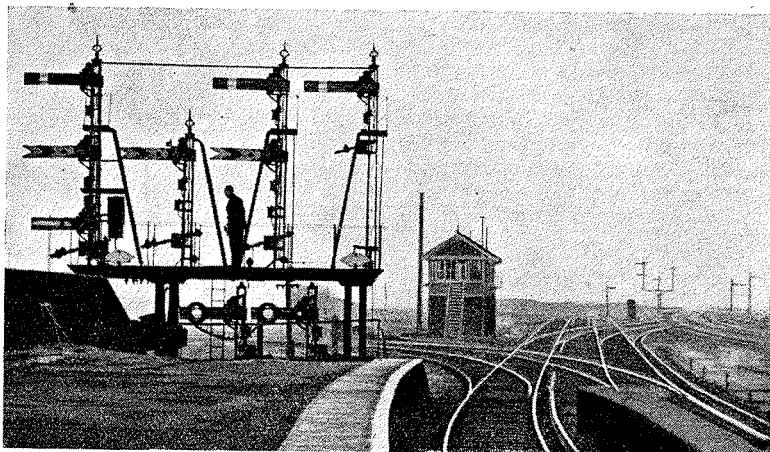


# The Croydon Tangle

By NORMAN CRUMP



Selhurst down starter signal and junction

**B**ETWEEN East Croydon, West Croydon, Selhurst, and Norwood Junction lies the "Croydon Tangle." As the diagram on the following page shows, this complex network is controlled by four signal boxes. Coming from London Bridge and Norwood Junction box, we reach Norwood Fork Junction box. This operates on two levels, for the down local line is here carried on a flyover. It is here that the local lines split into three, the East and West Croydon spurs running to Gloucester Road, and the spur round to Selhurst.

The Victoria traffic meets the tangle at Selhurst signal box, which has various junctions, including the connections with the electric car sheds. From Selhurst the down main or through lines proceed over the top, direct to Windmill Bridge signal box, where they join the London Bridge lines. From here there are five lines as far as South Croydon.

In the middle of the tangle is Gloucester Road signal box. This works four sets of double-line junctions, with very little overlap between them. Its job is to handle all the local-line traffic from Victoria and London Bridge to East and West Croydon. London Bridge—East Croydon traffic, however, rarely uses the West Croydon spur from Fork, and only

four trains are booked to run over the emergency spur to Selhurst.

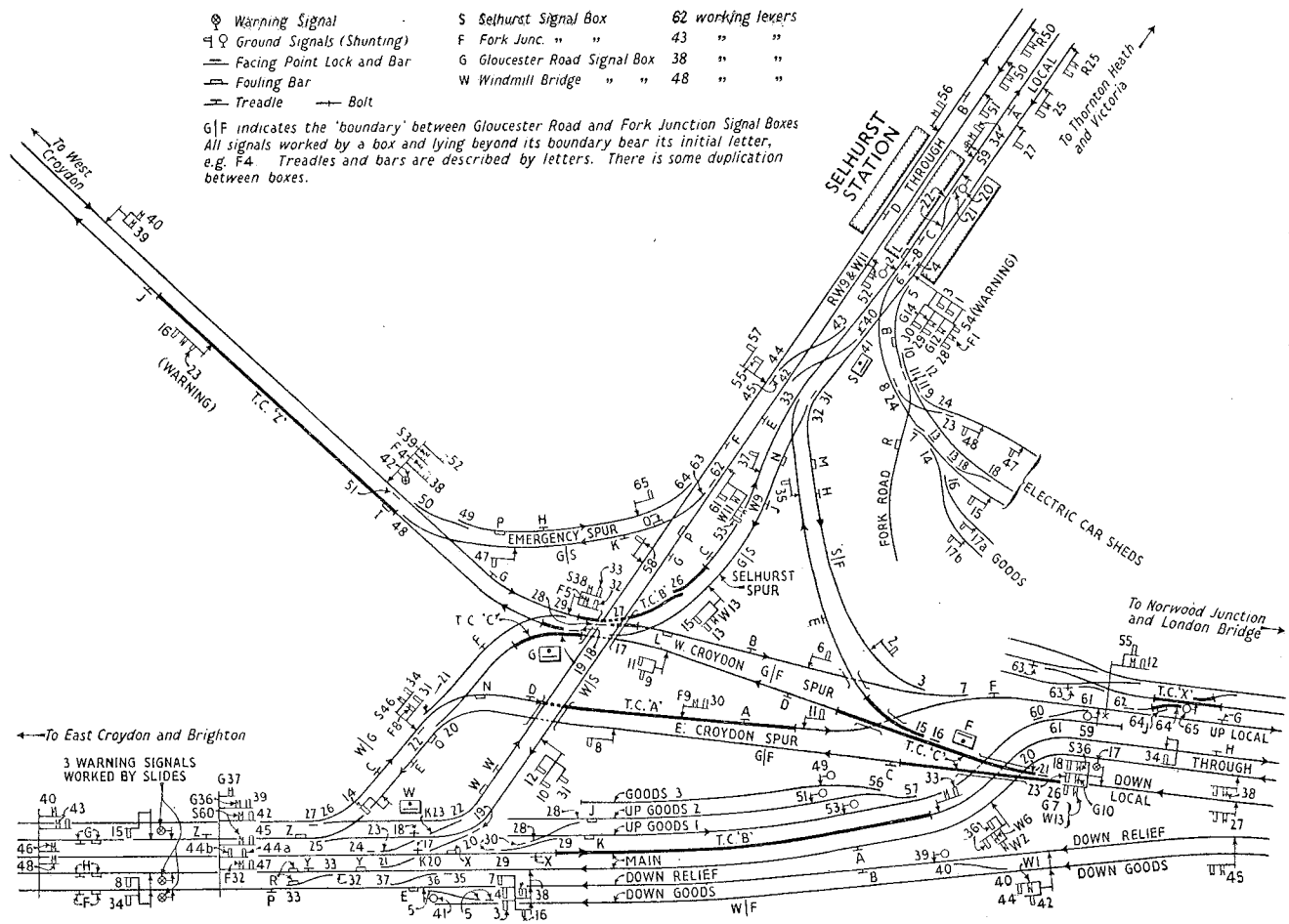
The working of this area is based on Sykes lock-and-block (Southern Region, Central and Eastern) system. This rests on two principles, namely rotation locking and the treadle-released back-lock. Between them, they ensure that a signal cannot be pulled off for a second train, until the signal in advance has been pulled off for the first train, that train has passed it and reached the treadle in advance, and that signal in advance has been replaced to danger behind the first train. The back-lock allows the lever to be replaced enough to throw the signal to danger in case of an emergency, but prevents it being put back completely home in the frame. Thus conflicting point levers are held locked, and the rotation lock on the preceding signal is not freed, until the treadle, which is situated at the clearing point, is depressed and releases the back-lock.

Here is the simple case of a down main train from London Bridge. The relevant instruments are shown in one of the illustrations.

Norwood Junction South Box offers the train. To accept it, Fork signalman presses in his plunger. This causes his lower tablet to drop from *Blank* to *Train*

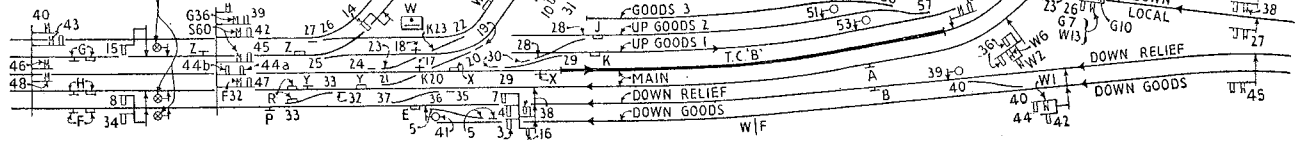
- ⊕ Warning Signal
- ⊘ Ground Signals (Shunting)
- Facing Point Lock and Bar
- Fouling Bar
- Treadle
- Bolt
- S Selhurst Signal Box 62 working levers
- F Fork Junc. " " 43 " "
- G Gloucester Road Signal Box 38 " "
- W Windmill Bridge " " 48 " "

G|F indicates the 'boundary' between Gloucester Road and Fork Junction Signal Boxes  
 All signals worked by a box and lying beyond its boundary bear its initial letter,  
 e.g. F4 Treadles and bars are described by letters. There is some duplication  
 between boxes.



← To East Croydon and Brighton

3 WARNING SIGNALS WORKED BY SLIDES



*On*. His plunger also becomes locked, so that he cannot plunge again.

Fork Junction offers the train on to Windmill Bridge. The latter plunges as above. This causes Fork's upper tablet to drop from *Locked* to *Free*. His 36 lever is released, but his block indicator is raised to the *On* position. Fork Junction pulls off 36, which raises his upper tablet to *Locked*, showing that the lever is back-locked.

When the train passes over Treadle A, it drops Fork's tablet to *Free* and releases his back-lock. 36 lever is put fully back in the frame. This restores his lower tablet to *Blank*, and his upper tablet to *Locked* and releases the plunger. The signalman gives "out of section" to Norwood and can now plunge for a second train.

Windmill Bridge offers the train to East Croydon North Box, gets a plunge from him, which drops his 8 tablet to *Free*, raises his block indicator and releases his 8 signal. He pulls off 8, 7 and 6 signals. As he does so, the tablets in both his instruments are raised to *Locked*; 7 and 8 levers are now back-locked.

The back-lock on 7 lever is released when the last vehicle of the train clears bar and treadle Y, which work in combination. When 7 is restored, Windmill Bridge's plunger to Fork Junction is once more free, and Fork's block indicator drops to *Off*. Windmill Bridge gives "out of section," and can now plunge for a second train. His tablet for 7 and 10 signals, however, shows *Locked*, and remains so until 8 is replaced. The back-lock on 8 is released by bar and treadle H. When a bar and treadle are used together, the last vehicle of the train gives the release. With a treadle alone the first vehicle gives the release. Thus the use of the bar increases overlap.

When the train reaches East Croydon North, so that the home signal there can be replaced, Windmill Bridge receives "Out of Section," and his block indicator falls to *Off*.

To refuse a train when offered, the signalman turns his switch-hook over his plunger. This prevents it from being used, and also puts the block indicator in the rear box to *On*. The switch-hook is also turned over when "Train Entering Section" is received, and turned back when "Train out of Section" is sent.

The Windmill Bridge crossings for the Victoria to main lines are provided with

moveable angles, K20 and K23, worked by the same levers as facing points 20 and 23. They are bolted by 17 and 18 which must be reversed before signals leading over the angles can be pulled off. The facing point lock-levers are reversed to unlock the points, and when reversed, lock the signal levers.

Here is an extract from the Windmill Bridge locking table. It shows how before the road is made for one train, other points have to be moved, so as to divert other trains out of the way. It does so without preventing simultaneous permissible movements.

Lever	Released by	Locks
7		21
10	17 21	19
12	18 25	19 23
14		25 26
17		20 N & R
18		23 N & R
19		10 12; when N, locks 20 N & R
20	23	
21	20	7
22	23	25 26
23		12 25 47
24		45 47; when N, locks 23 N & R
25		14 22 23
26		14 22 39
27		39 42; when N, locks 26 N & R
39		26 27
42	26	27
45	18 20 22	24
47	17	23 24

Locks on levers not included in the table are omitted

The table shows how signal 10 for a down main train from Selhurst needs 20, 21, and 23 points reversed and 25 points normal. Signal 45 for an up main train to Selhurst needs 20, 22, and 23 points reversed and 25, 26 points normal.

When 25 or 26 points are reversed, they lock the down local plunger for trains from Gloucester Road, as well as 14 signal. It follows that once a plunge has been given to Gloucester Road, these points are locked until the train has cleared bar and treadle Z.

Windmill Bridge signalman has the delicate duty of giving fair treatment to London Bridge and Victoria trains.

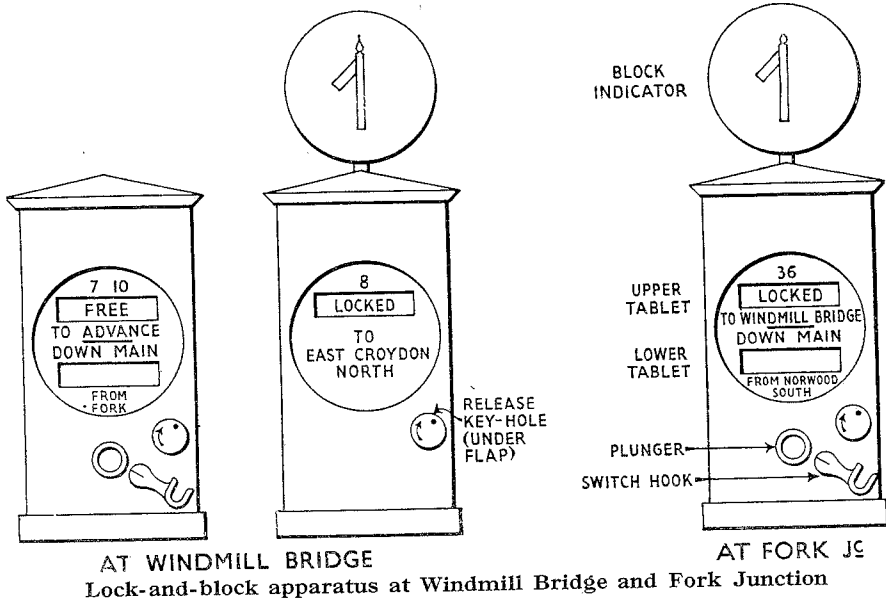
Coming now to Gloucester Road, 29 trailing points are locked normal until both 21 and 50 facing points are reversed. Thus not only is the road from East Croydon first made up to 29 points, but protection is given against the possibility of a train from West Croydon over-running 38 signal.

There is a little lever on the instrument

shelf; when it is to the left, 27 point lever is locked normal, and so is the down West Croydon spur plunger, for trains from Fork Junction; also, the down Selhurst spur plunger is free. When the lever is thrown to the right, 27 point lever is free and so is the plunger from Fork; but the plunger from Selhurst is locked. When 27 points are reversed, the little lever is locked to the right, nor can it be moved to lock either plunger, unless that plunger is free to be used to accept a train. Thus once a plunge has been given to either Fork or Selhurst, the whole thing is tied

after use by reversing and replacing his 37 signal, whose back-lock release is treadle C in Selhurst Station, it follows that the first train must depress this treadle before Windmill Bridge can pull off his signal 39 for a second train.

Because of the steep gradient from Gloucester Road up to Selhurst, 26 trap points are provided. They lead 33 signal (and therefore 34 and 38 signals for Selhurst trains), but are not back-locked by 33 signal ever. They are, however, back-locked by track circuit B, and also cannot be reversed until Selhurst plunges



up until the train has either depressed treadle E or has cleared bar I. This little lever system, though effective, is now obsolete, as conflicting plungers are now interlocked directly.

On the up side, the overlaps are so short that special locking is needed. 34 and 38 signals are each led by 32 or 33 signal, which need respectively plunges from Fork and Selhurst. The back-lock release on 34 is treadle F, and on 38 treadle G. But the rotation lock on both signals is 32 or 33 replaced and pulled again. Gloucester Road's up local plunger to Windmill Bridge is released only when 31 or 34 signal is pulled off, and the rotation lock is 31 or 34 replaced and pulled again. As Selhurst's up spur plunger to Gloucester Road is released

to Gloucester Road on that line. After the train has cleared track circuit B and treadle C, 26 must be replaced before 33 or the signalman finds himself tied up, and has to use his release key.

Gloucester Road 23 and 42 are warning signals (the last for the emergency line). Fork has 17 as a warning signal to Selhurst, and Selhurst's 54 is a warning signal to Fork. Windmill Bridge has warning signals on the down lines to Croydon, which are controlled by slides. A warning signal gives the road to the driver up to the next stop signal.

Each warning signal has its own Sykes instrument, and its plunger is interlocked with the plunger for the main running signal above the warning signal, so that

*(Continued on page 230)*

## The Croydon Tangle

*(Concluded from page 216)*

both cannot be used at once. To see what a convenience these warning signals are, Selhurst's main plunger, which releases Fork's 18 signal, locks Selhurst's 22 points normal and 33 points reversed. Its release after use is both 35 and 34 pulled and reversed, and the back-lock release on 34 is treadle A beyond Selhurst Station. Also 33 points, when reversed, lock 6, 32, 41, and 44 points normal, and also the plunger back to Gloucester Road. However, the warning plunger does not lock any of these levers, and its release after use is only 35 pulled and reversed. The back-lock release on 35 is treadle C. So Selhurst does not become tied up.

Warning signals may not be used in foggy weather or falling snow.

There are many other points of interest in this area, but I hope I have said enough to show how safety and elasticity of operation are combined. My thanks

are due to H.O. Inspector Pecksen, both for making available to me the diagrams and locking tables of these four signal-boxes and also for taking me on a tour round the area. I am also most grateful to the four signalmen on duty during my visit. They gave me much practical information on what the work meant, and left me with a great feeling of respect for the way in which they handled this complicated traffic.

In a few years this article will be of purely historical interest. Plans already exist for replacing these four boxes by a single power signal box, with 131 levers, to be situated near Gloucester Road box. There will be colour-light signals, and complete track-circuiting (instead of the few odd track-circuits, whose main function is to hold the relevant points). There will be an illuminated diagram, and no more Sykes instruments or block working. Today let us reflect how well the existing equipment looks after the Croydon Tangle.

## The Croydon Tangle

(See article on page 213)



Norwood Fork Junction signal box and flyover



Gloucester Road signal box and flyover



Interior of Norwood Fork Junction signal box



Interior of Selhurst Junction signal box