No. 744,336. PATENTED NOV. 17, 1903.

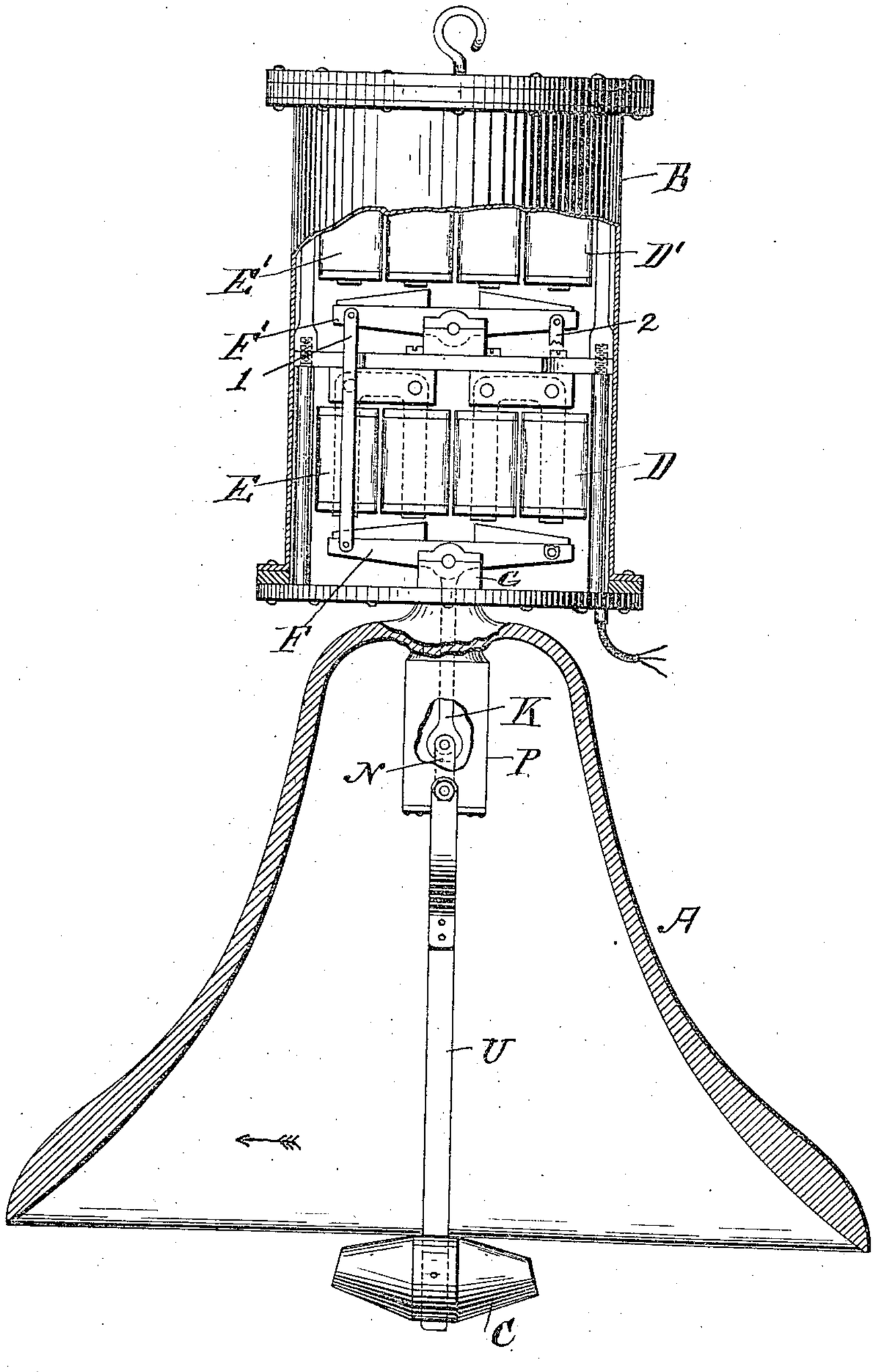
E. GRAY.

ELECTRICAL RINGING OF BELLS FOR SUBMARINE SIGNALING.

APPLICATION FILED DEC. 24, 1900.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 1.



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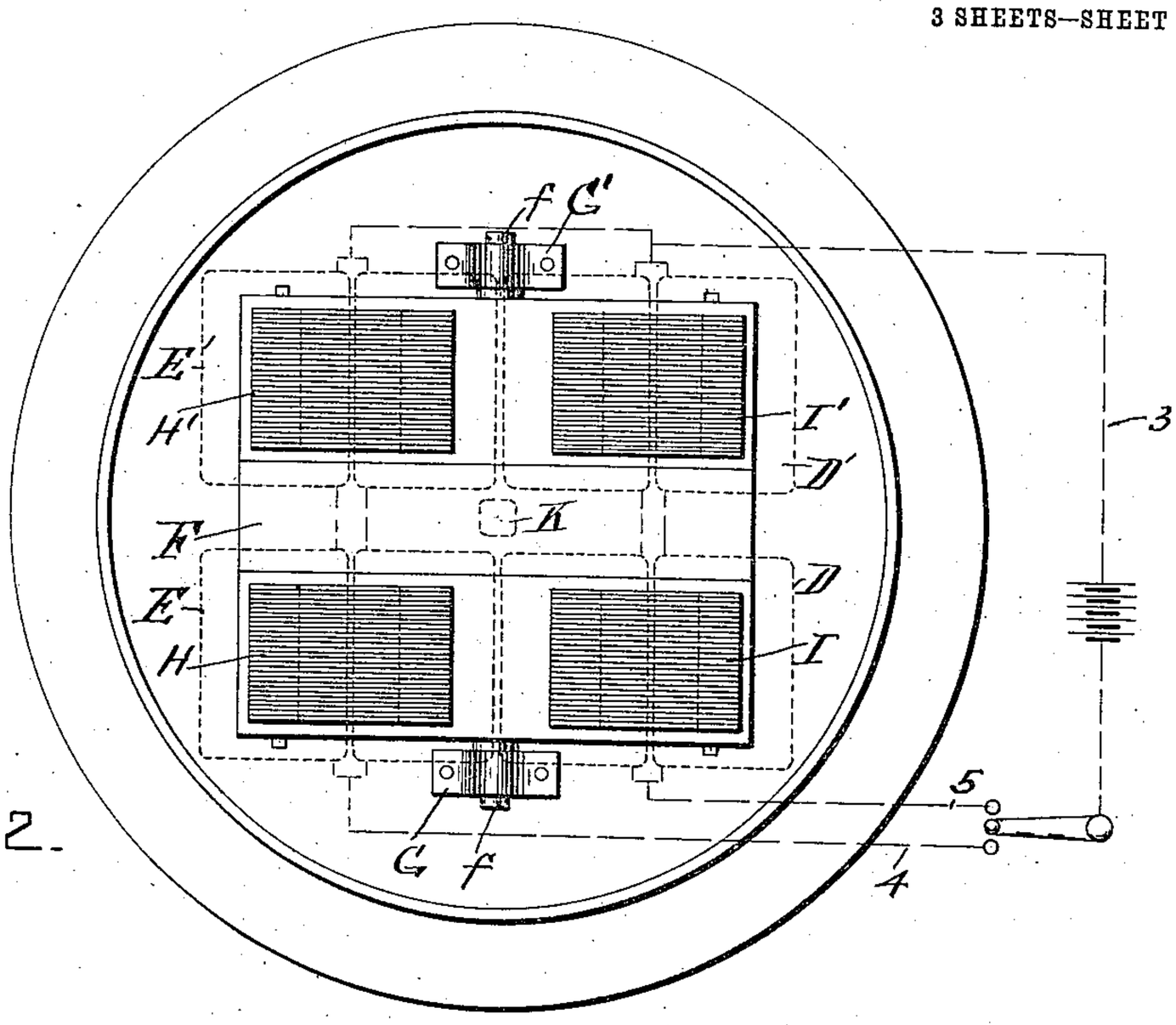

Fig. 2.

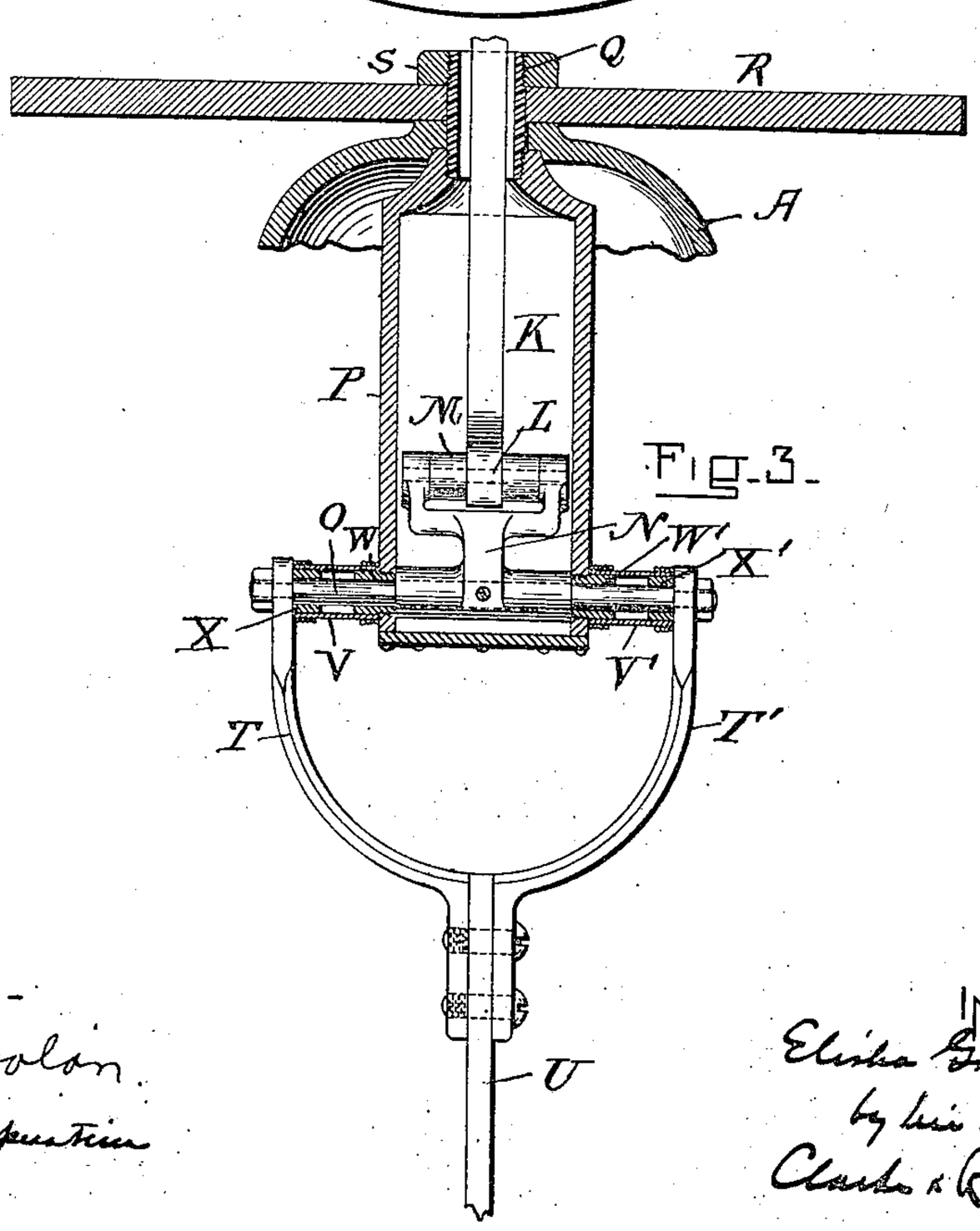

Fig. 3.

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NO MODEL. 3 SHEETS—SHEET 3.

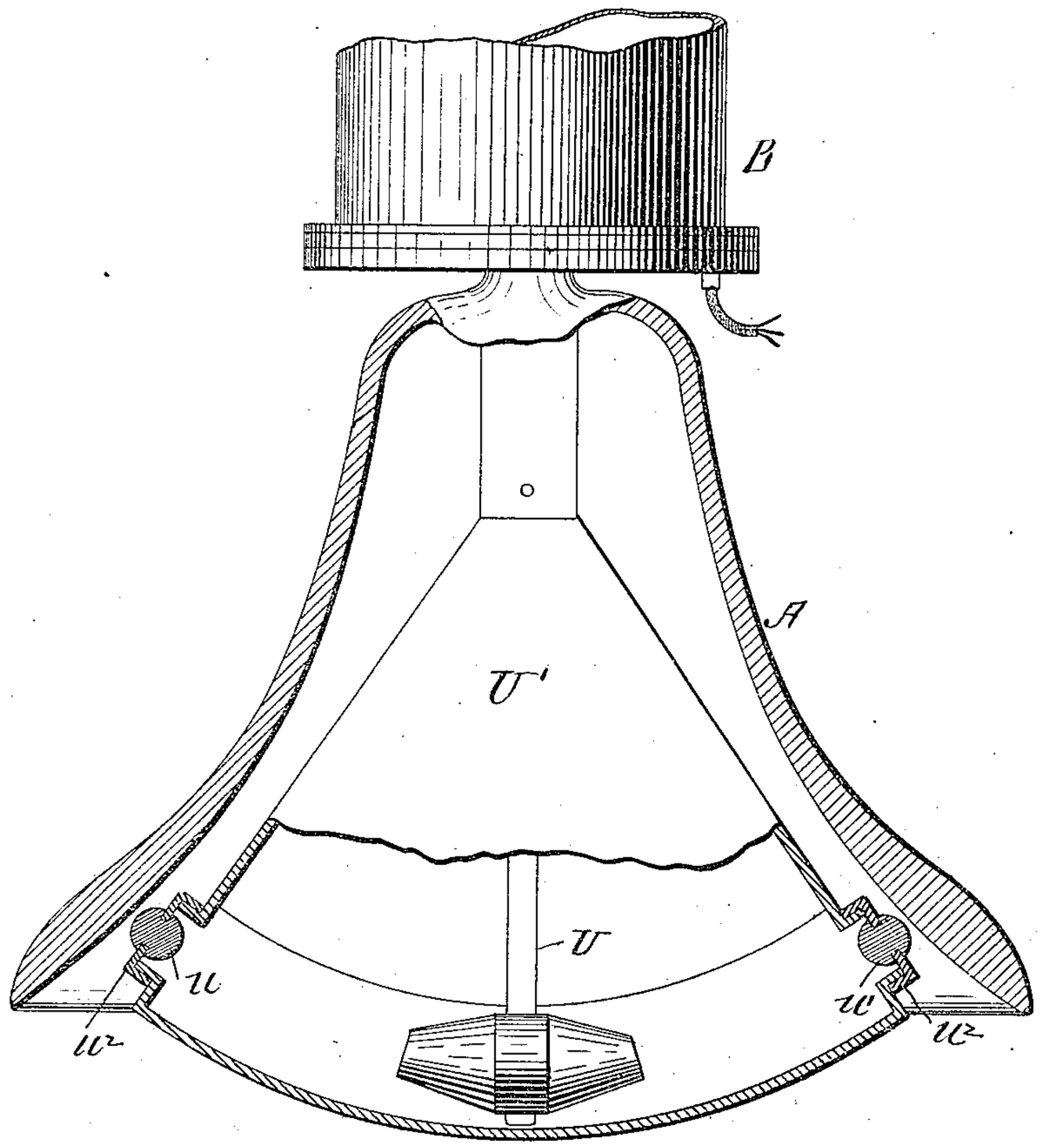

Fig. 4.

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No. 744,336. Patented November 17, 1903.

UNITED STATES PATENT OFFICE.

ELISHA GRAY, OF HIGHLAND PARK, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO SUBMARINE SIGNAL COMPANY, A CORPORATION OF MAINE.

ELECTRICAL RINGING OF BELLS FOR SUBMARINE SIGNALING.

SPECIFICATION forming part of Letters Patent No. 744,336, dated November 17, 1903.

Application filed December 24, 1900. Serial No. 40,888. (No model.)

To all whom it may concern:

Be it known that I, ELISHA GRAY, a citizen of the United States, and a resident of Highland Park, in the county of Lake and State of Illinois, have invented a new and useful Improvement in the Electrical Ringing of Bells for 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.

The invention relates to an improvement in the electrical ringing of bells for submarine signaling.

Heretofore all attempts to ring submerged bells by the direct blow of a hammer electrically actuated have been undertaken by inclosing the whole apparatus, including the bell and the hammer-actuating mechanism, in an air-tight inclosure, so that the sound or vibrations of the bell were first communicated to the air-envelop, thence to the inclosing medium, and then to the water surrounding it. This method of producing sound vibrations so deadened them that very little impulse, if any, gets into the water, and the device is practically of little or no use for submarine signaling. By my improvement the bell and bell-hammer are divested of covering of this character and are submerged in the water and in direct contact upon all sides with it, while the electrical operating mechanism for actuating the hammer is entirely contained within an air-tight chamber, which may also be submerged with the bell.

I will now describe my invention in detail in connection with the drawings, wherein—

Figure 1 is a general view of the bell and its actuating mechanism. Fig. 2 is a plan or top view of the rocker which carries the laminated armatures that are actuated by the electromagnets. Fig. 3 is a detached view of that part of the air-tight box where the inner and outer mechanism of the striking-hammer unite, also showing the manner of sealing the outer moving from the inner moving parts and the means for clamping the air-tight chamber with the hammer-uniting mechanism attached thereto to the bell. Fig. 4 is a view showing a modification to which reference is hereinafter made.

A is a bell which in Fig. 1 is represented in cross-section.

B is a circular drum with sealed top and bottom ends, forming a water and air tight chamber.

C is the bell-hammer, which is actuated by the magnets D E and D′ E′, which are mounted in the chamber of the drum.

F is a cast-iron rocker. (Shown in plan in Fig. 2.) It has trunnions *f*, mounted in the bearings G G′. Clamped within the frame of the rocker are four laminated armatures H I and H′ I′. These laminations are laid together so that their edges form the faces of the armatures that are presented to the poles of the magnets. There are four magnets, the poles of which present themselves to the armatures and which face downward over the upward faces of the armatures in the position shown in Fig. 1.

Fastened to the center of the rocker F and extending downward at right angles to it is an arm or lever K, having a forked lower end L, which engages with a roller M (see Fig. 3) on the end of a short arm N, which is fastened to a shaft O, having a bearing in the air-tight box P, located within the bell. The chamber of this inner box P communicates with the chamber of the drum B through the hole in a tube Q. The tube is threaded at both ends. The lower end is screwed firmly into the lower box, while the upper end passes upward through the crown of the bell and through the plate R, which forms the lower end of the drum B. The bell is seated inside to receive the upper end of the box P. A heavy nut S is screwed onto the upper end of the tube Q down upon the plate R to clamp the upper drum and lower box together and to at the same time clamp the bell firmly between them. The arm or lever K, which is secured to the rocker at its upper end, passes down through the hole in the tube Q into the chamber of the lower box, where its fork N straddles the roller M on the end of the short lever N on the rock-shaft O. Secured to the outer ends of the rock-shaft are two down-

ward-extending inwardly-bent arms T T'. The lower ends of these arms meet at a point directly under the center of the lower box P and are there secured to the bell-hammer arm U, which carries at its lower end the hammer C.

Instead of packing the rock-shaft O to prevent water passing into the chamber of the box P, which would cause too much friction, the following manner of packing may be used:

V V' are rubber tubes.

W W' are sleeves screwed into the sides of the box P. In these sleeves or journals the rock-shaft O turns loosely. It also passes through the lever N, which is rigidly secured to it. Sleeves X X' are now forced upon the ends of the rock-shaft and the air-tight rubber tubes V V' are slipped onto each end of the shaft and wired tightly at each end to the sleeves W W' and X X'. When the bell-hammer C moves, there will be a torsional strain put upon the rubber tubes, according to the direction in which the hammer moves. The hammer and the arm U that carries it are so shaped as to cut through the water with least resistance.

The rocker F may be used in teams—that is, one or more carrying armatures may be connected with it to be simultaneously operated by magnets in the manner herein indicated—and in Fig. 1 I have represented the use of a second rocker F' with armatures and operating-magnets supported upon trunnions within the chamber of the drum and connected with the rocker F by four connecting-rods, one of which (lettered 1) is shown as well as a portion of the other, (lettered 2.) The other two are behind the magnets. The group of magnets E E' are connected electrically and when charged act conjointly upon the armatures of both rockers, and the bell-hammer is thrown with great force against the bell in the direction of the arrow. The group of magnets D D' act similarly. If now the group E E' is deënergized and the group D D' energized, the hammer will be thrown as forcibly against the bell, but in the opposite direction. The wire 3 is common to both groups of magnets and is connected to one pole of the source of electrical power. The wire 4 is connected to the group E E', and wire 5 is connected to the group D D'. By means of a switch or commutator that may be worked either by hand or automatically the other pole of the battery or source of electrical power may be thrown from one group of magnets to the other, causing strokes of the bell in any predetermined order.

I do not confine myself in the employment of this apparatus to the use of a conventional form of bell, but may apply it to striking any sonorous substance whatever.

It will be understood that the apparatus is adapted to be submerged in water to any desired depth and at any required point, whether close to the source of electrical power or remote from it, and that the wires connecting the hammer ringing devices contained in the air-tight submerged drum with a source of electrical energy conveniently located at a distance from the bell, long or short, as the case may be, and that this provides a control of the striking of the bell from shore or other safe position under all conditions of weather. The bell itself, being in contact with the water in which it is submerged, imparts vibrations when struck by the hammer directly to the water, so that the initial vibration is communicated directly to the water without loss caused by passing through any intermediate medium of a different nature.

In Fig. 4 I have shown the hammer inclosed in a water-tight chamber contained within the bell and to which chamber there are secured metal transmitters to receive the blow of the bell-hammer and transmit its impulses to the bell, the transmitters being held resiliently close to the bell and so that the force of the hammer-blow drives them against the bell, from which they recede after delivering to the bell the blow of the hammer. U' is the water-tight case for the bell-hammer. It is suspended from the lower box P, into which it opens. It may be made of metal or any suitable material, and it is of a size to permit the oscillation of the hammer. It has in the line of oscillation, in close contact to the bell, the transmitters u u', which preferably are of metal and which are adapted to be struck by the bell-hammer. They are attached to the hammer-case U' by resilient holders u^2, preferably of rubber, and have cylindrical sections to fit upon cylindrical extensions of the case, to which they are fastened. The transmitters are held adjacent to the bell, so that when struck by the hammer they transmit its force to the surface of the bell, but are immediately returned from the surface of the bell, this having been done.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. As a means for producing in water sound-wave signals of high power for long-distance, submarine, wireless telephony, a submerged bell of large initial sound-producing capacity, a submerged hammer for powerfully striking the bell, each stroke of which is controlled, a submerged electric motor of large force to actuate the hammer in operative relation to the bell and hammer, the bell being in actual contact with the water.

2. As a means for producing in water sound-wave signals of high power for long-distance, submarine, wireless telephony, a submerged bell of large initial sound-producing capacity, a submerged hammer for powerfully striking the bell, each stroke of which is controlled, a submerged electric moter of large force to actuate the hammer in operative relation to the bell and hammer, the bell being in actual contact with the water and the motor being contained in a submerged water-tight chamber.

3. As a means for producing in water sound-

wave signals of high power for long-distance, submarine, wireless telephony, a submerged bell of large initial sound-producing capacity, in actual contact with the water, a submerged hammer for powerfully striking the bell, each stroke of which is controlled, an electric motor of large force to actuate the hammer, said motor held submerged in operative relation to the bell and the hammer, a source of electric energy and a means for controlling its connection with the motor located upon shore or at a distance from the submerged motor and bell and electric conductors connecting the said source of electric energy and means for controlling it with the submerged motor.

4. In a system of long-distance, submarine, wireless telephony, a means for producing in water sound-signals of high power comprising a submerged bell of large initial sound-producing capacity, a submerged hammer for powerfully striking the bell, each stroke of which is controlled, an electric motor of large force to actuate the hammer, said motor held submerged in operative relation to the bell and hammer, a source of electric energy and means for controlling its connection with the submerged motor, both means being on shore or at a distance from the motor.

5. In a system of long-distance, submarine, wireless telephony comprising a submerged sound-producing device and a submerged sound receiving and transmitting instrumentality, a means for producing in water sound-signals of high power comprising a submerged bell of large initial sound-producing capacity, a submerged hammer for powerfully striking the bell, each stroke of which is controlled, an electric motor of large force to actuate the hammer held submerged in operative relation to the bell and hammer, a source of electric energy and means for controlling its connection with the submerged motor, both means being on shore or at a distance from the motor.

6. The submerged means for ringing a bell consisting of a series of magnets adapted to be alternately energized, a lever having at each end an armature alternately attracted by the magnets, a rock-lever operated by the armature, a rock-shaft actuated by the rock-lever and the bell-hammer carried by the rock-shaft to be oscillated thereby and the bell.

7. The combination of a submerged water-tight case, a tandem arrangement of lever-actuating magnets contained therein and alternately actuated in groups, an armature-lever for each group coupled together and one of which is directly connected with the bell-hammer of a bell to transfer its movement thereto, the said bell-hammer and the bell.

8. The combination of a submerged water-tight case, electromagnets contained in said case, an armature-lever actuated by said magnets, and a connection contained in an air-tight extension of the case to actuate a submerged, unprotected bell-hammer and said bell-hammer making connection with the actuating means through water-tight joints, and the bell.

9. The combination of the submerged water-tight case, electric devices contained in the case for actuating a lever therein, said lever and a bell attached to the case, a water-tight chamber in the bell, a connection between it and the water-tight case through the crown of the bell, an actuating means in said water-tight chamber connected with a bell-hammer in operative relation to the bell, means connecting said bell-hammer-actuating device with the lever in the case.

10. A bell in contact with the water adapted to impart, when rung, vibrations thereto and means for ringing it, the actuating mechanism of which is contained in a submerged water-tight chamber.

11. The combination of a bell in physical contact with the water adapted to impart its vibrations, when rung, directly thereto, electrical devices for ringing the bell and a submerged water-tight case for holding said devices in submerged relation to the bell.

12. In the art of submarine wireless transmission of intelligence, a submerged transmitter comprising a bell or similar device for impelling sound-waves through the inclosing medium, and means for actuating said impelling means, said actuating means being flexible in action so as to operate the impelling means in a variety of ways.

13. In the art of submarine wireless transmission of intelligence, transmitting means consisting of a sound-producing device submerged in combination with selective impulse-receiving and actuating means for sounding said device.

14. In the art of wireless submarine transmission of intelligence, submerged transmitting means consisting of a sound-producing device in combination with means for actuating the same, and a sealed casing inclosing such actuating means and adapted to protect the same against the action of the elements during submersion.

ELISHA GRAY.

Witnesses:
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