ENGINEERING

New Type Boiler May Bring Great Changes in Navies

High Efficiency Makes Steam Effective Rival of Diesels As Power Source; Compactness Fits for Use in Narrow Hulls

A NEW type boiler which may bring a new era into the generation of power aboard warships, especially those of the destroyer class and perhaps submarines, is described in *Mechanical Engineering* (August). So efficient is the device that it makes steam a competitor of the Diesel engine.

The ultra-modern boiler is highly compact, light in weight, and easily adaptable to the narrow hulls of destroyers, according to Adolphe Meyer of Brown, Boveri and Company, Baden, Switzerland, in his report to the American Society of Mechanical Engineers. The boiler is already coming into use throughout Europe. Because the fuel gases travel faster than sound in some parts of the boiler, it is called "Velox," coined from the word velocity.

Saves Weight and Space

The weight of the Velox steam generator is only one-fifth that of the ordinary oil-fired water tube boiler, while it occupies only one-half as much space as even the most modern marine boilers.

"In submarines," says Mr. Meyer, "the small masses, the possibility of rapid cooling by running cold air through the boiler, and the small dimensions of the exhaust pipes enable the time required to prepare for submerging to be reduced to an extent hitherto only to be obtained with Diesel engines."

"In comparison with the Diesel engine," adds Mr. Meyer, "the Velox steam generator has the advantage that every kind of oil can be used and there is no restriction as to the use of the more expensive gas and Diesel oil."

In warships, the Swiss engineer explains, the full steam output is ordinarily obtained by forcing the boilers to about three or four times the amount which such a boiler would normally give if used for other purposes.

An efficiency of 75 per cent. or less is obtained under such forced conditions. By comparison, the Velox boiler has an efficiency of between 88 and 90 per cent.

An additional naval advantage is that the exhaust gas from the boiler is completely invisible even at maximum output.

"For obvious reasons," Mr. Meyer states, "no information about Velox plants in warships is available except the fact published in British papers, that one unit is built for the British Navy by Yarrow and Richardson Westgarth, the former building the boiler proper, the latter the gas turbo-blower and other auxiliaries."

Velox boilers are already being used in various countries throughout Europe in iron and steel works, central heating plants, and steam electric generator stations.

Special advantages of the new type boiler are:

1. It can be brought up from a cold condition to its full load steam generating capacity in from 4 to 8 minutes.

2. Changes in load can be handled quickly. A drop of 50 per cent. in the load can be dealt with by the automatic control device in but 20 seconds. Even when the full load is cut off suddenly, the boiler will not blow off.

As in warships, the best features of the Velox type boiler—small space requirements, light weight and high efficiency—exactly fit the needs of railroad locomotives.

Convertible Locomotives

The small amount of space needed for the new boiler means, Mr. Meyer points out, that in locomotives adequate room can be left over for the driving and attendance. Moreover, it is possible to substitute a Velox generator on the chassis of an existing locomotive without altering the driving mechanism.

Orders have just been placed for the transformation of an existing locomotive to 2,400 horsepower and 100 miles an hour speed.

The Velox generator operates essentially as follows:

Air and fuel are mixed in a burner at the top of the combustion chamber and are blown into the chamber to burn. The entering velocity is over 1,200 feet a second, faster than the speed at which sound travels. Lining the walls of the combustion chamber are hollow evaporator tubes containing many small pipes. These small pipes are part of the water circuit of the steam generator.

Power is obtained from the device in two ways:

1. By the action of the swift-moving exhaust gases on a gas turbine which drives a blower. The blower is used to mix the air and fuel in the intake burner.

2. By the action of superheated steam on a steam turbine which drives an electric generator directly coupled to it.

Following through the mechanism by which the exhaust gases are used directly to obtain power for the blower, the first step is the partial loss of the heat of combustion to the outer walls of the evaporator tubes. Still more heat is lost as the combustion gases go down to the bottom of the combustion chamber and then back up inside the evaporator tubes. This heat is transferred to the water inside the pipes filling the evaporator tubes.

Drives Gas Turbine

Continuing on their way, the exhaust gases, now down to a temperature of 1,500 degrees Fahrenheit, enter the superheater. By the time the gases have left the superheater, their temperature has fallen to 900 degrees Fahrenheit and their velocity is between 330 to 600 feet per second. Traveling at this rate, they strike a gas turbine.

The gas turbine, in turn, drives a blower which is used to send more air and fuel into the device.

Finally the exhaust gases, now down to a temperature of 700 degrees Fahrenheit, pass out through the chimney on whose inner walls are pipes containing the water which will eventually become steam in the water-steam system of the machine.

The water-steam system starts therefore in the chimney of the steam generator. The incoming water is warmed here and passes into the evaporator tubes inside the combustion chamber, where the real heating takes place.

Separating the Water

The steam and hot water thus formed issue from fine nozzles into a vertical drum. This drum acts as a centrifuge to separate steam and water, the latter falling back for more heating and the steam passing on to the superheater.

The steam at 600 pounds to the square inch pressure and temperatures as high as 850 degrees Fahrenheit passes to a steam turbine driving an electric generator directly coupled to it.

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