No. 768,567. PATENTED AUG. 23, 1904.

A. J. MUNDY.

SUBMARINE SIGNALING.

APPLICATION FILED APR. 23, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

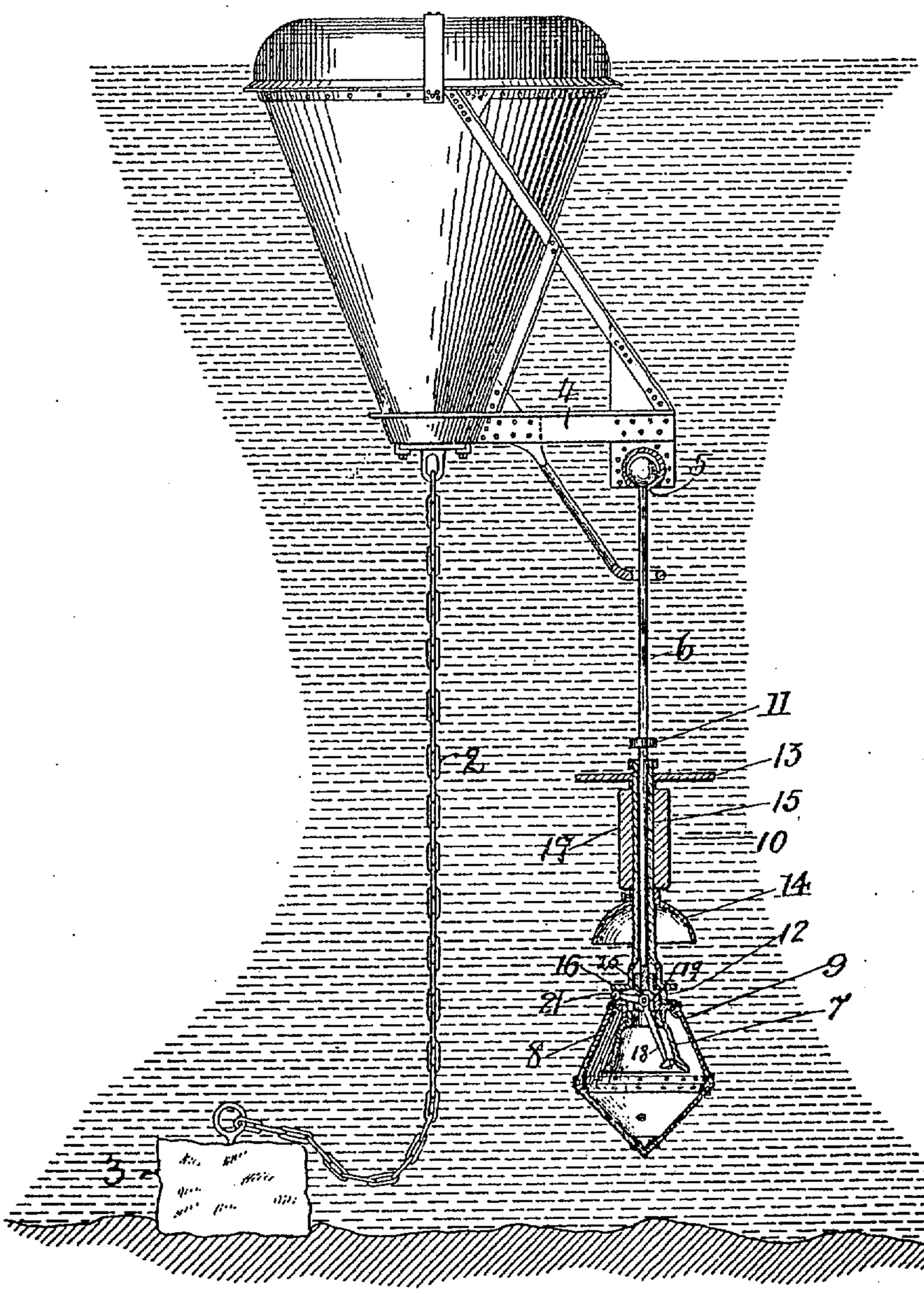

Fig. 1.

WITNESSES.

J. M. Dolan.

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Arthur J. Mundy.

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NO MODEL. 3 SHEETS—SHEET 2.

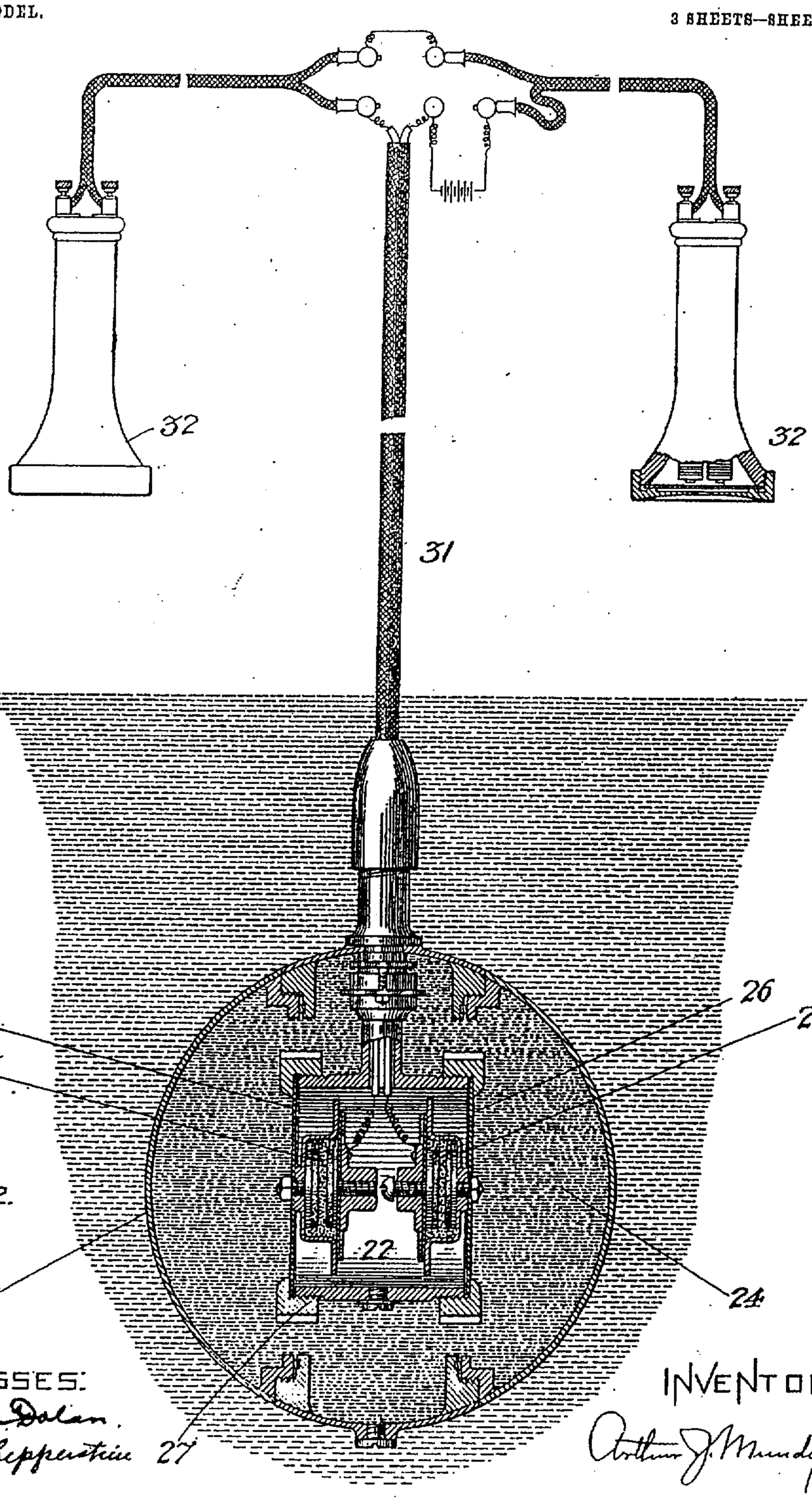

Fig. 2.

WITNESSES:

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INVENTOR:

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NO MODEL. 3 SHEETS—SHEET 3.

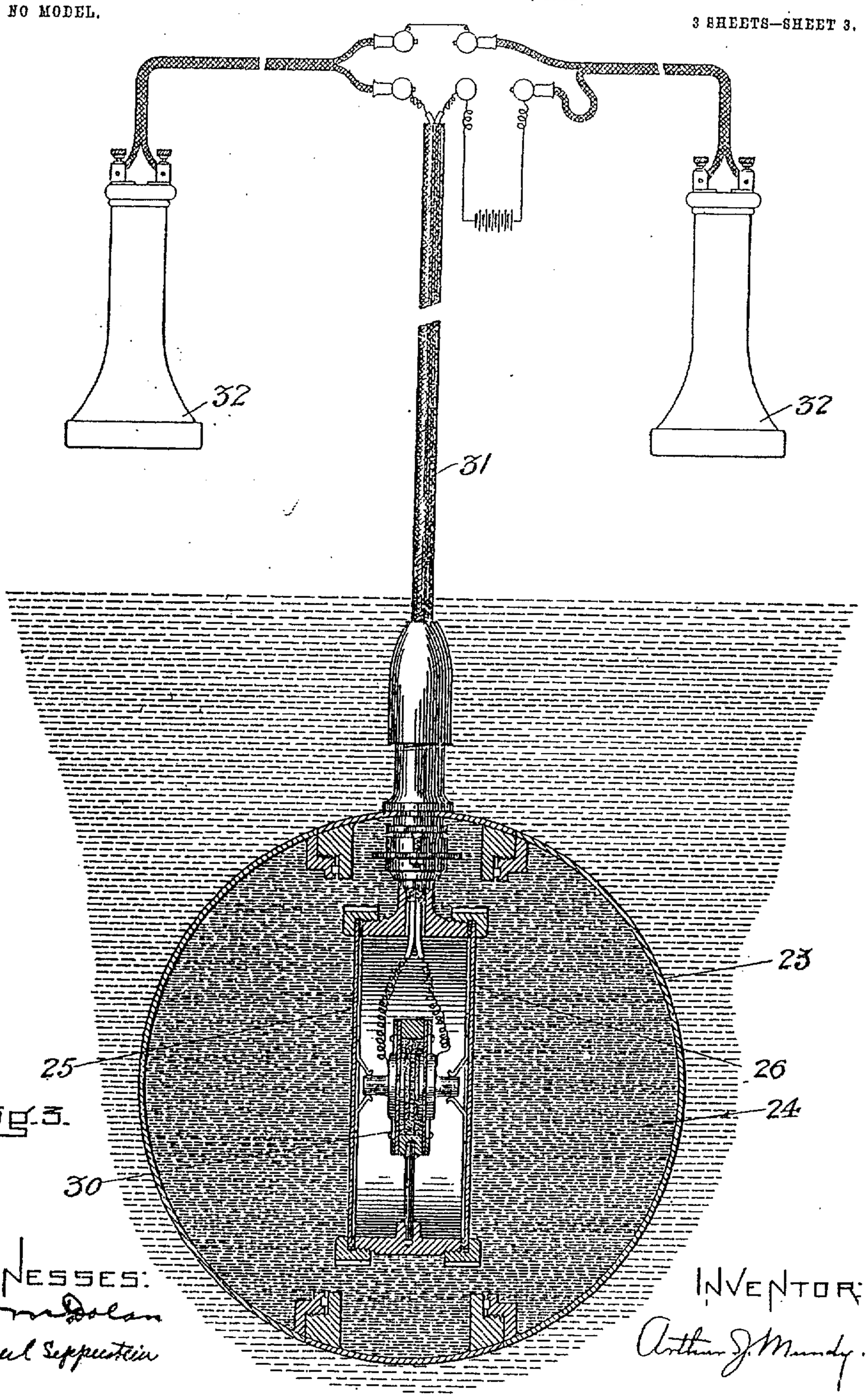

FIG. 3.

WITNESSES:

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Paul Seppenstein

INVENTOR:

Arthur J. Mundy.

No. 768,567. Patented August 23, 1904.

UNITED STATES PATENT OFFICE.

ARTHUR J. MUNDY, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO SUBMARINE SIGNAL COMPANY, OF WATERVILLE, MAINE, A CORPORATION OF MAINE.

SUBMARINE SIGNALING.

SPECIFICATION forming part of Letters Patent No. 768,567, dated August 23, 1904.

Application filed April 23, 1902. Serial No. 104,293. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR J. MUNDY, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Submarine Signaling, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

My invention relates to a method of submarine signaling in which the energy of the mechanical or wave motion of the conducting medium itself is transformed at points within itself into energy in the form of sound-waves, which waves are thereupon conducted by said medium to other points within it and are there gathered and delivered to actuate the diaphragm of a receiving instrument. The energy arriving at the receiving-station in the form of sound-waves is preferably relayed by means of an electric transmitter to an electric receiver, but may of course be at once conveyed by any suitable sound-conductor directly to the operator's receiving instrument without relaying.

The automatic production of sound in water must depend upon a relative movement of the sound-producing body and the mechanism for sounding the same. A bell is perhaps the simplest and best exemplification of such a sound-producing device. Heretofore for one reason or other the production of sound automatically has failed of accomplishment. In fact, until recently no device of the character just referred to adapted for the automatic production of sound had been successfully operated in any way whatever, whether manually, automatically, or otherwise, so as to produce sounds of sufficient intensity and clearness of note to be of practical and commercial value for signaling purposes. This condition existed for years, although eminent engineers recognized the probable value and the possibilities of such a device and vainly endeavored to produce it. Their efforts and experiments were acknowledged failures.

Of course I am aware of the existence of a number of patents, both United States and foreign, alleging to disclose successful signaling systems of this type. The inoperativeness of such alleged systems appears in most instances on the face of the patents in the insufficiency of the disclosure, and in other instances actual experimentation under the most favorable conditions has demonstrated their inoperativeness. I am also aware of the existence of patents relating to other types of signaling apparatus—such, for instance, as that in which sounds are produced in the water by means of steam injected therein. An inventor of a device of such type states that his invention was evolved only after experimentation had convinced himself of the utter inoperativeness of a bell for submarine purposes. I have found, on the contrary, that a bell is probably the most efficient and desirable of all sound-producing devices, provided the same is properly constructed and operated, and I have claimed such a device in patents heretofore granted to me.

My present invention goes a step farther than the mere successful operation of various types of submarine sound-producing devices. It relates to the successful automatic operation of such devices. Hitherto it has not been found that a bell or other device submerged in the water could be operated by virtue of the motion of the water alone. The difficulties in the way of the automatic operation of a submerged bell, for instance, are many. In the first place the natural movement produced by a wave upon a device suspended or floating in the water is almost entirely up and down, and it is not a lateral or rocking motion, such as would cause the freely-suspended clapper of an ordinary bell to strike the same. Again, whatever rocking motion the body of such a bell might receive by virtue of its suspension is resisted by the mass of the water itself. Any impulse of the water tending to rock the bell-body tends also to rock the clapper within it, and the slight differential movement of the two, due to gravity or relative inertia, produces but a faint contact, if any at all. Even this movement, however, is opposed by the

presence of the water between the bell and clapper. Provided, however, that the action of the clapper or the bell is not impeded by the water between the two, the contact of the water on the outside of the bell acts to so dampen any vibration of the same that all blows of the clapper must be clear and powerful to produce any effect. The mere falling of the hammer against bell by reason of its gravity is hardly sufficient to sound the bell, even if the fall is unimpeded.

For the above reasons and for various other causes, some inherent to the particular device under experimentation, bells and other devices have not previous to my invention been successfully automatically operated. So far as I am aware, I am the first to operate a bell by the natural power of the medium in which the resulting sound is transmitted. I accomplish this result by means of the apparatus hereinafter described, in which the parts are so constructed and interconnected that the up-and-down or wave motion of the water imparts to the sounding mechanism sufficient energy to cause the latter to violently throw the striker against the bell in spite of intervening water and other adverse influences such as mentioned. The sound-waves thus produced are conducted by the water to my receiving apparatus, by means of which apparatus the sound is collected and forwarded to the operator.

Having set forth the object and nature of my invention I will describe apparatus for effecting the same, reference being had to the accompanying drawings, in which—

Figure 1 represents in elevation my improved means for automatically producing sound. Fig. 2 represents in cross-sectional elevation a form of my improved sound receiving or collecting apparatus. Fig. 3 represents a modified form of sound-receiving apparatus, also in cross-sectional elevation.

Referring to Fig. 1, 1 is a metal buoy of the usual type and which is anchored in any desired place by an anchoring-chain 2 and anchor 3. It supports a bracket 4, from which is suspended, by means of a ball or jointed connection 5, a rod 6. This rod carries at its lower end a bell 7, which may be inclosed in a protecting-case 8, attached to the flanged collar 9, secured to the neck of the bell. This case is preferably of galvanized iron and incloses the bell upon its sides and bottom, but does not come in contact with them, the purpose being to prevent the bell and its hammer from being fouled by seaweed or other things. It is not intended to form a water-tight compartment, however, and it is provided with holes by means of which the water may enter and fill it, and thus be brought into contact with the bell. The rod carries a sea-anchor 10, which is attached thereto in a manner to permit of its movement and that of the bell with relation thereto, the movement being restricted in one direction by a collar 11, attached to the rod, and in the other direction by the sleeve 12, by which the bell is secured to the rod.

The sea-anchor may be of any usual type, and I have represented one provided with the wide circular flange 13 and with the bell-shaped flange 14. They are both attached to a long sleeve 15, through which the rod extends and which sleeve has a wide flange 16 at its lower end. The sea-anchor also carries a buoy 17 below the flange 11 and for the purpose of sustaining its weight. The bell has a hammer 18, which is attached to the collar 19 by a rock-shaft 20, having an arm 21, which projects outside the bell to a position beneath the flange 16.

Upon the movement of the buoy 1 the rod suspending the bell is moved and caused to rise or fall with respect to the sea-anchor, and when it rises it causes the arm 21 of the bell-hammer rock-lever to come into contact with the sleeve-flange 16, and thus cause the hammer to be swung against the bell and deliver to it a stroke which produces sound-vibrations, and which sound-vibrations are delivered to the surrounding water and transmitted by it. As the buoy 1 is swung or moved by the movement of the water in which it is these movements continue to cause variations in position between the sea-anchor and the bell, whereby the bell is caused to be rung as the two approach each other.

It will be understood that normally the sea-anchor is sustained by its buoy so that it rests, if at all, but little upon the arm that actuates the hammer of the bell. It is not, however, readily movable in the water in either direction, but permits the buoy to move the bell with respect to it, so that the movement of the bell by the buoy causes the bell-hammer arm to be brought into contact with the depending part of the sea-anchor, and thereby operate the bell-hammer to strike the bell. Every movement of the main buoy is thus communicated to the bell and bell-hammer. While, however, the sea-anchor thus acts it may be changed in position by the main buoy gradually as it is dragged by it; but this does not affect or change its operative relation to the bell and bell-hammer as above expressed.

The receiving apparatus (shown in Figs. 2 and 3) consists of a duplicate receiving-transmitter 22, suitably mounted within a casing 23, containing a sound-conducting medium 24. The transmitter consists of diaphragms 25 and 26, closing the ends of a cylindrical chamber 27 and maintaining the same water-tight and coöperating in the case of Fig. 2 with two resistance-varying means 28 and 29 and in the case of Fig. 3 with a single resistance-varying means 30, said resistance-varying means being connected in series through the connection 31 with the operator's receiver 32.

Having described the principle of my invention and apparatus for carrying the same into effect, what I claim, and desire to secure by Letters Patent, is—

1. In an improved method of submarine signaling, the transformation of the energy of the natural motion of the water into energy in the form of sound-waves of a quality for submarine signaling, and the delivery of such sound-waves to the water at a point below its surface.

2. An improved method of submarine signaling consisting in transforming the energy of the natural motion of the water into energy in the form of sound-waves, delivering said waves to the water at a point below its surface, taking rays of such waves from the water at a distant point and transmitting the collected rays to receiving means.

3. An improved method of submarine signaling consisting in transforming the energy of the natural motion of the water into energy in the form of sound-waves, delivering said waves to the water at a point below its surface, taking rays of such waves from the water at a distant point, transforming the energy of such rays into electrical energy, and transmitting the electrical energy to receiving apparatus.

ARTHUR J. MUNDY.

Witnesses:
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J. M. DOLAN.