input to which is the result of an AND operation between the switching waveform and 'clock'. The anode circuit of this valve is similar to that of V26; the transformer output is a positive 1μ sec. pulse of amplitude 50V (fig. 6.7), which is capacitively coupled to the grid (pin 1) of the tube.

14. The scaling pulses for speeding the trace between digit groups are generated in V28, the input to which is the result of an AND operation between the switching waveform, 'clock' and the scaling pulses derived from the logical circuits (fig. 17.3 of Volume 2a). The clipping diode at the anode of V28 is connected in the reverse sense to that at the anodes of the other two valves; consequently, the scaling pulses are initiated by the *back* edge of 'clock', i.e. *after* the digit pulse with the same logical timing has been displayed. Transformer TR9, which has a 1:1 turn ratio, is connected to give a positive-going output pulse with an amplitude of 18V and a mean width of 1.25μ sec. (fig. 6.7).

15. V30 is a monostable relay valve that is used to control the Y-shift for the half-word display. Its output is applied to the Y2 plate (pin 8), and is therefore in the opposite sense to the shift required. The triggering pulses are digit pulses, which are obtained from the logical control circuits (see fig. 17.3 of Volume 2a). The anode potential of V30a is switched between +230V and +60V, and the junction of R136 and R137 between +280V and +220V.

### Engineer's Display

16. The deflection circuit for the engineer's display, fig. 6.5, differs from that for the programmer's display principally in the provision that is made for the display of 'clocked' digits. These are taken from the cathode of V7, which acts in this application as a cathode-follower. V7 is cut off during the flyback, giving a cathode output at earth; during the sweep, an a-level signal raises the cathode level to +10V over the clock period, whereas a clocked-up 'nought' gives a level of about +1V. The output of the Y-shift relay valve, V12, is switched to the tube only on half word. The steady state of V12, incidentally, corresponds to the 'shift down' condition, and the valve is receiving 'shift down' pulses from the logical control even when the switch is set to one of the adjustable timebase frequencies (see fig. 17.3 of Volume 2a).

## DISPLAY TUBES

17. The display-tube circuits are shown in fig. 6.6. The negative-going sawtooth is fed to pin 9, and the positive-going sawtooth to pin 11, to give the desired right-to-left timebase. The Y-shift waveform is DC-restored with its 'up' level (shift-down condition) at a potential that can be preset by RV10 for the programmer's tube. When the coarse timebase control (SW3) is at HALF WORD, the arrangement is similar for the engineer's tube, except that the DC Y-shift control, RV3, is on the panel. When the coarse control is in any other operative position, the Y2 plate is connected direct to the slider of RV3. It is also connected through a close-tolerance resistor, R173, to one pole of the meter switch on the engineer's panel to give a means whereby signal amplitudes can be measured; preset control RV13 should be used to set the meter to zero with the Y-plate switch at E and the trace shifted by RV3 to coincide with a line engraved on the screen.