Jan. 6, 1948. H. A. ADAMS 2,433,971

UNDER-WATER IMAGE TRANSMITTING APPARATUS

Filed Feb. 28, 1944 3 Sheets-Sheet 1

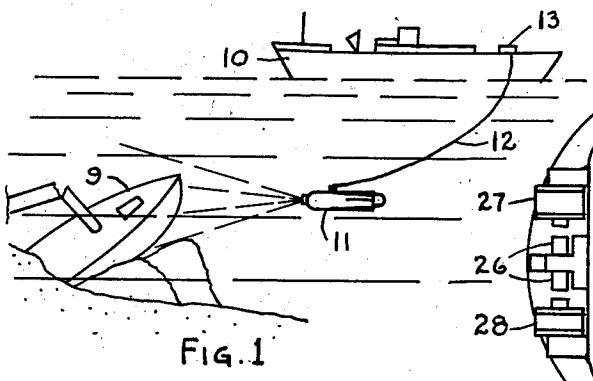

FIG. 1

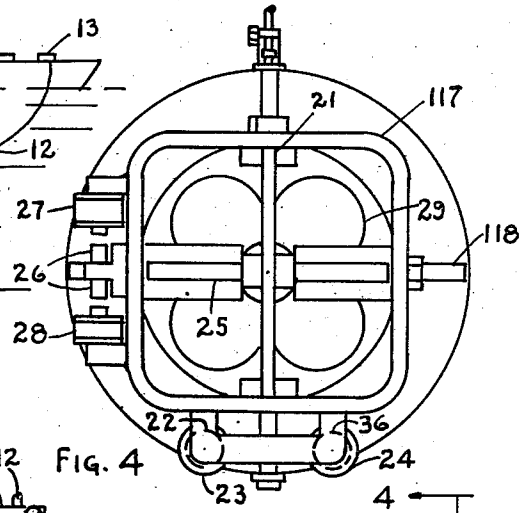

FIG. 4

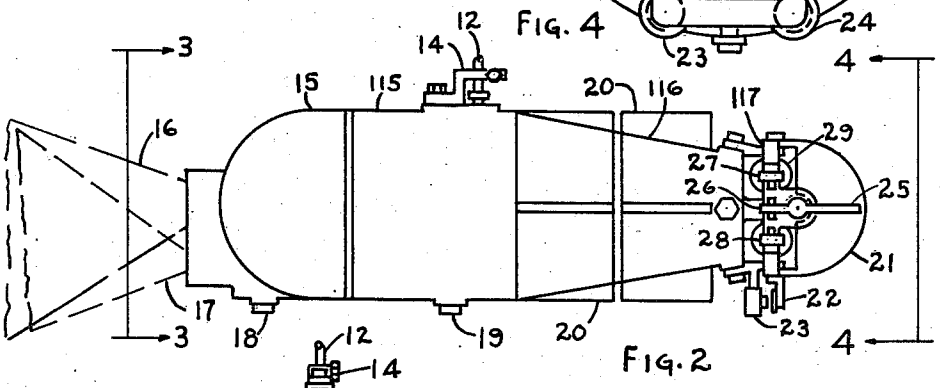

FIG. 2

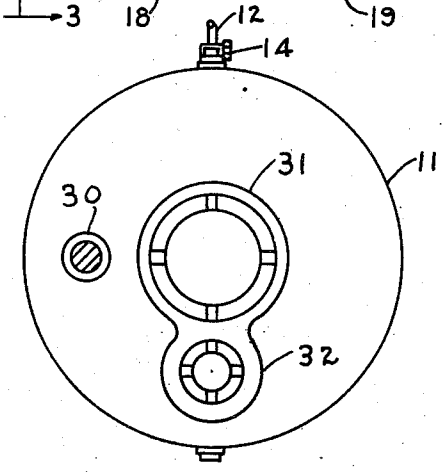

FIG. 3

INVENTOR.

Harold A. Adams

BY

ATTORNEY.

Jan. 6, 1948. H. A. ADAMS 2,433,971

UNDER-WATER IMAGE TRANSMITTING APPARATUS

Filed Feb. 28, 1944 3 Sheets-Sheet 2

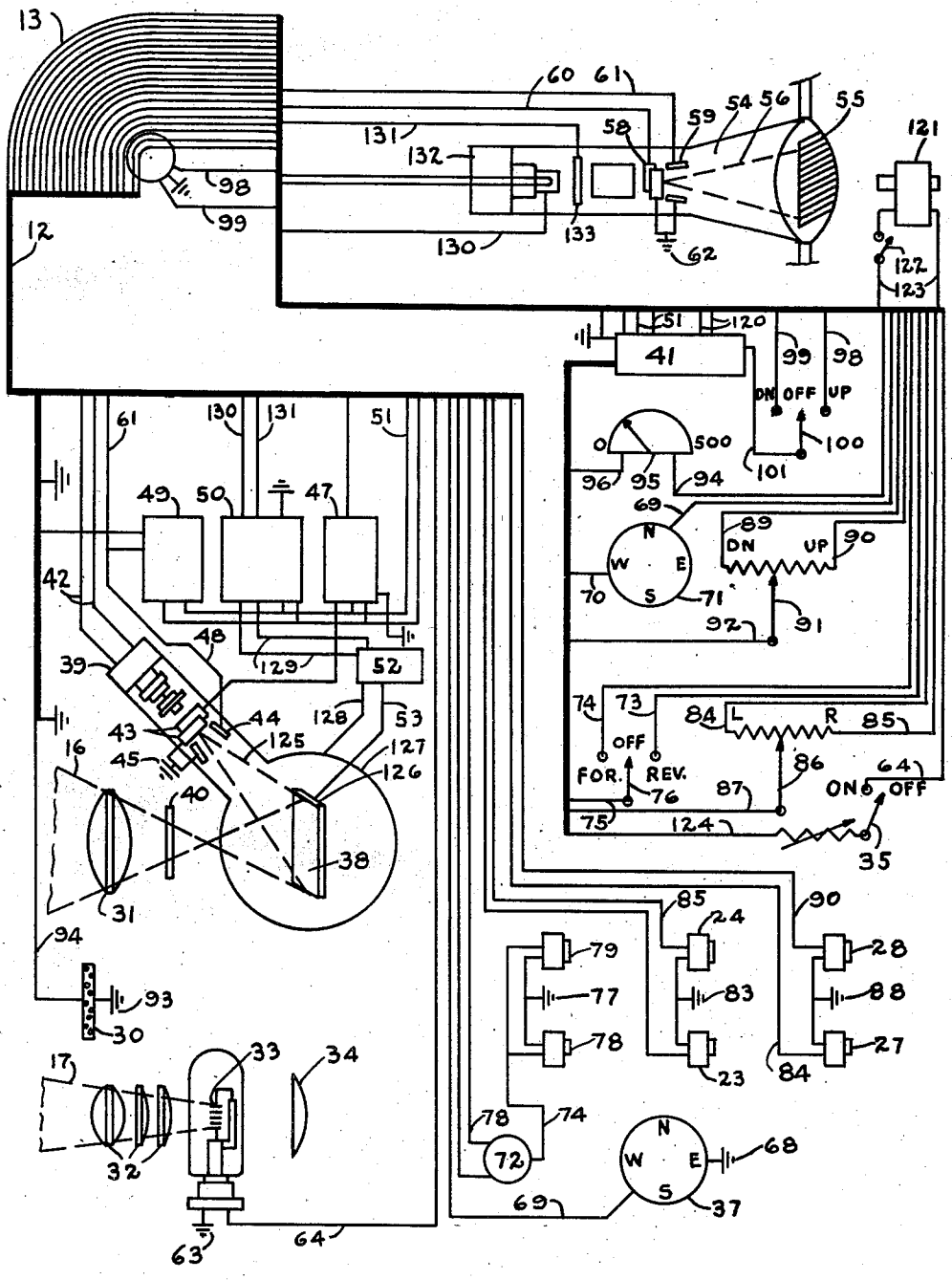

FIG. 5

INVENTOR.
Harold A. Adams

BY

ATTORNEY.

Jan. 6, 1948. H. A. ADAMS 2,433,971

UNDER-WATER IMAGE TRANSMITTING APPARATUS

Filed Feb. 28, 1944 3 Sheets-Sheet 3

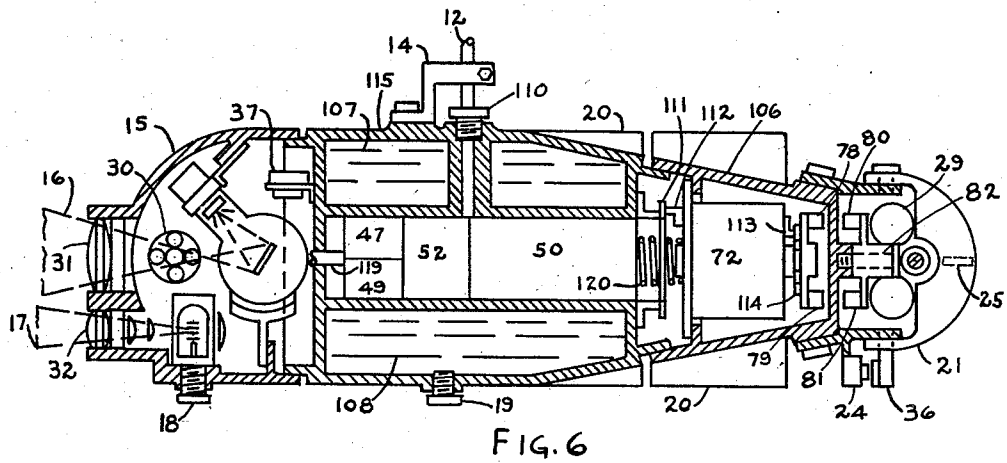

FIG. 6

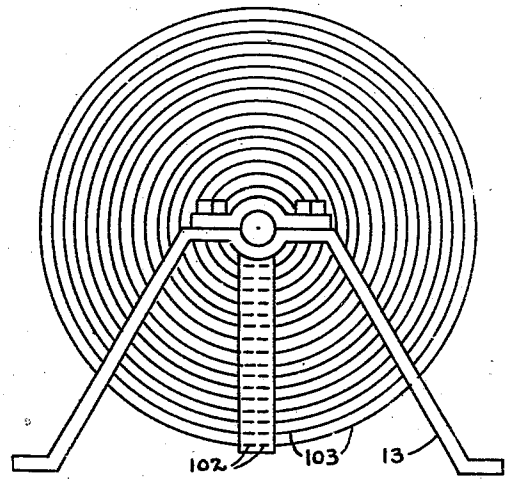

FIG. 7

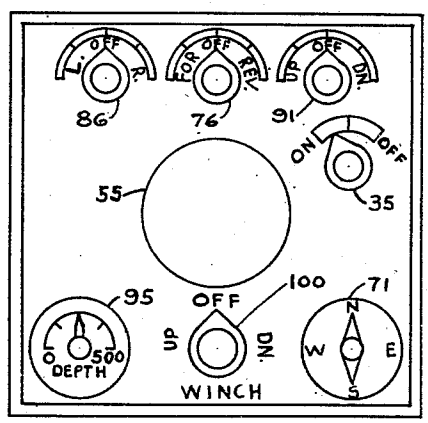

FIG. 8

INVENTOR.

Harold A. Adams

BY

ATTORNEY.

Patented Jan. 6, 1948 2,433,971

UNITED STATES PATENT OFFICE

2,433,971

UNDERWATER IMAGE TRANSMITTING APPARATUS

Harold A. Adams, Bakersfield, Calif., assignor of one-tenth to Arthur R. Cassidy, Bakersfield, Calif.

Application February 28, 1944, Serial No. 524,326

3 Claims. (Cl. 178—6.8)

1

My invention relates to under-water image transmitting apparatus, and it is a general object of this invention to provide a new and improved type of apparatus by which an operator at a land station, a surface or underwater ship may observe under-water scenes located at various depths and distances from the station or ship where the operator is positioned.

Another object of my invention is the provision of a mobile marine image observing unit capable of operation, on the surface or submerged, by propulsive means continuously under the control of an operator located at a remote point.

An additional object of my invention is to provide a mobile unit with an illuminating or ray producing element for projection on a scene and an image viewing and scene pickup element which may be directed to any desired point by means of horizontal and vertical deflecting mechanisms, forward and backward propulsive devices, with all movement and operations of the mobile unit controlled from a distant remote point by means of a flexible cable raised and lowered by a suitable winch, and the required operating switches, gauges, and other apparatus connected thereto, and combined therewith.

A primary object of my invention is to provide in effect a mobile periscope or marine seeing device which I call a submarinescope which may be operated from a remote control station and which will transfer and depict the scene picked up to a screen positioned in a more or less distantly located surface ship, land station, or an underwater ship commonly known as a submarine.

An important object of my invention is to provide in effect a mobile periscope or submarinescope by means of which a submarine, surface vessel or land station may discover the presence of and visually evaluate the military significance of other submarines, mines, nets, ships and other military devices without betraying the location of the remote control station which is receiving the information picked up by the mobile submarinescope.

A further object of my invention is to provide a mobile viewing unit, transmission system, remote control station and image screen which may be employed to detect, locate and explore sunken ships or other valuable objects which it is desired to salvage.

Another object of my invention is to supply a remote controlled mobile viewing unit capable of use in supervising, directing and controlling undersea salvage operations and undersea military

2

and civilian activities such as submarine, ship and dock repairing, channel dredging, mine laying and allied military and civilian underwater activities.

A further object of my invention is to provide a monitoring device by which the scenes continuously picked up by the mobile viewing unit may be permanently recorded on photographic film or other recording mediums for subsequent stationary or moving picture reproduction.

Certain further improvements in related mechanisms and additional or auxiliary devices, attachments and coordinating apparatus which are considered as differing species relating to this invention and requiring division are being made the subject of separate applications soon to be filed.

Additional objects and advantages of my invention will be apparent from the following description considered in conjunction with the accompanying sheets of drawings, or from both as supplements of each other, wherein are set forth certain novel features of construction, combination and arrangement of parts.

In the accompanying sheets of drawings, forming a part of these specifications, and in which like numerals are employed to designate like parts:

Figure 1 is a diagrammatic cross-sectional view illustrating the use of my invention to transmit a continuous illuminated picturization of a wrecked ship under water to the visual screen positioned on a ship on the surface of the water.

Figure 2 is a side elevation of the mobile, remote controlled illuminating and scene pickup unit of my invention.

Figure 3 is a front end view of the mobile unit.

Figure 4 is a rear end view of the mobile unit.

Figure 5 is a schematic combination electrical and mechanical diagram showing the component elements with the connecting and coordinating means all of which exemplify the principles of my invention.

Figure 6 is a longitudinal cross-sectional view of the mobile unit.

Figure 7 is a schematic representation of the collector ring and cable winch mechanism provided for the flexible control cable.

Figure 8 is a front view of the visible image screen and the control panel.

Referring now in detail to Figures 1, 2, 3, 4, 5, 6, 7, and 8, wherein for purposes of illustration are shown preferred embodiments of my invention, the numerals 9 indicates a wrecked ship resting on the bottom of the sea. Numeral 10

is a control ship riding on the surface of the sea. At a suitable place on the control ship is located winch mechanism 13, from which the control cable 12 connects to the mobile unit 11, which is illuminating and picking up the image of the wrecked ship 9.

In the mobile unit 11, as shown principally in Figure 2, 15 indicates the front section of the shell, in which are mounted the illuminating device, viewing mechanism and depth or pressure recorder and indicating compass. 16 represents the limits of the sight viewed by the pickup device, and 17 represents the beam impinging on the sight as emitted from the ray projecting device. 18 is a releasably sealed port for inserting and adjusting the illuminating device. 19 is a releasably sealed port through which ballast may be inserted in a ballast chamber. A clamp 14 for securing cable 12, is releasably attached to the middle section 115 of the mobile unit 11. Sectionalized fins 20 are provided on both the middle section 115 and the rear section 116 of the mobile unit. To the rear end of section 116 is releasably secured a deflecting and propulsion mechanism mounting frame 117, to which the left and right horizontally deflecting rudder 21 is attached. The horizontally deflecting rudder is diverted to the left by an electromagnetic system 23 and 22 and is diverted to the right by the electromagnetic system 24 and 36. To shaft 118 rotatably suspended in mounting frame 117 is fastened the vertically deflecting rudder 25. The vertically deflecting rudder 25 is diverted downward by the electromagnetic system 28 and 26 and is diverted upward by the electromagnetic system 27 and 26. Rotatably suspended in mounting frame 117 is the propeller 29.

Figure 3 representing the front view of the mobile unit 11 shows at 31 the lens of the image-viewing mechanism, at 32 the lens of the ray-projecting system, and at 30 is shown the exterior of the depth or pressure gauging mechanism.

The illuminating or ray-projecting system includes a filament 33 with the rays reinforced by reflector 34 and projected outwards through the lenses 32. An indicating compass 37 is secured in a floating mounting to a wall of the middle section 115. The middle section 115 is divided into several different compartments. Upper ballast chamber 1 is shown at 107 and lower ballast chamber 2 at 108. Separating these ballast chambers 1 and 2 is an equipment section which holds oscillators 49 and 47, primary amplifier 52, and the main amplifier 50. Cable 119 represents the wires interconnecting the various pieces of equipment located in the mobile unit.

The propulsion motor 72 is contained in housing 106 of rear section 116. Current for operation of the motor and propeller is supplied through collector ring 111, brush 112, and ground return friction spring 120. The rotation of the motor 72 is transferred to propeller 29 by means of magnets 80 and 81 attached to propeller shaft 82, and electromagnets 78 and 79 attached to shaft of motor 72 and excited by current supplied through brush 113 and collector ring 114.

Winch mechanism 13 is supplied with a series of brushes 102 and collector rings 103 for the purpose of connecting the circuit wires to the cable 12 while permitting the cable 12 to be raised or lowered.

On the visible image screen and control panel Figure 8 are mounted the screen 55, horizontal deflecting switch 86, propeller control switch 76, vertical deflecting switch 91, ray projecting switch 35, compass indicator 71, cable winch control switch 100, and pressure-depth indicator 95.

My invention as schematically shown in the electromechanical diagram 5 consists principally of the combination of a number of elements; a remote control panel, a visible image depicting screen and a captive mobile ray-projecting and image pickup device. For purposes of illustration the remote control panel and visible image screen are depicted as located on a surface ship, while the ray projecting and image pickup device is depicted as a submersed mobile unit connected to the surface ship equipment by means of a flexible cable and winch. The various connecting and coordinating facilities for the principal elements are displayed so as to indicate their relative locations and functions in the combination as a whole. In the operative functioning of my invention the ray projection system consists of a source of radiant energy such as a light ray lamp 33 connected to ground 63 and through conductor 64 to remote control adjustable switch 35, thence by conductor 124 to power source 41. The beam of radiant energy 17 is confined and directed by reflector 34 and lenses 32. Pressure depth recorder 30 is connected from ground 93 through conductor 94 to pressure depth indicator 95 and thence by wire 96 to power source 41. In the viewing device such as an Iconoscope an appropriate cathode ray tube picks up and converts the scene into electrical signals. The beam or sight 16 of the picture passing through screen 40 is focused by lenses 31 forming an image on the mosaic 38 which is scanned by an electron beam 125 emanating from the electron gun 39 having horizontal deflector plates 43 and vertical deflector plates 44.

The electron beam 125 in traversing the image on mosaic 38 causes a flow of current or electrical potential varying in accordance with the illumination on mosaic 38 in the video circuit passing through signal plate 126 and collector 127. The variable video circuit is conducted by wires 53 and 128 to primary amplifier 52. The modulated circuit of the primary amplifier 52 is conducted to the main amplifier 50 and from thence through flexible cable 12 and winch 13 to cathode 57 of cathode gun 132 by wire 130 and to valve or grid 133 of cathode gun 132 by wire 131. The modulated potential imposed on grid 133 varies the strength of electron stream 56 in accordance with the image on mosaic 38. This variable electron stream 56 impinging on electron sensitive screen 55 thereby creates a luminescence of screen 55 depicting the scene as viewed by mobile element 11 and picked up by mosaic 38.

The electron gun 39 is provided with horizontal deflector plates 43 having one plate connected to ground 45 and vertical deflector plates having one plate connected to ground 45. The other horizontal deflector plate 43 is connected to amplifying oscillator 47 and thence by conductor 60 to one of the horizontal plates 58 of electron gun 32 and the other vertical plate 44 is connected to vertical deflection oscillator 49 and thence by conductor 61 to one of the vertical plates 59 of electron gun 32. Oscillators 49 and 47 and amplifier 50 are supplied with power by means of conductors 51.

A monitoring system for recording on photographic film or other medium the visible image projected on screen 55 is shown at 121 operated by power conducted through wires 123 from power source 41 and controlled by switch 122.

In general use the mobile viewing unit or submarinescope 11 is directed and moved away from the control station located on ship 10 by the operative functioning of the motive mechanisms in the mobile unit 11 and the gauges and switches located in the control panel 8 through the interconnecting wiring system and flexible cable 12 and winch mechanism 13 in such a manner that the desired scenes are depicted on screen 5 located in the control panel 8 as follows:

The mobile submarinescope 11 is placed in the water by paying out the flexible cable 12 from winch 13 controlled by switching mechanism 100. Subsequent to entrance into the water mobile unit 11 is moved forward or backward by operation of the propulsion motor control switch mechanism 76. Movement of mobile unit 11 in the water to the right, in a straight line or to the left, in a horizontal plane is obtained by operation of the control switching mechanism 86. Movement of mobile unit 11 in the water upwards, in a straight line or downwards, in a vertical plane is obtained by operation of the control switching mechanism 91. As the mobile unit 11 travels in the water, the depth or pressure is indicated by recorder 30 and indicating gauges 95 and the relative direction is obtained from compass 37 and indicating gauge 71. Scenes or images at which the mobile unit 11 is directed are illuminated or activated by the rays projected from the ray producing device 33 of a suitable strength as controlled by the switching mechanism 35. The scene thus illuminated or activated is picked up and transferred into electrical signals at the electron gun 39 and auxiliary equipment, then transferred by means of conductors in flexible cable 12 and other means, to receiving electron gun 132 and depicted on screen 55. If desired, a continuous pictorial record is obtained by the operation of the motion picture monitor mechanism controlled by switching mechanism 122.

It will be understood that while the form of my mobile remote controlled viewing device herein described and illustrated is to be considered as a preferred embodiment of my invention, I do not limit myself to the precise construction as described but reserve the right to resort to and substitute various modifications and changes in shape, size and arrangement of parts without departing from the spirit of my invention or the scope of my claims as described and indicated above and in the drawings and the following claims.

Having thus described my invention I claim:

1. A scene illuminating unit; an image pickup device; an amplifying and modulating unit for converting said image pickup into electrical signals; an enclosure housing said illuminating, pickup and electrical signal converting units; a directionally reversable means of propulsion attached to said housing; a vertical travel control mechanism attached to said housing; a horizontal travel control mechanism attached to said housing; a flexible cable of conducting wires attached to said housing, and connected to said illuminating unit, pickup device, electrical signal converting unit, directionally reversable propulsion means, vertical travel control mechanism and horizontal travel control mechanism; a winch for reeling said flexible cable; a collector ring and brush system provided on said winch for connections to said flexible cable; conducting wires connecting at one point to said collector ring and brush system; an image reproducing mechanism, connected to said conducting wires; a control device panel connecting at various points with said conducting wires; a motion picture recording mechanism connected to said conducting wires; a power source connected to said conducting wires; a switching mechanism mounted on said panel controlling said scene illuminating unit and connected to said conducting wires; said power source controlling said pickup device, electrical signal converting unit and image producing mechanism; a switching mechanism mounted on said panel connected to said conducting wires and controlling said means of propulsion; a switching mechanism mounted on said panel connected to said conducting wires and controlling said vertical travel mechanism; a switching mechanism mounted on said panel connected to said conducting wires and controlling said horizontal travel mechanism; a switching mechanism mounted on said panel connected to said controlling wires and controlling said hoisting winch and said flexible cable.

2. A submersible mobile scene pickup vessel; a picture reproduction device; a remote control station; a pressure-depth recorder located in said vessel; a recording compass located in said vessel; means for attaining forward, reverse, right, left, up and down directional travel of said vessel; switches located at said remote control station operating said scene pickup vessel, said picture reproduction device and said means for attaining forward, reverse, right, left, up and down directional travel; instruments located on said remote control panel connecting with the said pressure-depth recorder and said recording compass; and a system of flexible conducting wires connecting said devices located in said submersible mobile vessel to said reproduction device and said switching mechanisms and instruments located at said remote control station.

3. In an image transmission apparatus the combination of; a captive marine mobile vessel; a remote control station; a control signal transmission system connecting said vessel with said remote control station; an image activating ray projector; an image pickup system sensitized to respond to an image activated by said ray projector; a remote image reproduction station; an image signal transmission system connecting said image pickup system with said image reproduction station; said ray projector and said pickup system enclosed in said vessel; a motion producing mechanism enclosed in said vessel and controlled at said remote control station through said connecting control signal transmission system; a depth gauge; a compass; a depth indicator; and an indicating compass; said depth gauge and compass enclosed in said vessel and connected through said control signal transmission system to said depth indicator and said indicating compass located at said remote control station.

HAROLD A. ADAMS.

REFERENCES CITED

The following references are of record in the file of this patent:

FOREIGN PATENTS

Number	Country	Date
482,835	Great Britain	Apr. 5, 1938