APRIL
1952

SERVICE ELECTRICAL and RADIO TRADING CHARTS

BAIRD P167, T167 TV
HEATRAE U.B. HEATER
MASTERADIO 700, 701 CAR RADIO
MY IDEAL BENCH

HEATRAE U.B. WATER HEATER

Non-pressure type storage water heater thermostatically controlled. Finished in white enamel and supplied with two mild steel fixing brackets. Designed for wall or floor fixing. Chromium plated control valve and outlet bibs are available as extras. Made in 1½- and 3-gallon sizes in models to cover all standard voltage ranges both AC and DC. Manufactured by Heatrae Limited, Norwich.

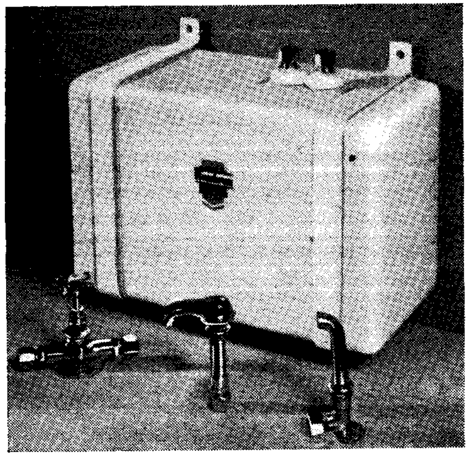

Fig. 1

THE Heatrae non-pressure automatic electric water heater, type U.B. (Fig. 1), is an appliance for fixing underneath sinks or handbasins where, owing to lack of space above, a standard type cannot be used. It is particularly suitable as a source of supply of hot water for glass washing, etc., in licensed premises where it can be installed under the bar counter.

The water heater has a capacity of 1½ or 3 gallons. The temperature is thermostatically controlled at between 70 and 190 deg. F. Fittings available for use with the heater consist of a wall-fixing control valve and two types of outlet bib—one for use over sinks and the other for hand or wash basins.

Overall dimensions of heater are: 1½ gallons, 18ins. wide, 9¼ins. projection, and 12¼ins. high; 3 gallons, 27ins. wide, 9¼ins. projection, and 12¼ins. high.

PRINCIPLE OF OPERATION

The heater is of the open outlet type in which the flow of hot water from the bib is controlled by the cold water inlet valve. When the inlet valve is opened the cold water flows through an inlet tube into the bottom of the chamber and displaces the hot water which is forced through outlet at top of chamber, up connecting pipe and through spout or bib.

As the heater is of open outlet type no precautions are necessary, such as incorporation of a non-return valve, to prevent hot water draining back into the cold supply system through the inlet valve, should this be turned on when water pressure is low due perhaps to water being drawn off through another tap on the same pipe.

CONSTRUCTION

The water chamber (Figs. 3, 4) is constructed of stout tinned copper, monel or other non-ferrous metal and consists of a cylindrical centre section, a dome-shape end cap and an open end neck. Sections are lapped and welded together to form a very rigid container.

The open end or neck of chamber is rolled and lapped over a hot brass pressed ring to the rear of which is attached a metal disc used to position the metal or fibre band forming the terminal box enclosure. Brass ring is tapped to take the six threaded studs on to which fit the nuts securing apparatus plate to end of chamber.

The inlet and outlet pipes are brazed to a plate, riveted and soldered to inside of chamber.

The water chamber is positioned in the casing at its open end by a metal or fibre band, one end of which abuts on to lip of circular opening in casing and the other end of which fits into groove formed between outer edge of chamber brass ring and rim of metal disc. This band forms recess or terminal box for electrical connections.

Other end of chamber is supported by cross strut of a wood framework or diaphragm fitted to interior of casing (Fig. 4). Horizontal side struts of framework and hole in diaphragm prevent sideways movement. Bakelite collars locked by metal clips to inlet and outlet pipes prevent vertical or rotary movement of chamber.

The apparatus plate (Figs. 2, 3) consists of a hot pressed brass circular baseplate on which are mounted the thermostat and heater. Heater element is housed in a tube expanded into rear of baseplate and the thermostat fits in a pocket which screws into a hole tapped ½in. BSPT.

Inner face of baseplate is provided with a flanged groove in which fits a rubber sealing ring. Apparatus plate is clamped securely to chamber by six hexagonal nuts which screw on the threaded studs tapped into chamber brass ring. Tapped holes are provided on baseplate for " forcing bolts " when dismantling.

The whole of the baseplate (apparatus plate) assembly is electroplated. Inlet and outlet pipes where they project through the Bakelite bushed holes in top of casing, are provided with drip collars. These collars are secured by the chromium-plated connectors for use with standard ½in. copper pipe.

The zinc-coated pressed mild steel outer casing of heater (Fig. 4) is of rectangular shape and consists of a centre section with two end covers. One end cover is permanently riveted to centre section and has a circular hole in its centre, the rim being turned inward to form a locating lip for the metal or fibre band (terminal box). The other end cover is fastened by two screws along each side.

Space between water chamber and casing is packed with specially prepared granulated cork lagging. Circular aperture in end cover, through which apparatus plate is accessible, is enclosed by a two-section cover plate held in place by a lug on each plate and a centre fixing screw (Fig. 2). Exterior of casing and cover plate are finished in white enamel.

ELECTRICAL SYSTEM

The heating core consists of a spiral threaded up and down eight circular ducts in a sectioned ceramic former, together with a top end piece and terminal locating base, all supported on a square centre rod, nutted at the top end to clamp the whole assembly. Core is retained in its tube by copper lug screwed to earthing terminal block formed on face of apparatus plate.

Temperature of water is automatically controlled over a range of 70 to 190 deg. F. by a microgap type B/1555 thermostat which clips into a pocket screwed into apparatus plate (Figs. 2 and 3). Thermostat is wired in series with live mains lead to heating core. Earth terminal is provided on apparatus plate. Outer casing of heater is connected by copper strap to water chamber.

Mains cable entry is through bushed hole in terminal box cover plate.

INSTALLATION

The water heater can be placed underneath a sink or handbasin and mounted flush against the wall or clamped to floor. When ordering, the method of fixing should be stated so that the appropriate type

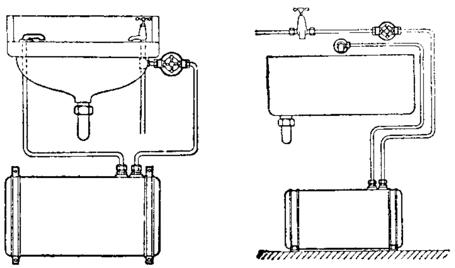

Fig. 5—Pipe connections for, left, basin using control valve and pillar bib and, right, sink using control valve and back-plate bib

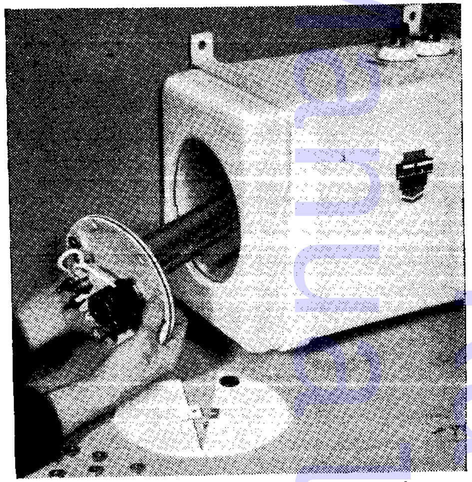

Fig. 2—For removing scale, after removal of cover plate, the apparatus plate can be unbolted and taken out complete with heater and thermostat

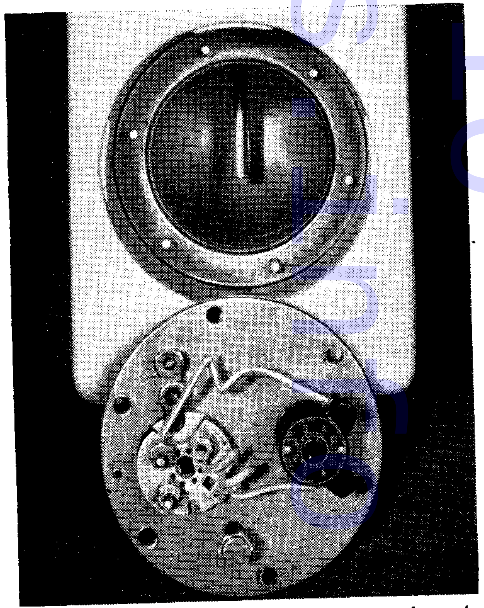

Fig. 3—Looking into the water cylinder. Both element and thermostat can be taken out when necessary while the apparatus plate is still in position

HEATRAE HEATER—*Contd.*

of brackets can be supplied. The heater side panels are each provided with name transfer so that the apparatus can be turned end for end to place the terminal box in the most accessible position. The diagrams (Fig. 5) show the plumbing layout (a) for handbasin using pillar bib and wall brackets and (b) sink using back plate bib and floor fixing brackets.

It is recommended that whenever possible an additional stopcock be provided on the cold inlet pipe to facilitate renewal of control valve washer. Furthermore, where water pressure is exceptionally high, this stopcock provides a means of restricting the pressure.

SERVICING

Replacement of element. When element fails no attempt should be made to renew the spiral but a complete new heating core should be fitted. To remove the faulty core the apparatus coverplates, held in place by a centre screw, should first be removed. Check to see switch controlling mains supply to apparatus is in off position, then disconnect mains lead from the heater terminals.

Undo and remove screw holding retaining lug in position. Heating core can now be withdrawn from its tube.

Insert new core and reassemble in reverse order making sure that live mains lead is connected to centre terminal on heater. This terminal is not coupled in any way to the element but is fitted as a convenient way of joining and anchoring the thermostat and live mains leads (see diagram inside cover).

Replacement of thermostat. Remove apparatus cover plate—disconnect live mains lead and thermostat connecting wires from heating core terminals. Withdraw thermostat by grasping body and pulling outward (unclip).

Defurring water chamber. The need for this will depend entirely on the hardness of the local water supply but in areas with average degree of hardness defurring should be carried out at least once a year. For complete and thorough defurring it is recommended that the water heater be disconnected from the electricity and water supplies and removed to a suitable spot.

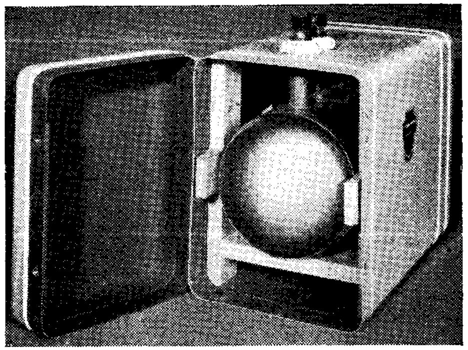

Fig. 4—Heater with end of case off and special granulated cork lagging taken out. With name transfer each side of case, heater can be mounted either way round for ease of access to apparatus plate

First withdraw heating core and thermostat, then unscrew and remove the six hexagonal nuts securing apparatus plate to water chamber. Insert "forcing bolts" in tapped holes on opposite sides of apparatus plate and screw in the bolts evenly until seal between rim of chamber and apparatus plate is broken.

Remove apparatus plate and place it in a bath of defurring solution and allow it to soak for a while. Then wipe off fur and thoroughly rinse in clean water.

Inside of chamber should be cleaned with pad soaked in solution and rinsed with water. If badly furred, then insert corks in inlet and outlet pipes, place water heater on end, fill with solution and allow to soak. Finally pour out solution, wipe chamber with pad and thoroughly cleanse with clean water.

When reassembling fit a new rubber sealing ring in groove on rear face of apparatus plate.

Casebook

GEC BT5145

WE had in a GEC BT5145 TRF receiver with poor vertical linearity. No adjustment would improve the picture, which was pulled-out at the top. As the vertical form control had hardly any effect we knew where the trouble lay.

This control, a pre-set slider, is a 250K resistor in series with two condensers from the anode of the N37 frame output valve to earth and enables the degree of negative feedback to be varied to the valve grid. Paralleling C56 in the manufacturer's Service Sheet immediately improved vertical scan, and on replacing it a first class raster was obtained.

The condenser was completely o/c, probably due to mechanical strain rather than electrical fault. The chassis of these receivers is light and, unless carefully handled can bend and put strain on certain components.

Apart from occasional sound-on-vision complaints, easily remedied by adjustment of the two Philips-type trimmers on the RF chassis, the only other trouble has been failure of frame scan, or distorted frame scan, due to a faulty N37 output pentode. We understand, however, that the cause of these valves' premature break-down has been rectified, and that N37 valves with the code GM on the envelope can be relied on.—G.R.W.

AERIAL AT FAULT

A REGENTONE Big 12 owner complained of low vision sensitivity and poor contrast. On the workbench the set behaved perfectly, thus casting suspicion on the aerial system. On investigation, the dipole was found to consist of an ex-WD sectionalised dinghy mast cut to the correct length. Due to atmospheric corrosion, there was an O/C between the sections, giving an effective aerial length of about 3 ft.—H. L. Brown, Walsall.

PHILIPS OUTPUT TRANSFORMERS

A THIRD set in as many months has been brought in with complaint of crackling on full volume, though in all other respects operation was normal.

In all three sets (Philips) the output transformers had already been renewed before the sets were received, and the new components had been mounted on the wood baffle board. A good job, too—all three had a short from the primary to the core, though otherwise perfect.

Though the cause of the crackling with volume at full is rather obscure, replacements effected a complete cure.—P.G., Port Erin.

K-B FB10—*Continued from p. 6*

AERIAL. Receiver is provided with internal MW frame aerial L2 and a LW loading coil L3. Socket is fitted at rear of chassis to enable an external aerial to be used with the receiver if desired. External aerial signal is fed through isolating capacitor C1 to loop winding L1 which is tightly coupled to L2.

Frame L2, in series with loading coil L3, is connected between g3 of heptode frequency-changer V1 and AVC line and to aerial tuning capacitor VC1. On LW band L2 L3 are tuned by VC1, trimming being carried out by adjustment of inductance of L3. Additional circuit trimming capacity is provided by C3 and C4 which is switched in by S1.

On MW band L3 C3 are shorted out by S1 leaving frame L2 tuned by VC1 and trimmed by T1. AVC, decoupled by R4 C2, is applied through the tuned circuits to g3 of V1. Screen (g2, g4) voltage is obtained direct from HT line.

Primary L6 C8 of IFT1 is in the pentagrid anode circuit, the HT for which is obtained from junction of R12 R13 and R14.

Oscillator employs grid (g1) and cathode of V1 in a cathode coupled circuit. On LW band, L4 L5 padded by C6 are switched by S2 through C5 to oscillator tuning capacitor VC2 and thence coupled by limiter R2 to g1 of V1 of which R1 is load. No LW variable trimmers are provided but C7 is switched in across tuned circuits by S3.

On MW band L4 is switched by S2 through padder C5 to VC2. MW trimmer is T2.

IF amplifier operates at 422kc/s. Secondary L7, C9 of IFT1 feeds signal and AVC voltages decoupled by R4 C2 to IF amplifier V2. Cathode bias is provided by R3 decoupled by C12. Screen voltage is obtained direct from HT line. Suppressor is connected down to chassis.

Primary L8 C10 of IFT2 is in the anode circuit.

Signal rectifier. Secondary L9 C11 of IFT2 feeds signal to one diode of V3. R5, the volume control, is the diode load with C13 as reservoir.

AVC is provided by the DC component of the rectified signal which is fed by R4 to second diode of V3 before being applied to g3 of V1 and g1 of V2. AVC line is decoupled by C2.

AF amplifier. Audio signal across volume control R5 is fed by C14 through stopper R7 to grid of triode section of V3. Cathode is connected down to chassis and bias for grid is developed on C14 with R6 as grid leak. R8 is anode load.

Output stage. Signal at anode of V3 is fed by C16 to beam-tetrode output amplifier V4 of which R9 is grid load. Cathode bias and negative feedback are provided by R10. Screen voltage is obtained from junction of R12 R13 and R14, decoupling being provided by C17.

OP1 in anode circuit feeds output signal to a 5in. PM speaker L12. C18 gives fixed degree of tone correction.

HT is provided by indirectly-heated halfwave rectifier V5 fed from 250V tapping on primary L13 of mains auto-transformer MT1 through limiter R15.

HT for anode of output valve V4 is obtained direct from reservoir smoothing capacitor C20. HT feed to screen of V4 and anode V1 is resistance-capacity smoothed by R14, C17.

Section L10 of OP1 which is in series with R14 provides hum cancellation. HT for V2 V3 and screen (g2) V1 is voltage dropped and RF decoupled by R11 R12 R13 C15.

Reservoir smoothing capacitor C20 should be rated to handle 150mA ripple current.

Heaters V1 to V5 and dial light are connected in parallel and obtain their current from 6.3V tapping on primary L13 of mains auto-transformer MT1. L13 is provided with tapping for 200-220 230-250V 50c/s input. S4 which is ganged to volume control spindle is ON/OFF switch. C19 is mains input filter capacitor.

Modifications. Earlier models differed from the above as follows: C3 deleted and C4 changed to 70pF. No cathode bias on V2 (R3 C12 deleted). Latest models are fitted with 6BW6 valve in place of 6V6GT and 6×4 in place of 6×5.

TRIMMING INSTRUCTIONS

Apply signal as stated below	Tune receiver to	Trim in order stated for maximum output
(1) 422kc/s to g3 of V1 via .1mF	MW Band 1.610Mc/s	Core L9, L8, L7, L6
(2) With gang at maximum capacity check to see that dial pointer coincides with datum mark		
(3) 600kc/s to aerial socket	600kc/s	Core L4/5
(4) 1.4mc/s as above	1.4mc/s	T2, T1. Then repeat (3) and (4) *
(5) 175kc/s as above	175kc/s	Core L3

* When T1, T2 are formed of insulated wire wound over stout wire stub soldered to condenser, care is needed to ensure trimming capacity is absolutely correct before surplus wire is cut off.

EKCO RADIOGRAM

THE turntable would slowly revolve when the receiver chassis was connected to earth although both receiver and gram motor were switched "off." The reason was that the mains "live" was finding a return to earth through the motor via the turntable chassis. Reversing the mains plug confirmed this.

The motor was stripped and cleaned of excessive grease and dirt and an ohms test revealed no further leakage. The motor was replaced and tested, operating only on the switch this time.—J. C. H.

RGD TABLE MODEL

CALLED to see an RGD table receiver. The customer informed us that soon after the receiver had "gone off" a smell of burning had been noticed and that a resistor visible through the inspection panel was getting hot.

At first glance this seemed a simple job but we found that, although the resistor had been cooking, there was no short circuit at either end.

The resistor, we found, was the HT feed to the screen of the AC/VP2 IF pentode. With the valve out the resistor stayed cool but with a new valve it heated up again.

Voltage checking revealed no voltage on the anode because of a failure of its own feed resistor, seemingly due to old age. The explanation of the screen resistor heating up became obvious. The screen was taking all the current and this proved too much for the resistor.—G. R. W.