THE LIFE-BOAT,

OR

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LIFE-BOATS OF THE NATIONAL LIFE-BOAT INSTITUTION.

IN the year 1852 this Institution adopted a new description of life-boat: many of the boats which it at that time possessed were worn out, and the result of the competition for a prize offered in the previous year by His Grace the Duke of NORTHUMBERLAND for the best model of a life-boat, led the Committee to believe that a boat of a safer and more efficient character might be produced than that hitherto in the possession of the Society.

The boat selected was the production of JAMES PEAKE, Esq., Assistant-Master-Shipwright in H.M. Dockyard at Woolwich. Mr. PEAKE had been a member of the committee appointed by the Duke of NORTHUMBERLAND to decide on the relative merits of the models and drawings which competed for the prize above alluded to, and which were no less than 280 in number. After the prize had been awarded, Mr. PEAKE was requested by the other members of the committee to furnish a design for a life-boat which might combine as many as possible of the advantages, and have as few as possible of the defects of the best of the models examined by them. A boat was accordingly designed by Mr. PEAKE, and, by the authority of the Lords of the Admiralty, was built at the expense of the Government, at Woolwich Dockyard. Some modifications were from time to time made in her, resulting from various experiments and a trial of her in a gale of wind at Brighton; and she, together with others on the same design, built at the cost of the Duke of NORTHUMBERLAND, the President of the Institution, was placed on the Northumberland coast in the autumn of 1852. In the course of the following winter these boats were taken afloat on trial by the Inspector of Life-boats to the Institution, some of them in heavy seas and gales of wind; and the result of the trials was considered highly satisfactory. The Committee thereupon decided to proceed with the building of other boats on the same plan; and at the present time no less than 23 of these boats are in the possession of the Institution, and stationed on the coasts of the United Kingdom, in addition to 3 which have gone to other countries and to 10 which have been built for harbour trusts and other bodies on our own coasts.

These boats have for the most part been of two sizes, viz., 27 feet and 30 feet in length, with 7½ to 8 feet beam, and rowing from 8 to 12 oars, double-banked, their weight averaging 2 tons. As, however, boats of this class and size have been found too heavy to be managed in some localities where but few boatmen are to be obtained to launch and man them, some of less beam and weight, rowing 6 oars single-banked, but on the same design in other respects, have been built under the denomination of second-class life-boats, to meet the necessities of such localities.

Of the former class of boats those most recently built by the Institution have so far undergone a further modification as to be reduced somewhat in beam, and to have less height, and greater sharpness of bow and stern, in order to enable them to be rowed with greater speed against a head gale and heavy sea. They are also built of fir, on the diagonal principle of double planking, without timbers; whereas the earlier

boats were of elm and clenched or clinker-built.

We have not at an earlier period given a description of these life-boats, as we were anxious that they should first have the advantage and experience of three or four winters' use, when we might, without presumption, be able to speak more confidently respecting them than we could have done before any sufficient practical trial had been made of them. We now feel that we are in that position. Several of them have already performed valuable services by saving the lives of shipwrecked persons, and the highest reports have been received respecting them generally from those who have been intrusted with their management. Coupling those reports with what we have ourselves seen of them and of other life-boats, we do not hesitate to pronounce the opinion that, as rowing boats, they are superior to all others. Of their properties as sailing boats we are not yet in a position to speak so positively, as nearly the whole of them are stationed on those parts of the coast where sails are not required. At the same time, we have every reason to believe that they would be equally efficient as sailing boats.

The qualities necessary in a life-boat may be thus summed up—we will remark on each in succession, and point out how far the boats of the Institution possess those qualities:—

1. Extra buoyancy.
2. Self-relief of water.
3. Ballasting.
4. Self-righting.
5. Stability.
6. Speed.
7. Stowage-room.
8. Strength of build.

1. The chief peculiarity of a life-boat, which distinguishes it from all ordinary boats, is its being rendered unsubmergible, by attaching to it, chiefly within board, water-tight air-cases, or fixed water-tight compartments under a deck, or empty casks. This property in one or more of the above forms is common to all life-boats, although some possess it in an inadequate degree, or badly distributed. So long as the necessary space for rowing and working the boat and for the stowage of shipwrecked persons is not interfered with, the amount of this "extra buoyancy" cannot be too great. Especially it is essential that the spare space along the sides of a life-boat, within board, should be entirely occupied by buoyant cases or compartments; as when such is the case, on her shipping a sea, the water, until got rid of, is confined to the midship parts of the boat, where it to a great extent serves as ballast, instead of falling over to the lee side and destroying her equilibrium, as is the case in an ordinary open boat. Barrels or casks, which do not conform in shape to the sides of a boat, but leave large interstices to be occupied by water, are not, therefore, suitable vehicles for providing extra buoyant power; yet, at the present moment, the Liverpool life-boats and some others are provided only with empty casks as buoyant power. The north country or Greathead class of life-boats, of which those at Shields may be considered the type, have their extra buoyancy provided by a water-tight deck at the load-water line, the space between which and the boat's floor is formed into water-tight air-chambers; water-tight compartments are also built along the sides of the boat, within board, sloped from the gunwale to the deck, thereby effectually excluding any water shipped from settling on one side. The life-boats of Messrs. White, of Cowes, have their buoyancy effected by similar air-compartments along the sides, extending from the gunwale to the boat's floor, but without any enclosed space under a deck. The large sailing life-boats on the Norfolk and Suffolk coast have very wide detached air-boxes or tanks, strongly made, to correspond in form with the boats' sides, and extending from the thwarts to the floor, having no deck. The life-boats of Mr. Peake's design have a water-tight deck at the load water-line and detached air-boxes along the sides, conforming closely to the shape of the latter, from the thwarts to the deck. A great amount of extra buoyancy is also in these boats derived from large end air-cases built across the bow and stern, and occupying from 3 feet to 4½ feet in length from the stem and stern posts to gunwale height. These cases are chiefly

intended to provide self-righting power; but in the event of the boat being stove in, and the space below the deck being filled with water, they alone have sufficient buoyancy to float her. The life-boats built by Mr. Beeching, of Great Yarmouth, and which obtained the Northumberland prize of 100*l*., are in this respect similarly fitted to those of Mr. Peake.

2. The second peculiar characteristic of a life-boat, and which is closely allied to the preceding, although it is not possessed by all life-boats, is the capability of self-discharging in a few seconds any water which may be shipped by the breaking over of a sea, or by a boat being suddenly thrown on her beam-ends. This power is accomplished by means of the water-tight deck at the load-water-line and a sufficient number of large open tubes, having their upper orifices at the surface of the deck and their lower ones at the boat's floor, passing through the space between the deck and the floor, but hermetically closed to it; thus providing an open communication between the interior of the boat and the sea, yet without suffering any leakage into the air-chambers under the deck. In some life-boats these tubes are kept always open; in others, plugs, moveable by hand, and having laniards or handles, to them, are fitted, which can be withdrawn on water being shipped. In Mr. Peake's boats the tubes are fitted with self-acting valves, which open downwards only, so that they will allow any water shipped to pass downwards, whilst none beyond a trifling leakage can pass upwards through them. It will be at once readily understood that, as the deck is placed at or above the load-water-line, any water which is above it will be above the outside level of the sea, with which it has, through the tubes, free communication, and that in obedience to the common law of fluids, which binds them to a uniform level, it must instantly, by its own gravity, descend through the tubes until none remains above the surface of the deck; or, if the boat be very deeply loaded, until the level of the water outside and of that within the boat shall be the same.

This quality of self-relief of water can, of course, only be possessed in perfection in boats with a raised water-tight deck at or above the load-water-line. The Norfolk life-boats before alluded to have holes through their *floors*, with plugs attached, through which they will relieve themselves to the outside level of the sea, or through which their crews can let water into them until the common level is obtained, which they accordingly do whenever they go afloat in a gale of wind and heavy sea. They have then, literally, several tons of water on board, but the wide side-cases confine the greater portion of it to the amidships of the boat, where it then serves as a loose ballast; the boatmen considering that it is safest to go off *under sail* with a boat deeply immersed. These boats will therefore only partially relieve themselves of water: they are splendid boats, and their crews have the utmost confidence in them; but we think that in this respect they might be improved on. Other life-boats, as, for instance, those at Liverpool, have no relieving-holes at all, and, if filled by a sea, their crews have no resource but the primitive, slow, and laborious process of baling with buckets; to do which the oarsmen must take in their oars, and, for a time, disable their boat.

3. A third and important property in a life-boat is ballasting. An ordinary open boat cannot with safety be taken into a heavy sea with metal, or stone, or other ballast having greater specific gravity than water, inasmuch as that if she were upset or filled with a sea she must then infallibly sink. As, however, a life-boat is provided with a large amount of *extra*-buoyant power, she may with impunity have a considerable amount of ballast of any description within her. We may here observe that ballast of some kind is very contributive to the efficiency of a life-boat. Not only must it add to her stability and thereby to her safety, but in proportion to the heaviness of the sea does weight become necessary to insure speed, its momentum being requisite to withstand the blow of each succeeding breaker, and to carry the boat through it as it strikes her; in the same manner that the fly-wheel of a steam-engine, or other machine, regulates and economizes the motive power, and

compensates for its irregular or intermittent action. The north country, or Greathead, life-boats have generally no ballast, their great breadth of beam being relied on for stability; but some of them have water let into a tank, constructed for the purpose in the midships of the boat beneath the deck. Beeching's life-boats were also ballasted with water on the same principle; but through a difficulty in securing the filling of the tanks, and in preventing the escape of the water from them, serious accidents, accompanied with loss of life, occurred to three of those boats. Water-ballast in an enclosed tank, if properly secured, is, we think, better than loose water, such as we have described in the Norfolk boats; but we prefer solid ballast to either, as it can be more advantageously placed, and is more manageable, and less liable to accident. Mr. Peake's life-boats are ballasted with heavy iron keels, and with solid wood and cork ballast stowed under their decks; which latter, in the event of their being stove in and the space under the deck filling with water, would then form extra buoyancy as well, thus fulfilling both purposes.

4. A fourth property, that of self-righting if upset, is not a universal principle in life-boats, although we must consider it a most important one, it being only possessed by those of Mr. Peake's and of Mr. Beeching's construction. It has been objected to by some boat-builders, from the impression that other more necessary qualities, and especially that of stability, must be sacrificed to obtain it: this, however, is a fallacy, as we have endeavoured to prove at length in a former number of this Journal (No. 19, page 125); the fact being that the very means which are employed to produce self-righting add to the stability of a boat, and improve her in other respects. That the property of self-righting may be useful is proved by the fact that on the only two occasions when self-righting boats belonging to the National Life-boat Institution have upset, the crews have been enabled to get into them again, and that their lives have thereby been saved.

The self-righting power is obtained by the following means:—1st. The boat is built with considerable sheer of gunwale, the bow and stern being from 1 ft. 6 in. to 2 ft. higher than the sides of the boat at her centre; and the space within the boat at either extremity, to the distance of from 3 to 4½ ft. from the stem and stern posts, to gunwale height, is then enclosed by a sectional bulkhead and a ceiling, and so converted into a water-tight air-chamber, the cubical contents of which, from the thwarts upwards, are sufficient to bear the whole weight of the boat when she is placed in the water in an inverted position, or keel upwards. 2ndly. A heavy iron keel (from 4 to 8 cwt.) is attached, and a nearly equal weight of light wood or cork ballast is stowed betwixt the boat's floor and the deck. No other measures are necessary to be taken in order to effect the self-righting power. When the boat is forcibly placed in the water with her keel upwards, she is floated unsteadily on the two air-chambers at bow and stern, whilst the heavy iron keel and other ballast being then carried above the centre of gravity, an unstable equilibrium is at once effected, and the weight of the iron keel, falling over on one side, immediately restores the boat to her proper position—in other words, she self-rights.

5. A fifth property is lateral stability, commonly called stiffness, being the tendency to preserve an upright position in the water, and proportionate resistance to upsetting. This property is of course held in common by all boats, but is more especially essential to life-boats, they being more exposed to the risk of upsetting than any others. As explained under the head of *ballasting*, it is obtained in life-boats by either breadth of beam or by ballast. In Mr. Peake's boats very great stability is obtained by an iron keel and other solid ballast, and by flatness and length of floor, with moderate beam only.

6. A sixth and most essential property is speed. We say most essential, since without speed or capability of being propelled against a heavy sea and head wind, the safest boat in the world would be useless, as she could not be conveyed from the shore to a wreck, frequently against a series of breakers of the most formidable description. As in ordinary boats, propelled by oars, the greatest speed can be obtained by sharpness of bow and,

within certain limits, narrowness of beam. Here, however, the similarity ceases; for whereas great lightness is an advantage in perfectly smooth water and calm weather—as stated under the head of *ballasting*—weight is essential in a heavy sea, and especially a broken sea, in which the light boat will lose her way or be beaten back by each heavy sea as it strikes her, whilst the heavier boat will by her own inertia carry her way through or over the seas. In a life-boat, height of bow and stern is also necessary to prevent the seas from breaking over and filling the boat; for, if sharpness of form be preserved quite up to the gunwale, the height of end will not check a boat's way so much as will a sea breaking into and half-filling her. Speed is not, however, alone necessary to enable a life-boat to force her way through the lines of breaking seas which form an almost impassable barrier between a lee shore and a wreck; we believe that it also adds greatly to her safety; for if she lose her way on meeting a very heavy broken sea or roller, she may not only be beaten back by it, but be thrown end over end or broadside to it, and be upset; but if she retain her way, she can be kept bow to the sea until it has passed her, when she will again gather additional speed in readiness to meet with impunity the succeeding wave. On account of the isolated position of life-boats, placed at distant intervals along the coast, there will rarely happen any opportunity for testing two boats of different construction in company with each other in a heavy sea, so as to form a correct comparative estimate of their power or speed. Judging, however, from the received reports of Mr. Peake's boats, we have no doubt that they are equal in speed and power to any, and superior to most that exist.

7. A seventh quality is stowage-room for passengers. It is of course desirable that a life-boat should have as large an amount as possible of stowage-room, as she might have to proceed to the wreck of an emigrant vessel, or other passenger ship, when it would be important that she should take on board a large number of persons so as to rescue the whole in as few trips as possible. The principal object in view will therefore be to distribute the air-chambers, forming the extra buoyancy of the boat, in such a manner as to occupy no more than can be helped of any space which would be available for the stowage of passengers. Life-boats vary much in this respect. It is a requirement which has been especially studied in Mr. Peake's boats.

8. The eighth and last quality which we have to consider is strength. As a life-boat is liable to be thrown heavily on a beach by the sea, or to be knocked with violence against a vessel's side, or to come in contact with spars or broken wreck floating in the water, she of necessity must be very strongly built: in this respect, Mr. Peake's boats will bear competition with any others.

The following diagrams show the general form and the nature of the fittings and air-chambers of one of Mr. Peake's life-boats, 30 ft. in length, and 7 ft. 6 in. in breadth.

In figs. 1 and 2, corresponding to the elevation and deck plans, the general exterior form of the boat is seen, showing the sheer of gunwale, length of keel, and rake or slope of stem and stern-posts. The dark dotted lines in fig. 1 also show the position and dimensions of the air-chambers within-board and of the relieving tubes.

A represents the deck.

B, the relieving-tubes (6 in. diameter).

C, the side air-cases.

D, the end air-chambers.

[For Figs. 1 and 2, *see* page 190.]

In fig. 3, the exterior form of transverse sections at different distances from stem to stern is shown.

Fig. 4 represents a midship transverse section.

A, represents sections of the side air-cases already described.

B, the relieving tubes, bored through solid massive chocks of wood, of the same depth as the space between the deck and the boat's floor.

C, spaces beneath the deck, filled up over 6 ft. in length at the midship part of the boat with solid chocks of light wood, or boxes of cork, forming a portion of the ballast, as before described.

D, a section of a tier below the deck, having a moveable hatch or lid, in which

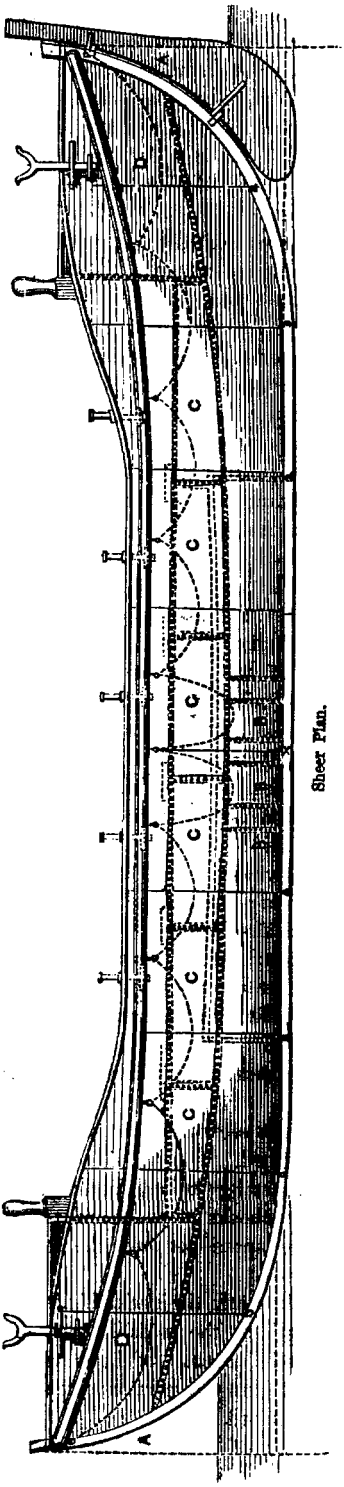


Fig. 1. Sheer Plan.

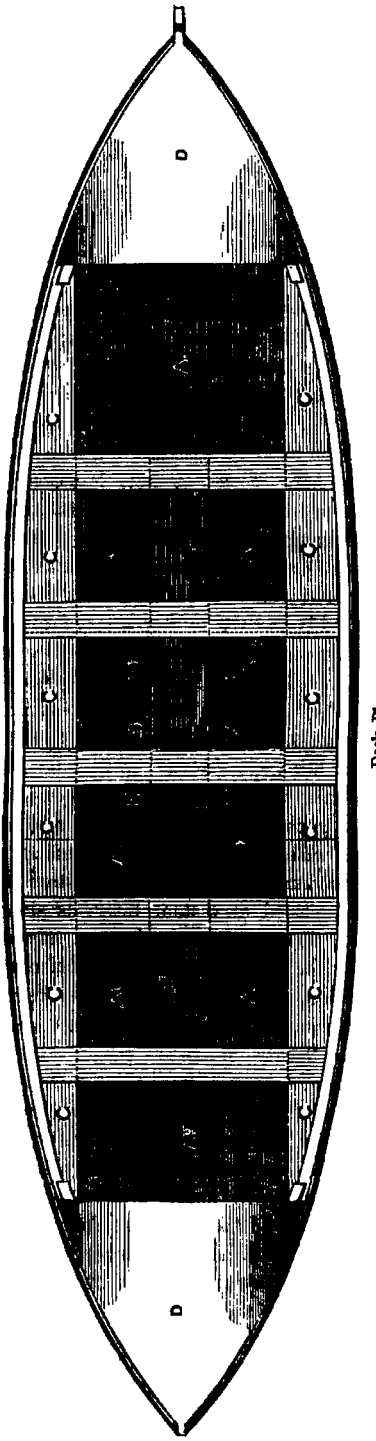


Fig. 2. Deck Plan.

the boat's cable is stowed, and into which all leakage beneath the deck is drained through small holes, with valves fixed in them. In some of the later boats, a small draining tier only is placed, having a pump in it, by which any leakage can be pumped out by one of the crew whilst afloat.

The proportions of one of these boats are as follows:—

Length, 30 ft.

Beam, 7 ft. 6 in.

Depth amidships, 3 ft. 4 in., exclusive of keel.

Ditto, from boat's floor to deck, 1 ft. 3 in.

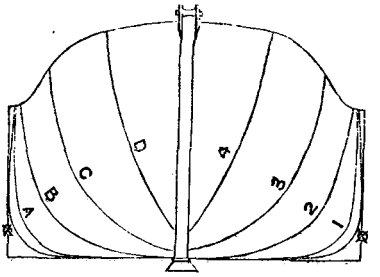
Ditto, from deck to thwarts, 1 ft. 3 in.

Ditto, from thwarts to gunwale, 10 in.

Length of end-cases (D), 4 ft.

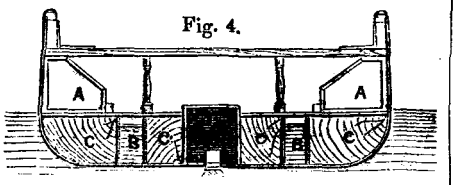
Width of side-cases (C), extreme, 1 ft. 6 in.

Fig. 3.



Body Plan.

Fig. 4.



Midship Section.

The festooned lines in fig. 1 represent exterior life-lines attached round the entire length of the boat, to which persons in the water might cling until they could be got into the boat: the two central life-lines are festooned lower than the others to be used as stirrups, so that a person in the water could more readily, by stepping on them, get into the boat, which is a very difficult operation for even a strong man to effect with heavy, wet clothes about him.

In closing these explanations of the life-boats of the Institution on Mr. Peake's design, it is a duty we owe to Mr. Peake to state that the design itself, and improvements in it from time to time, have been gratuitously furnished by him, and that he has devoted much valuable time to the consideration of the subject, and to personal superintendence of their building.

The whole of these boats belonging to the Institution, excepting one, have been built by Messrs. *Forrestt, the eminent boat*-builders, at their establishment, in the Commercial Road, Limehouse.

GRACE DARLING.

Who has not heard of Grace Darling, the heroine of the Longstone Lighthouse? whose name, associated with the wreck of the *Forfarshire* steamer, will long be remembered amongst the annals of those who, although holding humble stations in life, have yet exhibited traits of natural greatness which would grace the occupier of the loftiest position in society.

There are probably few persons in this country who have not heard of her, and of the act of daring courage in the cause of suffering humanity for which her name has become celebrated. The account of the transaction appeared generally in the newspapers at the time it occurred. As, however, a good and great act will not lose its lustre from being oft recited, and as a prominent object of this publication is to encourage and stir up the seamen on our coast to the exhibition of such deeds, we think that we cannot better promote the end we have in view than by thus holding up, to be emulated by them, the intrepidity of one of that sex whose virtues are commonly of a more retiring nature, and who are neither morally nor physically so constituted as to fit them for encountering such dangers as man's rougher nature enables him to cope with.

The subject of our memoir, Grace Darling, was born in November, 1815, and was the daughter of William Darling, keeper of the lighthouse on the Longstone, one of the group of the Farne Islands; in which solitary abode she constantly resided with her parents. She is described as having been

"remarkable for a retiring and somewhat reserved disposition—of a fair complexion and comely countenance — with nothing masculine in her appearance; but, on the contrary, gentle in aspect, and with an expression of the greatest mildness and benevolence;" which latter qualities, we need scarcely remark, are not uncommonly found associated with gallant bearing and the most resolute courage.

Previous to describing the distinguished act of Grace Darling, in proceeding with her father to the rescue of the sufferers on the wreck of the *Forfarshire*, it will be desirable that we should explain the nature of the dangerous locality where it occurred.

The Farne Islands lie off the Northumbrian coast. They are a group of barren and desolate rocks, inhabited principally by sea-fowl, and their sides are in many parts extremely precipitous.

Through the channels between the smaller Farne Islands the sea rushes with great impetuosity, and doubtless many a shipwreck of which there is no record has occurred there in former times, when no beacon existed to guide the mariner in his path through the deep. Rather more than a century ago, a Dutch 40-gun frigate, with all her crew, was lost amongst them; and numerous other wrecks are recorded to have happened between that time and the present.

Living on this lone spot, in the midst of the ocean, with the horrors of the tempest familiarized to her mind, Grace Darling was shut out as it were from the active scenes of life, and was principally occupied in assisting her mother in the management of their little household; and it is worthy of remark—in order to the better appreciation of the magnanimity she exhibited on this occasion—that she was not habituated to the use of an oar, or the management of a boat; those offices having been performed by other members of the family.

She had received a good education for her station in life, and had reached her twenty-second year, when the incident occurred which has rendered her name so famous, and which we will now proceed to relate.

On the evening of the 5th of September 1838, the *Forfarshire*, a steamer of about 300 tons burden, John Humble, master, sailed from Hull for Dundee, having on board a valuable cargo, and, as nearly as could be ascertained, 63 persons—viz., the master and his wife, a crew of 20 men, and 41 passengers. She was a new vessel, being only two years old, but her boilers were no doubt in a culpable state of disrepair. Previous to her leaving Hull a small leak had been discovered in them, and, for the moment, closed up; but when off Flamborough Head it broke out afresh to such an extent as to put out two of the fires. The boilers were, however, again partially repaired, and the fires relighted; and in this inefficient state she proceeded on her voyage, passing the "Fairway," between the Farne Islands and the mainland, at about six P.M. on the 6th. At about eight P.M. she entered Berwick Bay, the sea running high, with the wind strong from the north. The leakage now increased to such a degree that the firemen could not keep the fires burning, and at about ten P.M. she bore up for St. Abb's Head, the storm still raging with unabated fury. The engines soon after became useless and would not work, when the sails were hoisted fore and aft, and the vessel tacked, in order to keep her off the land. She, however, soon became unmanageable, and the tide setting strong to the south, she was carried by it in that direction.

It rained heavily during the whole time, and the fog was too dense to enable the position of the vessel to be ascertained.

At length breakers were discovered close to leeward, and the Farne lights became visible, leaving no doubt as to the imminent peril of all on board.

It was in vain attempted to avert the catastrophe by running between the islands and the mainland; she would not answer her helm, and was impelled to and fro by a furious sea. Between three and four o'clock she struck with her bows foremost on the rock, which was there so precipitous that a person could scarce stand erect on it.

A part of the crew now lowered one of the quarter-boats and left the ship, having one of the passengers with them, who had contrived to throw himself into the boat;

but two others in making the same attempt perished. The scene which now presented itself was of a most heartrending description. Several females were uttering cries of anguish and despair, and amidst them stood the bewildered master, whose wife, clinging to him, frantically besought the protection which he was unable to afford. Very soon after the first shock, a heavy wave struck the vessel on the quarter, and raising her off the rock, allowed her immediately after to fall violently upon it, when a sharp ledge striking her about amidships, she was fairly broken into two pieces, and the after part, containing the cabin and many passengers, was instantly carried off by a rapid current through the Pifa-gut, whilst the fore part remained on the rock.

A portion of the passengers and crew had previously betaken themselves to the foremost part of the vessel, considering it to be the safest place.

In this dreadful situation, exposed amidst darkness to the buffeting of the waves, and fearful lest each rising surge should sweep away into the deep the fragment of the wreck on which they stood, they awaited in anxious expectancy the breaking of the day. In the fore cabin, also exposed to the intrusion of the sea, was a female, the wife of a weaver, with her two children, who, when relief at last came, was found yet alive, but her two children lay stiffened corpses in her arms.

Such was their seemingly hopeless position, when, soon after the day broke, they were descried from the Longstone by the Darlings, at nearly a mile's distance. A mist hovered over the island, and though the wind had somewhat abated its violence, the sea was still raging fearfully, making any approach to the rugged pinnacles and sunken rocks which surround these islands, a work of extreme peril. Indeed even at a later period of the day, a reward of 5*l*., offered by the steward of Bamborough Castle, could scarcely induce a party of fishermen to venture off from the mainland.

To have braved the dangers of that terrible passage would have done the highest honour even to the well-tried nerves of the stoutest of the male sex. But what shall be said of the errand of mercy being undertaken and accomplished mainly through the strength of a female heart and arm!

Through the dim mist, with the aid of a glass, the figures of the sufferers were seen clinging to the wreck. But who could dare to tempt the raging abyss that intervened, in the hope of succouring them? Mr. Darling, it is said, shrank from the attempt—not so his daughter. At her solicitation the boat was launched, with the assistance of her mother—the father and daughter entering it, and each taking an oar.

In estimating the danger which the heroic adventurers encountered, there is one circumstance which ought not to be forgotten. Had it not been ebb tide, the boat could not have passed between the islands; and they knew that the tide would be flowing on their return, when their united strength would be utterly insufficient to row the boat back to the lighthouse island; so that, had they not got the assistance of the survivors on their return, they themselves would have been compelled to remain on the rock, beside the wreck, until the tide again ebbed.

It could then only be by the exertion of great muscular power, as well as of determined courage, that they could hope to reach the wreck; and when there the danger would be much increased from the liability they would run of being dashed to pieces on those rugged rocks.

It must have seemed to them a forlorn hope; but their courage rose with the emergency—God's blessing accompanied them—and their efforts were crowned with success. The whole of the nine survivors were taken into their little bark, and conveyed in safety to the lighthouse. Here, owing to the violent seas which continued to prevail, they were compelled to remain two days, during which time they received every kindness and comfort that the household could afford and of which they were in so much need.

The party who had left in the ship's boat, also nine in number, were picked up, the next morning, by a Montrose sloop, and conveyed to Shields.

The subsequent events of Grace Darling's life are soon told. The deed she had done may be said to have wafted her name all

over Europe. That lonely lighthouse became speedily the centre of attraction to curious and sympathizing thousands, including many of the wealthy and the great, who, in numerous instances, testified by substantial tokens the feelings with which they regarded the young heroine. Amongst the number were the Duke and Duchess of Northumberland, who invited her father and herself to Alnwick Castle, and presented her with a gold watch. Grace and her father received the silver medal of the National Life-Boat (then Shipwreck) Institution, and numerous testimonials from other public bodies and admiring strangers. A public subscription was also raised with a view to reward her for her bravery and humanity, which is said to have amounted to about 700*l.* To such an extent, indeed, did the popular enthusiasm reach, that portraits of her were eagerly sought for, and she was even offered large sums by the proprietors of one or more of the metropolitan theatres on the condition that she should merely sit in a boat for a brief space, during the performance of a piece whose chief attraction she was to be. All such offers, however, were promptly and steadily refused; and it is gratifying to know that amidst all this tumult of applause, Grace Darling never for a moment forgot the modest dignity of conduct which became her sex and station. The flattering testimonials of all kinds which were showered on her seemed to produce in her mind no other feelings than those of wonder and grateful pleasure. She continued to reside at the Longstone Lighthouse with her father and mother, finding, in her limited sphere of domestic duty, on that sea-girt islet, a more honourable and more rational enjoyment than the crowded haunts of the mainland would have afforded her; and thus giving, by her conduct, the best proof that the liberality of the public had not been unworthily bestowed.

Grace Darling did not live long in the enjoyment of the honours that had been showered on her. She died of consumption on the 25th of October 1842, at the age of twenty-seven years, and four years after the occurrence which has made her name so famous.

"Blessed are the dead which die in the Lord, for they rest from their labours, and their works do follow them!"*

We have been much gratified since the above was written at perusing a poem entitled *The Beacon*,† in which the whole scene of the wreck of the *Forfarshire*, and of Grace Darling's noble conduct on the occasion, is feelingly and graphically described, and in strains of considerable poetical merit, coming fresh from the heart of one who has himself been evidently practically acquainted with such scenes of danger.

The author of *The Beacon*, Mr. Thomas Moore, is himself, we believe, an old sailor, having been brought up in our coasting trade, and having himself commanded a merchant ship for many years. He now occupies the honourable position of President of the "United Seamen's Friendly Association," and has liberally transferred all the profits arising from the sale of his poem to a fund for providing the harbour of Seaham, on the coast of Durham, with a life-boat—a good work, which is being undertaken by the seamen of that port themselves.

Independently therefore of its own merits, which are quite sufficient to repay its perusal, we have an additional reason for recommending it to the notice of our readers.

ADDITIONAL STATIONS AND NEW LIFE-BOATS.

Drogheda, Ireland.—A life-boat, on Mr. Peake's design, has been recently placed at Drogheda by this Institution, aided by liberal contributions in that place, and the surrounding neighbourhood. This boat is 30 feet long by 7½ feet wide, she was built by Messrs. Forrestt, of Limehouse, at a cost of 155*l.*, exclusive of gear. She embraces the latest improvements which have been made, and may be considered a perfect spe-

* The substance of this narration has been taken from the popular work—*Chambers' Miscellany.*

† *The Beacon*: a Poem in three Cantos. By Thos. Moore. Price One Shilling. Published by Messrs. Longman, Brown, Green, and Co., Paternoster-row, London.

cimen of an efficient life-boat. She has been furnished with a superior carriage, built by Messrs. Ransomes and Sims, of Ipswich, after the design of the Institution, and a substantial boat-house has been built for her reception by the Drogheda Harbour Commissioners. A local honorary Committee has been organized to superintend the management of the whole establishment, of which H. George Smith, Esq., is appointed President, and a leading member of which is Francis Brodigan, Esq., through whose indefatigable exertions and public spirit this life-boat establishment has chiefly been brought into existence.

As numerous wrecks have occurred from time to time off the port of Drogheda, the life-boat will, no doubt, prove a valuable acquisition to that neighbourhood. The life-boat and her carriage were liberally conveyed to Drogheda, without charge, by the British and Irish Steam Packet Company.

Newcastle, County Down, Ireland.—A new life-boat has been placed at Newcastle by the National Life-Boat Institution, in lieu of one stationed there in 1854, which has proved too heavy to be readily managed by the limited number of seafaring men who are available to form her crew, and to assist in launching and hauling her up.

This boat is 26 feet long, with 6 feet beam, and weighs 23 cwt. She rows six oars single banked.

A proportionally small and light carriage has been furnished to her, which is fitted with Boydell and Glasier's endless railway apparatus.

Castletown, Isle of Man.—A life-boat station has been recently founded at Castletown, by the National Life-Boat Institution, and the boat and carriage which were at Newcastle, but found too heavy for that locality, have been removed to Castletown, for which place they are thought to be suitable. This boat is 27 feet long, by 7 feet 8 inches wide, and weighs about two tons. She is provided with an excellent four-wheeled carriage. A local committee has been established at Castletown to conduct the establishment, in connection with the Parent Society. The Lieut-Governor of the island, the Honourable Charles Hope, has accepted the office of President of the Isle of Man Branch of the Institution, and a liberal annual subscription towards the maintenance of the establishment has been promised.

It will be remembered by some of our readers that the Isle of Man was the scene of the distinguished exertions, in the cause of the preservation of life from shipwreck, of the late Sir Wm. Hillary, one of the founders of the National Life-Boat (then Shipwreck) Institution — a circumstance which will always excite additional interest in this branch of the Institution on the part of its members.

FRANCIS'S CORRUGATED IRON BOATS.

As iron ship-building has been most successfully practised in this country for several years past, and as we possess superior advantages over all other countries for the manufacture of that metal, it is surely matter for surprise that we should have made no attempts to use it also in the construction of boats, but have left it to our transatlantic cousins to show us the way. Such, however, is the case; and an American gentleman of New York, Mr. Joseph Francis, has recently patented in this and other European countries, a process for manufacturing boats of corrugated galvanized iron, which, judging from the reports by various authorities, and individuals in the United States, and elsewhere, appears likely to supersede, to a great extent, the use of wood in the construction of boats. It has, no doubt, been hitherto considered that there were difficulties in the way of the adoption of metal boats, or their construction would long since have been effected by some of our enterprising workers in iron.

The chief requirements of ordinary boats for ships are lightness, tightness, cheapness, durability, and strength; unless, therefore, it could be shown that iron boats would possess these attributes in a greater degree than wooden ones, and especially as regards cheapness, it could perhaps hardly be expected that the old material, with the

"prestige" of ages in its favour, should be made to give way to a new and hitherto untried one. And, indeed, we incline to the opinion, that without an improvement on the ordinary mode of manufacturing iron vessels by hand, the question would not now arise as to the comparative merits of the two materials, but that wood would still reign supreme in the hands of the boat-builder; for although, undoubtedly, boats of iron could, by the ordinary mode, be made both tight and strong, yet they would be more costly, and probably heavier, than boats of wood; and misgivings might well be entertained as to the capability of such thin sheets of iron to resist the effects of oxidation from constant exposure to moisture.

Mr. Francis has, however, invented a new principle and method of construction, by which he considers that he has not only overcome the above and all other objections to iron as a material for boat-building, but that boats built by his process possess all requisite qualities in a greater degree of perfection than do wooden boats, and have, in addition, the important advantages of being fire-proof, of being unliable to injury from atmospheric changes or exposure to the sun, and of needing no repairs for many years together.

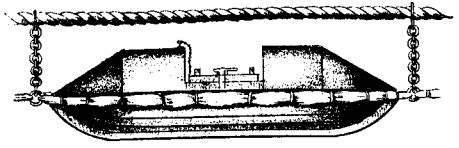
Mr. Francis is not a novice in the art of boat-building, having been engaged in that occupation for 35 years, during which time he is stated to have devoted much earnest and intelligent consideration to improving and perfecting that art, during the first 25 years of which period his labours were confined to boats of wood. His invention would, from this circumstance alone, be entitled to serious attention, if it was as yet unproved. It is not, however, a mere theory, his metallic boats having been in use in the United States' Navy, in their merchant steamers, and as life-boats on their coasts, for several years, during which time they have been put to severe tests, and have gradually increased in favour as their advantageous properties have developed themselves.

The material of which these boats have chiefly been constructed is galvanized iron, although some have been made of copper. Of the latter description were the boats used by Lieutenant Lynch, of the United States' Navy, in the exploration of the Dead Sea in 1848, when they were reported on by that officer in the highest terms, as having repeatedly descended rapids and cataracts amidst rocks and other impediments without injury, whilst the only wooden boat that accompanied him was almost at the outstart knocked to pieces and sunk. In a letter to Mr. Francis, in March, 1849, Lieutenant Lynch says:—"With no other kind of boat, however strongly constructed, could the descent of the Jordan have been accomplished, and the expedition must have been unsuccessful without them."

Galvanized iron has, however, been selected as the material for ordinary ships' boats, it being much cheaper than copper, and the experience of several years having shown that the galvanizing process, when properly performed, will effectually protect the iron from destruction by oxidation.

The chief feature of Mr. Francis's invention is the adoption of huge cast-iron dies, corresponding in form to that of the boats to be constructed, as shown in the accompanying illustration. The lower and concave die, forming the matrix, has its surface grooved in longitudinal channels, corresponding in depth and form with the intended corrugations of the metal, whilst the surface of the upper and convex die corresponds with it inversely. The two dies are fixed and nicely adjusted in a powerful hydraulic press, as shown in the illustration before referred to.

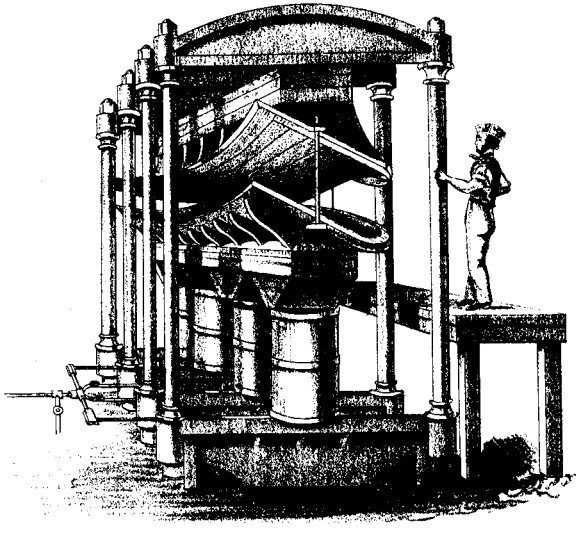
The galvanized-iron plates, of which the boats' sides are to be formed (weighing from 1½ to 2¼ lbs. per superficial foot, according to the character of the boat), are placed between the dies, which are then slowly brought together, and submitted by the hydraulic power to an enormous pressure, equal, it is said, to 800 tons. The whole side of the boat, or as large a portion of it as the largest-sized sheet of iron will allow of, is thus stamped into its proper form and corrugated by one simple operation. The permanency of this form and also great strength are secured by the corrugations in the iron, which are likewise so skilfully varied in depth and form as to secure the



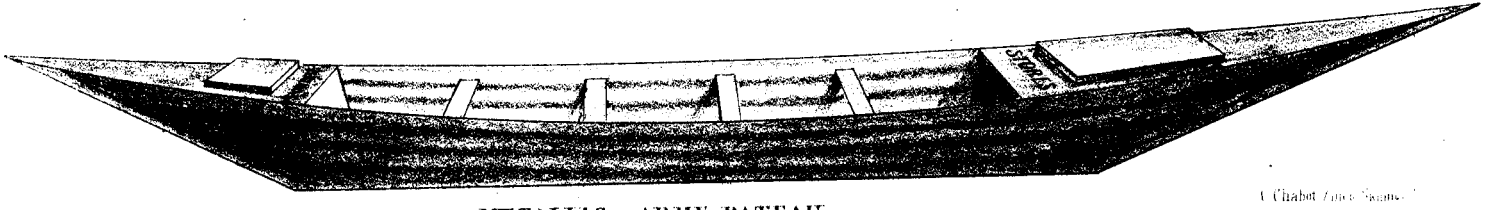
Outside View

LIFE CAR

Inside View



DIES FOR METALLIC BOATS.
Worked by the Hydraulic Press



METALLIC ARMY BATEAU

greatest strength where most required, and to prevent the wrinkling or puckering of the metal in the operation of changing the plane surface of the original sheet to the varying curves of the different parts of a boat.

The two sides of a boat being thus quickly formed, each in one or more parts, according to the size of the boat, they have only to be riveted together, and to the keel, stem, and stern posts, when the boat is formed complete, with the exception of the thwarts and other interior fittings which are subsequently added. A vast amount of labour and of consequent expense is thus economized, whilst the corrugation of the iron imparts so great a degree of strength and rigidity to the whole structure, that, except for the convenience of rowing, the thwarts might be altogether dispensed with.

As a metallic boat, if swamped, would of course immediately sink, air-chambers are placed within the boat of sufficient size to make her insubmergible in the event of being upset. To that extent, therefore, all these metallic boats are life-boats.

The presumed advantages of FRANCIS's metallic boats may be thus summed up.

1. That they can be made cheaper than boats of wood.

2. That they are not only perfectly water-tight when built, but that they will remain so under all changes of temperature and climate, or exposure to the heat of the sun.

3. That they are much stronger than wooden boats, and not liable to be stove in, or fractured, by striking on rocks or other hard substances.

4. That they are more durable than boats of wood, and under ordinary circumstances never need repair.

5. That they are fire-proof.

These alleged advantages are so important, that if they should be confirmed by experience in this country, the metallic boats cannot but, to a great extent, supersede the use of boats of wood; whilst their inventor must be looked on as one of the benefactors of mankind. For how many lives have been lost, from time to time, in boats, from the want of such qualities as those in question are said to possess!

We shall await, with much interest, the result of further trials of these boats in this country; not but that those which have already taken place are of the most sufficient and reliable character. The Reports possessed by Mr. FRANCIS in their favour, from various sources, are too numerous for us even to name in detail; they are from the chief proprietor of the COLLINS' line of steam-packets, the commanders of various American steam-ships, and from officers of the navy and public authorities in the United States, who testify to their "*economy, durability, and safety*"—to their "*extreme tightness and great strength*"—to their "unliability to become *nail-sick, worm-eaten, or leaky from exposure to the sun*"—to their being "*fire-proof as well as water-proof*," &c. &c.

These reports extend over eight years—a period quite sufficient to ascertain the permanent qualities of the boats. They have, during the present year, been twice subjected to severe tests in this country by direction of the Lords of the Admiralty, to which we shall presently refer. In the first place, however, it may be interesting to our readers to learn the occasion and manner of their introduction to us at the present time; for it appears that but a few months since Mr. FRANCIS had no intention of visiting this country, being under the impression that distinguished patronage and introductions would be indispensable to foster any such undertaking at its commencement, in order to give it a chance of success.

Mr. FRANCIS had, however, proceeded to Paris, where he has had the honour to introduce his plans for building boats, and for the construction of metallic floating military waggons, to the notice of the Emperor of the French, who so highly approved of them, that the following letter, accompanied by a gold box set with diamonds, was, by his Majesty's direction, on the following day, transmitted to Mr. FRANCIS:—

"Palais du Tuileries, 4th Feb., 1856.
"Cabinet de l'Empereur.

"SIR,—The Emperor has witnessed, with great interest, the experiments which have been made in the river Seine with the pontoon carriage of your invention. His Majesty has also taken pleasure in obtaining in-

formation in detail respecting the boat of corrugated metal which you have invented and constructed. The Emperor hopes that your invention may establish in France the foundation of a new branch of industry applicable to the public services for war and for the navy, as well as for the mercantile marine; and his Majesty has advised me to inform you that he will learn with pleasure your determination on this subject.

"I am happy in having to transmit to you the accompanying box, which the Emperor sends as a testimonial of his satisfaction.

"Accept the assurance of my distinguished sentiments.

"Fave."

We are further informed, that arrangements are now in progress in Paris for the establishment of a manufactory of Mr. Francis's boats and waggons; and that the French, Russian, and Belgian governments have seriously directed their attention to the subject, and will probably, at no distant period, adopt those inventions in their naval and military services.

Whilst at Paris, in July, 1855, Mr. Francis was most fortunately met by a British officer, Major Vincent Eyre, of the Bengal Artillery, then on furlough from his regiment in India. Major Eyre was at once struck with the apparent advantages and practicability of Mr. Francis's invention; and feeling desirous that his own country should not be backward in possessing itself of the advantages, both of the boats and the military waggons, he succeeded in persuading Mr. Francis to visit London, he himself volunteering to publicly lecture on the subject, and otherwise to assist in bringing the invention to public notice.

Accordingly Major Eyre, in the early part of the present year, delivered, on two occasions, at the United Service Institution in London, an interesting lecture on "Metallic boats and army floating waggons," which lecture has been since published by him under the above title, through Smith, Elder, and Co., Cornhill, London.

Our information respecting the invention has been chiefly obtained from this pamphlet, and Major Eyre has also kindly lent us the zinc plates from which the illustrations of his lecture were taken, which we are thus also enabled to place before our readers. We would, however, strongly recommend them to procure Major Eyre's lecture, which is alike interesting, both as regards the metallic boats and the floating waggons, which latter, in a military point of view, are, perhaps, as important an invention as are Mr. Francis's boats. Since, however, they are exclusively of a military character, and not connected with the subject of saving life at sea, we shall confine our present remarks to the metallic boats.* Aided by Major Eyre, Mr. Francis likewise brought his invention to the notice of the Lords of the Admiralty, in January of the present year, by whose directions it was put to experimental tests of a most severe character at Liverpool, under the direction of Commander Bevis, R.N. Two of the boats of the *Baltic*, one of the Collins' line of steam ships, were, by the courtesy of her Commander, Captain Comstock, placed at Captain Bevis's disposal on the occasion. On one of them, a large boat, then lying keel uppermost on the steamer's deck, a strong man inflicted some 20 blows on one spot with a long handled axe, using all the strength he could muster, yet he was unable to make even an indentation; whilst every blow it is said would have told with shattering effect on a wooden boat.

Another, a smaller boat, was then taken ashore and rolled and tossed about on the rough cobble-stone pavement with all the strength of 6 men; then lifted up many times on end, and suffered to fall with great violence on the stones without any injury being done; she was next launched and rowed several times stem on to a stone pier, with all the power of 4 men, but no leak or injury was produced. Yet these boats had been five years in constant use on board the *Baltic* without repair.

After the receipt of Captain Bevis's report, the Lords of the Admiralty ordered

* The "Metallic Army Plateau" in the accompanying page of diagrams shows another form in which this material has been made available in the United States.

two men-of-war's boats for further trials. These boats were, in June last, submitted to similar tests to those above related, and we are informed were in addition filled with large blocks of stone placed amidships, piled up to a considerable height, and then hoisted up with tackles at bow and stern; through all which rough usage they passed unscathed.

As these important results have now been made publicly known through the lectures and pamphlet of Major Eyre, above alluded to, and again more recently in a paper read by him before the British Association, at their recent meeting at Cheltenham, since published in the Journal of the Society of Arts, of Aug. 22, we cannot doubt that a full and fair trial will be given to the metallic boats, both by our own mercantile marine and in the Royal Navy. Indeed, we are informed that steps are already in progress for the establishment of a manufactory of them in London.

Although somewhat digressing from the subject of this article, we cannot conclude it without holding up for imitation the example of Major Eyre to our younger readers, especially if intended for the naval or military profession; for it is chiefly through his active and zealous exertions that the benefit of these apparently invaluable inventions are about to be conferred upon our country. Major Eyre had come to Europe on the usual leave or furlough allowed to officers in the service of the East India Company, as a relaxation from their duties, and a means of recruiting their health, after lengthened service in a tropical and often unhealthy climate. He, however, was desirous to devote this leisure time to some more useful and honourable purpose than mere idleness, and eagerly embraced this opportunity to do so. It is much to be wished that every officer in our military and naval services was actuated by the same desire to seize such opportunities of adding to his own professional knowledge, and of rendering service to his country, and thus to raise the standard of character and add to the renown of the profession to which he might have the honour to belong.

LIFE-BELTS AND SWIMMING.

We have, in previous Numbers of this Journal, advocated the use of life-belts, both on shipboard and in boats, especially in life-boats; and we have recommended the acquirement of the art of swimming by every one. As we think the subject very important as well as interesting, we propose to devote a portion of the space in our present Number to some remarks on the general principles according to which the human body is thus made to artificially float on the water's surface, and to a brief explanation of the requirements of efficient life-belts, together with a description of the one which has been adopted by the National Life-boat Institution for the use of its life-boats' crews.

Every person is aware of the property which is common to all fluids of "finding their own level," as it is vulgarly called, and that they cannot be made to stand in a heap, or be depressed into a hollow, except by the exertion of some extraneous force, which force must, therefore, be equal to the resistance opposed by the fluid in its endeavour to maintain its level.

It follows, then, that a solid body, placed in a fluid of greater specific gravity than itself, can only displace or push out of their level as many particles of that fluid as shall together equal its own weight, and that the excess of its bulk over the bulk of the fluid which it so displaces will remain above the surface of the fluid.

As a consequence of this law, the lighter any solid body is in proportion to the fluid in which it is immersed the higher it will float upon it. If it be of equal weight it will remain suspended in it, having no tendency to sink or float. If it be of greater weight it will sink, and it will then displace an amount of the fluid equal to its bulk, and having no reference to its weight.

Accordingly it is a received axiom in hydrostatics, that "all bodies which float in water displace as much of it as is equal to their weight, and all that sink as much as is equal to their bulk." Now the human body, as indeed are those of all terrestrial animals, is, when inflated by drawing in a full breath, somewhat lighter than the same bulk of

water: accordingly, if a person could hold his breath for any length of time, he would for so long remain floating at its surface, although not then sufficiently so to keep the apertures of his breathing apparatus, his mouth and nostrils, above it. He is not, however, able to retain his breath for more than a few moments at a time, and the action of his lungs, by successively filling and emptying his chest of air, alternately expands and contracts it; when the latter action takes place the bulk of his body is diminished, and it then displaces a less amount of water, and has in proportion a greater tendency to sink: it can then only be kept afloat by mechanical action, as birds support themselves, in that lighter fluid the air, by the action of their wings on it; or else by attaching to it some other bodies, which, whilst they add considerably to its bulk, shall but slightly in proportion increase its weight. By the first method this object is attained through the art of swimming; by the second, through the instrumentality of what are commonly denominated life-preservers, life-belts, or swimming-belts.

As the art of swimming is so advantageous, nay, so essential, to all those who have business on the waters, which, indeed, at the present day, and in this country, includes most people—and as, even with a life-preserver, the knowledge of swimming gives a person a much greater mastery over himself and greater presence of mind, it may be as well that, before proceeding to more particularly define the different descriptions of life-belts, we should enter into a short explanation of the art of swimming.

As we have already observed, the human body differs but little in weight from its corresponding bulk of water, and has, therefore, but a slight tendency to sink. This tendency may be counteracted by a simple motion of the feet alone, as in walking up a ladder or on a treadmill, which operation is technically called "treading water," taking care at the same time to keep the hands and arms under water also; but this would be a laborious operation to continue for any length of time, as the body has a greater tendency to sink when in an upright position, and the arms cannot then be conveniently brought into play. In swimming, therefore, the body is thrown forward, and so placed in a more horizontal position; by then striking backwards and downwards with the hands and feet, it is propelled through the water, and the more rapid its motion, the lighter it will float, for the following reason:—By the laws of motion a force or pressure applied to any plane surface exerts that force perpendicularly to it at whatever angle it may strike or press on it; accordingly, in the action of swimming, the advancing particles of water striking against the lower surface of the body, or, which is the same thing, the advancing body meeting the various particles of water, is pushed or pressed by them at right angles to its surface, and, therefore, in a more or less upward direction, according as the swimmer keeps his body in a more or less horizontal position, which pressure will also be more or less in proportion to the velocity of the progressive motion, and consequently increased pressure of the resisting particles of water. Accordingly we find, in fact, that all land animals maintain themselves at the surface of the water by propelling themselves through it, and, as is well known, even a stone or an iron shot will refuse to sink when a rapid motion has been imparted to it obliquely to the water's surface.

As the art of swimming, however, cannot be learned by any explanations, or from a theoretical knowledge alone, those who would acquire it must go into the water, and do so by practice and experiment. Most urgently, then, do we recommend every person who is not already able to swim to learn to do so, as well as every parent who has the opportunity to cause his children to be taught it, for they know not how soon they may be called on to put it in practice, either in order to save their own lives or those of others; and even if they should not be required so to exert it, their knowledge will give them greater self-command and presence of mind in any dangerous situation on the water.

Since, however, every person is not able to swim, and even those who are so may be overcome by fatigue, or may have received some injury to incapacitate them when thrown into the water, or, again, as they

may be required to assist other persons who cannot swim, it will be most desirable that a boatman, when on any dangerous service, and especially a life-boatman, should be supplied with some extra buoyant power, which would afford him greater security, and increase his ability to assist others.

To supply this deficiency, various descriptions of life-belts, &c., have of late years been designed; but as all are not equally efficient to supply it, and especially as all are not alike adapted for the use of a person who must undergo great physical exertion with his belts on, such as rowing in a boat against a head sea, we will offer an opinion on the qualities which we conceive a boatman's life-preserver (and it is such which we particularly have in view) should possess.

1st. It should contain as much buoyant power as would support one man with his head and shoulders above the water, although he might be disabled, by injury or otherwise, from swimming, or as would enable a man, if a swimmer, to support with ease another person besides himself.

2nd. It should not be liable to lose its buoyant property by any accident to which it might be exposed, such as by a heavy blow, or by absorption of water.

3rd. It should be of such a pliant, elastic, or soft nature, as to conform to the shape of the body, and not to prevent the free use of the arms and upper part of the person, or to confine the chest so as to impede the action of the lungs, on which the capability of enduring prolonged exertion or fatigue much depends.

4th. It should be of such a form as would offer as little resistance as possible to the water when propelled through it, and not thereby to retard its wearer's progression by swimming.

And here again, as man with advantage so constantly does, we may profitably betake ourselves to the great laboratory of Nature for our type and model; and although we may find ourselves but poor copyists after all, we may yet derive from that source some useful practical ideas, as well as, in a moral point of view, a profitable lesson on our own imperfect capacities and restricted powers.

We have stated above that the bodies of man and of the land animals are of nearly the same specific gravity as water; the same may also be said of birds, although, from their bones being hollow instead of being solid or filled with marrow, they are somewhat lighter than the former, yet we find that the large class of birds of the aquatic kinds, whose functions are chiefly performed on the surface of the water, such as the swan, goose, duck, and sea-gull, float lightly upon it, with a large portion of their bodies buoyed up above it; and here we have at once a beautiful model before us.

These birds are covered with an exceedingly light but thick covering of down and feathers, which, from being, whilst the animals are alive and in health, of an unctuous nature, prevents the absorption of water by capillary attraction, and, from the peculiarity of its disposition over their bodies, forms a surface quite impervious to water.

The bulk of one of these birds is thus greatly increased, whilst its weight is but slightly so, and thus it acquires its extra buoyancy. The shape of its body, with its broader and flatter breast than those of land birds, is also calculated to enable it readily to maintain its equilibrium, and to propel itself lightly and with considerable velocity over the surface of the water. We may also remark, in passing, that a further evidence of design and beauty of arrangement is shown by the position in which the head and neck of these tribes are placed, as compared with those of land animals. In the latter it is continued, when in its natural position, in the same line, or nearly so, as the spinal cord and the back, which in man raises his head into an elevated and upright position, and in the greater portion of the lower animals maintains in a horizontal one, enabling them the more readily to procure their food, which is the chief concern they have to attend to. In the swimming-birds, however, whose bodies are required to be horizontally on the water, that they may the better float and swim, but yet whose heads need to be raised above it, the neck, when erect, is nearly at a right angle to the back, and is of that flexible nature which enables the animal to turn its head about in every direction, and

either to immerse it in the water in search of food, or keep it raised above it at pleasure.

To return, however, to our more imperfect machinery to effect the same ends. Although we cannot equal the contrivances of Nature, yet we may, so far as we can, imitate them; and in doing so in this instance, our endeavour will be to attach a sufficient amount of buoyant power around the body to raise the head and shoulders perpendicularly above the water's surface, whilst this shall be effected without confining the limbs or impeding the free action of the lungs and the muscles of the arms and chest. On these two qualities will the efficiency of a life-belt chiefly depend, yet neither has been sufficiently considered by the inventors and makers of them. It seems, indeed, to have been generally supposed that the *least* possible amount of buoyancy which would suffice to raise the mouth above the surface of the water was all that was required, and, accordingly, many of the belts which are sold in the shops have only buoyant power equal to 6, 8, or 10 lbs.: a little consideration will, however, make it apparent that the largest amount of buoyancy which can be obtained without seriously incommoding the wearer, and depriving him of the free use of his limbs, is no more than is requisite.

In the 1st place, then, it must be remembered, that the same amount of buoyancy which would suffice in smooth water to raise the mouth above the surface, would be quite insufficient to do so in even a moderately rough sea.

2ndly. That boatmen, and especially fishermen, have often thick boots and other heavy clothing on them which will increase their tendency to sink.

3rdly. That when thrown out of a boat, other persons unprovided with life-belts may cling to them for support.

Lastly. That if from either of the above-named causes a person should find himself more deeply immersed than he had anticipated, his presence of mind would be more likely to desert him than if he felt himself buoyed up with his head well above the water, without any exertion on his own part. These considerations are all of importance, and none more so than the last named, for unquestionably more persons have been drowned, including even the best of swimmers, by the loss of their presence of mind than from any other cause.

We believe that a life-belt, for an adult person of average size, ought to have, at the least, buoyant power equal to 20 lbs., and as much more as can conveniently be obtained.

Having decided on the amount of buoyancy, the questions next arise as to the fittest material to be employed, and the best shape to be adopted. The only two descriptions of material worth notice are the rival ones of cork and of Macintosh cloth inflated with air. Horsehair and dried rushes have each been employed, but they are untrustworthy.

The advantages of inflated belts are—their greater buoyancy compared with their bulk, and their greater portability, which latter quality makes them especially convenient for travellers, since when emptied of air, they fold up and stow in a small compass, whereas an efficient cork belt must be of considerable size, and cannot therefore be stowed away in the portmanteau or carpet bag. The inflated belt will therefore, no doubt, take precedence of any others in the hands of tourists and travellers, to whom portability is an object of importance.

The disadvantages of inflated belts are—their liability to get punctured or torn, or to decay from being put away damp after use, or to have their inflating metal valves out of order from corrosion or otherwise; from any of which causes their whole efficiency would be destroyed. Again, in the hands of life-boatmen, amidst the hurry and anxiety of launching to the aid of a wrecked crew, they are liable to be only partially inflated, or the valves to be only half screwed up, and so to admit the escape of the enclosed air.

An inflated belt, having four compartments separately inflated, has been invented by the Inspector of Life-Boats to the National Life-Boat Institution, which has, in a great measure, got over the danger arising from risk of puncture, or injury to the inflating valves, as without being more incommodious than the ordinary belts, it has buoyancy equal to 30 lbs.; and if even two of its compartments should be disabled, the re-

maining two would be sufficient to float its wearer. It is, however, necessarily more expensive than those made with one compartment and one valve only.

The advantages of cork as a material for life-belts are its durability, and its non-liability to injury from puncture, fracture, or damp, so that it will bear the rough usage of ordinary boat work. By being divided into many narrow pieces, it can also be made more flexible and yielding to the body of the wearer than an inflated belt.

The only disadvantage of a cork belt is, that from its greater weight it requires to be of larger size than an inflated belt, and as it must always retain its full size, it cannot be stowed away in a small compass when not in use. For a life-boatman's belt, however, portability is not of much consequence, and the advantages of cork are so great in other respects, that that material has been selected by the National Life-Boat Institution for the belts of its life-boats' crews.

These belts are, however, of a new construction, designed by the Inspector to the Institution, Commander J. R. Ward, R.N. They have much greater buoyancy than any kind of cork belt previously introduced, and have other important peculiarities.

1. Their buoyant power is from 20 to 24 lbs.

2. The cork is uncovered, so that its quality can always be discerned, and it is divided into many narrow pieces, each of which is separately sewn on to a strong linen or duck belt, covering the body from the arm-pits to below the hips.

3. These pieces of cork are distributed in two rows, one above, and the other below the waist, the belt being secured closely about the body by strings passed round the waist, between the two rows of cork, and being further secured by other strings crossed over the shoulders, as men's trouser braces are worn. This division of the cork into two rows is one of the most important distinctions of these belts, as a sufficient quantity of cork to afford double the buoyancy of the ordinary cork belts can be thus attached, and in a manner which is much less inconvenient to the wearer than the lesser quantity in one row, which, not being secured round the waist, but round the chest, interferes with the free action of the lungs, and the muscles of the shoulders and arms. By this arrangement, in these belts, the trunk of the body is enveloped in cork, so attached as to be perfectly flexible, and to allow of all the ordinary movements of the body without inconvenience, being a nearer approach, in principle, to the buoyant covering of the swimming birds than any other belt, and forming also, like theirs, a great protection to the body against injury from a blow, and a preservative of its heat in cold weather.

About 800 of these belts have been supplied by the National Life-boat Institution to the crews of its life-boats and those of others during the last three years, and they have given universal satisfaction to those who have used them. A few have also been supplied to some of the vessels chartered by the Emigration Commissioners.

We consider that it would be a great boon to the merchant seamen of our country if every merchant vessel were compelled by Act of Parliament to have on board, and stowed on the upper deck, as many of these belts as formed the number of her crew, so that in the event of their having to desert their vessel from wreck, or leakage, or fire, and take to their boats, each man might be supplied with an apparatus which, as it would make it impossible for him to sink, would, doubtless, be often the means of saving his life.

As the inventor of these belts has declined making any profit by them, they are made very cheaply; and when their durable character is considered, the expense of providing them for his ship's crews would not be worth consideration by any shipowner, whilst the satisfaction to him would be great, if they were ever instrumental in saving the lives of those employed by him; and if they should never have occasion to be used, he would be amply recompensed by the additional regard and respect which his seamen would entertain towards him, on perceiving this instance of his humanity and kind feeling towards them.

These belts, although not patented, have been hitherto manufactured only by Mr.

Joseph Birt, junior, of No. 5, Wellclose-square, London Docks, under the general superintendence of the inventor.

MEETINGS OF THE COMMITTEE.

Thursday, Dec. 6, 1855. Thomas Chapman, Esq., F.R.S., in the Chair.

Read and confirmed the Minutes of the previous Meeting, and those of the Finance, Correspondence, and Wreck and Reward Sub-Committees.

Read and approved Captain Ward's Report of his recent visit to the Isle of Man. He reported that the Hon. Charles Hope, Governor of the Island, and other influential residents, had promised their cordial co-operation to re-establish a Branch of the Institution on that island.—Decided that the thanks of the Committee be given to the Governor and to the other gentlemen of the locality, and that a boat-house be built forthwith for the reception of the life-boat and transporting carriage which the Institution had decided to station at Castletown.

Read letter from Mr. Butcher, of Great Yarmouth, of the 29th Oct., stating that the Gorleston boatmen had received their life-boat from the boat-builders, and that she gave them much satisfaction. The boatmen expressed their grateful thanks for the donation of 50*l.* granted by the Institution in aid of their boat.

Read letter from the English Commissioners of the Paris Exhibition, stating that it had been decided to give the Silver Medal of the Exhibition to this Institution, in acknowledgment of the model life-boats and other articles exhibited by it there.

Read letter from Captain Martin, stating the services of the Ramsgate life-boat, in conjunction with the Commissioners' steam-tug *Aid*, to two vessels in distress.

Read also a letter from Captain Martin, Ramsgate, of the 17th Nov., transmitting a contribution of 2*l.* from himself and the men under his orders, in aid of a fund for the relief of the widow of Thomas Cable, who was drowned whilst engaged in saving life from shipwreck. The Earl of Clanwilliam was so pleased with the feeling exhibited by Captain Martin and his men in this case, that he added a donation of 5*l.* to their contributions.—To be acknowledged.

Read letter from Captain Kennedy, R.N., of the 13th Nov., transmitting a copy of a letter from the Inspecting Commander at Donaghadee, stating the necessity of a life-boat at Groomsport.—Deferred.

Read letter from Mr. Bryant, of Padstow, of the 29th Nov., forwarding replies to the life-boat querries, from which it appeared that a second-class 30-feet life-boat, on Mr. Peake's plan, would be a suitable boat for that locality. A house would be provided for the boat by the Harbour Association. A carriage would also be required for the boat.—70*l.* and upwards would be raised towards the first cost of the boat, and about 30*l.* would probably be collected annually towards the support of the establishment.—Decided that a life-boat of the above description be built forthwith for Padstow.

Read letter from Mr. Shadwell, the Secretary of the Royal Harbour Trust, Ramsgate, of the 20th Nov., relative to the loss of 3 lives from a Colchester smack, outside the harbour of that place, on the 26th Oct. last, and requesting the opinion of the Committee on the best plan for extending the Harbour Commissioners' means of saving life from shipwreck.—Decided that Captain McHardy, R.N., and Captain Ward, R.N., be appointed to proceed to Ramsgate to report on the means in use at that place to save life.

Read letter from Mr. Kitching, of Eastbourne, of the 10th Nov., stating that, through the distribution of the circular letters supplied by the Institution to that Branch, he had succeeded in increasing the annual subscription of the Branch from 11*l.* to 25*l.* per annum.—To be thanked.

Read letter from Messrs. Troughton and Bevan, of Gravesend, of the 16th Nov., transmitting a prospectus of Russell's patent davits for disengaging ships' boats.—To be acknowledged.

Read letter from Mr. G. Hole, of Gravesend, of the 17th Nov., calling attention to his life-raft, and inquiring whether the Institution would purchase the same from him.—To be acknowledged, and the purchase declined.

Read letter from JOHN JOHNSTON, Esq., of Ryde, of the 27th Nov., transmitting a pamphlet containing some description of a Cliff-crane, invented by him, for the purpose of saving life and property in cases of shipwreck.—To be acknowledged.

Read letter from Captain EDYE, R.N., of the 23rd Nov., forwarding a sketch of his plan for conveying a line from a wreck to the shore.—To be acknowledged.

Read letter from the Secretary to the Fishguard Branch, transmitting an estimate amounting to 55*l.* for building a transporting carriage for the life-boat at that place.—Ordered a carriage to be built accordingly.

Voted—one Silver Medal—twelve Thanks of the Committee — and 138*l.* 5*s.*, as rewards for saving life from wrecks, as follows:—

Voted a reward of 7*l.* to the crew of the life-boat of the Institution, stationed at Aldborough, in Suffolk, for putting off in the life-boat to the rescue of nine men of the crew of the barque *Corregio*, of Poole, which was wrecked opposite the Coastguard watch-house, during a heavy gale of wind on the 3rd Nov.

Voted also the thanks of the Committee, inscribed on vellum, to NEWSON GARRETT, Esq., Lloyd's agent at Aldborough; and a reward of 3*l.* 10*s.* to seven men who assisted him in rescuing, by means of a small rope thrown from the shore to the ship, nine out of eleven persons from the Swedish brig *Vesta*, which became a total wreck during the fearful gale of the 2nd Nov., near the Aldborough Low lighthouse.

Voted also 20*l.* to the widow of an extra boatman in the Coastguard service, named THOMAS CABLE, who, having succeeded in saving the life of a lad from the wreck, was drawn by the under-tow under the ship's bottom and drowned, the rope that was round him having broken by the force of the wind and waves. The poor fellow had come a distance of two miles to render the assistance which cost him his life. He started in company with his officer, but being desirous to make his services available as soon as possible at the scene of the wreck, he outstripped the officer, and ere the latter had arrived at the spot he was informed of the gallant man's death. He left a wife and five little children, who were entirely dependent on his exertions for their livelihood. He bore a good character, and was always foremost to assist in saving life from wrecks.

The Committee voted also their special thanks to R. C. ROWLEY, Esq., Captain MURRAY, R.N., Inspecting Commander of the Coastguard, Lieutenant RAMSAY, R. V. GORHAM, Esq., and to other gentlemen of Aldborough, in acknowledgment of their valuable services to many shipwrecked crews that were cast on the shore during the prevalence of the storm. It appeared that great credit was due to Mr. GORHAM, who is the active and zealous Secretary of the Aldborough Life-boat Branch of the Society, for his untiring exertions on those distressing days, the 2nd and 3rd November.

Voted also a reward of 11*l.* 5*s.* to 5 fishermen for putting off in their boat to the rescue of a lad from the billyboy *Charlotte and Mary*, which, during a fearful gale, went to pieces near Thorpe Haven, on the 3rd Nov., when a female, three children, and two of her crew unfortunately perished.

The thanks of the Committee, inscribed on vellum, were voted to Messrs. CARPENTER and WEATHERAL, lighthouse-keepers, in consideration of their laudable conduct in saving, by means of a line, the crew of four men of the ketch *Albion*, of Rye, which became a total wreck near Orford Low lighthouse, on the 3rd Nov. The lighthouse-keepers treated the sufferers with much kindness in their houses for two or three days.

The thanks of the Committee, inscribed on vellum, were also presented to JOSHUA RODWELL, Esq., of Alderton-hall, WILLIAM WILLIAMS, Esq., R.N., chief officer of the Woodbridge Coastguard Station, and to JOHN BUNGARD, chief boatman in charge of the Orford Haven Coastguard Station; and 8*l.* 10*s.* to the men under their directions, in testimony of their valuable assistance to the crews and others of the numerous vessels which were stranded during the awful gales of the 2nd and 3rd Nov., at the mouth of Orford Haven, where 124 men, 5 women, and 3 children were cast on shore.

The thanks of the Committee were also presented to Captain JOACHIM, R.N., to

whom the Medal of the Institution had been voted for previous services, and a reward of 15*l.* 10*s.* to the men who accompanied him in the Lowestoft life-boat, when she put off to the rescue of nine men of the crew of the brig *Louisa*, of Newhaven, Sussex, which, during a heavy gale of wind, became a total wreck on the Holm Sand, on the morning of the 2nd Nov.

Voted also a reward of 9*l.* 10*s.* to the crew of the Pakefield life-boat, for putting off with the view of rendering some assistance to the crews of many vessels that were wrecked in the neighbourhood of Kessingland, during the heavy gale of the 2nd Nov.

Voted also a reward of 32*l.* to the crew of a Lowestoft yawl, for their laudable conduct in putting off to the rescue of the sloop *Union*, of Portsmouth, which was wrecked on the Holm Sand, on the 7th Nov. On nearing the sloop, they found that they could not board her, as the sea was making a complete breach over her, and there was much danger of the yawl filling; the yawl's crew then hailed the shipwrecked men that they would return for the life-boat, but the former entreated them to attempt their rescue. The appeal was irresistible, and a gallant and successful attempt was made to board the sloop, and her crew were saved.

Voted also the Silver Medal of the Institution to Mr. Wm. Gruer, of the Coast-guard, Lossiemouth, in testimony of his gallant services to the master and boy of the schooner *Thor*, of Leith, which became a total wreck near that place, through the intemperance of the master and neglect of the crew. It appeared that in a pitch-dark night, Mr. Gruer swam on board the vessel with a life-buoy. The master was helplessly drunk in the cabin, in which he had locked himself. Mr. Gruer broke the door open, open, and took him on deck by force. Having secured him to a life-buoy, he then dropped him into the sea, and he was thus pulled on shore.

Voted also 10*l.* to the crew of 5 men of a fishing smack, for putting off and rescuing, at risk to themselves, the crew of 9 men and the master's wife, of the brig *Hartlepool*, of Shields, which was observed in a sinking state, near Bridlington, on the 1st Nov.

The Thanks of the Committee, inscribed on vellum, and 1*l.*, were also voted to Mr. G. Rosser, master of the steam-tug *Beaufort*, and 2*l.* to his crew, for putting off in the steamer to the rescue of the crew of the brig *Anna Catherine*, of Sunderland, wrecked in a gale of wind, near Swansea, on the 25th Nov.

Voted also a reward of 9*l.* to 9 men of the lugger *Eclipse*, of Margate, for their praiseworthy conduct in saving the crew of the Dutch schooner, *Jantje Meier*, from Newcastle to Genoa, wrecked in thick weather on the Long Sand Head, on the 26th Oct.

Voted a reward of 2*l.* to a fisherman named Jordan for rushing into the surf to the rescue of the mate of the barque *Enchantress*, which was driven on shore in a heavy gale on the western side of Dungeness Point, on the coast of Kent. The shore being there very steep, the ship came close to the beach, and a line was thrown on board by a person on the spot. A stouter line had been previously fastened to it, which, if it had been hauled on board by the shipwrecked crew, might have been made the medium of saving all; but, unhappily, the man who first caught hold of it, either from ignorance or from the selfish feeling of consulting his own safety alone, quickly secured it round his own arm, and then jumped overboard into the boiling surf, where, becoming entangled in some of the floating wreck, he perished ere he could be drawn to the shore. All subsequent attempts to throw another line on board failed, and one man only was, by the daring act of Jordan, rescued out of the surf.

FRANCIS'S METALLIC LIFE-SAVING CAR.

In an account of the New York Life-Saving Association, in the 15th Number of this Journal, we alluded to a metallic Life-Car, which, in conjunction with the mortar and rocket life apparatus, had been instrumental in saving a large number of lives from wrecked vessels on the coasts of the United States: as many as 290 persons having been con-

veyed on shore by it from a single wreck. It appears that we had been misled as to the party entitled to the credit of so truly valuable an invention, having erroneously attributed it to Captain Ottinger, of the United States Revenue Service. We are now informed that Mr. Francis, the inventor of the metallic life-boats, is also the inventor of the Life-Car.

One of these Cars has been recently presented to the National Life-Boat Institution by A. W. Jaffray, Esq., of St. Mildred's-court, London, that gentleman having sent expressly to New York for it.

The great advantages of the Car are that it will take in four or five persons at one time, and not only convey them safely to the shore, but will so effectually preserve them from the effects of the sea that they will not even get wet on the passage through the heaviest breakers, whereas, by the ordinary conveyances hitherto in use in this country, one person only at a time can be conveyed to the shore, and that not without serious liability to injury, on some occasions, from the violence of the sea, or even to be drowned by being hauled through it.

The Life-Car is made in the form of a whale-boat, of galvanized iron plate corrugated, the top being arched over or roofed, like *the ark* of old; of which, indeed, on a small scale it is a fitting emblem; for are not the dangers of shipwreck as great and as fearful to those who are exposed to it as was that great wreck of all things on the then habitable globe, to the contemporaries of our forefather Noah? And must not the deliverance to the inmates of this little ark of mercy be as complete and as grateful to them as was that afforded to the ancient Patriarch and his family in that huge structure which afforded them a safe refuge from the waters of the Great Flood, when all the peopled world beside succumbed to that vast calamity?

The Life-saving Car, or *ark*, as we think Mr. Francis might more befittingly designate it, has a single opening in the roof, which provides for the ingress and egress of those taking refuge in it, the same being furnished with a lid or hatch, which prevents the admission of water whilst battling with the surf on its passage shoreward. The only provision for the admission of fresh air is through small holes not larger than those on the rose of a common garden watering-pot. No inconvenience has however been experienced on this account, on any of the occasions when it has been used with such success in the United States; and on a recent trial of it at the Great Yarmouth Regatta, as many as ten boys were shut up in it, whilst they were hauled to and from a boat at about 120 yards from the beach, the time occupying between three and four minutes; no distress being felt by them from an insufficient supply of air.

This Car is 10 feet 9 inches in length, and 3 feet 9 inches in width. A part of the interior space, at the extremities, is occupied by air-chambers, as shown in the annexed sheet of diagrams, which however do not correctly show the shape of the upper body of the Car, which in those now manufactured is a perfect arch, both laterally and longitudinally, a form which affords greater strength, and a larger supply of air for the consumption of those shut up within.

The accompanying interesting engraving of the wreck of the *Ayrshire*, on the coast of New Jersey, in 1850, shows the manner in which her crew and passengers, numbering in all 201 persons, were conveyed to the shore in safety through a heavy sea. This plate, as well as that containing the separate diagrams of the Car, and of Mr. Francis's metallic boats, is taken from the pamphlet of Major Eyre on Mr. Francis's inventions, alluded to in our account of his metallic boats in the present Number of this Journal; Major Eyre having kindly lent them to us. And who can look at such a scene as is here represented, and not picture to himself the imaginable but indescribable feelings of those pent up within this little ark during their short journey, as it were, from death to life! We will not make the vain attempt to describe them, but will conclude our description of this admirable invention by expressing the hope that Mr. Francis may shortly have the gratification to see his "safety-arks" placed at suitable stations around our own shores, as well as on those of the United States.

ROYAL NATIONAL LIFE-BOAT INSTITUTION,

For the Preservation of Life from Shipwreck.

Founded in 1824.—*Supported by Voluntary Subscriptions.*

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The Committee of the Royal National Life-Boat Institution would earnestly call the attention of the Public to the great and extraordinary exertions which the Society has recently made to provide efficient Life-Boats at various parts of the coasts of the United Kingdom, including Boulmer, Hauxley, Southwold, Dover, Dungeness, Teignmouth, Padstow, Fishguard, Tenby, Lytham, Drogheda, and the Isle of Man. To supply these Life-boats, together with Transporting-carriages and Boat-houses for some of them, has involved an expenditure of upwards of £2,000.

Other appeals for aid in the establishment of Life-boats continue to be received by the Committee.

This important work can only be continued by the aid of a generous Public. The rescue of shipwrecked persons from drowning is a work of mercy and humanity, which so manifestly claims the sympathy of all classes of persons in this Maritime and Commercial Country, that the Committee feel assured that the present pecuniary position of the Institution need only to be known to insure for it the liberal support of the Community at large.

	£.	s.	d.
His Majesty the King of Prussia . (Donation)	50	0	0
Vice-Adm. Sir Josh. R. Rowley, Bt., V.P. (Don.)	50	0	0
Auldjo, Henry, Esq., Bryanston-sq. (3rd Don.)	1	1	0
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Marshal, Rev. E., M.A., Oxford . (Annual)	0	10	6
Ditto ditto . (Donation)	0	10	6
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S. B. X., per Captain Martin, Ramsgate (Don.)	1	0	0
Shersby, Henry, Esq., Woolwich, per Captain Robertson, R.N., Sur.Gen. Board of Trade (Don.)	10	10	0
Shersby, Miss, ditto ditto (Donation)	10	10	0
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Warden, Capt., R.N., C.B., Charles-st. (2nd Don.)	5	0	0
Watt, Mr. H., Irvine . . . . (Donation)	1	0	0

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