(No Model.) 6 Sheets—Sheet 1.

W. THOMSON.

NAVIGATIONAL SOUNDING APPARATUS.

No. 352,589. Patented Nov. 16, 1886.

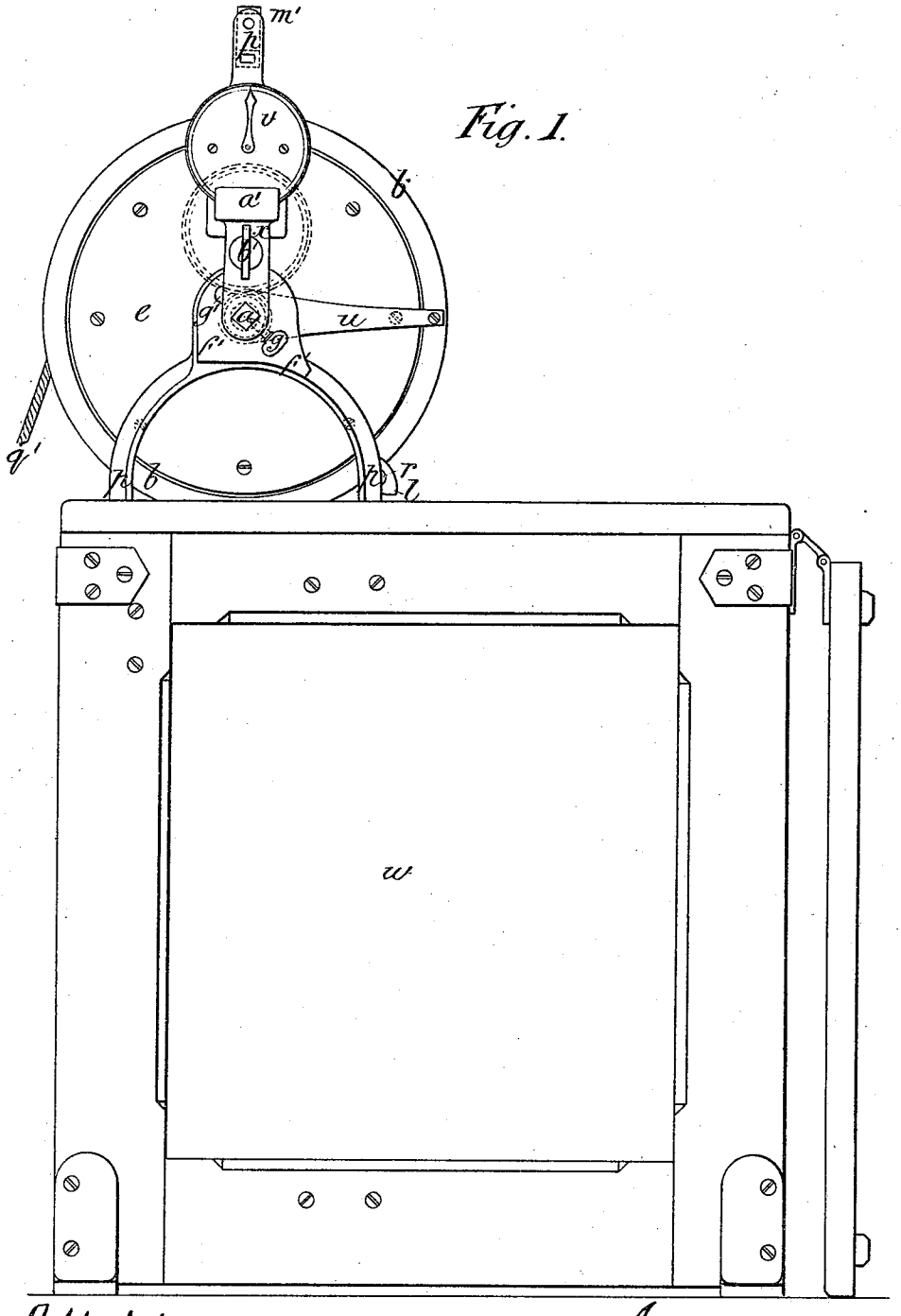


Fig. 1.

Attest:
F. A. Hopkins.
Geo. L. Wheelock.

Inventor:
William Thomson
By Knight Bros
attys

N. PETERS. Photo-Lithographer, Washington, D. C.

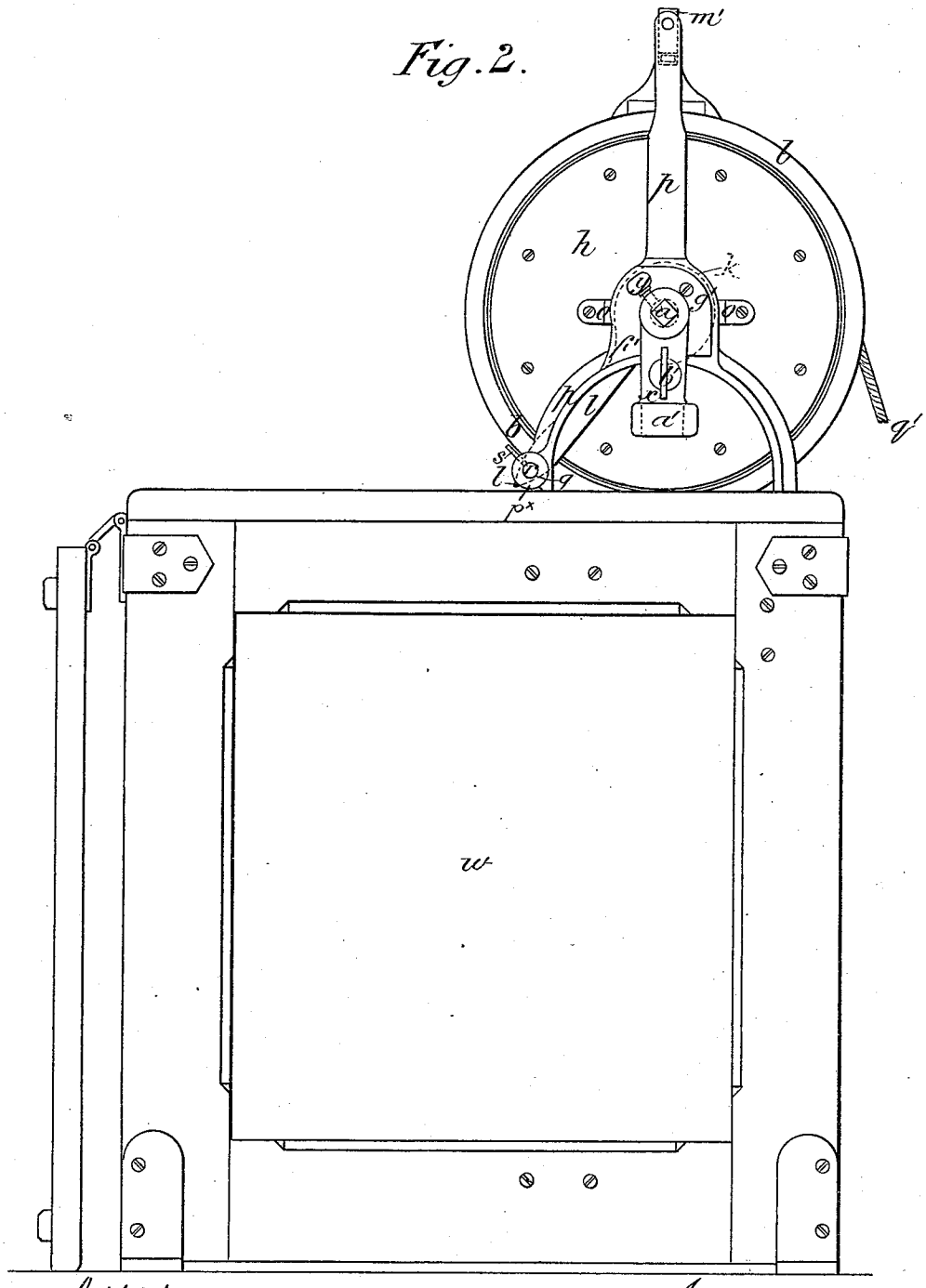
(No Model.) 6 Sheets—Sheet 2.

W. THOMSON.

NAVIGATIONAL SOUNDING APPARATUS.

No. 352,589. Patented Nov. 16, 1886.

Fig. 2.



Attest:
F. A. Hopkins
Geo. L. Wheelock

Inventor:
William Thomson
By Knight Bros
Atty's.

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.)

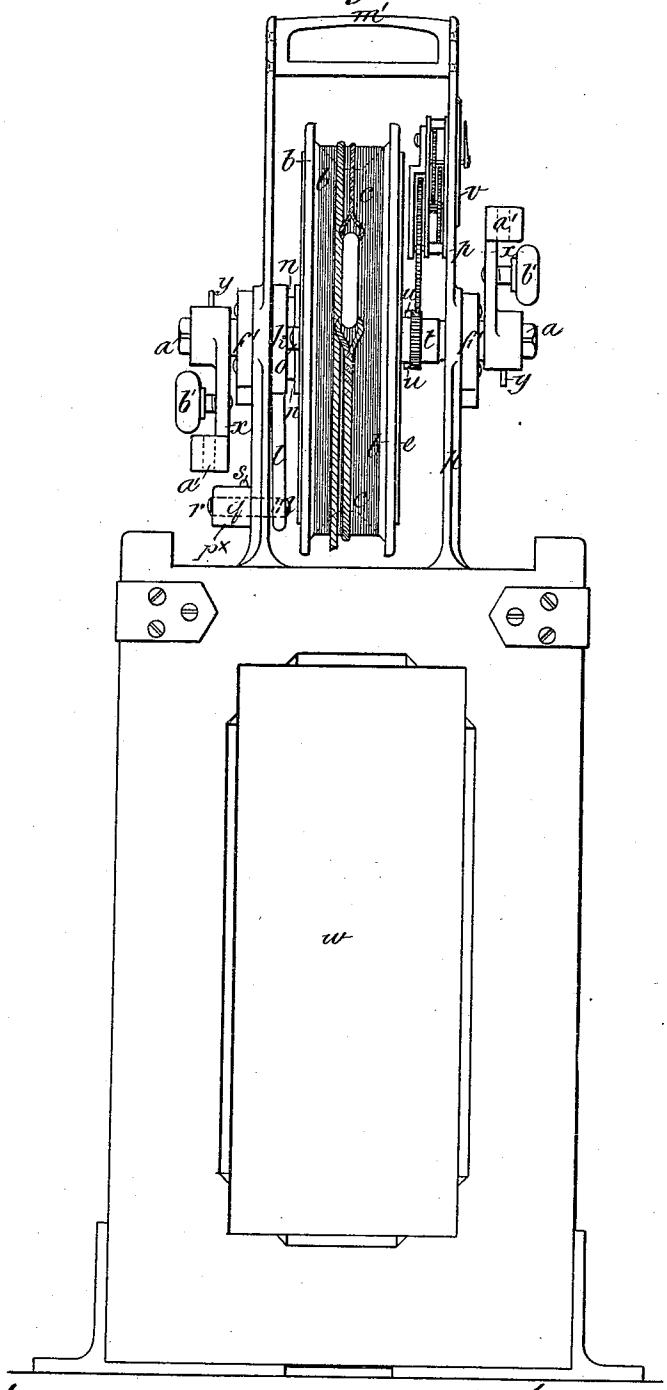
6 Sheets—Sheet 3.

W. THOMSON.

NAVIGATIONAL SOUNDING APPARATUS.

No. 352,589. Patented Nov. 16, 1886.

Fig. 3.



Attest:
F. A. Hopkins.
Geo. L. Wheelock

Inventor:
William Thomson
By Knight Bros
attys.

N. PETERS. Photo-Lithographer, Washington, D. C.

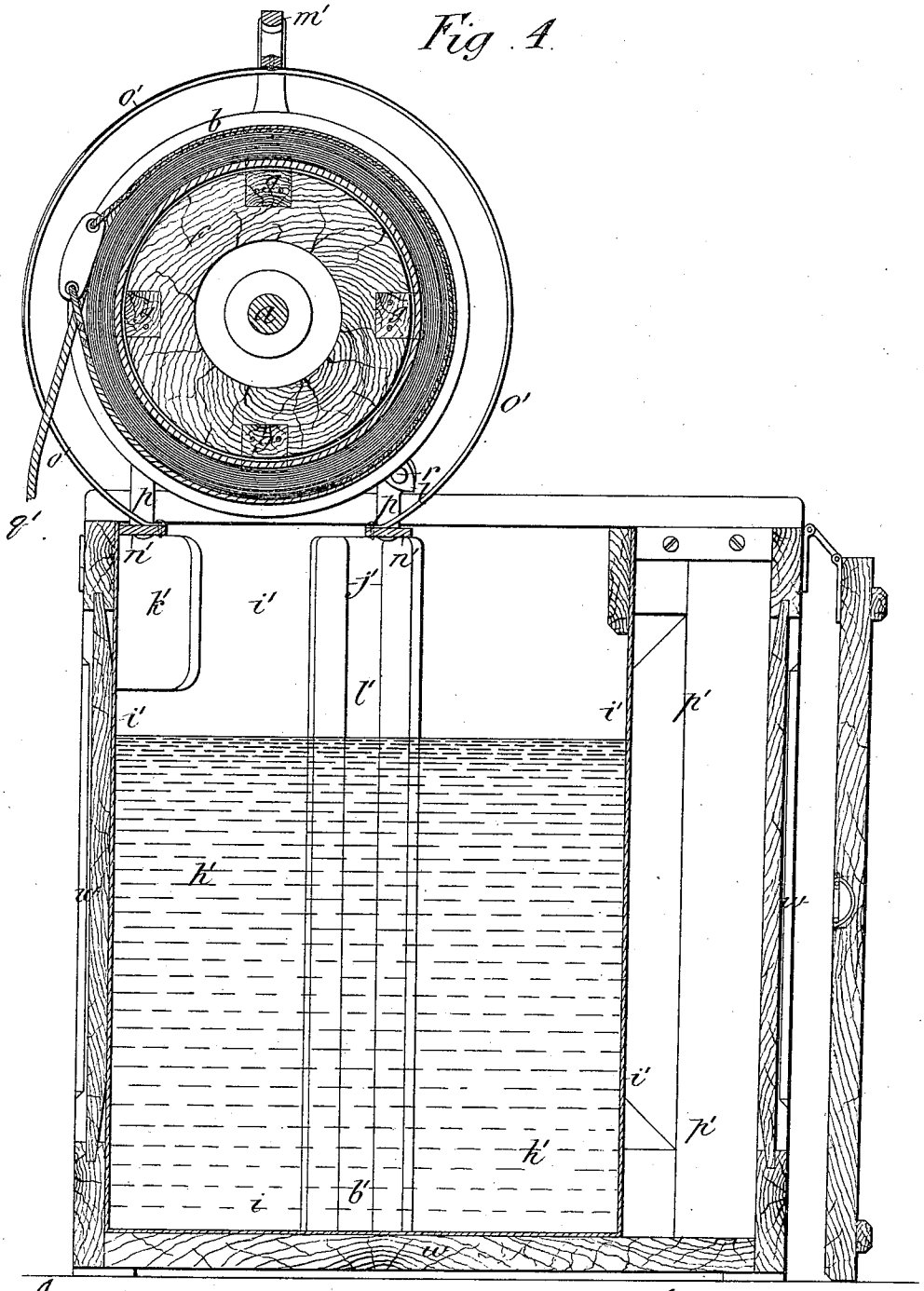
(No Model.) 6 Sheets—Sheet 4.

W. THOMSON.

NAVIGATIONAL SOUNDING APPARATUS.

No. 352,589. Patented Nov. 16, 1886.

Fig. 4.



Attest:
F. A. Hopkins
Geo. L. Wheelock

Inventor:
William Thomson.
By Dwight Bros
Attys

N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.) 6 Sheets—Sheet 5.

W. THOMSON.

NAVIGATIONAL SOUNDING APPARATUS.

No. 352,589. Patented Nov. 16, 1886.

Fig. 5.

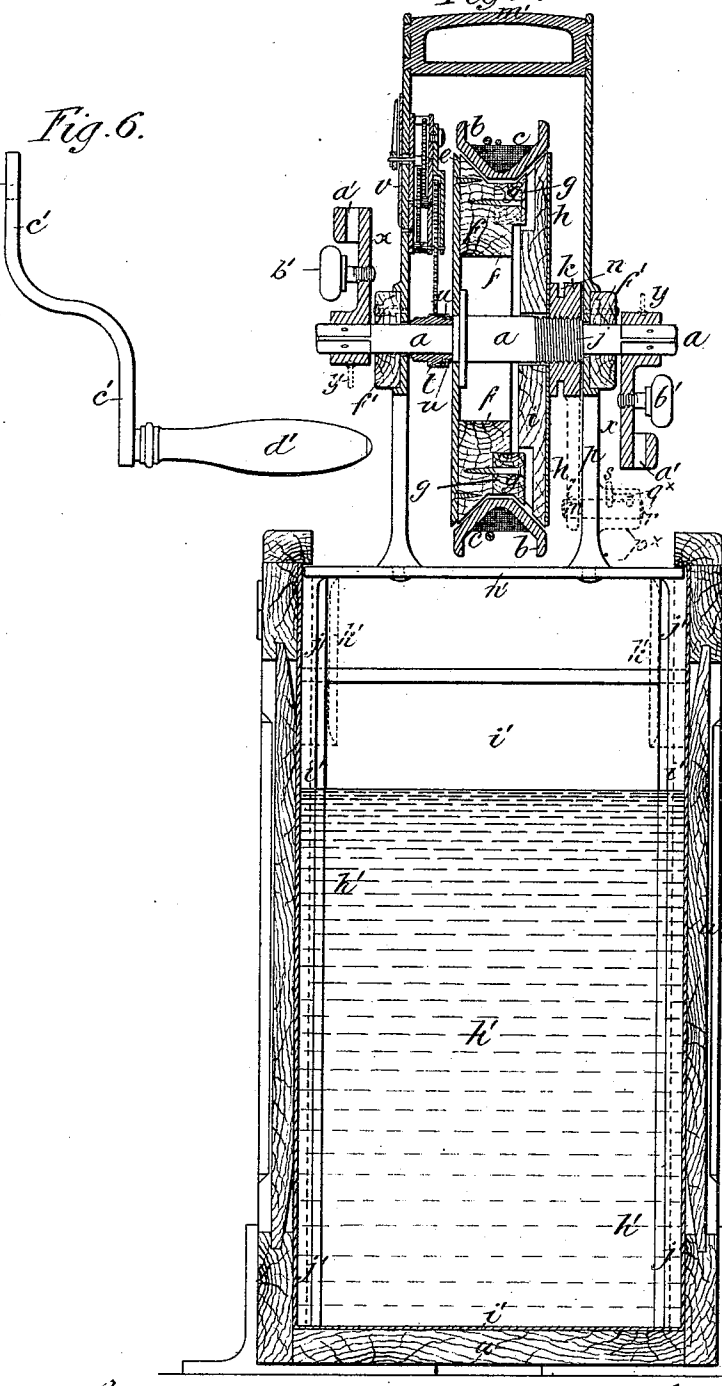


Fig. 6.

Fig. 7.



Attest:
F. A. Hopkins,
Geo. L. Wheelock

Inventor:
William Thomson
By Knight Bros
Atty's.

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 6 Sheets—Sheet 6.

W. THOMSON.

NAVIGATIONAL SOUNDING APPARATUS.

No. 352,589. Patented Nov. 16, 1886.

Fig. 8

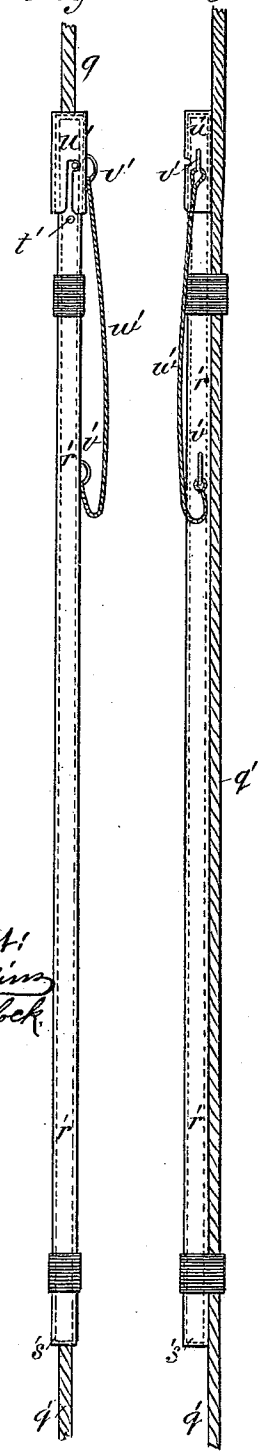


Fig. 9

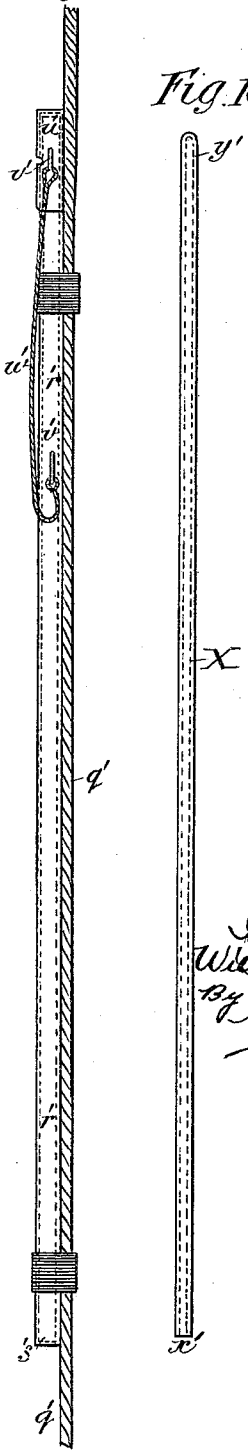


Fig. 10

Attest:
P. A. Lopsinn
Geo. L. Whitcock.

Inventor,
William Thomson
By Knight Bros
attys

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

WILLIAM THOMSON, OF GLASGOW, COUNTY OF LANARK, SCOTLAND.

NAVIGATIONAL SOUNDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 352,589, dated November 16, 1886.

Application filed February 9, 1886. Serial No. 191,359. (No model.) Patented in England December 8, 1883, No. 5,675; in France June 6, 1884, No. 162,591, and in Italy May 18, 1885, No. 18,234.

To all whom it may concern:

Be it known that I, Sir WILLIAM THOMSON, Knight, of Glasgow College, Doctor of Laws, and Professor of Natural Philosophy in the University and College of Glasgow, in the county of Lanark, Scotland, have invented Improved Navigational Sounding Apparatus, of which the following is a specification.

This invention, which relates to improved navigational sounding apparatus, is an improvement on that which forms the subject of United States Letters Patent No. 210,067 and No. 298,798, granted to me, the said Sir WILLIAM THOMSON, on the 19th November, 1878, and the 20th May, 1884, respectively.

In the drawings, Figures 1 and 2 represent, in side elevations taken at respectively opposite sides, a navigational sounding-machine constructed according to and constituting this present invention. Fig. 3 represents the same in end elevation. Figs. 4 and 5 are respectively longitudinal and transverse sections through the same. Figs. 6 and 7 are respectively a side and a front elevation of the detachable portion of the operating crank-arm and of the crank-handle. Figs. 8 and 9 are respectively elevations looking from positions at right angles to each other, showing the tube or casing for containing the glass measuring-tube lashed to the sinker line or rope. Fig. 10 is an elevation of the measuring-tube removed from the casing.

Instead (as in the apparatus shown in the before-mentioned Letters Patent) of allowing the shaft or axle *a*, which carries the wire drum or wheel *b*, to run round or rotate with the said drum or wheel *b* during the egress of the wire *c*, and attaching the hauling-in handles after the sinker reaches the bottom of the sea or of other water whose depth is being taken, it is preferred to keep the said shaft or axle *a* at rest with the said hauling-in handles fixed to it, and allow the drum or wheel *b* to rotate around the same by unclamping it from rigid attachment to the said shaft or axle *a*, as hereinafter more particularly described.

The wire drum or wheel is preferably constructed of a grooved ring, which is carried on the disk *e*, secured to the shaft or axle *a*. To the inner face of this disk *e* the ring *f*, of wood or other suitable material, is attached, and into the face and outer periphery of this ring *f* the blocks *g*, of hard wood, (preferably lignum-vitæ,) are inserted. In place of forming the ring *f* of softer wood than the blocks *g*, all these parts may be formed of lignum-vitæ. The grooved ring constituting the wire drum or wheel *b* is free to rotate in the groove formed between the oblique faces of the ring *f* and of the blocks *g*. Upon the axle *a* there is further provided the disk *h*, preferably of steel or other suitable springy material. To the inner face of this disk the ring or disk *i*, of wood or other suitable material, is secured, its edge being turned obliquely, so as to fit against the oblique face of the wheel *b*. This disk *h*, with its attached ring *i*, of wood, is mounted loosely and is free to slide longitudinally upon the shaft *a*. The face of the ring *i* is recessed out sufficiently to admit the blocks *g*, entering the same when the rings *f* and *i* are pressed together to clamp the wheel *b*. Upon the shaft *a* there is formed the screw-thread *j*, and upon this screwed portion the screwed nut *k* is free to work. This nut *k*, as shown more particularly at Figs. 3 and 5, and in dotted lines at Fig. 2, is provided with the arm *l*, through the outer end of which the hole *m* is formed, and the nut *k* is further provided with the circular groove *n*, into which the brackets or clips *o*, secured to the disk *h*, project at opposite sides.

Through one of the supports *p* and also through a stud or boss, p^x, projecting outwardly therefrom is formed a hole or perforation, *q*, within which fits a bolt, *r*, which is free to slide longitudinally. The stud or boss p^x is also provided with a longitudinal slot, q^x, which opens into the perforation *q*, for the passage of a short arm or pin, *s*, projecting from the side of the bolt *r*, whereby the latter is moved in its bearing. Extending laterally from each end of the longitudinal slot q^x in the boss p^x is a short notch or slot, which notches are adapted to receive the short arm or pin *s*, and thereby hold the bolt *r* at one or the other extremity of its permitted movement.

The pinion *t* is mounted upon and is free to rotate upon the shaft *a*. The said pinion is rigidly connected to the forked end of the ra-

dial arm *u*, the outer end of which is secured to the rim of the wheel *b*, and between these parts it is bent sufficiently to clear the non-rotating disk *e*. By means of this pinion *t* the wheels for operating the counter *v* are rotated. This counter *v* shows approximately the length of wire unwound from the wheel *b* by indicating the number of revolutions of the said wheel *b*.

The hauling-in handles are constructed in such a manner as to allow portions of them to be taken off, so that the box *w*, required to hold the whole machine, may not be inconveniently large. For effecting this the arms *x* are provided, the said arms being secured permanently, by the clamping-screws *y* or by other suitable means, to the squared ends of the shaft *a*. These arms *x* are provided at their outer ends with the collars *a'*, and at any suitable position with the clamping-screws *b'*. The requisite additional lengths of arm *c'*, as represented at Figs. 6 and 7, (respectively in side and front elevation,) carry the handles *d'* at right angles thereto, are slipped through the collars *a'*, the forked portions *e'* passing over the clamping screws *b'*, which are tightened therein, and thereby secure the fixed and movable portions of the handles together. The shaft *a* is carried in the bearings *f'*, of lignum-vitæ, and the said shaft and all its attachments may be easily removed from the frame or supports *p* by removing the screws *g'*, which secure the said bearings *f'* to the frame. The shaft may then be drawn horizontally out, the supports *p* being slotted for this purpose.

During intervals between casts, and when out of use, to preserve the wire and the iron-work of the drum *b* and other parts of the machine, the whole machine is kept immersed under lime-water or other preservative liquid, *h'*, which is contained in the tank *i'*, provided inside the box *w*. To the sides of this tank *i'* the supports *j'* and *k'* are secured. The supports *j'* are slotted, as shown at *l'*, so as to form guides for the portions of the squared ends of the shaft *a*, projecting out beyond the bosses of the arms *x* when the machine is being lowered into the said tank *i'*.

When the machine is required for use, it is drawn up out of the tank *i'* by means of the handle *m'* and is drawn horizontally forward until the transverse bars *n'*, to which the frames *p* are secured, bear upon the supports *j'* and *k'*, and the forward transverse bar, *n'*, is against the end of the tank *i'* or other suitable stop. The bolt *r* is then passed through the hole *m* in the arm *l*, so that the nut *k* is retained in one position. The shaft *a*, if previously frictionally geared with the wheel *b*, is then turned by means of the handles in the direction necessary for unwinding the wire, when the pressure of the nut *k*, thus released from the disk *h*, allows the wire drum or wheel *b* to rotate freely during the descent of the sinker. The moment the sinker has touched the bottom of the sea or other water whose depth is being measured, the indication of the counter *v* having been taken, the wire is hauled in. This is effected by the nut *k*, still being secured by the before-mentioned means, and a few turns given to the handles in the direction necessary for hauling in. By these means the drum or wheel *b* is frictionally geared with the shaft *a*. At this stage the bolt *r* is disengaged from the arm *l* and the hauling in continued, the shaft *a*, the nut *k*, and the drum or wheel *b* all revolving as one body. The shield *o'*, Fig. 4, is provided in order to prevent the lime-water or other preservative liquid from flying off into the face of the operator.

For the object of compactness there is provided the space *p'*, between the ends of the tank *i'* and the box *w*. In this space the sinker and the removable portions of the handles and other attachments may be placed when not in use.

The case or shield, in which the glass tube (hereinafter described) is placed when taking soundings, is lashed to the rope *q'*, as shown at Figs. 8 and 9, respectively, in front and side elevation, and consists of the tube *r'*, preferably of brass. The rope *q'* forms a continuation of the sounding-wire *c*, (being secured to the free extremity thereof,) and has secured to its free extremity the sinker, which is nowhere shown in the present drawings. This tube *r'* is closed at the bottom, save the small aperture *s'*, which is left for the admission of water, and the upper end is also provided with an aperture, *t'*, through which the water can escape. The case is provided with the cap or cover *u'*, which fits over the said case and is locked after the manner of a bayonet-joint. The cap or cover and the case are provided with the eyes *v'*, to which the two ends of the cord *w'* are secured, and by these means the cap or cover *u'* cannot become lost.

The apparatus for measuring the depth consists of a glass tube, X, similar to that described in Patent No. 210,067, before mentioned. One end, *x'*, of this tube, as represented at Fig. 10, is open, and the other end, *q'*, hermetically sealed. The glass tube is then coated with a solution of aniline blue, which is dried by any suitable means, so as to be left adhering to the sides of the tube.

The mark showing the depth of the water into which the glass tube has been lowered by the sounding apparatus is made by such water rising in the tube, and then washing off the aniline color for a certain known distance from such tube.

Having thus described my invention, the following is what I claim as new therein and desire to protect by Letters Patent:

1. The combination, with the pulley having the circumferential groove in its periphery, and the shaft to which it is secured, of the wire drum, ring, or wheel fitting loosely and capable of rotating upon said grooved pulley, and a friction clutch or brake for retarding or

preventing the rotation of said wire drum independently of the grooved pulley, substantially as set forth.

2. The combination, with the shaft *a*, the disk *e*, the ring *f*, and the blocks *g*, constituting a pulley having a groove in its periphery, of the wire drum, ring, or wheel *b*, the disk *h*, perforated for the passage of the shaft *a*, the ring or disk *i*, secured to said disk *h*, and the nut *k*, working upon a threaded portion of the shaft *a*, substantially as and for the purposes set forth.

3. The combination, with the shaft *a*, the pulley secured thereto and having the groove in its periphery, and the wire drum or ring mounted and adapted to rotate on said pulley, of the elastic disk *h*, having the friction-surface *i*, and means for forcing said disk against the wire drum, whereby its rotation relatively to the pulley is retarded or prevented at pleasure, substantially as set forth.

4. The combination, with the shaft, the pulley fixed thereto, and the wire drum mounted and adapted to rotate upon said pulley, of the pinion *t*, mounted loosely upon the shaft *a*, the arm *u*, secured at its respective ends to said pinion *t*, and the wire drum, the indicator *v*, and gearing connecting said pinion with said indicator, substantially as and for the purpose set forth.

5. The combination, with the shaft *a*, the pulley and the wire drum, ring, or wheel mounted and adapted to rotate thereon, of the friction-disk *h i*, perforated for the passage of the shaft *a*, the nut *k*, engaging a threaded portion of the shaft *a* and having the groove *n*, and the brackets or clips *o*, secured to the friction-disk and engaging in said groove, substantially as and for the purposes set forth.

6. The combination, with the shaft *a*, the pulley secured thereto, and the wire drum, ring, or wheel mounted and adapted to rotate upon said pulley, of the friction-disk *h i*, perforated for the passage of said shaft *a*, the nut *k*, connected to the disk *h* and engaging a threaded portion of the shaft *a*, the arm *l*, projecting from the said nut, the frame, and the locking-bolt *r*, fitting within a socket in the frame and adapted to engage said arm, substantially as and for the purposes set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM THOMSON.

Witnesses:
ROBERT ADAM GUNN,
JOHN MADDER ZUDHOPE,
Both of 115 *St. Vincent Street, Glasgow.*