

976,376.

Patented Nov. 22, 1910.
 3 SHEETS—SHEET 1.

FIG. 1.

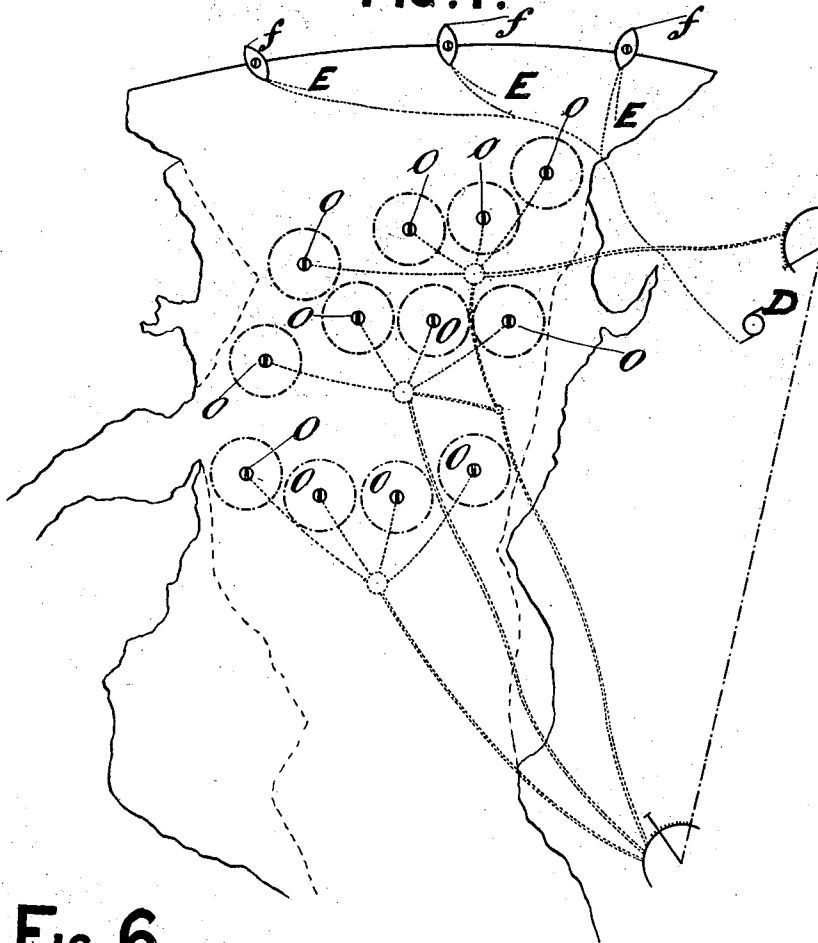


FIG. 6.

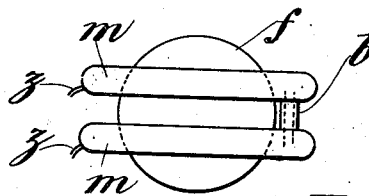
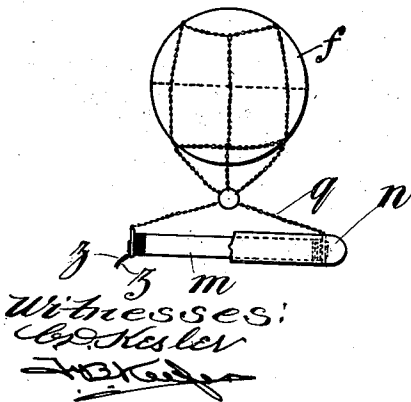


FIG. 7.

Inventor
 Howard Lacy
[Signature]
 James L. Norris
[Signature]

[Signature]

976,376.

Patented Nov. 22, 1910.

3 SHEETS—SHEET 2.

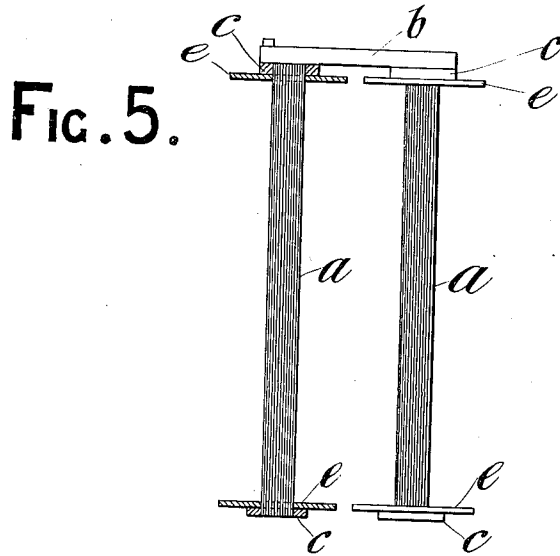


FIG. 3.

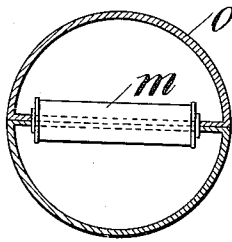
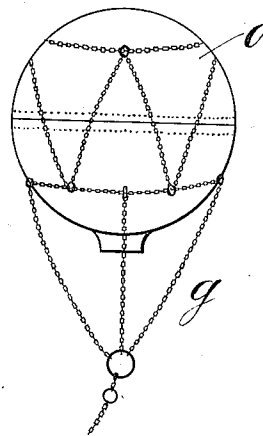


FIG. 2.



Witnesses:
C. D. Hester
J. B. Keefe



Inventor
Howard Lacy
 By
James L. Norris

Atty

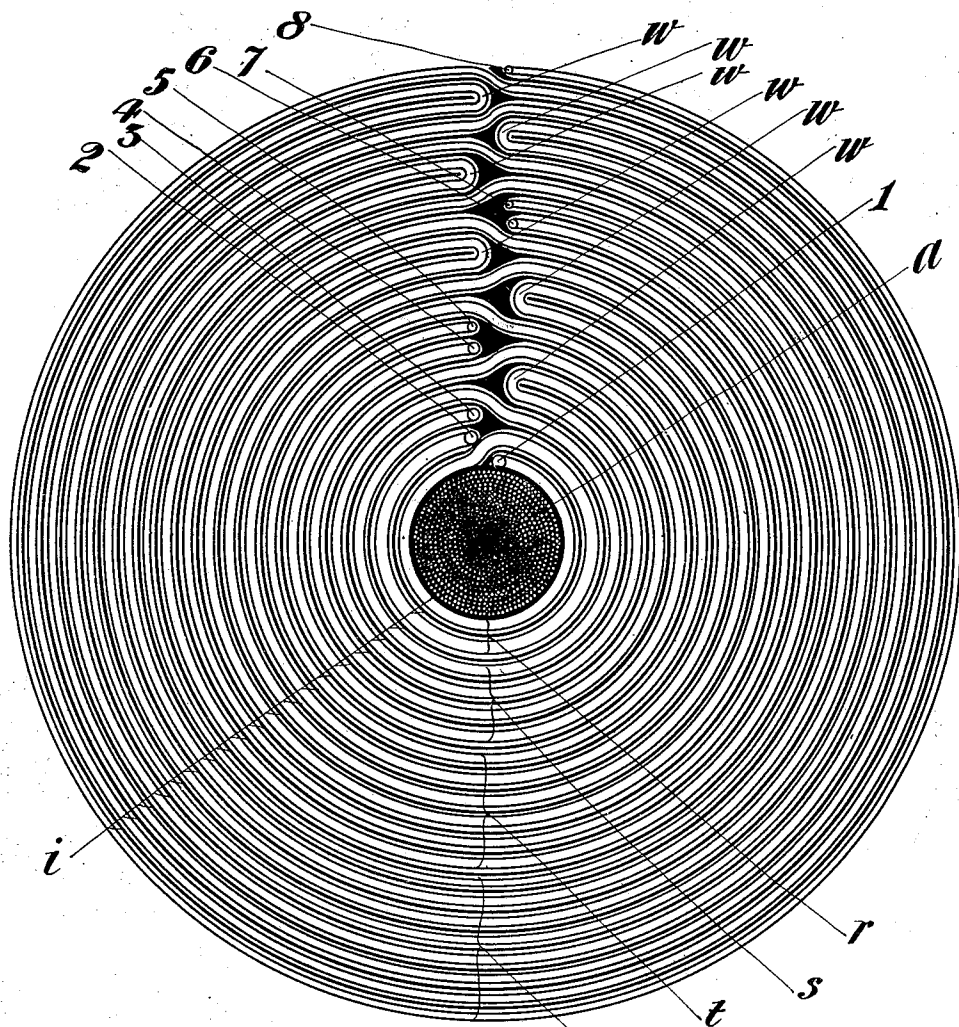
H. LACY.
 FLOATING MINE AND THE LIKE.
 APPLICATION FILED JULY 26, 1907.

976,376.

Patented Nov. 22, 1910.

3 SHEETS-SHEET 3.

FIG. 4.



Witnesses:

Chas. Nesler
James L. Norris

Inventor
Howard Lacy

James L. Norris
Atty

UNITED STATES PATENT OFFICE.

HOWARD LACY, OF CARSHALTON, ENGLAND.

FLOATING MINE AND THE LIKE.

976,376.

Specification of Letters Patent.

Patented Nov. 22, 1910.

Application filed July 26, 1907. Serial No. 385,750.

To all whom it may concern:

Be it known that I, HOWARD LACY, a subject of the King of Great Britain, residing at Kelvin, Camden Road, Carshalton, in the county of Surrey, England, engineer, have invented certain new and useful Improvements in Floating Mines and the Like, of which the following is a specification.

This invention relates to floating mines and the like devices for the defense of harbors and other places.

According to my invention use is made of the attractive force inherent in large masses of iron or steel for the magnetic field of a magnet located in a floating body fixed within a certain range of movement, the extent of the movement being determined by a chain attached to a mooring, or otherwise. This chain or mooring connection in the case of a mine to be exploded by wire conducts may serve as a support therefor. The floating body carries the explosive charge and in the case of a contact explosion mine also the contact devices.

The purpose of the electro-magnets of high power attached to floats or buoys is to effect the derangement of the working or disablement of working utility of the parts of an adversary's vessel, for instance the small parts of the engines, pumps, guns, valve motions and other more delicate machinery apt to be disabled by the magnetic action set up; as well as by affecting the compass needles of the adversary's ship to confuse all reckoning and destroy all points for guidance—advantage being taken for the purpose of the fact whereby the magnetic force available is so much more powerful in water than in air.

The floating submarine mine provided, as prescribed herein, when subjected to the attractive force of an oncoming mass of metal, such as a battle ship or cruiser, has a powerful tendency to be drawn toward the mass and as far as its mooring will permit it to travel in that direction, and the mass on-coming acting as its armature causes a powerful excitation to be set up throughout the field created, with disastrous effect to such destructible parts of the machinery etcetera referred to. When electromagnets are attached to the mines the attractive force of the mass of the on-coming vessel exercised upon the floating body draws the mine into contact if within the range of the mooring connection and brings about collision be-

tween the two with consequent explosion in the case of contact mines; or, in the case of observation mines the moment of explosion will be determined by usual means, employed for that purpose, and the effect brought about in the ordinary manner, but with the greater efficiency and certainty of destructive action arising from the closer proximity or actual contact secured.

This system of constructing and operating floating magnetic structures, of the kind referred to, renders the use of contact mines more efficient and reliable at a much reduced cost owing to the enhanced area covered and protected by the floating magnetic structure and the feature that it has not merely to lie idle until struck by the vessel of the adversary, but it goes to meet such vessel within the range of the mooring connection. Such a floating magnetic structure could be operated from a boat (which would be of wood or diamagnetic material for obvious reasons) either by conducting mains or otherwise, but its value as a floating magnet inimical to all delicate or assailable portions of the machinery or instruments on the vessel approaching remains a constant menace apart from any means for causing vehement explosion.

Figure 1 in the accompanying drawings shows a diagram indicating an entrance to a harbor protected by a field of magnetic mines of the kind referred to; and a curved line of floating magnets *f, f, f*, of high intensity at the entrance to the harbor, also observation stations provided with usual appliances for determining the appropriate moment for bringing about explosion of the mines and effecting the firing contacts accordingly at the proper places, the drawing being to a greatly reduced scale. Fig. 2 shows one of the mines in elevation with portions of the chain mooring *g*. Fig. 3 is a section of a mine case *o* such as that indicated in Fig. 2 showing the magnet *m* mounted within the mine. Fig. 4 shows to a much enlarged scale a diagrammatic projection of the helix with its graduations, *r, s, t, u*, of thickness of wire and reverses of direction of winding at *w, w*. Fig. 5 shows a core *a* for such a magnet separate; with its spreaders *c, c*, and diamagnetic plates *e, e*, in contact with the backs of the spreaders. Fig. 6 shows one of the buoys or floats with an electromagnet *m*, suspended therefrom by chains *q* and covered by a water-

proof casing n the left hand half of the casing being in this figure broken away to expose the helix. Fig. 7 is an external underside view of Fig. 6. In these Figs. 6 and 7 the ends and beginnings of the windings are gathered up into two mains $z z$.

The electromagnet employed is constructed as follows:—The core a is made of bunches of soft wrought iron wires cut into even lengths and clamped on the ends of the poles by spreaders c of twice the diameter of the bundle a it is placed upon. This clamping should be done so firmly as to bring the spreaders c and the wires a at the ends into the closest possible contact. The core is constructed of soft wrought iron wire cut into even lengths straight and thoroughly cleaned.

The diamagnetic plates $e e$ are of such material as copper, brass, aluminium or the like and are slipped on over the mass of iron wire a before the shrinking on of the last spreader c of a core takes place. These plates e are for the double purpose of (in a mechanical sense) holding the helix surrounding the core and (in an electromagnetic sense) to aid in concentrating the force lines caused by the vibration of the currents around the spreaders.

Winding of the helix.—Having thoroughly insulated the core a the spools of the magnet are wound in layers, each layer of winding being carefully and efficiently insulated at i, i, i from the layer above and the layer below it, the size of winding wire furthermore being varied as to its thickness—the layer or layers next adjacent to the core a being formed of heavier wire than those superimposed thereon. The component wire for each successive set r, s, t or u of layers of winding wire extending from core to circumference of the helix is of diminished thickness and the thickness of wire for each set of layers r, s, t or u is so graduated as to bring in sufficient resistance at each change of thickness of wire without producing any excessive retardation of current, the outermost layers here marked u being necessarily those of the finest grade. The wires of the respective windings s, t , and u are reversed at w, w as regards the direction of their winding at the end of every second layer, the direction of winding of the two first layers have been determined and arranged say, in that direction known as clockwise and the next two layers in the opposite or contra-clockwise direction and so on alternately. Thus with two layers of the heaviest size r of wire superimposed on each other next to the core a then four layers of reduced size of wire s , then six layers of

thinner wire t , then eight layers of still thinner wire u and so on diminishing the thickness of the wire used while at the same time increasing the number of layers of each particular size of wire, care being taken to thoroughly insulate each layer of winding from its neighbor as already prescribed and indicated at i, i, i .

The beginnings 1, 3, 5, 7, and endings, 2, 4, 6, 8, of each of the different sized insulated high conducting wire forming the helix are all brought out through holes in one of the diamagnetic plates e at one end of the magnet to enable combinations to be made say as follows:—series; multiple; series multiple; multiple series; multiple-series-series-multiple; all series multiple; all multiple; shunt series; shunt multiple; shunt-multiple-series; shunt-series-multiple, and so on; the more wires the more combinations so that the electro-magnetic field can be adjusted to be effectively increased according to the electric current produced and utilized from a suitable source of supply.

D in the drawing represents diagrammatically a dynamo which serves as a source of electrical power to energize the magnets of the several mines.

E in the drawing indicates the earth connections for the row of floating magnets f arranged at the entrance to the harbor.

I claim—

1. The combination of a floating mine comprising a casing to contain the explosive agents, and an electro-magnet carried interiorly of said mine casing and adapted when energized to magnetize said casing and to cooperate with a metallic portion of a vessel acting as an armature whereby the mine casing is attracted into contact with said vessel.

2. The combination with a floating mine, of a single electro-magnet carried interiorly of said mine and connected to a suitable source of energy, groups of windings upon said magnet adapted to be connected up in different combinations to vary the strength of the magnet, and a mine casing adapted to be magnetized by said magnet and to cooperate with the metallic parts of a vessel acting as armatures whereby the casing may be attracted into direct contact with said vessel with a force dependent upon the degree of magnetization of said casing.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HOWARD LACY.

Witnesses:

ALFRED GEORGE BROOKES,
JOHN COOKE ROWE.