No. 862,510. PATENTED AUG. 6, 1907.

J. REID.

SHIP.

APPLICATION FILED DEC. 3, 1906.

3 SHEETS—SHEET 1.

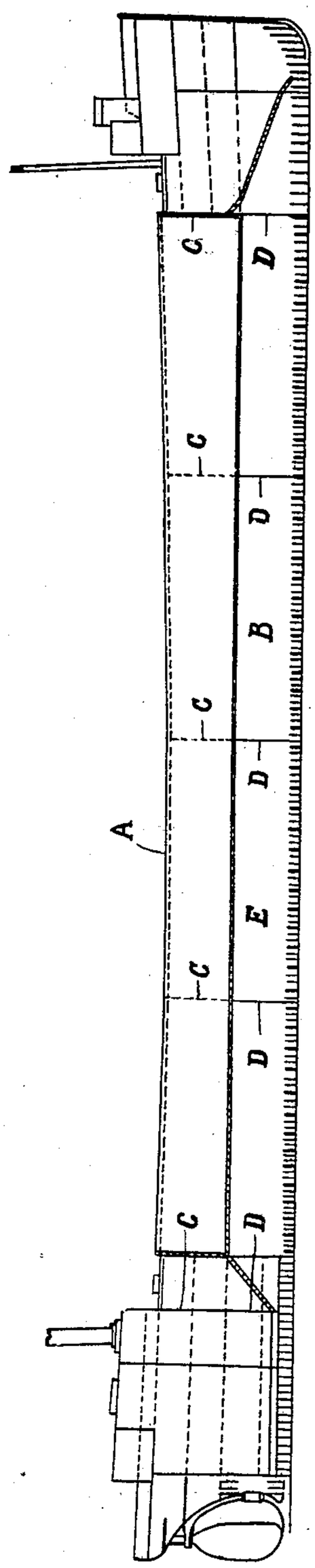

Fig. 1.

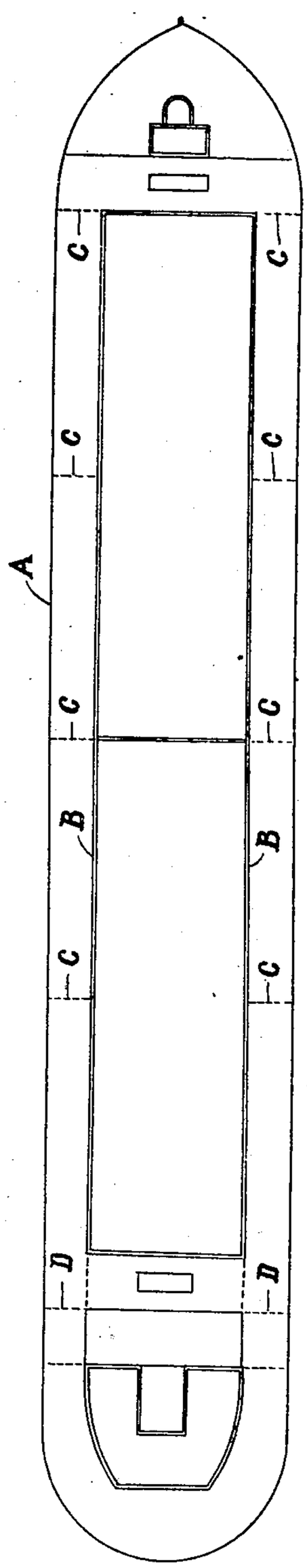

Fig. 2.

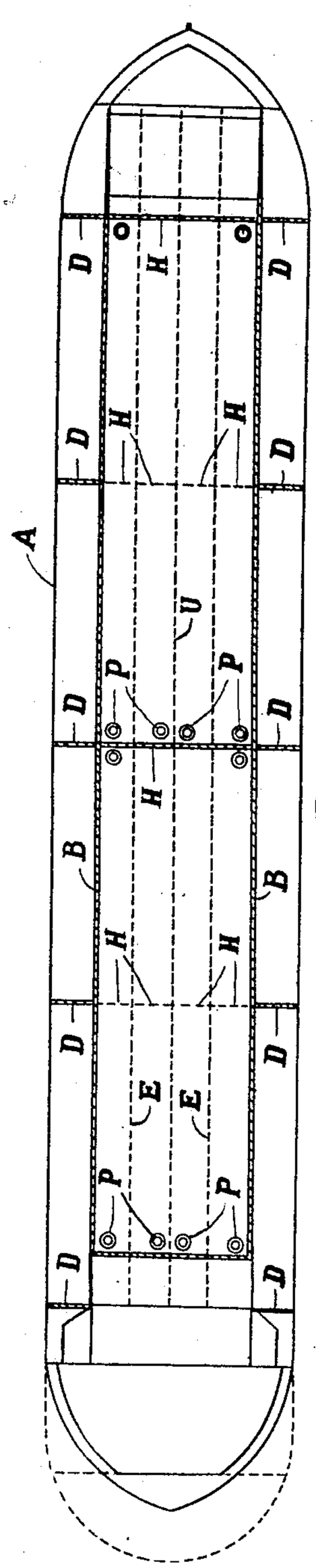

Fig. 3.

Witnesses.

Lloyd Blackmore

D. W Colton

Inventor.

John Reid

by E. J. Fetherstonhaugh atty.

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3 SHEETS—SHEET 2.

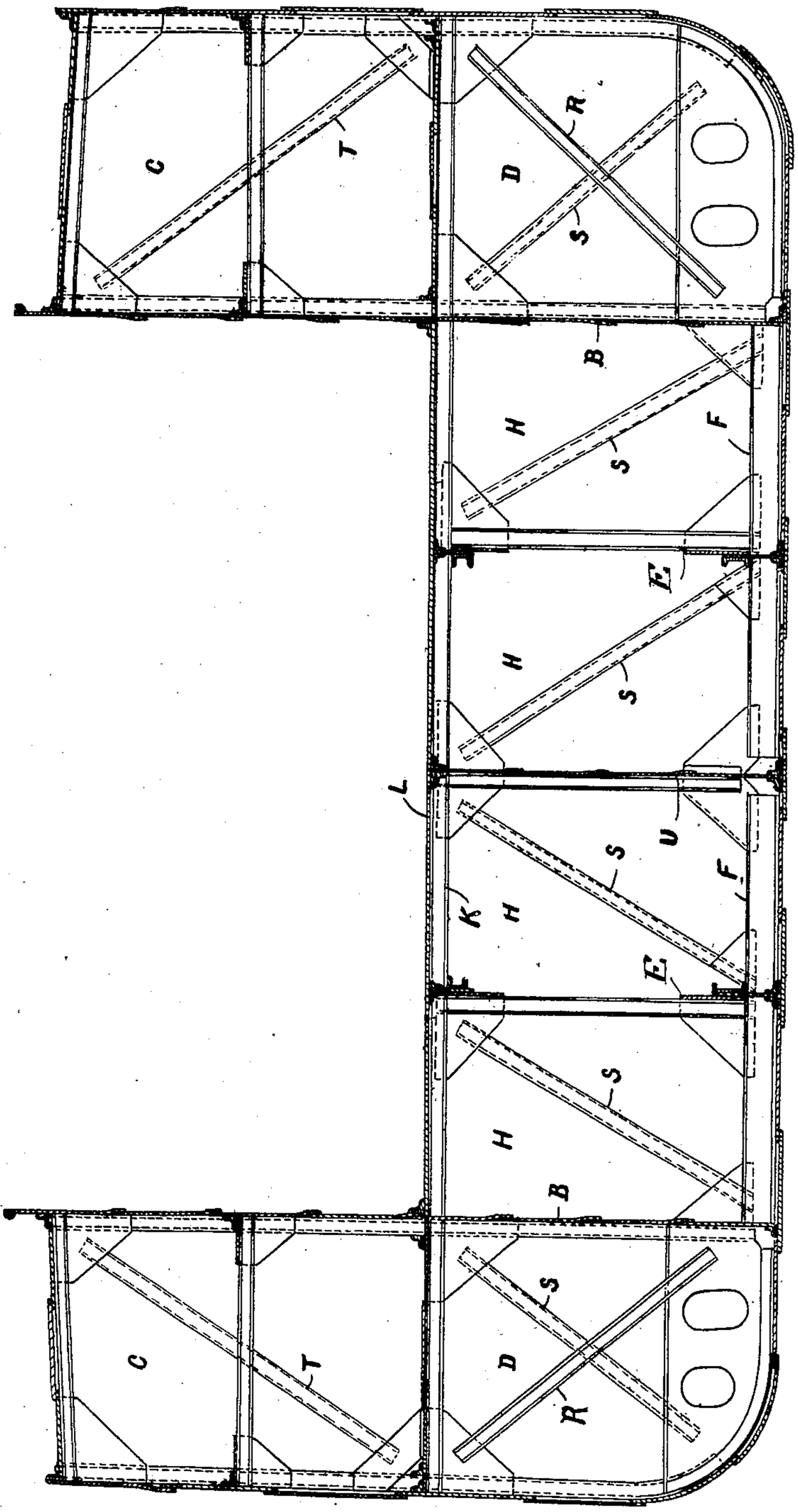

Fig. 4.

Witnesses.

Lloyd V. Blackmore

D. W. Colton.

Inventor.

John Reid

by E. J. Fetherstonhaugh Atty.

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3 SHEETS—SHEET 3.

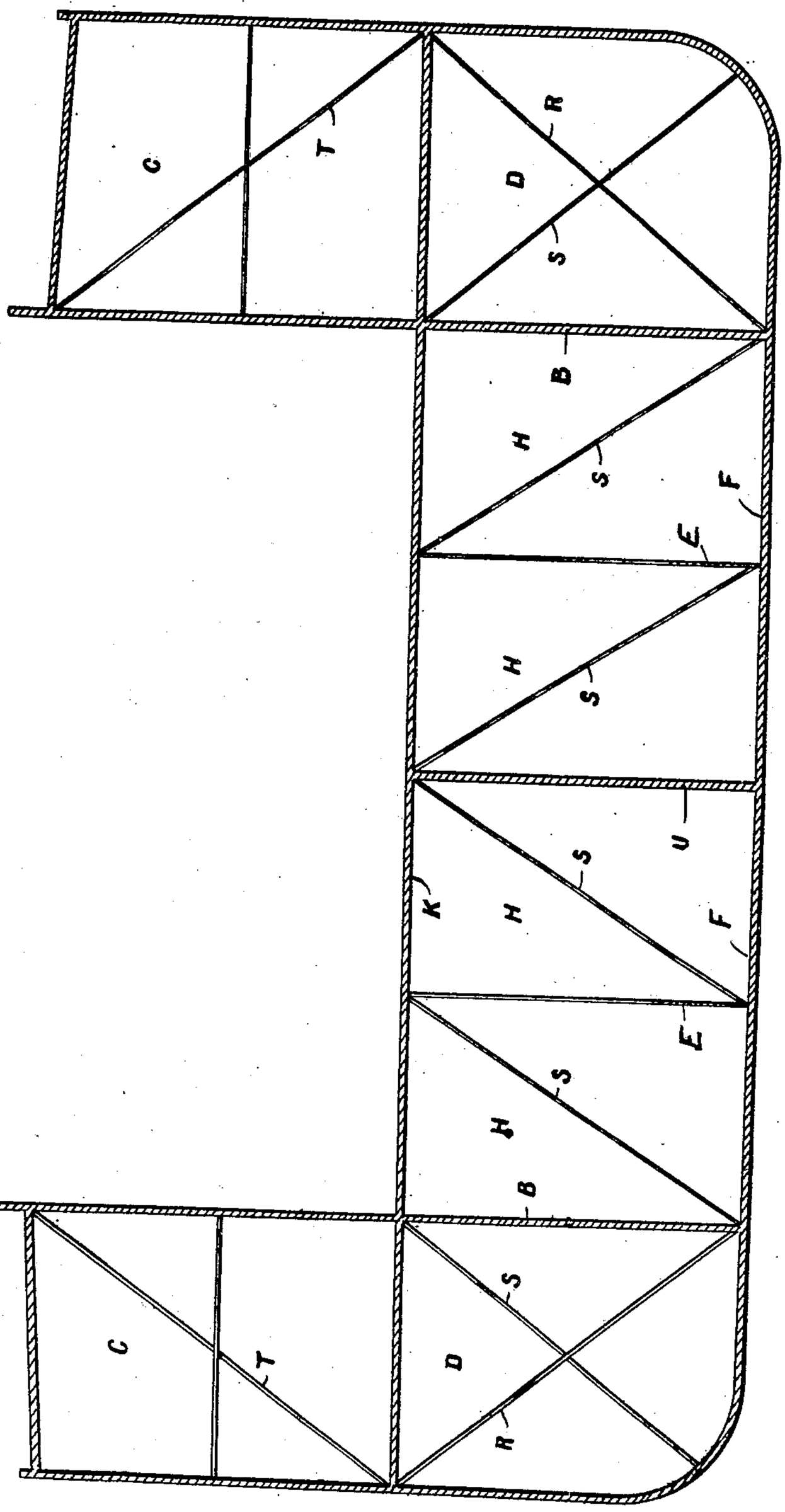

Fig. 5.

Witnesses.

Lloyd Blackmore

D. W. Colton

Inventor.

John Reid

by E. J. Fetherstonhaugh atty.

UNITED STATES PATENT OFFICE.

JOHN REID, OF LONDON, ENGLAND.

SHIP.

No. 862,510. Specification of Letters Patent. Patented Aug. 6, 1907.

Application filed December 3, 1906. Serial No. 346,149.

To all whom it may concern:

Be it known that I, JOHN REID, a subject of the King of Great Britain, residing at 95 Leadenhall street, in the city of London, England, have invented certain new and useful Improvements in Ships, of which the following is a specification.

This invention relates to improvements in ships, and more particularly steel ships, such as are commonly employed on the Great Lakes of the continent of North America for the carriage of ore or cargoes of a similar nature, as described in the following specification and shown in the accompanying drawings that form part of the same.

The invention consists essentially in constructing within the hull of the ship, a hopper or trunk hold, having its bottom forming a deck of the ship substantially level with the load water line, and its wall or walls vertically rising from said bottom and inclosing said hopper space.

The primary object of my invention is to construct an ore carrying vessel so that substantially the entire cargo of ore will be open absolutely to the attack of the discharging gear, that the portions of hull structure which would interfere with the vertical and fore and aft action of the unloader, are reduced to a minimum or entirely eliminated, and that cargo being much higher in vessel and more concentrated will be entirely visible to operators of discharging mechanism which can more safely and expeditiously remove it.

Another object is to so dispose of the structural material in the hull of the vessel that without any large addition in weight of material the whole longitudinal and transverse strength will be greatly improved and the weakness of the modern ore carrying vessel on account of its enormous length as compared with its molded depth may be counteracted.

Another object is to so arrange the ballast tanks in the vessel that great latitude is possible in the positions in which water ballast is carried. I desire more especially to carry the water ballast high up, so that not only may the metacentric height in the ballast condition be reduced to a moderate amount and thus make vessel's motions easier in a sea-way, but also by the mere opening of suitably placed valves or sluices the water carried may in a short space of time be discharged without pumping and loading operations be thus facilitated. Unloading operations may also be facilitated by preventing rapid changes in vessel's draft and trim, by providing large inlet sluices to lower tanks and powerful pumping plant to upper tanks, so that as ore is removed, water may be run in to compensate and retain vessel as nearly as possible at a mean draft and obviate the necessity for frequent changes in the stops on the automatic mechanism which exist to prevent damage to vessel by grabs striking bottom of cargo space. I desire also to elevate the ore or similar cargo that the excessive stability which the loaded vessel would otherwise have through the great beam of my vessel, will be moderated, her motions in a sea-way will be easier and the resulting sea stresses reduced. This vessel, in nautical language will be "sea kindlier."

Another object is to do away not only with all beams, decks, and other obstructions covering the cargo, and hampering operations of discharging mechanism, but also to enable vessel to dispense with hatch coverings of every kind, save only what may be necessary to guard against climatic or sea conditions which might affect the nature or value or handling of the cargo.

I also desire to greatly improve the safety of vessel by a series of compartments made perfectly watertight and containing a much larger sealed reserve of buoyancy than is usual in such vessels, so that cargo space is bounded by an entire double hull affording valuable provision against vessel's loss by collision or stranding.

In the drawings, Figure 1 is a profile plan of the vessel at center line. Fig. 2 is an upper deck plan. Fig. 3 is a main or lower deck plan. Fig. 4 is a midship section plan which most clearly indicates the nature of my invention. Fig. 5 is a diagrammatic representation of the elements of strength in a vessel designed to embody my invention.

Like letters of reference indicate corresponding parts in each figure.

The present ore carrying vessels are usually provided with trough or hopper holes in order to facilitate the discharge of their ore cargoes in conjunction with automatic unloading appliances at the lower lake ore receiving ports. Owing to the enormous size of these appliances and the restricted area of the vessels, hatchways through which they have to operate in removing the ore, great care is necessary in their operation to prevent violent contact between the unloader and the vessel, and consequent heavy damage. Serious accidents to ship and unloading machines have in fact occurred from such causes and in endeavoring to avoid their repetition the greatest available speed of machines cannot be maintained. In certain ponderous forms of unloading apparatus, also it is necessary to first lower the automatic grab through the hatchway, then open it to its fullest reach, swivel it round, close the jaws, swivel back to first position and then withdraw through the hatch. Such a sequence of operations involves some loss of time which cannot be obviated where there are the usual narrow 9 feet hatch openings to work through. It is also necessary, on account of the narrow hatchways with plating between limiting the scope of the unloader, to shovel or scrape by manual labor or mechanical means the last portions of the cargo, amounting

from five to ten per cent of the whole, which cannot be lifted by automatic unloader, thus involving delay and greatly increased cost. So large, also is the capital involved in these ore carrying lake vessels and the dock unloading piers and mechanism, and so great is the pressure of work during the ore shipping season that strenuous efforts are made to reduce the time taken in the discharge of cargo. Any saving in this direction is multiplied in value many times by the special conditions under which the work is carried on, viz:—Shortness of season of navigation, and enormous burden of ore to be transported.

Referring to the drawings, A is the hull of the vessel constructed of any suitable proportions of breadth to depth required to give stability sufficient to enable one to elevate the bottom of the cargo space or to provide sufficient strength in connection with the desired length and the conditions of trade and service. In a lake steamer for the ore trade with a length of five hundred and fifty feet the corresponding beam and depth employed would be about sixty five feet and thirty two feet respectively. Such proportions enable me without concern as regards the stability of a loaded vessel to have the bottom of the cargo space at or about the level of the load water line and by so doing greatly improve sea qualities of the vessel and increase her structural strength. In the usual types of large ore-carrying steamers there is a double bottom framed of solid and built-up floors from four to five feet in depth and supporting a complete double skin, in many cases there are also wing tanks carrying this double skin up to level of main deck shelf and forming a longitudinal hopper hold. This structure is much stronger than is necessary for the longitudinal strength of the vessel, and is not balanced by any corresponding strength in the deck and topsides where the material is subjected to equally, or more severe tensile and compression stresses.

The particular arrangement and construction may be more clearly understood by reference to Fig. 4 the midship section of my vessel.

It is possible by my invention to arrange for a much more satisfactory distribution of strength both longitudinally and transversely. In the bottom of the vessel I retain floors F of such depth only as are necessary to support the pressures on the bottom plating and I dispense entirely with the inner bottom plating. At or near level of load line, or about half molded depth of vessel, I insert a complete main deck L composed of heavy cross beams K rigidly connected at outer ends by brackets to ship's main framing and plated over in the usual way. I support beams at numerous points in their length by the longitudinal wing bulkheads B. B. and combined center bulkhead and keelson U and bulkheads E. E. This structure forms a complete unpierced water-tight steel deck extending from machinery space to forward peak bulkhead and forming bottom of cargo hopper. In very small vessels I may leave out portions of the deck plating where this is not required for strength or as a bottom to cargo hold. In order more efficiently to support this deck and the great weight of cargo which it must sustain and also the better to stiffen the vessel transversely and render through upper deck tie beams and hatch plating unnecessary, I introduce diagonal struts S. S. of channel or other suitable section. I thus convert the framing between main deck and bottom plating into a deep girder or bridge truss of great strength, while at the same time numerous longitudinal girder bulkheads maintain the longitudinal strength. I may introduce further diagonal ties R. R. crossing those already described or vary the form of the girder as may be required by structural requirements to obtain greater strength or economy of material or workmanship.

The upper portions of the two wing bulkheads above main deck form the sides of the cargo hopper, and they may be continued, if desired, above upper deck sufficiently to form high weather coamings and to keep heavy seas from reaching cargo. The vessel's topsides and upper deck at sides of hopper are completed in the usual way, but the greater breadth of uncut upper deck which the relatively great beam of my vessel permits, and the absence of hatchways extending nearly to sides of vessel as in usual types of lake steamers, results in my vessel in a great addition to the strength of its topsides. I may introduce further struts T. T. as already described to assist in the maintenance of the vessel's transverse form. By the above mentioned construction I obtain an under-water body of great rigidity transversely and longitudinally, employing bridge girder construction in both directions. I also maintain great strength in the topsides by the symmetrically constructed spaces C. C. flanking hopper, which in present form of construction lack the very valuable support of the inner longitudinal bulkheads. I thus secure adequate strength where the most severe stresses are known to arise. No such efficient transverse tie or strut exists in any form of present day ship construction as is provided by the main deck which I introduce, and which is uncut by any hatches or other large openings.

I construct the four wing spaces C. C., D. D. as tanks for water ballast, all independent of each other if necessary, and further subdivided into convenient size by transverse watertight bulkheads. By use of these wing tanks and the high center of gravity of the water they contain, the ballasted vessel in a sea-way will have a much easier motion than where the ballast is confined to a cellular double bottom of usual construction low down in vessel, even if reinforced by wing tanks; the resulting concentration of thousands of tons of weight at a low position in vessel combined with enormous length and beam producing excessive stability and very violent rolling motions. By the use of these tanks and the provision of large sluices I am able to run off by gravity the whole or greater part of their contents and thus quickly and economically effect discharge of ballast, a matter of much importance in the ore trade, owing to great rapidity with which these vessels are filled from the hopper ore docks, immediately on arrival at loading port. Also alongside the older ore loading docks where chutes are low and difficulty is experienced in loading into very large vessels, I am able to retain sufficient ballast on board to keep ship well down in water and to discharge same at will as cargo is loaded into her and to thus maintain vessel at a convenient water level. I may decide in a vessel of this description to fit one or more transverse watertight bulkheads extending unbroken from side to side of vessel and crossing hopper. I may fit two such bulkheads close together and connect them at

upper deck level by a strip of deck plating with angles, brackets and beams to provide an efficient cross tie at the center of vessel should such be deemed necessary. This will merely divide my hopper hold into two independent portions without interfering with the main objects of my invention.

Owing to the cargo hold of my vessel being restricted to a capacity suitable for ore or other similar heavy cargo, a great reserve of buoyancy is retained in the sealed portions C. C., D. D. and H. H. which are subdivided again transversely into numerous watertight compartments. It results from this that so much of the vessel's buoyancy being sealed I do not require to protect the cargo space by elaborate hatch coverings as is necessary in usual forms of vessels where an ore cargo occupies a comparatively small proportion of the cargo cubic contents of hold under hatches. By considerable areas of deck space alongside hopper hold and suitable weather coamings I provide sufficient protection in all ordinary conditions of weather even when vessel is loaded down to extreme draft. To prevent the cargo, however, being wet by rain water, heavy seas or spray, which might affect the nature of the cargo or cause it to bind or in cold weather to freeze and thus prevent proper operation of discharging plant, it may be advisable to provide a covering of any suitable construction.

When the vessel is running light or in ballast trim the water line will be considerably below the level of bottom of cargo space; by fitting large sluice pipes P. P. in the corners of the hopper, or in each of its divisions, and leading these through the bottom plating, any sea or rain water finding its way into the hopper will naturally drain to sea level and obviate any danger of an accumulation of free water in the hopper which might affect vessel's sea-worthiness or stability. It will not be necessary therefore, in the light or ballast condition to cover over the hopper under any conditions. These drain pipes will be protected by suitable sunk covers bolted down when ore is to be loaded. They may be used as drains for the upper ballast tanks by fitting the necessary branch pipes and sluice valves from said tanks.

What I claim as my invention is:

1. In a steel ship for carrying cargo in bulk, in combination, a hull having perpendicular sides and substantially flat bottom, a shell of substantially similar shape in cross section and forming the inner skin of the ship and a hold for cargo in bulk, extensions from the bottom of said shell to the side walls of the ship forming an uncut flooring equivalent to a main deck at or about the level of the load water line transverse girders supporting said flooring, bulk heads separating the spaces between said inner skin and said hull into water tight compartments and supports and struts extending to said shell from said hull, substantially as described.

2. In a steel ship for carrying cargo in bulk, in combination, a hull having perpendicular sides and substantially flat bottom, a shell of substantially similar shape in cross section, extensions through to the side walls of the hull from the bottom of said shell at or about the level of the load water line, a water bottom below the aforesaid bottom of the inner skin, a central keelson extending upwardly to the bottom of said inner skin, a plurality of vertical supports arranged between said inner skin and hull, a plurality of lateral supports between said inner skin and hull, said hull and said inner skin forming therebetween a plurality of wing and lower water-tight compartments and said inner skin forming a hold for said cargo in bulk, substantially as described.

3. In a steel ship for carrying cargo in bulk, in combination, a hull forming the outer skin of the ship and having perpendicular sides and substantially flat bottom, a flooring extending thereacross at or about the level of the load water line, transverse girders supporting said flooring, vertical walls extending parallel to the sides of said hull above and below said flooring, supports from the hull to said flooring and to said vertical walls, said flooring between said vertical walls and said vertical walls above said flooring forming an inner skin to said ship and a hold for said cargo in bulk, and bulk heads dividing the spaces between said skins into a plurality of water-tight compartments, substantially as described.

Signed at the city of Montreal, district of Montreal, in the Province of Quebec, in the Dominion of Canada, this 20th day of November, 1906.

JOHN REID.

Witnesses:
LLOYD BLACKMORE,
B. CHARLELOIS.