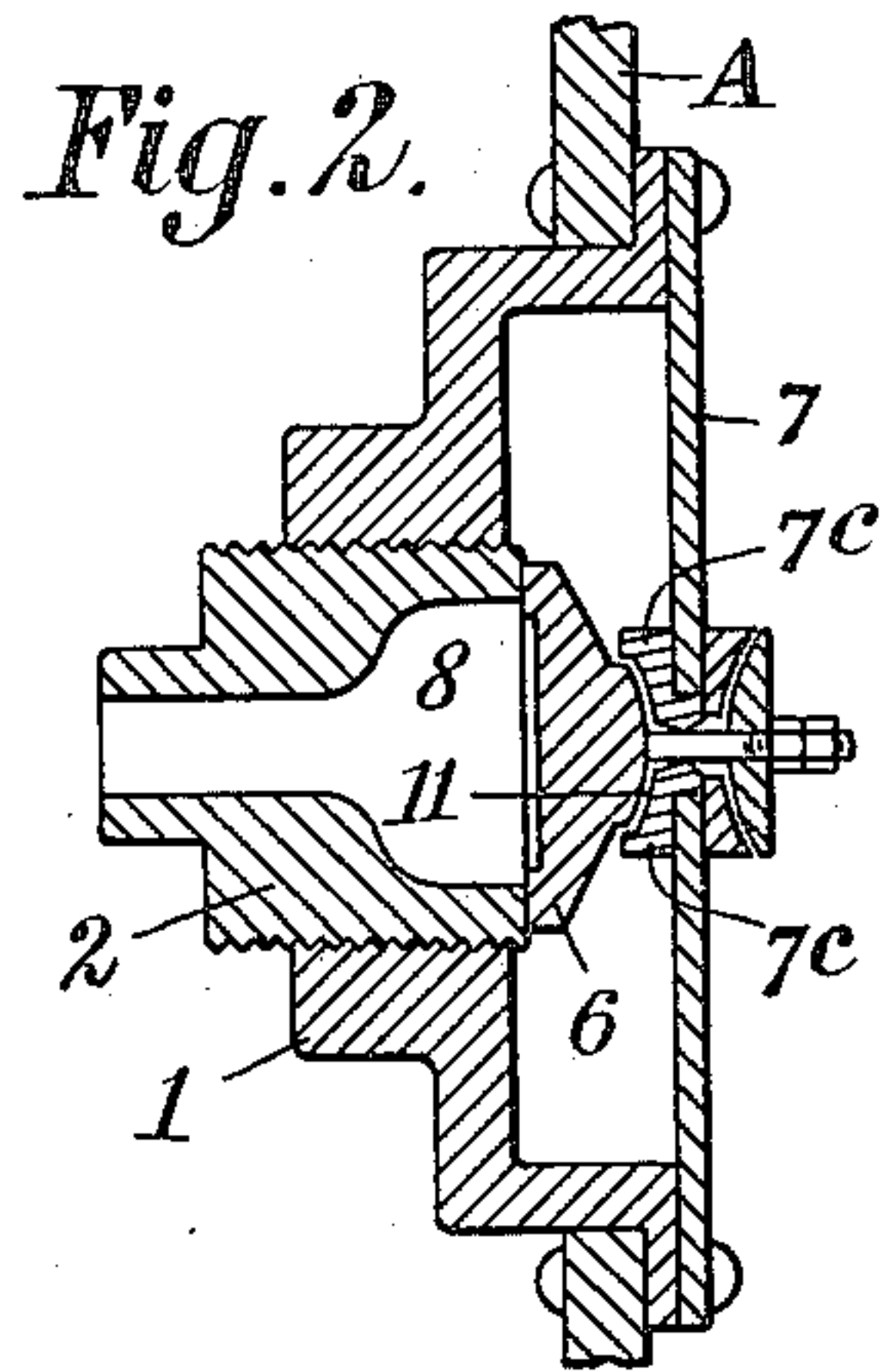
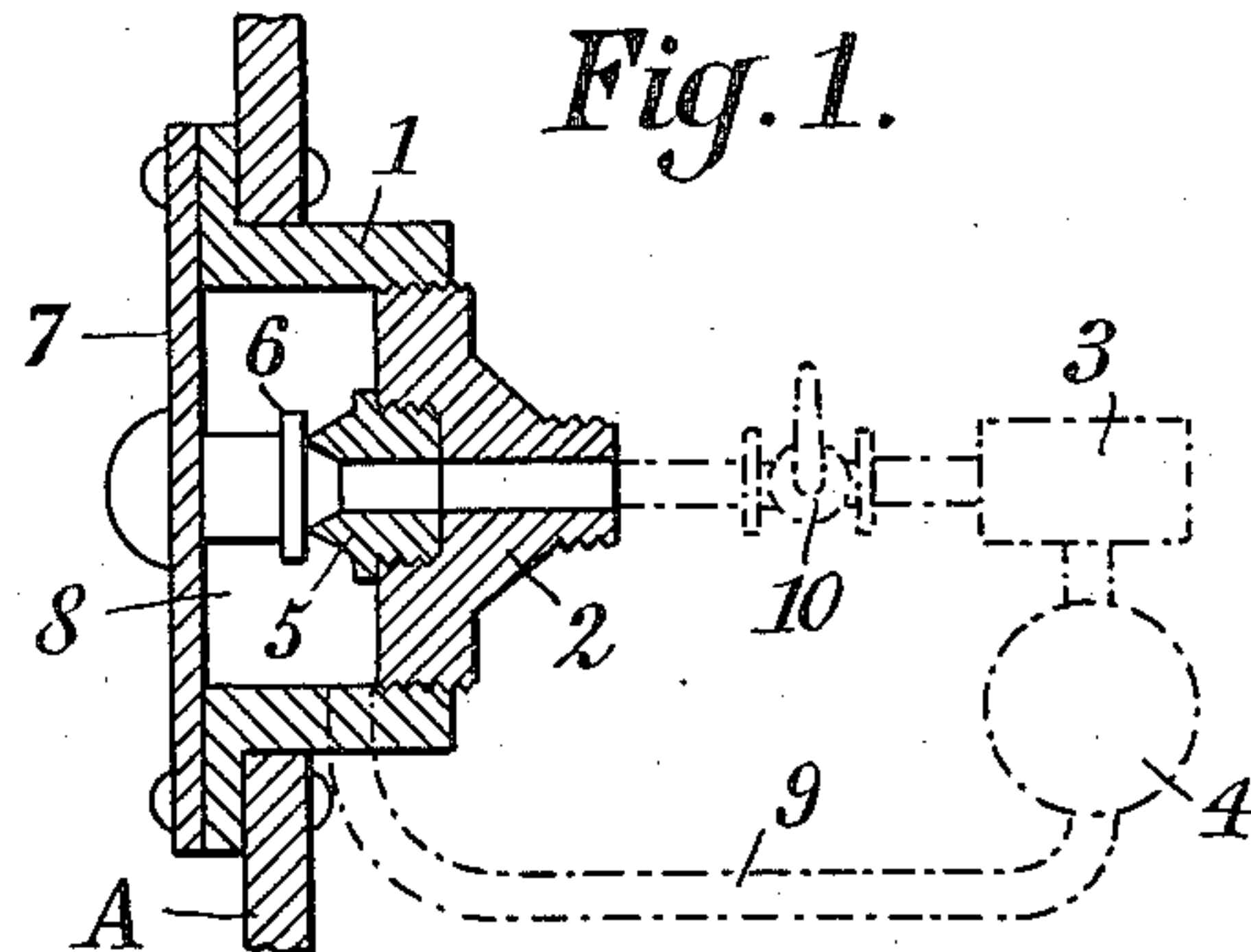


R. NIRENBERG.
 DEVICE FOR TRANSMITTING SOUND WAVES.
 APPLICATION FILED MAR. 23, 1909.

929,623.

Patented July 27, 1909.



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UNITED STATES PATENT OFFICE.

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DEVICE FOR TRANSMITTING SOUND-WAVES.

No. 929,623.

Specification of Letters Patent.

Patented July 27, 1909.

Application filed March 23, 1909. Serial No. 485,356.

To all whom it may concern:

Be it known that I, ROBERT NIRENBERG, a subject of the Czar of Russia, and residing at St. Petersburg, Russia, have invented certain new and useful Improved Devices for Transmitting Sound-Waves, of which the following is a specification.

The present invention relates to devices for transmitting sound-waves through water or earth, namely such as are to be used for submarine signaling, and an important object is to provide a device in which a mechanical interrupter is employed, an elastic closure which closes the pressure-chamber being periodically lifted under the influence of the pressure medium, which may be both gas and a liquid, so that oscillations are produced which are transmitted by the closure either to a diaphragm or to the hull of a ship itself, in order to transmit them to the water or earth.

More particularly, the present invention has for its object a constructional form in which the pressure-body can be adjusted, by means of screw-threads, in the frame which serves simultaneously as the holder of the diaphragm, whereas the closure may be attached to the diaphragm by means of a ball-joint in order that the closure may be adjustable. The pressure-body may, however, consist of two reciprocally adjustable parts, so that the mouth-piece of the pressure-body can be adjusted or, if necessary, be fitted to the closure which is connected rigidly with the diaphragm. Further, it is particularly suitable to connect the frame holding the pressure-body by means of a ring and the closure directly with the hull of the ship, so that the part of the hull of the ship inclosed by the ring acts as a diaphragm. The closure may also pass through an orifice in the wall of the ship and be connected with an optionally large and powerful diaphragm arranged outside the latter. Lastly, a special closure being omitted, the pressure-body may be formed of a larynx-like diaphragm, i. e., one comprising two parts.

In order that the invention may be clearly understood reference will be made to the accompanying drawing in which several embodiments are represented by way of example, and in which:

Figure 1 is a section through a sender for

producing sound-waves in water or in the earth, in which apparatus the pressure-body 55 can be screwed into or is adjustable in the frame which serves as holder for the diaphragm; Fig. 2 is a like view of another constructional form, in which the closure is connected by means of a ball-joint with the diaphragm, and Fig. 3 is a like view of a modified form; Fig. 4 is a section through another modified constructional form, in which the closure member extends through an orifice in the wall of the ship and is connected with the diaphragm outside the latter.

Referring to the drawing and first particularly to Fig. 1, 1 is a frame which, for example, is firmly riveted or screwed to the wall A of the ship. In this frame there is arranged adjustable by means of screw-threads or in other manner a hollow body 2 used as a pressure-body which is connected with a pump 3; the latter is fed from a reservoir 4 and forces the medium, which may be a liquid or gas, into the body 2. On its inner side the pressure-body 2 is connected with an exchangeable muff or socket 5, against the mouth of which the closure member 6 lies, and care must be taken that the area of contact of the mouth-piece 5 with the closure 6 is as small as possible. In the constructional form shown in Fig. 1 this closure 6 is connected directly with the diaphragm 7 which is arranged fixed outside the frame 1. The frame 1 and the pressure body 2 together constitute a housing forming a chamber 8 which can be connected by a pipe 9 with the reservoir 4 in order to return to the reservoir again the medium which collects in the chamber. A valve or stopcock 10 may be provided in the pipe which connects the pump 3 with the pressure-body 2, in order that the device may be operated for a shorter or longer period by opening or closing the stopcock, whereby signals like the Morse alphabet, for example, may be sent.

The manner in which this form of the device operates is as follows: As soon as a fluid under pressure enters into the pressure-body 2 when the stopcock 10 is opened, the closure 5—6 is opened a little and some of the fluid passes out into chamber 8. In consequence of the elasticity of the diaphragm, however, the closure is then rendered tight again, opened again by the continued pres-

sure of the fluid, and closed again by the diaphragm 7. This action repeats itself at short intervals as long as the pressure lasts, the consequence of which is that the diaphragm 7 is vibrated exceedingly rapidly, the number of vibrations per second being dependent on the amount of the pressure as well as the diameter and strength of the diaphragm. By releasing and cutting off the pressure by means of a valve or stopcock 10 which can be rapidly closed and opened, the vibrations can be caused at optional intervals according to an optional system, for example corresponding to the Morse alphabet. The fluid which passes out when the closure 5—6 opens is returned by the pipe 9 to the reservoir 4. It is to be understood that air or gas may be employed instead of a liquid. The diaphragm 8 can be used directly to oscillate the surrounding water or earth, the oscillations of which can be transmitted in the form of sound-waves to great distances. Further, it may be mentioned that, particularly when a liquid is used as the pressure-medium, the mouth of the muff 5 wears away relatively quickly, so that, since good operation is dependent on the closure being seated well at the mouth of the pressure-body, it is preferable to make the muff 5 exchangeable which is readily possible in the arrangement represented in Fig. 1.

Whereas in Fig. 1 the closure 6 is connected directly with the diaphragm 7, in the form according to Fig. 2 the closure member 6 in combination with corresponding projecting extensions 7^c of the diaphragm 7 is formed as a ball-joint 11, whereby the possibility is afforded of placing the closure 6 exactly in the orifice or contacting face of the muff or pressure-body 2.

In the example shown in Fig. 3 a specially tight closure of the pressure-body 2 with the closure 6 is likewise obtained in a manner which can be regulated. The pressure-body 2 is here formed of two spherically ground parts 2^b and 2^c which are held together by screw-bolts 12. By loosening the screw-bolts on the one side and tightening the opposite bolts the mouth-piece 2^c of the pressure-body can be varied in position with regard to the closure 6 attached to the diaphragm 7 and be so placed that normally the closure 6 always makes an absolutely tight joint.

In the constructional form of the invention represented in Fig. 4 the closure 6 of the pressure-body 2 passes through a small orifice B in the wall A of the ship and is connected with an optionally large and strong diaphragm 7 arranged outside the hull of the ship. This construction is of great importance for submarine boats where it is important to avoid all perforations in the wall of the boat or the perforations must be made so small and closed so tightly by other parts

that, even in the case of considerable pressure of water, it is impossible for water to penetrate into the boat. That is the case in the form shown in Fig. 4, since the opening B requires to be only just large enough to receive the closure 6, but is also perfectly closed toward the interior of the boat by the diaphragm 7 and by the frame 1. It is to be understood that in all the constructional forms of the invention the chamber 8 may be connected by the pipe 9 by way of a reservoir 4 with the pump 3 as clearly shown in dotted lines in Fig. 1.

Whereas in the constructional form shown in Fig. 4 the individual parts of the apparatus must be mounted individually, the construction may also be such as shown in Fig. 1. The pressure-body 2 may not only be adjustable by means of screw-threads or in other manner in the frame 1, but it may also be made, for example cast, in one piece with the frame 1, which in both cases would have the advantage that such a sender can be made, assembled and adjusted in the works ready for operation on the ship.

In the claims the word "diaphragm" is to be understood as referring to any structure or material capable of setting up in connection with the other elements of the claims vibrations operative for this purpose.

What I claim as my invention and desire to secure by Letters Patent is:

1. In a device for transmitting sound-waves, the combination of a housing forming a chamber therein and provided with an orifice, a vibrating diaphragm closing one side of said chamber, means connected to said diaphragm for normally closing said orifice, means for forcing a fluid through said orifice into said chamber, and means for permitting the fluid to exhaust from said chamber.

2. In a device for transmitting sound-waves, the combination of a frame, a pressure body adjustably mounted in said frame, and having an aperture, a mouth-piece adjustably mounted in said aperture, a diaphragm attached to said frame and forming a chamber with said pressure body and said frame, means connected with said pressure body for forcing fluid through said aperture and mouthpiece into said chamber, a closure in said chamber attached to said diaphragm and normally closing said mouth-piece, and means for permitting the fluid to exhaust from said opening.

3. In a device for transmitting sound-waves, the combination of a frame having an exhaust opening therein and internal screw-threads at one end and a diaphragm attached thereto at the other, a pressure body having external screw threads and screwed into the screw threaded end of the frame and having a central aperture having an enlargement at its inner end, a mouth-piece adjustably screwed into said enlargement, a closure at

5 tached to said diaphragm at one end and normally fitting in and closing said mouth-piece, and means attached to said pressure body for forcing a fluid through said aperture and said mouth-piece and into the chamber formed by said diaphragm, said frame and said pressure body.

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

ROBERT NIRENBERG.

Witnesses:

JAS. R. HENY,
JOHN H. GROUT.