

steamship "City of Glasgow," with about 480 persons on board, disappeared, leaving no trace behind, and in the same year the "Arctic," of the Collins Line, and one of the fastest steamers then afloat, was sunk in a collision off Cape Race, and 562 persons perished. Two years later the "Pacific," of the same line, disappeared, leaving no trace behind. A remarkable fact in the history of the Allan Line is that, between 1857 and 1864, it lost no fewer than nine steamers. The Hamburg-American steamer "Austria" was, in 1858, burned at sea, with a loss of 471 lives. Of the more remarkable losses since that date may be mentioned the Inman liner, the "City of Boston," in 1870, the White Star liner "Atlantic," the German steamer "Schiller," the North German Lloyd steamer "Deutschland," the Hamburg-American steamer "Pomerania," and the French steamer "Ville du Havre." When we analyse the causes of the losses up to 1879 we find that twenty-four vessels never reached the ports for which they sailed, their fate being veiled in mystery, ten were burned at sea, eight were sunk in collisions, and three were sunk by ice. Since 1879 it is satisfactory to find that the number of losses have not been nearly so numerous. The most memorable are the burning at sea of the "Egypt," of the National Line, and the "City of Montreal," of the Inman Line, both without loss of life; the stranding of the "State of Virginia," and the sinking of the "State of Florida," by collision with a sailing ship, and of the "Oregon," in collision with a coal schooner. These facts are so far satisfactory that they show a great decrease in the list of accidents during what may be considered the modern period of the steamship. This may be accounted for by the fact that, having passed the transition period, the officers in charge were more thoroughly acquainted with their duties, and the ships and engines were more efficiently constructed. The record of last year is of a most satisfactory kind. Notwithstanding all the risks from collisions, hurricanes, icebergs, and other causes, we find that nearly 2,000 trips were made from New York alone to various European ports, and that about 200,000 cabin passengers were carried, in addition to 372,000 immigrants, all without any accident. The risk of collision has been very much reduced by the adoption of the system of "steam lanes," suggested by Professor M. F. Maury—that is, of having definite courses for the steamers, based on calculations as to probable areas of fog and ice. If any accident should occur to a steamer there is thus every probability that assistance will be rendered by one of her companion ships.

The improvements which have taken place in the methods and appliances of navigation have, no doubt, added much to the safety of the ships, and this has been increased also by the higher standard of education, and consequently of intelligence, than formerly was found, both among officers and men. Sir William Thomson, in a volume of papers recently published, has said: "It is a common saying that sailors are stupid; but I thoroughly and heartily repudiate this statement, not from any sentimental fancy, but from practical experience. No other class of artisan is more intelligent; and, moreover, sailors' wits are kept sharp by the ever nearness of difficulties and dangers to be met by ready and quick action." Sir William himself has done much to improve navigation, not only by his writings on subjects directly connected with it, but also by his inventions. His improved compass and his sounding apparatus are to be found in all first-class steamers, and his influence has been felt in many direct and indirect ways. We would refer to the volume of papers above mentioned on subjects relating to navigation for full details regarding these, and also for suggestions which may come to be of great practical utility in the future. He expresses the

opinion that the regulations for preventing collisions at sea contain everything that human wisdom has been able to devise for diminishing the chances of collision. The action of the recent Maritime Conference at Washington showed that the members agreed with this opinion, as they provided very conservative in their policy. They declined to adopt a large number of resolutions sent in from more than one country of importance, and contented themselves with a number of not very important amendments, and with the passing of some new rules for the marking of wrecks and the removal or destruction of derelicts. Considerable improvements have been made in recent years in lighthouse arrangements, but Sir William Thomson would like to see all the lighthouses flashing out their characters like electric signals, instead of the present rather slow revolving method. A certain advance has been made in another direction in the application of the Morse alphabet to marine signalling by sounds. Sir William is anxious that lighthouses should be able to flash light signals. He says that a lighthouse, to fulfil the reason of its existence, must not only be seen, it must be recognized when seen. He argues that there has not hitherto been amongst lighthouse authorities quite enough determination to make every effort to give a distinctive character to coast lights which science and common sense have placed at their disposal. The dangers from collisions with icebergs have been reduced by the useful charts which are issued by the Hydrographic Bureau at Washington. From the records of this Office it appears that from 1882 to 1890 thirty-six steamers were more or less injured by ice in the North Atlantic, although some of these were freighting and coasting vessels. Probably the commonest explanation of the fate of missing ships is collision with ice in fog or in the darkness of the night. In case of accident, the number of boats now available is much larger than formerly, but to ensure that all the passengers in one of the large Atlantic steamers should be accommodated would require a very great amount of space.

We need not go into details of the improvements which have taken place in the construction of the ships and engines, as we have drawn attention to them from time to time. A large number of bulkheads is the most important point which requires attention in order that safety may be ensured, and, in fact, these and double bottoms are prime necessities. The bulkheads should not only be transversal, but also longitudinal, so that the engines driving separate screws may be quite self-contained. There can be no doubt that the bulkheads saved the "City of Paris" last year, and that was the case in spite of the fact that the longitudinal one was damaged by the breakage of the engines. It seems rather odd that the twin-screw and separate engines did not commend themselves to ship-owners and shipbuilders at an earlier period, as they had been in common use in the Royal Navy. Of course in the Navy the arrangement was adopted on account of its advantage in manœuvring, but the security afforded by it in case of accident to one set of the engines is a sufficient reason for its being adopted in large passenger steamers. This has already been recognized by the proprietors of some of the most influential lines. The improvement in the quality of the materials used in the construction of ships and engines, as well as the methods of working them, has done much to lessen danger, and we are convinced that our shipbuilders and naval engineers are now in a position to take a considerable step in advance as regards speed without lessening the safety of ocean travelling.—*Industries.*

There are 7,671 engineers employed on the great Pennsylvania railroad system.