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No. 717,356. Patented Dec. 30, 1902.

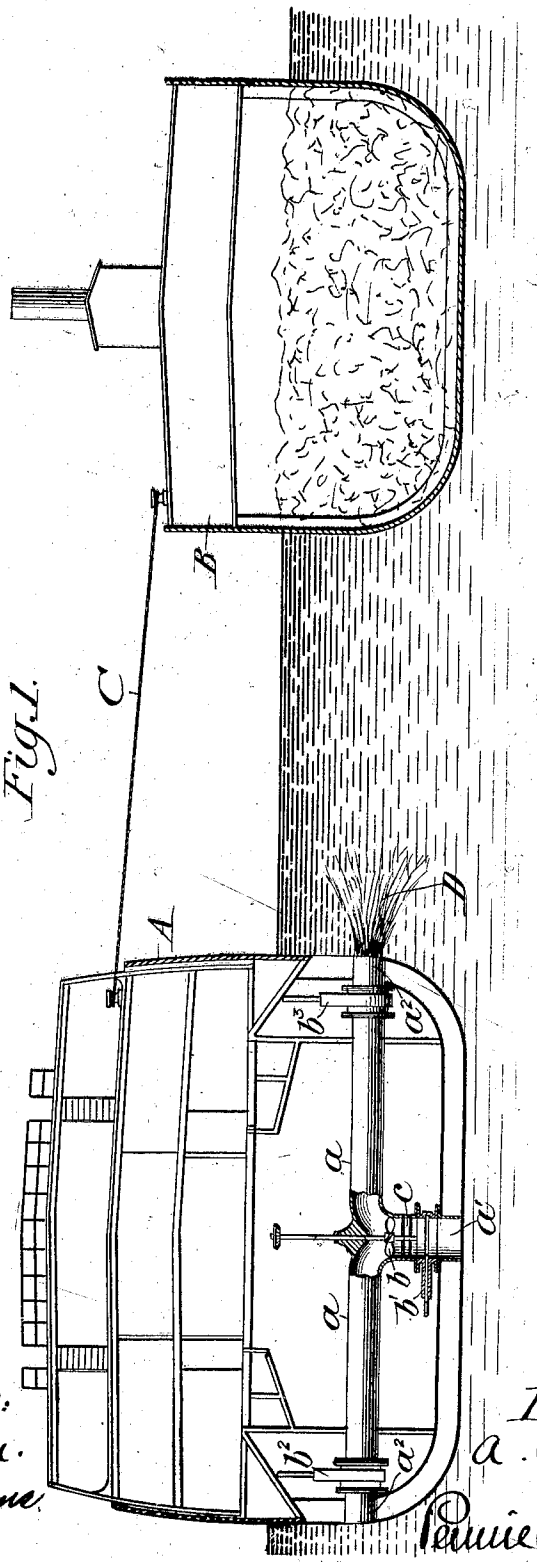
A. C. CUNNINGHAM.

MEANS FOR COALING SHIPS AT SEA.

(Application filed Oct. 26, 1901.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



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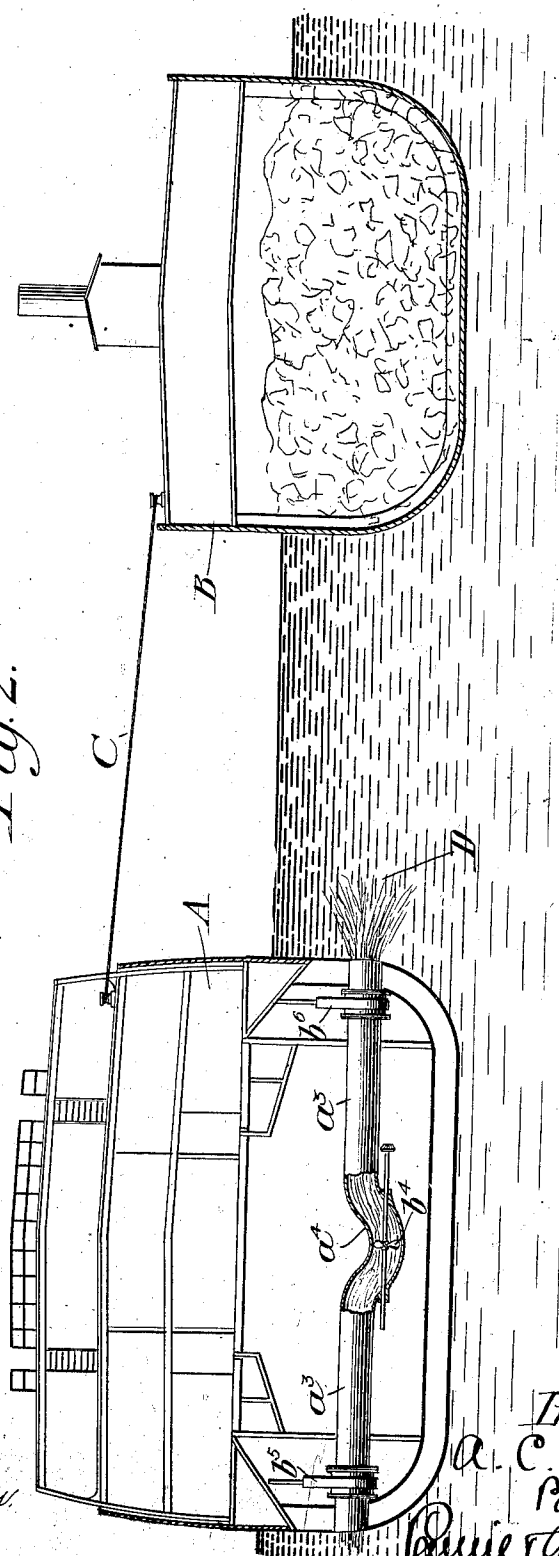
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Fig. 2.



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Fig. 5.

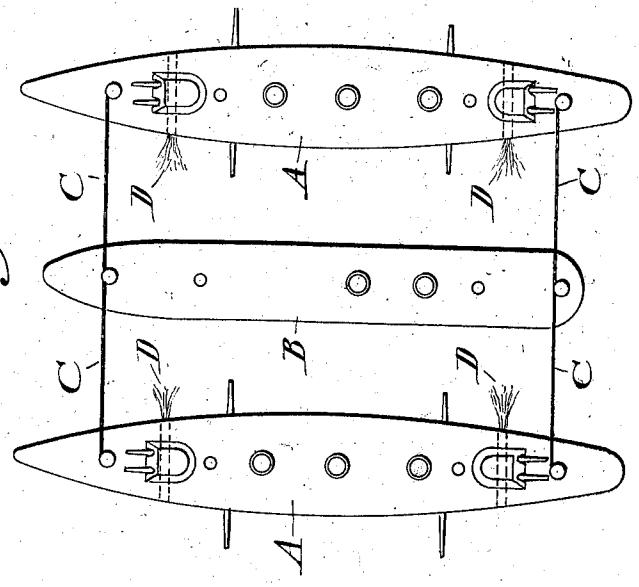


Fig. 4.

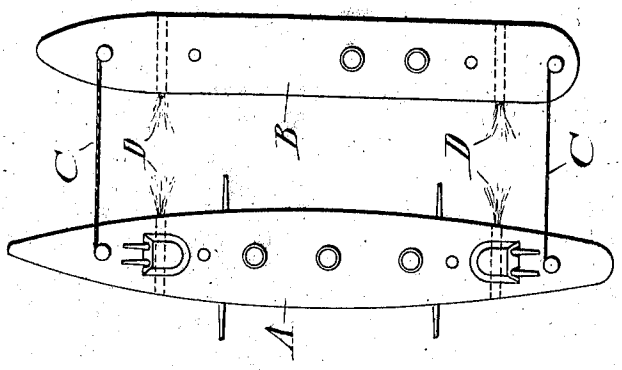
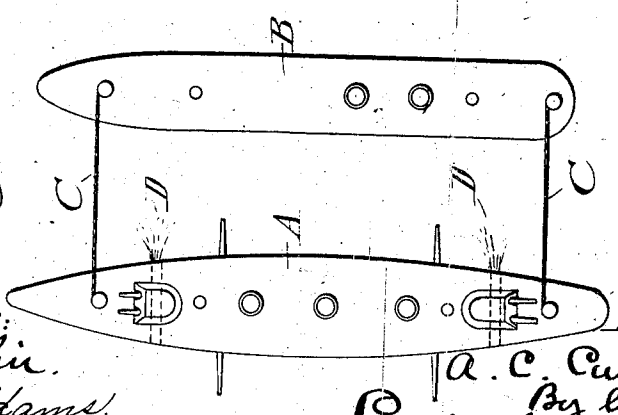


Fig. 3



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UNITED STATES PATENT OFFICE.

ANDREW C. CUNNINGHAM, OF WASHINGTON, DISTRICT OF COLUMBIA.

MEANS FOR COALING SHIPS AT SEA.

SPECIFICATION forming part of Letters Patent No. 717,356, dated December 30, 1902.

Application filed October 26, 1901. Serial No. 80,067. (No model.)

To all whom it may concern:

Be it known that I, ANDREW C. CUNNINGHAM, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Coaling Ships at Sea; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to the art of coaling ships of war, merchantmen, and other sea-going vessels in the open water, where moorings or anchorages are impossible and where it is necessary to take on coal while under way or drifting. It is not particularly concerned with the means employed for transferring the coal from one vessel to another, but has to do with the connection of the vessels together in such manner and at such distance apart that each is permitted to pitch and roll independently of and without danger of interference with or by the other and to the maintenance of such relation between the ships while so connected during the process of transferring the coal by the employment of any suitable apparatus that may be rigged up for that purpose.

It is essential to the successful transference of coal in mid-air across the intervening space between any two vessels, first, that they should be secured together at such distance apart as not to interfere with each other in pitching or rolling; second, that the connection between them should be such that each is free to pitch and roll independently of the other or at least so that the effect of such movements of one upon the other is minimized as far as the conditions will permit, and, third, that the established distance and relation between the two shall be substantially maintained throughout the coaling process in order to hold the vessels apart and for keeping the elevated carriers employed in the operation, on the one hand, as nearly taut as possible, and, on the other, without imposing such strains on the apparatus as to endanger its safety.

Many different plans have been proposed for coaling ships at sea, but so many difficulties have been encountered in realizing the above conditions when coaling athwartships or beam when not under way that the plan of coaling in tow—that is to say, steaming ahead at a slow rate with one vessel towing the other—has been decided upon as practically the only feasible plan to meet the varying conditions encountered at sea. This plan is, however, objectionable for many reasons unnecessary to here recount. On the other hand, the advantages of coaling sidewise or with the ships abeam are obvious and of great importance, especially when time is an object and it is desirable to effect the operation when not under headway.

The present invention therefore relates to the latter plan; and it consists, broadly stated, in means for connecting the vessels abeam or side by side at a sufficient distance apart to eliminate the danger of interference with each other due to the pitching, rolling, or other necessary movements of either, said means being any sort of flexible connection between the vessels to prevent them from moving farther apart, combined with means for instituting or creating and maintaining a lateral pressure between either or both the vessels and the surrounding water, tending to force them apart against the tension of the connecting-cable.

In carrying out the invention I employ a chain cable, rope hawser, or any other sort of flexible connection between the vessels, and although the invention is not limited to the employment of any particular means for creating the force tending to hold the vessels apart I prefer to employ a modification of an old hydraulic apparatus that has been proposed in many different forms as a steering auxiliary in maneuvering ships at dock or in the open water. The manner in which I make this connection between the vessels and the way in which I prefer to install and operate the hydraulic apparatus for forcing the vessels apart are illustrated in the accompanying drawings, wherein—

Figure 1 is a sectional view of a battle-ship and collier connected together in the way contemplated by the invention and showing one form of hydraulic apparatus. Fig. 2 is a similar view showing the battle-ship provided with another form of hydraulic apparatus. Figs. 3, 4, and 5 are diagrammatic plan views illustrating the general operation of the in-

vention, the third figure showing only the battle-ship provided with a hydraulic apparatus, the fourth showing both ships provided with similar apparatus, and the fifth showing two battle-ships coaling simultaneously from the same collier, the ships only being provided with hydraulic apparatus.

Referring first to Fig. 1, a denotes a pipe located in the hold below decks and having an intake a' through the bottom of the ship near the keel. This pipe extends clear across the ship and has outlets a^2 on each side above the bilge. The intake portion of the pipe extends vertically a short distance, and an ordinary propeller wheel or screw b is arranged therein with its shaft projecting upwardly above the horizontal portion of the pipe, where it is connected with suitable gearing, so as to take power from any of the engines aboard ship. The intake is also provided below the screw with a valve b' for shutting off the entrance of water, and the outlet ends of the pipe are provided with similar valves b^2 b^3. These three valves are here shown as sliding gate-valves; but obviously any other form of valves might be employed. The shaft of the screw should preferably have suitable bearings for its lower end in the intake-pipe, as well as other bearings above the screw for intermediate portions, and I prefer to locate grids or coarse strainers c in the intake below the screw to prevent the clogging of the pipe or screw by the entrance of fish, weeds, or other foreign bodies. It is also desirable to locate similar strainers at the outlet ends of the horizontal portions of the pipe.

In Fig. 2 a somewhat different form of this apparatus is shown. Referring to this view, a^3 denotes the same horizontal pipe; but the vertical intake is dispensed with and in its place a depression or bend a^4 is made in the pipe about centrally of its length and the screw b^4 is arranged to work horizontally, its shaft having bearings in the lower walls of the bend. In this modification the same sliding gate-valves b^5 b^6 are employed, and the operation of the apparatus is precisely the same as that shown in Fig. 1, except in the following particulars.

In the modification shown in Fig. 1 the ends a^2 a^3 are outlets only, and the water enters always at the intake a'. In this arrangement also the screw b is so geared up as to be rotated always in one direction, and the direction of the outflow is controlled entirely by the valves b^2 b^3, the port valve being closed when the outflow is to starboard and the starboard valve being closed when the outflow is to port. In the modification shown in Fig. 2 the water is taken in always at one side and discharged at the other, and the direction of flow is controlled by reversing the rotation of the screw. In this arrangement also the valves b^5 b^6 are differently operated, for both must be opened and closed together, since each operates sometimes as an intake-valve and sometimes as an outlet-valve. It is believed that neither of these forms of apparatus requires any further description of its construction or operation, and I will therefore proceed to describe the manner of utilizing the same in the carrying out of my invention, it being understood that in the light of my invention either apparatus is to be regarded merely as a means for moving or tending to move the ship whereon it is installed sidewise away from the vessel to which it is connected while neither of the vessels has steerage or headway.

Referring now to Figs. 2 to 5, A A denote battle-ships, and B B indicate the colliers from which the coal is to be taken. In Figs. 2, 3, and 5 the ships are shown provided with the above-described hydraulic jet apparatus for moving them laterally; but it is to be understood that the colliers may also have similar apparatus, as indicated in Fig. 4. It is preferable to install one of these jet apparatuses in the bow and one in the stern of each of the vessels; but I do not regard the invention as limited to the use of any particular number of such devices or to any particular location of the same on board ship, and I do not intend my claims to be restricted in either of these particulars.

In all the figures above referred to C C denote guy-lines that are made fast, preferably at or about the deck-line, to the collier and the ship to be coaled. There may be any number of these lines, but two will usually suffice, one forward and the other aft, as shown in the drawings. These lines form the means and the only means contemplated by my invention for connecting or securing the vessels together, and the only essential requirement (apart from their strength) is that they shall be flexible, so as to permit the vessels, or either of them, to roll toward each other and of sufficient length to localize the ships with respect to each other, so as to eliminate all danger of interference due to the rolling, pitching, or other movements of either. To this end these lines may be ordinary rope hawsers of appropriate material and dimensions or chain cables, and they may be made fast at any convenient point on either vessel. The length of these cables depends so largely upon the size of the vessels and the conditions of weather and water prevailing at the time that no particular rule as to length can be laid down, except that it must be such as to locate the vessels so far apart that there shall be no danger of interference from any of the causes above mentioned. Within the limits of this rule the nearer the ships are together the more easily and speedily the coaling can proceed. As will be understood from the character of this connection, the only function of these cables is to prevent the ships from moving apart, and the flexibility of the connection is essential in order that the ships may roll toward each other. It is not intended or desired that the ships shall move bodily toward each other, because, apart from the danger of such

movement, the successful operation of the coal-transferring devices depends largely upon the maintenance of a substantially uniform distance apart, and it is in this respect that the greatest value of my invention is found. For the purpose of maintaining this separation of the two vessels experience has demonstrated that under ordinary conditions it is out of the question to employ any force or means reacting between the vessels themselves, and the gist of my invention in this respect therefore consists in the employment of a force reacting between one of the vessels (it matters not which) and the surrounding water on the side toward the other vessel. To this end I employ any form of hydraulic apparatus (of which those illustrated in the accompanying drawings may be taken as a type) that will throw a jet of water, as D in all the figures, from the side of the vessel at a point below the surface into the surrounding water. In order to produce the best results, the point at which these jets issue should be at or near the center of lateral resistance of the ship, the size and velocity of these jets depending, of course, upon the size of the pipes and the number of revolutions of the screw, and, as will be readily understood, this is entirely under control and may be regulated and stopped and started whenever and as desired, having in mind that the principal object of this apparatus is to maintain the ships apart at or substantially at the distance that is predetermined and fixed by the length of the connecting-cables, so as to keep the cables substantially taut or at least to keep the ships so far apart that although they are fastened together there shall be no liability of their approaching within the limit of danger from collision.

It is not intended that the vessels should be so close together that the jets D issuing from the side of one should have any direct influence upon the other, though I do not desire to limit myself to the maintenance of any particular distance. Neither is it intended to push the vessels apart with sufficient force to put any great strain on the connecting-cables. A safe working rule in this respect will be to regulate the speed of the screw in the pipe so as to throw a jet whose reaction between its own vessel and the water will be just about sufficient to keep the cables taut.

My invention being as above described it is to be noted, first, that the vessels are broadside to each other, thereby greatly facilitating the rigging up or working of any of the elevated trolley-carriers now employed in general loading and unloading operations; second, that so far as moving bodily farther apart is concerned they are connected together by a practically rigid connection, limiting their movement in that direction; third, that as to all necessary movements toward each other they are, in effect, unconnected, so that each is free to move independently of the other, and, finally, that by the employment of the described hydraulic jet apparatus the vessels are kept apart by an elastic force that is regulable according to existing conditions and which reacts on the surrounding medium without liability to jar or strain any part of either vessel and greatly tending to steady both. It is further to be noted that, as indicated in Fig. 5, the invention permits the simultaneous coaling of the two ships from one collier, one ship on each side the collier, and also that the operation of coaling may be carried on while the ships are under way as well as while they are at rest.

Although I have herein shown the hydraulic apparatus as only adapted to throw the jets at right angles to the keel of its own vessel, I may, if desired, direct them at angles forward or aft, it not being at all necessary that the direction of the jets should fall within the lines of the opposing vessel.

What I claim, and desire to secure by Letters Patent, is—

1. The combination of a ship to be coaled, a collier or supply-ship, a flexible connection athwartships between said ships of sufficient length to permit both ships to roll and pitch without interference with each other, and means for creating a lateral pressure between one of the ships and the surrounding water on the side toward the other ship sufficient to maintain them at such distance apart.

2. The combination of a ship to be coaled, a collier or supply-ship, a flexible connection athwartships between said ships of sufficient length to permit both ships to roll and pitch without interference with each other, and means for creating a lateral pressure between each of said ships and the surrounding water on the side toward the other ship sufficient to maintain them at such distance apart.

3. The combination, to form a means for coaling ships in the open water, of three ships, flexible connections athwartships between said ships securing them together at sufficient distances apart to permit each to roll and pitch without interference with the others, and means for creating a lateral pressure between the outside ships and the surrounding water on the side toward the other ships sufficient to maintain them at such distances apart.

In testimony whereof I affix my signature in presence of two witnesses.

ANDREW C. CUNNINGHAM.

Witnesses:
EDWIN S. CLARKSON,
J. A. GOLDSBOROUGH.