(No Model.) 2 Sheets—Sheet 1.

D. C. PIERCE.

STEAM SHIP.

No. 263,805. Patented Sept. 5, 1882.

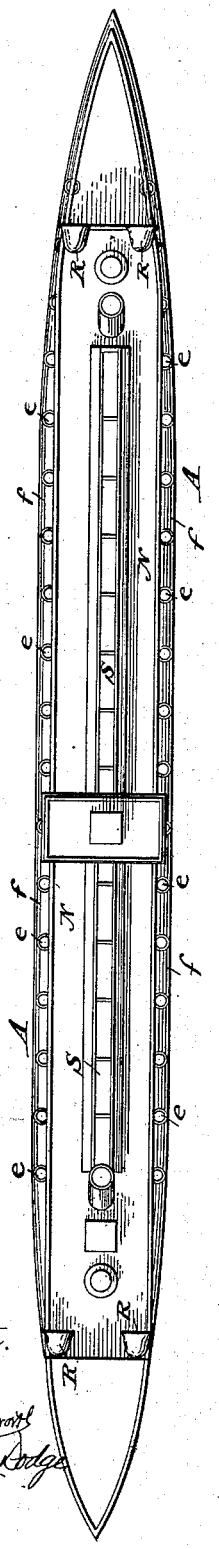

Fig. 1.

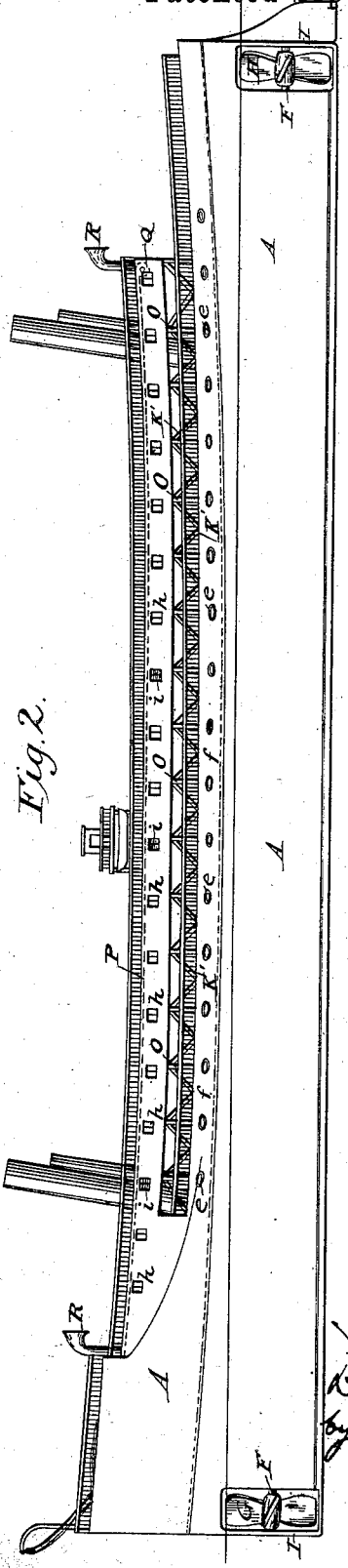

Fig. 2.

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Fig. 3.

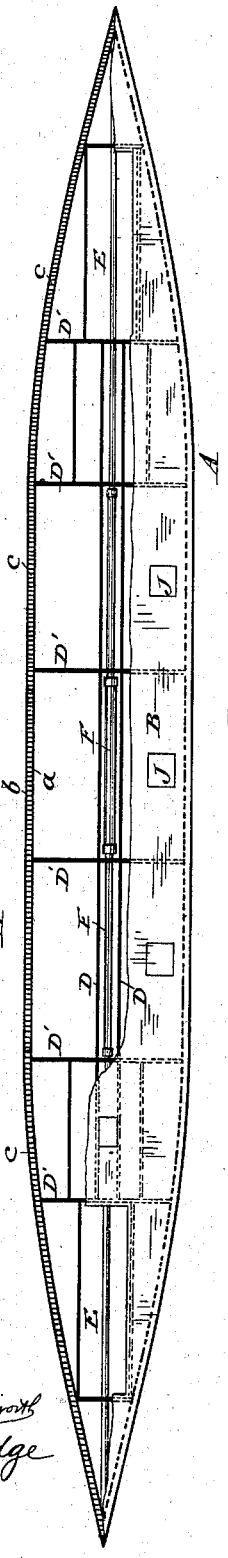


Fig. 7.

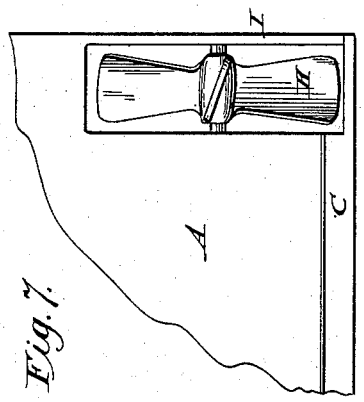


Fig. 4.

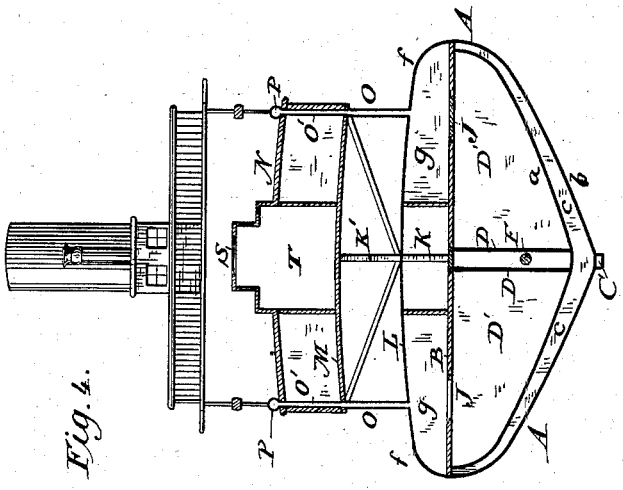
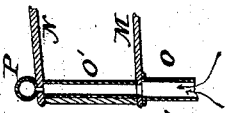


Fig. 6

Fig. 5.



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UNITED STATES PATENT OFFICE.

DENISON C. PIERCE, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO HARVEY B. MERRELL, OF MORRISTOWN, NEW JERSEY.

STEAMSHIP.

SPECIFICATION forming part of Letters Patent No. 263,805, dated September 5, 1882.

Application filed April 28, 1882. (No model.)

To all whom it may concern:

Be it known that I, DENISON C. PIERCE, of Chicago, in the county of Cook and State of Illinois, have invented certain Improvements in Steam-Vessels, of which the following is a specification.

My invention relates to the construction of ocean-steamers designed for passenger-trade, and to travel at high rate of speed; and it consists in various features and details of construction hereinafter fully set forth, whereby I am enabled to attain the desired speed, and whereby, also, the vessel is rendered staunch and strong, comfortable, and free from danger of fire or sinking.

In the accompanying drawings, Figure 1 represents a top plan view of my improved vessel; Fig. 2, a side elevation of the same; Fig. 3, a horizontal section on the plane of the lower deck, partly above and partly below the same, to show the compartments beneath the deck and the hatches in or upon the same; Fig. 4, a vertical cross-section of the vessel on the line *x x* of Fig. 1; Figs. 5, 6, and 7, views illustrating details of construction.

Hitherto ocean-steamers have been usually constructed with a view to carrying a general or special cargo besides transporting passengers, and hence have been made far heavier and more unwieldy, and their displacement has been much greater than would be required for a vessel designed to carry only passengers. Other things being equal, the power required to propel the vessel and the speed which can be attained will be substantially in proportion to the displacement. Hence I seek to decrease such displacement to the greatest practicable degree.

To this end I construct my vessel of steel throughout, thus getting the maximum strength with minimum weight, and at the same time producing a vessel which cannot burn. The hull is made with double walls, both the inner and outer skin being of steel, and the space between the inner and outer skins increasing from about two feet at the water-line, or at the lower deck, to about four feet at the keel. The skins are separated, strengthened, and retained in proper relative position by ribs of steel placed about three feet apart and firmly united to the skins by riveting or bolting, as in vessels now built of metal, the ribs being placed about three feet apart, and dividing the hollow walls of the hull into numerous air-tight compartments, which render the vessel practically safe against sinking. Within the hull I arrange two longitudinal bulk-heads on opposite sides of the center of the vessel and about four feet apart, thereby forming a well or tunnel in which to carry the propeller-shaft, which I propose to construct in sections, and to join together by couplings at suitable intervals, in order that the shaft may be constructed at less cost than if forged in one piece, and that it may be made heavier in its middle portion than at the ends, it being my intention to employ a propeller-wheel at both ends of the vessel, and ordinarily to mount them upon a common shaft, in which case the middle portion of the shaft is subjected to the greatest torsional strain. The wellway or tunnel formed by the longitudinal bulk-heads or partitions is of sufficient width to permit access to the shaft at any time. At suitable intervals I provide transverse bulk-heads or partitions which divide the vessel into suitable compartments for carrying fuel, which preferably will be crude petroleum, for the engines and machinery, and for such other cargo or supplies as are necessarily carried. From the lower deck the sides of the vessel curve inward and upward, and are joined by the main deck, which forms a ceiling or roof over the lower deck, the curved sides being furnished with bull's-eyes or lights to admit light and air to the lower-deck room. The upper deck and cabin are supported above the main deck by tubular steel columns, which serve also as ventilator stacks or shafts for the lower deck or emigrant-cabin, a current of fresh air being constantly supplied to said cabin, and the foul air being drawn off by a fan through a trunk communicating with the tubular stanchions and discharged through funnels or cowls above the promenade-deck, over the heads of passengers thereon. A rail is carried around the main deck, and a truss or central support is carried longitudinally beneath the upper and the main deck; but beyond this support, the

stanchions and the smoke-stacks there is nothing between said decks abaft the forward stack. Hence, in case a heavy sea is met with, the waves, instead of beating against the straight flat side of the vessel, as under the common construction, will simply break or wash over the main deck, and between it and the upper deck, in consequence of which the rolling of the vessel and the severe straining thereof will be largely overcome. There will be companion-ways or raised hatchways on the main deck, which will be smooth and unbroken, and formed of steel. As stated, I propose to employ two propeller-wheels, one at either end of the vessel, and in order to employ as large a wheel as practicable, the keel is cut away at each end to permit the blades to fall to the lowest practicable point, the keel being made of hollow form of steel.

Referring now to the drawings, the construction will be more fully pointed out and explained.

A represents the hull of the vessel, composed of the inner and outer shells, *a* and *b*, connected, braced, and stayed by steel ribs *c*, and carried upward about two feet above the water-line, where the lower deck, B, is placed in position, as shown in Fig. 4. At the upper edge or side of the hull the distance between the shells *a* and *b* is about two feet, and from that point to the keel C the distance gradually increases to about four feet.

D D represent two longitudinal bulk-heads or partitions, running through the center of the vessel from one engine-room E to the other, there being two engine-rooms, one at either end of the vessel. Transverse partitions D′, also divide the hull into a suitable number of compartments for the storage of fuel, which will preferably be crude petroleum, because it affords a more intense heat than coal, and the necessary supply weighs far less than an equivalent supply of coal.

The engine-rooms are designed to contain each two independent engines, the power of each or all of which may be applied to a single shaft, F, running through the well or tunnel, and carrying at opposite ends screw-propellers G H, as shown; or the propellers may be on independent shafts and separately driven, if preferred, or, in case of accident, to either.

In order to avoid the expense and difficulty of producing a continuous shaft of the necessary length to reach from end to end of the vessel, I construct the same in sections or lengths, as indicated in Fig. 3, connecting said sections by joints or couplings, as shown, the middle section being of greater diameter than the end sections, in order to withstand the greater torsional strain to which it is subjected.

The keel C is formed of steel and of about two feet in depth. It is hollow, being formed of plates riveted together, or of a single plate in cross-section, bent into proper form and riveted to the bottom of the hull, as in Fig. 6.

In order that the propellers G H may sink well into the water, while at the same time being properly supported and sustained, the keel is cut away at each end between the rudder-post I and the end of the hull proper, as shown in Figs. 2 and 7, leaving a depth of about six inches of said keel remaining to support the rudder-post.

As above stated, I prefer to mount the propellers upon a common shaft, and this for the reason that one or the other being always in the water, the "racing" or rapid rotation of the other, which is at the moment out of water or partly so, and the beating of the water in again sinking therein, will be largely prevented. As this is one of the most common sources of injury to the screws, and to the engines and machinery, the importance of this arrangement will be readily seen.

The hull is made of substantially the same form or model at both ends, so that it will run with facility either end first, but the bow or forward end is built or carried higher to cause it to ride over instead of sinking below a heavy wave.

To provide against possible accident to the rudder, I place a second rudder at the fore end of the vessel on the promenade deck, ready to be lowered at any moment and shipped or placed in position upon the bow or stem of the vessel, davits being located in proper position to lower the rudder to place.

The lower deck, B, which, as stated, is about two feet above the water-line and of steel, is furnished with flush-fitting hatches J, one for each compartment in the hold, including the compartments of the shaft well or pit, said hatches being fastened down by clamping devices of any usual style, or by screws. In this way each of said compartments is kept isolated from the others, and, the hatches being packed with rubber or like material, the compartments become water-tight air-chambers, which will effectually prevent the sinking of the vessel.

A longitudinal truss, K, extends along the middle of the lower deck and serves to aid in supporting the main deck L, which joins the lower deck by arched or curved side walls, *f*, furnished with bull's-eye lights *e*. The curved side walls and main deck are supported by bulk-heads *g*, which extend from the sides of the lower deck inward and stop about eight feet from the middle line of the vessel, as shown in Fig. 4, the bulk-heads serving to divide the space into rooms for passengers. The main deck will be about eight feet above the lower deck, and, as the latter is about two feet above the water-line, the main deck will be about ten feet above the water-line, and hence practically safe against waves and heavy seas. It may therefore be occupied by the passengers in the emigrant-cabin, while at the same time they are effectually shut off from the first-class passengers above. Being thus raised, the main deck will be above the reach of even a rough sea; but in very severe weather, or in a gale, when the waves are unusually high, they

will wash or break over the main deck, which, being rounded at the sides, will offer little resistance thereto, and hence the vessel will not be struck and strained by the waves, as the ordinary straight-sided vessels are. In this way the rolling of the vessel will be materially lessened. This construction is clearly distinguished from that in which the hull is rounded over on the top and raised but a few feet above the water-line, so that even a light sea may break or wash over it, because under my construction the deck is made serviceable instead of being unused, as in other vessels employing an elevated cabin.

M represents the upper deck, and N the promenade-deck, between which two are built the first-class passenger cabin, saloon, &c. The upper deck, M, is raised about twelve feet above the main deck, and is supported by tubular stanchions or columns O, placed directly over the bulk-heads *g*, flanged at their ends, and riveted or bolted to the main deck and to the upper or cabin deck, as shown in Fig. 5. The stanchions, besides giving the necessary support to the cabin-deck, serve also as ventilator-stacks for the emigrant-cabin, their lower ends opening into said cabin and their upper ends communicating with a pipe or trunk, P, along the top of the first-class cabin above, the connection between the upper ends of the stanchions or columns and the pipe or trunk being made by thinner and lighter pipes or columns O′, extending from the deck to the roof of the cabin, in which distance they have no weight to sustain.

A fan, Q, communicating with the pipe or trunk P, withdraws the foul air from the emigrant-cabin and discharges it through stacks R, provided with cowls or funnels, above the heads of passengers who may be on the promenade-deck. Any suitable number of fans may be employed, and they will be driven either by special motors or by any suitable connection with the engines of the vessel.

The cabin-deck is supported at its middle by a longitudinal truss, K′, placed directly over the truss K, and made of open construction, to offer as little surface as practicable.

It will be seen that, being thus separated and isolated from the emigrant-cabin and from the hold of the vessel, the upper cabin will be free from the many unpleasant odors common to vessels of ordinary construction; and the emigrant-cabin will also be much more free of such odors than commonly, because of the very perfect ventilation secured.

The upper cabin is designed to be finished in elegant style, and to be fitted and furnished with all the improvements and conveniences of modern hotels.

The vessel herein described is designed to be about five hundred feet in length and sixty feet beam, and the dimensions and proportions herein given have reference to a vessel of those dimensions. To more clearly give an idea of the proportions of the vessel, I will give her principal measurements other than length and breadth, as follows: keel, two feet square; distance from inner to outer skin directly over keel, four feet; from inner skin over keel to lower deck, twelve feet; from lower to main deck, eight feet amidships, increasing gradually to fourteen feet fore and aft, thus raising the main deck as far out of water as in ordinary sea-going vessels, and less liable to be washed by a heavy sea because of the great buoyancy of the vessel; from main deck to upper or cabin deck, twelve feet; height of cabin, eight feet; width of upper cabin, forty feet.

The engines and their smoke-stacks being at the ends of the vessel, I am enabled to construct a saloon, T, two hundred and seventy feet in length, eighteen feet in width, and thirteen feet in height, a portion of said height being afforded by a raised skylight, S, by which the saloon is lighted and ventilated, without break or interruption of any kind. On both sides of the saloon are large airy rooms, which will be well lighted and ventilated by windows *h*, provided with steel shutters *i* to protect them in case of severe storms. Amidships there will be bath-rooms supplied with hot and cold water, opening off from large bed-rooms, and there will also be parlors fitted up in the same manner as the parlors of a hotel or dwelling. Abaft the after smoke-stack there will be a ladies' cabin thirty-five feet long, eighteen feet wide, and thirteen feet high. Forward of the forward smoke-stack will be a gents' cabin forty-five feet in length, eighteen feet in width, and thirteen feet in height, thus making the total length of upper cabin three hundred and fifty feet. On the same deck, forward of the gents' cabin, there will be another large cabin for first-class passengers, and directly over that will be the officers' rooms and additional rooms for passengers. Forward on the main deck will be rooms for the different employés of the vessel, and on either side of the engine-rooms will be rooms for the men connected with that department. On the main deck, forward, will also be the kitchen, with all the necessary room for that department, and directly above this will be the pantry. The entrance to the cabins, both the first-class and the emigrant cabin, will be on the main deck, forward, such location enabling one to avoid all obstructions on the main deck, such as companion-ways, hatch-ways, &c. All partitions, bulk-heads, and decks will be of steel, the promenade-deck being covered with non-conducting water and fire proof material—as asbestus compounds now used for covering steam-pipes, &c.—and, if necessary, made double, to prevent heat or cold from finding its way too readily through it.

I do not confine myself to the precise dimensions given, nor to the particular arrangement of the cabins and apartments.

The boilers will preferably be of steel, and the furnaces adapted to burn crude petroleum,

furnaces of proper construction for that purpose being now well known to persons familiar with such matters, and therefore not described herein.

The absence of masts, spars, sails, and boats relieves the vessel of a vast amount of weight and removes a large amount of surface which in ordinary vessels is exposed to the action of the wind, and that at a height above the water where it acts with great force upon the hull to rock or tip the latter. By drawing the sides of the hull inward and making the cabin of reduced width I bring the weight of the cabin nearer the center line of the vessel, and this again reduces the tendency to roll.

I am aware that both iron and steel have been employed in the construction of vessels, that an elevated cabin has been employed, and the covering of the hull below the cabin made water-tight, but brought so close to the water as to be rendered useless as a deck, and that a turret or tower has been arranged between two engine-rooms in an iron-clad war-vessel of circular form. So far as I am aware, however, no one has ever before located the engines of a steam-vessel at or near the ends thereof, as proposed by me, and thus secured a long and open saloon, uninterrupted by smoke-stacks or machinery from one end to the other, and the value of such construction will be apparent to any one familiar with the art of ship-building.

I am further aware that two propellers, one to act in the water and the other in the air, have been carried at opposite ends of a shaft jointed at an intermediate point to permit the two parts of the shaft to be thrown out of line. This I do not claim.

Having thus described my invention, what I claim is—

1. In combination with propellers G H, below the water-line at opposite ends of the vessel, a shaft extending from one to the other and composed of sections united by joints or couplings, and independent engines connected with opposite ends of the shaft, whereby the shaft may be disconnected from either propeller without interfering with the action of the other.

2. In combination with the propellers G H, at opposite ends of the vessel, and both below the water-line, a shaft extending from one to the other and composed of sections united by joints or couplings, the middle section being of larger diameter than the end sections, as and for the purpose explained.

3. In combination with the hull A and elevated cabin M, intermediate tubular stanchions or columns, O, passing from the emigrant-cabin to a point above the elevated cabin, whereby they are adapted to support the upper cabin, and to serve as ventilating-shafts.

4. In combination with two propellers located at opposite ends of the vessel, a shaft extending from one to the other and formed of larger diameter at the middle than at the ends, whereby it is adapted to withstand the torsional strain.

5. In combination with the tubular columns or stanchions O, the pipe or trunk P and means, substantially such as shown and described, for producing a draft of air through said pipe or trunk.

6. In combination with the tubular stanchions communicating with the emigrant-cabin, the pipe or trunk P, the stacks R, and fan Q, whereby the foul air is withdrawn from said cabin and discharged above the promenade-deck.

7. In a vessel, the combination of a hull constructed with inwardly-curved walls at the top supporting the main deck, and an elevated cabin supported above and of less width than the hull, as shown and described, whereby the waves are caused to act with less force upon the vessel and the tendency to tip or roll is diminished.

DENISON C. PIERCE.

Witnesses:
WILLIAM W. DODGE,
SIDNEY P. HOLLINGSWORTH.