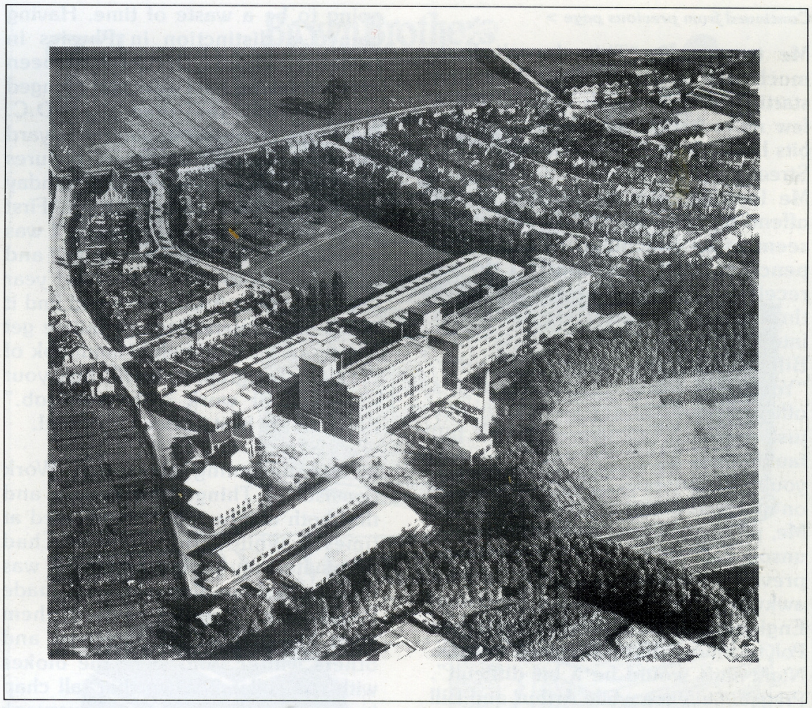
The following article was first published in the Bulletin of the British Vintage Wireless Society in 1994. At the time the author must have been about 70 but it is written in an interesting style and provides a good insight into what it was like to work in the early thirties. The original articles have been scanned, OCRed and re-laid out in Publisher. There has been no attempt to edit the original text. Please accept my apologies for any errors which may have crept in during the process—Richard Stow

Super-inductance, and all that

Early days with Philips at Mitcham Works.

by Carl Van der Meulen



Mitcham works c1936. Mullards occupied the original multi-storey building and Philips the single floor one.

It is most unlikely that, in the Summer of 1932, many people in this country would ever have seen a battleship. Even fewer would have seen one under construction. Yet "Built like a Battleship" was one of Philips' slogans for promoting its 830 and 630 wireless sets. The other contemporary eyecatcher was "The Superinductance Receiver", or variations using that intriguing epithet. So on the one hand there was the appeal to the imagination, whilst the other approach was expected to arouse the man in the street to show off his supposed mastery of wireless jargon.

Both advertising novelties missed the real target. Within a couple of years the Philips market research people discovered that it was "the lady of the house" who chose which wireless set to buy. If the silk behind the loudspeaker fret clashed with the lounge curtains, or the Philite cabinet didn't match the G-Plan fumed-oak sideboard, than to hell with the technicalities! And it was "so handy to have that one control in the middle instead of all those silly little knobs

all over the place". We all make mistakes. We all make mistakes.

What, you are asking, has all this to do with what it was like to make the blooming things? A good question. Let's look at it from an insider's rather nostalgic recollections.

Ninepence an hour

In July 1932, if you care to look up the socio-economic records, the labour market was hardly ticking over. A school-leaver with a rich father could get into a university as could an egghead with an unbelievable l.Q. I enjoyed neither circumstance having achieved Matric standard with only a micron to spare and a violinist father struggling to make ends meet. In the previous October, having been continually frustrated in attempts to gain apprenticeship with any firm making electrical instruments, I accepted fivepence halfpenny an hour (old pence) helping to make 'luxury three valve receivers' for Gamages in a tumbledown shack in Sutton.

Having survived eight months of Fluxites soldering, connecting wander plugs, and the shock of receiving a ha'penny rise, the news suddenly broke that the outfit was closing down next day. Within the hour l was on my bike with my cards making for 'that big concrete place' in Hackbridge which was rumoured to have something to do with making wirelesses. Arriving at the Main Gate at about 4 pm the uniformed commissionaire, on hearing my name, must have thought l had managerial connections and conducted me to the third floor.

Vivid experiences make indelible implants in our recall systems. The scene greeting me, having climbed three flights of stairs, ranks second only to the Zeppelin air-raids in 1917. Women in profusion, sitting in long straight rows and each doing something incredibly fiddly with an. electric soldering iron or pump-action screwdriver suspended on a spring. Wireless chasses, hundreds of them, lined up on the floor as far as the eye could see. Space. Light. Clatter. An environment so unreal to me as to be a quantum leap from the medieval cottage industry shed in Sutton which I had left barely an hour ago.

Little did l know that Philips, then occupying the third floor of Mitcham Works, were having a spot of bother. The 830A was misbehaving, aided and abetted by its big brother the 630A. And the Radio Show (then, I believe, the Wireless Exhibition) was looming. It seems that someone 'upstairs' had said, "We must have more faultfinders", without specifying what sort of faults needed finding.

So my arrival was somewhat cushioned. ‘Was this chap a possibility.’

By today’s standards my engagement procedure was somewhat less than exemplary. Arthur B., Superintendent Main Assembly, made some notes on a piece of paper, and sent for his Assistant, Bill S. Then followed:

Arthur to Bill: “Bill, give this chap a test; might do as a faultfinder” Bill to me: “Come with me”. We walk to an unoccupied test bench, Bill picking up an 830A chassis from the floor. Bill: “This set doesn’t work on Medium Wave. Find out why”. Bill walks off.

Me to myself: “This doesn't look much like the mains set I’ve just starting to build. Wish l could find a few more bob to get the rest of the bits I want from Mrs Raymond in Lisle Street”.

Me looking into the bowels of the offending chassis: “Those two wires seem to be touching, I’ll use this pencil to push ’em apart” I do so, receiving a minor electric shock through the graphite. The set bursts into life.

Bill arrives, aroused by the noise: “You’ll do”. We go back to Arthur’s office. Arthur: “O.K. l see you’re only just eighteen, — Can't give you full faultfinder’s rate (1/3d. per hour) till you’re twenty-one, but you can start on night shift tonight at ninepence”. Me, probably stunned mentally by the unsolicited offer of 50% increase on previous wages: “That's a' bit awkward, sir. I’m on the Electrical Engineering course at Battersea Polytechnic, - three evenings a week. Night-shift would be a bit difficult”. Pregnant silence while Arthur and Bill recover from shock of meeting someone actually attending night school, and apparently prepared to forego offer of a job, and thinking ‘on the other hand we’ll be saving sixpence an hour if he’s any good’. Arthur: “All-right Bill, put Charlton on nights and start this chap on days from Monday”.

And so it was. l have sometimes wondered about Bill’s random selection of the reject. Had it been the next one along with a label saying “o/o cal on bot end LW” or something equally enigmatic my chances of success would have approached zero, they would have said “sorry”, and l would have given up any further interest in wireless and joined the Palestine Police.

The next few weeks, however, accelerated my transition from the amateurish approach to making wireless sets to the rigours of radio receiver mass production. Technical know-how was rapidly enhanced by being thrown into the deep end of the faultfinders’ pool.

This was subsidised by the inevitable shop-talk during the midday meal break discussing matters like the properties of Litz wire, the meaning of ‘q’, various causes of mains hum (50 cycles or 100?), how these new-fangled electrolytic condensers worked and if Philips would ever use them; and so much more of contemporary interest.

l was beginning to think that the Elect. Eng. course at Battersea was going to be a waste of time. Having gained a distinction in Physics in General Schools Cert. I had been excused taking First Year and plunged straight into the theory of D.C. machines involving equations a yard long and drawing imaginary pictures of armature reaction, etc. On Monday evenings, Maths, embarking on “First Steps to Calculus’. Fortunately l was advised by one of my older, and wiser, friends to stick at it. “Next year you’ll be doing A.C. theory and find it much more interesting. Meantime get a copy of the Admiralty Handbook of Wireless Telegraphy. It will link your night-school work with your job.” Some of the best advice l ever had.

It was becoming clear that Work consists of Things and People and that both can be a bit complicated at times. While the Things had dominated my initial thinking it was time to perhaps find out what made People tick. Why did some of them wear khaki-coloured dust-coats and others white? Who were the blokes with red collars? When that tall chap in the grey suit was around everyone seemed a bit twitchy, - I wonder why. There's a rumour going around that someone had been pinching valves. Perhaps that’s why that commissionaire chap was in Arthur’s office just now; In the fullness of time all, and much more, would be revealed.

By the beginning of August the crisis was subsiding. The backlog of rejects had been dissolved and there had been a drive to create a repair gang to deal with rectifications. This had relieved the rather constipated production rate but caused a bit of an uproar in despatch which had to work overtime to carton-up the finished sets for shipment to factors.

Fortunately for me, Eric the faultfinder on Belt Two, had a wife who came from Newcastle, and wanted to go back, - or else. l took his place and had “my own belt”. This meant that I had ‘arrived’, and was now the member of a team whose working life was centred on a long conveyor belt peopled by some fifty souls producing thirty 830A’s an hour between them.

Belts 1, 2, 3 and 4 were all making 830A’s, 5 and 6 probably responsible for 63OA’s. All belt layouts were identical and (we were

told) based on the Eindhoven model. The 'start' end was embedded in the expanded metal structure which formed the component marshalling area from which a chassis plate plus kit of the major components on a tray was ejected at a rate determined by supervision. This could vary plus or minus a fraction of a minute depending on the number of absentee operators etc., and was controlled by means of different coloured spots painted on the centre of the Belt. 'Working on Reds' could mean twenty-eight per hour, while 'working on Blues' might indicate that everyone was raring to go and thirty-two was the target. Some six colours in all.

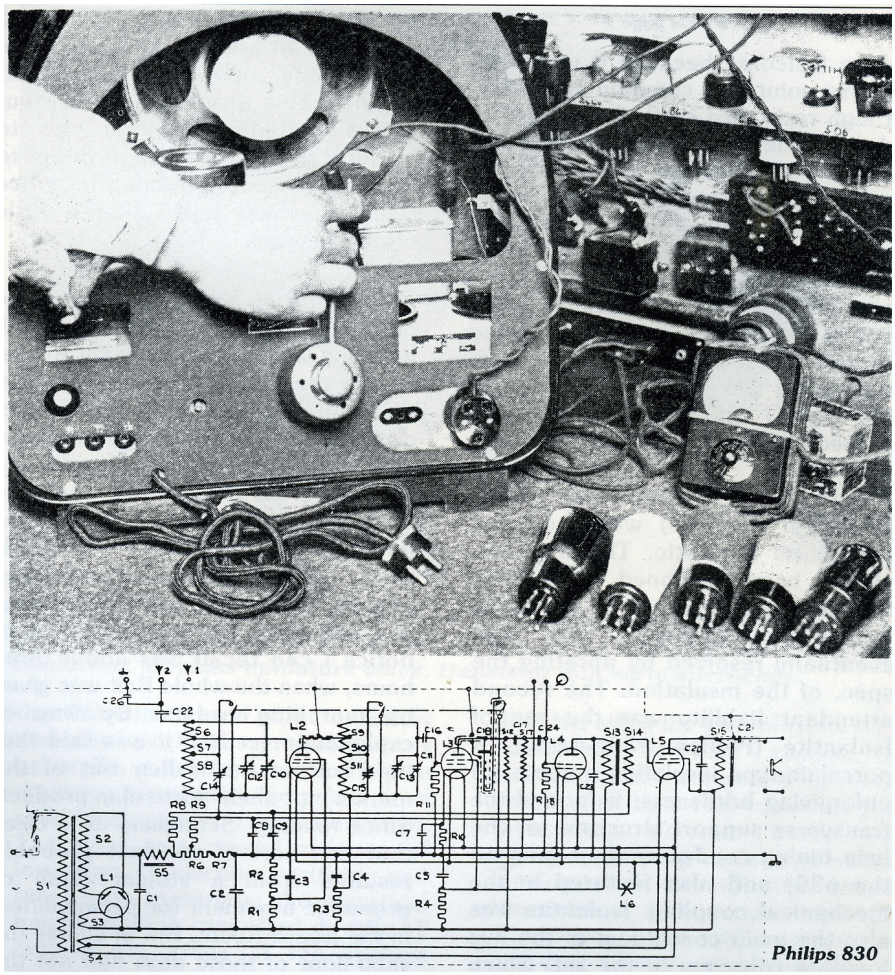
Once launched, the chassis and its family of components would b destined to become an "all-singing, all-dancing" marvel of the age within two hours. Shuttling between two rows of ladies, some forty in all, sitting on either side of the Belt, it would progressively grow in content and complexity as each lady added her particular dexterity. Operator One would have fitted the valveholder and socket panels and perhaps a couple of tag-boards in time to place the chassis on the Belt to travel a couple of feet to be picked off by Op. Two to do her stint, and so on. Meanwhile Op. One would have collected the next chassis plate etc.

By the time the set in progress reached Operation Ten or thereabouts it would have become progressively heavier and more vulnerable to incidental damage. So one of the operator's tasks would be to fit two 'outriggers' to the chassis plate, — a simple device in light alloy tubing attached by means of a spring-loaded toggle.

In theory, some sixty minutes later, the set which started as a bundle of bits awaiting attachment to a pre-worked machine-folded sheet of 20-gauge cadmium-plated mild steel would be ready to burst into song subject to having five valves pushed into the appropriate holders. In practice, however, there was the hurdle of Inspection to negotiate by running the gauntlet of some six ladies in white coats receiving a ha'penny an hour more than the others. Their task was to use pre-set test apparatus to ensure that a.c. and d.c. circuitry was within resistance or impedance limits, and that the H.F. alignment was properly trimmed for prescribed performance on Medium and Long Wave, and that calibration (in Metres on a translucent celluloid scale) was within limits.

Finding the faults

Because of manufacturers' obsession with fears of electrocution from the early mains receivers, Philips had introduced a Flash Test.



This was the first trauma to beset our so-far docile 830A. With its ON/OFF switch made, it was placed on a metal plate inside a metal cage and a connection was made to its mains circuit. With the door closed, l.5kV d.c. was impressed between the 'Earth' plate and mains circuit for five seconds. If nothing happened, the first hurdle was over. If there was "a 'splash' followed by an unearthly smell there was a rupture somewhere along the 'screened pair' from the mains transformer to the on/off switch which ran along most of the underside of the chassis plate. This entailed a time-consuming repair as a number of major components had to be dislodged for access.

Failure on Flash Test was of no concern to the Belt Faultfinder, because the remedy was so well known. Being the last link in the technical hierarchy, his opinion as to a feasible preventive measure was never sought. The lab. boys upstairs were of course sending reports to Eindhoven on this and other design weaknesses, but solutions were severely restricted to decisions made on the other side of the North Sea.

So my employment at ninepence an hour wasn't really justified until the next and subsequent stages of the Inspection process. Just before the five valves were inserted, however, we had the 'dollies', which substituted the 'toobs' by providing equivalent circuits which were monitored on four large diameter meters. By plugging a rugged device into the top of each 'dolly' in turn, the inspector read off the reading on each of the four meters which of course displayed a 'pass band'. This was known as the 'Characteristic Test' (probably a

translation from the Dutch) by which a simple code provided the faultfinder with the observed discrepancy/s. The five valves were inserted at the end of this test.

The chassis was now entering its interesting stage. RF and AF would shortly course its veins to result in the intelligent agitation of a very rugged speaker cone to assault the human ear.

Because of its relatively simple circuitry (allowing for continental unorthodoxy) and the exacting standard to which all its components were manufactured, the achievement of the specified performance presented little difficulty. Even so, things could go wrong. The fact that the forty or so ladies who had put it together, the inspection team, and even the chargehand (typically a Royal Artillery ex-sergeant) were all non-technical meant that the faultfinder was the only member of the Belt who had any technical background. So apart from his direct role of finding out why a chassis failed to pass one or more of its tests, he could to some extent lighten his workload by explaining to others Why it was important to ..... , How to avoid ..... , What a dry joint looks like ..... , etc. Unlike today, there existed then an attitude to work which sought to find out what it was all about because people were usually told only what to do. You learned the hard way but it helped if there was someone to answer your questions.

In retrospect it was very fortunate that the dear old 830A was in production when I made my debut as a faultfinder. The "deep-end" was sufficiently shallow for me to just "touch the bottom" and so survive. It was a lovely set for a "learner". Our only 'tool' was a multi-range mains-energised AVO (Philips version, of course) which sufficed to deal with the vast majority of rejects, — 'shorts' and 'opens' prevailing. But just to keep us on our toes there would be the occasional 'unstable at bot. end. MW' or perhaps 'weak LW'. A sudden rash of such a symptom would be more welcome because it would of course point to a common error, e.g. a high resistance earth connection to chassis due to cadmium plating not properly removed, or, more rarely, a batch of condensers incorrectly value-marked. On several occasions an epidemic of instability was due to a defective batch of valves (S4VA) and one dreadful spell of trouble turned out to have been caused by a rat having taken a bath in a tank of simmering wax used to impregnate the high-Q tuning coils that were housed in the famous copper cans.

The three main weaknesses of the 830 (and the 630) were however much less dramatic. The first has already been mentioned, - failure

of the cabling, on flash test, to the mains transformer primary. This was eventually resolved by uprating the spec. of the insulation. The second attendant liability was the use of Isolantite (Philips trade-name), a porcelain-type insulating material of unforgiving brittleness. It formed the transverse support structure for the twin tuning condenser (four-gang on the 630) and also featured in the mechanical coupling. Isolantite was also the main constituent of the five low-loss trimmers in the set, which were in fact the only variable-value pre-sets in its whole make-up. Isolantite was possibly the sine-qua-non of 'Superinductance' but the real value of its electrical properties was largely offset by the high cost of its failure to sustain relatively small degrees of mechanical shock and/or distortion. I hope to find someone in the Society who has, or can borrow, a copy of the circuit diagram of the 830 which fifty years ago I could draw from memory.

The third idiosyncrasy of the 830 was the 'open-plan' wiring in non-insulated 28 SWG tinned copper wherever practicable, much of it H.T- live. A new faultfinder became well aware "of this feature by about tea-break on his first day!

Mention of tea-break recalls the fact that they didn't exist as such. The tea trolley came round (a half-penny a cup, - pay on Friday) but there was no break to drink it in. Conditions of Service were strict but attempts to impose the harsher quasi-military regimes from the Continent were resisted by Management (U.K.) who were even seen to smile occasionally. During my eight years as first a belt-faultfinder, then a chargehand, and ultimately an assistant foreman I can recall only one industrial near conflict. This arose from a rumour that the Bedaux System was to be introduced on the shop-floor to replace the simple existing incentive scheme, which itself offered little reward anyway.

The factory at Mitcham followed the normal practice of a 47½ hour week with one week paid holiday in August during the planned factory closure. The one concession was the closedown at noon on Christmas eve which created a major crisis for the local taverns. Legally one could be made redundant at one hour plus one minute's notice. Single dismissals were rare. Unemployment had peaked, which inhibited the incidence of misconduct. The shortest period of notice l can recall was about three hours, when the whole Belt was given its marching orders. By way of explanation (verbal) it was said that the 'bottom had fallen out of the market' for their particular product. Since reading 'Setmakers' it is clear that this

sort of incident probably resulted from a violent clash of economic argument (or personalities) in the Board Room. But of course the shop-floor of those days had not the slightest knowledge of what went on 'up there' to gain entrepreneurial advantage in what was becoming a major international industry.

When the last 830 rolled off my Belt sometime in 1933 I believe that Mitcham Works had turned out about 180,000 of them including the DC version. Rather fewer 630's were made, — the 'snobs set' with four copper cans and a wooden (veneer) cabinet. But it was the end of an era. Philips had yielded to the inevitable and embraced the superhet motif, albeit with some reluctance. Just to show their disdain for the whole idea, Eindhoven initially adopted 1l0kc/s for their Intermediate Frequency presumably so as to be not too far away from their beloved HF.

To the radio enthusiast, amateur or professional, these were exciting days. It is unlikely that the gradient of technical change arising from invention rather than development will ever be repeated. The sheer delight of grasping new fundamentals and techniques by involvement rather than just acquaintance with the technical (and not-so-technical) press engendered further enquiry to ensure that nothing 'was being missed'. For us faultfinders it was 'teach yourself and teach each other'. No Tech. College 'refresher' course for us. Even had there been, the state of the art was advancing so rapidly that the inertia in the educational system would have rendered any attempt to do so constantly outdated for those earning a living at the sharp end of the business.

So it was to be observing something and then thinking it out. Applying one's test meter prods to an electrolytic for the first time and watching the pointer performing some 'Law' or other (Logarithmic?, square law?, exponential?, or just leaking for some reason?). And then applying the prods the other way round to see the difference.

Another milestone was getting the hang of AVC (the term 'gain' was not yet in common use) by shunting the diode (where is it?) with different values of resistor, and then looking up something about time-constants.

Superhets were to bring in a whole new field of intrigue. Resolving the mysteries of padding and tracking. I F transformers with iron-dust cores instead of 'manageable' trimmers. Getting hopelessly mixed aligning IF by ear. New valves sprayed red with odd-looking

bases and lots of electrodes in the one envelope. Negative feed back and ingenious biassing systems. Image rejection.

In addition to this sudden rush of new applications and rumours of more in the pipeline, "Short Wave" emerged with a new set of peculiarities and which only about one per cent of listeners were likely to tune-in to anyway.

These then were some of the necessary additions to the fault-finder's mental toolkit and manual knowhow. They had resulted from inspired ideas stemming from inventors and developers in the Western world who had muscled in on what had been once the domain of a few brilliant brains. And "out there" was an enormous market craving for instruments in this field of gadgetry that was to sound a death knell of bridge clubs, mahjong, snakes and ladders and intelligent conversation; aided by a quantum leap in the provision of broadcasting 'for the millions'.

Always something new

And here we were, the set-makers, as purveyors of brains to the bemused. In particular, Philips had not lost its genius for capturing the domestic market by producing something 'different' for a public that was moving from wireless sets as a novelty to radio receivers as a way of life. Let Ekco, HMV, Pye, McMichael and the rest of them carry on serving up the same sort of stuff; Philips had learned that visual distinction was the key to success, - not aural discrimination. Hence the 'Monoknob'. Something in the lounge that the eye would lock on to, - "We must get one of these, George".

On the surface this looked like a good idea, - something simple to use. A central tuning knob which also had freedom of movement some seventy five degrees in any direction to control volume in vertical mode and tone in horizontal mode. Concentrically mounted was an annular moulding with finger slots with four click-stop positions, LW/MW/SW/GRAM. A mains ON/OFF switch was inset on the side of the cabinet.

All very neat and simple. Except that there was now embodied a further eye-catcher the retracting escutcheon, a design masterpiece which housed the illuminated scale and cursor, the magic-eye, and the band-switch position indicator. Mounted at the top-front of the cabinet this escutcheon assembly could be set manually at any angle from 'fully retracted' to almost upright. It takes little imagination to deduce that displayed movement of any Monoknob function must be conveyed via a variable axis. Solution. Bowden

cables.

Cyclists will not be unaware of the peccadilloes of Bowden cables and their dislike of kinks and dents. Had it been possible to mount the escutcheon on to a light frame forming part of the chassis, the vulnerability of these cables to handling stresses in the later stages of assembly and inspection would have been much reduced. As things were, however, it became rather a challenge between Belts to find ways and means to firstly avoid mishandling leading to hang -ups and undue friction, and secondly to adopt acceptable 'tricks' to de-kink deformed cables, in such a way as to restore their original freedom of action - permanently.

Sometime in 1934 sideways promotion came my way following the transfer of a Belt chargehand, Bob C. to another post in the Planning Office. l was afforded two hours on a Friday afternoon to acquaint myself with the new roles to be assumed on the following Monday. This allowed Saturday morning to hand over to my successor.

Bob C. did his best to indicate the key functions of the job and what he felt were the main constraints. Fortunately his Belt was producing the same model as the one with which I was familiar, and his faultfinder and myself were on very good terms which augured well for my debut. I sought all the support l could get to justify my new remuneration of £2.75 per week (old money), which was a three-and-sixpence per week improvement on my faultfinding rate. I would now also grace my white coat with a red collar.

Being now faced with supervisory decisions rather than technical activity was no bad thing because I was able to influence the impact of one upon the other. In particular I felt that the advancing technology required a combination of working practices which straddled the entrenched pattern of demarcation between assembly and inspection. Adjustments of certain electro-mechanical features demanded a combination of dexterity with judgement which was available for development in certain experienced assembly operators who had already proved their above average range of skills and versatility. Adoption of this arrangement, which carried a modest financial advantage for those concerned, proved a success.

The next fashion to arrive was again concerned with customer-appeal in the shape of fewer knobs to twiddle. (The dyed-in-the-wood knob twiddler had by now become disenchanted with sophistication and hoisted his gear up into the attic out of sight of the

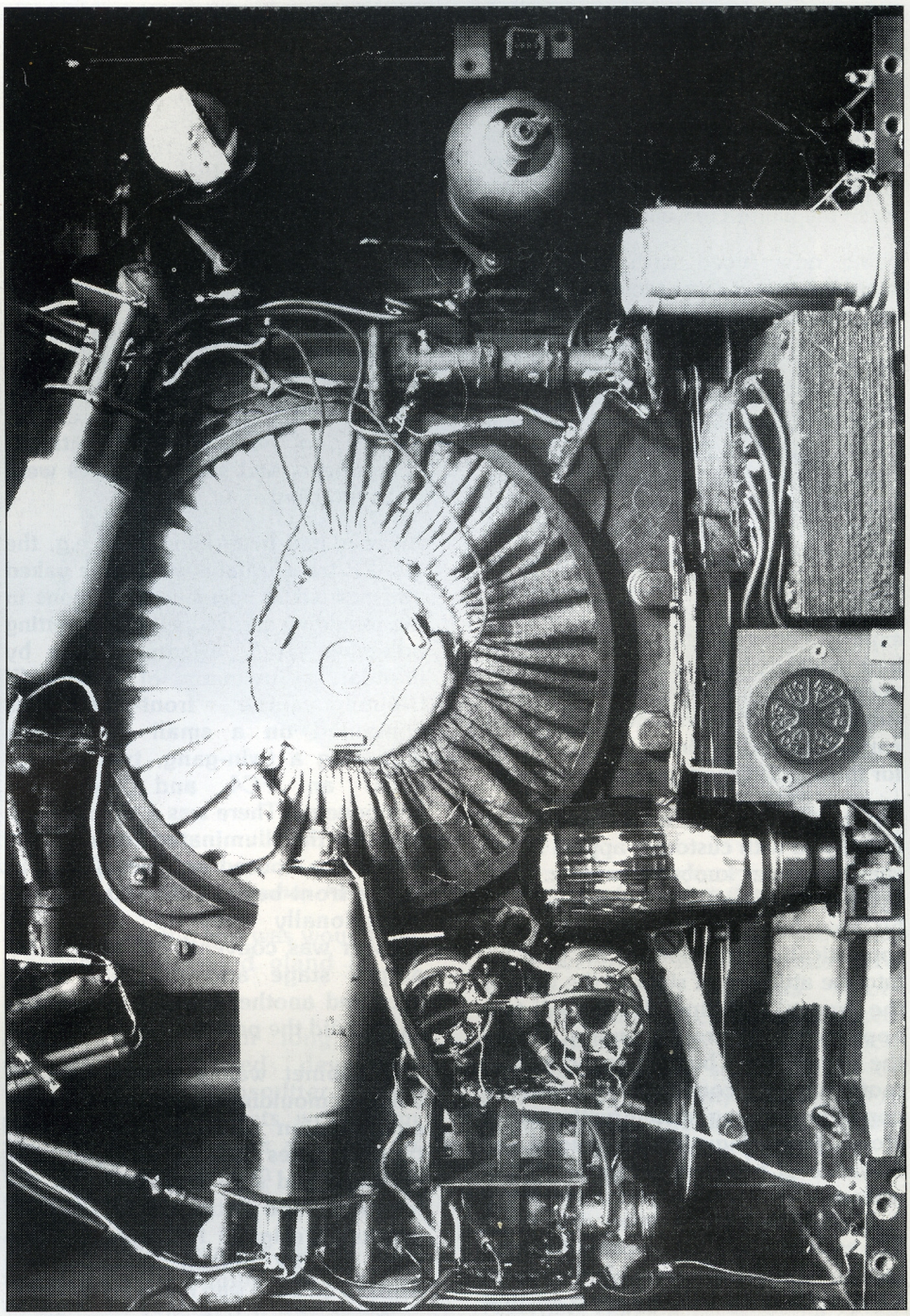
lady of the house). Philips developed two approaches to pre-set tuning. Firstly the use of push buttons to activate a motor-driven conventional variable condenser tuning system with pre-set stops. A muting circuit avoided the nuisance of transient reception during traverse.

The second approach became a reality in the shape of one of the most successful why-didn't-I-think-of-that developments ever to come out of Eindhoven. This was the 3-gang in-line variable condenser using concentric intermeshing fixed and moving vanes. This design, which led to the famous Philips concentric trimmer, depended simply on setting lead screws to control the position of a thrust plate fixed to the common shaft of the moving vanes. The head of the lead screws was easily accessible by removing celluloid windows from the press buttons. Up to six stations could be so pre-set each having been manually tuned in turn. Properly adjusted, this rugged system provided a backlash-free spot-tuning facility of high reliability for six settings and was of course interconnected with a conventional manual drive for free tuning. Its only disadvantage was probably high unit-cost of production.

Probably the most dramatic decision by Philips circa 1935 was to launch the V7, which initially caused much merriment born of incredulity. Those cynics who recalled the 830/630 adverts thought it should be promoted as "Built like a Butterfly". Whether figuratively it was inside-out or back-to-front was a matter for debate because instead of the cabinet being just a container it also served as the main chassis and was therefore the first 'component' to be fed on to the conveyor belt (in a padded carrier frame) to which all functional components and sub-assemblies were to be attached.

All frills had been eliminated e.g. the two I.F. transformers were quite naked and nestled in specific depressions in the moulding secured with slow-setting adhesive. Their alignment was by manual adjustment of 'wind-off' trimmers: The 'front-end' was contained on a small sub-chassis mounting a twin-gang, two canned coils, an FC4 and associated components. There was a simple cord-drive to the illuminated tuning scale which was housed in a bevelled skirt at the front-base of the cabinet and exceptionally easy to read. The speaker was conventional as was the output stage and its feed which occupied another bracket sub-chassis as also did the power module.

The cabinet was a masterpiece in bakelite moulding with the additional complication of many profiles and tapped holes set in



The "works" of the 1935 Philips V7 – which caused merriment born of incredulity.

strengthening columns and stub extrusions for the location and attachment of the 'works'. Designed for rapid production, the V7 placed a heavy flow demand on Ekco who made the cabinets.

Performance was exceptional for its austerity, the only inherent weakness being a tendency to drift off-tune with temperature change. On the other hand it was lightweight, neat, easy to use, reliable and cheap. The main production problem was handling-damage exacerbated by the sheer quantity of receivers moving about at any one time. Pockets of sets could quickly build up if a particular operation was only temporarily out of action and thus the incidence of accidental damage to cabinets would rise. Minor scratches and bruises could be invisibly mended but depth injury demanded a 'cabinet change'. At first this was a major operation but a special repair team of two experienced ladies, with their own little hide-away, soon proved its worth. Most of their time was spent working separately but as each reached the

‘critical’ dismantling stage the other would provide the two additional hands to lift all the ‘organs’ simultaneously out of the defective cabinet and into "a prepared replacement. Everything would then be re-secured (only about seven soldered joints were involved apart from some twenty c/h screws and adhesive) and the set would then be re-inspected and re-aligned if necessary.

In common with other wireless manufacturers, the least elegant of Philips’ designs was its car-radio (illustration in ‘Setmakers’, p.209). Unlike the dainty and unobtrusive devices we have today, the need to use conventional valves and not-yet-miniaturised components without the advantage of printed circuitry was in conflict with the layout of the average motor-car. In other words the ‘works’ had to be located where it would cause least obstruction to the driving function and minimal injury to nylon stockings, but yet be controllable.

So back to Bowden cables, this time rather more sturdy and connecting the set to a remote controller for which a convenient gap could usually be found.

The need for H T was the problem which delayed the debut of car-radio until the invention of the vibrator about which the least said the better, except to excuse the inventor on the grounds of ‘needs must’. Nevertheless, when everything was properly earthed and the aerial properly sited, the equipment provided excellent results, especially when the engine was switched off and there was no other traffic in the vicinity. Universal ignition suppression was a long time coming.

Microphony was not unusual due to the integral speaker‘ and exceptional confinement of everything in a cubic metal container. One also had to be prepared to accept a tuning tolerance of about + or - 30-40Kc/s at mid-scale on MW due to lost motion in the tuning drive cabling. Otherwise a major step forward. Or was it?

The foregoing has attempted to portray a miscellany of events, things and circumstances which were typical of life and work with Philips at Mitcham in the 1930’s. How nice it would be if it were to trigger the memory of one or more of my long-lost contemporaries there who may have had the patience to read it, and perhaps amplify or refute anything I have recorded, - just for old times’ sake.