## Faraday and Marine Boilers.

FARADAY was probably the first man of science in Great Britain to be called upon to give advice on the working of marine boilers. There is little to show that his views affected marine engineering practice at the time, for his evidence was hidden away in a Government report which few engineers read, but it is not without interest to find that subsequent experience led to the adoption of methods the germs of which are to be found in what he said.

The circumstances in which Faraday came to be associated with the matter of marine boilers were as follow. In 1822 a Select Committee of the House of Commons was appointed to consider the question of steam navigation as relating to the communication between Great Britain and Ireland by steam. The committee, of which Sir Henry Parnell, Bt., was the chairman, became known as the Holyhead Roads Committee, and it sat when Telford was busy with the great Holyhead road and the suspension bridge over the Menai Straits. At the time the inquiry was held, ten years had elapsed since Bell's *Comet* had inaugurated regular steam navigation in Europe, and in Great Britain alone there were about 150 steam vessels afloat. Most of these were running on the rivers, but the eminent marine engineer, David Napier, had proved that steam vessels could be built for work in the open sea and had successfully established services between Dover and Calais, Holyhead and Dublin, and between Glasgow and Belfast. This success in turn led to the dispatch of mails to France by steam, and in 1821 the Post Office decided to have its own steam boats. That year, therefore, the *Dasher* and *Arrow* were built for running between Dover and Calais, and the *Royal Sovereign* and *Meteor*, somewhat larger vessels, for the Holyhead and Dublin route. As these were the first steam vessels owned by any Government department, they were regarded with great interest, and the committee of 1822 was mainly concerned with the construction, maintenance, and running of the *Royal Sovereign* and *Meteor* and other vessels which it might be decided to build.

The committee sat on various days between March 21 and June 1, 1822. Among the witnesses examined were officials of the Post Office, captains of steam vessels, and well-known engineers such as Joshua Field, Bryan Donkin, Timothy Bramah, James Brown, and others. These all gave valuable information as to the size and construction of the boats, the types of engines and boilers, the staffing of the engine rooms and such matters, but it was left to Faraday, who described himself as "chemical assistant at the Royal Institution to Mr. Brande", to enlighten the committee on the chemistry of steam raising. He had to tell the committee all about the composition of sea water, what salts it contained, what happened to the salts when the water was evaporated, what action the salts had upon iron and copper, what was the effect of incrustation, what could be done to prevent deposits forming, how fires in bunkers could be avoided, and so forth.

In 1822, and for many years afterwards, marine boilers were just great rectangular tanks with internal furnaces and flues of square or rectangular section, and they were invariably fed with sea water. The engines had jet condensers, not surface condensers, and there was no way of keeping the boiler water fresh even if the boilers were filled with shore water before starting on a voyage. As, however, the steam pressure was only about 2 lb. or 3 lb. per sq. in., by taking proper precautions the density of the boiler water could be kept down, and engineers who knew their work could keep their boilers remarkably clean. In other cases there was much incrustation, while corrosion was rampant. Iron boilers in some vessels only lasted two years, and so a good many engineers adopted copper for the material for boilers.

These facts were all known to Faraday, who had prepared a long memorandum for the committee, dated from the Royal Institution, May 7, 1822, and it was in this and in his evidence he made his many valuable suggestions. One of these was that engineers should be provided with hydrometers, another that the density of the water in the boiler could be kept down by a continuous system of brining, and a third that the action of acids could be neutralised by the use of lime, potash, or soda. If copper boilers were to be used, iron bolts and fastenings should not be used, while if there was fear of fire in bunkers it would be an easy matter to fit horizontal temperature tubes of iron through which thermometers could be passed. Many strange practices were in vogue among marine engineers in the early days. Dung, potatoes, and oatmeal were all put into boilers for stopping leaks, and other substances were used with the idea of preventing incrustation. It therefore occasions no surprise to find that Faraday was asked, "Would a dry holly or thorn bush introduced, if practicable, into the boiler take off a part of the crystallisation which would otherwise adhere to the bottom of the boiler?"

## News and Views.

DEC. 12 was the thirtieth anniversary of Marchese Marconi's first successful attempt to transmit a radio signal across the Atlantic. In 1901 there were no valves, no amplifiers, no sensitive receivers, and no means of making continuous waves. All that was available for transmission was a system of damped waves produced by irregular spark discharges; the coherers then used for reception were very insensitive. In 1900 a station was erected at Poldhu in Cornwall and another at Cape Cod, Mass. In designing these stations, Marconi had the help of Sir Ambrose Fleming, R. N. Vyvyan, and W. S. Entwistle. When the