

Just an Installation Job

BY E. D. GRIESS

THERE ARE many in the Works who never have the opportunity of seeing the products of their skill in the final setting and who may be unaware of the amount of installation work entailed on site before these products come to life. This article is written to give some idea of what goes on during a typical installation contract.

The Sutton Coldfield Television Station, which is the most powerful in the world, was often in the news during the past year, and it will be remembered that the Company was responsible for much of the equipment including the complete aerial system, the two transmission lines which carry the radio frequency power from the transmitters to the aerial, and the sound transmitter. Our one-time collaborators and present day competitors, Electric and Musical Industries, supplied the vision transmitter.

AERIAL SYSTEM

Many must remember the aerial assembly erected outside Building 46 in the summer of 1949. The whole structure, apart from the temporary octagonal steel supporting framework, was subsequently mounted at the top of the main support mast at Sutton Coldfield.

The support mast itself, a centre of attraction for the many visitors who came to while away the hot summer afternoons watching it grow, consisted of a triangular section lattice steel structure rising to a height of 600 feet surmounted by an enclosed cylinder some six feet in diameter and 115 feet high. The top of the cylinder was covered by a platform on which was mounted the 35 feet topmast that carried the aerial system.

The actual erection of both the main and the topmast was the responsibility of British Insulated Callender's Construction Company, but we were responsible for erecting the aerial. While waiting for the mast to be completed Rigger R. W. Savage, A. A. Pitches of the Aerial Design Group, and I gained our mast legs by making several trips aloft in the cradle which dangled from the end of a seemingly very thin wire rope hauled by a diesel winch. To those unused, as I was, to this method of transport the jerks experienced on the way up were rather disconcerting. Our concern was not lessened by the veterans of the game remarking "That feels like one more strand broken." The jerks were, however, quite normal and were due to the wire settling down on the winch drum. A second anxiety arose as one neared the top and saw the wire passing over the pulley. The only means of communication with the winch driver on the ground was a whistle blast and a wave of the arm, and as the pulley came in sight the thought became a conviction that the winch driver had suddenly been struck deaf and blind and would fail to stop the winch before trying to pull the cradle through the pulley. Fortunately he always stopped with just that couple of inches to spare. On a blustery day, despite the fact that as many as seven men might be pulling desperately on the tail rope attached to the cradle in an effort to hold it away from the mast, the wind could whip you suddenly towards the mast and round the corner to bring the cradle crashing against the steelwork. The winch would stop immediately and the tail rope gang exert all their efforts to



A. A. Pitches (left) with R. W. Savage on the mast

pull you well out from the mast before the winch started again and you continued on your way. The greatest danger occurred when the cradle was being lowered and was about to pass a stay point for, should one corner of the cradle have caught the stay wire the occupants were in considerable danger of being tipped out before the winch could be stopped.

Those of you in the Jobbing Shop who worked on the intricate assembly of large diameter copper tubes and brass castings known as the diplexer, may be interested to learn that this complete assembly, still shrouded in its packing case, was hauled up the outside of the mast and dropped into the cylinder before the top platform was in position. The diplexer, protected by its case, was

left lashed inside the mast until the mast construction gang had finished their job and removed all their heavy tackle. Only then was it considered safe to remove the packing case from around the diplexer and manoeuvre the latter into its final position, securely clamped within the top 12 feet of the cylinder.

The first job on the aerial proper was to assemble the rotating derrick and chain tackle on the summit of the topmast. Remember that the topmast itself was only 18 inches square and that most of the aerial assembly had to be done while standing on the step bolts which projected about six inches from the face of the mast; a very tiring working position, especially at a height of 750 feet where one's muscles seemed to be in a permanently tense condition.

The main task was to mount the eight dipoles, those large double hairpins of sheet steel each weighing 250 pounds which formed the aerial. In order to do this, wooden platforms were built out from the topmast beside each dipole support arm to enable the riggers to stand firmly. Four of the dipoles were hauled to the top platform by the main winch and were then transferred one at a time to the chain tackle mentioned earlier and raised to the ends of their respective support arms, positioned correctly and bolted in place. After all eight dipoles were in position came the tricky business of assembling the various lengths of the aerial distribution feeder in the cramped space within the steelwork of the topmast itself until, working downwards, it met with the diplexer inside the cylinder.

The aerial was then handed over to E. M. Wells of the Research Department and J. E. Martin of the B.B.C. for them to take electrical measurements and make such adjustments as were necessary to enable the complete aerial system to perform the exacting task required of it. These tests entailed the raising aloft of bulky test equipment and its safe stowage from wind and rain for a period of several weeks.

During our activities aloft a wary eye was kept for any clouds that might possibly foretell thunder. Often an approaching storm was heralded by a sizzling noise coming from the lightning arrester at the mast head long before any other signs of a storm were apparent. The tall mast was, of course, a first rate lightning attracter and was almost certain to be hit in any local storm. There was in fact one occasion on a dull winter's afternoon when, without any warning, a sudden flash ran down one side of the mast and shattered two of the lamp sockets of the obstruction lights which were mounted at intervals up the mast. Theory suggests that one should be safe inside the cylinder, but I wonder!

THE TRANSMISSION LINE

Members of the Harness and Machine Shops will remember this as a never ending series of 5-inch diameter copper tubes to the ends of which brass flanges were brazed and the complete units then tested for air leaks.

These tubes together with their associated brass angle and anchor boxes and the concertina-like expansion joints were laid from each transmitter to the base of the mast and then built up its full height until they joined the diplexer at the top of the cylinder.

Our main concern was to get tubes in position without the slightest damage occurring, since any dents would impair the electrical characteristics of the transmission line.

The completed feeder tube consisted of the 5-inch outer together with a 2-inch inner tube supported centrally by

Going aloft in the cradle



means of short peg insulators which rested in depressions in the surface of the inner tube and butted against the inside surface of the outer tube.

In preparation for going aloft each length of outer tube was carefully cleaned and the inner tube assembled. A wooden disc was bolted to one end of the outer to prevent the inner falling out when the assembly was being hoisted up the mast. To exclude moisture and dust the other end of the tube was covered by an oilskin decontamination helmet purchased from the local Army and Navy Stores for twopence.

Two long wooden boxes were made, each large enough to take one 12-foot length of feeder tube. One side of the box was hinged to allow the tube to be laid in the box, after which it was closed and fastened by two clasps. An iron frame at one end of the box enabled it to be suspended from the main winch wire so that it could be controlled from the cradle. The operator in the cradle, instructing the winchman by whistle signals, was hauled aloft complete with one tube in the box, until he was several feet above the point at which the tube was required. The winch was stopped, the lower end of the box was manœuvred between the mast bracings, and the winch driver instructed to lower gently until the box, now dropping inside the mast, was near its final position. The tube was then removed from its protecting box and manhandled into position and clamped to the face of the mast. The wooden disc was removed from the lower end and the inner tube joined to the one below. The clamps were then eased and the outer tube dropped on to the one below and the flanges bolted together. Meanwhile, the empty box was hauled upwards and out of the mast, lowered away to the ground where the second box already containing a tube was ready. When the cylinder was reached it was necessary to land the box on the 600 foot high platform and transfer it to a rope by which it



By courtesy of the B.B.C.

Dr. Griess below one of the dipoles of the aerial

was hauled by hand up the inside of the cylinder.

The system may sound rather crude but in fact it worked very well as the crew aloft were just about able to keep pace with the fastest speed that the winch could raise the tubes. The two feeders from mast base to mast top were installed in four working days; they were rather long ones of course, but it was necessary to take advantage of the good weather.

THE SOUND TRANSMITTER

In point of fact the installation of the transmitter was the first task to be undertaken at Sutton Coldfield. It was, fortunately, possible to have Marconi fitters on site who were already familiar with the transmitter, having helped to build it in the Works.

The four fitters, E. Conoley, W. B. Hanchett, R. G. Rayner, and C. Warwick, who were lucky enough to go to Sutton Coldfield, were probably surprised at the variety of jobs they were expected to tackle, but despite this I really believe they enjoyed themselves.

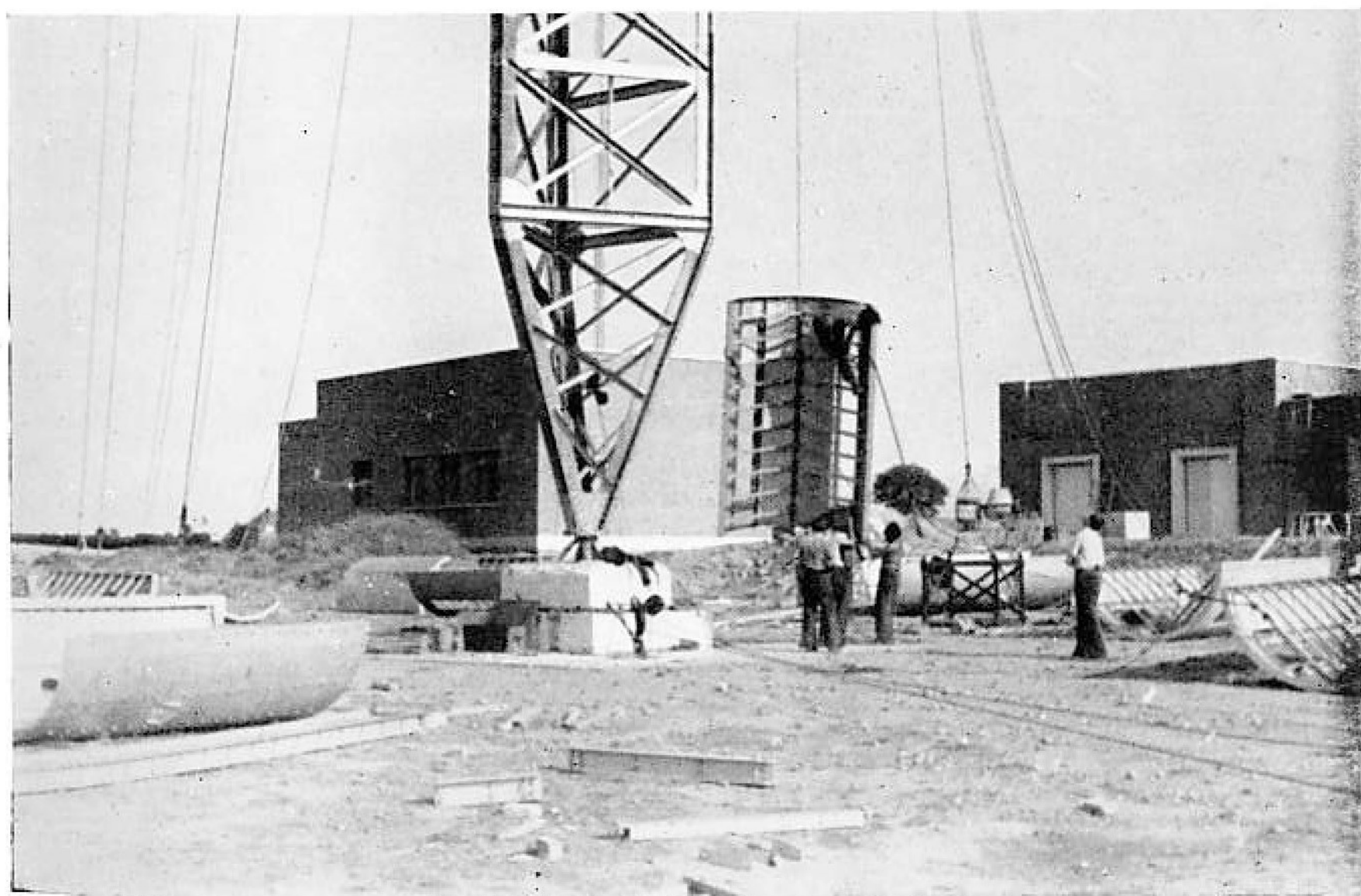
If the Installation Engineer imagined that the erection of the transmitter was the main activity in the building he was soon disillusioned. On arrival he immediately encountered hordes of bricklayers, electricians, carpenters, and workmen of all trades who appeared to be concentrating all their efforts on doing something or other in the exact spot where he wanted to erect the transmitter. Inevitably the building was incomplete and he was horrified at the thought of putting delicate and highly finished equipment amongst the ever present pother of cement dust. But it had to be done.

We were fortunate that all the equipment arrived in our own lorries packed in the main only in hessian and paper so that we were not confronted with the usual problem of finding storage for a mountainous pile of packing cases. Even so, the question of where to put everything during the erection period presented the usual headaches.

For the first few days we forgot all about radio. The main object in life was to knock holes in floors and walls to take the fixings for the main framework of the transmitter and its power supply. Then came the struggle to make everything plumb and square on a floor which, from our rather exacting point of view, appeared to have been made by a manufacturer of corrugated paper. All fitters who ever go on erection jobs are warned to take with them a plentiful supply of shims.

The early days were interminable. Long hours were worked in the vain hope of polishing off the dirty work quickly and getting on to the more pleasant job of the general assembly of the transmitter. A vain hope, I may say, because inevitably throughout the whole erection period there was somebody or other who would come along just after we had cleaned up, to punch a hole through the wall for a water pipe, an air duct, or an electrical conduit.

Hauling sections of the cylinder to the top of the mast



During this initial period it was necessary to work in with other contractors so that water, air ducting, and electric supply cables were brought along at the appropriate moment and did not hold up progress.

In due course a calm fell and the fitters disappeared behind the various units to do the wiring. Slight diversions occurred as mice, long resident in the cable ducts below the floor, were disturbed by the pulling in of cables. Later on one was unfortunate enough to short circuit 7000 volts in the vision transmitter during the early test period and cause a good deal of damage.

Finally the wiring was completed and checked to see that it all went to the right place. At this stage J. Sutton, of the Development Department, arrived with his colleague, D. Jarvis, to carry out the final tests on the transmitter. Now came

the time when every dry joint *you* made revealed itself. So if any of you remember your ears burning in September 1949 you now know the reason. Tests, however, went according to plan and it was not long before the transmitter was handed over to the B.B.C. Station Staff for them to make themselves familiar with its operation before the official opening day.

It was some time after the transmitter was finished that the aerial and feeder were completed. Eventually tool boxes were packed, belongings collected together and arrangements made for their return.

Then, after a final drink in the "White Lion", where we had had such good lunches in the days before the B.B.C. Canteen was open, we departed for Chelmsford at the end of another trying but successful job.

Dr. Griess (right) helping to erect the copper tubes on the mast

