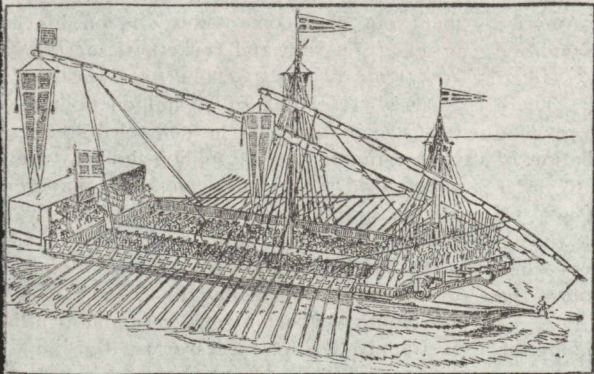
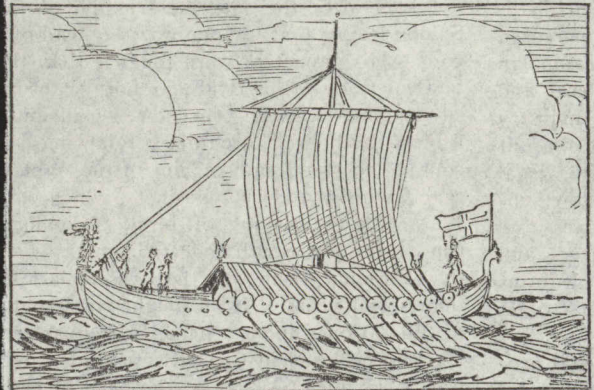


Egyptian ship of the fifth dynasty.

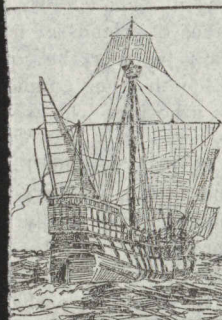
INVENTIONS MARK ERAS IN EVOLUTION OF MODERN SHIP



... comparatively huge ships known as galleys."



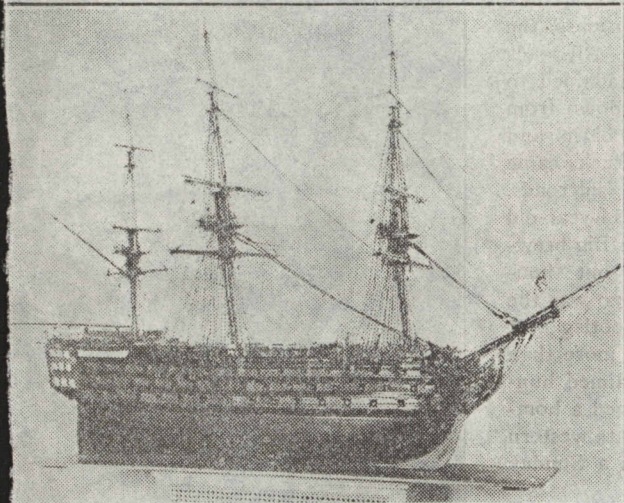
"The Viking ship of the eighth century was ... remarkable ..."



"The little Santa Maria ..."



... Spanish armada of sailing galleons ..."



"... the flagship of Lord Nelson at Trafalgar, the Victory ... this great warship was launched in 1766."

(Cont'd from Page One)
turret and armored decks almost flush with the water line. The success of the Monitor marked the advent of iron and steel armored warships such as those of the present day.

The Monitor, built in 1861, was designed by Capt. John Ericsson, one of the inventors of the screw propeller. The queer looking ship was 172 feet long. Its sides were protected by armor plate 5 inches thick and its turret by armor 8 inches thick. The queer appearance of the Monitor caused it to be known as "the Yankee cheese box on a raft."

By the end of the Civil war steam had definitely "arrived." as the future propelling force of ships. Until the 1880's shipbuilders continued to equip vessels with sails, but by the turn of the century the day of the sailing ship had ended. The first attempts to adapt steam successfully to trans-Atlantic cargo and passenger carriers were crude, chiefly because the marine engine had not been sufficiently developed to be relied upon.

Great strides were made in the design and building of marine steam engines between 1875 and 1900. During this period also the submarine, which was to become the chief weapon of Germany in the World war, was successfully developed from the crude beginnings made hundreds of years previously. John P. Holland, an American engineer and inventor, has been credited with having designed the first successful undersea craft. It is true that the giant submarines of today, powered by electric and Diesel motors and carrying formidable armaments, scarcely resemble the Holland submarines of 1900, but the principles evolved by Holland still are the guiding ones for present-day submarine design.

In the early days of steamships was begun the shipbuilding race which has continued to the present day. Many of the great trans-Atlantic lines were organized in the latter half of the nineteenth century, and each vied for leadership in the race to build the fastest and most luxurious passenger and cargo vessels. It must be recorded, unfortunately, that in this race America, which with clipper ships had enjoyed the cream of the maritime commerce of the world, played an insignificant

role. England, France, and Germany were the leaders in the building and operating of commercial ships, and, with the addition of Italy as a contending commercial maritime power, have remained so.

Of the early steamships designed to carry huge cargoes and many passengers, a notable example was the Great Eastern. This ship, one of the first vessels ever built as a steamship, was completed in England in 1857. Originally designed to inaugurate a line between England and Australia, the Great Eastern never made such a voyage, because its engines were not sufficiently powerful. The ship was used, however, in laying the first trans-Atlantic cable.

Before 1900 the great ocean liners, almost as large and luxurious as we know them today, had been developed. Marine engineers had devised the powerful steam turbines and multiple screw propellers, electricity had been adapted to navigation in countless ways, and with this progress came a new era of safety for the crews, passengers, and cargoes entrusted to the seas.

Constantly have the shipbuilders of the twentieth century adapted new inventions and refinements to the design of passenger and cargo ships. Radio communication, oil-burning turbine engines, Diesel engine power for huge motorships, and hundreds of other inventions and refinements have been developed within the last thirty-four years and have made possible the superliners which today cross the oceans of the world in a few days. Speed and more speed has been the keynote in the advance of navigation, but there has been no less emphasis on safety and comfort. A speed comparison of some of the more notable Atlantic crossings is interesting as an illustration of shipbuilding and navigation progress.

Columbus made his historic crossing from Palos, Spain, to the Bahamas in 1492 in 71 days.

In 1620 the Mayflower, bringing the first Pilgrim colonists to America, crossed from Southampton, England, to the American coast in 63 days.

In 1819 the steam and sailing ship Savannah crossed from America to England in 26 days.

During the height of the clipper ship era in 1854 the clipper Red Jacket made the fastest crossing of any sailing ship from America to England, in 13 days 1 hour.

In 1841 the steamship Acadia crossed from Savannah to Liverpool in 9 days 21 hours.

In 1889 the City of Paris made an At-

lantic crossing in the record time of 5 days 19 hours 18 minutes.

The giant British liner Mauretania bettered this record by crossing in 5 days 2 hours 34 minutes, a speed record which was unbroken until the German-built Bremen captured the Atlantic speed title in 1928 by making the run from Cherbourg to New York in 4 days 15 hours 48 minutes. More of the Bremen later.

So much advertising and publicity have been accorded the huge, fast, and luxurious passenger liners of modern times that the general public has come to consider these giants of the sea as representative of all steamships. In reality they represent only a small percentage of ocean-going vessels. The vast bulk of the maritime commerce of the world still is carried in the comparatively small freighters, ranging in size from the 5,000 to 10,000 ton class. It was the terrific rate of destruction of these smaller vessels by German submarines during the World war which for a time threatened to defeat the Allies.

In the United States have been developed several types of specialized vessels propelled by steam. Unlike any other steam vessels before or since were the steamboats which plied the western rivers a few decades preceding and following the Civil war. The age of the river steamboat has passed, but these great "floating palaces" were of vital importance in helping to build up the great middle west empire.

On the great lakes of inland America two specialized types of steamship have been developed, the whaleback, a cargo carrier of great capacity, and the lake freighter, distinguished by its great length and capacity for bulk cargo loads. The whaleback is distinguished by its peculiarly shaped hull. In fact, the whaleback freighter is little more than this big hull, with a pilot house fore and crew's quarters aft for superstructures. Familiar to residents of Chicago and Milwaukee was a passenger whaleback steamer, the Christopher Columbus, built in 1893 as a Chicago World's Fair excursion steamer. Until recent years this large vessel carried passengers on a regular schedule between Chicago and Milwaukee. Following the Eastland disaster in the Chicago river in 1915 the Christopher Columbus was subjected to an interesting test for stability. Sandbags loaded with thousands of pounds of sand were placed along one side of a top deck. The ship made a short trip thus unevenly loaded, but remained on an even keel.

Amazing as has been the progress in the development of marine engines and

the other improvements and refinements of navigation, the fundamental advancements which made the present-day ocean liner possible were the use of steel plates in ship construction and the screw propeller. When it had been proved that it was feasible to build ships of iron, and later of steel, the day of the modern liner dawned. The next big advance was the change from side paddlewheels to the screw propeller.

Today the public has come to think of an ocean liner as a great floating hotel, in which every possible comfort, convenience, and luxury has been provided. Since 1912, when the world was shocked by the Titanic disaster, such progressive safety measures have been taken by the steamship operators that the factor of danger is no longer taken into consideration in connection with a sea voyage. The sheer size and power of the modern ocean greyhound is enough to stagger the imagination.

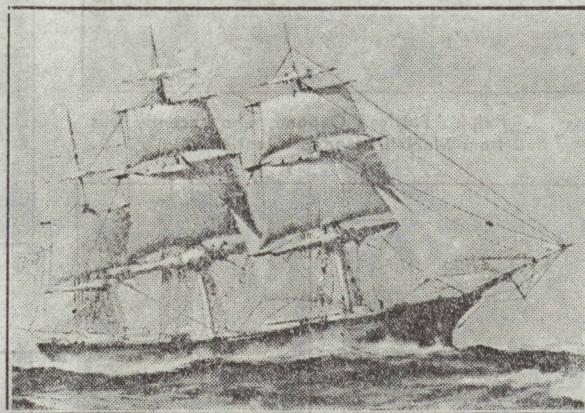
Consider the newest holder of the Atlantic speed title, the giant liner Bremen. This huge ship was launched in 1928. An army of 15,000 men was employed in its construction. The completed vessel cost in excess of \$15,000,000. The Bremen's tonnage is 46,000. Its over-all length is 938.8 feet. Power for its four large screw propellers is provided by steam turbines. The steam is generated by oil-burning boilers. Operation of the vessel requires a crew of 950. The passenger capacity is 2,800.

On the forward boat deck of the Bremen is an airplane catapult, which launches a mail plane as the ship is nearing port. By this means trans-Atlantic mail is speeded up by a matter of days. The interior of the ship resembles the most modern and luxurious of hotels ashore. There are, in addition to the spacious passenger cabins and staterooms, large dining and recreation salons, swimming pools, libraries, shops, a completely equipped hospital, and medicinal baths.

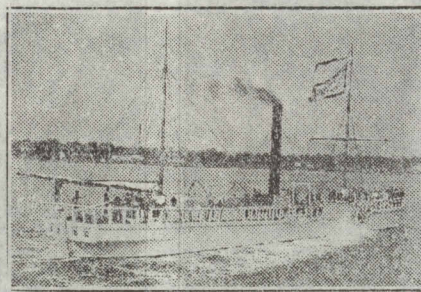
The Bremen is cited, however, only as one of many of the great liners built in recent years.



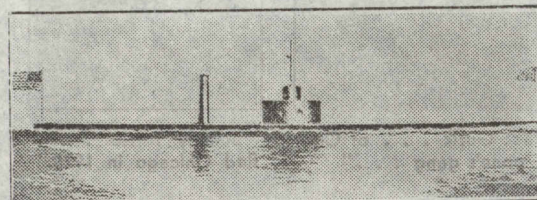
"... the famous American frigate Constitution ... had an over-all length of 302 feet ..."



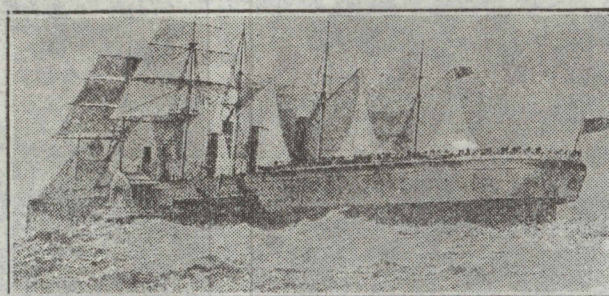
"... the American clipper type, fastest of the big sailing ships ..."



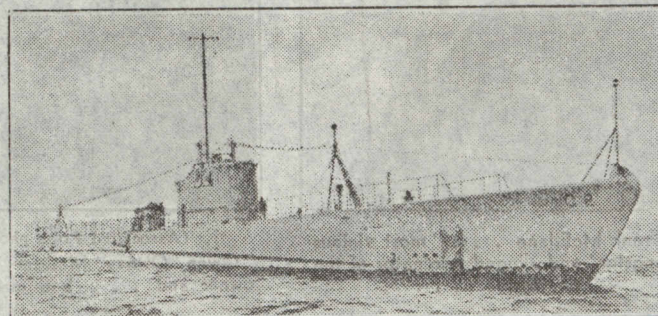
Fulton ... built his first steamboat, the Clermont ... A replica.



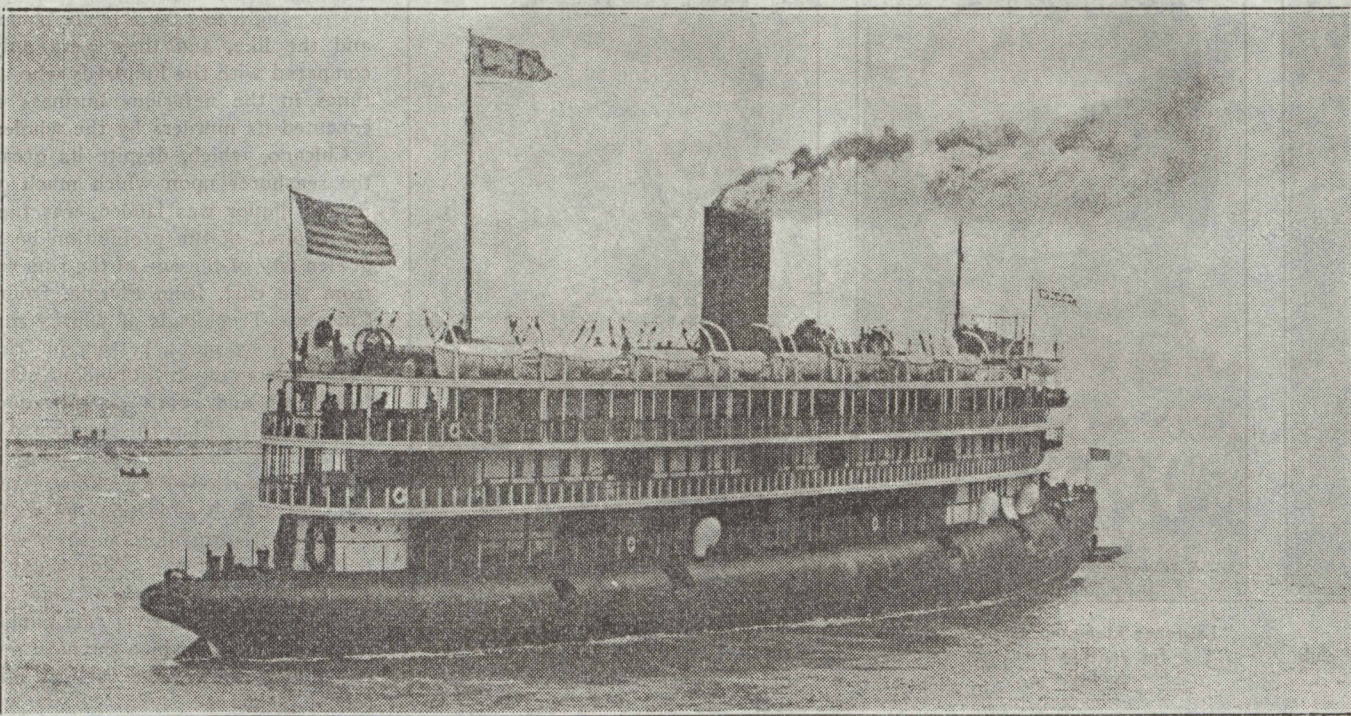
"... the Monitor, an iron-armored warship with a circular gun turret ..."



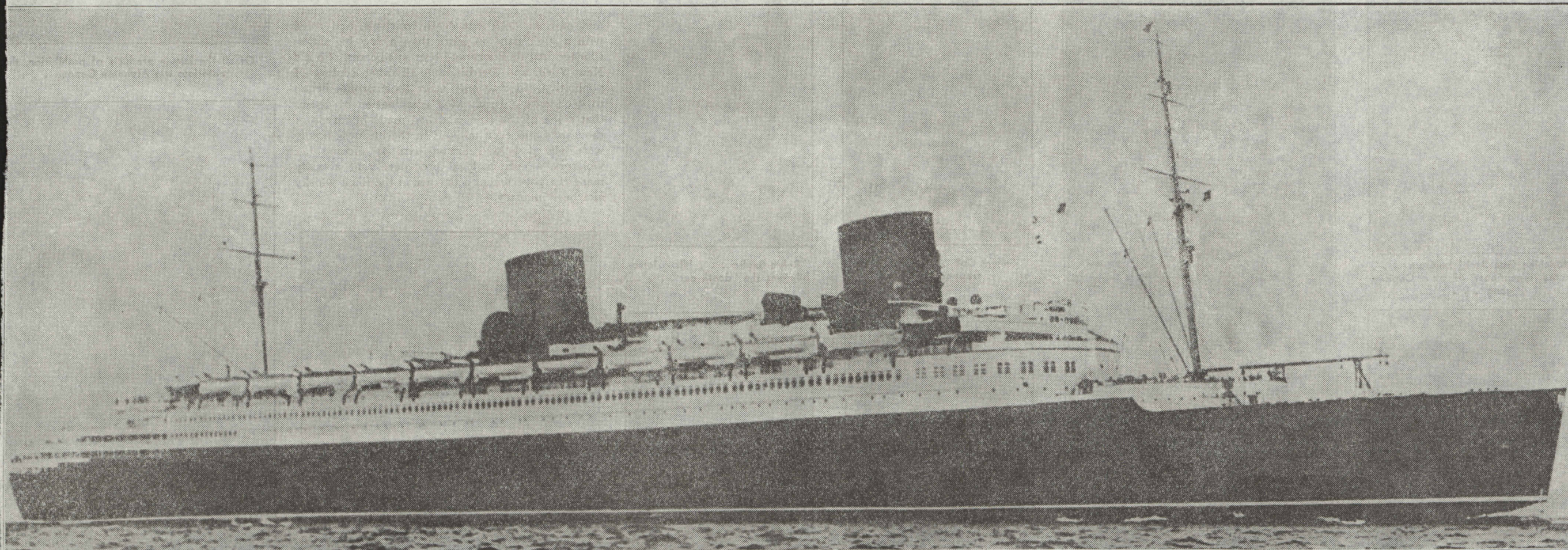
"Of the early steamships designed to carry huge cargoes and many passengers ... the Great Eastern ..."



"... the giant submarines of today, powered by electric and Diesel motors and carrying formidable armaments ..."



"Familiar to residents of Chicago and Milwaukee was a passenger whaleback steamer, the Christopher Columbus, built in 1893 as a Chicago World's Fair excursion steamer. Until recent years this large vessel carried passengers on regular schedule between Chicago and Milwaukee."



"Consider the newest holder of the Atlantic speed title, the giant liner Bremen. This huge ship was launched in 1928. An army of 15,000 men was employed in its construction. The completed vessel cost in excess of \$15,000,000. The Bremen's tonnage is 46,000. Its over-all length is 938.8 feet. Power for its four large screw propellers is provided by steam turbines. ... Operation of the vessel requires a crew of 950." The size of this picture and of the others gives an approximate comparison of the various ships represented.