whenever they landed at docks built of concrete.

As a consequence, the cross-braces were put back into the design of the new steamers and, to further strengthen the hull sides, the side tanks were extended to the underside of the spar deck. This design also eliminated the problem of cargo becoming lodged on top of the side tanks and, more importantly, provided space for an access tunnel through which the crew could travel fore and aft during severe weather instead of walking on the exposed deck above.

During the early years of the twentieth century, the Pittsburgh Steamship Company was a true pioneer in vessel technology, especially in the field of propulsion. Many of its ships were built with water-tube boilers, and many older units of the fleet that originally were equipped with Scotch boilers were upgraded with the installation of more modern water-tube boilers. For the GOVERNOR MILLER and each of her sisterships, power was provided by a geared steam turbine engine, and to provide steam, two coal-fired, water-tube boilers were fitted. The steam turbine could provide 2,000 normal shaft-horsepower at 90 revolutions per minute. The main generator supplied 120 kilowatts for a total of 2,300 shaft-horsepower. The two boats built by the American Ship Building Company were equipped with s ateam turbine built by the DeLaval Steam Turbine Company and water-tube boilers manufactured by the Foster-Wheeler Company, while the vessels constructed by the Great Lakes Engineering Works came fitted with a General Electric steam turbine and Babcock & Wilcox boilers.

The June, 1938, issue of "Mariner Engineering and Shipping Review" gave details of the double-reduction geared turbines fitted in the GOVERNOR MILLER and WILLIAM A. IRVIN. "Each unit consists of a high-pressure ahead turbine, a low-pressure ahead turbine, and astern element which is built in the low-pressure ahead turbine, and a set of double-helical, double-reduction gears. The turbines are mounted side by side forward of the reduction gear, with the high-pressure element on the starboard and the low-pressure turbine on the port side of the main shaft.

"The steam enters at the forward end of the high-pressure turbine, exhausting from the high-pressure into the low-pressure turbine through a pipe from the lower high-pressure turbine casing into the low-pressure turbine casing, entering at the aft end of the low-pressure turbine and finally, after passing the low-pressure ahead turbine, exhausting downward into the condenser arranged athwartship underneath the low-pressure turbine.

"The astern steam enters at the forward end of the low-pressure turbine, passing through the astern element which comprises one double and one single-row turbine wheel, and then also exhausts downward into the condenser.

"This new departure in the choice of propelling machinery for Great Lakes freighters has its advantages not only in the space and weight required but also in the fuel economy obtained. The turbines are designed for efficient operation with a steam pressure at the throttle of 375 pounds per square inch gage and 725 degrees F. total temperature, exhausting to a 28½-inch vacuum."

Of the boilers, the same journal commented: "The steam generators are of the Foster-Wheeler two-drum 'D' type, coal-burning with automatic stoker firing. This is the first use of such boilers on the Great Lakes, although they have given notable performance in many tankers on the Atlantic seaboard.

"The design includes two horizontal drums; a steam drum of 42-inch diameter is placed directly above the water drum, and connected to it by vertical tubes. Space is provided for a convection superheater between the third and fourth row of tubes, counting from the furnace. The three rows of tubes nearest the furnace are of 2-inch diameter while the remainder of the bank is of 1½-inch diameter.