Chapter 4

BURNERS, DUPLEX, 3

TYPES C.S.H. 54, 60, 62, 63, 65, 69

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LIST OF ILLUSTRATIONS

General

1. These instructions apply primarily to the type CSH 69 burner. They are applicable also to types CSH 54, CSH 60, CSH 62, CSH 63 and CSH 65 which are basically identical except that the shroud of the CSH 65 and CSH 69 burners have anti-carbon slots, a different design of atomizer, and a shroud nut which also forms the sleeve.

2. The burner is a duplex type, employing two separate fuel inlet passages, each with its own swirl and orifice plates.

3. During the reconditioning of the burner precautions must be taken in every instance to ensure that all details are thoroughly clean.

4. The strainer is supplied as a complete assembly. All other parts of the burner may be separately renewed with the exception of the atomizer parts; if any of these are defective a new atomizer assembly must be fitted.

5. Before dismantling the burner ensure that there is no external damage and that the rubber protective cap is fitted over the burner outlet and a dust cap over the inlet connections. Consider any complaints or defects reported with the unit.

Special tools

6. The following special tools are required :

Tool No.	*Description*
T.233072	Dismantling and assembling fixture
T.233073	Pressure test fixture
T.166505	C-spanner
T.167265	Torque spanner adapter
T.157870	Peening punch
G.72857	Quadrant gauge
R.42 or R.76	Universal test rig

Dismantling

7. Remove the protective caps and mount the burner in the fixture T.233072.

8. Release the points of the lock washer/s by using the punch T.157870 and slacken the locking ring with the C-spanner T.166505. CSH 65 and 69 burners have a separate shroud nut and air shroud, the latter acting as a sleeve over the atomiser assembly. The nut and shroud are secured by a smaller lock washer.

9. Unscrew and remove the shroud, lock washer/s, sleeve, shroud nut and locking ring as applicable.

10. Withdraw the atomizer assembly, noting that types CSH 65 and 69 have only four plates and no locating dowels in the distributor plate. When dowels are fitted, they should not be disturbed unless they are loose or damaged.

11. If fitted, remove the fuel inlet connections at the flange of the stem. Withdraw the strainer assembly from the banjo pillar.

12. Remove the stem from the assembly fixture.

Cleaning

13. The bench should be covered with zinc sheeting, linoleum or bakelized fabric and kept free from dirt and swarf. A clean container should be available in which to place the dismantled parts and if they are to be stored for long periods it is advisable to keep them in thin oil.

14. Cleaning is best carried out with the use of a parawash machine. Compressed air only should be used for drying.

15. Carbon deposit, may be removed from the atomizer parts by the careful insertion of a tufnol lapping stick, the parts being held in the hand.

Inspection

Permissible wear

16. Checks for permissible wear are listed in the Schedule of Fits, Clearances and Repair Tolerances (Vol. 2, Part 2).

Redundant and consumable parts

17. Parts rendered redundant by the

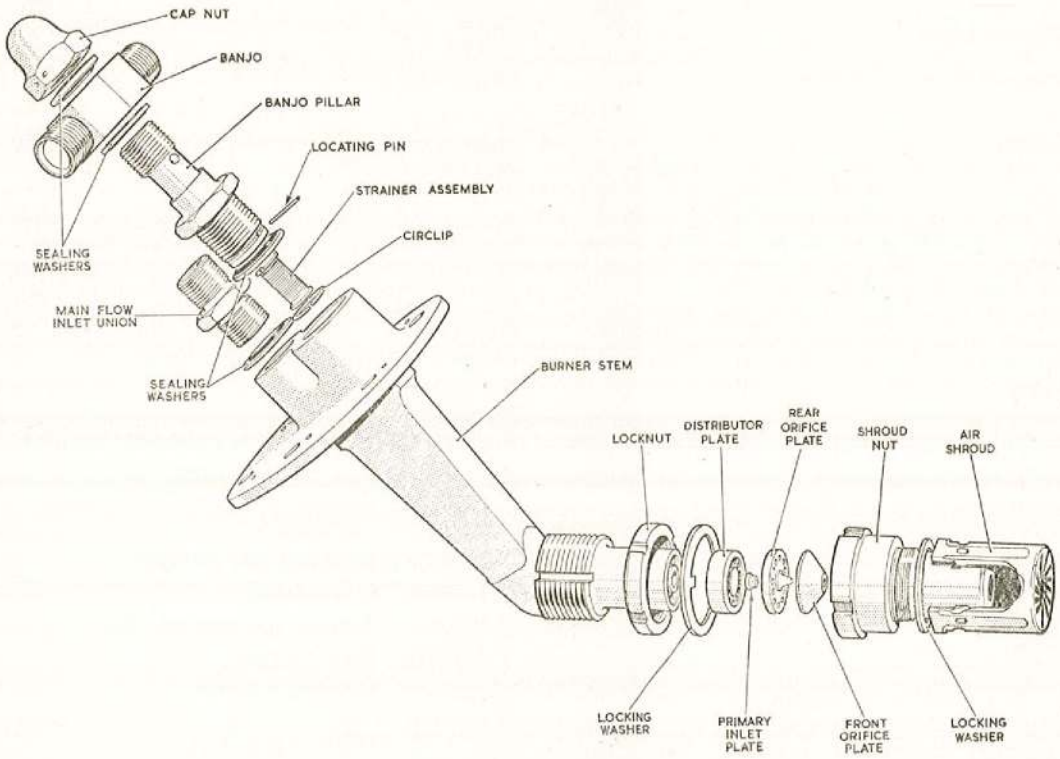

Fig. I. Dismantled burner

embodiment of modifications must be rejected, and therefore, information concerning applicable modifications must be available. Lock washers, sealing washers, locking pins and circlips must be discarded irrespective of condition.

Surface damage

18. The standard of acceptance for surface damage may vary depending upon the number of hours the burner is to be in use and the availability of spares. Where it is found necessary to alter any accepted standards, instructions will be issued accordingly.

19. If there are signs of flaking on any plated parts, the defective item is to be rejected.

Air shroud

20. Examine the shroud, and if applicable, the shroud nut for general condition. Ensure that the internal threads are sound and that the edges of the locking slots are not cracked or broken. See that all air holes are clean and free from sharp edges. Check that the end flange of the shroud at the outlet end is not distorted and that the locating diameter of the shroud is free from fretting and corrosion.

Sleeve

21. On applicable units examine the sleeve for corrosion and cleanliness. The sealing face must be free from damage and distortion.

Atomizer

22. On CSH 65 and 69 burners the atomizer comprises the distributor or back plate, primary swirl plate, rear orifice plate and front orifice plate. On types CSH 54, 60, 62 and 65 it consists of the distributor plate, main swirl plate, rear orifice plate, primary swirl plate and front orifice plate ; these are located by two dowel pins which terminate in blind holes in the inner faces of the distributor plate and front orifice plate.

23. Ensure that the atomizer details are clean and undamaged, that all holes are unobstructed and that the dowel pins are in good condition. In the event of damage to any of the plates, the complete atomizer assembly must be renewed.

Locking ring

24. Examine the inner threads of the locking ring and ensure that the ring is not damaged or corroded.

Burner stem

25. Inspect the stem for cleanliness and general condition ensuring that the fuel passages are unobstructed and the threads undamaged.

Strainer

26. Examine the strainer for cleanliness and general condition of the coils. Inspect the union adapters and banjo pillar for damage to the threads and hexagon. Where applicable, examine the strainer spring for serviceability.

Assembling

27. Only one set of component parts should be on the bench at a time in order to prevent inclusion of other burner parts.

28. Before fitting the strainer, carry out a pressure drop test, using the fixture T.233073. The pressure drop must not exceed 10 lb. per sq. in. at a flow of 50 g.p.h.

29. When satisfactory, insert the strainer in the banjo pillar and secure it with a new circlip and locking pin. Assemble the pillar and banjo connection to the burner, including three new seals, fit and tighten the cap nut. Fit the seal and main flow inlet-union.

30. Fit the burner stem to the fixture T,233072. Assemble the atomizer, (locating the dowel pins on applicable types), place the assembly on the stem face and fit the locking ring, locking washer/s, sleeve and shroud or shroud nut (according to type) to the burner stem, using a little grease, XG-285 on the threads.

31. Place the quadrant gauge G.72857 over the stem and shroud and tighten the shroud to the values stated in the appropriate calibration code, using a torque spanner and the adapter T.167265. Check the air gap with the applicable gauge piano wire i.e., 0·006 to 0·014 in. for CSH.65 and 69, and 0·029 to 0·034 in. for other types. Do not lock the locking washer/s at this stage.

Rig tests

General

32. All calibration and test results are to

be entered on the approved record sheet; the calibration values being quoted in the appendix. Unless otherwise stated the fuel used must be AVTUR at a temperature of 20 to 21 deg. C. and a specific gravity of 0·801 to 0·806.

Master burners

33. A master burner for each calibration point must be used to correct the test rig for error due to line pressure drop, viscosity changes and temperature. Duplex 3 burners are calibrated against the master burner pressure required to give the nominal flow at each calibration point. Where the fuel temperature is in excess of the requirements, temperature correction curves for each particular flowmeter are to be used in conjunction with the master burner. A typical correction curve (*fig.* 3), shows flowmeter variation with temperature for a particular flowmeter. A similar curve must be made available for the particular flowmeter in use.

34. The master burners are identical in construction to the burners to be calibrated. Identification is provided by the letter M and the output marked on the body.

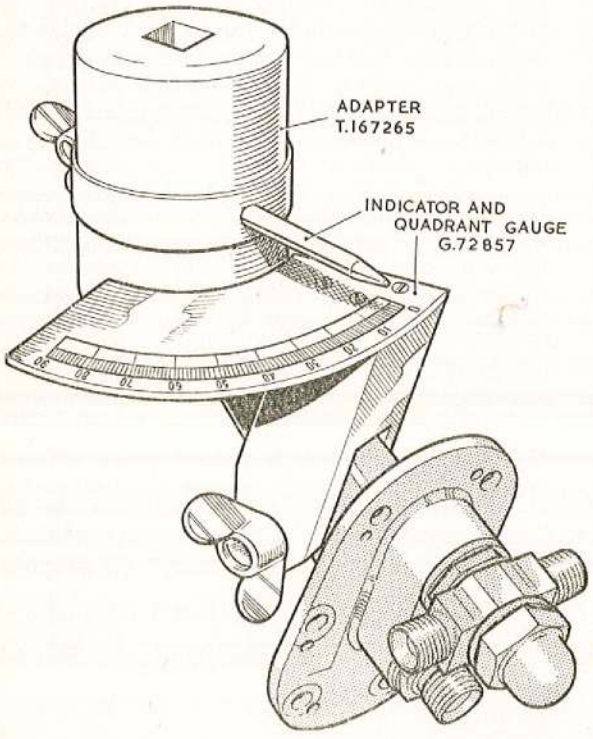

Fig. 2. Torque loading angular indicator

35. Maintenance of the master burners should include periodical checking for accuracy at the calibration values specified in the appendix.

36. A suitable T-piece connection must be provided on the rig so that true burner pressure is recorded and no external losses are included.

37. Connect the master burner to the rig T-piece, adjust the output (read on the flowmeter) to the specified flow figure and note the pressure on the pressure gauge.

38. Remove the master burner, connect the burner to be calibrated to the rig and apply the pressure previously obtained. The flow is to be within the limits stated.

39. Repeat the tests as above with the remaining burners and master burners.

Flow performance

40. Mount the burner on the rig, apply the inlet pressure specified in the appendix. The spray must be symmetrical about the nozzle axis, free from streaks and the flow within the stated limits.

41. When checking the primary flow, close the main cock and observe the recovery or back pressure up the main line. Connect the recovery pressure gauge direct to the burner to eliminate any leakage past the main cock.

42. When checking the combined flow performance, open the main cock and again inspect the spray. Note that any adjustment to the primary calibration will affect the combined flow and will necessitate a re-check of the combined performance. The flow on final tests are to be recorded on the test sheet.

43. Streaks indicate the presence of foreign matter or scratches on the atomizer face. Mal-alignment of the plates may possibly cause the flow to be beyond the limits. If still unsatisfactory after investigation, fit a new atomizer assembly and repeat the tests so far described.

Spray angle

44. The spray angle is defined as the angle made by the fuel cone emitted from the atomizer before complete atomisation takes place i.e. approximately the first $\frac{1}{4}$ in. of the cone ejected from the orifice.

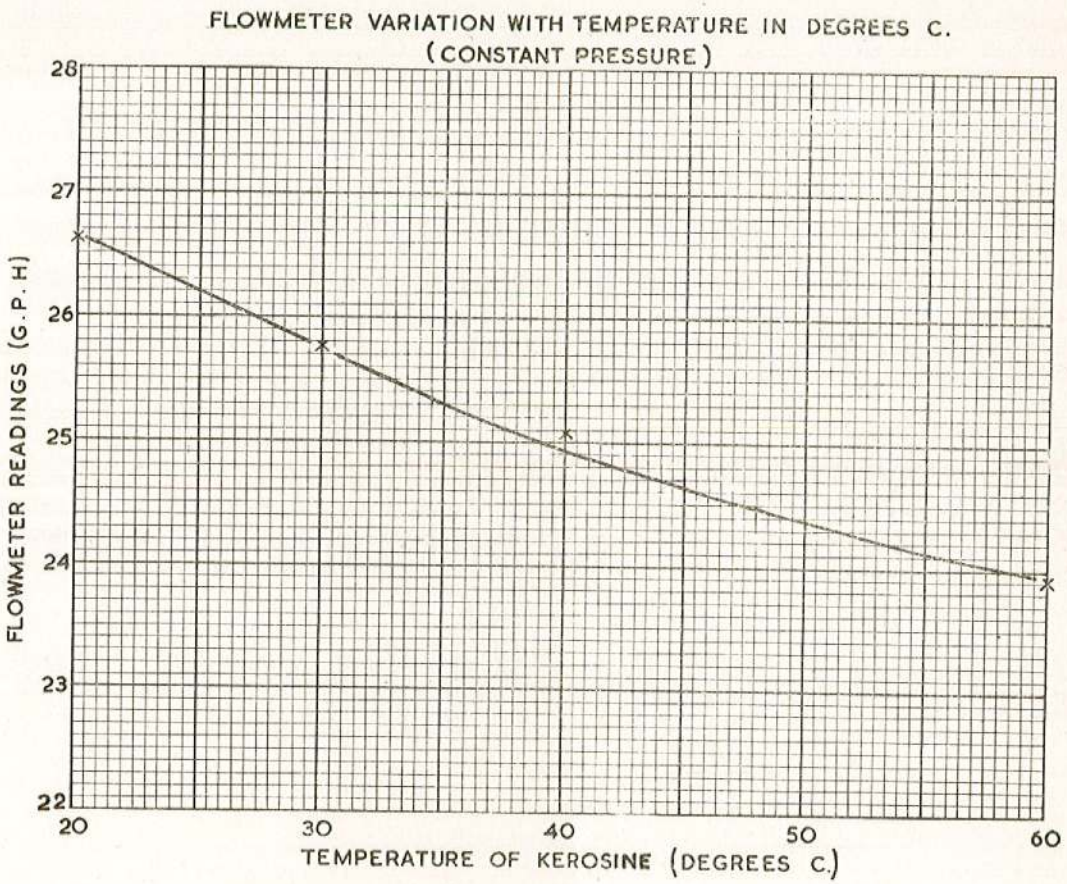

Fig. 3. Typical master burner temperature correction curve

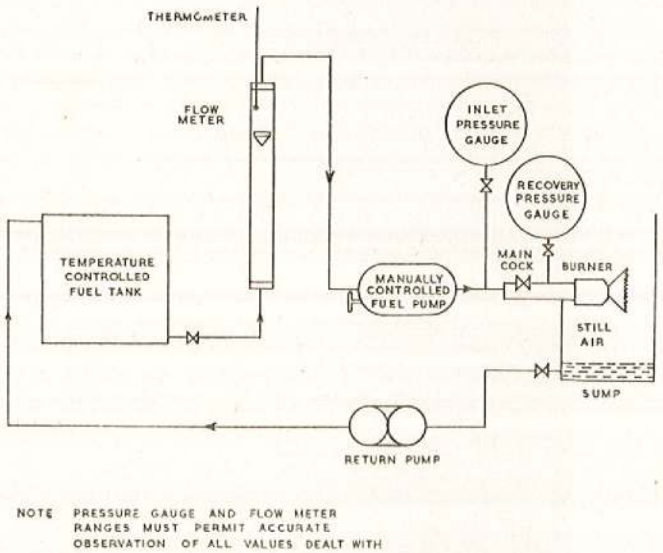

Fig. 4. Diagrammatic lay-out of test rig

45. With the burner mounted on the rig so that the image of the spray cone is thrown upon the screen, apply the specified fuel pressures and examine the spray cone. Should the spray angles be beyond the limits, inspect the atomizer assembly for correct alignment and repeat the tests so far described. Record the final readings on the test sheet.

Mixing characteristics

46. Adjust the main cock and manual control of the rig pump to give the inlet pressures and total combined flow as specified in the appendix. The spray angle is to be within the limits stated.

(A.L.48, Jan. 57)

Patternation

47. The purpose of the patternation test is to check the equal distribution of fuel over the whole cone angle of the burner spray.

48. The cone of fuel ejected is sub-divided into segments which are arranged to separate into graduated measuring cylinders on the universal test rig.

49. The burner is connected to the rig, the fuel pressure adjusted to that stated in the appendix and the flow directed into the tubes and then cut off when the highest reading reaches the upper limit. The lowest reading must be at or above the lower limit stated.

50. In the event of any readings falling outside the limits, renew the atomizer assembly and repeat the tests so far described.

Leakage test and calibration test

51. Check the torque load tightening to the values stated in the appendix.

52. Ensure that the burner is thoroughly clean and is dried off by compressed air.

53. Raise the fuel inlet pressure to the figure stated and during the specified time period examine the burner for leaks particularly at brazed joints. There must be no leakage other than the spray through the orifice.

54. Finally tighten the atomizer to the torque loading given in the appendix and re-check the air gap between the shroud and sleeve (para. 31).

55. On applicable units, carry out a second leakage test at the stated conditions.

56. On applicable units, repeat the calibration checks referred to in para. 40 to 46.

57. Using the punch T.157870, peen the lock washer/s on the shroud and locking ring into the slots provided.

Inhibiting

58. Inject oil, OM-11 into the inlet connections. Fit the dust caps and a rubber protection cap over the shroud.

Appendix 1

CALIBRATION CODE

CSH 65

Atomizer Flow Number: FN 4.3/0.4/90 deg.

Note . . .

The values quoted must be rigidly adhered to. Reference should be made to the applicable paragraph in the foregoing chapter.

Fuel-AVTUR. Temperature 20 to 21 deg. C. Specific gravity 0·801 to 0·806

Flow performance (para. 40 to 43)

Visual inspection at 200 lb. per sq. in. inlet pressure.

Primary flow at 100 lb. per sq. in., inlet pressure to be 3·9 to 4·1 g.p.h.

Combined flow at 400 lb. per sq. in., inlet pressure to be 84·6 to 87·4 g.p.h.

Spray angle (para. 44 and 45)

Primary spray angle to be 85 deg. ± 2 at 200 lb. per sq. in.

Combined spray angle to be 90 deg. ± 2 at 200 lb. per sq. in.

Mixing characteristics (para. 46)

When measured at each of the following conditions the spray angle must be 80 to 91 deg.

Total flow 28 g.p.h. at 500 lb. per sq. in.

Total flow 19·4 g.p.h. at 440 lb. per sq. in.

Total flow 14·5 g.p.h. at 400 lb. per sq. in.

Patternation (para. 47 to 50)

Primary flow at 75 lb. per sq. in. inlet pressure to be 75 c.c. (maximum), 50 c.c. (minimum) volume.

Combined flow at 200 lb. per sq. in. inlet pressure to be 75 c.c. (maximum), 56 c.c. (minimum) volume.

Leakage tests (para. 51 to 57)

With the atomizer tightened to 20 lb./ft. torque + 5 deg. rotation, a leakage test is to be made at an inlet pressure of 2,500 lb. per sq. in. for a period of four minutes.

Finally tighten the atomizer to 20 deg. total angular rotation. In no instance should the torque exceed 100 lb./ft. or be less than 50 lb./ft.

Second leak test be carried out at inlet pressure of 2,500 lb. per sq. in., duration four minutes.

Second calibration checks as in para. 40 to 46.

Appendix 2

CALIBRATION CODE

CSH 69

Atomizer Flow Number: FN 6.0/0.4/90 deg.

Note . . .

The values quoted must be rigidly adhered to. Reference should be made to the applicable paragraph in the foregoing chapter.

Fuel-AVTUR. Temperature 20 to 21 deg. C. Specific gravity 0·801 to 0·806.

Flow performance (para. 40 to 43)

Visual inspection at 200 lb. per sq. in. inlet pressure. Primary flow at 100 lb. per sq. in. inlet pressure to be 3·9 to 4·1 g.p.h.

Combined flow at 400 lb. per sq. in. inlet pressure to be 118 to 122 g.p.h.

Spray angle (para. 44 and 45)

Primary spray angle to be 85 deg. ± 2 at 200 lb. per sq. in.

Combined spray angle to be 90 deg. ± 2 at 200 lb. per sq. in.

Mixing characteristics (para. 46)

When measured at each of the following conditions, the spray angle must be 80 to 91 deg.

Total flow 17 g.p.h. at 440 lb. per sq. in.

Total flow 12·8 g.p.h. at 400 lb. per sq. in.

Total flow 9·5 g.p.h. at 350 lb. per sq. in.

Patternation (para. 47 to 50)

Primary flow at 75 lb. per sq. in. inlet pressure to be 75 c.c. (maximum), 50 c.c. (minimum) volume.

Combined flow at 100 lb. per sq. in., inlet pressure to be 75 c.c. (maximum), 56 c.c. (minimum) volume.

Leakage tests (para. 51 to 57)

With the atomizer tightened to 20 lb./ft. torque + 5 deg. rotation, a leakage test is to be made at an inlet pressure of 2,500 lb. per sq. in. for a period of four minutes.

Finally tighten the atomizer to 20 deg. total angular rotation. In no instance should the torque exceed 100 lb./ft. or be less than 50 lb./ft.

A second leakage test must now be carried out at an inlet pressure of 2,500 lb. per sq. in for four minutes.

Second calibration checks as in para. 40 to 46.

Appendix 3

CALIBRATION CODE

CSH 54, CSH 60, CSH 62, CSH 63

Atomizer Flow Number : FN 4.3/0.4/90 deg.

Note . . .

The values quoted must be rigidly adhered to. Reference should be made to the applicable paragraph in the foregoing chapter.

Fuel-AVTUR. Temperature 20 to 21 deg. C. Specific gravity 0·801 to 0·806.

Flow performance (para. 40 to 43)

Visual inspection at 200 lb. per sq. in. inlet pressure.

Primary flow at 100 lb. per sq. in. inlet pressure to be 3·9 to 4·1 g.p.h.

Combined flow at 400 lb. per sq. in. inlet pressure to be 84·6 to 87·4 g.p.h.

Spray angle (para. 44 and 45)

Primary spray angle to be 85 deg. ± 2 at 200 lb. per sq. in.

Combined spray angle to be 90 deg. ± 2 at 200 lb. per sq. in.

Mixing characteristics (para. 46)

When measured at each of the following conditions the spray angle must be 80 to 91 deg.

Total flow 28 g.p.h. at 500 lb. per sq. in.

Total flow 19·4 g.p.h. at 440 lb. per sq. in.

Total flow 14·5 g.p.h. at 400 lb. per sq. in.

Patternation (para. 47 to 50)

Primary flow at 75 lb. per sq. in. inlet pressure to be 75 c.c. (maximum) 50 c.c. (minimum) volume.

Combined flow at 200 lb. per sq. in. inlet pressure to be 75 c.c. (maximum) 56 c.c. (minimum) volume.

Leakage tests (para. 51 to 57)

With the atomizer tightened to 20 lb./ft. torque + 15 deg. rotation, a leakage test is to be made at an inlet pressure of 2,500 lb. per sq. in. for a period of four minutes.

Finally tighten the atomiser to 40 deg. total angular rotation. In no instance should the torque exceed 150 lb./ft. or be less than 75 lb./ft.

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