

A View from Works Office - Ted Richardson



Ted Richardson

Works Office was the department, under the control of Eric Whitehouse, which dealt with new products. An interesting place to be in the early 1960's when the 'rocker' operated 'Classic' switch was moving towards production.

It was Eric who came into Works Office one morning and asked, "Are the parts for that new switch ready yet?" I said they were. "Well put the thing together and let's see what it looks like." He went back into his office, but then popped his head round the door, "Let me know as soon as it's done."

Initial assembly was done on my desk using a hammer and steel punches – the punches being used to 'turn-over' brass terminals to force them to grip switch contacts. When in production this turning-over was done either on a small foot operated press, or by a drilling machine with a blade that forced the brass over the contacts. I always assembled the first switches by hand, as it meant we had something to check well before the trial run on an assembly line.

Within half an hour the first 'Classic' switch to be assembled lay on my desk.

This switch was designed for automatic assembly, and was particularly easy to put together as everything fitted from the back, in an easy to follow order. The final job was to tap in the fixing rivets holding the back plate. For these first trial assemblies there were special clear plastic backplates made – so we could see inside and watch the action of the switch. Those clear backplates were produced 'secretly' one Saturday morning by Howard Beebee, foreman of the Press Shop - which reminds me that much of the early production was treated in a 'hush-hush' manner.

As I held up the first complete 'Classic' switch, there was polite applause. I'd been too engrossed to notice my Works Office colleagues had been watching the whole operation. Peter Williams, Frank Locke, Harry Bentley and Mary Baker had wanted to be there when the first 'Classic' was put together. Eric Whitehouse heard the noise and came from his office to see what the fuss was about.

After everyone had tried the new flat dolly (in the early days this new switch had been called the 'Rocker' switch), I telephoned the designer, Jim Butcher, and told him what I'd done; he asked me to bring the switch over to his office. He was pleased to have it, and it made me think how pleasant it must be for designers to hold in their hands something that, up to that moment had simply been an idea in their mind, a drawing, or an experimental model. I left him with the first switch, and going back to Works Office, I assembled three more.

This trial assembly was still some months ahead of production, and I now had to get down to putting tooling and trial runs into place, so all the parts would be available at the same time.

The 'Classic' was the first Crabtree switch to be designed for automatic assembly. The faceplate was laid on its front, and every part could be fed in from above.

Design work was excellent, and parts certainly went together in the way they were intended; where problems started was with theory trying to turn itself into practicality.

From the earliest design days, the Development Department (under Ernie Bradbury) had been working on an automatic assembly machine. The prototype was a flat belt tractor conveyor, the belt moving forward the distance of one switch at a time. When the faceplate was in position, parts were fed down chutes and fixed into position with compressed air operated plungers. When the backplate was in position, it was secured with four brass rivets, pressed into place. The assembly machine, with its many air



Howard Beebee



Ernie Bradbury

tubes moving as required, looked, when working, like a frantic dancing octopus.

But the machine worked, and 'Classic' switches came off the assembly line every twenty seconds.

There were problems of course, and it took much ingenuity to sort things out. As the assembly was completely automatic, there had to be devised ways of checking every part was in its correct place. A system of feelers and probes was used; there could be no risk a switch would leave the factory with parts of its innards missing.

Cleanliness was vital. Up to this time a certain amount of dust and machined debris could be tolerated, as assembly line workers could easily remove it, but with an automatic machine there was no way of doing this. Joe Topp (in charge of Fitting Stores) saw to it that not only were parts clean when they came from the Machine Shop, but that they were stored in plastic bags.

The most difficult problem to overcome was the fixing of the backplates. They would not stay attached. Fred (Curly) Joesbury, sharp-eyed member of the Inspection Department, found the cause; the fixing holes moulded into the back of the faceplate were slightly too big, and the brass rivets couldn't grip. Special rivets were made to a larger diameter, and this cured the problem.

The faceplate moulding tools were returned to the Toolroom, and it was a simple matter to fit new parts. Because there were two different diameter brass rivets in existence at the same time, Harold Smith (Progress Department) suggested colouring the special 'larger' ones a light grey. The correct diameter rivets were kept in the 'Bond Store', only to be used when the new production of faceplates became available. All this business of the two different rivets may seem trivial, but it was Edna Roberts (Stock Control) who pointed out that with two different diameter items, both with the same part number, and in circulation at the same time, we all had to be very careful.

All this seems simple and obvious now, but at the time, with production pressure looming, these teething troubles seemed insurmountable problems.

Though the conveyor on the assembly machine moved forward a plate at a time, it was soon decided to modify the tractor motion so the plate could be moved to a specific position. This was vital for the assembly of two and three gang switches. What happened was that the faceplate went through the assembly machine and one gang would be completed, the tractor feed would be changed, and the plate fed through again to have the other gang fitted, and once again if it were a three gang switch.

There were other problems too. It was noticed the faceplates had a 'bloom' surrounding the rocker aperture. This was thermal stress in the moulding caused by difference in thickness of material between the face and the assembly area at the back. Jack Sedgwick, foreman of the Moulding Department, solved the problem through experimental work - using different curing times.

The first moulding tool for the 'Classic' rocker produced a large amount of waste 'flash' round the edge of the moulding; how to remove it quickly and conveniently was the problem faced by Mrs Charles (Trimming Department). The answer was to place all the material, rockers and 'flash', into a large hexagonal barrel rotated by an electric motor, the tumbling together of the parts knocked the rockers from the 'flash'.

The difficulty here was that when the barrels were emptied, there was so much crunched-up 'flash' with the rockers that it took an hour or so to sort the wanted



Joe Topp



Fred "Curly" Joesbury



Harold Smith



Jack Sedgwick

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Mrs. Charles

parts from the rubbish. Mrs Charles was not happy about her girls doing this work; it was very dusty from the tiny remnants of tumbled 'flash'. She called in her assistant Don Tolley, and we talked about how we were going to overcome this quite serious problem, but couldn't come up with an answer.

It was one of those instances where the answer is obvious, once you have seen it working.

A few days after our unresolved discussion, I was talking to Fred Allen, Foreman of the Colour Shop. I noticed his clerk, Ruby Hathaway, pushing a folded note through the expanded metal grating used all over the works as dividing partitions. Ruby tried to push the note through the grating in an upright position, but it wouldn't pass. She turned the folded paper on to its side, and it went through easily.

I cannot be certain I shot out of Fred Allen's office as fast as Archimedes jumped out of his bath, but 'Eureka!' was at the forefront of my mind. Within a few minutes Don Tolley and I were pushing rockers against the partition grating, they were too large to pass through the diamond shaped opening, but the smaller pieces of 'flash' went through easily. It was the diamond shape of the expanded metal that allowed this.

We thought we had solved the problem, but the answer was to put it to the test.

I took a solid door from one of the barrels to the Woodwork Department, where the wood panel was taken out and a piece of expanded metal substituted. Half an hour later I was back in the Trimming Department, where Don had already filled a barrel with rockers and 'flash'. The lid was fixed into position, the motor switched on, and we watched with delight as 'flash' was thrown out. Within a few days the Woodwork Department had made a new barrel with all the sides filled with expanded metal. The problem of sorting the rockers from the 'flash' had been solved.

Some of the first completed switches were taken to the Electrical Laboratory for intensive testing. Machines with rollers pushed the 'rocker' backward and forward thousands of times a day, and for week after week. The object being to make sure the working life of the 'Classic' would be a long one. These tests went far beyond any normal expectation of use, but it was 'Crabtree' tradition to test to destruction.

The Laboratory applied heavy inductive loads to some of the test switches in an attempt to weld the contacts together. There could be no risk of the switch 'welding' when being used to control banks of fluorescent lights. To forestall any likelihood of the switch not being able to disconnect the load, the rocker was designed so that when strongly depressed, it came into direct mechanical contact with the contact mechanism and finger pressure could be used to break the weld. Effective design at work.

With the first switches under intensive testing, and trials going on with the prototype assembly machine, management took the decision to go into production; though on a small scale until tests proved the new switch to be capable of everything required of it.

It was appreciated that automatic assembly would take time to perfect, so George Barrett (Fitting Shop foreman) laid out an assembly line for 'Classic' switches. Sensing something special was going on, there was no shortage of volunteers to work the new line.

Hand assembly was easy. After years of setting switch contacts by hand, assembly line workers found the interior of the 'Classic' almost fell into place, and there was no individual 'adjustment' as this had all been taken care of during the design stage. It really was a delight to assemble, and soon the women working on the line were so adept that it began to look as though they would be able to beat the automatic



Fred Allen



Ruby Hathaway



George Barratt

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assembly machine. For all the production benefits of automatic assembly, the watchful and experienced eye of an assembly line worker could beat feelers and probes in detecting if something was missing or not quite correct.

The 'Classic' switch led on to the 'Rockergrid' switch and its assemblies, and 'rocker' operated switched sockets soon followed; but it was work on the 'Classic', with its facility for automatic assembly, which paved the way to progress.



The Works Office Team 1965. Left to right - Harry Bentley, Eric Whitehouse, Frank Locke, Ted Richardson and Peter Williams.

