

BRISTOL CHANNEL CENTRE.

DISCUSSION

ON

MARINE BOILERS AND STEAM PIPES

BY

MR. J. F. WALLIKER (MEMBER),

WEDNESDAY, MARCH 9th, 1898.

CHAIRMAN :

PROFESSOR A. C. ELLIOTT, D.Sc. (LOCAL PRESIDENT).

Mr. DAVID GIBSON (Vice-President) said that with most of Mr. Walliker's recommendations he was in cordial agreement. He could not, however, quite concur with the statement that there had been no improvement in the design of the marine boiler since the introduction of the triple-expansion engine. He considered that improvements in design, although of a detail nature, had been made, especially when they remembered the thickness and size of the plates dealt with and the effect which these improvements had had upon the life of the boiler. The improvements to which he alluded were the making of shells in one plate, making the boiler-ends in one plate in some cases, and in others welding the end-plates at the end of the landing where they took the shell of the boiler. The flanging of the shell-plate of the boiler end-plates was also a considerable improvement. The stamping-in of the manhole doors and the various improved designs of furnaces,

too, were improvements which added to the life of a boiler. He would strongly emphasise the author's opinion that accessibility should be placed in the forefront of design. With regard to the fitting of man-hole doors at the back, he thought it would only be making the back of the boiler accessible at the expense of the front. He could quite imagine one of Mr. Walliker's colleagues criticising the designer of such a boiler, when desiring to examine the front circumferential seam of rivets, which was one of the most troublesome features of a boiler, and required frequent inspection. But perhaps Mr. Walliker would like doors fitted at both ends. [Mr. Walliker: No, no.] That would be very objectionable. The fewer holes put into a boiler the better. If a good space was allowed between the furnaces and the combustion chamber, as the author suggested, it would meet all requirements, and make the boiler quite accessible for all necessary examinations and repairs. A happy medium must be aimed at, because the more accessible they made a boiler the more weight did they add in the shape of steam and water. On the question of steam pipes he had again to recommend—the subject having been recently discussed—the multiple system of steam pipes and the adoption of a method of automatically closing of the stop valve, fitted so as to shut off steam when a rupture took place in the steam pipe.

Mr. CHELLEW (Member) said as to lagging the main boiler underneath, this would be a great pity for the repairing shop people. They knew how fond they were of a tank top. As to steam pipes, they had all had more or less sad experience with them. Some suggested a bigger bend and others the expansion joints. He thought a good bend in steam pipes prevented a good deal the fracture in the flanges.

Mr. T. A. REED (Member) said he agreed with the author that the majority of boiler builders erred on the

side of sticking to thin plates instead of thicker ones. Nor did they give sufficient access to boilers for cleaning and other purposes. It was a very good practice in new boilers to keep the small stays say an eighth of an inch bigger than required by Lloyd's rules, and the large steam stays a quarter of an inch bigger. This meant that the lifetime of the stays would with care be very nearly the lifetime of the boiler, as it would allow a good margin for wasting. He knew of a pair of boilers about sixteen years old which had man-hole doors both in back and front plates, which were very handy for inspection, etc. It would be inadvisable to do away with the front doors, on account of the convenience of cleaning the boilers out on to the stoke-hole floor. Where fourteen years used to be the average lifetime of a marine boiler, there seemed to be no reason why it should not last twenty-five or even thirty years under modern conditions.

Mr. BODDY (Member) said the donkey-boiler was usually very much neglected. The great cause of the corrosion in the donkey-boiler was doubtless the leakage from the main boilers when at sea; and he quite agreed with Mr. Walliker that a stronger and more efficient stop-valve, fitted to the donkey-boiler to keep the steam from entering, would be very beneficial. The ventilator pipe, too, was very efficient in keeping the inside of the boiler dry. In his opinion, all steam pipes should be fitted with an expansion bend.

Mr. R. H. STRONG (Member) said undoubtedly boilers were made with too small water spaces. They were too narrow between the furnaces, the boiler sides, and the back. He did not consider that a boiler should have anything less than 5 in. between the furnaces and less than 7 in. at the sides. As to the backs, they wanted to revert to the old rectangular boiler at the back of the combustion chamber. They would then have the manhole doors

at the other end of the boilers. They would have a better circulation, and a better steaming boiler. Narrow water spaces had been the great trouble with boilers. He had in his mind two boilers with the water space at the back of the combustion chamber, $4\frac{1}{2}$ in. from the bottom, and not more than 5 in. from the top. Three rows of stays in each boiler were broken at the back plate of the combustion chamber—not the bottom row. This showed that the impingement of the flame over the bridge striking upon one point was so great that the water was driven away from the plate altogether, and the stays were broken right inside, as if they had been cut off. He had seen the same thing happen with narrow water spaces in the rectangular boilers with the low pressure. Since nuts were put on, thin plates had begun to go between them, although at the proper pitch for sustaining the pressure. With regard to thick end plates, he had built lots of boilers to pass the Board of Trade, and where the Department wanted stays he had obviated that by putting in thick end plates.

Mr. McNAIR said his firm had been making a speciality of iron and steel pipes suitable for the higher pressures, and particularly adapted to the heavy work to which any material connected with ship work was subjected. In this respect the electric arc had assisted them a great deal. The electrical welding on of flanges and outlets, and the manufacture of any particular or peculiar shape, had now become every-day work, whereas formerly these things could only be supplied in the form of a casting. They also claimed that by the electric process a complete weld joint could be made with the pipe, and not partly solid, but solid right through. As an indication of the strength of these welds, recently at Lloyd's Proving House at Netherton an 8-in. iron pipe, $\frac{1}{4}$ -in. thick, having electrically welded flanges, was tested to destruction, with the result that the pipe broke in the body at 88 tons. Recently, in Cardiff, a $6\frac{1}{2}$ -in. iron pipe broke at 75 tons.

The CHAIRMAN said he knew that Mr. Walliker believed in the future of the water-tube boiler, although the paper professed to deal with current practice rather than to forecast the future. He (the Chairman) believed very strongly in water-tube boilers for exceptional purposes to-day and for all purposes in the future; and he did not think Mr. Walliker would disagree with this remark. As to the doubling of plates and the thickening up of end-plates, this, as had been pointed out, involved an addition to the weight. Practically, whatever be the thickness of the plate, the weight of the stays remained the same. On the other hand, the increasing of the plates and the stays was a great practical advantage in certain cases. That it was a practical advantage was quite apparent in the case of the stays in the steam space, but he did not see the great advantage of any wider spacing of the short stays. There should be some sort of reasonable size for a stay in that particular, and it would be unwise to go beyond it. Of course, Mr. Walliker committed himself to the approval of the thick end-plates. Some four or five years ago it would have been rather a daring thing to do; it was universally condemned; but they had Mr. Walliker's approval of it, and most people were inclined to work in that direction. On the question of steam pipes his mind was thoroughly made up long ago. He had a great respect for the copper smith in his own proper place, but in the engine-room and in the engineer's shop he thought he was an anachronism, especially in the matter of steam pipes. The fearful loss of life due to incompetent copper tinkering was quite enough to condemn the copper pipe, at least the brazed copper pipe; and he hoped the Legislature would make it a criminal offence to put a pipe of that sort into any British boat. He agreed with Mr. Walliker that too much faith was often reposed in bent steam pipes in the matter of allowing for expansion. If people would only make one or two small calculations before putting in a bend upon which they placed so much

faith, it would show that in many cases an unreasonable faith had been indulged. With regard to the general design of steam pipes, the modern practice was rightly tending towards doing away with the bends altogether, necessitating, of course, an expansion joint; but there was no reason why the expansion joint should not be made in the way to meet Mr. Walliker's criticism. With regard to the present design of the check nut, Mr. Walliker had done a good service in so strongly emphasising the point. As to the testing of steam pipes by water pressure, there did not seem to be any great difficulty in testing the boilers and the pipes at the same time. He did not see why the engine stop-valve should not be shut down and the pipes filled up, and the whole thing tested at the same time. There was no difficulty at all, and it would be a safeguard and would afford a great deal of satisfaction to all concerned.

Replying on the discussion, Mr. J. F. WALLIKER said Mr. Gibson had spoken on the point of the mud-hole doors. It was very important to get round the mouth of the furnaces, but it was far more important to get easily and quickly at the back end. With the mudhole doors at the back end, they could see at a glance the condition of the combustion chambers; the men could work at them easily and they were always under the eye of the chief engineer and superintendent, without having to crawl, it might be, through a lot of water and dirt. He was glad Mr. Chellew agreed with him as to lagging the bottoms of boilers, and to learn that it was becoming more general. Mr. Reed agreed with fitting thicker plates and larger stays, and he had said he would fit the stays a little larger than the requirements of Lloyd's. He could assure him that nobody in Lloyd's Register would object to his fitting the stays almost as large as he liked. They liked to see stays of good size, and generally stays were made a little larger than the requirements of Lloyd's rules. With regard to the

remarks of Mr. McNair, he was at a very interesting experiment some years ago, where a wrought-iron pipe, which had been cut out of a ship after going for a good many years, was tested to destruction, and it gave exceedingly good results. The pipe itself had the original bloom on the interior of it after eight years' working, and the only place where there was corrosion was on the outside, attributable to ordinary oxidisation, and due to a little water dripping from the deck. Personally, his experience of iron pipes had been of a very satisfactory nature. As to the water-tube boiler, this was a most excellent boiler in its place, but he did not think it had yet given such results as would induce shipowners generally to adopt it, especially for the ordinary run of cargo boats. It required special care and pains to be devoted to it, which could not be always given on board a cargo boat, and until it could be run under somewhat different conditions they would, he believed, continue building the present type of boiler. The President had said he could not see why the combustion chamber stays should have a wider pitch. This was a matter which came home to many of them. With 160 lb. pressure and a 9-16th plate, they could have an 8-in. pitch for their stays; where they had a $\frac{3}{4}$ -plate they could have something like 10 in. He left it to them to say whether a combustion chamber plate with 10-in. pitch stays would not be an easier plate to clean, especially in view of there being 50 stays less in each boiler with this increased pitch. With regard to steam pipes, he was glad that Dr. Elliott concurred with him in the belief that copper, at all events in some forms, had had its day. At the same time, he could not agree with the President that the use of a copper pipe on board ship should be made a criminal offence.

A cordial vote of thanks was passed to Mr. Walliker for his paper, on the proposition of the President, seconded by Mr. T. A. Reed.

PREFACE.

58 ROMFORD ROAD,

STRATFORD,

April 4th, 1898.

A meeting of the Institute of Marine Engineers was held here this evening, when a paper by Mr. J. F. WALLIKER (Member) entitled "Notes on Marine Boilers and Steam Pipes" was read by Mr. J. R. RUTHVEN (Convener of Papers' Committee), and the adjourned discussion on Mr. HAWTHORN'S paper, read at the previous meeting, on "Boiler Scale and Incrustation" was concluded. Mr. T. F. AUKLAND (Companion) presided.

Mr. WALLIKER previously read the paper at Cardiff on Wednesday, March 9th. The paper is given on page 5, and the discussion at Stratford follows.

JAS. ADAMSON,

Hon. Secretary.