United States Patent

Desmoulins

[15] **3,700,048**

[45] **Oct. 24, 1972**

[54] **DRILLING INSTALLATION FOR EXTRACTING PRODUCTS FROM UNDERWATER SEA BEDS**

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[22] Filed: **Dec. 30, 1969**

[21] Appl. No.: **889,357**

[30] **Foreign Application Priority Data**

Dec. 31, 1968 France.....6819266

[52] **U.S. Cl.**.....**175/6,** 175/171

[51] **Int. Cl.**.....**E21c 19/00**

[58] **Field of Search**.....175/6, 8, 9, 7; 166/.5, .6

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Assistant Examiner—Richard E. Favreau
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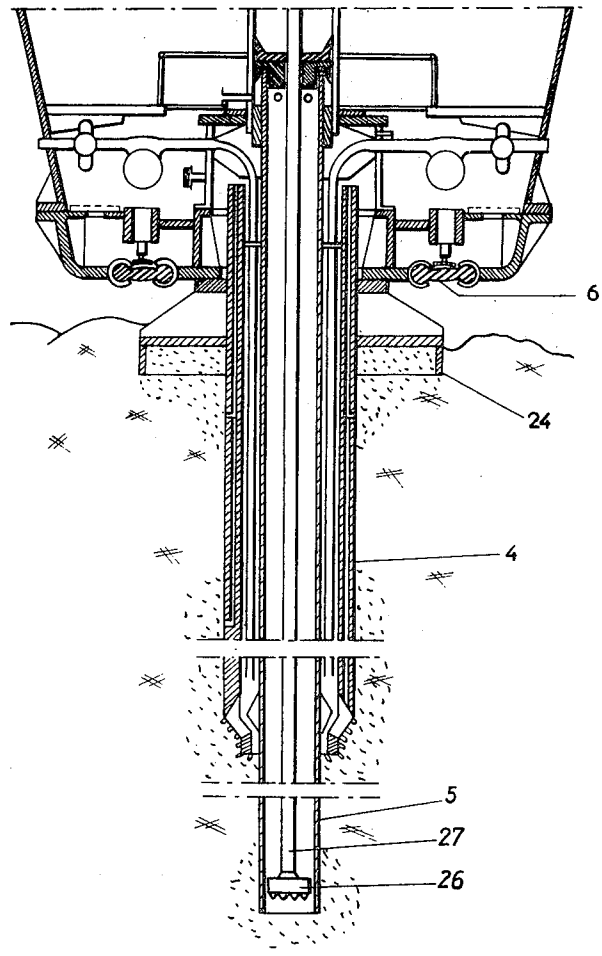
[57] **ABSTRACT**

An installation for extracting products from underwater sea beds comprises a base section which is permanently sunk in the sea bed, a reusable well section, and water-tight flexible connecting means releasably connecting together the base section and well section. The well section has sufficient internal dimensions to allow workmen and equipment to pass therethrough and is open to the atmosphere so that the working space for the workmen is maintained at atmospheric pressure. The reusable well section may be disconnected from the base section and reused again at another extracting site.

10 Claims, 17 Drawing Figures



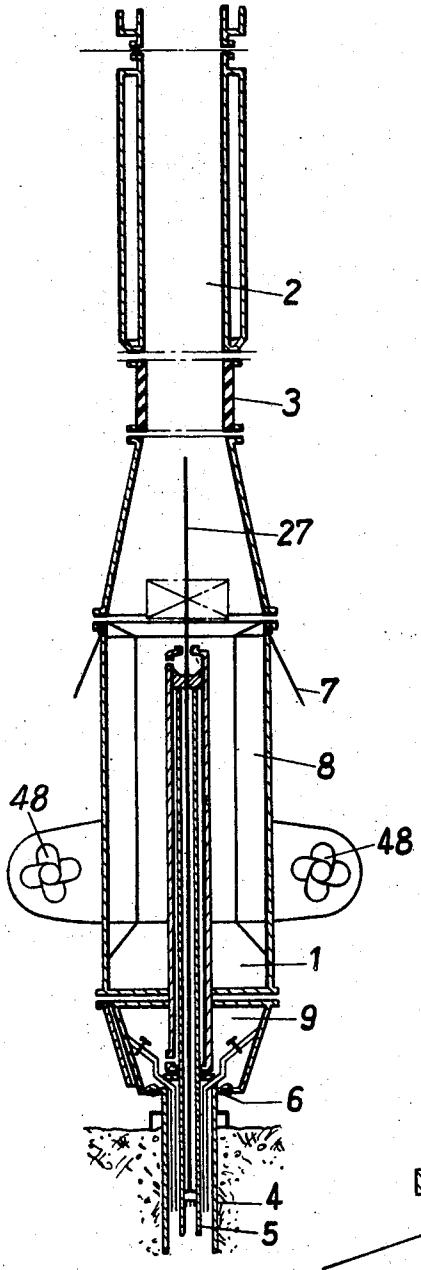


Fig.1

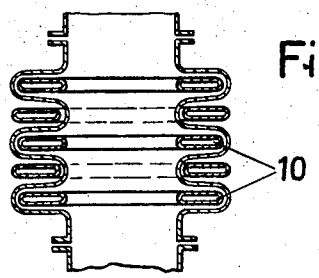


Fig.1a

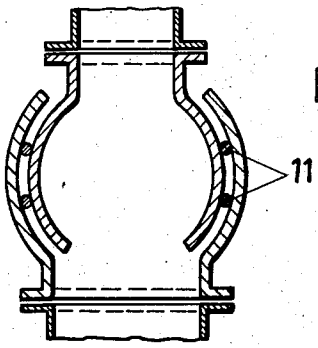


Fig.1b

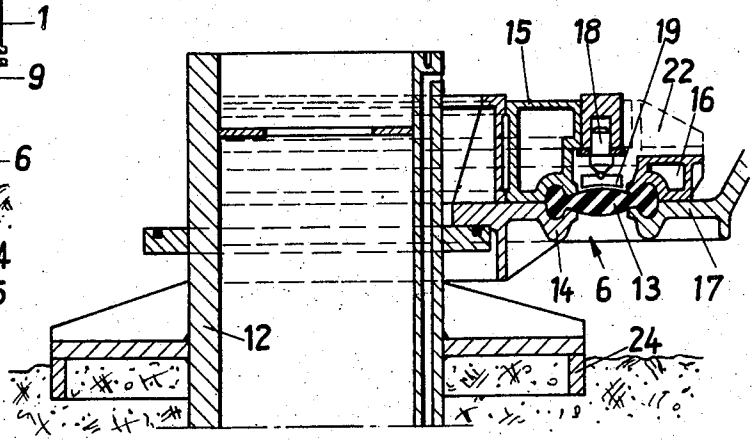


Fig.2

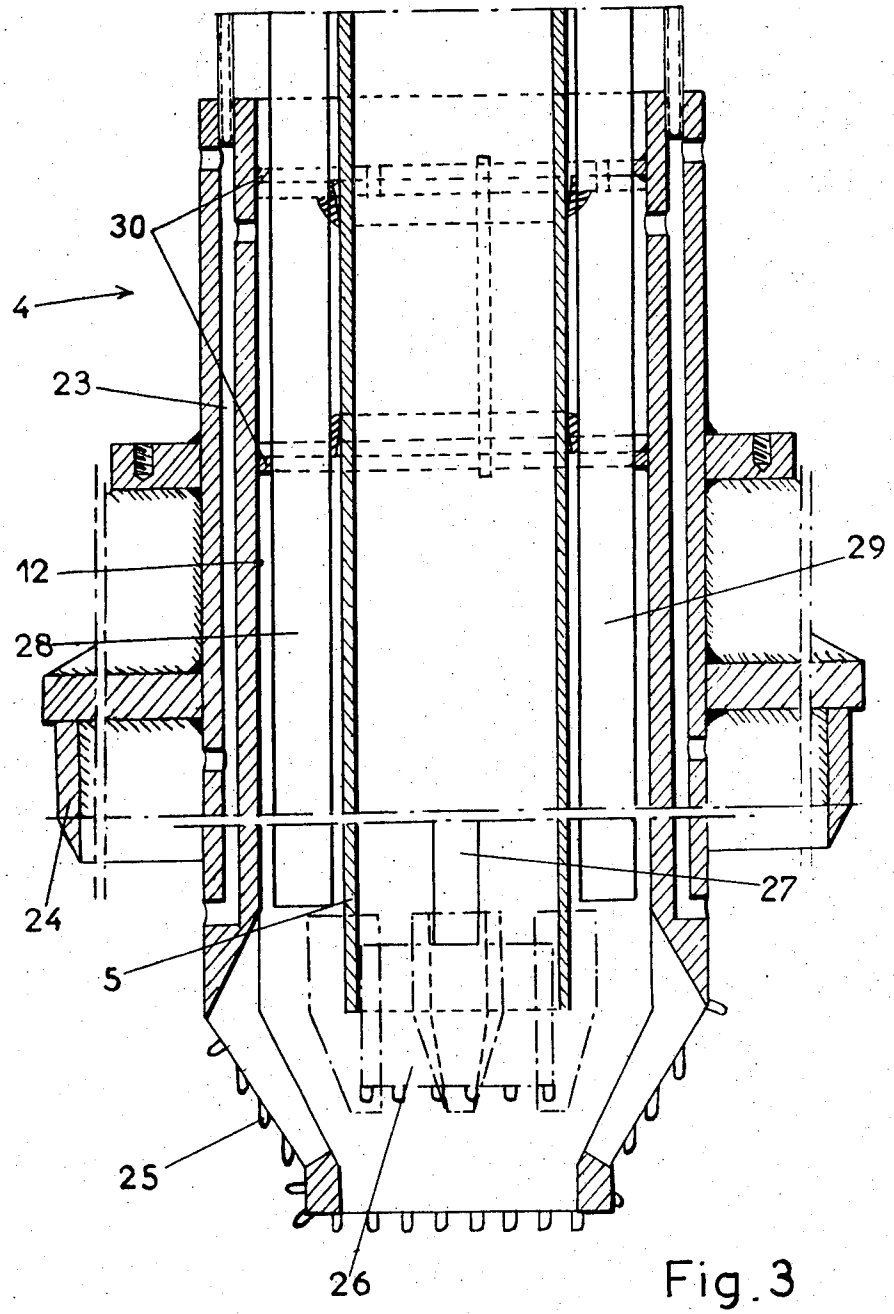


Fig. 3

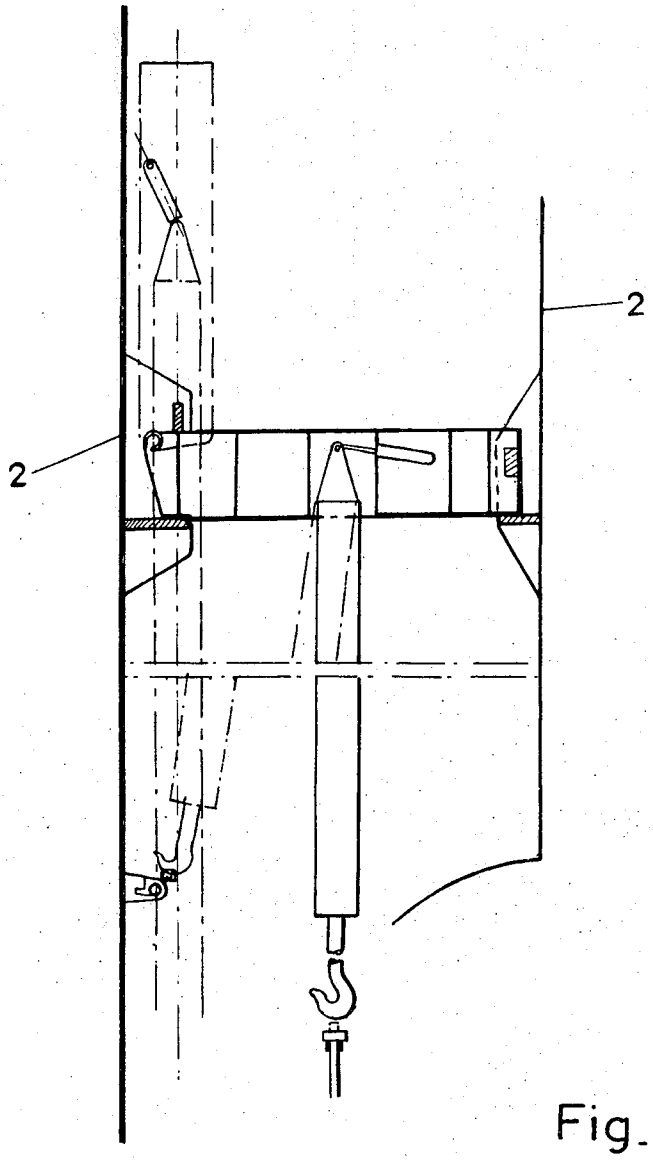


Fig_4

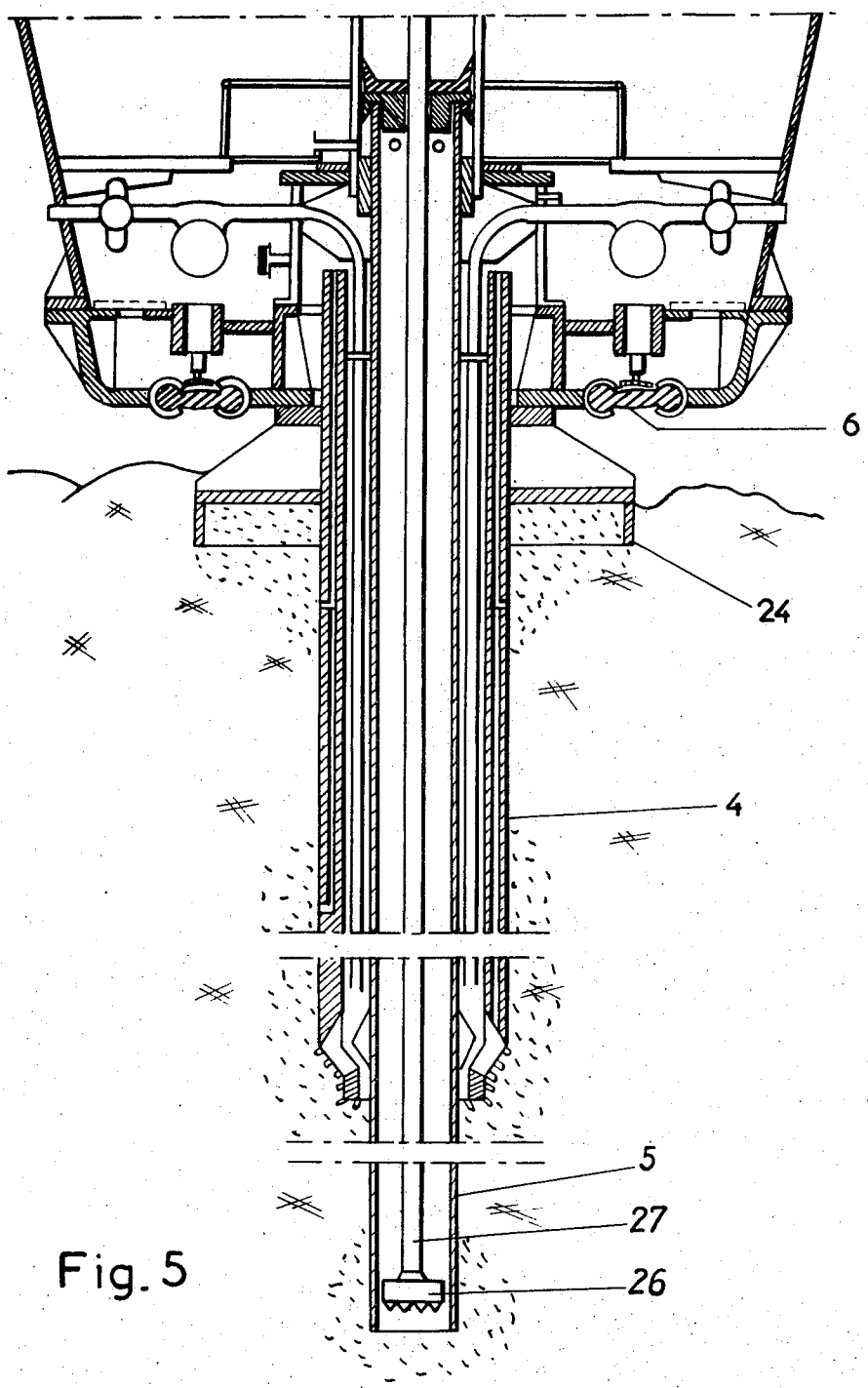


Fig. 5

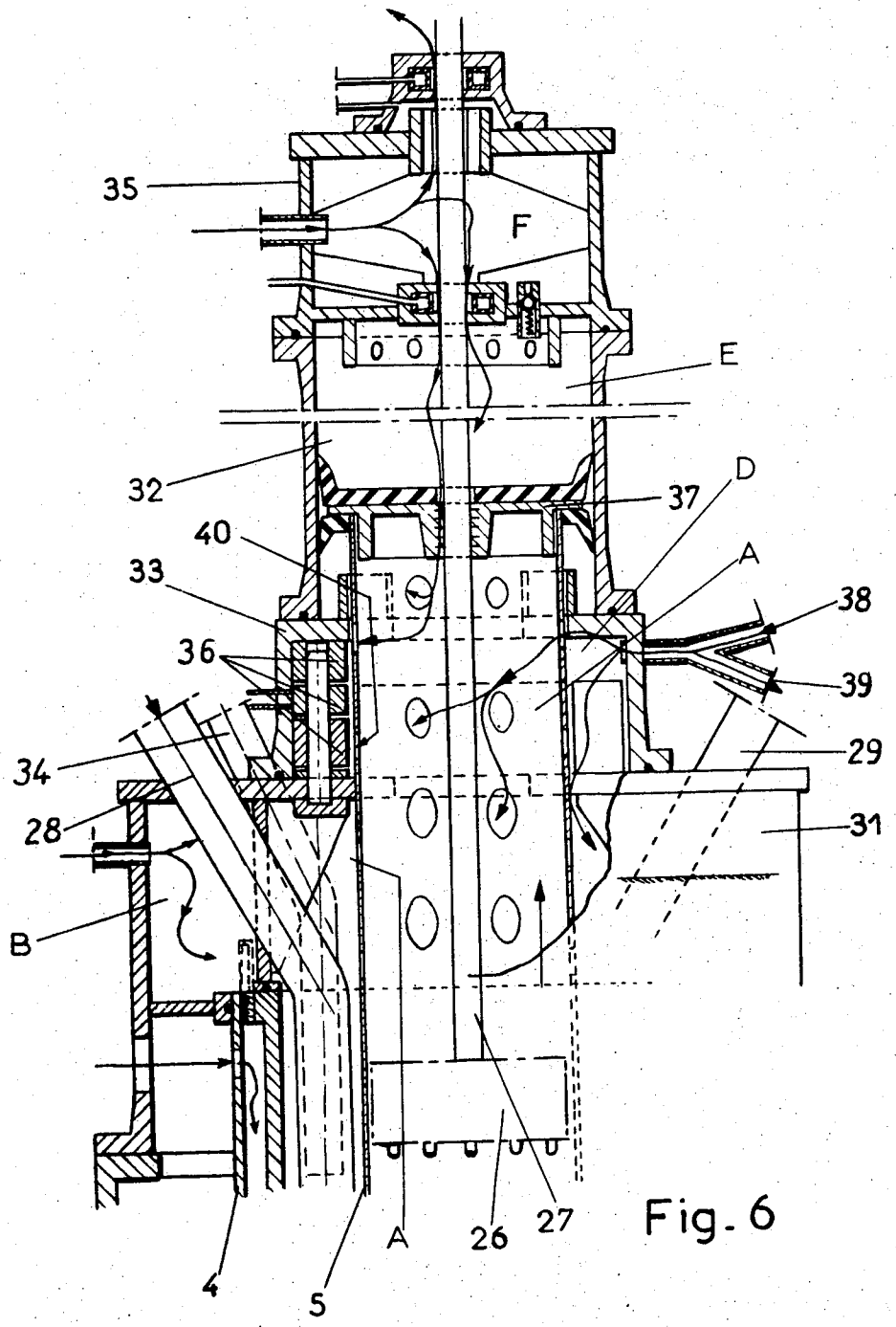


Fig. 6

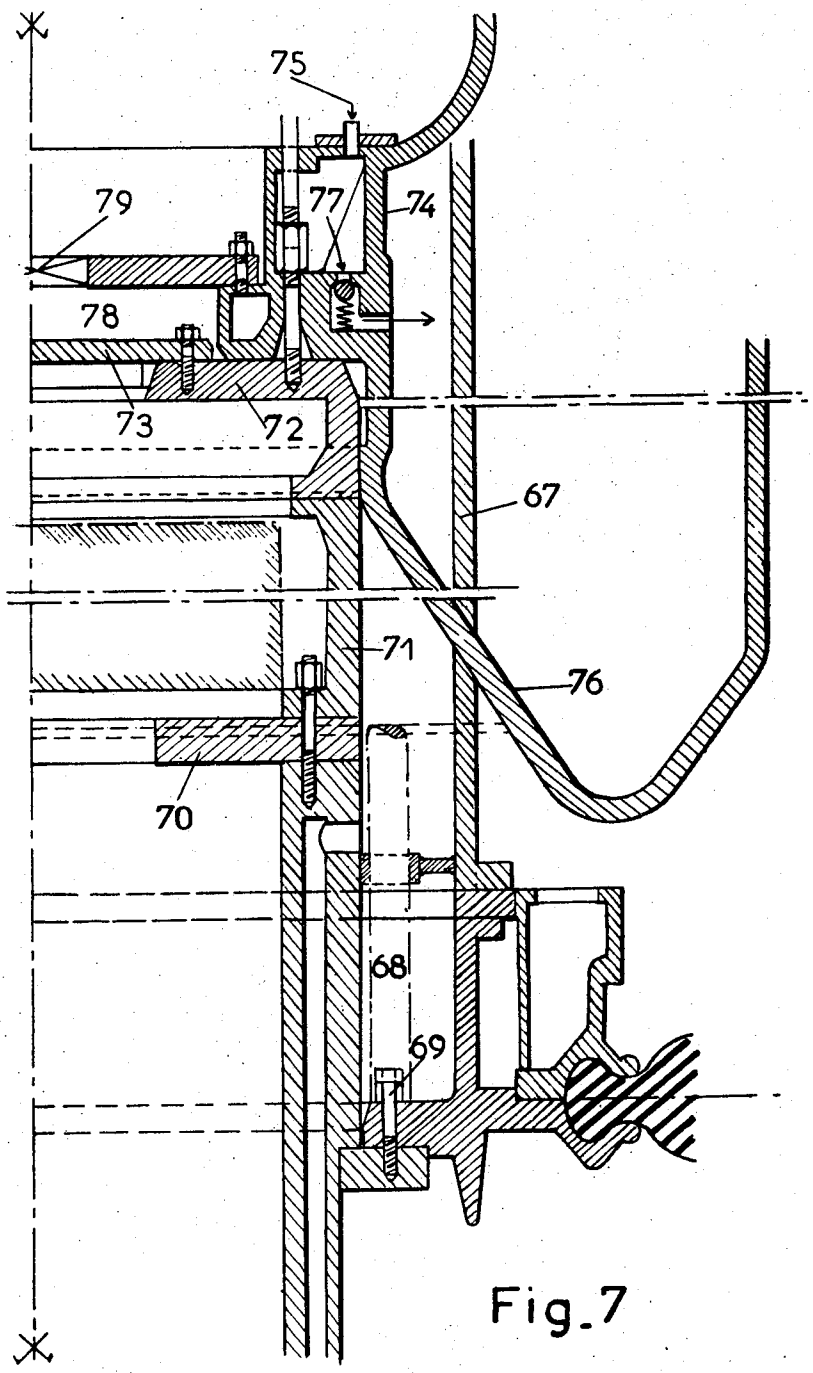
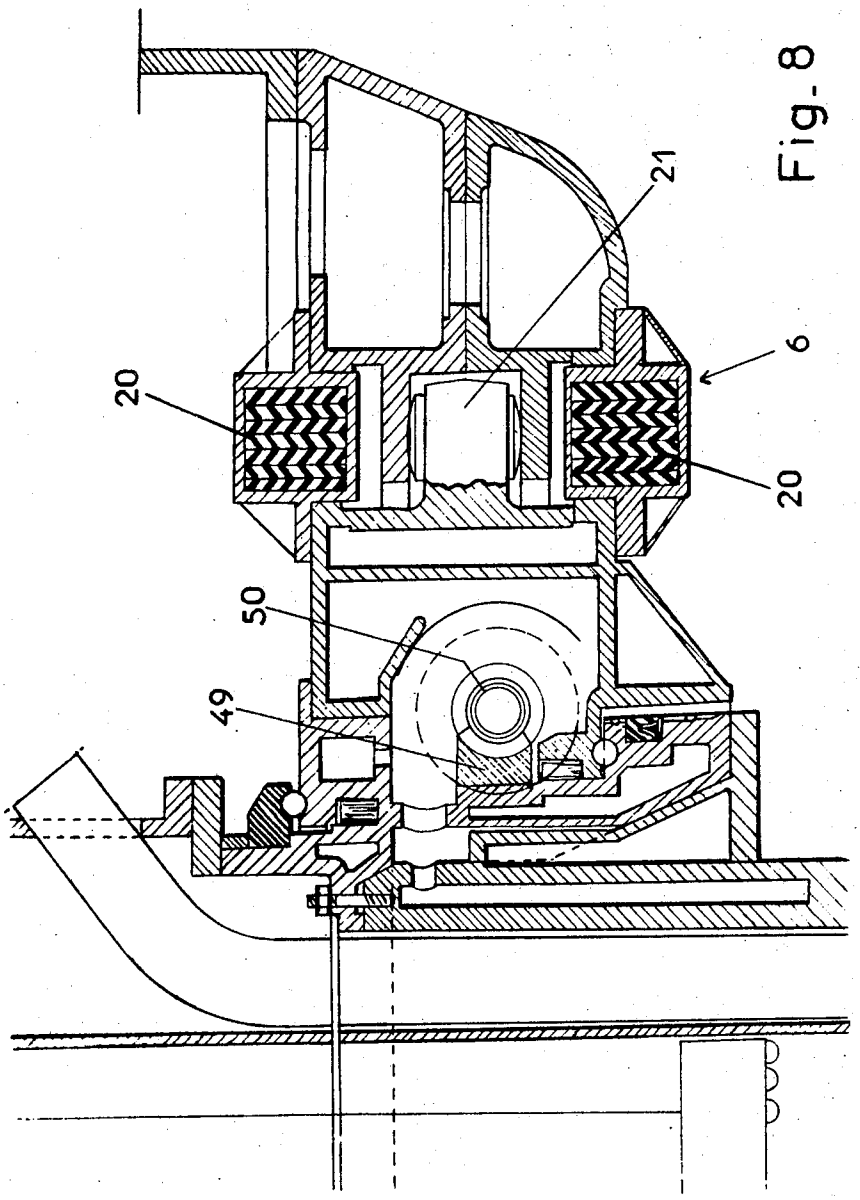


Fig. 7



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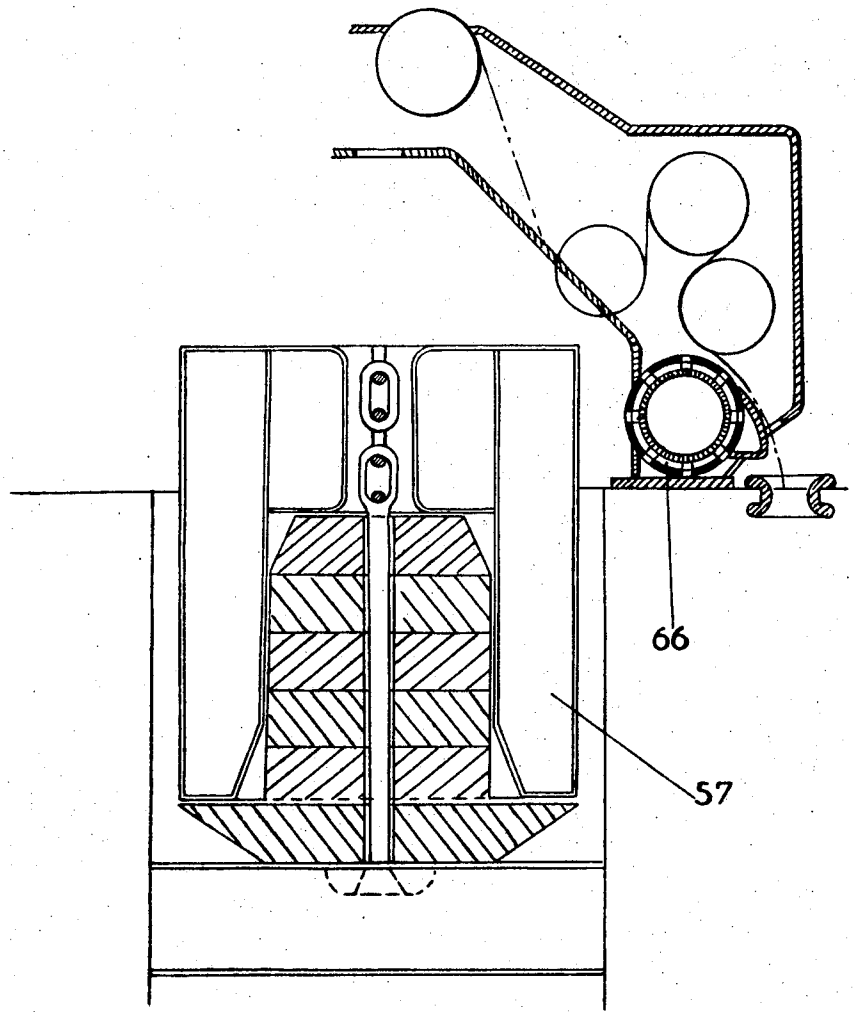


Fig. 9

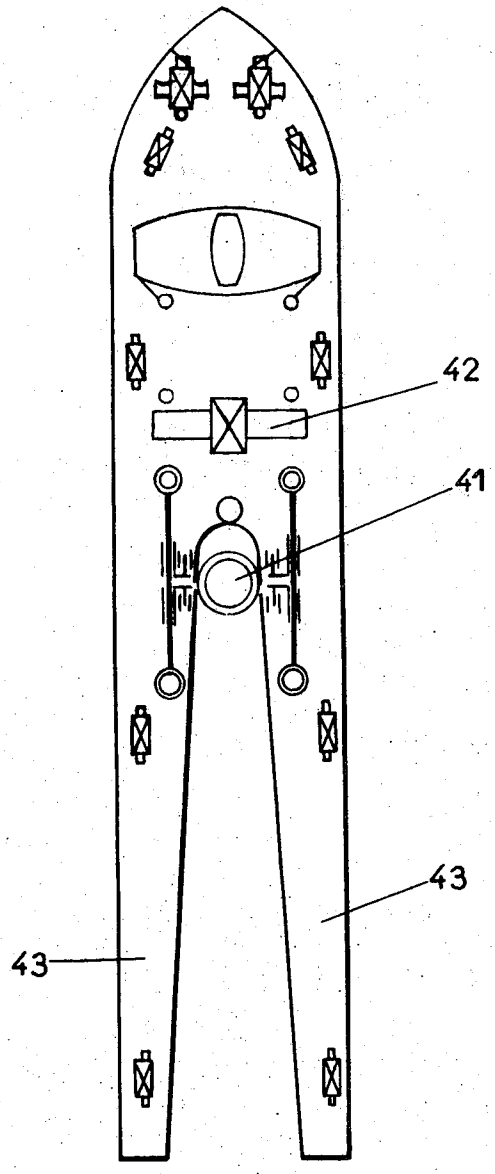


Fig. 10

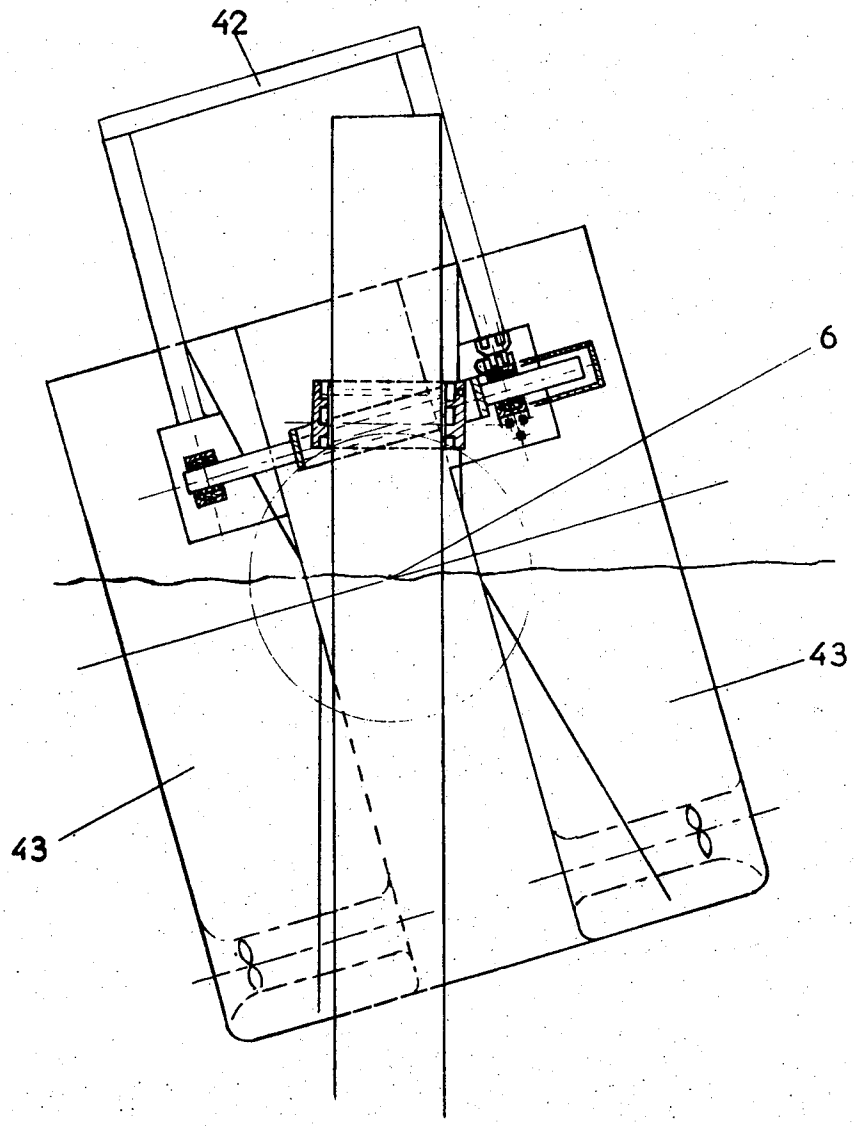


Fig. 11

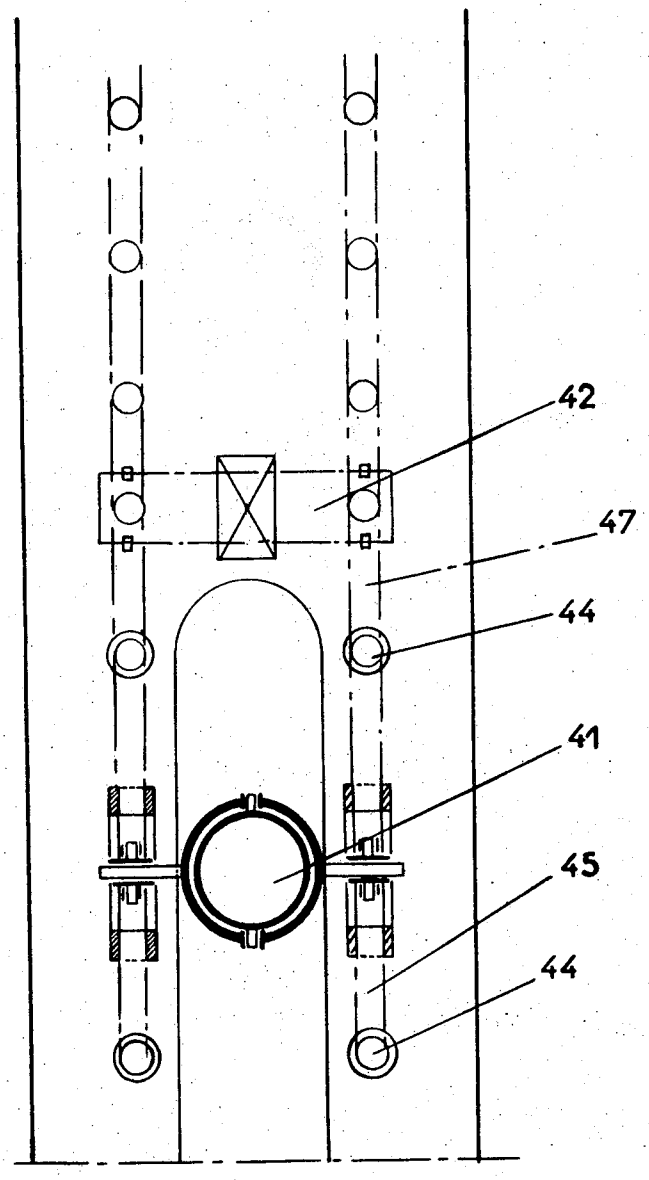


Fig_12

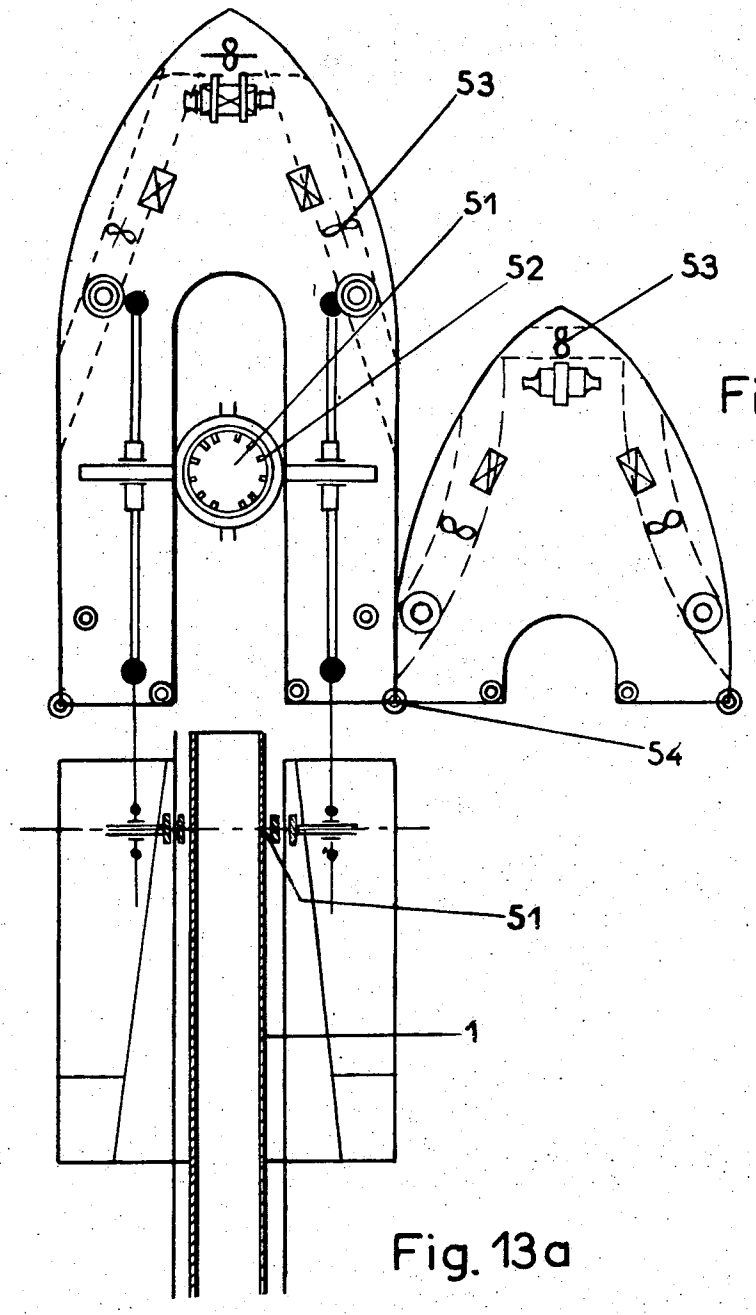
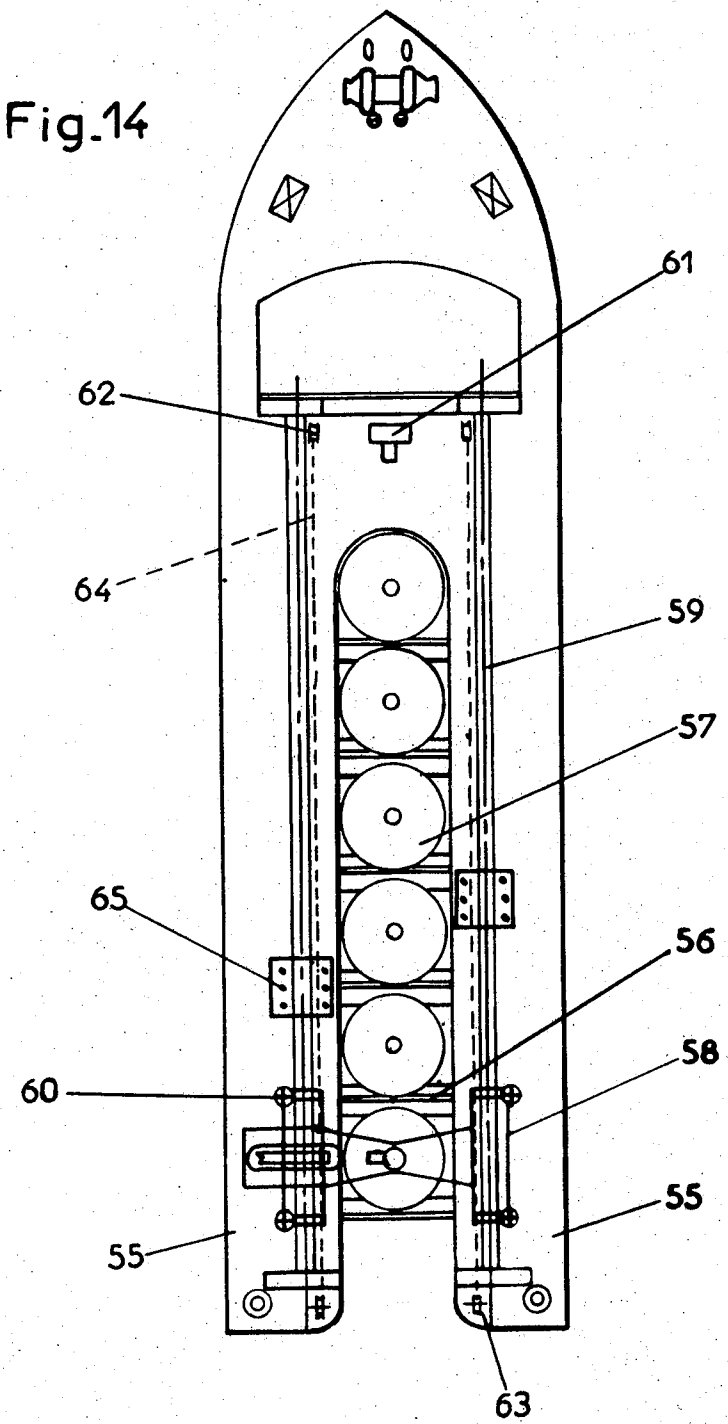


Fig. 13

Fig. 13a

Fig. 14



DRILLING INSTALLATION FOR EXTRACTING PRODUCTS FROM UNDERWATER SEA BEDS

The invention relates to an installation for laying underwater bases leading to the open air intended for the extraction of hydrocarbons or any other solid, liquid or gaseous mineral products contained in the underwater bed itself, or taken from the surface of it. This same apparatus can be used for anchoring points for support pylons, fixed or floating islands and all surface maritime installations.

For this type of installation, it has heretofore been necessary to find available personnel with long training in diving techniques and who were willing to work very arduous conditions.

The present invention relates to an apparatus for installing such an installation and which obviates the forementioned drawbacks.

The present invention is characterized in that the drilling operation for a shaft opening to the air, the base center-point sleeve of which is implanted in the sea bed is carried out by rotation of the center-point itself.

The present invention will be better understood with the aid of the following description, made by way of nonlimiting examples, and with reference to the accompanying drawings, wherein:

FIG. 1 is a vertical diagrammatic axial section of the well drill;

FIG. 1*a* is a detail view showing, in axial section, a modified form of embodiment of the seal provided between the pivot pipe and the well pipe;

FIG. 1*b* is an axial section showing another modified form of embodiment of the seal between the pivot pipe and the well pipe;

FIG. 2 is a fragmentary axial section showing the lower portion of the pivot pipe;

FIG. 3 is an axial sectional view showing on a larger scale the pivot of the well drill;

FIG. 4 is a fragmentary vertical section of the well pipe;

FIG. 5 is an axial section showing on a larger scale the pivot and the lower portion of the well pipe;

FIG. 6 is an axial section showing the equipment for installing the first drilling tube;

FIG. 7 is a fragmentary axial section showing on a larger scale a modified form of embodiment of the lower portion of the pivot pipe;

FIG. 8 is a fragmentary axial section showing another form of embodiment of the lower portion of the pivot pipe;

FIG. 9 is a diagrammatic sectional view of an anchoring layer;

FIG. 10 is a plan view from above of a workshop ship;

FIG. 11 is a diagrammatic side elevational view from astern of the workshop ship;

FIG. 12 is a fragmentary plan view from above showing the workshop ship on a larger scale;

FIG. 13 is a plan view from above of a pontoon workshop in its open position;

FIG. 13*a* is a diagrammatic vertical section of the central portion of the pontoon of FIG. 13, and

FIG. 14 is a plan view from above of a ship for laying the anchoring means.

These internal arrangements are carried out on land before the material is embarked on the floating

workshop and transport to the site where the drilling is to be carried out.

If the rig does not have a prohibitive length it is possible to completely assemble same on the loading wharf and then tow if over the water to the implantation site.

To put the rig into the vertical position, balancing ballast tanks may be used.

Each sleeve section of the shaft-rig thus has a definite place in the assembly.

In its entirety, the shaft-rig, shown in the present FIG. 1, is essentially composed of three principal parts, a center-point sleeve 1 implanted in the underwater bed, a shaft sleeve 2 which leads to the open air and one or several hoops 3 which form the articulated joints and serve as connections between the center point sleeve 1 and the shaft sleeve 2.

The center-point sleeve is intended to be solidly implanted in the underwater bed.

This implantation must bring about and guarantee that the base of the entire shaft-rig is waterproof.

As a result, a rigid implantation; similar to that of a solidly driven pile, should be made deep into the underwater bed.

The fact of being thus rigidly implanted then imposes the obligation of guaranteeing the installation against all possible oscillations about the vertical axis which could be provoked by a shock which might affect the waterproofing of the sleeve 4 and of the first boring tube 5.

Although underwater beds are generally considered to be calm regions, for the sake of this invention, however, they are considered as always being susceptible to perturbations by liquid masses in various directions.

In order to eliminate all possibility of incidents due to forces provoked by these large volumes of liquid in motion, the head of the sleeve 4 which rigidly extends from the ground, is provided with a flexible unit 6, which allows slight oscillations of the center-point sleeve about the vertical axis of the shafts.

In certain particular doubtful cases of violent liquid movements, these oscillations can be corrected and reduced to a minimum by the addition of adjustable stays 7 which may be adjusted from inside the shafts. In addition, it should be clarified that according to the geological composition of the underwater terrain and relief at the implantation site, the shaft-rig and, particularly, the center-point sleeve 1 may be of a different conception thereby allowing the judicious adaptation to the site under consideration.

The center-point sleeve 1 essentially consists of a cylindrical body with a double wall forming a waterproof space where the water ballast 8 is provided and which allows all balancing operations for traction or compression necessary to the implantation or to the exploitation of the shafts.

This cylindrical body ends at the lower part by a spherical or conical chamber 9, containing, in part, all materials and special gear intended for the work of implanting of this center-point sleeve 1 and the placing of the first tube 5 to carry out the boring.

In order to allow for the installation of all the necessary materials for the implantation of the shaft-rig and of the boring itself, at the same time, the outside diameter of the center-point sleeve 1 can be made to considerable dimensions.

Also, the upper part of this principal body ends in a cone which allows the diameter of the center-point sleeve **1** to be made to fit that of the shaft-sleeve **2**, and the cone also allows the center-point sleeve to be connected to the shaft-sleeves by means of the intermediate flexible hoop **3**. According to the depths to be reached, this hoop can be of different design.

For slight depths, this hoop will be of the classic type and produced in reinforced rubber or in all other flexible materials which have acceptable mechanical and chemical characteristics capable of resisting the forces posed on it by the environment.

For medium depths, it is proposed to utilize a compressible bellows **10** (FIG. 1*a*) in metal or in any other flexible material having acceptable mechanical and chemical characteristics and capable of resisting all forces imposed on it by the environment.

In an other variation of the embodiment, air cushions are also placed in the undulations from the outside.

For great depths, a very strong ball and socket joint, (FIG. 1*b*), capable of supporting the enormous vertical forces, is used the waterproofing is insured by an assembly of inside joints **11**. The force applied on the outside joint by the pressure of the water is balanced by a counter pressure applied to the inside surface. In the case of failure of an inside joint, the resulting flow is such that it can be held in spite of all the necessary pressure on the outside point, even being able to be systematically created and recuperated to be put back into the circuit.

The sleeve **4** (FIG. 3) of the shaft-rig consists of a steel sleeve **12** of considerable thickness.

The sleeve **4** is intended for boring the hole in the implantation site and, at the same time, to hold the entire installation in place.

This sleeve is connected to the body of the shaft-rig, by means of the complex deformable assembly **6** (FIG. **2** and **5**) forming a supple joint which protects the fixed sleeve against all possibility of shock caused by shaft oscillations. This articulation **6** (FIG. **2**) is constituted by a membrane **13** in rubber or any other flexible material, even metal, gripped between two sets of flanges and counter flanges, **14** and **15** as well as **16** and **17**, forming a waterproof fitting.

The very great force, resulting from the outside water pressure, which is exerted on this supple membrane **13** is balanced by a series of hydraulic jacks **18** connected to one or several oleopneumatic accumulators. Each jack **18** controls the movement of a section **19**. The total all of these sections **19** uniformly is distributed on the membrane **13** thus making a stop bearing of multiple layers capable at all time to resist any collapse of the membrane **13**.

In one variation of the embodiment, this articulation is obtained by a unit consisting of flexible joints **20** held in equilibrium by jacks **21** also connected to an oleopneumatic compensator (FIG. **8**).

During all rotational movement of the entire shaft-rig, intended for implantation, it must necessarily be maintained rigid in order to eliminate all possibility of relative movement between the sleeve and the entire body of the rig.

On the other hand, the membrane **13** must not be subjected to torsion forces in the perpendicular plane of its axis and to prevent such forces, blocking parts **22** (FIG. **2**) have been provided.

In an other variation of the embodiment, the joint **6** is obtained by a swivel similar to that described for the joint between the shaft sleeve and the center-point sleeve.

The sleeve **4** (FIG. **3**) is very thick because of the enormous forces to which it is to be subject, and especially because this wall is drilled longitudinally with the channels **23** opening to the outside and intended for the injection of liquid concrete required to achieve the absolute and sought waterproof condition.

This sleeve carries an external skirt at its upper part forming a crown **24** which serves as a base its bell shape allowing the injected concrete to be held in position.

The sleeve ends at its lower part by a particular unit which forms the crown drilling tool holder **25** needed for its implantation.

In the inside of the center-point sleeve **4** is placed the first drilling tube **5**, the lower end of which preceded by the drilling head **26** carried on the drilling shank **27**, follows the progression of the center-point sleeve **4** in driving.

In the annular space between the wall **12** of the center-point sleeve and the drilling tube **5**, are installed the conduit **28** for the injection of water under pressure and the conduit **29** for the extraction of drilling products.

The shaft-rig also comprises an implantation tool unit on the first drilling tube **5** (FIG. **6**).

This tool has three functions which are: the blocking of the end of the center-point sleeve **4**, the implantation of the first drilling tube **5**, and the recuperation of the shaft-rig when the sleeve **4** and the first drilling tube **5** are implanted and the drilling work finished.

This tool comprises three cylindrical bodies **31**, **32** and **33**.

The first body **31** is arranged to allow the evacuation of drilling sludge produced by the sleeve **4** and the drilling head **26**, at the same time.

The body is fixed by flanges and bolts on the same base as the shafts (FIG. **5**). Two toric joints are provided on the double flange of cavity B to ensure it is water tight.

This cavity B can be subjected to pressure so that it balances the force of the water pressure on the toric point of the head.

In the interior of the body, in the cavity A, are installed the water injection conduit **28** and extraction conduit **29**, as well as a purge conduit **34** which allows the evacuation of the residue when the center-point sleeve has been implanted, the first injections of concrete having been carried out, and the waterproofing has been ensured.

This purge conduit is also intended for the injection of the concrete into the annular space between the tube **5** and the sleeve **4** when the tube **5** has been implanted in its turn.

The first body **31** is surmounted by a suit intended for implantation of the first drilling tube **5**.

This unit is composed of three essential parts:

- a cylindrical frame **33** carrying the blocking handling clamps for tube **5**,
- the cylindrical body **32** which contains the tube **5**, and
- an air chamber **35** is intended to feed air from cylinder **32**. A drilling rod **27** passes through the unit and in case of leaks in the passages, the water proofing is ensured by instantaneous static joints.

The first drilling tube **5** is housed in the body **32**, it passes through clamp **36** and descends to the center of the sleeve **4** to the base of the latter (FIG. **3**).

Air pressure on the piston **37** (FIG. **6**) effects gradual driving of tube **5** and the protection of the boring head **26**.

This same piston **37** prevents all possibility of encroachment by water and drilling sludge into cavity E.

The head of water which enters the cavities A and D, namely all the space below the piston, is balanced by the air injected by pipe **38**.

A pneumatic pressure regulating device is connected to the conduit **39** and allows constant high pressure to be maintained inside the unit and at the same time regulates the head of water within the limits imposed for good progress of the boring operation.

The upper end of tube **5** is drilled with holes **40** intended for the evacuation of the drilling sludge and waste produced by the head **26**.

Through the undermining work of the head of the sleeve **4**, the tube **5** is held in place and steadied by clamp **36** in a position such as shown (FIG. **3**) namely, slightly behind the base of the sleeve **4**.

The drilling head **26** which is driven by a rotating table mounted above the tool unit inside the shafts, breaks down the central drilling-core cut out by the crown of tools **25** of the center-point sleeve **4**.

The broken-down products are evacuated by the extraction pump which sucks them out.

During the period of implantation by the center-point sleeve **4**, practically no drilling sludge will pass into the inside of tube **5**.

The level of the head of water is thus held at a minimum in order to allow an easier visual check on the workings through the port-holes provided for this purpose.

When the pivot **4** is implanted, its crown **24** (FIG. **5**) is in contact with the bed, at least buried in the surface sands, and the rotation of the shafts is stopped.

The injection of concrete into the outside of the sleeve **4** is then carried out by means of the holes **23** provided for this purpose.

These first injections are limited to the lateral part of the center-point sleeve and particularly in the upper part (on average two-thirds from the top) and under the support flange.

In this first stage concrete is not injected into the base of the sleeve since it would prematurely flow into the interior, itself, of the sleeve **4**.

When the first injections are finished and the concrete has set, the boring head **26** carries on the work. As the tube **5** progresses, it goes down into the drilling under the action of the thrust from compressed air fed on to the piston **37**.

When the tube **5** is in place, the drilling head **26** is drawn up again under the piston **37**.

With the aid of the purge conduit **34** and the extraction pump, the annular cavity between the tube **5** and the sleeve **4** is cleared of the sludge therein.

In the annular space the level is held below the lower diaphragm **30**. The concrete plug is poured in the annular space limited by the two diaphragms **30**, then for a last time, the residual mud accumulated at the base of the sleeve is evacuated.

As this moment, by conduits opening into the base of the center-point sleeve a large quantity of concrete is injected. In case of particularly soft terrain, concrete can be also injected by the purge conduit **34**.

When all work has been finished, the shaft-rig is implanted and held in place by the center-point sleeve.

The preparatory work to the boring operation is finished.

In terrain which is particularly soft the first boring tube **5** can be prolonged as required. But before all dismantling of the assembly of cylinder **32** allowing the "boring" to proceed, a very close check of exterior waterproofing of sleeve **4** must be carried out in order to avoid all possibility of the shafts being inundated a state which is no longer guaranteed by the cap unit on the head of the center-point sleeve.

For the implantation of the shaft-rig itself, the work can be carried out with the help of the floating workshop (FIG. **10**).

The floating workshop is essentially intended for the transport of material, for assembly and implantation of the shaft-rig on site, and is accordingly equipped.

This equipment fundamentally consists of a very powerful revolving table **41**, jointed in all azimuths, and with a gantry hoist **42**, especially designed for handling and positioning components on the axis of the table **41**.

The rotating table **41** is intended to drive units of shafting during implantation of the center-point sleeve **4**.

The fore end of the workshop vessel has a normal stem with a classic hull shape up to the beam. The stern half consists of two distinct hulls **43**, separated by an open space having a V-shape (FIG. **10**).

The space between these two hulls **43** forms a calm-belt and in this calm space the mounting and the implanting work of the shaft-rig are carried out.

The rotating table is mounted on four columns **44**, two of which are on each of the two hulls **43** of the vessels.

These columns **44** are both supports and guides for the vertical movement of the unit.

This vertical movement is ensured by jacks centered in the columns **44**.

The two beams **45** (FIG. **12**) allow longitudinal movement.

All the articulations are mounted on central rollers in order to eliminate all possibility of seizing and jamming.

The vertical axle of the table **41** passes through the center of gravity G of the vessel.

The introduction and the placing of the sleeves in the diagonally trussed well **41** is ensured by the gantry bridge **42** which is moved on roller tracks **47** in order to serve all the forward area of the vessel where the shaft-rig sleeves are stored.

The gantry bridge **42** and its operating cabin are of special design. The longitudinal and transversal translation are effected by two sprocket and chain units which allow all handling in a calm or rough sea.

In a variation of the embodiment, the implantation of the shaft-rigs is carried out by self-propulsion rotationally of the center-point sleeve, owing to two pairs of motor-driven propellers mounted on the base of the shafts (FIG. **1**).

In this case, the rotating table **41** no longer serves as a guide for the shaft casings. The mechanism is very

simplified since in this solution, the centering sleeve of the rotating table is provided with centering rollers on which the sleeves of the shaft-rig rests and rolls.

In another variation of the embodiment of the implantation of shaft-rigs, the center-point sleeve **4** is driven in rotation by the means of a worm drive **49** and **50** (FIG. **8**), thus producing a self-drilling shaft-rig. These last two types of implantation are particularly recommended in the case of medium and very great depths.

The general arrangement of self-drilling rigs are similar to those of the two first embodiments, given the need to balance the couple created by the gear and worm screw unit on the outside of the base of the rigs, the center-point sleeve must be stabilized by brakes. These brakes consist of two diametrically opposed paddles installed in such a way that they can be worked as required, from inside the shafts.

In this solution the entire tooling, intended both for recuperation of sludge and for the positioning of the first drilling tubes, is necessarily mobile in relation to the sleeve of the shafts which is fixed. The evacuation of sludge and all other products must thus be made first in this tooling and, next, the rotation of the center-point sleeve **4** is stopped and the drilling products accumulated in this space, are evacuated to the outside joining the part to be emptied with the evacuation orifice, provided with this in view, in the sleeve of the shaft-rig, by a hoop, the inlet and outlet being blocked by the working valves.

These three types of shaft-rigs have one point in common. Their whole is one sleeve which emerges on the surface. On the platform which caps this end, the classic drilling derrick can be positioned.

This solution can be retained in the case of slight depths, as the length of the jointed rods from the surface to the attack on the underwater bed are not prohibitive.

In the case of medium and very great depths, it is preferable to utilize a jacked bridge (FIG. **4**) installed inside the shafts.

The design of this handling gear allows the need for the libe ration of the center of the shafts to be omitted.

Similarly, the rotating table installed inside the shafts is conceived in such a way that it can also be omitted or put into the position for working in at least two different stages, on the one hand, above the tooling when implanting the center-point sleeve **4**, and, on the other hand, a little nearer the head of sleeve **4**, when the tooling is dismantled and replaced by that intended for the boring.

The placing of the jacked bridge can follow variations in gradient.

On the other hand, when the workshop vessel has carried out its work on the shaft rigs, it must be freed to carry out other implantations as this is an extremely costly unit and, therefore, its immobilization must be very short. Also, it is anticipated to replace this workshop ship with a pontoon workshop (FIG. **13**).

The workshop pontoon is equipped with all necessary gear for drilling and machines intended to feed the shafts by motive force (electricity, compressed air and hydraulic energy), it is provided with all kinds of required installations for the comfortable lodging of crews and drilling teams.

This pontoon would take the place of a workshop vessel. It must, as a unit in itself, support the sleeved shaft. Thus, its emerging part must be girdled with an articulated unit **51**in all azimuths, as the ship, but in which the driving of the shafts will be replaced by a simple sleeve with central rollers **52**. This sleeve and its outside support would be in two parts, joined by bolts in such a way as to be able to be mounted on the shaft sleeve of the shaft-rig by its traverse.

The vertical movement due to the tides and swells will be made directly on the sleeve of the shaft-rigs which serve the roller track by the central rollers **52**.

The pontoon is equipped with windlasses, fore and aft, handling winches and the necessary capstans for all operations at the same time, when being put into place and during all drilling work.

The end and side propellers **53** allow a stabilization of the whole unit and help to maintain the axis substantially in the center of gravity. It also permits the vessel's head to be held on to the swell.

As shown (FIG. **13** and **13***a*) this pontoon is in two jointed parts and flexibly held together by hinged joints.

When the collar of the shafts is engaged in the space reserved for it, the aft part of the pontoon swings about the axis **54** and closes and locks itself in the devices provided with this in view.

The transport, mooring and the lifting of anchors intended for staying the shaft-rigs is a very important work. Also in order to complete this installation, it is necessary to produce a tumbler (FIG. **14** and **9**).

The tumbler is a small boat specially designed and equipped for the transport, the casting, and weighing of anchors and buoys intended for staying shafts. It also allows the carrying out of the mooring of these buoys to shafts.

The tumbler is fundamentally composed of a hull consisting of two caissons **55**, joined together by a series of cradles **56**. Each cradle **56** supports a group consisting of one buoy and one kentledge **57**.

The whole is straddled by a toric bridge **58**, which moves on two roller-tracks **59**. This movement is carried out by casings, each end of which is provided with a brake **60** which allows an absolute blocking into place of the gantry bridge.

The movement of the bridge is ensured by a winch **61**, and the chain and sprocket assemblies **62**, **63** and **64**.

Each of these roller-tracks is provided with two or four mobile intermediary supports which are intended to support to the nearest extremities of the roller housings **66**, the tube, in order to ease the efforts due to lifting a kentledge **57**. These intermediary rests are blocked, as required, as is the deck of the vessel.

The gantry bridge is provided with such supports. These are arranged on the lower part of each housing **66** coming into contact with the points foreseen on the deck.

The entire frame work of the gantry contains the winches intended to handle the mooring and the weighing of kentledges and buoys.

The shafts of chains are arranged in each of the caissons which form the hull of the vessel.

Such an installation allows the implantation of underwater recuperable bases intended for the extraction

of petroleum and gas or any other products accumulated in the soil itself, or on the surface of the sea bed, by means of shaft-rigs open to the air.

These same shaft-rigs can be employed for the implantation of bases intended for the anchoring of support pylons, floating or fixed islands or all other maritime surface installations.

These shaft-rigs allow drilling crews to work at the bottom of the shaft head under conditions identical or similar to those encountered during land drillings. In fact, the work at the bottom is carried out in the open air, namely in all circumstances at atmospheric pressure.

When the drilling is finished, three hypotheses can be demonstrated: the drilling is unproductive (no product or non profitable products), the drilling permits a profitable exploitation where the shafts remain in place for the duration of the exploitation of the drilling. In the case where the drilling is unproductive, it is indispensable to immediately recuperate the whole of the installation apart from the center-point sleeve **4** which is implanted for good in the sea bed.

All the tools intended for drilling are dismantled. The head of the sleeve **1** is stripped of all accessories. It is then capped with a cylindrical chamber or a "nose-cap" which is connected to the base of the shaft-rig by a flange. This "nose-cap" carries a tool essentially consisting of a set of keys **68** which, passing through a stuffing-box and balanced by compression springs, mounted on bearings, can be operated from inside the shaft-rig.

These keys are intended to undo the bolts **69** which join the shafts to the center-point sleeve by means of flanges.

In order to carry out this dismantling operation, the water ballast tanks are filled up and, consequently, allow pressure to be transferred from one flange to the other.

When the screws are taken out, the water rushes into the cavity and the head of the sleeve. The force thus produced by the water on this free surface cooperates with the give of the water ballast to slacken off the base of the shaft from the head of the center-point sleeve.

Owing to the give provided by the water ballast, the shaft-rig is brought up again, sleeve by sleeve, and recuperated on the workshop vessel.

Re-equipped with a new center-point sleeve, it can them be put back into service again.

In the second case, where the drilling allows a profitable exploitation, the head of the center-point sleeve **4** is blocked up by a base plate **70**. On this base plate **70** is placed the drilling material and all its accessories. This unit is then held within a hermetic space consisting of a cylindrical chamber **71** closed by a cover provided with a valve and connected to the head of the center-point sleeve by studs.

The cover is provided with a valve and a manhole **73**.

The joints of the elements constituting the drilling material is made through the wall of the body **71** and the blocking off is ensured by the valves which can be remote-controlled.

The whole of the chamber **71** and of its cover **72** is capped in its turn by a second cylindrical chamber **67** connected to the bottom of the shafts, as indicated in the preceding case, which allows recuperation in this case.

In the second hypothesis, it would be necessary to periodically visit the drilling material. Thus a nacelle **74**, consisting of a unit, is foreseen: living space, water ballast tanks, such machinery to be capable of, at all times, being brought into equilibrium inside itself, with the environment in which it is found.

A living chamber **75**, specially arranged, allows several men to live there at normal atmospheric pressure for several hours or several days.

This nacelle which can be guided by remote control or connected to the surface by means of a cable, or be independent and piloted by its occupants, sits on top of the chamber **71** fitting to its cover **72** by centering on the studs and on the rim with the help of the volume in the water ballast tanks **76**.

A device of special nuts and studs allow it to be hermetically fixed on the head of the shaft.

An air purge clears water from cavities **77** and **78** at the same time.

When the nacelle is in place and the waterproof state has been verified, the plugs **79** and **73** are lifted out to give access to the drilling material.

When work is carried out, the plugs are replaced and the nacelle freed to rise back to the surface.

For particular reasons of exploitation, it can be used to maintain the whole shafts rig in place during the whole duration of the exploitation of the drilling which is carried out according to the third case envisaged above.

This method allows an easy access to the head of the shafts which remain in the open air.

In this case, the workshop ship must be freed and replaced by the workshop pontoon, foreseen with this in view.

When the exploitation is finished, it will be necessary to recuperate the shaft-rig. This operation can be performed according to the pro cess in the first case.

It is obvious that the invention is not limited by the example described and illustrated above, from which can be anticipated other forms and other methods of the embodiment without departing from the scope of the present invention.

What is claimed is:

1. Installation for laying an underwater, recoverable base for extracting by means of drilling means oil, gas or any other useful products available under the sea bed, by anchoring supporting masts, floating or fixed islands, or other surface offshore installations, which comprise: a recoverable well having means opening into the free atmosphere and having transverse dimensions sufficient to enable a gang of workmen to have access to the bottom of said well; drilling means for performing a drilling operation installed in the bottom of said well; a well base pivot permanently sinkable in the sea bottom bed; means for rotatably driving said base pivot about its longitudinal axis in order to sink same into the sea bed; and water-tight flexible connecting means disposed between said base pivot and said well to allow a slight inclination or oscillation of said well in relation to said base pivot.

2. Installation as set forth in claim **1**, wherein said water-tight flexible connecting means disposed between said base pivot and said well comprises a flexible membrane, a set of flanges one carried by said well and the other by said base pivot for gripping the edges of said membrane, and a presser cylinder and piston

units positioned to exert a pressure on the membrane portion lying inside said well and to react against a fixed point on said base pivot to balance the external pressure.

3. Installation as set forth in claim 1, wherein said means for rotatably driving said base pivot comprises propeller power units having horizontal axes and disposed externally and at spaced intervals about the periphery of said well.

4. Installation as set forth in claim 1, wherein said well comprises at its lower end a working chamber at atmospheric pressure and a double-walled body constituting a fluid-tight annular jacket receptive of a ballast material for compensating the Archimedean thrust.

5. Installation as set forth in claim 1, wherein said base pivot comprises a cylindrical body having a relatively thick wall, means defining channels extending longitudinally in said wall opening at one end into said body and at the other end to the outside of said body to permit the injection of concrete, a retaining bell for preventing the injected concrete from rising, a first drilling tube housed within said base pivot, a drilling rod and head unit housed in said first drilling tube, and at least one tube for injecting water under pressure and evacuating the drilling products disposed in the annular space bound and defined by the cylindrical body of said base pivot and said internal drilling tube.

6. Installation as set forth in claim 1, including at least a lower pivot pipe and an upper well pipe, and mechanical means assembling said pipes in an end to end relationship while allowing a slight oscillation of one pipe in relation to the other.

7. Installation as set forth in claim 6, wherein said mechanical means comprises a compressible bellows.

8. Installation as set forth in claim 6, wherein said mechanical means comprises a ball-joint, and sealing elements fitted in said ball-joint.

9. A partly reusable installation for extracting products from a sea bed comprising: a reusable well section having an elongated, hollow configuration and having sufficient interior transverse dimensions to enable workmen to pass through said well section from one end to the other end and positionable in a vertical disposition in the sea to communicate said one end with the atmosphere whereby the interior of said well section is at atmospheric pressure during use of the installation; a well base section having anchoring means responsive to rotation thereof for permanently anchoring said well base section in the sea bed; water-tight flexible connecting means releasably and flexibly connecting together said reusable well section and said well base section to enable relative movement therebetween; extracting apparatus disposed within said reusable well section at said other end thereof and extendable through said well base section into the sea bed to extract products from the sea bed; and drive means for rotationally driving said anchoring means to effect permanent anchorage of said well base section in the sea bed.

10. An installation according to claim 9; wherein said water-tight flexible connecting means includes means connecting said reusable well section and said well base section together for rotation as an integral unit; and wherein said drive means comprises a plurality of propellers connected in circumferentially spaced-apart relationship around the exterior of said reusable well section for effecting rotation thereof.

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