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E. L. Berthon M.A.

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Ebening Meeting.

Monday, May 1, 1876.

VICE-ADMIRAL SIR FREDERICK W. E. NICOLSON, Bart, C.B.,
Vice-President, in the Chair.

COLLAPSING BOATS.

By the REV. E. L. BERTHON, M.A.¹

GREAT, if not the greatest, amongst the wonders and signs of the times in which we live is the enormous expansion of international communication. It is probable that for every *one* person that travelled by sea or land fifty years ago, a *thousand* travel now. Queens, Emperors, and Princes obey the new law that steam has enacted, and by its mighty aid pass over continents and seas with far less hesitation than of yore they visited a town or province a score of leagues distant from their capitals.

At once the cause and the effect of this craving of the civilized world for running to and fro, has been a rapid development of ocean-going ships, till at this day floating palaces of huge dimensions, defying winds and waves, carry their human freights across every ocean and sea with a speed and regularity our fathers would have deemed incredible.

Still the march of improvement and development goes on, and as the science of navigation receives fresh accessories, it is reasonable to hope and believe that individual risk of life in travelling by sea is less than it used to be. Yet from the very nature of the case, and the multitude of human beings collected in one ship, the calamity of the wreck or collision is incomparably more awful than it ever was before; for there is a want which till now has never been supplied, the want of a sure and ever ready means of refuge when the great fabric of the floating palace burns or sinks.

The object of this paper is to lay before the members of the Royal United Service Institution, and the nation, with humility allied with confidence, a really practical way of meeting the deficiency above mentioned.

It is not denied that boats and lifeboats now carried by ships have made considerable progress in numbers, size, and efficiency, especially in the magnificent Indian troop-ships, and the passenger-steamers in

¹ The publication of this paper has been unavoidably postponed.—ED.

the great ocean steam companies; nevertheless, it is sadly true that no such ship when carrying her full number of troops or passengers, can also carry a supply of seaworthy boats to save one half of them in case of necessity.

For instance, let us take Her Majesty's Indian troop-ships. It is not uncommon for one of these magnificent vessels to convey at one time 1,700 men, women and children; every available spot in which a boat can be stowed is utilized, so that each of these ships carries fourteen boats, four of them being the largest troop-boats hitherto known; yet were a fatal accident to happen to such a ship, which God forbid, and by some unheard-of discipline, or self-denial, all those boats were safely launched and completely filled with people, only 600 at the utmost could be saved, and 1,100 must inevitably perish.

In emigrant ships the deficiency reaches its most appalling limit. The legislature cannot enjoin impossibilities. The regulations of the Board of Trade with respect to boats have little or no regard to the number of crew and passengers, but only to the tonnage of the ship, and thus it came to pass that in two typical cases of frightful loss of life by collision and fire—the “Northfleet” and the “Cospatrick”—the official report of the Board of Trade enquiry, after stating the numbers and capacities of the boats, and thus showing that they would not have held one-third of the human beings, makes this startling announcement almost in the same words in each case, that “the ship was well supplied in boats, which were in excess of what is required by law.” That such a state of things should be tolerated is a reproach to the intelligence and humanity of the age. Two years ago, the Board of Trade sent two nautical surveyors to Romsey, to inspect and report upon some of my large collapsing lifeboats building there. That the report was highly satisfactory I have reason to know, but no action was taken upon it. It is true that Sir Charles Adderley's Merchant Shipping Bill of last session, in its *first* draft, contained a clause which practically amounted to “lifeboat accommodation for all hands;” but, in its second edition, the life-saving clause was sadly curtailed. It never became law; and, I believe, in the Bill now in Committee, “sauvetage” is entirely passed over. Thus, though it is perfectly well known at the Board of Trade that it is no longer impossible to supply any amount of lifeboats to every ship, passengers, emigrants, and crews, are still sent to sea without any refuge from the dreadful calamities of fire, wreck, or collision. Forsooth it is the law of the first maritime nation in the world.¹

But it is not only the deficiency of boat accommodation that occasions a frightful loss of human life. There is another fatal evil, which is very frequent even in those cases in which the numbers of persons are *small*, and that is the practice rendered necessary in bad weather of carrying the boats inboard on the booms, or chocks, or skids, so that though the boats might be sufficient, they cannot be got out in time. Such was the case with the ill-fated “Strathmore,” and probably the “Strathelyde” too.

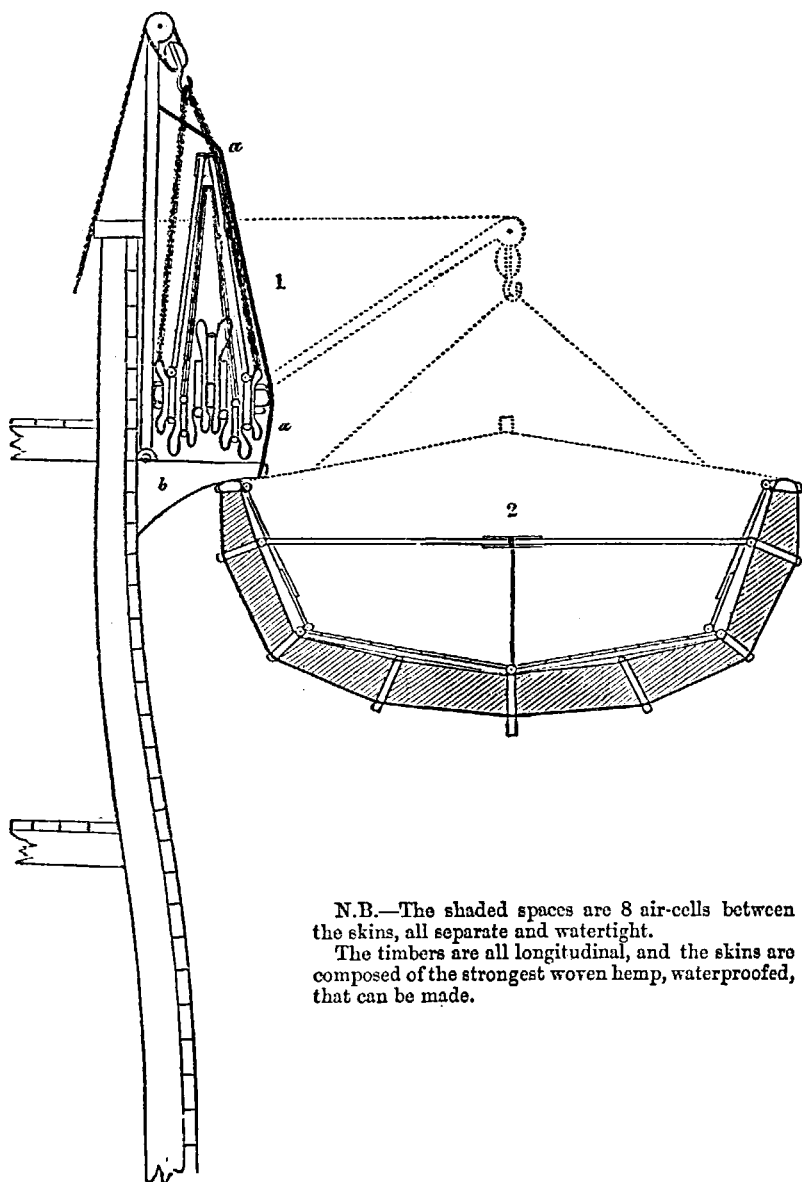
¹ Since this paper was read the “Merchant Shipping Bill” has passed, without any clause relating to increase or improvements of the means of saving life at sea!

It would be ungracious of me to ignore the efforts made by others to remedy this state of things by various kinds of life-saving apparatus, such as deck-houses disporting themselves as floating arks, as a distinguished member of my profession recommends, or several varieties of bridge "*life-rafts*," as they are called; or again, the many puffed up bags of india-rubber. In my humble opinion all these, laudable and ingenious as they are, prove the existence of a great want rather than supply it.

The two great desiderata of the boat system of every ship are, first, their supply should be abundant, and second, that they should be so stowed as to be available at any moment without the labour of hoisting out. Both these advantages are secured by the system of collapsing boats, which I have the honour to bring forward now; for not only can boats of this kind be carried in numbers and capacities far exceeding those now in use, but owing to their great compressibility they can be carried outboard without the slightest risk of injury, in fact they collapse into about one-sixth of their breadth when open.

It may be interesting to some present on this occasion, if I relate briefly the history of the collapsible boat. It is closely connected with the narrative of the "*Orion*," which ran on a rock on a clear and still summer night in June, 1849, near Portpatrick, when nearly 150 of the crew and passengers (chiefly first-class) were drowned. Whilst drawing for an engraving the final plunge of this favourite but luckless steamer, I suddenly conceived the idea of building a boat with *longitudinal timbers* jointed at each end, and substituting a flexible material for the ordinary planking. That the first impression of a canvas boat is doubtful, if not decidedly adverse, can scarcely be a matter of surprise, though I think a stronger and far more reasonable prejudice against that treacherous gum called caoutchouc or india-rubber has retarded for a quarter of a century the adoption of this invention. Had there indeed existed, a desire, either in the Royal or Mercantile Marine, for such an augmentation of ships' boats as this system rendered possible, this only objection would soon have been removed, and a far better and cheaper material substituted for it, such as I now employ. But there was no such desire, and though I spent £6,000 in those days in proving the admirable qualities of these boats, the world was not ready for them, and the world would not have them. To this day, where they are most wanted, they are not to be found, for the owners of emigrant ships will do nothing beyond what the law enforces. In making this statement I bring no charge of indifference against this large and influential class, for their conduct may well be explained without such an imputation. I have reason to know that what they fear in adopting such a comprehensive system as this, is not expense, but responsibility. At present they are not held liable for the lives of their passengers and crews, simply because adequate refuges are counted impossible. Thus they act strictly up to the law and the regulations of the Board of Trade, and are jealous of anything that tends to fasten upon them a responsibility from which they are now free, for once prove that it is possible and easy to carry lifeboats *for all hands*, the strong voice of public opinion will

Fig. 1.—1. Boat collapsed against bulwarks. 2. Same boat expanded automatically on letting go the grips, *aa*.



N.B.—The shaded spaces are 8 air-cells between the skins, all separate and watertight.

The timbers are all longitudinal, and the skins are composed of the strongest woven hemp, waterproofed, that can be made.

hold them responsible for human lives. I have alluded to the *prima facie* distrust of canvas boats, but I think I can truly say that perfect confidence is restored in the minds of those who examine the peculiar construction of my lifeboats. You will perceive that the timbers which are jointed together at the ends are broad and flat, and that the

Fig. 2.—Gunwale plan of the same boat, drawn to a smaller scale.

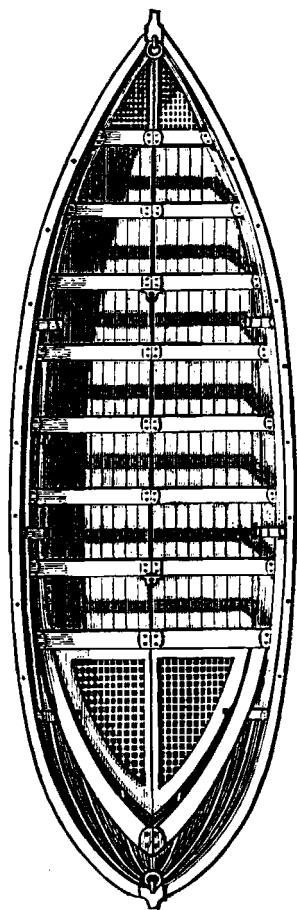
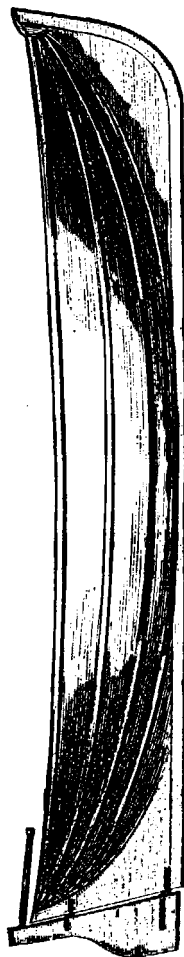


Fig. 3.—Side elevation of the above.



canvas is secured in two separate skins, one to their outer, the other to their inner edges, thus the bottom and sides of the boat are divided into as many distinct and separate compartments as there are spaces between the timbers, so that in case of injury the water enters no further than the damaged compartment, and the efficiency of the boat is not perceptibly impaired.

I shall call your attention to many details of construction in these boats which will be far better understood by examining the specimens than by any oral or written description. I will only add that these details have required an enormous amount of careful consideration, and that now they are thoroughly practical and efficient.

I rejoice to say, with deep thankfulness, that through the most humane and highly intelligent recognition of the value of these boats by the Director of Transports, I have the full support of the Admiralty and the Indian Council, and I am now engaged in executing orders by which all Her Majesty's troop ships will be abundantly supplied.

The plan and manner of stowing these boats in the above ships is the following:—

Each ship carries four large troop boats, 38 feet long; the davits of these boats will be increased in strength and spread, so that they will hang about 2 feet 6 inches clear of the top rail, and in this space, *i.e.*, between the ordinary troop boat and the netting the collapsers will be placed, their weight supported by their spans or slings upon the straight parts of the davits. When the boats have to be put out the ordinary boat is lowered first, the tackles are then overhauled and hooked to the slings of the collapser, which, when its gripes or frapping lines are cast off, swings out and opens itself by its own weight, it is then lowered like other boats. In hoisting, the collapser is raised first, collapsed by its own weight and boused in, the tackles are then fleeted, and the other boat is hoisted. But this is not the only method of carrying collapsers. In Her Majesty's ship "Assistance" they are stowed abreast of the foremast, or a little more forward, upon straight wooden davits, which are topped up into a vertical position when the boats are hoisted and collapsed like the model before you.

Boats for Horses and Artillery.

I have just delivered at Portsmouth a pair of very remarkable collapsers, which, I have reason to hope, will be found extremely useful. They are probably much larger than any boats ever seen in the Royal Navy, being 40 feet long and 13 feet 4 inches wide, and, carrying their beam with a rather flat floor, well fore and aft, they have very great displacement, at least 30 tons, in fact, they will draw only about two feet with a weight of 20 tons. The bottoms of these boats are divided into cellular compartments 20 inches deep, above which their platforms or decks, nearly 12 feet wide, are raised above the load water line, so that with their gunwales let down to the same level, they will still carry all their freights.

A long rectangular space amidships bounded by haunch rails 28 feet \times 6 feet is devoted to horses, of which each will carry twelve with parting bars between, or fifteen without. This space is divided into three 9 feet 4 inches \times 6 feet, and when a gun is to be carried, the horses are put in the two end spaces and the gun with one or two more horses in the middle one, thus each boat will land a 16-pounder field gun with nine horses when the parting-bars are used, and eleven

or twelve horses without them, and there still remains room on the ends and wings for 60 or 70 men.

When required to land on a beach or a flat shore, one gunwale is let down, and by means of a brow or broad gang-board, the gun is wheeled out and the horses follow. Below the haunch-rails are longitudinal bars 20 inches above the deck, and when the boats are used to land troops, or for the still more important purpose of saving life in case of accident, the parting bars are made use of as thwarts. The compartments thus arranged, one forward and the other aft, may be surrounded and covered over with canvas, giving shelter to 50 persons seated on the thwarts, and leaving the ends and the midships space for working long oars.

The stems and stern-posts of these boats terminate in very substantial bollards, which are very convenient when towed; or anchored at both ends broadside to a beach.

Their use for Purposes of Offence.

Experiments made with boats smaller and far inferior in strength to those just described, proved that they can be used with heavy guns which would be fatal to solid boats, for their great elasticity and the absence of solid planking enables them to withstand any amount of concussion and recoil without injury. With a 95-cwt. 68-pounder, or its equivalent of more modern type, and the boat's crew it would draw only 12 or 14 inches of water; and I am quite prepared to put either of these horse collapsers to this test if it be so desired, firing it either forward or aft. I humbly suggest that there are many circumstances of attack in shallow waters where such a light draught flotation for a long range gun might be found extremely useful. But having, as in duty bound, briefly alluded to this kind of service, I leave it to other heads and hands to make this warlike application. My province and aim is *saving* life and not *destroying*—to produce not a *deathboat*, but such a *lifeboat* as can be carried by any ship in any required numbers, and in such a way as to be instantaneously available in case of need.

Arctic Sledge-Boats.

Dinghies of the smallest dimensions are built on this principle, and are in very great demand in all parts of the world for purposes of exploration and pleasure. Captain Nares has three of them which promise to be very useful to the sledge parties now, as we hope, on their triumphant progress to the North Pole. Others are now in use by two different parties exploring Central Africa. The smallest of these boats weighs 40 lbs., and collapses into about four inches. The most convenient and safest way to use them for crossing and navigating rivers and lakes is to combine two such boats together, more "*Castalia*," when the twins will carry from eight to ten men. Collapsed, and slung between two men, the pair of boats with seats, mast, sail, and sculls forms a package eight feet long and eight inches wide, weighing less than 1 cwt.

Pontoon Bridges.

Very excellent bridges of all sizes and to carry all weights, from men in single file to the passage of the heaviest siege train or elephants, can be made on this plan of much less weight, and requiring less than half the number of wagons necessary in the most approved bridge-trains now in use.

I submit that very light bridges of this kind would be useful for infantry. I constructed a bridge in this manner and threw it across the river Test a few weeks ago, over which I sent our Volunteer corps, and then made them stand upon it as close as possible. The result was highly satisfactory, and proved that one horse or mule can easily carry two such boats with twenty feet of road-way complete, with anchors, ropes, and sculls.

With respect to large and heavy bridges, the following will give some idea of what may be done on this plan.

The ordinary pontoon boat is twenty-two feet long and about four wide, weighing 900 lbs. Only one of these can be carried on a wagon. I am prepared to put on one wagon, in the same length and breadth, *three* or even *four* boats of far greater buoyancy and of equal strength, the total aggregate weight of which shall not exceed half a ton. The peculiar construction of these boats admits of a better mechanical arrangement of baulks and chesses, so as to produce a greater degree of strength with a less weight of material than in the bridges now in existence.

Boats for Yachts, &c.

These are made of all sizes, and are found to be superior in speed, stability, and safety to wooden gigs. A nine feet dinghy four feet wide weighs about 70 lbs., and shuts into less than six inches.

A very handsome gig 26 × 5·2 with mahogany thwarts and all complete, weighs about 4½ cwt., and shuts into less than a foot.

A New Method of Lowering the above, and all kinds of Ship's Boats.

Two deeply grooved rope-wheels attached to *whelp wheels*, are connected together by an endless chain; one of these is placed by each davit, and the chain lies under the rail. The usual falls are used, but instead of belaying the ropes at once to the cleats or belaying-pins, they are first passed round the grooved wheels, and thus "*married*," so that neither of them can run out without the other. The stoppage of one stops the other; thus it is impossible for the boat to be lowered except on an even keel. One man at either end, whether in the boat or on board the ship, can lower the boat evenly and safely, for the control of one fall is, by means of the chain "*messenger*," communicated equally to the other.

MR. STIRLING LACON: I should be glad, Sir Frederick Nicolson, in the presence of Sir William Mends, to offer an observation or two, not with regard to these appliances—but how they are to be released from the ship. At the Admiralty some years ago, I was almost laughed at for imagining that any person could attempt to lower a boat at full speed, but the case of the "*Amazon*," a West

Indian mail steamer, twenty-five years ago, may be recollected, where they were not able to stop the engines, the vessel tore along through the water at full speed, and the boats, hanging in the position of the one before us, were all dragged under water and swamped; therefore I wish to speak of the necessity of having some efficient plan by which you can get the boat detached from the vessel. What has occurred in the Admiralty Court to-day and on Saturday? The mate of the "Franconia" told us that after the accident to the "Strathclyde," the "Franconia" lowered her boats (I think five or six), within four feet of the water; and his evidence is that it is dangerous to lower a boat going at half speed. "You cannot lower a boat," says the mate of the "Franconia," "unless the vessel is stopped." Now I am not going to advocate any particular principle of detaching the boats from the ship, but I wish to say, in face of the evidence of this German officer to-day, that I myself was lowered, twenty-five years ago, in the presence of several thousand people at Folkestone, six times over (four men each time being in the boat with me), and the vessel steaming at full speed, or 13 knots. If the thing could be done off Folkestone, I say the thing can be done on any occasion. Admirable as I believe this boat to be, and perhaps no person is more competent to judge of the merits of the boat itself than Sir William Mends, I denounce these tackles by which the boat is held, and if there is any speed upon that vessel you cannot get the boat detached from the ship. It is a principle in mechanics that in raising a weight you require a power. That power is the tackles by which the boat is raised, but as soon as the boat is at the requisite elevation, the power which is now only in the way, ought to be removed, and the boat will go down of her own weight if the descent is only regulated by some requisite appliance. That is the principle upon which I acted twenty-five years ago. I say the thing is to be done, and that I myself was in a boat with four men, and we were lowered going 13 knots an hour; and yet the mate of the "Franconia" yesterday said in court it was not safe to lower a boat except the ship was stopped.

Vice-Admiral Sir WILLIAM MENDES, K.C.B.: The lowering apparatus is a thing quite apart from the boat itself. Every one of the boats in our troop ships is really hung by the disengaging hook, so that each one of them lowered from those ships would be detached and disengaged, and clear herself uniformly. I can scarcely understand any seaman of the present day saying a boat cannot be lowered equally and detached, with such appliances as we now have. Very many plans for disengaging boats of course come before the Admiralty, and it would be very invidious if I were to name one more than another, but to the present time every one of the boats of the Indian troop ships is hung by Kynaston's hook. There is no reason whatever why a disengaging hook should not be applied in lowering these collapsing boats, but the point we are discussing now is the boat and not the hook.

Mr. STIRLING LACON: I merely mention what came before the Admiralty Court to-day, and I wish to call attention to the fact that there is a great fleet of German vessels almost daily coming to this country, and that according to the evidence of their officers they cannot lower a boat unless the ship is stopped.

Sir WILLIAM MENDES: I should like to say a word with reference to the subject-matter of the lecture to which we have listened. It has been on my mind for years that the vast number of people we carry on troop ships is quite beyond the boat service supplied for conveying them in case of disaster, but I have consoled myself always with the idea that in past times our three-deckers never carried boats for all their crew; and I believe no ironclad of the present day carries boats for her complement; and I have further consoled myself in the fact that the structure and arrangements of the Indian troop ships, and all other troop ships under the Admiralty, are as perfect as human foresight could suggest, and that the ships are in themselves as safe as it is possible to make them, whilst ordinary boats are supplied in number as many as we can put into them, and they are of the very best description. Nevertheless, with the boats and with the large raft in the Indian troop ships, which holds about 330 people when put together, and is very useful for many purposes, we do not carry more than about 800 people. Mr. Berthon referred to the pontoon raft. I am of opinion, with reference to the raft, which does not merit the name of an invention, that in

case of any serious calamity, such as the ship on fire, or on shore, with little or no prospect of getting off, it might be available, not as a whole, but by using two of the pontoons at a time, connected by rough spars with a platform of hatchway gratings. I have, however, been so struck by this invention of the collapsing boat that when, a few months ago, it was for the first time brought to my notice by Mr. Berthon himself, I requested some of the members of the Board of Admiralty to come to my room to see the model, and we were so impressed with the principle, that I obtained permission to go to where they were built to examine the structure and method of building for myself. Officers were also sent by order of the Board from the Comptroller's department to examine it, and their report was most favourable. I made a report at great length, recommending its adoption, at any rate to give it a serious trial, and happily, as Mr. Berthon observed, Mr. Plimsoll has, as he has also said wisely in much, unwisely in some, called public attention to the subject of safety of life at sea, and I think what has occurred will really bring about in time a supply of these boats to almost all ships carrying large numbers of people. When I drew up my report to the Board, I did not know that in June, 1854, a very favourable report had been made by experienced practical officers of Portsmouth Dockyard on the mechanical construction and probable durability of such boats, and that it was laid before the House of Commons by order, but from that time to this it has hung fire. I had heard of the boat, and my much lamented friend, the late Admiral Halsted, introduced it in some ship models of his own; but I thought that my friend was one who put too many eggs into one basket, and in ignorance of the principle, as well as of its value, I did not look into it as I ought. But when I came to examine it for myself, I felt I had been wrong; and I can assure you all, I shall sleep more soundly in my bed when I feel that all troop ships are carrying boats capable of accommodating the whole of the people they convey. These Indian ships carry 1,650 to 1,700 souls, while their boats and rafts will only take 800. If any calamity were to befall one of these ships, and it could be shown that advantage had not been fully taken of such an invention as this, it would be such a reflection on those entrusted with the responsibility, as would not unjustly rouse public indignation to a high pitch. The Board of Admiralty and the Secretary of State for India in Council viewed it, as is their duty, and ordered these boats to be built and supplied to all troop ships.

As it has heretofore been considered impracticable, without the most serious inconvenience to other important matters connected with the working of the ship, to supply room for ordinary boats or rafts in sufficient number, so does it now appear to me, become criminal to neglect taking advantage of this great invention of Mr. Berthon's genius, a collapsible boat, which is at the same time a perfect life-boat. It is but just to him to say that his plan of stocking each boat with a supply of provisions and water so that she shall be always ready in her collapsed condition for the people she can save, is as ingenious as the principle of the structure is clever, and affords to my mind no excuse to those who neglect to adopt it in ships crowded with human beings; for it must be borne in mind that this description of boat, though piled to the gunwales with human beings, cannot be swamped, as would be the case with ordinary boats.

The adaptation of this description of boat to military purposes, such as the landing and embarking of field artillery or cavalry on a beach, is exemplified in the models before you; for pontoon purposes, it equally merits the attention and consideration of both services, but as it is not improbable that on this subject a discussion may take place on a future day, I do not think it necessary to enlarge upon it beyond saying that two boats, 40 feet by 13, similar to the models on the table, have been built and are about to be tried at Portsmouth in landing and embarking field artillery on a beach.

LORD ALFRED CHURCHILL: Sir Frederick Nicolson and Gentlemen, some few years ago I crossed to New York in one of the largest ships of the Inman line. She was 450 feet in length and carried ten boats of the ordinary construction, but these were either fitted upon chocks or upon booms, and fitted over the deck, so that you positively could not walk up and down it. The boats were all inboard, and were so fitted that in the event of sudden emergency, it would be ten to one if they could be used at all. There were 1,350 souls on the ship, 1,000 ordinary

emigrants and 350 first-class passengers and crew, and I must say every day I felt some amount of trepidation and fear of any accident happening to the ship, because I felt convinced that the first-class passengers would have no chance whatever. There would have been no discipline; the whole of the bone and sinew comprised in the lower orders would have mastered us, swamped the boats, and probably a very large number of lives would have been lost. I must say when I saw those boats at your factory at Romsey, Mr. Berthon, in the autumn, I was very much struck with them indeed, as everybody must be. The exceeding simplicity of their construction, and the admirable arrangements you have shown us for lowering them, at once commend them to the judgment of any person of any thought or consideration. One great advantage, besides the collapsing principle, is the facility with which the boat can be carried outside the ship, so that all that heavy labour, the necessity to hoist an ordinary boat, is obviated. The only point which at that time I raised to you, which I think you satisfactorily settled in my mind, was the possibility of the cloth cracking when laid by for any time. I think as long as a boat is exposed and open, there is no fear whatever, because the action of the air and water upon it would keep it moist; but whether when laid by, as it probably would be for a long period of time in ships in harbour, and not being looked after, there would be any liability of the canvas cracking, was the point I mentioned. I think you explained to me the reason why there was no fear, but still it would be satisfactory if you could satisfy others in the same direction. I do sincerely hope that in the approaching Exhibition in Brussels, which is to be opened in June by the King of the Belgians, these boats will form a very prominent part. I am certain it is one of the questions which will be discussed at the Congress on that occasion, and I hope it will lead to their introduction on board every passenger ship.

The Rev. Mr. BERTHON: With respect to the mode of detaching, I did not put this forth as the way in which the boat was to be hung. I was exhibiting the boat, not the lowering gear. All sorts of contrivances may be adopted, and I do not for one moment suppose that this is the only way of detaching the boats.

With respect to Sir William Mend's observations, I am exceedingly obliged to him for the kind way in which he has spoken, and not only that, but for the far more than kind way, in which, with so much intelligence and humanity, he has seen what may be made of this invention. I am sure that without his help I should have been still in that quandary in which I had been labouring for many a long year.

With respect to the pontoon raft, I am by no means wishing to disparage that, because I think it is a capital thing: but all I want to say is, in a sea-way out in the middle of the Atlantic it could not be used as a boat might be used; you could not drop it into the water with Hill and Clark's disengaging gear and leave it behind, or anything of that kind. I know it has been used on many occasions for landing troops, horses, and guns, with very great success.

As to the question that Lord Alfred Churchill was kind enough to put to me both at Romsey, and also again this evening, that I may relieve your minds of any doubt about it, I will just simply tell you that the canvas cracking is a very unlikely thing indeed, and the reason why the canvas does not crack is, because a very large quantity of soap enters into the composition of the peculiar paint that we use. Probably you would fancy if a great deal of soap were put into the paint, it would not dry, and I should certainly have believed it, but it does dry and dries very rapidly, though the soap prevents it from getting hard.

Lord Alfred Churchill was kind enough to ask about Brussels. I shall be extremely glad to go to Brussels, though I may tell you I have had such a sickener of exhibitions that I am tired of them. I was asked three years ago to exhibit this boat at the "Northfleet" Exhibition. Well, there was a gallant Admiral at the head of the jurors, and they all went round, and I said, "Will you look at it?" "Oh, no, no!" They never even mentioned it. In Paris, at the Maritime Exhibition last year, I had, at great expense, a good large boat and a small one placed there, and I had a man all day and every day showing them, and people were very much struck with them, but when the jurors, consisting of two French admirals, some captains, and a great many others, came round, all very wise men, they looked at my exhibit, and said, "Oh, no; it is not worthy of our consideration;" and they gave the first prize to baking powder, and the second to pale ale, and very little to saving life at

sea! So that I do not like exhibitions. However, my Lord, I think I shall take your advice, and go to Brussels.

Admiral Sir HENRY CODRINGTON: How are the horses secured from kicking against the side?

Mr. BERTHON: They may kick against the side *rail*, but they cannot get at the sides of the boat. We have tried with all the power we could bring upon the haunch-rails to move them, but cannot do it; they are strutted in such a way that horses cannot get loose.

General Sir LINTON SIMMONS: What sort of deck do they stand on?

Mr. BERTHON: A solid deck that will bear ten times as much weight as will be wanted to put upon it. You would form a much better idea of it, if you saw the large boats. The only question in my mind is whether I have not made them too strong. I think when they are tried, the verdict will be that some weight might have been spared.¹

The CHAIRMAN: I think we have very little more to do but to return our best thanks to Mr. Berthon for having brought this subject before us. It is quite evident that he has given much time and labour to a very interesting and, I am sure, very useful invention. He has made an allusion to the "Northfleet" Exhibition. I do not think Mr. Berthon is aware I am one of the culprits who made a report on that occasion.² We had a very crowded exhibition, and very little time to examine everything thoroughly, and the best we could say about most of the models was that certainly some of them deserved to be further tried. However, I am very glad to hear that Mr. Berthon has now got into much better hands, and that Sir William Mends is really going to put to the test this very ingenious invention. I am sure every one who has ever commanded a ship at sea must have often felt what a dreadful calamity there would be, if he had to put his ship's company into the boats. We all know that the boats of a man-of-war cannot carry anything like the number of men on board. If in the Indian troop-ships, so admirably fitted and arranged, it is provided for the future that on any emergency, all the people on board of them can be put into boats, the whole country will be indebted to Sir William Mends for introducing this system, and of course especially to Mr. Berthon for his invention, which will enable this arrangement to be carried out. In the name of the meeting I have to convey our best thanks to Mr. Berthon.

¹ Since this paper was read many trials have been made with the collapsing horseboats, both with living and dead weights. On the first occasion of placing on board at Southsea beach, eight artillery horses and the 16-pounder field-gun and limber, and with the gunners and the boat's crew, it was found that, owing partly to the boat's being improperly anchored, she was dragged on shore by the effort of hauling the gun on board, when it became impossible to raise the gunwale that had been lowered, and water overflowed the deck of the boat *up to the fetlocks of the horses*, the water in which the boat was floating not being deeper than a man's knees, but in the subsequent trials, not only was this error avoided, but the gunwales themselves had received additional support, and the result was in every respect perfectly successful. The boat was found fully capable of carrying a much heavier load than was intended for her; and the time occupied in embarking or disembarking the gun and limber, with eight horses and all the men, was thirteen minutes in one case and only seven in the other.—E. L. B.

² The model of the collapsing boat exhibited by Mr. Berthon at the "Northfleet" Exhibition, in 1873, had its skin, the equivalent to the planking of an ordinary boat, constructed of a material prepared with india-rubber. The three referees, of whom I was one, considered this material unsuitable for the purpose, especially in hot climates. For this reason no special mention was made of the boat in the referees' report. The canvas now used by Mr. Berthon is prepared in a different manner, and is therefore not open to the same objections.—F. W. E. N.

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MAJOR LONSDALE A. HALE,

Royal Engineers,

Royal United Service Institution,

Whitehall Yard, London, S.W.