

Feb. 7, 1950

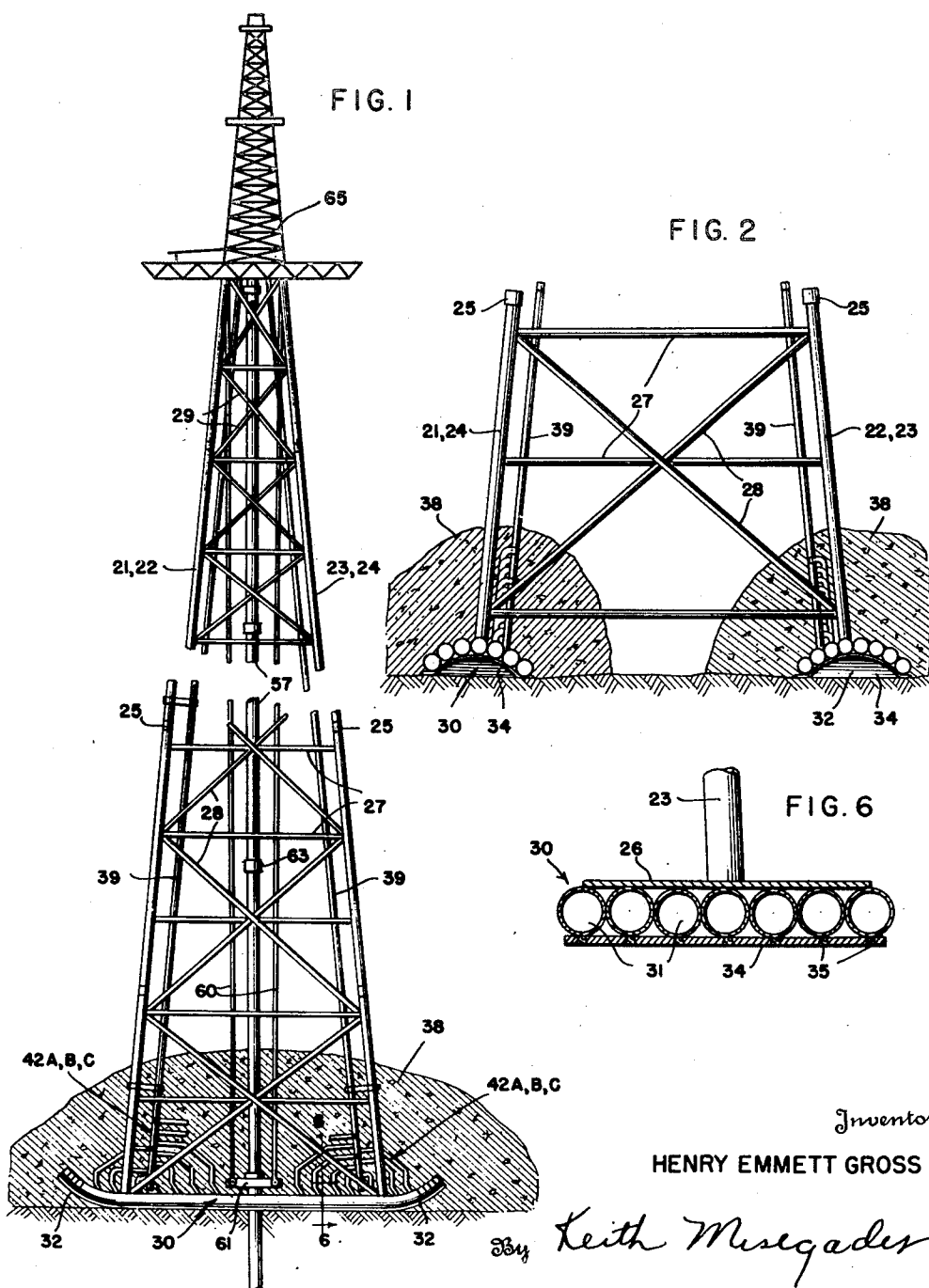
H. E. GROSS

2,496,532

PORTABLE MARINE FOUNDATION

Filed Oct. 21, 1944

3 Sheets-Sheet 1



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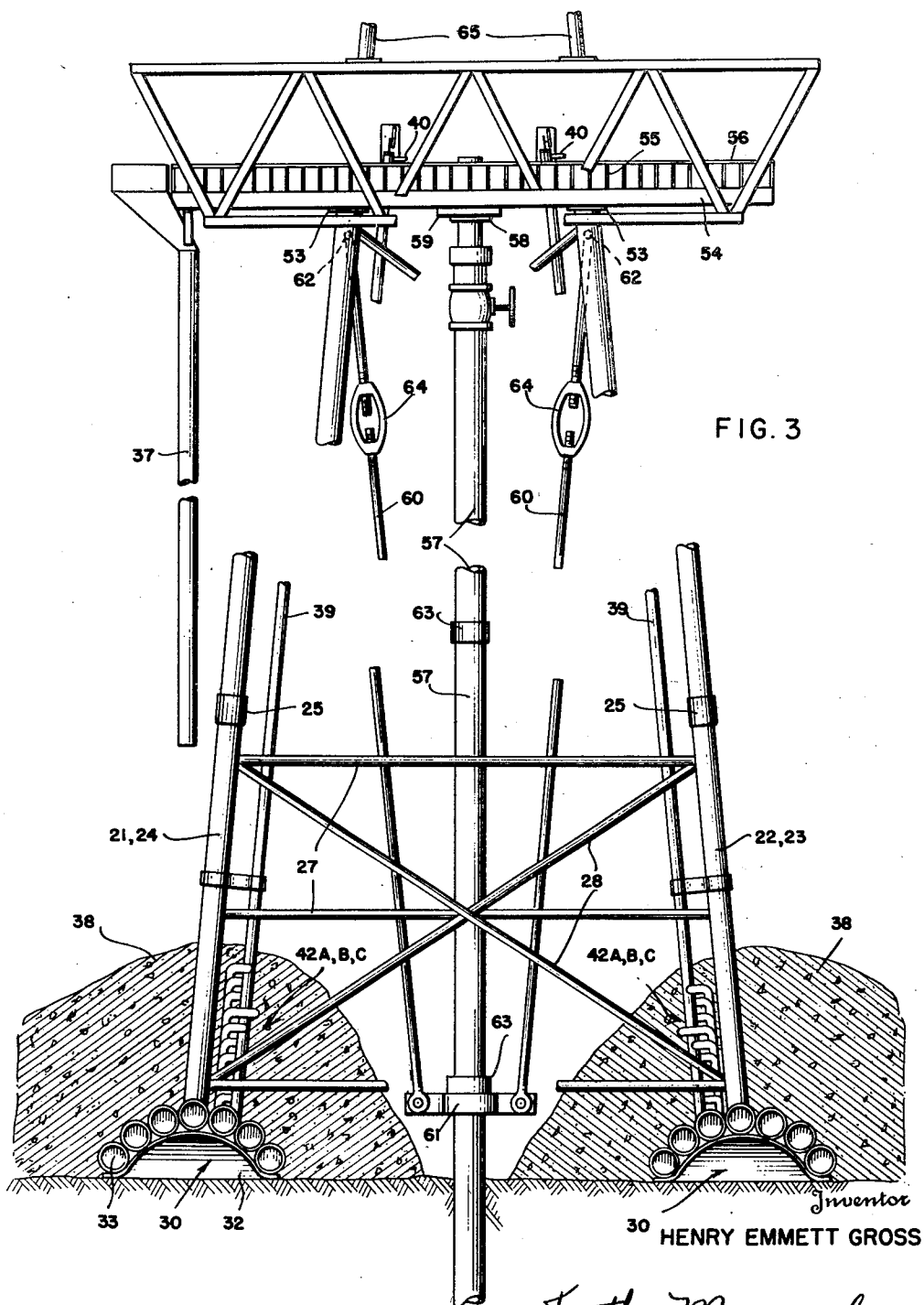
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3 Sheets-Sheet 2



Inventor
HENRY EMMETT GROSS

By *Leith Masegades*
Attorney

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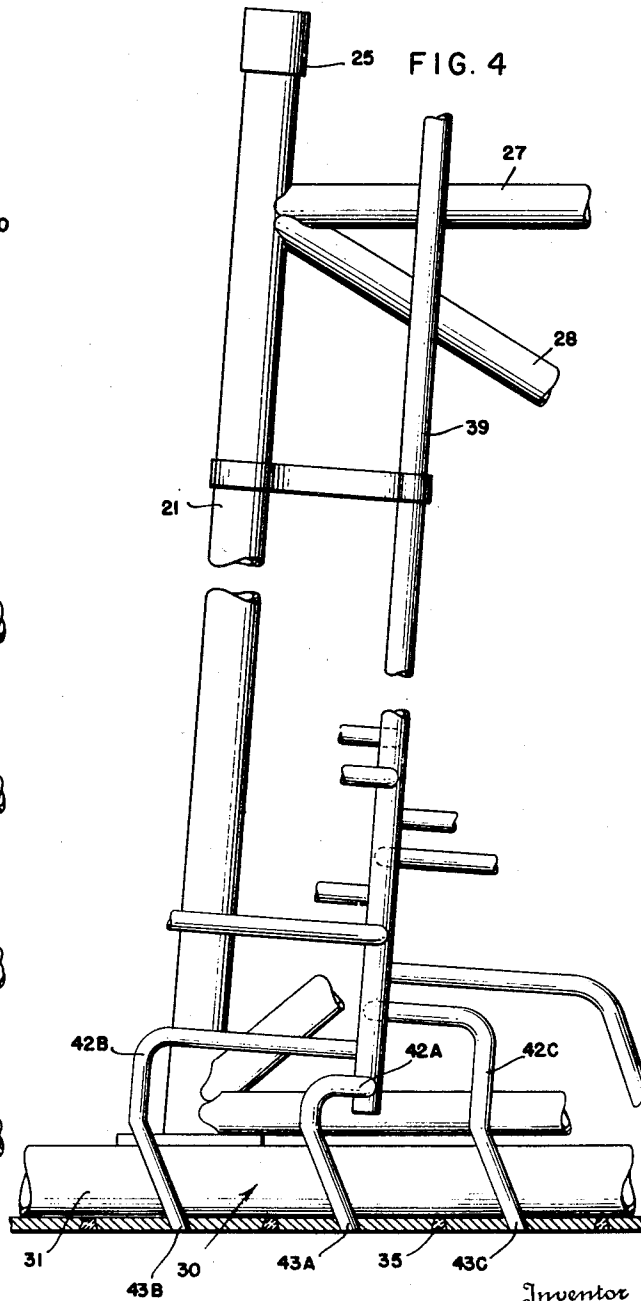
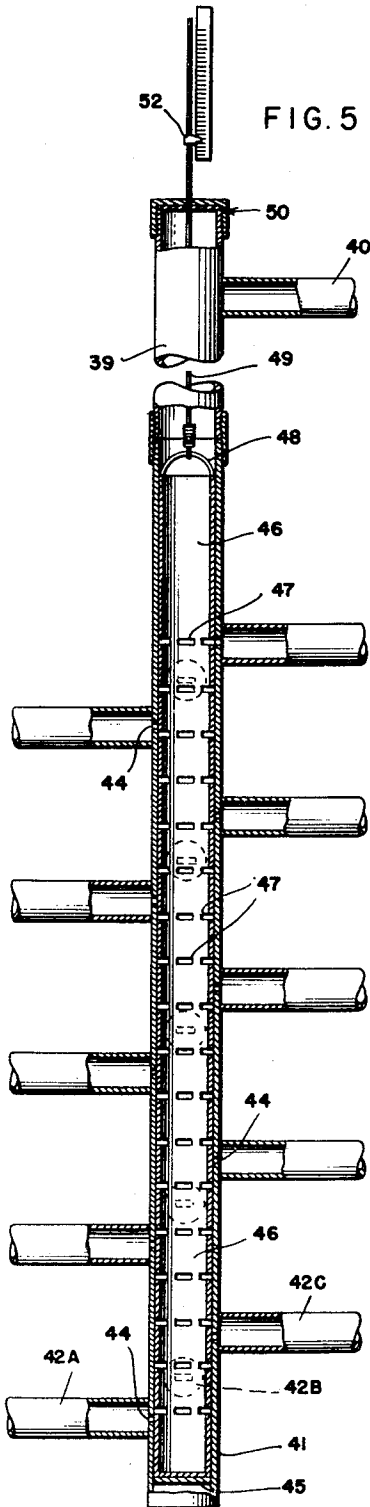
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PORTABLE MARINE FOUNDATION

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3 Sheets-Sheet 3



Inventor
HENRY EMMETT GROSS

By *Keith Muegades*
Attorney

UNITED STATES PATENT OFFICE

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PORTABLE MARINE FOUNDATION

Henry Emmett Gross, Chicago, Ill.

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6 Claims. (Cl. 61—46)

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This invention relates to a portable marine foundation and a method of anchoring it adaptable for use in moderately deep water where it is desired to at least partially assemble the foundation at a point remote from use. It is also contemplated that the structure shall be removable and reusable after it has served its purpose so that the expense of a permanent foundation will be avoided.

More particularly my invention includes improvements which are especially useful in conjunction with my inventions disclosed in my prior Patents 2,318,685, dated May 11, 1943; 2,236,682, dated April 1, 1941, and 2,326,353, dated August 10, 1943, although they are not confined to use therewith.

An object of my invention is to provide a low cost marine foundation which does not employ piles or caissons; which will be strong and stable, while imposing only a moderate weight on the sea floor so that it may be moved about on the bed of the ocean.

Another object of my invention is to provide a foundation capable of construction from a wide variety of alternate materials so that it may be constructed of such materials as may be most readily procured near the site of construction.

Another object of my invention is to provide a construction which may be easily put together or taken apart to simplify the construction or demounting of the structure.

My invention is particularly adaptable for use in the drilling of oil wells in water of moderate depth and for illustrative purposes will be described in connection with its use for that purpose.

The details in construction of a preferred form of my invention, together with other objects, will be better understood from the following description when read in connection with the accompanying drawings, which are chosen for illustrative purposes only and in which:

Figure 1 is a side elevation of a foundation made in accordance with this invention, and illustrates particularly its use as a foundation for oil well derricks and complete drilling equipment;

Figure 2 is a partial front elevation of the same foundation;

Figure 3 shows the foundation in more detail and in a more advanced stage of construction;

Figure 4 is a detail of the footing showing means for breaking the adhesion between the marine floor and the foundation;

Figure 5 is an enlarged detail of part of Figure 4; and

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Figure 6 is an enlarged detail of the skid on line 6—6 of Figure 1.

In general, the structure as built for oil well drilling, consists of a derrick-like foundation made up of buoyant uprights, advantageously of sealed lengths of hollow casing surrounding a hollow central conductor pipe all rigidly spaced apart by cross braces, which also may be hollow and buoyant. The uprights may be vertical and parallel or they may taper inwardly from the bottom upward in the manner commonly found in oil well derricks. In either case, the lower ends of the uprights are spaced apart sufficiently to give the entire structure a large bottom area, which area will be governed by the height to which the finished structure will be built.

It will be understood throughout this description that the central conductor pipe will be included in the structure only when its use is appropriate, as for example, in well drilling. When used for other purposes its use may not be essential and may be eliminated.

Hollow or other buoyant structural members are useful in constructing the foundation, section by section in the water and also serve to maintain the structure in vertical position in the water.

Referring to the drawings, the upright members 21, 22, 23 and 24 may well be formed of numerous sections of hollow casing, the adjacent ends of the sections being rigidly fastened together by means of the usual pipe joints 25 the joints being welded to lend additional rigidity as well as to assure a watertight joint. As an additional means of keeping the structure buoyant, there may be inserted plates 26 welded across the tubing to produce large numbers of watertight compartments. The horizontal and diagonal cross bracing members 27 and 28 may be constructed of the same hollow pipe, the ends thereof being carefully precut to abut the other members firmly for support, and in order to yield a watertight welded joint. Other smaller braces 29 may more conveniently be made of solid rod, in which case the rods are split longitudinally, heated and bent to shape around the larger members and then firmly welded in position. Proper selection of hollow and solid members enables the relative buoyancy of various sections of the foundation to be controlled quite precisely.

It is not to be understood that the invention is to be limited to metallic construction. For relatively shallow and more or less temporary foundations, wood may prove more economical. To the same end, second-hand metallic tubing may be employed so long as it is watertight. Whether

wood, all hollow metal or part hollow, part solid metal construction is employed, a proper balance of buoyance must be maintained.

It is contemplated, of course, that the operating location of the foundation will have been previously determined and the depth and wave conditions at the point will have been determined. The condition of the marine floor whether firm or soft and its relative evenness all must be considered in order to properly determine the size of base necessary to support a foundation of the height required.

The base 30 is preferably constructed of numerous lengths of hollow tubing 31, upturned at the ends 32 and sealed with plates 33 in like manner to plates 26. If extensive wear from dragging on the marine floor is expected an additional plate 34 may be welded at points 35 to the underside of the skid. In order to spread the load under the legs of the foundation, plates 26 are welded to the upper side of the skids and the legs are in turn welded thereto, thereby uniting the whole structure firmly. This style of structure is more extensively disclosed in my Patent 2,236,682 to which reference is to be had for the details thereof.

As indicated in my Patent 2,236,682, the skids and lowermost portion of the foundation are preferably constructed on the shore of the body of water where the foundation is to be used. After the first section has been launched and towed into the water in the direction of its point of use until a relatively small portion thereof remains above water, an additional section is welded in place above the lowermost portion. This process is repeated after the foundation has been towed further into the water until it reaches the desired height at the desired location. In general, it is desired to maintain a slight positive buoyancy in order to permit ease of moving the structure through the water. This is brought about by carefully engineered proportioning of the structural members as pointed out in my Patent 2,236,682.

In order to prevent movement of the foundation after it has been located at the desired spot, and to prevent overturn in rough weather I have provided a means for weighting the structure. Herein my present invention differs markedly from that disclosed in my previous patents. When the foundation is located at the point desired, I conduct loose aggregate such as sand and gravel to the base of the foundation by means of a tremie pipe 37 so as to cover the skids with a bed of the loose material as shown at 38. It is contemplated that for ordinary operations, deposition of the loose material, should continue until a depth of about 10 feet is reached with the material being allowed to assume its natural angle of repose in the water. A mixture of sand and gravel is usually the most readily obtainable satisfactory material for the purpose.

As indicated previously, one of the advantages of my invention is the ease with which it may be moved from place to place when so desired. In order to dislodge the attachment to the marine floor brought about by the gravel beds 38, I provide auxiliary apparatus designed to bring this about. Running down closely adjacent one or more of the main upright members 21, etc. is the pipe 39 provided at the top, in close proximity to the working platform with a fluid inlet 40. From the lowermost section 41 of pipe 39 a series of connecting pipes 42a, b, c, . . . radiate out closely adjacent the skid base 30 to spaced points

42a, b, c, . . . along the underside thereof. Appropriate provision is made to support pipe 39 and pipes 42a, b, c, . . . on the principal members of the structure against possible dislodgement by the elements or rough handling.

The lowermost section of the pipe terminates in a straight casing 41 to which the pipes 42a, b, c, . . . are connected at evenly spaced points as by flush welding. Fluid connection is established by means of relatively narrow ports 44, extending circumferentially about casing 41, the width of pipes 42. The lower end of casing 41 is closed by plate 45. Within the casing 41, is a hollow piston 46 open at both ends, closely fitting the casing and free to move up and down therein. Circumferential slot-like ports 47 extending the length of the piston register circumferentially with the casing ports 44, but their distribution lengthwise although regularly spaced, is less by one than the casing ports so that at any one time there can be but one of the piston ports in coincidence with one of the casing ports while all the rest will be substantially cut off. By employment of this vernier principle it is possible to direct substantially the entire flow of fluid in the main pipe 39 through each of the connecting pipes 42a, b, c, . . . in series to the corresponding outlets 43a, b, c, . . . and thus expend the full energy of the whole stream at each outlet in turn.

The piston 46 is provided with a bail 48 by which wire 49 extending the length of the pipe 39 out through stuffing box 50 may be pulled to operate the vernier valve. A scale fixed to a portion of the frame and an index 52 fixed to the wire indicate the particular port and outlet in operation relationship.

Operation of the valve and jet system is effective to break the adhesion of the skids to the marine floor. A substantial portion of the overlying bed may be removed by conventional dredging devices such as orange peel buckets or the like.

The upper portion of the foundation may be completed with cap plates 53, sills 54, stringers 55 and decking 56. Upon the surface thereof, the desired operations may take place. If the operation contemplated is well-drilling a conductor pipe 57 is usually driven first, well into the marine floor. When this has been driven home, it may be used to support a substantial portion of the weight on the platform by means of a bed plate 58 fastened on the top thereof and supporting some of the stringers 55 through auxiliary sills 59.

The conductor pipe 57 may also be employed to improve the resistance of the foundation to overturn by means of tie-rods 60. These are secured to a casing clamp 61 near the marine floor and to the corners of the foundation by means of pins 62 passing through the columns 21, 22, 23, and 24. The casing clamp is prevented from riding up the pipe 57 by fastening below one of the couplings 63. Tension is applied to the rods 60 by means of turnbuckles 64. When a load is to be suspended from superstructure 65 erected upon the deck 56, as for example, when a string of casing is being run, it is desirable to loosen the turnbuckles. When the load is removed, the turnbuckles may again be tightened.

It is to be understood, although I have set forth the basic principles underlying my invention, that it admits of many minor variations within its scope. Besides, it is obvious, since conditions of

nature are to be dealt with, that an extensive application of sound engineering is always necessary to adapt the conditions of nature which happen to be encountered in each case.

I claim:

1. A portable marine foundation comprising a plurality of rigid water buoyant structural members of skeleton formation superimposed one upon another rigidly secured together, a broad, generally flat-bottomed skid rigidly secured to the lowermost section, adapted to facilitate movement of the structure across the marine floor and also adapted to serve as a base for said structure, a bed of loose particulate material overlying said skid for preventing movement of said foundation, a fluid conducting line extending from an upper part of the foundation to a point near the skid, a multiple port, distributing valve in said line, a series of lines leading from the discharge ports of said valve to spaced jets along the edge of said skid and remote control operating means for actuating the distributing valve to selectively supply fluid from the main line to one or more of the jet feed lines.

2. A method of utilizing a portable marine foundation made up of a skeleton framework and a skid-like base, said foundation varying between slight positive and negative buoyancy which comprises moving said foundation about from place to place by dragging it over the marine floor, anchoring it by depositing upon the upper surface of the skid, a bed of loose particulate material and preparing it for movement again by displacing substantial amounts of the bed of particulate material and by breaking up the bed along the edge of the skid by streams of high pressure fluid.

3. A method of utilizing a portable marine foundation made up of a skeleton framework and a skid-like base, said foundation varying between slight positive and negative buoyancy which comprises moving said foundation about from place to place by dragging it over the marine floor, anchoring it by depositing upon the upper surface of the skid, a bed of loose particulate material and preparing it for movement again by dredging the main body of the bed of particulate material and breaking the attachment of the bed to the marine floor by directing streams of high pressure fluid into the bed along the edge of the skid.

4. A marine foundation for well drilling comprising a plurality of spaced, sealed, gas-filled upright leg members, a greater plurality of spaced, sealed, gas-filled cross-bar members rigidly secured to said leg members, all of said members forming a rigid, buoyant structure, a conductor

pipe centrally placed within said structure extending into and embedded in the subterranean formation, a collar secured to said conductor pipe beneath the surface of the water near the marine floor and adjustable tension members securing the collar to the upper part of the structure.

5. A portable marine foundation comprising a plurality of rigid water buoyant structural members of skeleton formation superimposed one on another and rigidly secured together, a broad, generally flat-bottomed skid secured to the lowermost portion of the foundation adapted to serve as a base for the foundation and also adapted to facilitate movement of the foundation across the marine floor, a conductor pipe located within the framework of the foundation and extending from a point above the water level to the marine floor and embedded in the subterranean formation, a collar attached to the pipe near the entrance of the pipe into the floor and adjustable tension members extending from the collar to the upper part of the foundation structure.

6. A portable marine foundation comprising a plurality of rigid water buoyant structural members of skeleton formation superimposed one on another and rigidly secured together, a broad, generally flat-bottomed skid secured to the lowermost portion of the foundation adapted to serve as a base for and also adapted to facilitate movement of the foundation across the marine floor, a conductor pipe located within the framework of the foundation and extending from a point above the water level to the marine floor and embedded in the subterranean formation, a collar attached to the pipe near the entrance of the pipe into the floor and adjustable tension members extending from the collar to points in upper part of the foundation structure above the water level, the adjustable section of the tension members being also located above the normal water level.

HENRY EMMETT GROSS.

REFERENCES CITED

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

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2,236,682	Gross	Apr. 1, 1941
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2,320,905	Bateholts	June 1, 1943

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Number	Country	Date
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