

July 13th, 1916.

THE COLONIAL TYPE BOILER—LAND AND
MARINE.

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It has occurred to me that some notes and discussion on this type of boiler would be of mutual advantage to the members of this Association, and would serve to put on record data which might be adopted as standard practice, more especially as all our British text books are practically silent on this particular type of steam generator.

I cannot lay claim to any special right to deal with this subject, as I take it there are many others who have had a wider experience and who have collected more data than I have, but my hope is that these remarks will, in a measure, serve as an introduction, and that others will come forward gladly with their experience, as it is a subject on which every engineer has his own ideas and data.

Every country has its own particular type of machinery engines, boilers, pumps, etc.—and, indeed, at one time every industry in England more or less approached to a particular kind; thus we find the Cornish type boiler evolved in Cornwall with the mines, and I believe still greatly used there. The Lancashire, as its name denotes, used in that country and associated with textile mills; the French or Elephant boiler, and so on. The Colonial type, following the same lines of reasoning, was designed to suit the Colonies, where ease in transport and a prevalent idea of temporariness were the ruling ideas. However, the type has shown itself to be a useful and long-lived boiler, easily maintained and able to burn almost anything, so that we can, with all confidence, allow that it is in the same category as the abovementioned types.

By the "Colonial" boiler I mean that type which is fired directly under the shell, the hot gases going into a combustion chamber formed in the casing, then through tubes and up the stack. In the boiler known as the "Return Multitubular," the gases follow the same path, but return along the sides. I have thought it better, however, to confine these notes mainly to the Colonial type, or, as the Americans call it, "the return smoke tube" type.

It is well worth knowing that in almost every case where it has been possible to do away with the side flues in a return multitubular boiler and throw the space occupied by them into the furnace proper, or, in other words, make it a Colonial boiler, that economy has resulted. I knew of one boiler originally built in as the ordinary return multitubular; the first alteration was to divide the furnace into two and do away with the side flues. This gave a saving of 4 per cent. in the fuel consumption. The furnace was then made one large one, and the boiler showed a further saving, in fact, on a weekly consumption of 18 tons a total saving of 28 cwt. resulted.

It would be impossible to get back to the beginning of the Colonial type of boiler with any certainty. The design has probably occurred to different men at widely separated times and places. I have seen it as far back as 1873 described in "Engineering" working at 95 lbs. pressure, but as we have our own country in our mind, I think it can be safely assumed that the old firm of Tangye were the introducers of the type in Australia, as most of the old mills I have seen had the Cornish and Lancashire type in use, and so our first plate is the well-known photo. in Tangye's catalogue. The boiler, as built to-day, has undergone one or two departures from this design, but these modifications have resulted from various Colonial boiler makers' attempts to "fill the bill" for our local conditions. The most important alteration to this design is in the ash

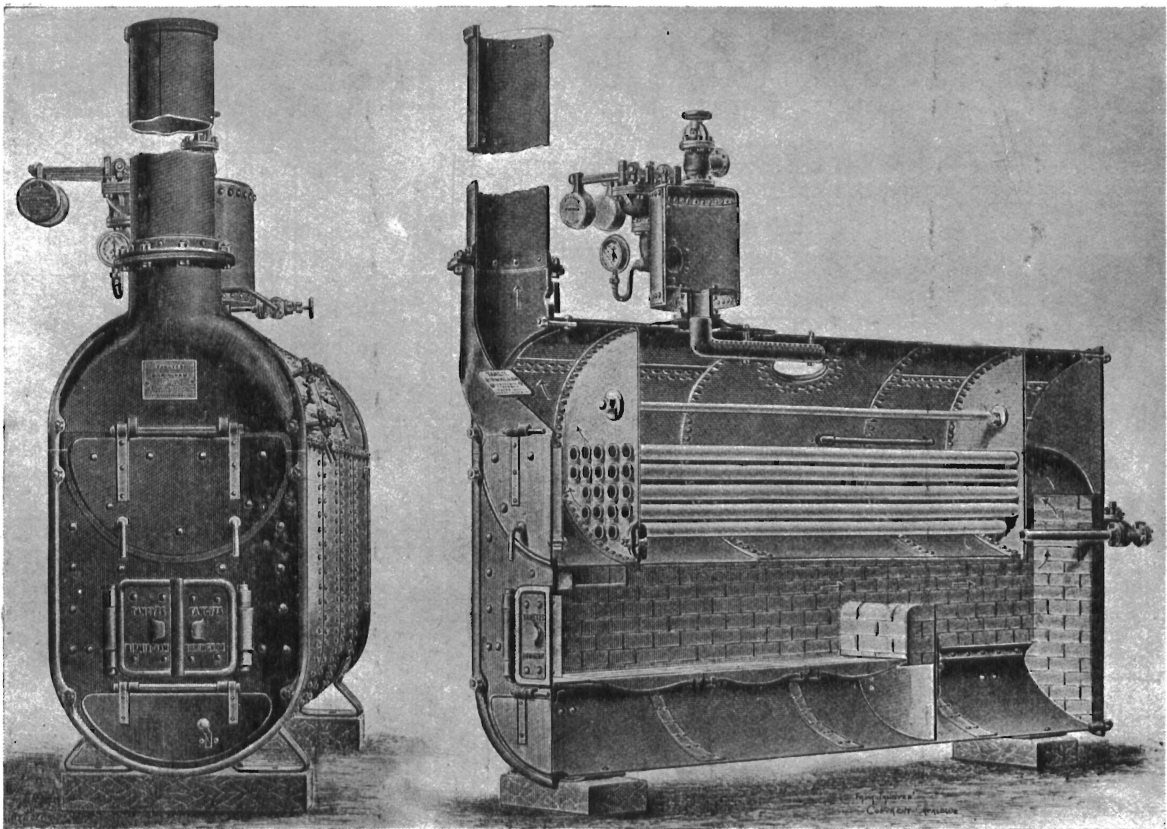
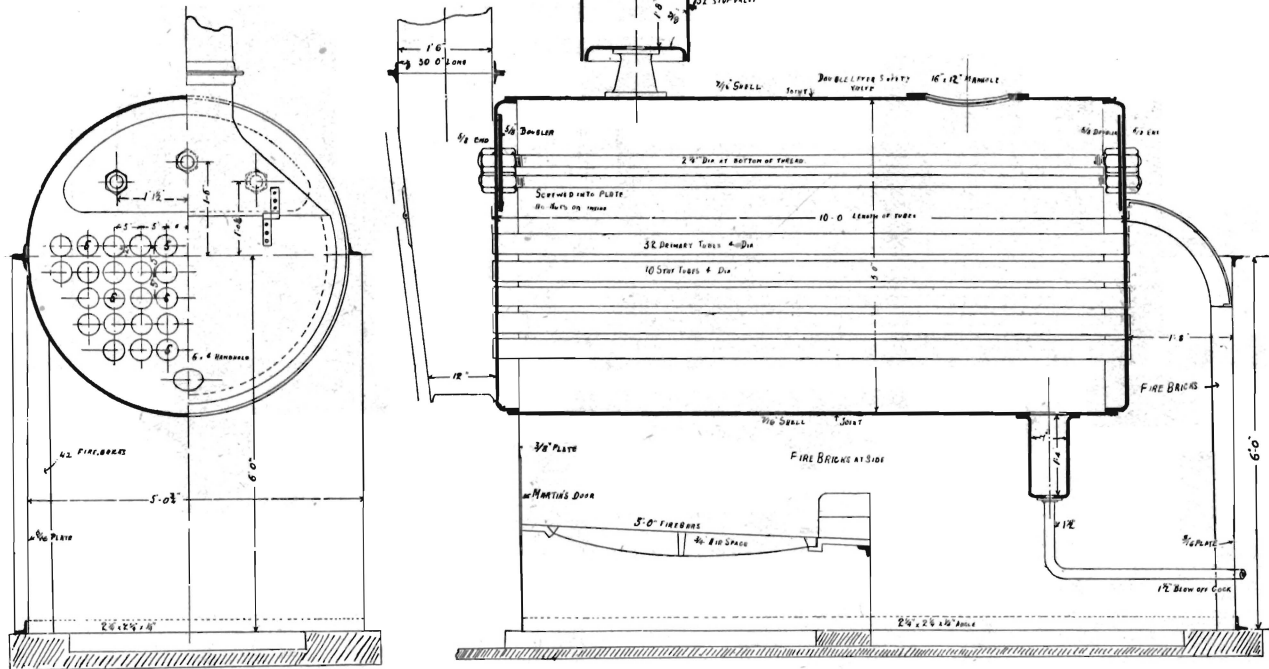


Fig. 1.



5'-0" x 10'-0" COLONIAL TYPE BOILER

W.P. 100 LBS Q"

SCALE 1 1/2" = 1 FOOT.

Fig. 2.

pit. The general design as shown did not work well in some cases: there was too little space for ashes, and the air supply did not readily get to the grate, more especially at the back of the fire, as it was not easy to thoroughly rake out the ash pit. The general method now is to lay down a foundation of brick or concrete and place the boiler casing sides on this, and so raise the level of the bars much higher than in the old design. This has the double advantage of making the ash pits open and free, and at the same time gives the fireman a better chance of handling his tools.

The shell plating in the old design is carried out at each end beyond the tube plates, in one case to form the smoke box and the other to form the combustion chamber top. As now made, the boiler shell terminates at the tube plates, and the smoke box and combustion chamber are formed externally, the smoke box by lighter plate, and the combustion chamber, generally the extension of the brick-lined casing, with brick top. This means that, with practically the same amount of shell-plate, a longer boiler is obtained.

Fig. 3 shows a drawing of the boiler as it is now usually made for the smaller sizes, and Fig. 4 for the larger.

Our old friend "Horse Power" always figures largely in describing boilers of the Colonial class, and, indeed, other classes too, and although one may speak of a water tube boiler of such and such a surface, a Lancashire of such and such an evaporation, the old term "Horse Power" always seems to be associated with the Colonial boiler. The usual method of calculation allows that 62 lbs. of water actually evaporated per hour is equal to 1 h.p.; that means about 4 lbs. water evaporated per square foot of heating surface, and allowing 15 to 16 sq. ft. per h.p. Some makers modify these figures, and rate as high as 6 lbs. water actually evaporated per sq. ft. Every engineer, however, has his own records and data, and, like many other figures, it is better to adhere to a figure one actually knows than to take book

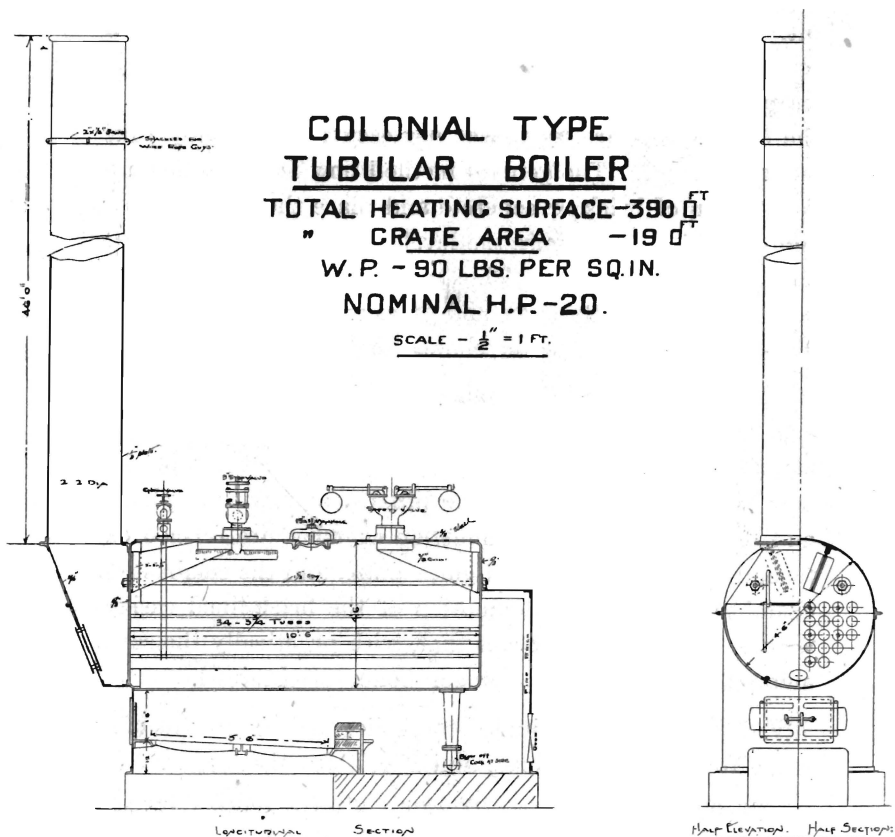
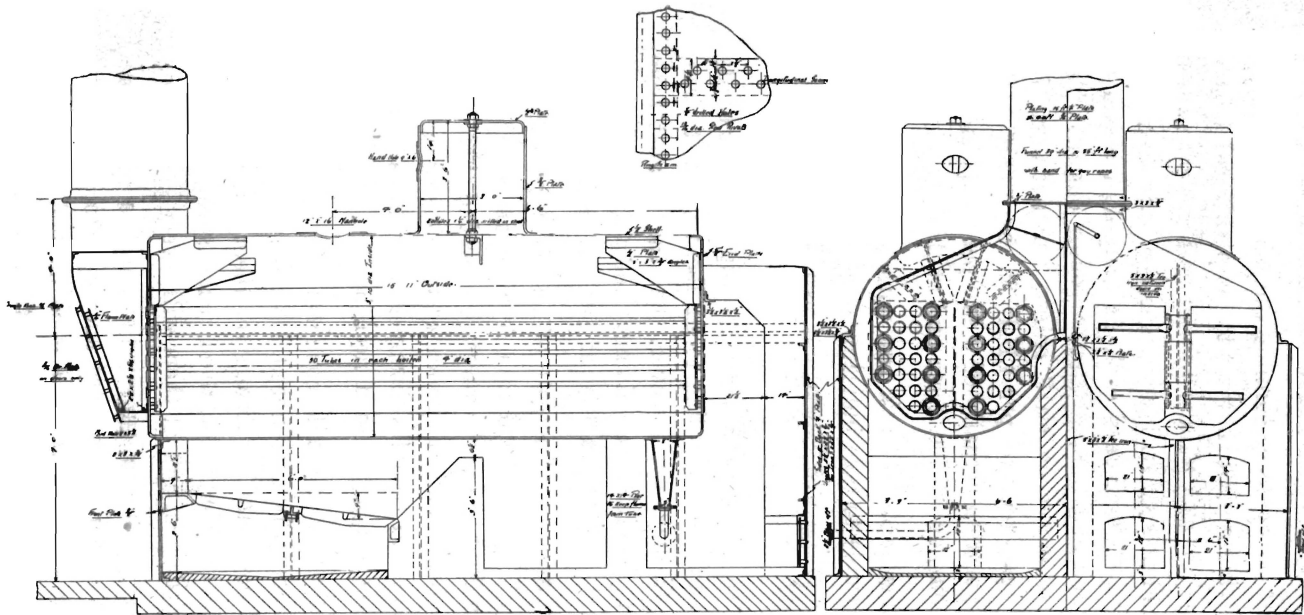


Fig. 3.

or catalogue values; and whatever figure we ultimately do take, it is better to figure on the actual heating and grate surfaces, and leave the term "horse power" out of it. Boiler tests, as given in text books, are of great comparative value, but to apply them to actual design is not usually done without the introduction of a known factor—call it "personal" factor, "safe margin," or any other name, it cannot be overlooked.

Some years ago I had an opportunity of working an engine and a Colonial boiler up to their full capacity on a full day's run. Beyond an indicator on the engine, I had no



Working Pressure 100 lbs.
 Steam Pressure 40 lbs.
 Surface of Shell 100 sq. ft.
 Total Heating Surface 1000 sq. ft.
 For Coal 20 G.P.

— 50 HP MULTITUBULAR BOILERS —
 — FSR —
— THE CENTRAL QUEENSLAND MEAT EXPORT CO. LD. —
 — ROCKHAMPTON —

Working Pressure 100 lbs.
 Steam Pressure 40 lbs.
 Surface of Shell 100 sq. ft.
 Total Heating Surface 1000 sq. ft.
 For Coal 20 G.P.

— Scale 1 in = 1 Foot —

Fig. 4.

other gear, but the engineer running the job had particular reasons for giving a good showing to his plant, and I have always looked on it as a standard as far as I was concerned. This boiler had 800 sq. ft. heating surface, was fired with Maitland district unscreened coal, and supplied steam to a feed pump and to a 16in. x 32in. horizontal engine. The indicated horse power on an 8 hours' run averaged 75, and the steam consumption per I.H.P. 32 lbs. This works out at an evaporation actually of 3 lbs. per sq. ft. heating surface per hour, or 3.5 lbs. from and at 212°.

Again, I once made a day's run with a smaller boiler. It was not possible to take indicator cards, but by calculation, the evaporation was figured out with the following result:—

Boiler 140 sq. ft. heating surface, evaporation actually 500 lbs. per hour, corresponding to 4.2 lbs. per sq. ft. from and at 212°. I may say, however, that the exhaust from the engine was led into the chimney, and this had an appreciable effect on the quantity of fuel burned.

Fig. 5 is a drawing of a pair of marine type Colonial boilers as supplied and fitted to a ferry steamer and used as one unit, and where small powers are needed there is no better steam raiser and no boiler easier cleaned and repaired, all back end troubles disappear, and an exceptionally large grate can be got in if need be.

A good deal of unfavorable comment has been made on the Marine Colonial boiler; indeed, I believe that the Board of Trade will not grant certificates for them, but those who have intimate knowledge of them make sure of certain constructional details, and fit them with every confidence.

These boilers, as shown, supplied steam to a set of compound surface condensing engines, and indicator cards from the engines on trial trip afford a good method of arriving at the evaporation. The calculated steam consumption for

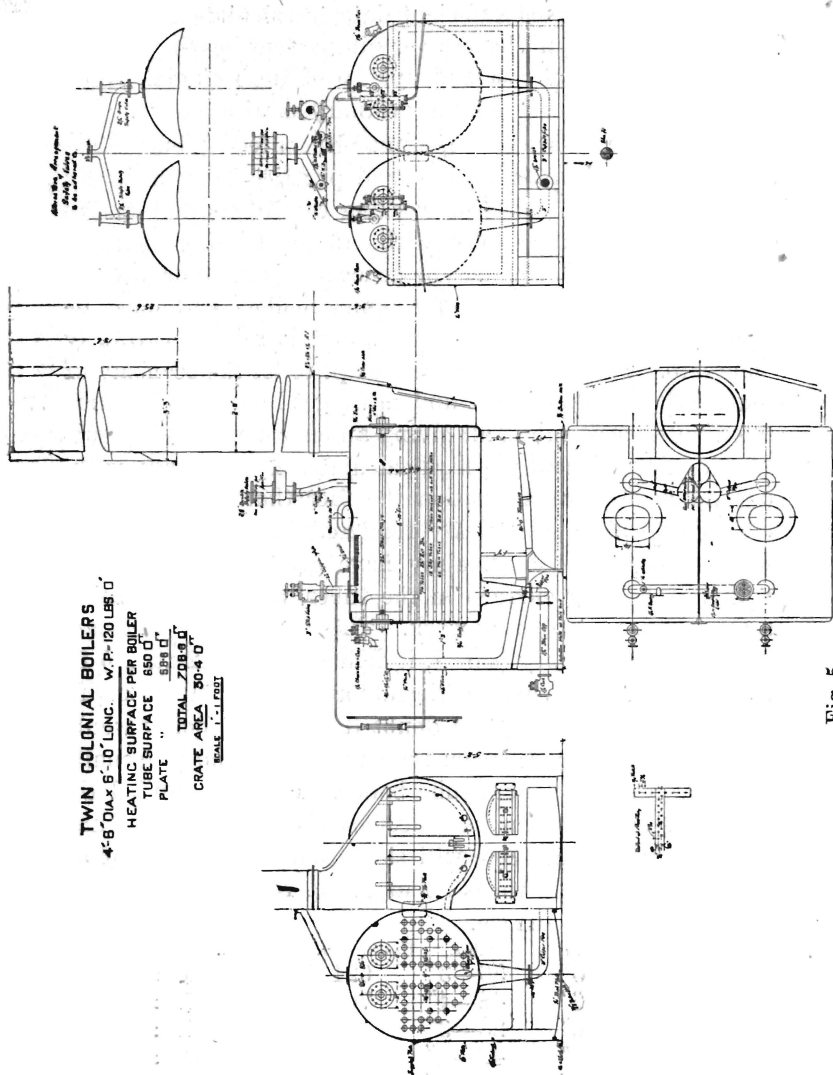


Fig. 5.

engines and auxiliaries was 5306 lbs. per hour. The heating surface in the boiler totalled 708 sq. ft. This gives an actual evaporation of 7.5 lbs. per sq. ft. of heating surface, or equivalent from and at 212°, 8.5 lbs., the same figure as usually given for the ordinary marine boiler. I