E. A. INGLEFIELD.

STEERING APPARATUS.

No. 111,546. Patented Feb. 7, 1871.

Fig. 1.

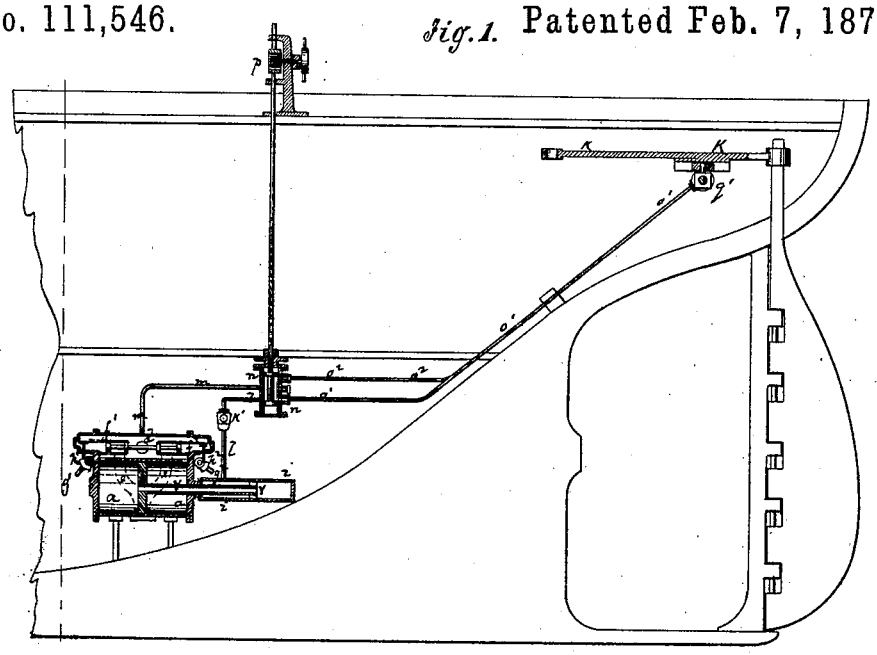
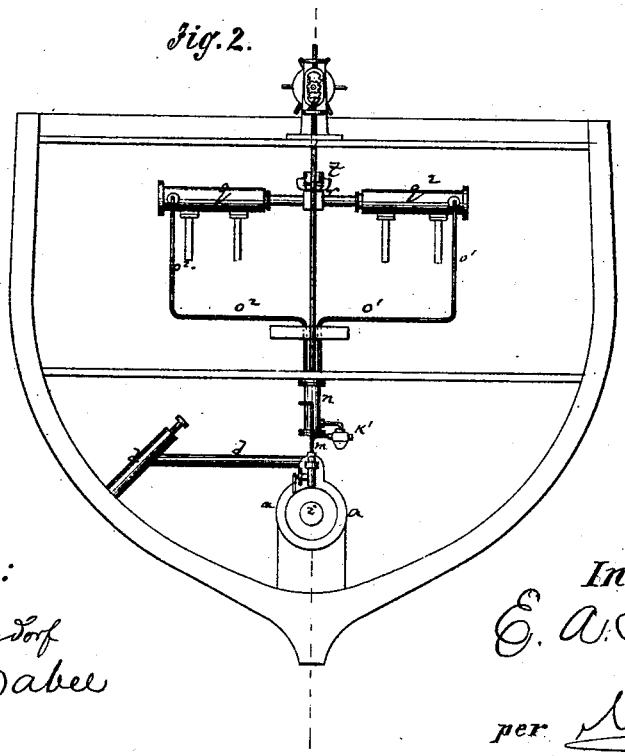


Fig. 2.



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EDWARD AUGUSTUS INGLEFIELD, OF 10 GROVES END ROAD, ST JOHN'S WOOD, ENGLAND.

Letters Patent No. 111,546, dated February 7, 1871.

IMPROVEMENT IN STEERING APPARATUS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, EDWARD AUGUSTUS INGLEFIELD, of 10 Groves End Road, St. John's Wood, in the county of Middlesex, in England, have invented a new and useful Improvement in Hydraulic Apparatus, to be used on shipboard for utilizing the pressure of the external water; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawing forming part of this specification.

It is well known that the water in which a vessel floats exerts a pressure on the bottom of the vessel, and that, if a certain quantity of that water be admitted through the bottom into the bilge of the vessel, the force of the water so admitted under pressure can be utilized as a moving power by means of suitable apparatus, it being understood that the water so admitted into the vessel is afterward to be removed by pumping. Thus no power can be actually gained, as the work applied to removing the water must exceed that developed by its admission; but it often happens on shipboard that a very considerable power is occasionally wanted for a short time, as for moving the rudder, for raising or training a gun, for turning a capstan-windlass or gun-turret. Now, by the apparatus which I am about to describe, I am enabled to obtain such occasional power from the inflow of external water, employing constantly a moderate power for removing, by bilge-pumps or other convenient means, the water which has done its work in entering the vessel.

When rotary motion is required, as for turning a windlass-capstan or gun-turret, I prefer to employ a turbine, which I place as low as possible in the hold of the vessel, so as to get the highest possible working column to act upon it. I supply this turbine from the external water, the supply-pipe being governed by a sluice, valve, or cock; and I discharge the water from the turbine into the bilge of the vessel. I connect the axis of the turbine by suitable gearing, which may be toothed gear, or pulleys or drums, with straps or chains to the axis of the windlass, capstan, or gun-turret, regulating the velocity by the proportion of the gearing. As the construction of turbines and of intermediate gear is well understood, and as I lay no claim to these apparatus in themselves, I do not give any drawing or detailed description of their construction.

Instead of a turbine two or more water-cylinders with cranks may be employed, the external water acting on them as steam acts in a steam-engine.

When a partial rotation is required, as for training a gun, or for moving a gun-turret partly around, or for steering by moving the tiller to the one side or the other, I adopt the following constructions.

Around the circumference or part of the circumference of a gun-turret, or of a drum fixed on the axis of a gun-turret, or an axis on which the carriage of a gun is mounted, I fit a chain, the links of which may catch onto cogs or beds in suitable recesses formed on the circumference, and I attach each end of the chain to the piston-rod or ram of a hydraulic cylinder either directly or with intermediate pulleys. The two hydraulic cylinders so connected to the chain are placed in the lowest possible position in the hold of the vessel, and each of them is connected by a pipe fitted with a sluice, valve, or cock, with the external water, and has a port fitted with a valve for discharging into the bilge.

When it is desired to move the turret or gun in the one direction the supply-valve of the one cylinder is opened and the discharge-valve of the other. The external water thus permitted to press on the piston or ram of the one, while the piston or ram of the other is relieved from pressure, causes the one piston or ram to move and pull the chain to which it is attached, and thus to give a partial revolution to the gun-turret or rudder.

A similar arrangement is applicable to steering, the chains acted on by the pistons or rams being conveyed over pulleys, or made to act by bell-cranks on the tiller-arm of the helm. I prefer, however, to effect the operation of steering by an apparatus which is so constructed as to convey the power by means of fluid pressure instead of chains, pulleys, or cranks.

Figure 1 represents a longitudinal section of part of a vessel fitted with this apparatus, and

Figure 2, a transverse section of part of the apparatus, which is connected immediately with the tiller.

Similar letters of reference indicate corresponding parts.

a is a cylinder, placed as low as possible in the hold of the vessel, and fitted with a piston, *b*.

On the cylinder there is a slide-jacket fitted with a double slide.

The middle part of this jacket is connected, by a pipe, *d*, with the external water, and two chambers, f^1 and f^2, toward either end, are connected, by openings or by breeches-pipe *e e*, to the bilge of the vessel.

Each end of the slide is made to fit as a piston in the end parts of the jacket, and the portions of the jacket beyond these pistons communicate by passages with the middle part of the jacket, these passages being fitted with valves h^1 and h^2.

Each of these valves is double, being made to seat up or down, covering in the one case the passage from *d*, and in the other case covering a passage which communicates with the bilge.

These valves have each a stem or rod projecting downward and bearing on a crank-lever, g^1 g^2; and from each of these crank-levers a tappet or short rod projects through packing into the cylinder *a*, one at each end.

When the piston *b* reaches one end of the cylinder it presses on the tappet at that end, and thereby causes the crank-lever g^1 to raise the valve h^1. This, closing the upper passage and opening the lower passage, relieves that end of the slide from pressure, while the pressure of the external water, acting on the other end of the slide, causes it to move toward the right hand.

By this movement the port communicating with the right-hand end of the cylinder is connected with the middle or supply portion of the slide jacket, while the port communicating with the other end of the cylinder is connected to the discharge into the bilge.

Thus the pressure of the external water is made to act on the piston and force it toward the left hand.

On reaching the end of its stroke it bears on the other tappet and acts in a similar manner on the valve h^2, which causes the movement of the piston to be reversed.

I fix to each or one end of the cylinder a pump or barrel, *i*, connected by a pipe with a valve-box, which contains suction and discharge-valves like those of an ordinary force-pump.

The piston *b* has a projecting rod passing through packing into each of the barrels *i i*, and these rods act as plungers in those barrels, so that as long as the piston *b* moves to and fro water supplied to the valve-box is drawn alternately into each of the barrels and discharged from them.

I sometimes construct the cylinder *a* with one barrel and plunger, as represented in fig. 1. In this case the piston *b* has a tubular rod, *v*, projecting from one side of it and working in a barrel, *i*, the end of the rod being fitted with packing and with a central supply-valve and an annular discharge-valve. When the piston *b* moves toward one side the annular discharge-valve is closed, while the central supply-valve is opened.

Water from the cylinder *a* enters by the tubular rod and supply-valve into the barrel *i*, and the water contained in the annular space round the tubular rod, being prevented by the annular valve from returning into the barrel, is forced along a pipe, *l*.

When the piston *b* returns the central supply-valve in the tubular rod is closed and the annular discharge-valve is opened.

The water contained in the barrel *i* passes into the annular space, which contains half of it, the other half being forced along the pipe *l*, under pressure, as before. The water thus discharged, whether from the valve-box or from the barrel *i*, is conveyed by a pipe, *l*, to a valve-box or regulating slide, *n*, a return-pipe, *m*, from that slide communicating in the one case with the supply of the valve-box, and in the other case, that represented in fig. 1, with the discharge-pipe into the bilge.

The regulating slide *n* consists of a jacket or casing, made with two parts, and a D or double-piston slide fitted thereto.

One of these ports communicates with a pipe, o^1, and the other with a pipe, o^2, and the slide can be moved to and fro within the jacket by means of a rod, which is carried up through one or more decks to a convenient place, or to several convenient places, for the steersman.

The upper part of the rod is provided with a rack or worm at *p*, which is acted on by turning a small steering wheel, so that the steersman, by turning the wheel in either direction, can place the slide in *n* so as to open both passages, o^1 o^2, to the middle part of the jacket, or to open either to the middle, and the other to the end part of the jacket.

The middle of the jacket being in communication with the discharge-pipe *m*, while the ends of the jacket are connected to the pressure-pipe *l*, either of the pipes o^1 o^2 can thus, by the movement of the steering-wheel, be subjected to pressure, the other being relieved from it, or both can be relieved together.

The pipes o^1 o^2 are conveyed to two cylinders, q^1 q^2, placed one on either side of the tiller-lever K.

Each of those cylinders is fitted with a plunger or piston, which is connected by a rod to a pin on the tiller-lever K.

When it is desired to turn the helm to one side or to the other, the steersman turning the wheel at *p*, so as to move the slide in *n*, causes the pressure of water in one of the pipes o^1 o^2 to act on one of the pistons or plungers in q^1 or q^2, while he relieves the other piston or plunger of pressure. Thus the tiller-lever is pushed to the one side or the other.

When it is desired to leave the rudder free, the slide is so moved that the pressure in the two cylinders q^1 q^2 is equalized. The rudder can then right itself, or can be worked in the ordinary way.

Sometimes it is desirable to have the apparatus constructed so that it can be readily thrown out of gear with the rudder.

For this purpose I fit a sliding block, *r*, upon the tiller-lever K, and form on its lower side a slot or gab, into which a pin attached to the plungers of q^1 q^2 enters.

The sliding block *r* is fitted with a screw, by turning which it can be drawn along the lever, and thus its gab can be removed out of reach of the pin.

Instead of employing a horizontal cylinder, q^1 q^2, as represented in figs. 1 and 2, I sometimes find it convenient to place it vertically, in which case the cylinder *a* has an upper and lower port fitted with a slide, the rod of which is connected to a piston in a cylinder above it.

The lower end of this cylinder is always open to the supply, but the upper end is fitted with a slide, by which it can be made to communicate either with a branch from the supply-pipe or with a passage leading to the bilge.

The slide is connected by a rod and bell-crank to a rod which is fixed to the piston, and which has on its two stops or collars at a distance apart somewhat less than the stroke of the piston.

The apparatus above described may be also applied to raise heavy weights on board ships, as, for example, to elevate a gun.

For this purpose I mount the gun, or its carriage, on the ram of a hydraulic cylinder, and connect this cylinder to an apparatus such as I have described.

By means of a suitable valve or slide I either turn the pressure onto the hydraulic cylinder or relieve it, at pleasure.

In the one case the ram of the cylinder is pushed upward and raises the gun, in the other case the ram and gun descend by their own weight, the rapidity of descent being regulated by the valve.

Having thus described my invention,

I claim as new and desire to secure by Letters Patent—

1. The cylinder q^1 q^2, containing a piston, which is connected with the tiller-lever, a capstan, a gun-turret or gun-carriage, to operate the same, by pressure applied to the ends of said piston, as specified.

2. The cylinder *a*, provided the jacket f^1 f^2, valves

h^1 h^2, and piston b, to operate substantially as herein shown and described.

3. The cylinder n, connected with the pipes l, m, o^1, and o^2, and with the steering-wheel, substantially as herein shown and described.

4. The barrel i, applied to the cylinder n, and combined with the hollow plunger v, substantially as herein shown and described.

The above specification of my invention signed by me this 11th day of May, 1870.

E. A. INGLEFIELD. [L. S.]

Witnesses:

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