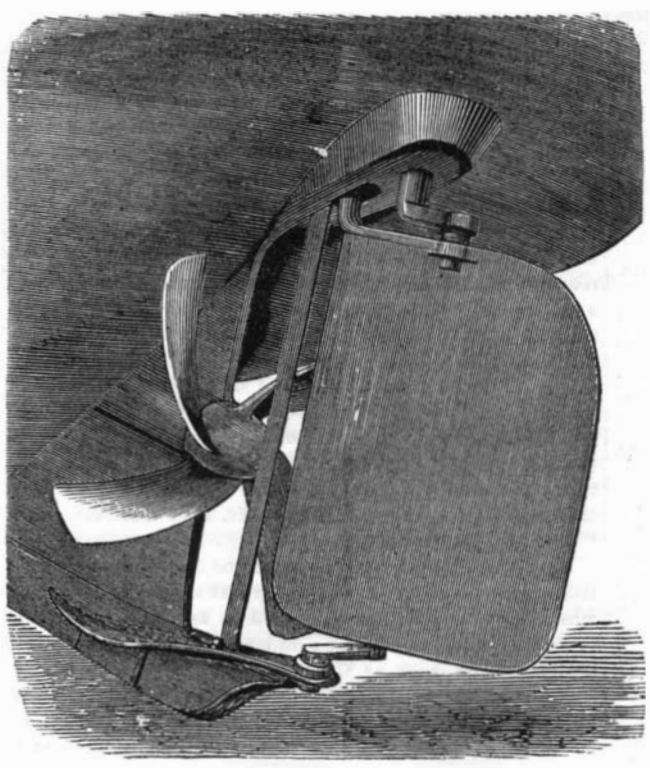
IMPROVED RUDDER.

The ordinary balance rudder, as is well known, is pivoted near its middle, and can, with a large rudder area, be easily put over to large angles. But it has certain disadvantages which have prevented its being adopted in any except a few very large steam vessels in the Royal Navy. It stops the way of the ship at slow speeds, and is uncertain in its action when the vessel is under sail. This is supposed by many to be due to the fact that the fore part of the rudder is on one side of the ship while the after part is on the other side; and the idea of Mr. Gumpel's rudder is to retain the advantage of the ordinary balance rudder as to ease of turning with a large rudder area, and to obviate its drawbacks by keeping the whole of the rudder on the same side of the vessel for any degree of inclination.

The means by which Mr. Gumpel accomplishes this can best be described by reference to the engraving, which is taken from a photograph. The fore part of the rudder is kept in the middle line of the vessel by the guide rod at its upper fore corner, which is capable of sliding forward and aft in a groove or slot under the vessel's counter. The inclination of the rudder is obtained by making its axis, which is near its center, move round on a crank on what usually forms the rudder head. A spindle goes down through the rudder center, round which the rudder is capable of revolving, and this spindle, with the arms at the top and bottom, form the crank, which carries the rudder center out of the middle line; and the direction of the plane of the rudder is regulated by the guide rod at the fore end being compelled to slide along the middle line. It will easily be seen that the advantage which this rudder has over the common rudder in point of power is mainly at large angles.

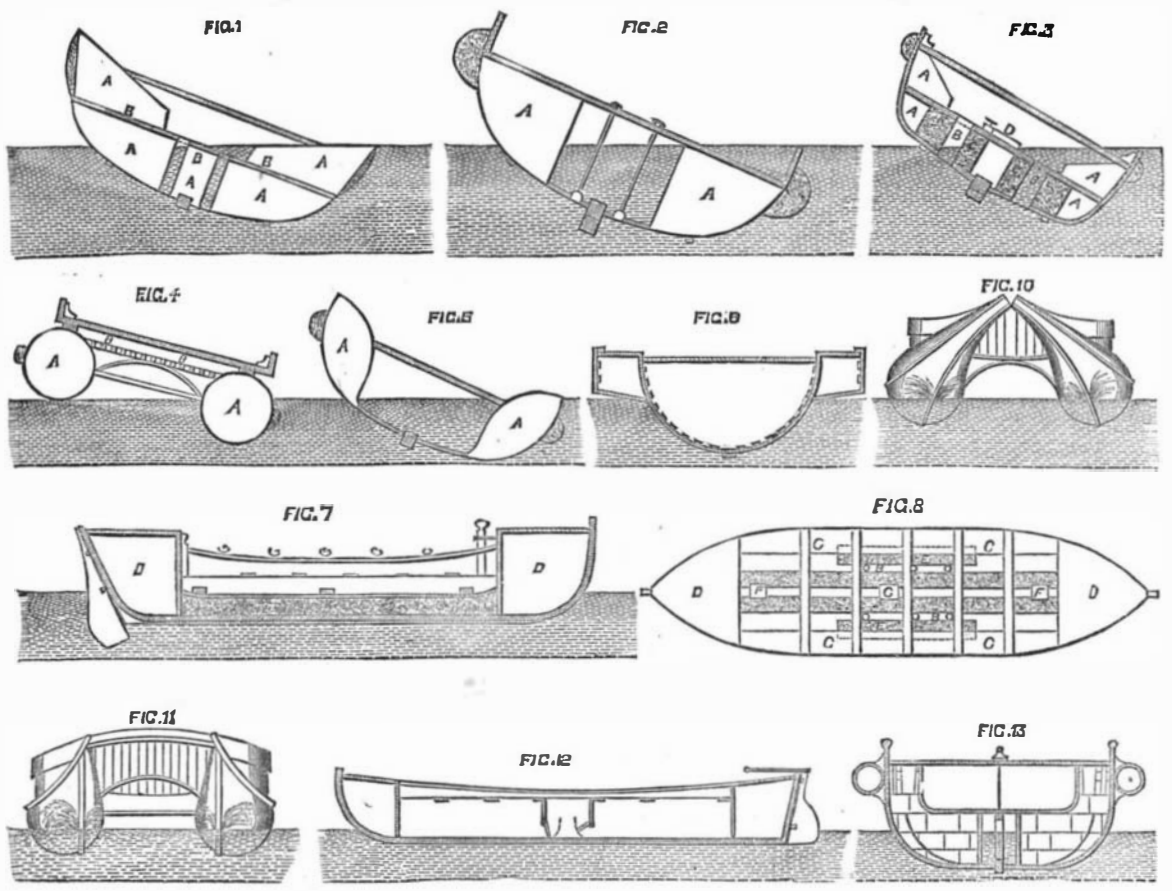
The chief objection, says *Engineering*, from which we extract the engraving, raised to Mr. Gumpel's rudder is that it seems complicated. It certainly does appear more complicated on paper than when seen fitted to the vessel; and the ease with which it could be worked, although the steering wheel was small, and a half turn of it put the rudder hard over, was a subject of much remark on the trial. That it would be of great advantage to river steamers and other craft requiring good steering powers, there can be little doubt; but it would be premature to pass an opinion on it for sailing vessels. The tendency appears to be rather in favor of small rudders for sailing vessels of the mercantile marine, although in yachts they are sometimes of considerable area in proportion to the size of the vessel. It is obvious that the advantage of a balanced rudder of any kind is felt chiefly where large rudder area is required.



GUMPEL'S RUDDER.

ON LIFEBOATS.

Mr. Charles H. Beloe, C. E., recently read before the Liverpool Polytechnic Society an exhaustive and able paper on the above important topic. Excluding such appliances as rafts, buoys, belts, and similar apparatus, he confines himself solely to the single subject in question; and dividing the boats into two classes, namely, those used off shore and those kept aboard ship, he proceeds to discuss the peculiarities and valuable improvements existing in the many types now in use. In general, the qualities which should be present in every vessel of this description are summed up by the Royal National Life Boat Institution as: (1) Great lateral stability or resistance to upsetting. (2) Speed against a heavy sea. (3) Facility of launching or taking the shore. (4) Immediate self discharge of any water breaking into her. (5) Self-righting if upset. (6) Strength. (7) Stowage room for a large number of passengers. From the descriptions which follow, taken from Mr. Beloe's paper, and by the aid of the annexed diagrams, for which we are indebted to the *Engineer*, the reader will be able to examine comparatively the principal varieties of life boats now in use in England:



LIFEBOATS.

Fig. 1 represents the north country or improved Greathead plan, and is now nearly obsolete. These are the widest rowing life boats in existence, some of them having as much as 10½ feet to 11 feet beam, with a length of 30 feet. These wide boats require long oars, with two men to each, to propel them, thereby risking a large number of lives in every boat. They do not possess the property of self-righting, and it was in one of them that twenty lives were lost in 1849. The airtight compartments are marked A. These side air cases contribute vastly to the stability of the boat, by leaving a very small space for the water to occupy, when one gunwale is thrown level with the sea, and that space but slightly on one side of the center of gravity, consequently the water shipped would have but little tendency to weigh the boat down. The continuation of the air cases to the gunwale is objectionable, as they occupy space which is valuable for the stowage of shipwrecked persons. A water tight deck, marked B, extends across the boat, a little above the level of the sea outside; and any water that may be shipped is discharged through tubes into the sea below. Fig. 2 represents one of the Norfolk and Suffolk sailing life boats, which are nearly as ancient in model as the one just described. The extra buoyancy is obtained by means of cork fenders outside the gunwale and by side air cases, occupying a large portion of the interior of the boat. With regard to stability, these Norfolk boats retain more water when inclined to leeward than some boats, as shown by Fig 2, but a large portion of it is to the windward or higher side of the center of buoyancy, where it serves the purposes of ballast, and thereby adds to the stability. They are almost entirely ballasted with water. One great advantage of this plan is that the boats are so easily handled in launching or beaching, as they are launched empty; but as soon as they are cleared of the beach, the plugs are withdrawn, and the water admitted to the outside level. In addition, they are furnished with iron keels. They are exclusively sailing boats, being nearly unmanageable under oars. They measure from 39 feet to 46 feet in length, and from 10½ feet to 12 feet in breadth. A plan and sections of the self-righting life boat of the Royal National Lifeboat Institution are shown by Figs. 3, 7, and 8. This is the result of all the experience gained by the institution in the management of its large fleet, now consisting of 235 lifeboats.

On the plan, Fig 8, A represents the watertight deck, B the relieving tubes, C the side air cases, D the end air chambers, E the ballast, F scuttles to admit of a free current of air under the watertight decks when the boat is ashore, G another scuttle for air, and to receive a pump. In the cross section, Fig. 3, A represents the sections of the side air cases; B the relieving tubes, of the same depth as the space between the decks and the boat's floor; C C C C are spaces beneath the deck, placed longitudinally at the midship part of the boat, and filled with cases packed with cork, forming a portion of the ballast; D, scuttle for ventilation, having a pump fixed in it, by which any leakage beneath the deck can be pumped out when afloat. The extra buoyancy is obtained entirely by means of air cases. When the lee gunwale is level with the sea, there is more space inside to leeward of the center of gravity than in Figs. 1 and 2, the air cases having the corners taken off to afford room for the stowage of passengers, and to prevent the side buoyancy being placed too high for the purposes of self-righting. The self-discharge of water is provided for by the relieving tubes, B, for, as the watertight deck is always slightly above the level of the water outside, any sea that is shipped must flow out through these tubes, which are furnished with very simple self acting balanced valves, that afford no obstruction to the free egress of water, but, closing by the pressure of the sea outside, effectually prevent the admission of any. The actual time occupied by one of these boats in freeing itself from water is about 30 seconds. A large portion of the ballast is composed of cork or wood, as shown at CCCC. The really distinguishing feature of these boats is the property which they possess of self-righting. The best proof of the safety of the boats is the fact that during the last twenty-two years the Institution has only lost from all causes, twenty-nine persons from its own lifeboat crews, and many of these lives were lost by the men being crushed against wrecks, falling overboard, etc. The method by which this peculiar property is obtained is by attaching a heavy iron keel to the boat, and otherwise providing a sufficient weight of ballast, by giving a considerable amount of sheer, and by enclosing the bow and stern by airtight chambers. These chambers have sufficient buoyancy to support the whole weight of the boat when upset, with the keel at a considerable hight above the water; it is then floating on two points, with the ballast far above the center of buoyancy, thus forming an unstable equilibrium. In this position the boat cannot remain; and as soon as the keel falls to one side or the other of the center of gravity, the weight of ballast drags the boat round, the water escapes through the relieving tubes, and she is again ready for service. The following are the requirements requisite to insure self righting: (1) Ballast. (2) Enclosed air chambers at the bow and steru, placed sufficiently above the center of gravity. (3) Limited breadth of beam. (4) Limited side buoyancy.

In order to insure strength and elasticity, these boats are now built of fir, on the diagonal principle; formerly they were clinker-built, of oak.

Figs. 10 and 11 represent two boats built on the tubular principle. One is stationed at Ryl, and the other at New Brighton, both being under the control of the Lifeboat Institution. The latter boat tows and sails admirably, though a trifle heavy under oars. A sectional elevation of her is shown in Fig. 10. Her dimensions are as follows: Length over all, 40 feet; diameter of tubes, 3 feet; distance apart, 3 feet 6 inches. The Mersey Docks and Harbor Board has a boat built on this principle, but with a difference in the mode of construction. The tubes, instead of being circular, are flat on the inner sides, see Fig. 11; the ends of the tubes are not brought together, but the inner sides remain parallel throughout, and have a sort of bow or cutwater at one end. One object of this plan is to prevent the water thrown off by the bows of the tubes being thrown in between them, where the space is confined, and where it undoubtedly retards the boat. By the altered plan, it is contended that all the water thrown off by the bows shall pass away freely outside the tubes. This boat is undoubtedly faster under oars than the New Brighton one, but not equal to her in buoyancy and strength. Her dimensions are as follows: Length, 36 feet; breadth, 10 feet 2 inches outside tubes; breadth, 9 feet 8 inches outside gunwales; diameter of tubes, 3 feet. The objections to this class of boat are: The prejudices of the fishermen and boatmen respecting a boat so unlike anything to which they have been accustomed; their great weight, the clumsy carriage which they require, their unsuitability for launching off a lee shore, and their great cost.

SHIPS' LIFEBOATS.

In order to improve this most important description of boat, in February, 1870, the Society of Arts offered its gold medal for a ship's lifeboat, suitable for the mercantile marine, under the following conditions, mentioned in the second division of the discourse. Mr. Beloe said that all ships'