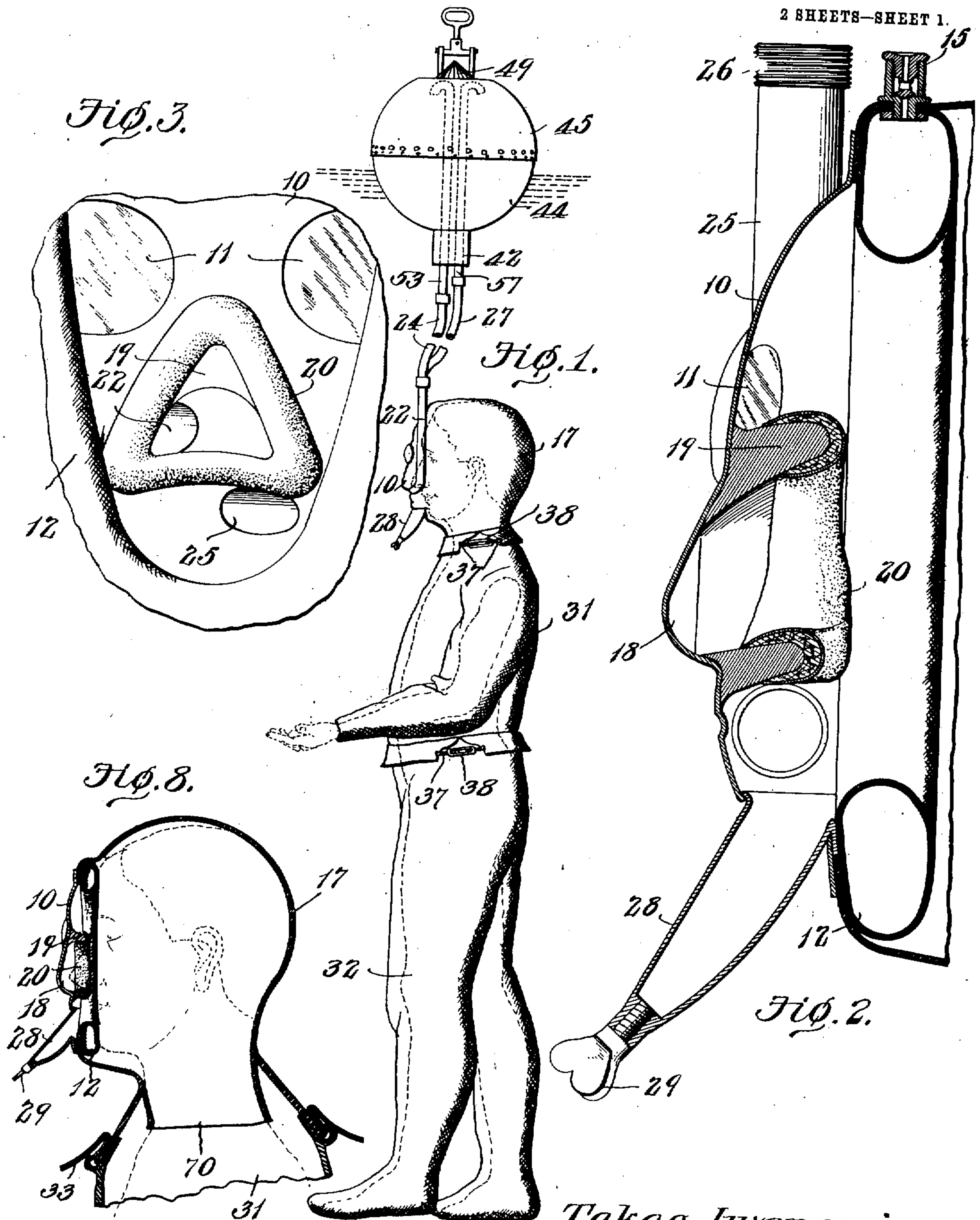


No. 835,950.

PATENTED NOV. 13, 1906.

T. IWANAMI.  
DIVING APPARATUS.  
APPLICATION FILED MAR. 26, 1906.

2 SHEETS—SHEET 1.



WITNESSES:  
*E. H. Stewart*  
*Jno. C. Parker*

Takao Iwanami,  
INVENTOR  
By *Chas. H. Deo*  
ATTORNEYS

No. 835,950.

PATENTED NOV. 13, 1906.

T. IWANAMI.  
DIVING APPARATUS.  
APPLICATION FILED MAR. 26, 1906.

2 SHEETS—SHEET 2.

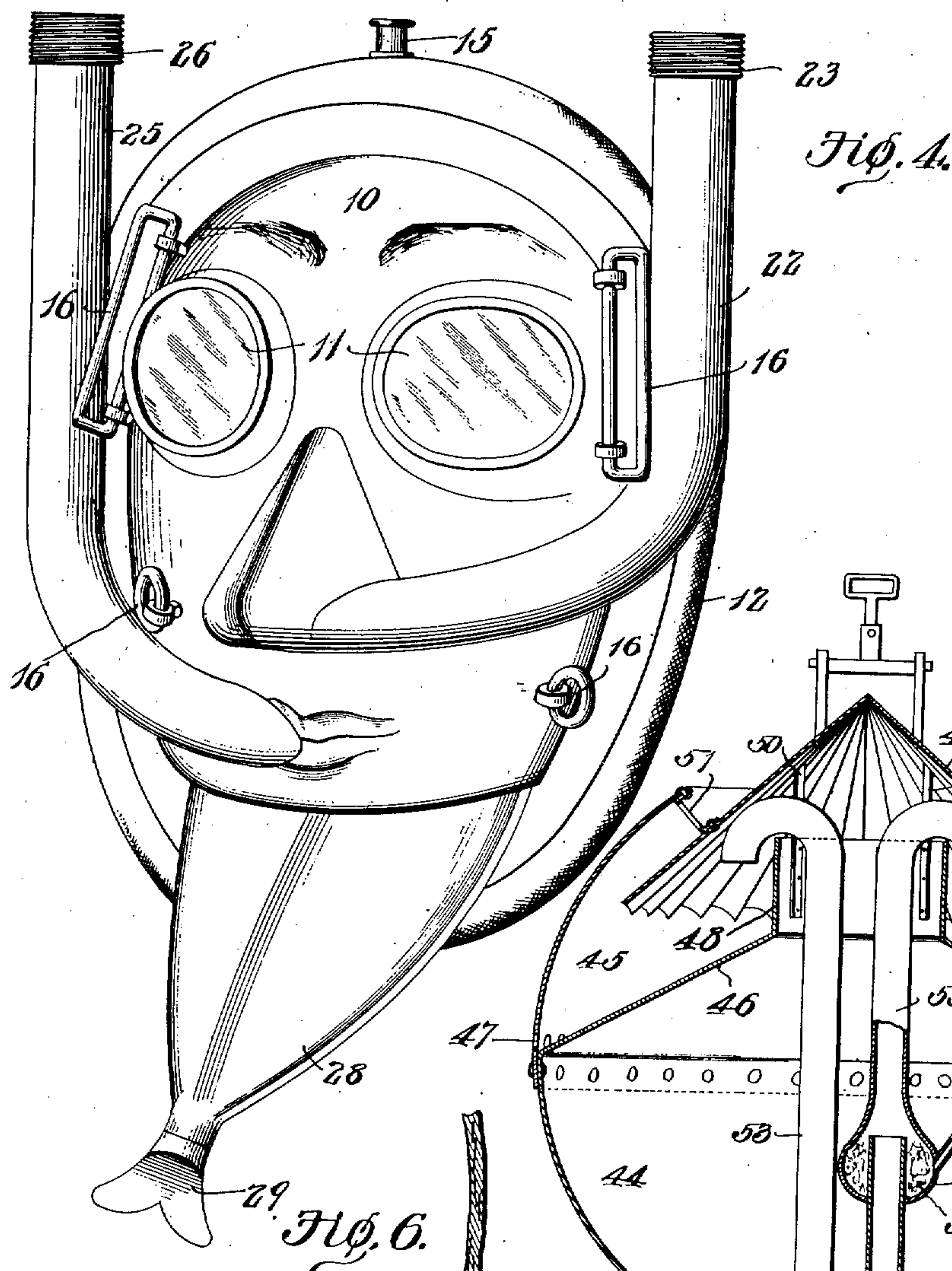


Fig. 4.

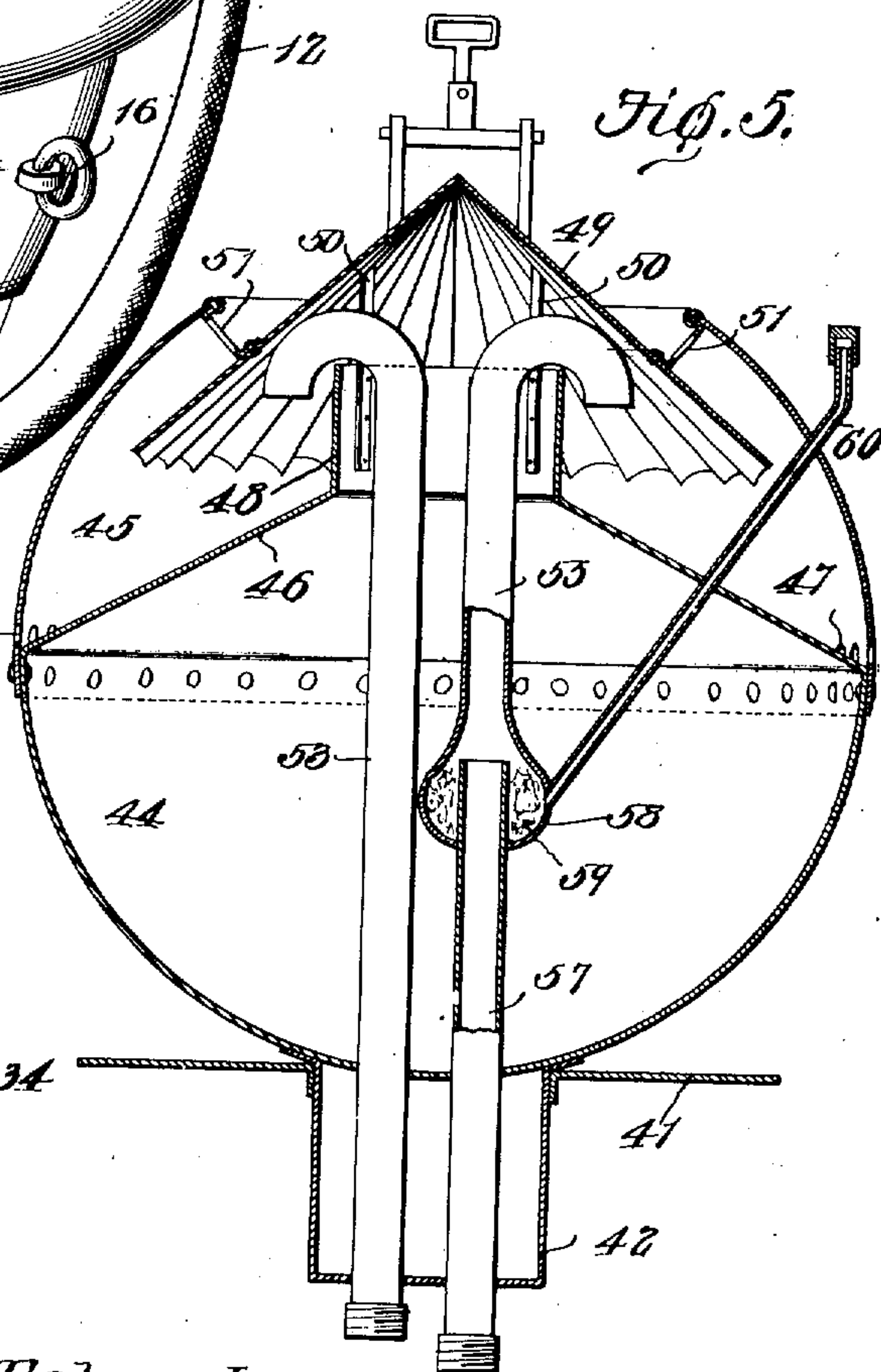


Fig. 5.

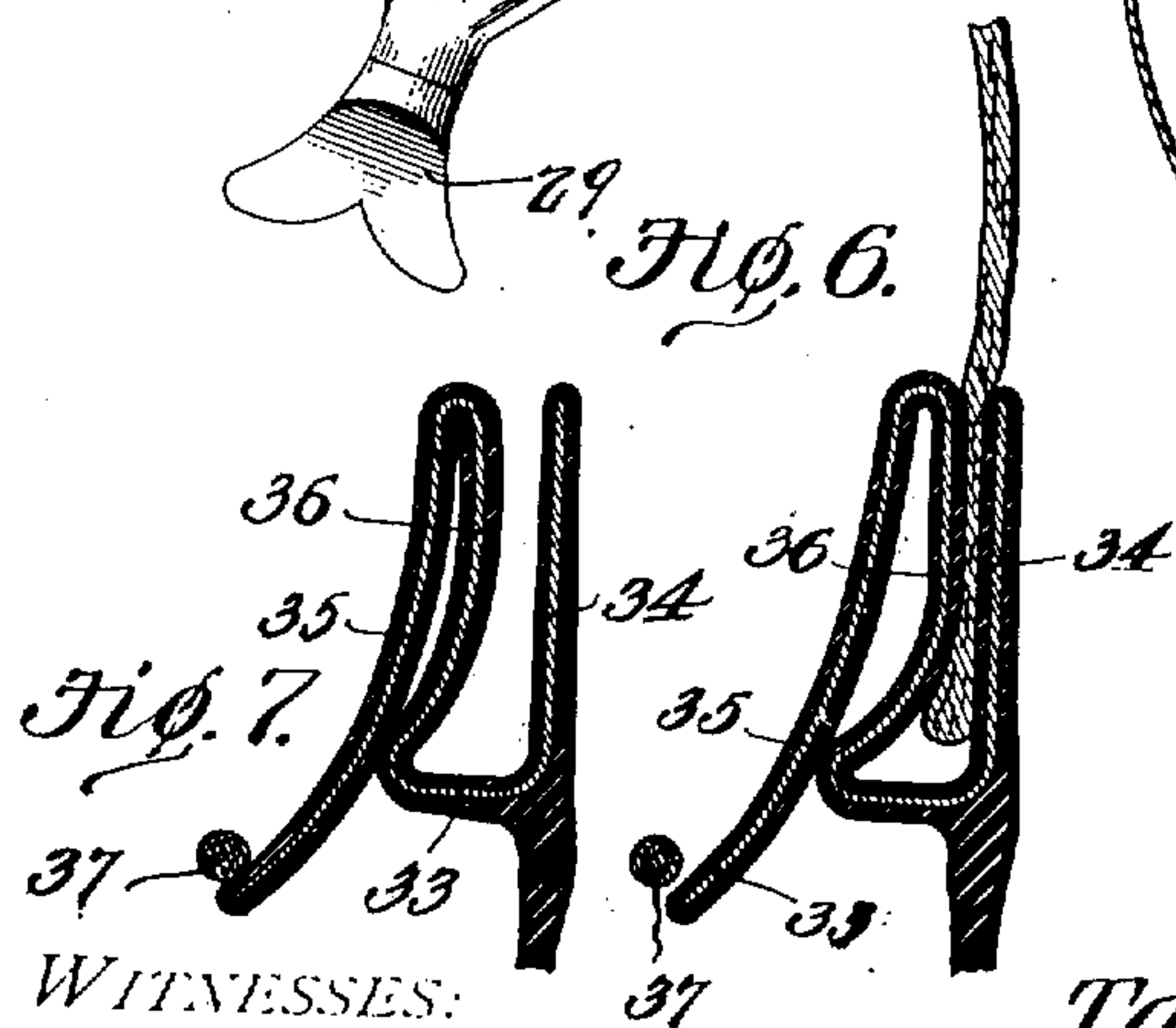


Fig. 6.

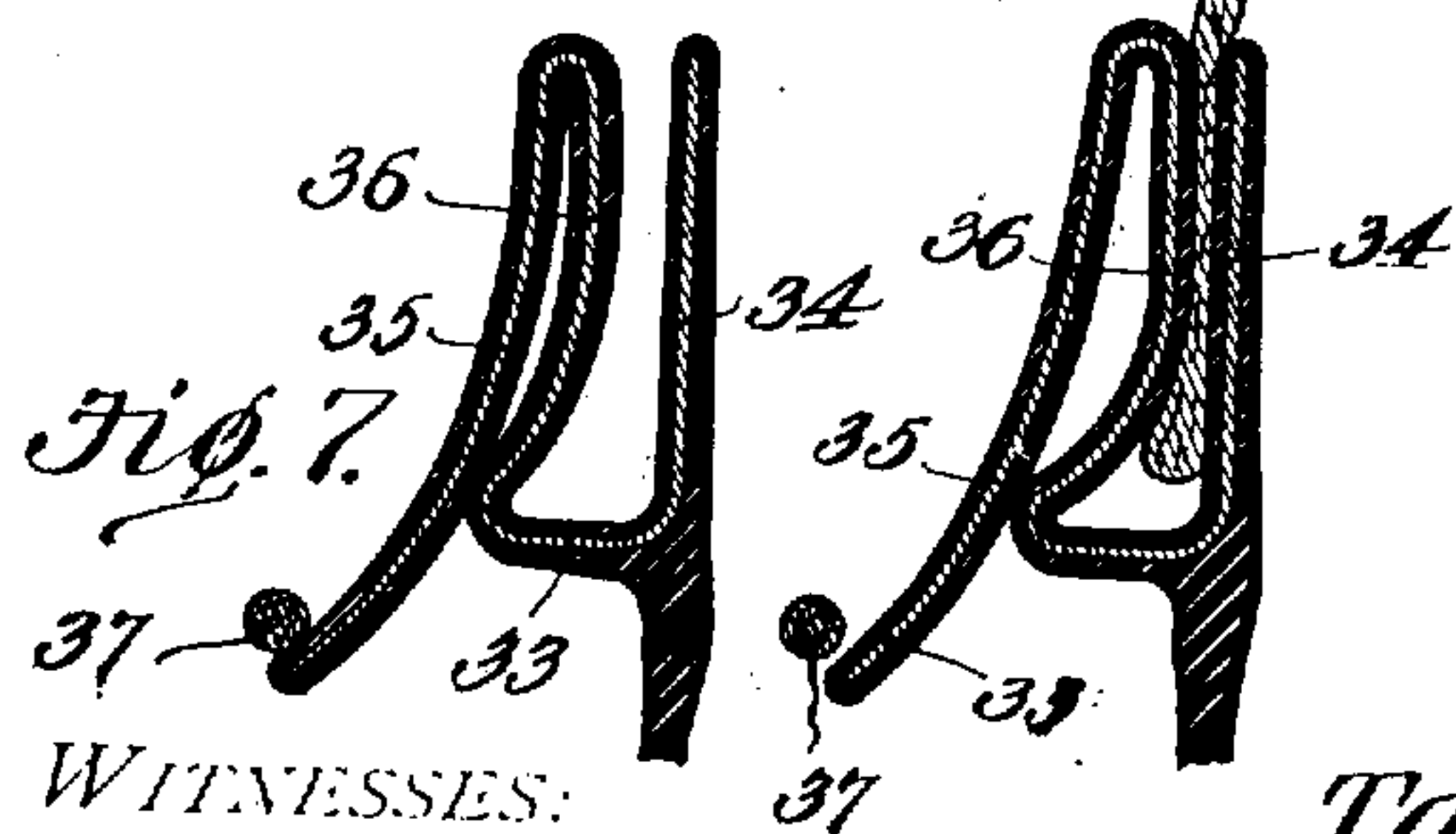


Fig. 7.

WITNESSES:

*E. H. Stewart*  
*John C. Parker*

Takao Iwanami, INVENTOR

By *Chas. H. Steele*  
ATTORNEYS



# UNITED STATES PATENT OFFICE.

TAKAO IWANAMI, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR  
OF ONE-HALF TO EDGAR M. GREENE, OF WASHINGTON, DISTRICT OF  
COLUMBIA.

## DIVING APPARATUS.

No. 835,950.

Specification of Letters Patent.

Patented Nov. 13, 1906.

Application filed March 26, 1906. Serial No. 308,164.

*To all whom it may concern:*

Be it known that I, TAKAO IWANAMI, a subject of the Emperor of Japan, residing at Washington, District of Columbia, have in-  
5 vented a new and useful Diving Apparatus, of which the following is a specification.

This invention relates to diving apparatus, and has for its principal object to provide a light and servicable apparatus adapted more  
10 especially for use in shallow water, the apparatus being of such nature as to render the diver wholly independent of any mechanical apparatus for supplying air.

A further object of the invention is to provide a mask or helmet of improved construction in which an air-inlet tube is so connected  
15 as to supply air to the nostrils, while the air expelled from the lungs is directed through the mouth to a discharge-tube.

A still further object of the invention is to provide an improved mask or helmet which may be readily applied to the face alone, if  
20 desired, and which will act to exclude water, and will effectually separate the inlet and discharge tubes.

A still further object of the invention is to provide a mask having a pneumatic cushioning-ring at the edge of the mask for the purpose of excluding fluid and permitting the  
25 application of the mask to persons of different facial contour.

A still further object of the invention is to improve and simplify the construction of the diver's suit by providing garment connections which may be readily applied or de-  
35 tached and which will operate when in position to form perfectly water-tight connections between the various garments.

A still further object of the invention is to provide a novel form of air supply and exhausting float designed to rest on the surface  
40 of the water, the float being so constructed as to prevent the entrance of water to either the inlet or discharge tubes in case the water is rough or if the float be accidentally submerged.

A still further object of the invention is to provide a float which is freely open for the passage of air and in which all of the water  
50 that may enter will be drained off and prevented from entering the float proper or the inlet or exhaust tubes.

A still further object of the invention is to

provide improved means for insuring the discharge of vitiated air from the exhaust-tube  
55 without the aid of pumping or other mechanism which would require the work of an assistant.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts hereinafter fully described, illustrated in the  
60 accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size, and minor details of the  
65 structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings, Figure 1 is an elevation showing a diver's suit and the air-supply and exhaust-float constructed and arranged in accordance with the invention.  
70 Fig. 2 is a vertical sectional view of the mask or helmet. Fig. 3 is a view looking at the inner face of the mask, showing more particularly the pads which surround the nose and separate the inlet and outlet ports of the mask. Fig. 4 is a face view of the mask.  
75 Fig. 5 is a sectional view, on an enlarged scale, of the float. Fig. 6 is a detail sectional view, on an enlarged scale, of a portion of one of the garment connections, showing the same in operating position. Fig. 7 is a similar view  
80 showing the garment-clamping device open for the release or reception of the edge of a garment. Fig. 8 is a sectional view of the mask or helmet, showing the neckband, which is intended to fit tightly around the  
85 neck and exclude water where the mask or helmet is used without the remaining portion of the diving-suit.

Similar numerals of reference are employed to indicate corresponding parts throughout  
95 the several figures of the drawings.

In carrying out the invention the mask or helmet 10 is formed of metal or other suitable material and is provided with transparent panels 11 in front of the eyes. The mask  
100 is intended to fit over the face of the diver, and the edge of the mask carries a pneumatic ring 12, formed of rubber or other flexible material and provided with air-valve 15, which may be opened when the air-tube is to  
105 be inflated. This pneumatic tube or ring



when pressed against the face or head will act to exclude all fluid and permits the application of the mask to persons of different facial contour. The mask is provided with 5 rings or links 16 for the reception of head-straps, which may be employed to fasten the mask in place, or the pneumatic tube may be secured to a head-covering or helmet proper, 17, as shown in Fig. 1, which is designed to 10 completely inclose the head of the diver and afford protection when working in deep water or in working at low temperature. The mask is provided with a recess 18 to receive the nose of the diver, and this recess is sur- 15 rounded by a marginal flange 19, that is designed to entirely inclose the nose, the surface of the flange being provided with a flexible covering or padding 20, which may be pressed firmly against the face without dis- 20 comfort and which will serve to prevent the passage of any air from other portions of the mask to the nostrils. The recess 18 commu- nicates with an air-supply pipe 22, which preferably is formed of metal and is provided 25 with a shorter upper end 23, which may be connected to a flexible tube 24, that leads upward to the float.

The vitiated air is expelled through the mouth of the diver and passes through a dis- 30 charge or exhaust pipe 25, that is provided at its upper end with a threaded portion 26 for connection to a flexible tube 27, that leads upward to the float. The lower front por- tion of the mask is provided with a duct or 35 chamber 28 in which the moisture from the air may be collected, the lower end of the chamber having an opening that is normally closed by a threaded plug 29.

The diver's suit comprises a mask or hel- 40 met 17, a shirt or similar garment 31, and trousers 32, and the garments are preferably formed of some flexible waterproof material. At the waistband of the trousers and at the neck portion of the shirt are arranged clamps 45 for holding the shirt and helmet, respectively. These clamps are of the construc- tion best shown in Figs. 6 and 7, and each comprises a spring-metal band 33, that is in- 50 serted in the edge of the garment, said band being of approximately sigmoidal form in cross-section and comprising an inner arm 34, an outer arm 35, and a central arm 36. The lower edge of the shirt or helmet is ar- 55 ranged for insertion between the arms 35 and 36, and the arm 36 is so constructed as to clamp firmly against the inserted garment and hold the same in the manner shown in Fig. 6, the joint formed being waterproof. To open the clamping-band, the outer por- 60 tion 35 is cut away, forming a recess, from each wall of which extends a screw 37, the screws being provided with right and left hand threads, respectively, and being con- nected by a turnbuckle 38 or like member, so

that the clamping-band may be opened and 65 the edge of the adjacent garment inserted or withdrawn.

The float is in the form of an approxi- 70 mately globular vessel, preferably construct- ed of sheet metal and having a circular keel- piece 41, which will act to steady the float in the water, and depending from the float and 75 keel-piece is a cylindrical chamber 42, which tends to lower the center of gravity. The float proper is divided into upper and lower 75 sections 44 and 45, that are riveted or other- wise secured to each other, the top of the sec- tion 45 being open to permit the free passage of air. The top of the section 44 is bent in- 80 ward to form a frusto-conical partition 46, which acts as a watershed to direct any wa- ter which may enter at the open top of the float outward through drainage-openings 47, 85 the latter being disposed some distance above the water-line of the float. The inner upper end of the partition 46 is turned upward to 85 form an annular flange 48, over which ex- tends a fluted conical deflector 49, that is supported by hooks 50, extending from the flange 48 and outer hanger-strips 51, which 90 depend from the edge of the section 45 of the float.

The air-inlet tube 53, which is formed of 95 metal within the body of the float and is pro- vided with a threaded lower end for connec- tion with the flexible tubes 34, is provided with a curved upper end which extends over the flange 48 into position beneath the de- 100 flector 49; and the upper section 55 of the ex- haust-tube is also bent over the flange 48.

The construction and arrangement of the float is such that in case of rough water and the splashing of any of the water over the 105 edge of the section 45 such water will be di- rected by the partition 46 through the dis- charge-openings 47. Should the float be ac- cidentally submerged, the lower edge of the deflector 49 will coact with the flange 48 to 110 form a sealing-trap that will prevent the en- trance of water to the body of the float or to the air-tubes, and when the float emerges the water will flow off through the drainage- 115 openings 47.

The outer end of the flexible discharge- 120 tube 27 is connected to the lower threaded end of a discharge-tube section 57, that ex- tends upward into a casing 58, the latter forming the lower enlarged end of the section 55 of the exhaust-tube. This casing 58 is 125 arranged to contain a sponge or other ab- sorbent 59, that is disposed well below the upper end of the discharge-tube 57, and this absorbent is saturated with some volatile liquid, such as ether, which by evaporation will induce the flow of air upward through 130 the discharge-tube, so the vitiated air will be withdrawn from the mask and will not be re- tained to the injury of the diver.



The casing 58 is in communication with a filling-tube 60, through which the volatile liquid may be introduced.

The mask or helmet is so constructed as to permit its use without the employment of the remaining portion of the diving-suit, and in Fig. 8 there is shown a depending neck-piece 70, formed of flexible material and arranged to fit tightly around the neck for the purpose of excluding water.

The diving apparatus described is of especial value in comparatively shallow water, although it may be used in water of any depth, being of sufficient strength to resist the pressure. The diver is rendered wholly independent of an assistant and may cover large areas without the attendant air-pump and boat which must be employed in connection with an ordinary diving-suit.

I claim—

1. A diver's mask or helmet having nose and mouth recesses, a padded partition separating said recesses from each other, there being an air-inlet port leading to the nose-recess and an air-outlet port leading from the mouth-recess, and a receiving duct or chamber extending downward from the mouth-recess at a point below the outlet-port for catching the moisture from exhaled air.

2. A diver's mask or helmet having a moisture-receiving chamber at a point below the air-discharge connection.

3. A diver's mask or helmet having a moisture-receiving cup at its lower front portion, and a removable drain-plug for closing the bottom of said cup.

4. In diving apparatus, an air-supply float comprising an approximately globular casing having an open top, an inclined partition disposed within the casing, the latter having water-drainage openings at the bottom of the partition, a deflector extending over the upper open top of the partition, and air-tubes terminating under said deflector.

5. In diving apparatus, an air-supply float having an open top and provided with water-drainage openings at a point above the water-line, an inclined partition for directing the water through such openings, the upper portion of the partition being extended to form a vertical flange, a conical deflector extending over said flange, and disposed within the open top of the casing, and air-tubes extending over the flange.

6. In diving apparatus, an air-supply float having an open top, air-tubes extending through the float and terminating below such open top, and a deflector extending over the tops of the tubes.

7. In diving apparatus, an air-supply

float, air-tubes extending therethrough, and means for producing within the exhaust-tube an upcurrent of fluid in addition to the up-flowing current of vitiated air.

8. In apparatus of the class described, a tube for the discharge of exhaled air, and a chamber in communication with the tube and arranged to contain a body of material which by evaporation will induce an updraft in said tube.

9. In apparatus of the class described, an exhaust-tube for exhaled air, said tube being formed in sections that communicate with each other, the lower end of one of said sections being enlarged to form an absorbent-receiving chamber, and an absorbent arranged within the chamber and arranged to receive a volatile liquid.

10. In apparatus of the class described, a tube for the passage of exhaled air, and a volatile-liquid-containing chamber in communication therewith.

11. In diving apparatus, a garment-connecting means including a continuous contractile ring arranged at the edge of one garment, and adapted to engage with and clamp with the edge of another garment.

12. In diving apparatus, a garment-connecting means including a continuous ring bent to approximately sigmoidal form in cross-section, two of the walls of such ring or band forming a garment-engaging clamp.

13. In diving apparatus, a garment-connecting means including a continuous band or ring of approximately sigmoidal form in cross-section, two of the walls of the ring or band forming a clamp, and means for contracting a portion of the outer wall to thereby separate the central and inner walls from each other.

14. In diving apparatus, garment-connecting means including a continuous ring or band of approximately sigmoidal form in cross-section, the two inner walls of the ring or band forming a garment-engaging clamp, and a portion of the outer wall of said band being recessed, right and left hand screws extending from the walls of the recess, and a right and left hand nut or turnbuckle connecting the screws and serving as a means for contracting the outer wall of the band to thereby separate the central and inner walls from each other.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

TAKAO IWANAMI.

Witnesses:

E. HUME TALBERT,  
E. D. MAXWELL.