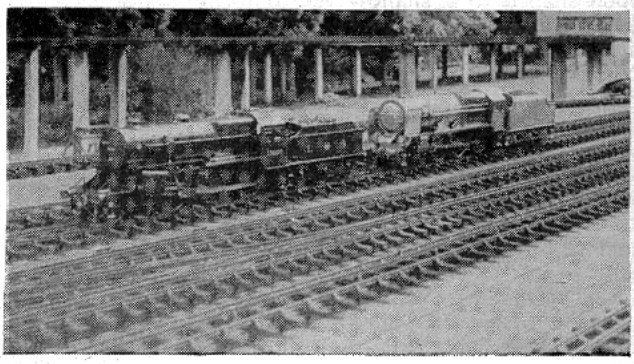


or

ELECTRICAL FIRING & CONTROL

by G.M.T. OF GAUGE I LIVE STEAM LOCOMOTIVES

Having two electrically fired engines presents many problems of control. With a double track end to end layout, it is possible to have the maximum of two engines at either end in steam at the same time. To maintain them in steam at the same time, the locos must have access to individual power units. The existing sole power unit with electrical contactors for the push buttons was not only bulky and weighty, but costly and the prospect of constructing three more was forbidding. A compromise was reached by constructing two additional controllers (one RH and one LH) for each of the termini with facilities on either of the new controllers to pick up the original controller through the electrical contactors on the original controller. All section switches have three positions: own controller, off, and magic box. Henceforth the original controller was named the "magic box". See diagram 9.)

One of the drawbacks of this system of control is that a current failure means loss of control—the engine continuing to run at the setting on the engine when the current failure occurs. With 60/75 lbs. pressure, this can be a very long time.. In each controller, therefore, red light indicators are provided to each set of push buttons (remote as well as direct control) which are illuminated when control is available. It is one of the first rules in driving that the indicator lights are kept under observation. Similar indications are incorporated for circuit breakers and re-set. The new controllers also incorporate a facility for converting them to DC only, thus being available to drive any DC electric loco up to 24 volts (from TT3 to ½ in. scale).

This is achieved by replacing the tap changing switch with a four position switch giving OFF—LOW TAP—MAX TAP—and DC positions. A telephone switchboard type key is used for reverse. Two tappings from the transformer were found adequate after experience with the original controller. The two new transformers were wound specially for us by a local Manchester firm. The address can be supplied if necessary.

The final refinement was the facility to tap change the "magic box" remotely from the new controllers. This scheme also incorporates remote re-setting of the "magic box" circuit breaker, again with indicator light. When the circuit breaker is re-set it does so on the minimum voltage and pressing the remote tap change button switches it to maximum. If lower current is subsequently required, the re-set button on being pressed, switches to lower current. Any one of the four other tappings can be selected by adjustment at the "magic box".

As an additional safeguard, car-type ignition key locks are provided on each controller to switch off the mains.

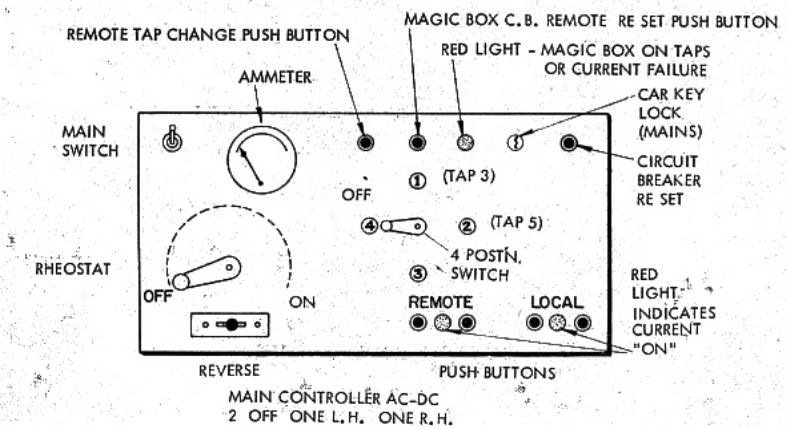
From experience it was found that the mains voltage varied considerably and this variation could materially affect the running. To guard against this a "Variac" is used on the input side to all controllers. Note: all these controllers have to be in 'phase'.

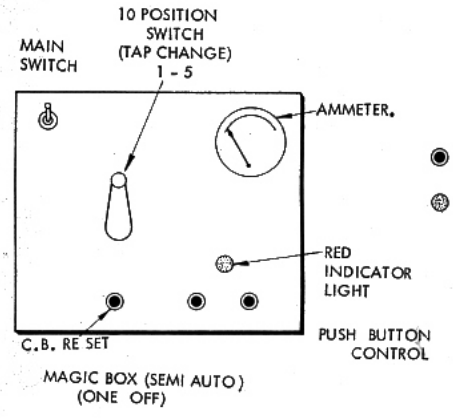
The above, together with accompanying diagrams, completes the electrical side.

Signalling consists of ⅜ in. scale LNWR signals with one scale upper quadrant and one four aspect colour light signal.

The layout and locking is given in the diagrams which will follow at a later date and is self-explanatory. All points are detected where necessary. Motor points with four position lever are also incorporated at Merrills Bridge (No. 6) which are operated by an RAF motor under the base-board, camouflaged with a scale point motor body visible on the top.

All the baseboards are wired with 13 gauge bare copper wire to brass terminal strips, where relevant, on the ends of each baseboard. The baseboards (and therefore





the circuits) are coupled together by O BA bolts with lock nuts and spring washers through each terminal strip. The baseboards are equipped with end boards (7 ply) for transport—2 baseboards per pack, back to back—4 bolts per end board.

By a sheer coincidence it transpired that four times the number of end boards equals the actual number of O BA bolts required to make the connections in full!

After the connections have been made and the "Harness" cabling connected, the first duty is to test for incorrect phasing by using a 110 volt test lamp.

The engines are also phased to run the same way as the control press buttons, i.e. if the LH button is pressed the loco will start off in the LH direction and vice versa. As an added facility the "Crab" and "Scot" have current reversing switches incorporated in the tenders.

The Claughton and Crab still use the Bassett-Lowke four-way valve for combined reverse and speed regulation. There is no doubt that this is very wasteful on steam but we can make plenty of that.

The Scot, however, is a "Pukka" high pressure job with full Walschaerts valve gear with lap and lead.

The same system of electrical control is used but the gearbox on the engine operates a correct type regulator in the dome after putting the engine in either forward or reverse gear, i.e. pressing the LH button would put + DC on the line—make the control motor revolve clockwise, which first moves the reverse gear into forward gear then opens the regulator.

Pressing RH button then reverses the motor and first shuts the regulator, afterwards bringing the reverse gear to mid gear or reverse. There is an overrun position for the motor in full forward and full reverse positions giving the same audible indication as per Claughton and Crab.

The Scot was converted to this system between January 10th and April 5th 1965, a total number of 342 man hours being consumed—just in time for the London MRC Easter 1965 Exhibition.

At the time of writing, the engine is stripped completely for painting, which it is hoped will be completed in time for the Manchester December Show, 1966.

The Claughton is also stripped for overhaul of cylinders and motion, the valve chests having finally worn out.

The Scot is a considerable improvement over the other two, both in steam consumption and handling. It has the same fittings as the others, plus an axle-driven water pump and by-pass. The Crab will no doubt be similarly converted, but the Claughton, being the first of the series, will remain virtually as now.

Finally, here are some photographs taken of the outdoor layout at present under construction by Arthur Bridge, where some test runs have been made with Scot and Crab late last year. If anyone wants the nearest thing to real steam, this method of control is highly recommended, providing the builders have the necessary qualifications.

The system has the added advantage that it can be used to control:

(a) Ordinary electrics (protected from AC by similar relay to the control relay); we have three such locos.

(b) Diesel locos: AC for starting, DC for control.

(c) AC electrics : AC for power, DC for control.

(d) Clockwork—AC for winding, DC for control. (This is not as daft as it first appears).

(e) Steam locos without electric firing. It can be done on two rail. We don't, because there is too much stock to convert.

Photos:
Heading: The Crab and the Scot waiting their turn.

Below, Upper left: Stan Thompson and Bob Mills working on the viaduct. The height of the railways can be judged.

Lower left: The crack engine of the old line—a clockwork *Sir Sam Fay*. She was the only engine which would run non-stop end to end on the original layout. It won't pull three up this incline now.

Upper right: Stan and Bob wiring the "junction"; note the coil of 13 gauge wire for bonding and section feeds.

Lower right: View of the viaduct to the junction; this rises at the RH corner at 1 in 50 easing to 1 in 120.