PART IV.

DESIGN OF REPORT SHEETS FOR THE NEW CODE.

The following is the design of "Report Sheets" I would suggest for use with boiler tests carried out according to an International Code. The explanation of each item, the exact method of carrying out the test and logging the results, say, every half-hour, and the working log sheets for actual use on the test itself will hardly need much description and it will not be necessary to include it in this book.

In general, however, the International Test Code Sheets I would suggest be divided into four main and distinctive groups in logical order, namely, (1) A General Description of the Whole Plant, (2) Particulars Relating to the Burning of Fuel, (3) Particulars relating to the Production of Steam, (4) Tabulated Results.

After the preliminary sheet, item (1), is a detailed description of every part of the plant in the natural sequence, commencing with the boilers, following through with everything relating to coal, that is, coal and ash handling plant, grates, control of firing, economisers, chimney flues and mechanical draught, then following with details relating to steam production, such as boiler feed-water, method of boiler feeding, measurement of feed-water, superheaters, measurement of steam output and steam pressure. This will give a complete account of the details of the equipment of the plant, and, in my opinion, it is much better to be embodied in the Test Sheets in this way.

Item (2) deals with all the particulars of the test relating to the fuel, namely, the description and quality of the fuel, the
analysis, the amount used, the particulars as regards the ash, flue gas temperatures, draught, flue gas analysis, and black smoke.

Item (3) deals in the same way in order with each item relating to the production of steam, namely, the amount of water evaporated, the temperature of the water, the steam pressure, the amount of superheat, and the auxiliary steam or power used for the production of steam.

Item (4) then gives the tabulated results, that is, the water evaporated per lb. of coal, "from and at," "from and at" per 1,000,000 B.Th.U., and the efficiency figures, that is, the net working efficiency of the plant, and the separate figures for the boiler, economiser and superheater. Also, the cost for evaporation of 1000 gallons of water.

The last sheet is the "Long Check Test," giving the essential figures of the water evaporated, and the amount and analysis of the coal used.

The example given of a Report on these lines, with the figures of an actual test, will doubtless make the matter clear.

COMPLETE STEAM BOILER PLANT TEST REPORT.

(Tests Carried out According to the International Steam Boiler Plant Test Code.)

GENERAL PARTICULARS.

(a) Boiler plant situated at . . . . Manchester.
(b) Name of plant . . . . Main boiler plant (paper mill).
(c) Date of test . . . . June 21-28, 1921.
(d) Duration of test . . . . 8 hours.
(e) Duration of long check test . . 168 00 hours.
(f) Test carried out by . . . . .
(g) Test carried out in the presence of . . . . .
(h) Object of the test . . . . To find the performance figures for the present ordinary running from week to week.
(i) General remarks . . . . The present summer load is roughly 10 per cent. less than the winter load.
DESIGN OF REPORT SHEETS

GENERAL DESCRIPTION OF THE BOILER PLANT.

1. BOILERS.

(a) Type of boiler . . . . . . “Lancashire”.
(b) Number of boilers on the plant . . . . . . 3.
(c) Number of boilers used on the test . . . . . . 2.
(d) Chief dimensions . . . . . . 30 x 8 ft.
(e) Heating surface per boiler . . . . . . 1000 sq. ft.
(f) Maker . . . . . . . . . . . . . X.
(g) Date installed . . . . . . . One boiler 1910, two boilers 1914.
(h) Maker’s rating of boiler output . . . . . . 7500 lbs. steam per hour.
(i) Amount of water equivalent to
    in. of gauge-glass at commencing level of test . . . . . . 950 lbs. per boiler.
(j) Brief résumé of last report of insurance company . . . . . . General condition of boiler very good but fair amount of scale.
(k) Condition of the brickwork . . . . . . Very bad.
(l) Condition of the covering . . . . . . Very bad. Lagging is of an inferior quality and very old.
(m) Remarks . . . . . . The brickwork is generally in a deplorable condition, and the cold-air leakage is enormous.

2. MECHANICAL, COAL AND ASH HANDLING.

(a) Is the coal handled mechanically? . . . . . . . . . . . . . . Yes.
(b) If so, state the following particulars:

(b1) Type of plant . . . . . . “Boot” elevators to each stoker.
(b2) Name of maker . . . . . . X.
(b3) Maker’s reference number . . . . 42,619.
(b4) When installed . . . . . . 1915.
(b5) Number of hours working
    compared with the boiler plant . . . . . . Continuously day and night. Stopped at week-ends.
(b6) Power required to work the plant . . . . . . 2.85 H.P.
(b7) Remarks . . . . . . Have not had much trouble in working.

(c) Is the ash handled mechanically? . . . . . . No.
(d) If so, state the following particulars:


BOILER PLANT TESTING

(d1) Type of plant
(d2) Name of maker
(d3) Maker's reference number
(d4) When installed
(d5) Number of hours working compared with the boiler plant
(d6) Power required to work the plant
(d7) Remarks

A spiral screw type of ash elevator was originally installed, but scrapped after two years because of breakdowns. Ashes now taken away by hand in wheelbarrows.

3. GRATES.

(A) Is the firing hand or mechanical
(B) If hand-fired, state —
(B1) General type of fire-bar
(B2) If special make, name of maker
(B3) If mechanically moved, state power required
(B4) Remarks
(C) If mechanically fired, state —
(C1) Type of stoker (sprinkling, coking overfeed, or coking underfeed)
(C2) Name of maker
(C3) Maker's reference number
(C4) When installed
(C5) Amount of power required to drive the stoker mechanism per boiler
(C6) Remarks

Mechanical.
Not hand-fired.
— — —
— — —
— — —
— — —
Coking overfeed.
X.
51,206.
With the boilers. One in 1910, two in 1914.
1.25 H.P.
The drive is a small non-condensing steam engine, and the exhaust is blown to atmosphere.

(D) Total grate area on test
(E) Length of bars (including dead plate)
(F) Total width of furnace

69.00 sq. ft.
5 ft. 9 ins
3 ft.
DESIGN OF REPORT SHEETS

(G) Average air space between the bars . . . . . . . . 4 in.

(H) If steam jets are used, state:

(H1) Number of nozzles per boiler under front of fires 14.

(H2) Number of nozzles per boiler under back of fires None.

(H3) Number of nozzles per boiler over the top of the fires 2.

(H4) Approximate diameter of the nozzles . . . . . . . 1/2 in.

(H5) Size of steam pipe supplying the nozzles . . . . . 3/4 in.

(H6) How is the valve on this steam pipe supplying the nozzles generally worked? Full open all the time.

(H7) Is there any method in use of determining the amount of steam used by these nozzles? None.

(H8) Remarks . . . . No difference is made to the valve controlling the nozzles which is left full open all the time irrespective of the speed of working.

(I) Is the boiler fitted with any smoke preventer or other special type of apparatus auxiliary to the grates? None.

(J) How are the boiler dampers generally worked? Full open.

(K) Can they be controlled from the firehole? No.

(L) General remarks . . . . The dampers are worked by weights but the chains are only short and the weights hang over the back of the boilers.

4. CONTROL OF FIRING.

(A) Is the firing controlled by means of flue gas analysis? No.

(B) If a CO₂ Recorder is used, state . . . . . . . . .
(B1) Is more than one recorder in use?  .  .  .  .  No.
(B2) Name of maker  .  .  .  .  X.
(B3) Is it being worked continuously?  .  .  .  .  No, out of order.
(B4) Is it in good condition and giving good results?  .  .  .  .  No, out of order.
(B5) Remarks  .  .  .  .  The CO₂ Recorder has not worked for several months, the pen mechanism being out of order.

(C) Is an "Orsat" or other hand apparatus in use? If so, how often?  .  .  .  .  None in use.
(D) Is there any method of collecting flue gas analysis over a number of hours? If so, give a description  .  .  .  None.
(E) Is the plant fitted with draught gauges? If so, state particulars  .  .  .  One draught gauge in fan inlet.
(F) General remarks  .  .  .  .  No attention is paid to flue gas analysis and draught regulation.

5. ECONOMISERS.

Is the plant fitted with economisers at work?  .  .  .  .  Yes.
If so, state:—
(A) Name of maker  .  .  .  .  X.
(B) Maker's reference No.  .  .  .  25,625.
(C) When installed  .  .  .  .  1908.
(D) Number of tubes in the installation  .  .  .  .  480.
(E) Of what metal are the tubes composed  .  .  .  Cast iron.
(F) Number of tubes at work during the test  .  .  .  .  480.
(G) Height of tubes (or length)  .  .  .  9 ft.
(H) Total heating surface of the installation  .  .  .  .  4800 sq. ft.
(I) Number of tubes' wide  .  .  .  .  10.
(J) General arrangement at  .  .  Straight line.
(K) Method of driving the scrapers  .  .  .  Small steam engine supplied with economiser.
DESIGN OF REPORT SHEETS

(L) Conditions as regards scale from the last report of the insurance company. Fairly good.

(M) Conditions as regards corrosion. Slight signs of wasting at the bottom.

(N) Is a circulator fitted? If so, state particulars. None fitted.

(O) As cold water (100°) or under-run through the economiser at night or at week-end? Yes. Cold water (60°) seems to be run in at week-ends.

(P) Condition of the brickwork. Fairly good. The whole economiser seems to be subsiding a little at the chimney end, the ground being bad.

6. CHIMNEY.

(A) Height above fusing level. Not known exactly, about 150 ft.

(B) Height above ground. About 3 ft. more.

(C) Internal dimensions (top). 6 ft.

(D) Internal dimensions (bottom). 7 ft. 9 ins. diameter.

(E) Material, brick, stone or steel. Brick.

(F) Shape, circular, square, horizontal. Circular, square base 12 ft. high.

(G) When was it erected? About 1900.

(H) General condition. Very good.

(I) Is it lined with fire-brick inside? If so, for what height? Yes. About one-third the height.

(J) Will it stand cutting for another entrance? Yes.

(K) Are the foundations good enough for the height to be increased? Yes.

(L) Remarks. Chimney generally is in fine condition and when built originally was meant for about six boilers.

7. FLUES.

(A) Give a thumb-nail sketch of the general run of the plant.

(B) What is the internal height of the main flue? 5 ft. 3 ins.

(C) What is the internal width of the main flue? 3 ft.
(D) Do these dimensions hold good from the economiser exit right into the chimney? Yes.

(E) Are the flues damp? No.

(F') If "Lancashire" or "Cornish" boilers what is the dimensions of the smallest space in the side flues? 10 ins.

(G) Remarks The brickwork of the flues is fairly good, but rather leaky, and should be "pointed".

8. MECHANICAL DRAUGHT.

If mechanical draught is in use, is it induced, forced, or "balanced"? Yes. Induced draught.

State:—

(A) Name of maker of fan X.

(B) Type of fan (multiple or paddle bladed) Multiple blade.

(C) Maker’s reference number 123.

(D) When installed 1910.

(E) Is fan full housing or not? Full housing.

(F) Area of fan inlet 40 ins. diameter.

(G) Area of fan discharge 28 sq. ft. (effective).

(H) Diameter of fan runner 40 ins.

(I) Is the fan provided with ring-lubricated and water-cooled bearings? Two bearings ring-lubricated, the water-cooled.

(J) How is the fan driven? High-speed engine.

(K) If fan driven by steam engine, state:—

(K1) Length of stroke 6 ins.

(K2) Area of piston 9 ins. diameter.

(K3) Maximum speed 515 R.P.M.

(K4) Is the engine direct-coupled or is it belt-driven? Direct-coupled.

(K5) If direct-coupled, is the fan and engine on combined cast-iron bed-plate? Yes.

(K6) Is the full boiler pressure on the fan engine or is
ther a reducing valve fitted? If so, what is the steam pressure on the engine stop valve?

*Is a surplus valve fitted? Full boiler pressure. No surplus or reducing valve.

(K7) Can the speed be controlled from the firehole? No.

(K8) What is done with exhaust steam from the engine? Blown away in the air.

(K9) Remarks Fan discharge not good.

(L) If fan driven by electric motor, state:

(L1) Name of maker of motor

(L2) Maker's reference number

(L3) Rated maximum revolutions per minute. Output of motor, amps.

(L4) Output of motor, volts

(L5) Is the motor direct-coupled or driven (chain, belt or rope)?

(L6) If direct-coupled, is the fan and motor on combined cast-iron bedplate?

(L7) What is the figure of electric current available? amps., volts

(L8) Is the current generated on the works or from outside current?

(L9) What is the real net price paid for the current?

(L10) Can the speed be controlled from the firehole?

(M) If fan be driven from a line shaft, state:
(M1) Method of drive (rope, chain, belt) .... --- ---
(M2) Speed of driving shaft ... --- ---
(M3) What are the usual running hours of this shaft? .... --- ---
(M4) Is there a friction clutch or other arrangement to disconnect the fan at will? .... --- ---
(N) If any other method driving the fan is adopted, give full particulars .... No other method.
(O) Normal speed, revolutions per minute at which the fan is run .... 550 R.P.M.
(P1) Maker’s maximum rating of the mechanical draught plant .... --- ---
(P1') Revolutions per minute .... 615 R.P.M.
(P2) Cubic feet of gas or air handled at stated temperature (350° F.) per minute .... 23,000.
(P3) B.H.P. taken at this maximum rating .... 23.
(P4) Remarks .... --- ---
(Q) Is the draught given sufficient Not quite.
(R) General remarks .... The fan as installed is hardly big enough and seems to be throttled by a bad discharge to the chimney.

9. BOILER FEED-WATER.

(A) What is the source of the feed-water? .... River.
(B) If more than one source is used, state the usual proportions .... No other source.
(C) Is the water muddy? If so, is any filtering plant used? and give description .... Not particularly. No filtering plant used.
(D) Is there any scale? .... Yes.
(E) Is there any corrosion? .... A little.
(F) Is any chemical or boiler composition used? If so, give:
- Name of composition: None.
- Name of maker: 
- How it is added to the boiler: 
- Does it give satisfactory results? 
- Remarks: A boiler composition was used before the water-softening plant was installed.

(G) If any type of water-softening plant is in use, state:
- Name of maker: X.
- Maker's reference number: 2578.
- When installed: 1910.
- Maker's rated output of softened water, gallons per hour: 2000 gallons.
- How many hours settling does the plant allow of? 2 hours.
- At what output is the plant being worked? About 1500.
- If lime is used, is it as lime cream or milk of lime? Lime cream.
- How many times a day is the water analysed? Once.
- What is average figure for the analysis before treatment? 24 total hardness.
- What is average figure for the analysis after treatment? 8.
- Remarks: Softening plant is not being particularly well looked after.

(H) Is any special method adopted for the prevention of corrosion? No.

(I) Is a trace of alkali in the steam prejudicial to the use of the steam? No.
10. METHOD OF BOILER FEEDING.

(A) If an injector is used, state:—
   (A1) Is it in regular use or only
        as a stand-by? . . . . Only as a stand-by.
   (A2) Is it live steam, exhaust
        steam, or mixed pressure? Live steam.
   (A3) Name of maker . . . . X.
   (A4) Remarks . . . . Practically never used.

(B) If a boiler feed pump is used, state:—
   (B1) Type of pump . . . . Vertical direct-acting.
   (B2) Name of maker . . . . X.
   (B3) Maker's reference number . 26,727
   (B4) When installed . . . . 1910.
   (B5) Maker's rated duty, amount
        of water pumped under
        given conditions of power
        or steam supply, speed,
        and boiler pressure . 1500 gallons at 12 double strokes
        per minute with and against
        150 lbs. gauge.
   (B6) Amount of suction lift to the
        pump . . . . None falls from overhead tank.
   (B7) Average speed of pump . . . About 15 double strokes per
        minute.
   (B8) If steam driven, what is
        done with the exhaust
        steam? . . . . Blows away in the air.
   (B9) Average steam or power
        taken by the pump . . . . Approximately 150 lbs. steam per
        hour.
   (B10) Remarks . . . . Feed pump gives no trouble at all.

(C) If feed-water regulators are in
    use, state:—
   (C1) Number of regulators at
        work . . . . 3.
   (C2) Name of maker . . . . X.
   (C3) When installed . . . . 1914.
   (C4) Remarks . . . . Do not work particularly well.
   (D) General remarks . . . . — — —

11. MEASUREMENT OF BOILER FEED-WATER.

(A) Is there any method in use of
    measuring continuously the
**DESIGN OF REPORT SHEETS**

<table>
<thead>
<tr>
<th>Amount of feed-water pumped to the boilers?</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) If tanks are used, give a description.</td>
<td></td>
</tr>
<tr>
<td>(C) If a water meter is used, state.</td>
<td></td>
</tr>
<tr>
<td>(C1) Name of maker.</td>
<td></td>
</tr>
<tr>
<td>(C2) Maker's reference number.</td>
<td></td>
</tr>
<tr>
<td>(C3) When installed.</td>
<td></td>
</tr>
<tr>
<td>(C4) Is it used regularly?</td>
<td></td>
</tr>
<tr>
<td>(C5) Is there any test tank or other method in use for testing its accuracy?</td>
<td></td>
</tr>
<tr>
<td>(D) General remarks</td>
<td>Staff have no idea of the amount of water evaporated.</td>
</tr>
</tbody>
</table>

### 12. SUPERHEATERS

If the plant is fitted with superheaters, state: --

| (A) Number of boilers fitted | 3. |
| (B) Number used on test | 2. |
| (C) Name of maker | X. |
| (D) Maker's reference number | 26,300 |
| (E) When installed | With the boiler; one 1910, two 1914. |
| (F) Can the superheat be controlled with dampers? | No. |
| (G) Is the superheat fitted with bye-pass to main steam circuit? | No. |
| (H) Number of tubes per superheater | 36. |
| (I) Heating surface of tubes per superheater | 176 sq. ft. |
| (J) What is the maker's rated output, temperature rise per stated evaporation of the boilers at stated pressure? | 100° F., superheat. |
| (K) Is provision made for further tubes to be added if necessary to the existing superheater header? | No. |
| (L) General remarks | Superheaters have given no trouble. |
13. MEASUREMENT OF STEAM OUTPUT.

Is there any steam meter installed to measure the actual steam output of the plant? None.

If so, state:

(A) How many steam meters installed? —

(B) At what points are they installed? —

(C) Name of maker —

(D) Maker's reference number —

(E) General remarks They seem to be impressed with the idea of installing steam meters.

14. STEAM PRESSURE.

(A) What is the blow-off pressure of the plant? If different boilers have different pressure, give full particulars. 150 lbs. Only one pressure.

(B) What is the lowest pressure permissible on the plant without reducing the factory efficiency, that is, what margin of pressure is permissible? 140 lbs. 10 lbs. margin.

(C) General remarks Some low-pressure steam is used through a reducing valve, but is not much, and this mill seems to do very little "boiling".

PARTICULARS RELATING TO THE BURNING OF FUEL.

15. DESCRIPTION AND QUALITY OF FUEL USED.

(A) Nature of fuel Small slack.

(B) Name of fuel X.

(C) Price per ton delivered to the firehole or fuel conveyers £2 5s. per ton.

(D) What is the average fuel used all the year round? Small slack as above.

(E) Remarks In general, have not used much other coal.
16. ANALYSIS OF THE FUEL.

(A) Gross B.Th.U. in dry coal per lb., as fired . . . . . 12,608.
(B) Net B.Th.U. per lb. corrected for moisture in coal . . 11,715.
(C) Percentage of ash . . . . . 11.0 per cent.
(D) Percentage of water . . . . . 6.5 per cent.
(E) Remarks . . . . . This coal is stated to be about average quality.

17. AMOUNT OF FUEL USED.

(A) Total amount of fuel used on test . . . . . 15,960 lbs.
(B) Corresponding fuel burnt per boiler per hour . . . . 997.5 lbs.
(C) Corresponding fuel burned per sq. ft. grate area per hour . . 28.5 lbs.
(D) Is there much difference between one hour and another in the fuel consumption on the test? . . . . Not much.
(E) Is there much difference in fuel consumption on individual boilers? . . . . No.
(F) Remarks . . . . Load is very steady for a paper mill. Approximate variation in steam demand per half-hour does not exceed 20 per cent.

18. ASH PARTICULARS.

(A) Total amount of ash produced (lbs.) . . . . . Not taken.
(B) Percentage of unburnt material in ash (by analysis) . . . .
(C) Corresponding B.Th.U. per lb. . . . .
(D) Remarks . . . .

19. FLUE GAS TEMPERATURES.

(A) Average temperature leaving boiler . . . . . 300° 55°.
(B) Average temperature leaving superheater . . . . 580° F.
(C) Average temperature entering
economiser                  . . . 570° F.
(D) Average temperature leaving
  economiser                  . . . 400° F.
(E) Average temperature at chim-
  ney base                    . . . 400° F.
(F) Remarks                  . . . No pyrometers are installed per-
                              manently on the plant

20. DRAUGHT.

(A) Draught in chimney base or
  near fan inlet, ins. W.G.     . 0·95 in.
(B) Draught at exit (or side flues)
  of boiler, ins. W.G.          . 0·50 in.
(C) Draught over the boiler fire,
  ins. W.G.                    . . . 0·30 in.
(D) If forced draught, pressure
  over fire, ins. W.G.          . No forced draught.
(E) If forced draught, pressure in
(F) Remarks                    . . . As already stated, fan not big
                                enough, and badly installed.

21. FLUE GAS ANALYSIS.

(A) Complete analysis.
  (A1) Percentage of CO₂         . . . 5·8 per cent.
  (A2) Percentage of oxygen     . . . 14·5 per cent.
  (A3) Percentage of CO          . . . 0·2 per cent.
  (A4) Percentage of nitrogen (by
      difference)                . . . 79·5 per cent.
  (A5) Average of how many       Six different samples of about
      analyses                   . . . 15,000 c.c. each.
  (A6) Remarks                   . . .

(B) Combustion recorder figures
  (B1) Percentage of CO₂        . . . 6·00 per cent.
  (B2) Average of how many      About 150.
      analyses                  . . .
  (B3) How many hours run      . . . 8·00 hours.
  (B4) Remarks                  . . . As already noted there is a lot of
                                leakage of cold air.

28. BLACK SMOKE.

Is the plant troubled with black
smoke                      . . . . . . No. Very good on the whole.
PARTICULARS RELATING TO THE PRODUCTION OF STEAM.

23. AMOUNT OF WATER EVAPORATED.
   (A) Method of measuring the water on the test. . . . . . Calibrated pressure meter.
   (B) Total net amount of water evaporated on the test (lbs.) . . . 105,328 lbs.
   (C) Corresponding water evaporated per boiler per hour (lbs.) . . . 6583 lbs.
   (D) Corresponding water evaporated per sq. ft. grate area per hour (lbs.) . . . 190.8 lbs.
   (E) Remarks . . . . . The variation in demand per half-hour is less than usual for a paper mill (see test log figures).

24. TEMPERATURE OF FEED-WATER.
   (A) Average temperature before economisers . . . 121° F.
   (B) Average temperature after economisers . . . 296° F.
   (C) Corresponding percentage of coal bill saved by economisers. . . . 16.1 per cent.
   (D) Remarks . . . . . The economiser is doing extremely well.

25. STEAM PRESSURE.
   (A) Average lbs. per sq. in., gauge . . . . 147 lbs.
   (B) If different pressures on the same plant, give the separate averages for each division of boilers . . . . . . . . Only one pressure.
   (C) Average lbs. per sq. in., absolute . . . . 162 lbs.
   (D) Remarks . . . . . Steam pressure is maintained on the whole very well.

26. SUPERHEAT.
   (A) Temperature of saturation of steam at the average pressure of the plant . . . . . 364.2° F.
BOILER PLANT TESTING

(B) Average temperature of superheated steam leaving the superheaters on boilers fitted with superheaters 475° F. All fitted.

(C) Average temperature of superheated steam leaving the plant (boilers fitted and not fitted with superheaters both included) 475° F. All fitted.

(D) Corresponding average degrees of superheat 475° F.

(E) In general is each individual superheater giving the same amount of rise? Yes.

(F) Percentage saving in the coal bill due to superheaters 5.1 per cent.

(G) Remarks. Superheater installation in general working very well.

27. AUXILIARY STEAM OR POWER USED FOR THE PRODUCTION OF STEAM.

(A) Mechanical coal handling 0.4 per cent.

(B) Mechanical ash handling 0.3 per cent.

(C) Mechanical stoker or hand-fired, mechanical moving furnace drive 0.5 per cent.

(D) Steam jets 8.05 per cent.

(E) Mechanical draught 2.4 per cent.

(F) Boiler feed pump 0.9 per cent.

(G) Injector None.

(H) Water softening 0.2 per cent.

(I) Economiser scrapers 0.2 per cent.

(J) Any other auxiliary steam None.

Total 12.95 per cent.

(K) Remarks Enormous amount of steam being taken by the steam jets.
• **TABULATED RESULTS.**

31. Water evaporated per lb. fuel, as fired... 6•00 lbs.

32. Equivalent evaporation of water from and at 212° F. per lb. fuel, as fired... 7•52 lbs.

33. Equivalent evaporation of water from and at 212° F., evaporated per 1,000,000 B.Th.U. in fuel, as fired... 641•9 lbs.

34. **EFFICIENCY OF PLANT.**

(A) Net working thermal efficiency of the plant after deducting the steam or power used auxiliary to the production of steam corresponding to 12•95 per cent. of the total steam production of the plant 57•20 per cent.

(B) Percentage of total heat absorbed by the boiler... 52•31 per cent.

(C) Percentage of total heat absorbed by the economiser... 10•02 per cent.

(D) Percentage of total heat absorbed by the superheater... 3•37 per cent.

35. **COST IN FUEL FOR THE EVAPORATION OF 10,000 LBS. WATER... 365•3 pence.**

36. **LONG CHECK TEST.**

(A) Duration (hours)... 165•00 hours.

(B) Dates and times... — — —

(C) Quality of fuel used... Small slack.

(D) Price of fuel used... £2 5s. per ton.

(E) Amount of fuel used, tons... 110•58.

(F) Analysis of fuel used:—

(F1) B.Th.U. (net calculated)... 11,000.

(F2) Ash... 11•0 per cent.

(G) Total net amount of water evaporated... 162,040 lbs.
(H) Approximate average temperature of inlet water. 120° F.
(I) Water evaporated per lb. coal. 6'54 lbs.
(J) Cost in fuel to evaporate 1000 gallons of water. 368'6 pence.
(K) Approximate annual coal bill of the plant. £12,450.
(L) Remarks. Week's results would be expected to be like the day's test since the plant works day and night.