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THE WATER TUBE BOILER ON ITS TRIAL.

There has recently been brought to a close a series of trials of the water tube boiler, which has attracted more attention than any event that has happened in the engineering world for many months past. We refer to the trials of the 25,000 horse power installation of Belleville boilers on the cruiser Powerful.

These trials were remarkable, not because this was by any means the first use of water tube boilers at sea, but because it was the first attempt to use them on such an enormous scale. The public has long been familiar with this type as used on torpedo boats, and of late it has been winning its way into fuller recognition on shore, where it is doing good work in the general industries, It was natural that it should meet with favor for marine, and especially naval work, where its light weight, compact form and capacity for sudden generation of power render it specially useful. In the earlier days of torpedo boat building it had the locomotive type of boiler for its competitor; but as the demand for combined lightness and power has grown, the locomotive boiler has practically disappeared from the contest and left the water tube type in possession of the field. The excellent results obtained by the French navy in fitting some of their smaller cruisers with this type have led the British Admiralty to equip their two largest cruisers, the Powerful and Terrible, entirely with the Belleville boiler. The decision was based upon the French experiences, and also upon a series of exhaustive trials in one of their own gunboats. The decision evoked a storm of criticism from experts, naval and otherwise, and it was freely predicted that the attempt would be a costly failure. The results of the recent trials, however, are reported to have been exceptionally favorable, the contract horse power, 25,000, being largely exceeded, and steam being maintained with ease and regularity.

The Belleville boilers, forty-eight in all, are divided up into eight groups—four groups of eight boilers each and four others of four boilers each, each group in its own compartment. The four latter groups are arranged side by side and fired athwartship. The other four groups are arranged for fore and aft firing. There are twelve stoking spaces, arranged with four boilers and six stokers to each space. It is found that if the men replenish the fires every four minutes by the clock, perfect uniformity of pressure can be maintained.

It has frequently been urged that the results of official trials of foreign battleships are worth very little because they are of too short duration to really test the qualities of the machinery and boilers. It must be admitted that no such charge can be made in this case, the trial tests, indeed, being of an extraordinarily severe nature, such as have never been attempted in any other navy. They included two runs at 5,000 and 18,000 horse power respectively, each of thirty hours' duration, and a final run of eight hours, the first four hours at 25,000 horse power and the remaining two at 22,000 horse power.

In the first trial the average indicated horse power was 5,008 and the coal consumption 2·07 pounds per horse power per hour. Sixteen out of the forty-eight boilers were used. In the second thirty hour trial the indicated horse power was 18,433 and the coal consumption 1·83 pounds. The four hours' full power trial was carried out on November 27. The boiler pressure was 257 pounds; the mean indicated horse power was 25,886, the maximum being 26,497; and the speed of the vessel against a head sea and wind was 21·8 knots, the distance being measured by landmarks. The coal consumption was not taken. It was estimated that in smooth water the speed would have been about 22·75 knots.

During both thirty hour runs the two furnaces of each boiler were fired alternately at intervals of four minutes. At the commencement of the full power run this was reduced to three minutes. The fires were kept at a thickness of six inches, coal being put on only in sufficient quantities to fill up the holes and hollows. The draught plates were kept three-quarters open, the air supply being controlled by varying the speed of the fans. The Belleville system is run upon the "open" as against the "closed" system of forced draught, and the fans are used primarily for ventilation. The work of the ordinary closed stokehold fan is done in a Belleville boiler plant by air compressing engines, one of which is placed in each stokehold.

It will thus be seen that the introduction of the water tube boiler has removed at a stroke all the discomforts attendant upon the old forced draught. The maximum temperature in the stokehold never exceeded 90 degrees; in the engine rooms it was 75 degrees. It is claimed, and very justly, too, that this moderate temperature will be of inestimable value when the engine and boiler room staff is called upon to endure the long continued strain of a war cruise.

Some idea of the saving of weight which is made by the use of this type of boiler as against the ordinary Scotch boiler may be gathered from the fact that the Powerful can carry a coal supply of over 3,000 tons. On the other hand it must be borne in mind that the consumption of coal per horse power is higher for the water tube than for the common type of boiler. It is a common occurrence for a Scotch boiler to show a consumption of less than 1·5 pounds per horse power hour, and it was only the other day that, chancing to step aboard a tramp steamer and inquire as to her coal consumption, the engineer promptly responded by handing us the cards of the voyage just ended, which showed a consumption of 1·4 pounds. So that in considering the merits of the Belleville boiler as regards saving of weight, we must remember that if the weight of boiler per horse power is less, the weight of coal per horse power is greater.

Warships, however, are not run for economy. The value of this type of boiler lies in its power to generate high pressure steam rapidly and in great volume for a considerable length of time in response to an emergency call, such as will continually be made in active service. The trials just concluded prove that all these conditions can be fulfilled with an installation of the unprecedented capacity (for water tube boilers) of 25,000 horse power.

A RETROSPECT OF THE YEAR 1896.

It will be pardonable to take a rapid glance at the international affairs of the past year, before entering into a detailed recapitulation of the scientific achievements which have marked its progress; and, as a journal devoted to the arts of peace, we note with deep satisfaction that whereas the opening of the year was marked by a widespread international distrust and jealousy, and the gathering of ominous war clouds, its close finds the political sky growing clear, a more reasonable temper of tolerance and forbearance manifesting itself, and, with the exception of three widely separated corners of the earth, a prevailing and apparently long to be continued peace established. With the Venezuelan scare replaced by the prospect of a permanent peace tribunal; with England, France and Russia united in the effort to bring about reforms in the East; with the Boer government promising concessions to the foreign element in the Transvaal; with a satisfactory treaty concluded between Italy and Abyssinia and the hostages returned—the prospects of peace are certainly brighter now than they were in the opening days of the year which has just drawn to a close. The three existing wars are attendant on the struggle of Spain to hold what she has in Cuba and the Philippines, and of England to reconquer the Soudan.

It is encouraging to note that in the industrial world there is evidence of a marked revival of trade, which has been felt in every quarter of the globe, and in this respect is as widespread as the gradual depression which commenced in 1891. We were the last nation to feel the decline, and we have been among the last to show signs of recovery. With the opening of the year, however, we may congratulate ourselves that trade is thoroughly convalescent, and there is every reason to look for a prosperity which will be permanent, because it is more gradual in its return, and comes in a natural course. One of the most notable events of the year has been the astonishing development of Japan, whose victory over her traditional enemy seems to have awoke in her a spirit of aggressive ambition, which is showing itself in her evident determination to take her place as one of the leading nations of the world.

It was hoped when the Chinese statesman and ambassador, Li Hung Chang, made his tour through the western world at the time of the coronation of the Czar of Russia, that his return to China would be marked by a similar activity in the ancient empire. There is little doubt but what Li Hung Chang himself was earnestly in favor of introducing modern improvements and industries. The tidings, however, that soon after his arrival he had been again degraded shows that the conservative party is yet all powerful. The awakening of China seems to be indefinitely postponed.

The most notable event in the field of engineering was the opening of the river Danube to navigation. This event formed part of the millennial festivities in Hungary, and as such took rank with the great exposition at Buda-Pesth. The undertaking was intrusted to Hungary by the treaty of Berlin, 1878, and work was commenced in 1890 and completed on the last day of 1895. The blasting operations covered a distance of sixty miles, and involved the removal of 1,635,000 cubic yards of material, 915,600 of which were excavated under water. Nine thousand workmen were continuously employed and the total cost was $10,000,000. Previous to the opening of the Iron Gates five feet was the limit of draught for river steamers for a large part of the year. The canal now affords an unobstructed outlet from Vienna to the sea for boats drawing ten feet of water. The Nicaraguan Canal Company states in its annual report to the Secretary of the Interior that no work has been done since August, 1893. Its rival, the Panama Canal, is almost equally inert, a small force being employed merely to fulfill charter obligations. It is with pleasure we turn to the Chicago Drainage Canal, which is being pushed with commendable energy. Apart from its magnitude, this work is remarkable for the magnificent excavating machinery which it has called into existence and the novel methods of handling material which are employed. The pre-