

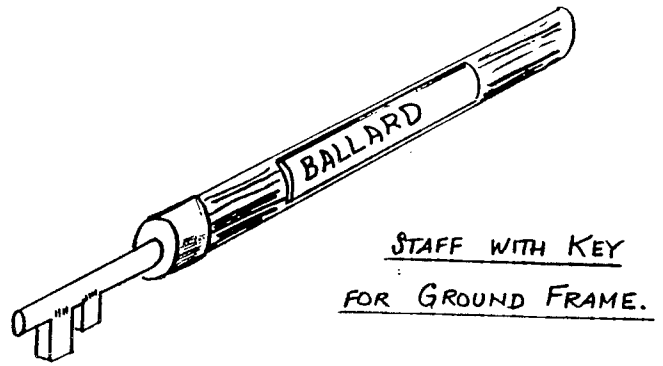
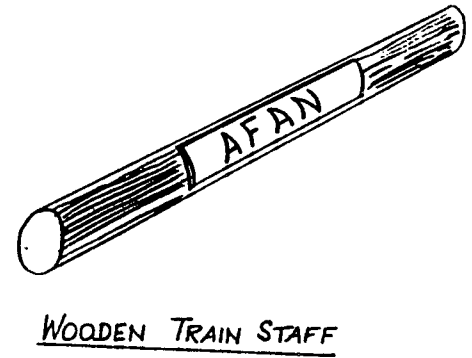
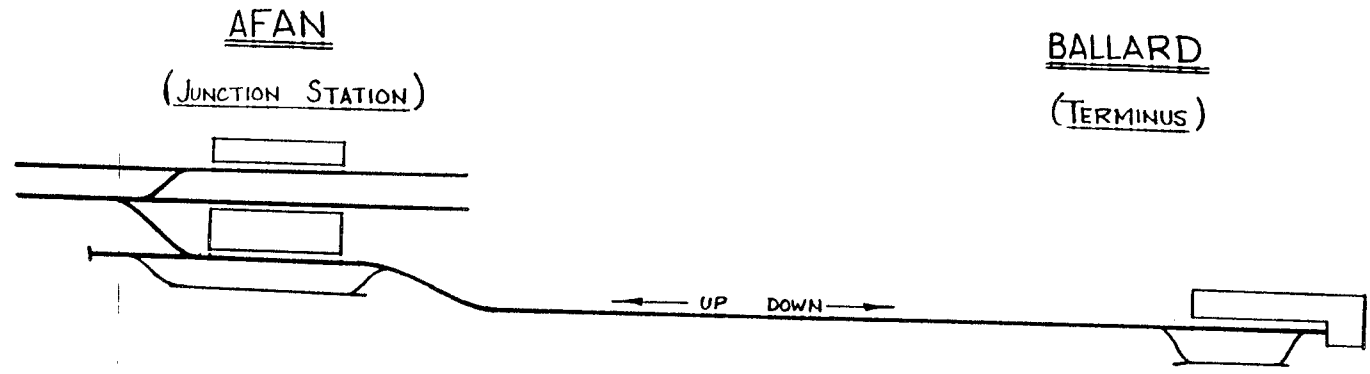
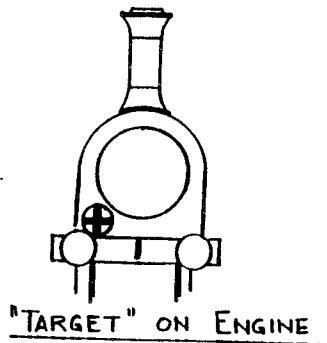
# SIGNALLING OF A SINGLE LINE

## SUPPLEMENTARY SKETCHES

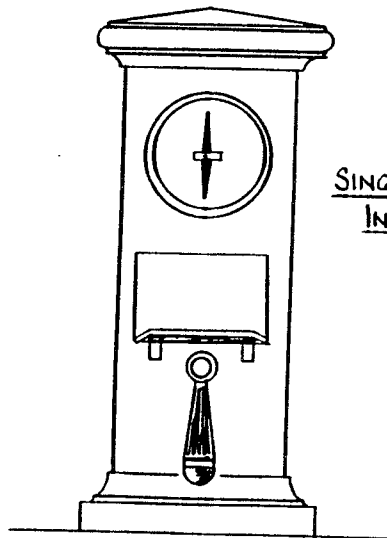
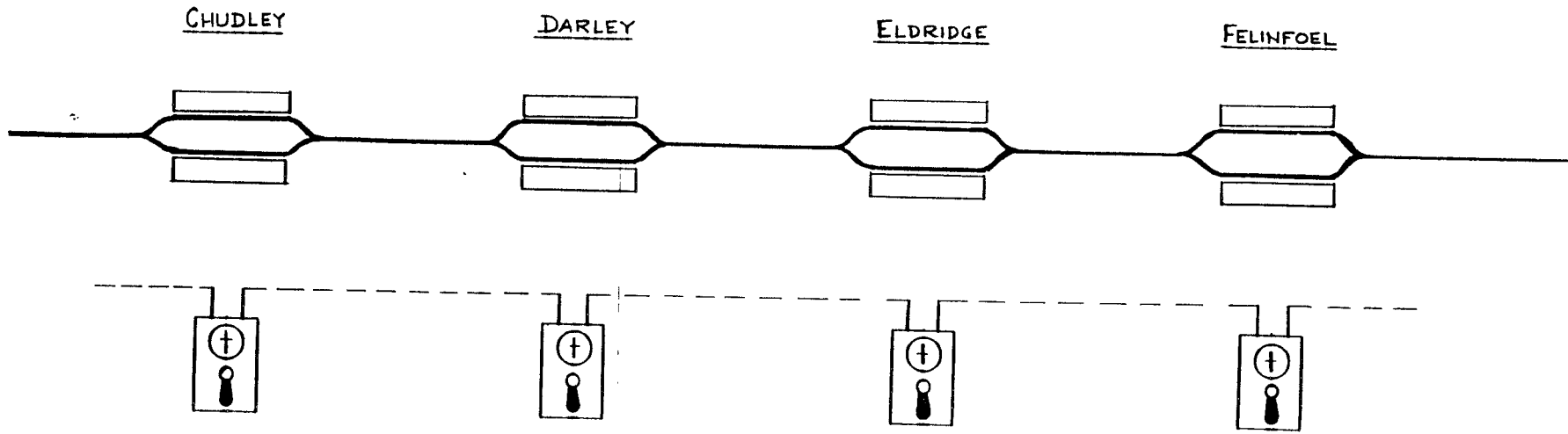
NOTE - THESE SKETCHES WERE PREPARED AS SLIDES TO ACCOMPANY A LECTURE. THE COPIES CONTAINED IN THIS PAMPHLET ARE PROVIDED AS A RECORD OF WHAT WAS USED DURING THE LECTURE. MANY WERE INTENDED TO ILLUSTRATE A PARTICULAR FEATURE, AND SO OMIT SOME IRRELEVANT DETAILS. THEY SHOULD NOT, THEREFORE, BE TAKEN AS FULLY COMPLETE IN EVERY DETAIL.

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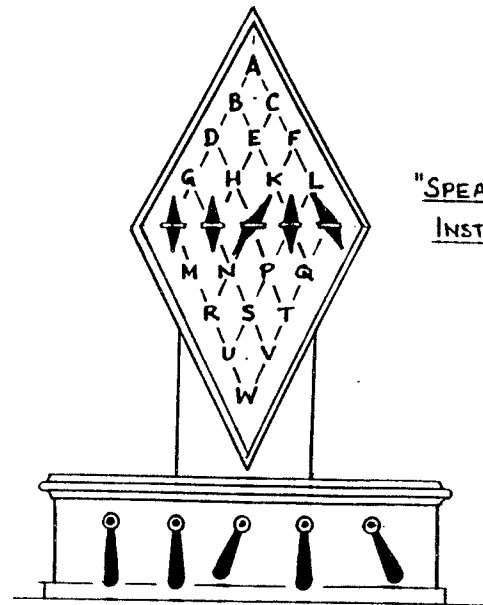
- 1 - ONE ENGINE IN STEAM,  
WOODEN STAFF,  
(ONE TRAIN ONLY).
- 2 - SINGLE LINE WITH TELEGRAPH.
- 3 - TRAIN STAFF AND TICKET.
- 4 - PRINCIPLE OF TABLET CIRCUIT.
- 5 - VARIOUS INSTRUMENTS.
- 6 - ELECTRIC KEY TOKEN CIRCUIT.
- 7 - CONTROL OF SECTION SIGNAL.
- 8 - INTERMEDIATE INSTRUMENT (TOKEN).
- 9 - "NO SIGNALMAN" KEY TOKEN.
- 10 - TOKEN EXCHANGING.
- 11 - "LONG" AND "SHORT" SECTIONS.
- 12 - DIRECTION LEVER WORKING.
- 13 - TOKENLESS BLOCK INSTRUMENT.
- 14 - TOKENLESS BLOCK CIRCUIT.
- 15 - INTERMEDIATE SLIDING (TOKENLESS).
- 15A - CENTRAL WALES LINE (SKETCH MAP).
- 16 - "NO SIGNALMAN" CROSSING LOOP
- 17 - "NO SIGNALMAN" LOOP, MIXED TRAFFIC LINES
- 18 - ELECTRIC TOKEN OVER B.T. LINES - FREQUENCIES.
- 19 - — BASIC CIRCUITS.



# SINGLE LINE WITH TELEGRAPH

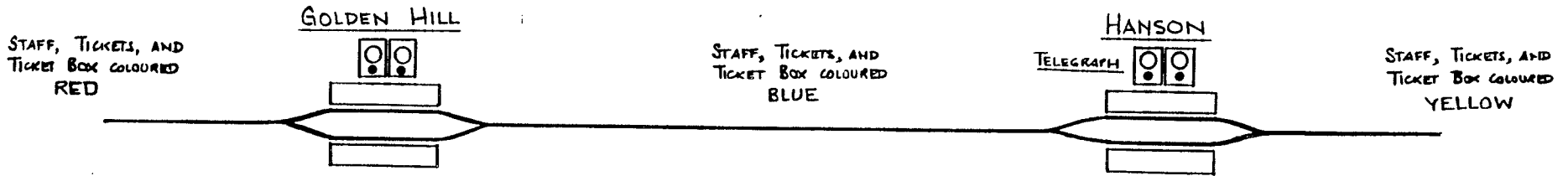


SINGLE NEEDLE  
INSTRUMENT

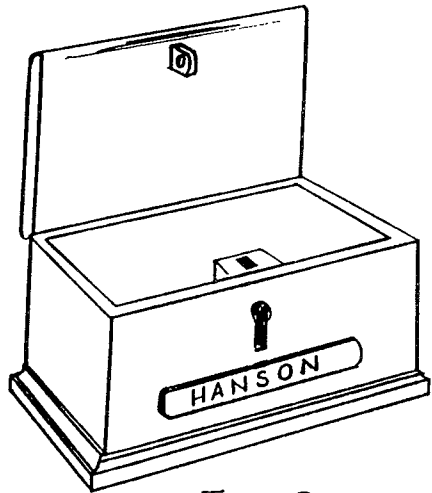
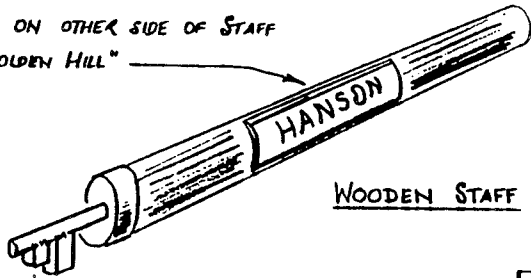


"SPEAKING"  
INSTRUMENT

# TRAIN STAFF & TICKET



LABEL ON OTHER SIDE OF STAFF  
"GOLDEN HILL"



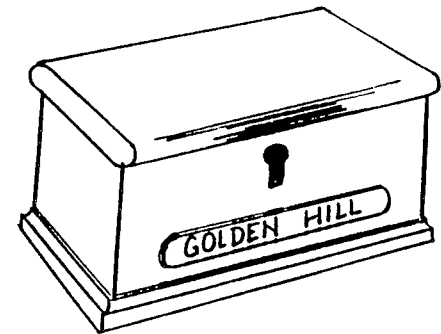
NEW JUNCTION RAILWAY.

TRAIN STAFF TICKET

\_\_\_\_\_ TRAIN FROM \_\_\_\_\_

TO THE ENGINE DRIVER:—  
YOU ARE AUTHORIZED, AFTER SEEING THE  
TRAIN STAFF COLOURED BLUE FOR THE  
SECTION, TO PROCEED FROM  
GOLDEN HILL TO HANSON  
AND THE TRAIN STAFF WILL FOLLOW.

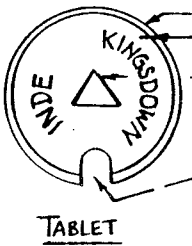
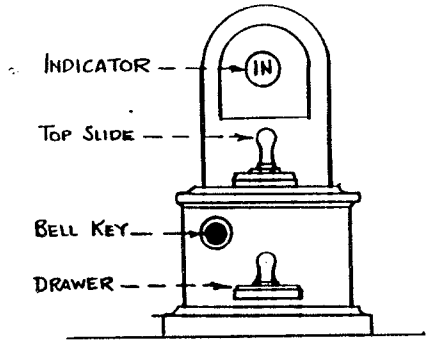
DATE \_\_\_\_\_ SIGNED \_\_\_\_\_



# — PRINCIPLE OF CIRCUIT —

(EDWARD TYER: 1878)

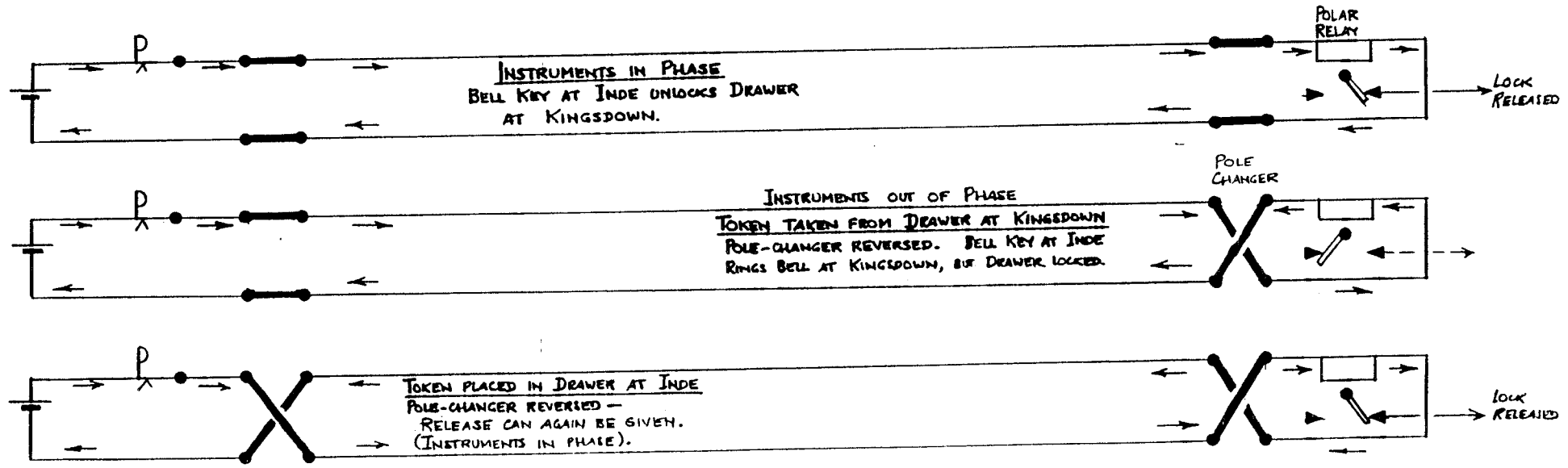
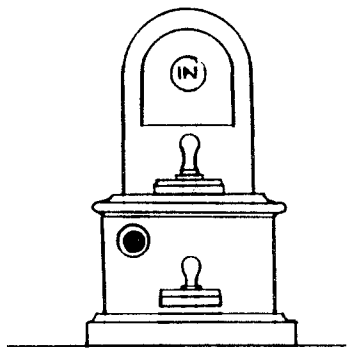
INDE

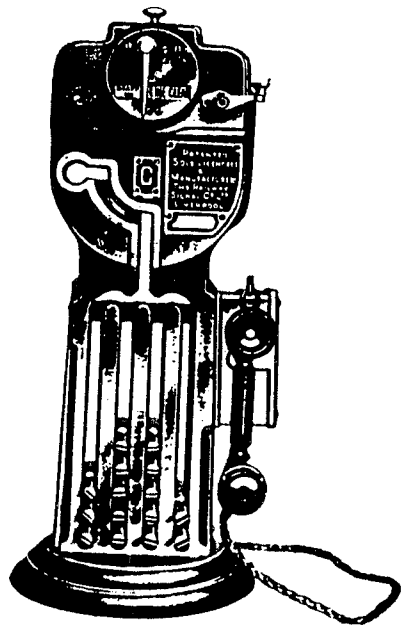
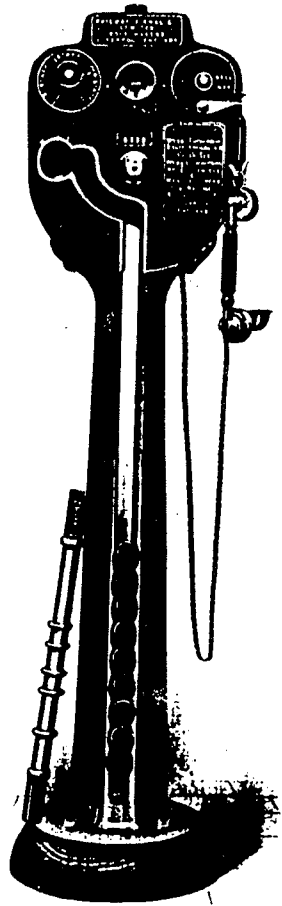


IRON RIM WITH BRASS CENTRE  
 CONFIGURATION BY SHAPE OF HOLE  
 NOTCH TO ENSURE CORRECT ALIGNMENT IN MACHINE

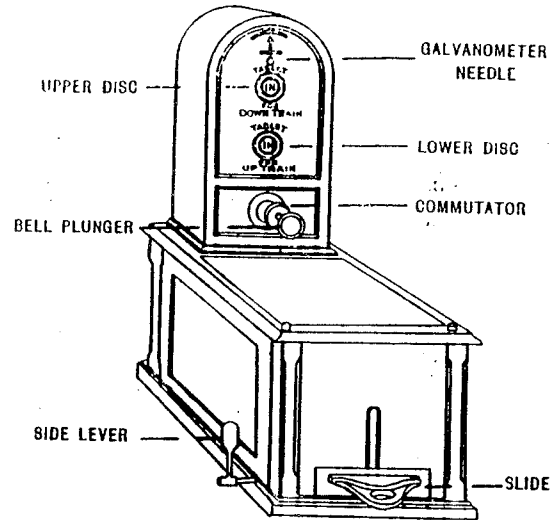
ETC

KINGSDOWN





TYER'S NOS. 3 AND 6 ELECTRIC TRAIN TABLET INSTRUMENTS.



TYER'S NO. 7 ELECTRIC TRAIN TABLET INSTRUMENT.

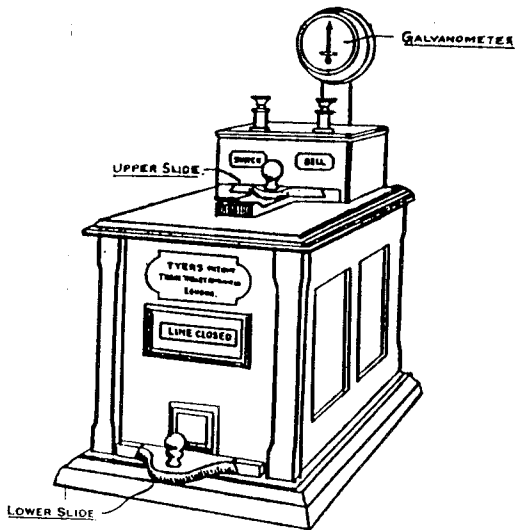
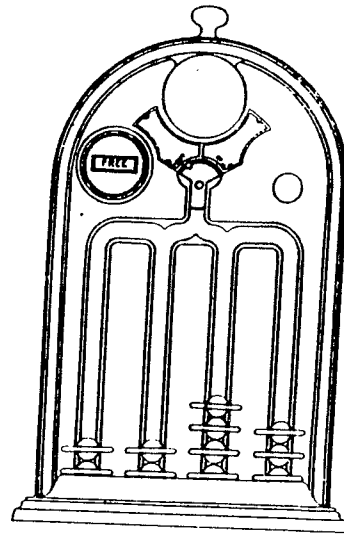
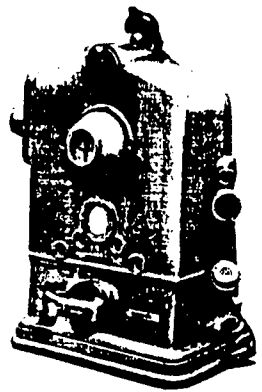


DIAGRAM OF KEY-TOKEN INSTRUMENT.



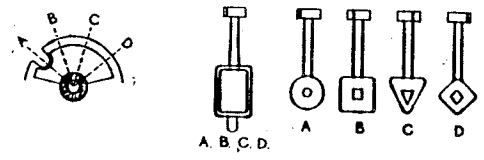
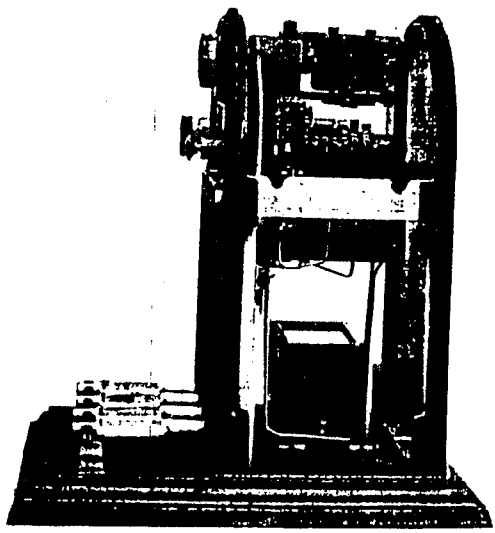
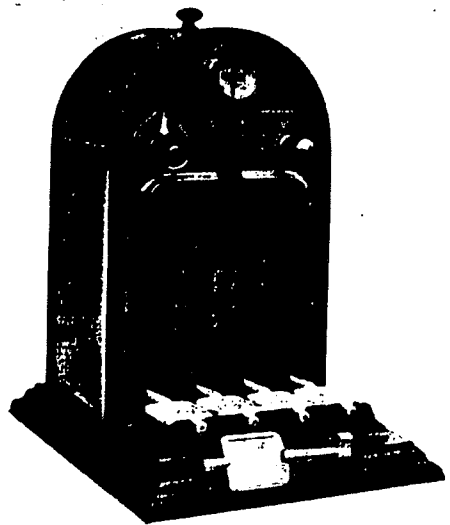
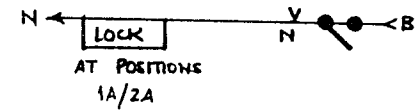
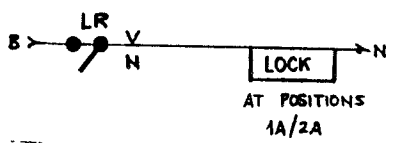
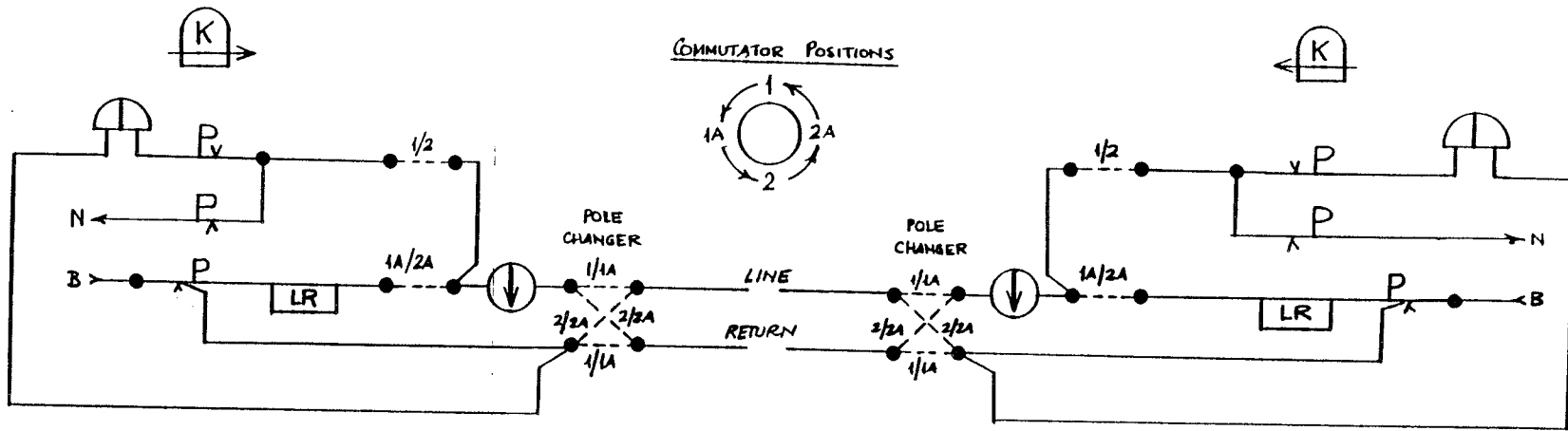
NEALE'S TOKEN INSTRUMENT



# ELECTRIC KEY TOKEN

THEAKSTON

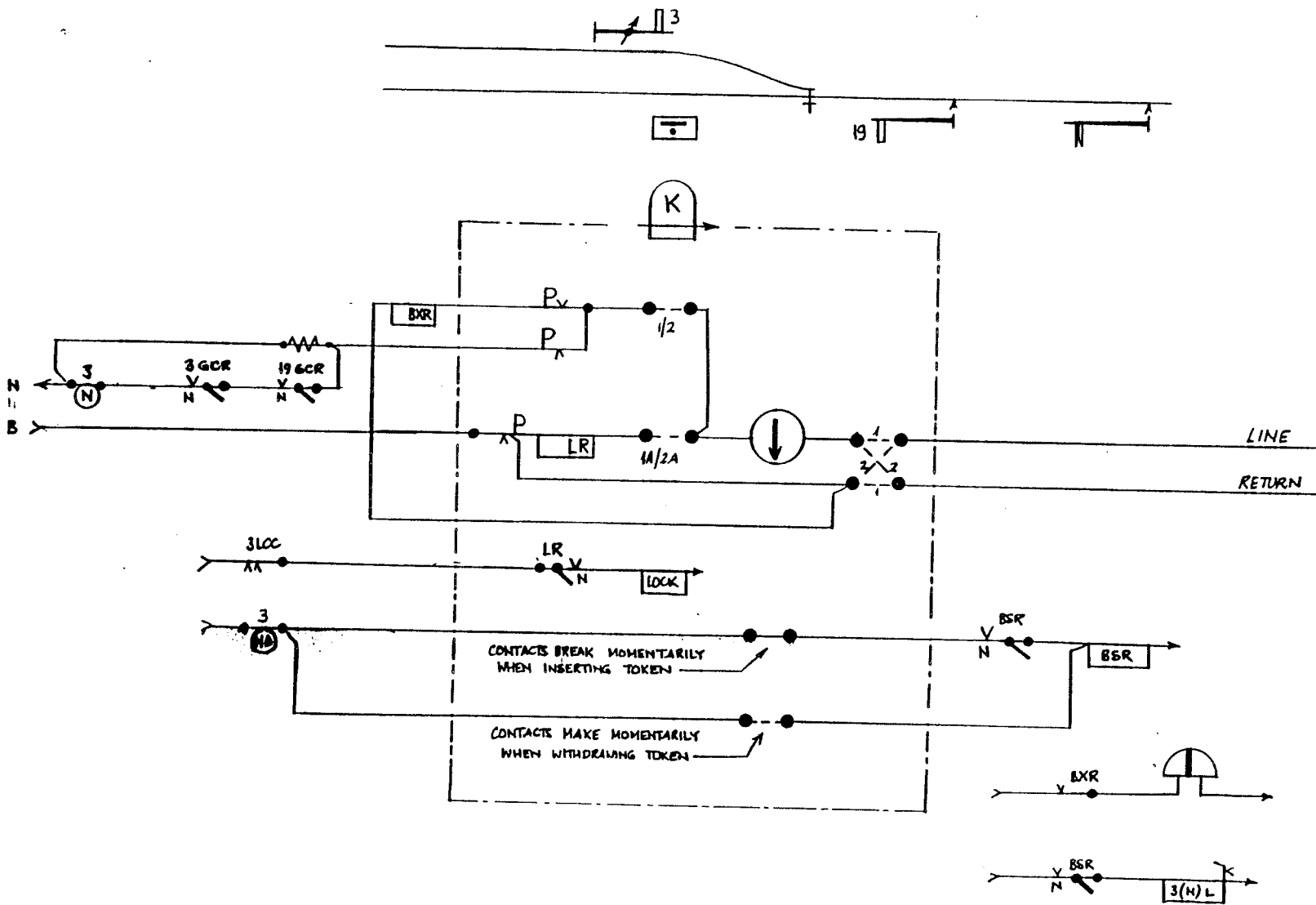
YATE



TOKEN COLOURS

A	RED
B	BLUE
C	GREEN
D	YELLOW

# ELECTRIC KEY TOKEN - SECTION SIGNAL CONTROLS



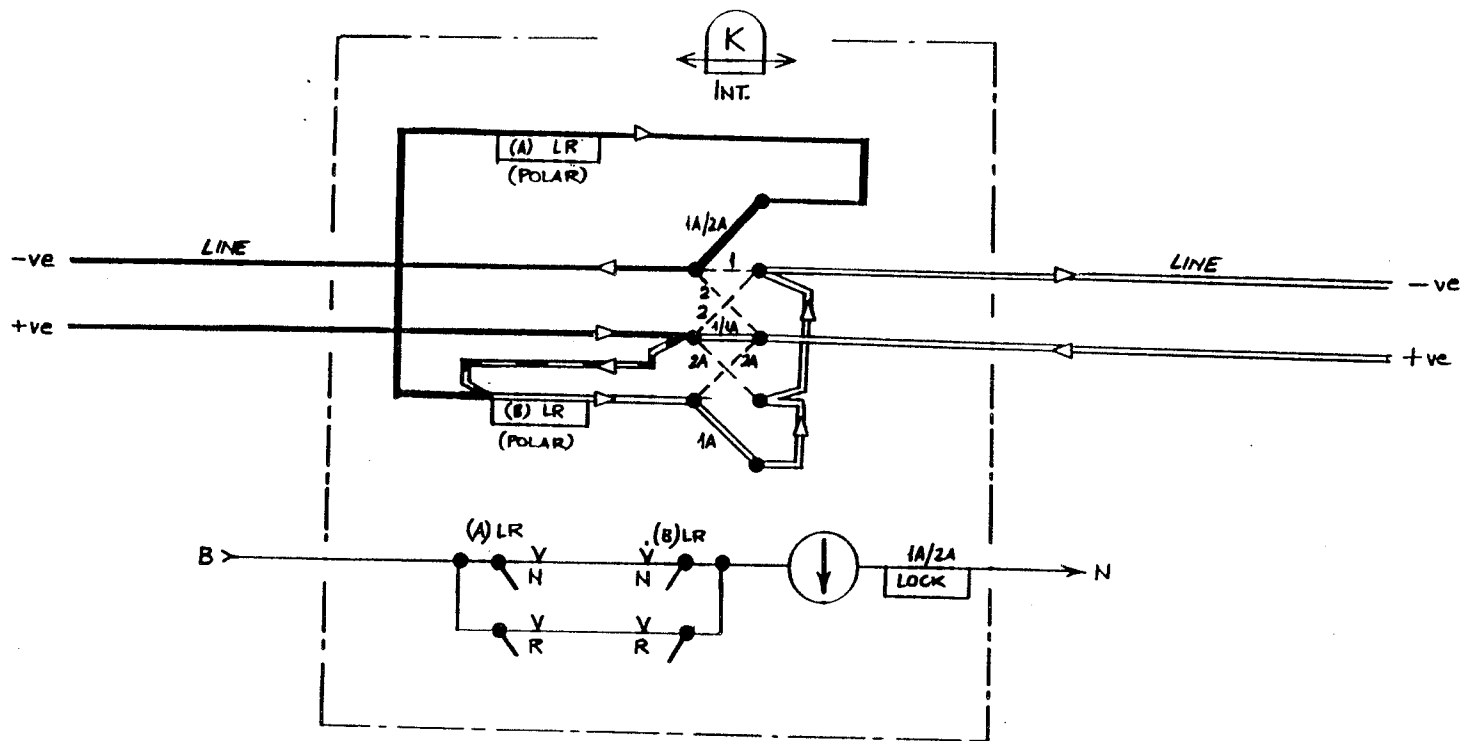


ELECTRIC KEY TOKEN INTERMEDIATE INSTRUMENT

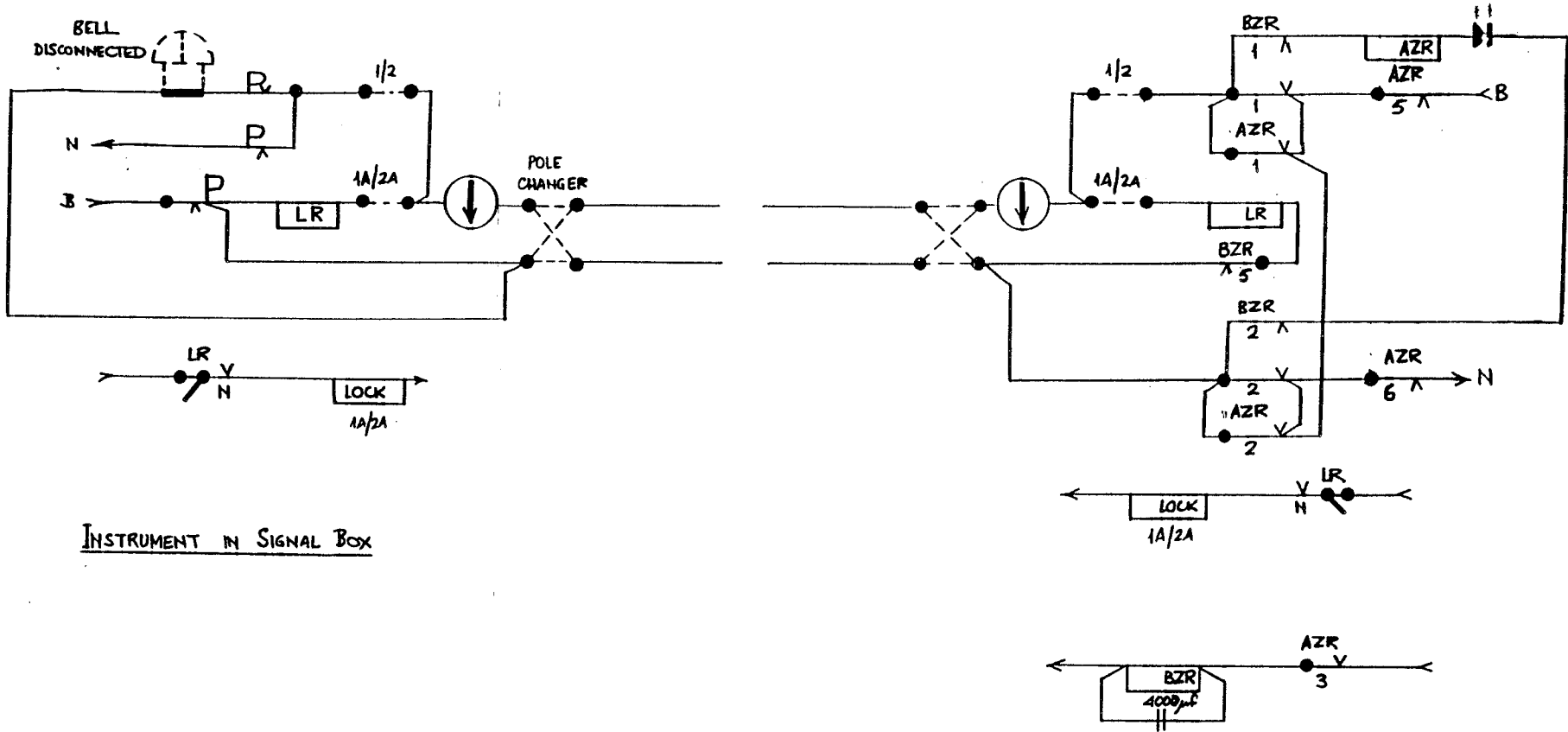
THEAKSTON

WEM

YATE



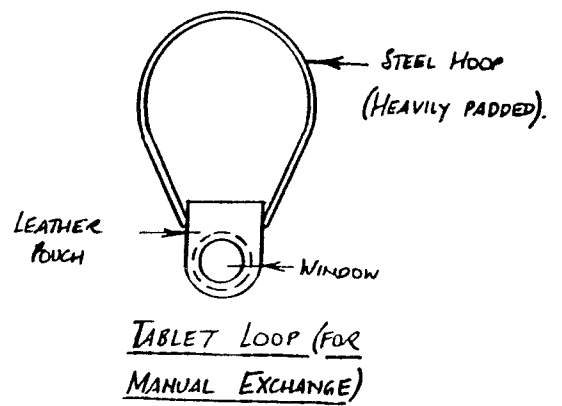
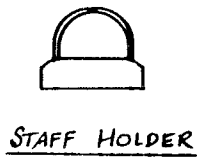
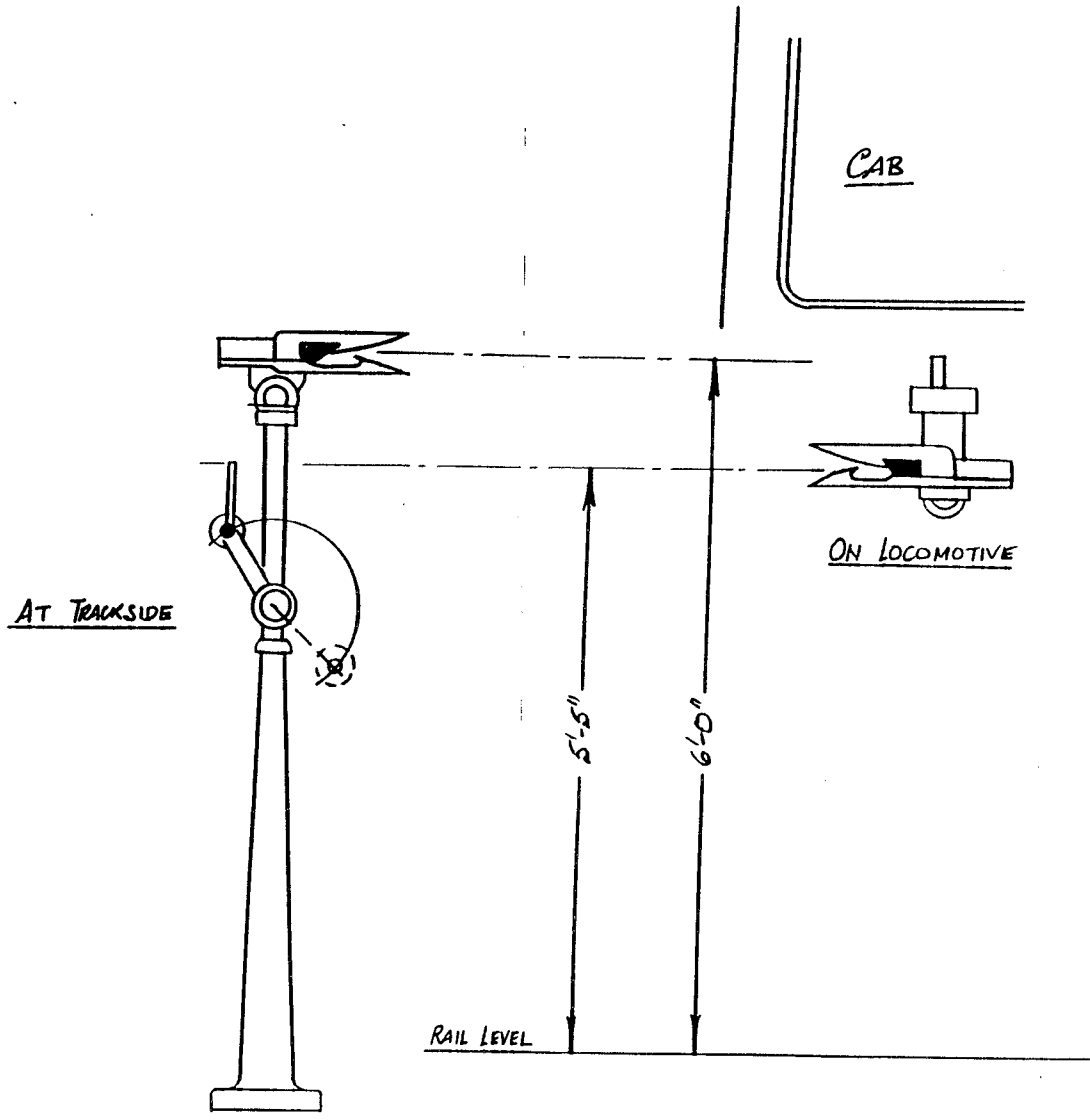
"No SIGNALMAN" KEY TOKEN



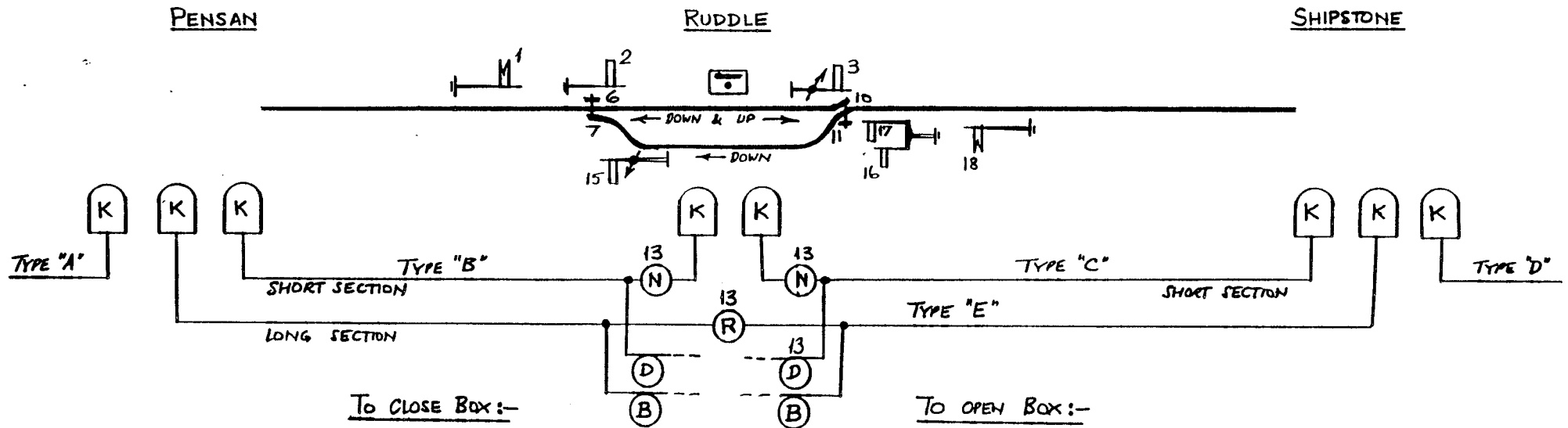
INSTRUMENT IN SIGNAL BOX

"No SIGNALMAN" INSTRUMENT

WHITAKER'S TOKEN EXCHANGER



LONG AND SHORT SECTION WORKING  
WITH TOKEN INSTRUMENTS.



To CLOSE BOX:-

SET THROUGH LINE - PULL 11. 10. 6.

PULL KING LEVER 13 TO (D) POSITION.

OBTAIN TOKEN RELEASE FROM PENSAN AND SHIPSTONE - PULL 13 TO (R)

LOWER SIGNALS 2. 3. 1. 17. 18.

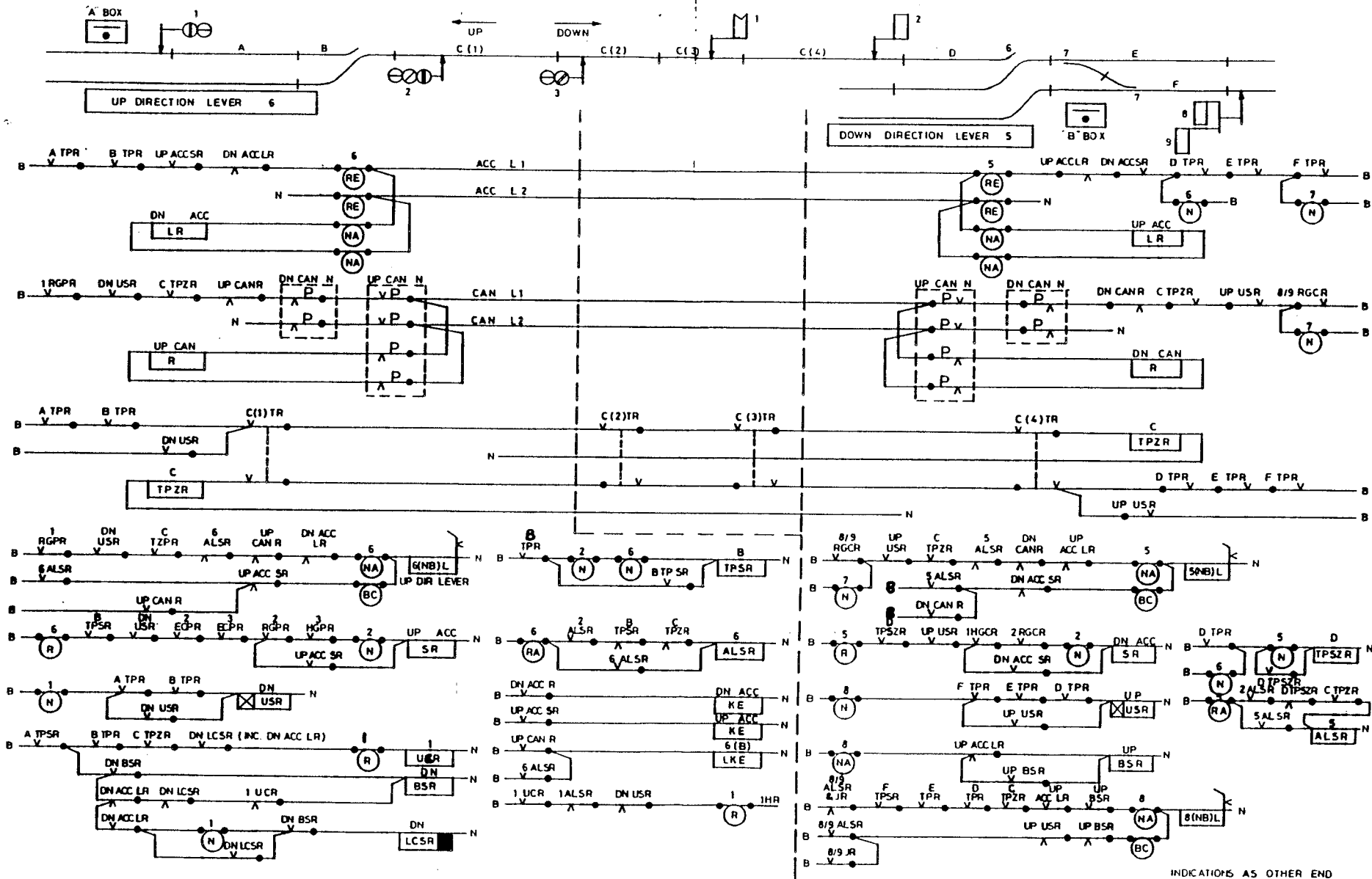
To OPEN BOX:-

PUT SIGNALS TO "DANGER".

MOVE 13 TO (B) POSITION.

OBTAIN RELEASE FROM EACH END ON LONG SECTION INSTRUMENTS.

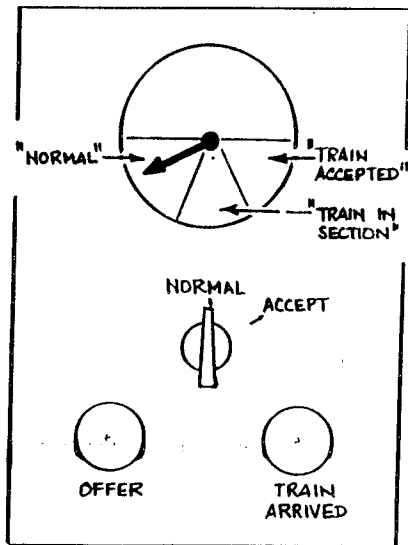
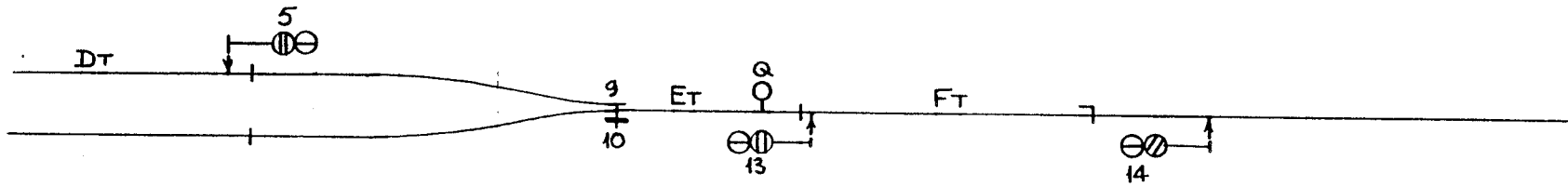
REPLACE 13 TO NORMAL.



DIRECTION LEVEL CIRCUITS.

TOKENLESS BLOCK

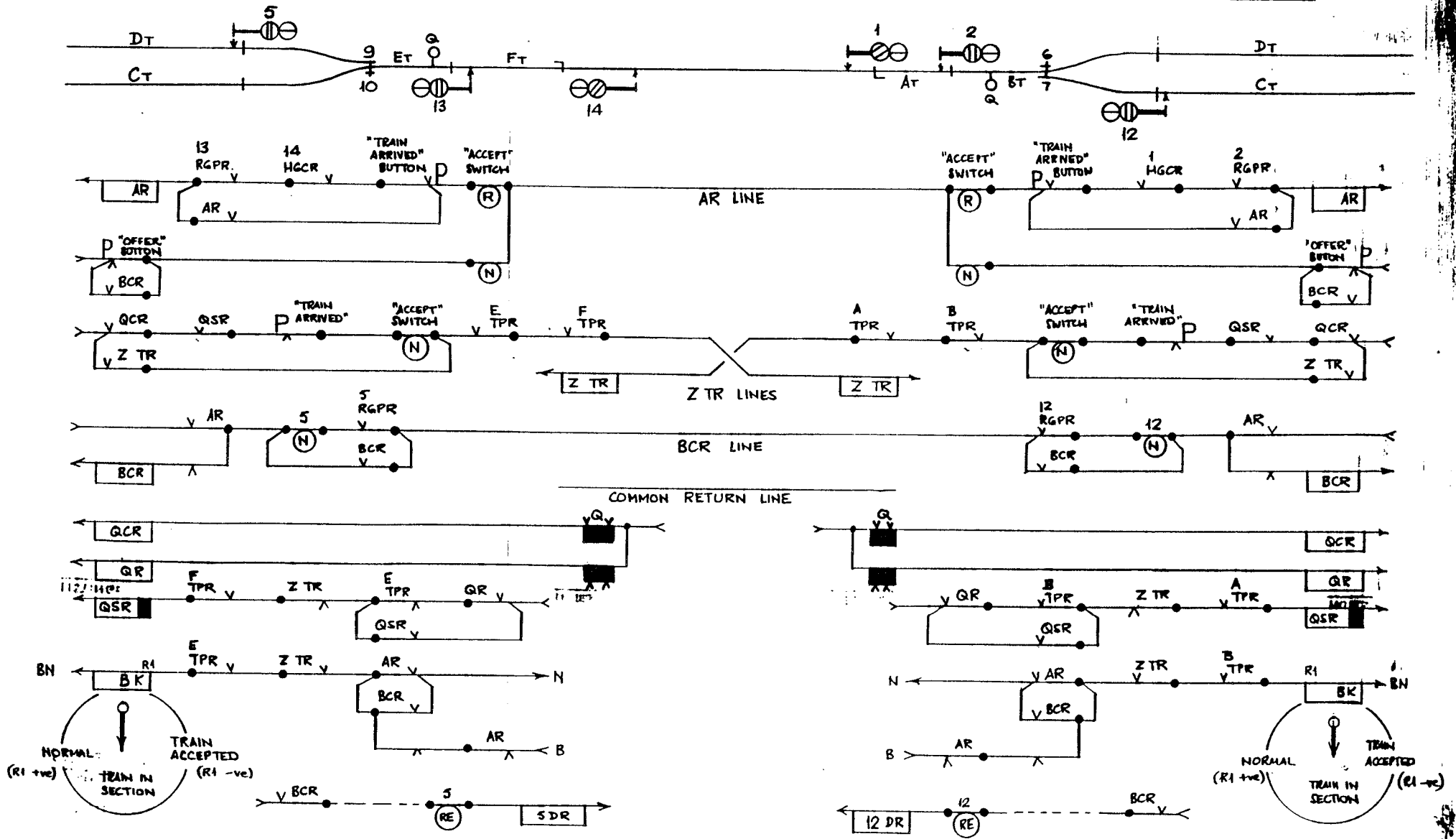
LITCHBOROUGH



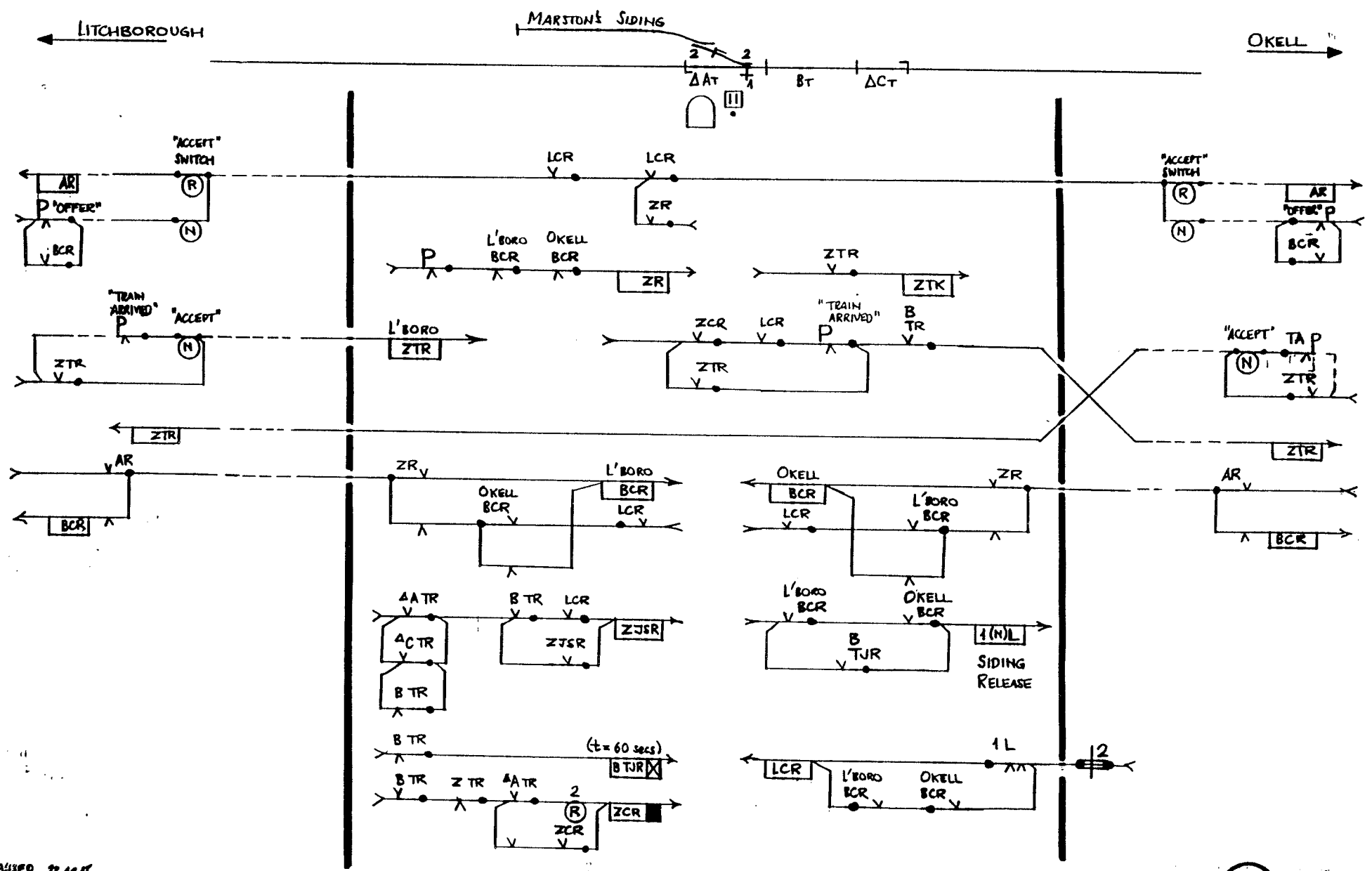
# TOKENLESS BLOCK: CIRCUIT PRINCIPLES

LITCHBOROUGH

OKELL



# INTERMEDIATE SIDING (TOKENLESS BLOCK)








REVISED 23 APR 66

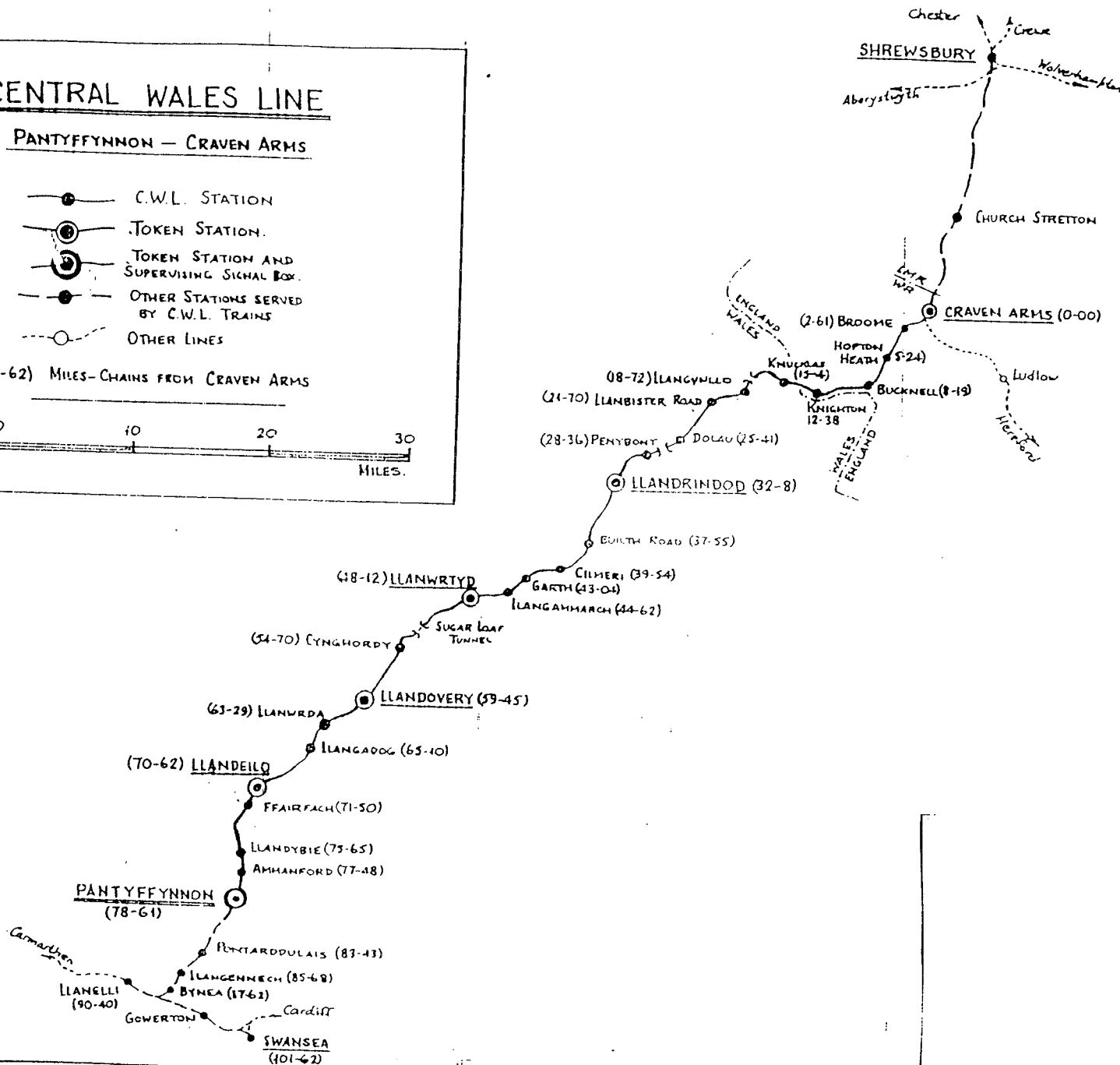
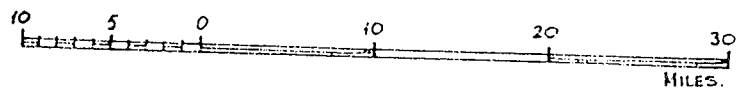


# CENTRAL WALES LINE

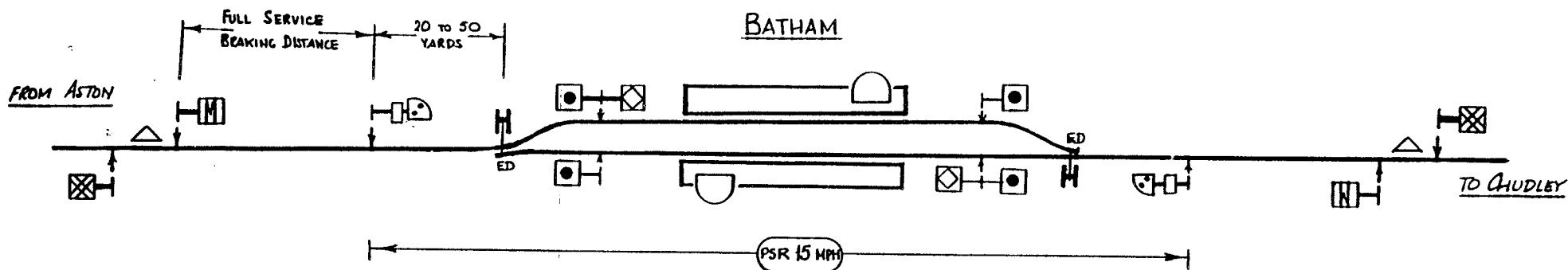
## PANTYFFYNNON — CRAVEN ARMS

-  C.W.L. STATION
-  TOKEN STATION.
-  TOKEN STATION AND SUPERVISING SIGNAL BOX.
-  OTHER STATIONS SERVED BY C.W.L. TRAINS
-  OTHER LINES

(70-62) MILES-CHAINS FROM CRAVEN ARMS



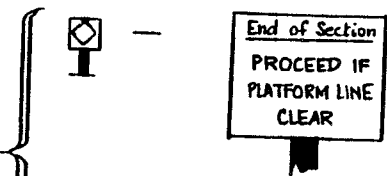
"NO SIGNALMAN" CROSSING LOOP



△ — A.W.S. PERMANENT MAGNET.

⊞ — "FIXED DISTANT" BOARD.

◑ — POINT INDICATOR (WITH RETRO-REFLECTIVE PLATE).



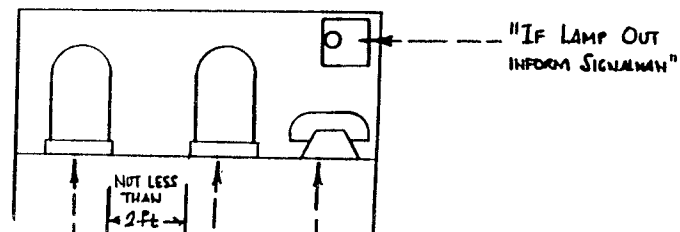
ERECTED AT FOULING POINT

NAME OF NEXT TOKEN STATION.

ED — HYDRO-PNEUMATIC POINTS (ELECTRICAL DETECTION)

⊞ — A.W.S. CANCEL BOARD.

◑ — INSTRUMENT CUPBOARD: (AS SEEN FROM PLATFORM)

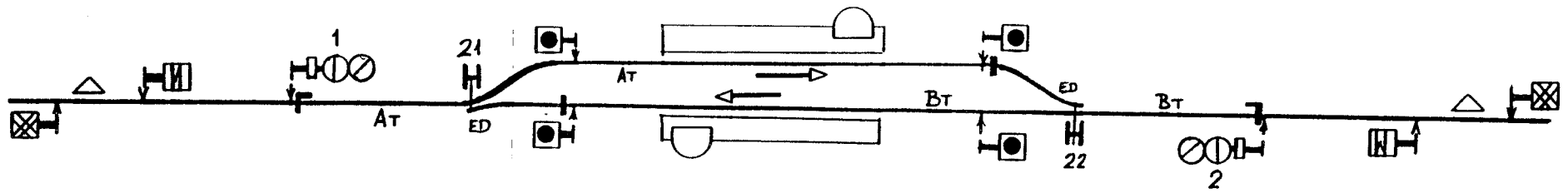


"NO SIGNALMAN" INSTRUMENTS

REAR SECTION —  
ADVANCE SECTION —

TELEPHONE TO SUPERVISING SIGNALMAN

"NO SIGNALMAN" CROSSING LOOP  
FOR LINES WITH FREIGHT TRAFFIC



— POINT INDICATOR (WITH RETRO-REFLECTIVE PLATE).

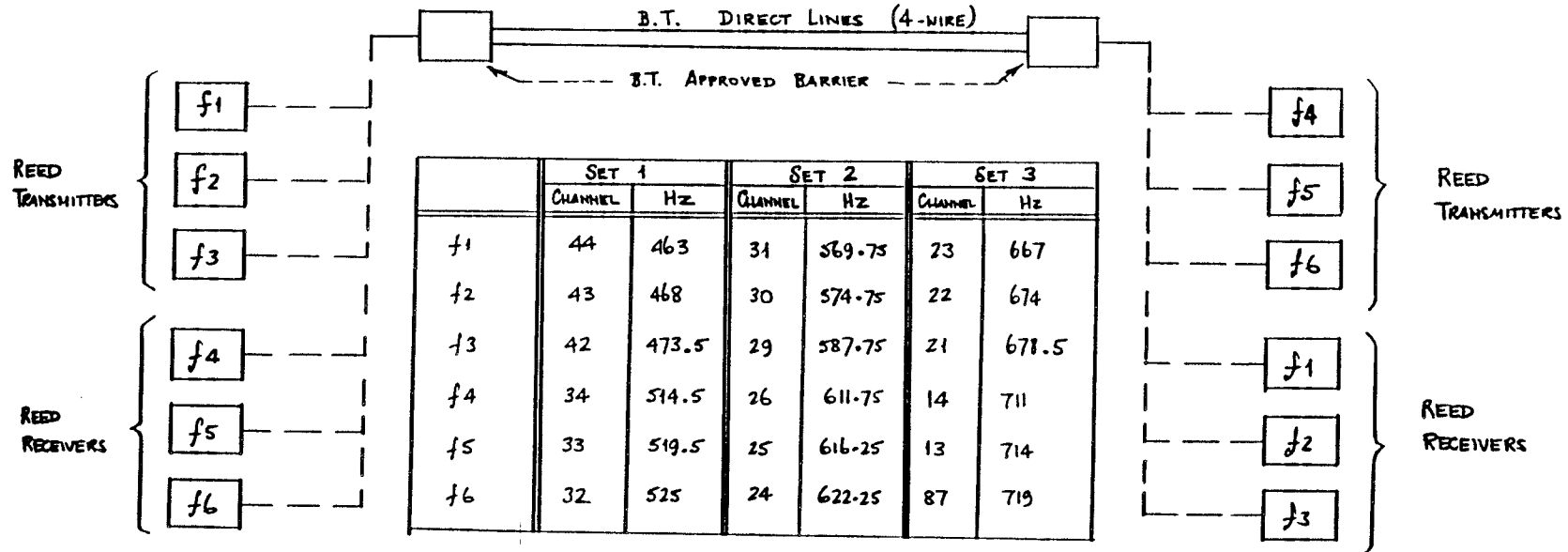
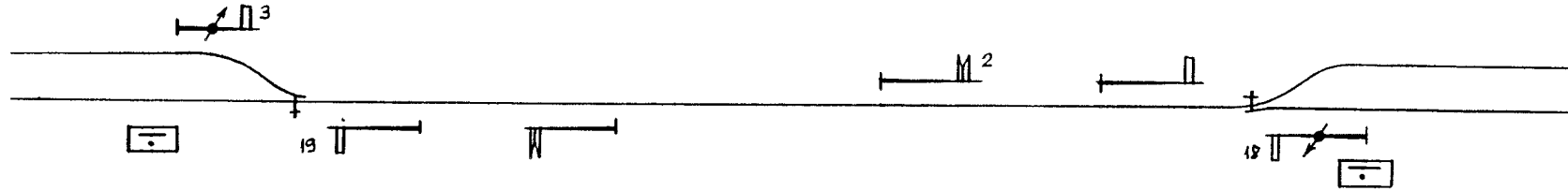
- 1 REQUIRES 21 POINTS NORMAL AND TRACK A CLEAR.
- 2 REQUIRES 22 POINTS NORMAL AND TRACK B CLEAR.

# ELECTRIC TOKEN OVER B.T. LINES

## USE OF FREQUENCIES

THEAKSTON

YATE



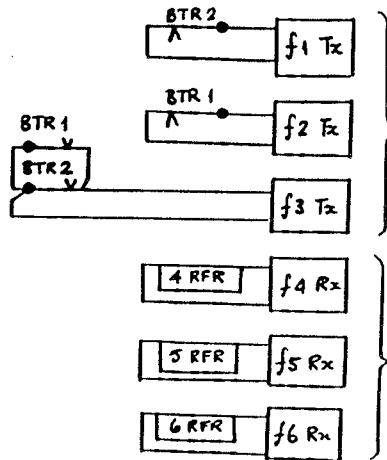
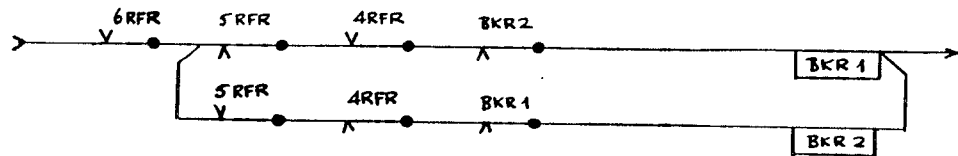
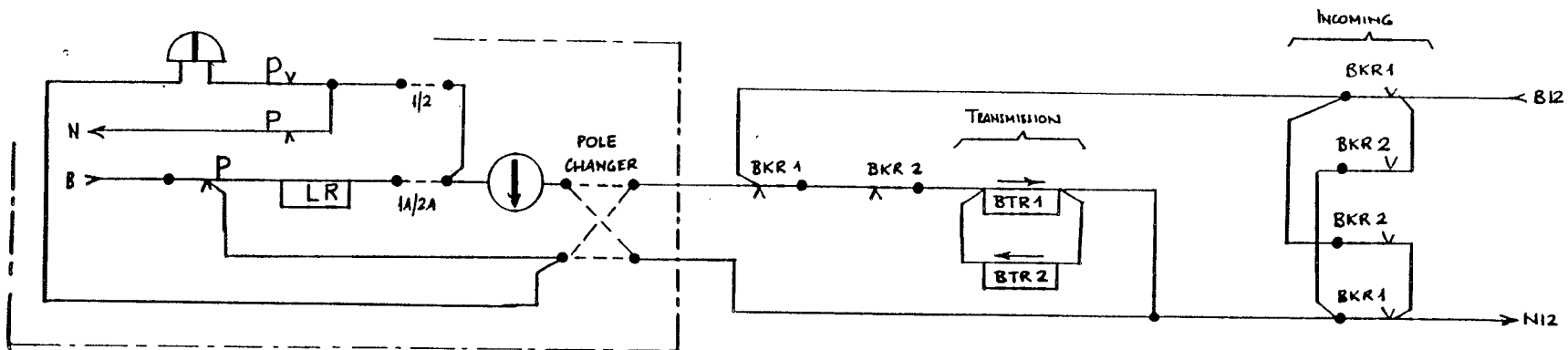
$f1 + f2 \rightarrow$  NORMAL STATE  $\leftarrow f4 + f5$

$f1 + f3 \rightarrow$  PHASE 'A'  $\leftarrow f4 + f6$

$f2 + f3 \rightarrow$  PHASE 'B'  $\leftarrow f5 + f6$

# ELECTRIC TOKEN OVER B.T. LINES

## BASIC CIRCUITS



### TRANSMIT :

$f_1 + f_2 \rightarrow$  NORMAL  
 $f_1 + f_3 \rightarrow$  PHASE 'A'  
 $f_2 + f_3 \rightarrow$  PHASE 'B'

### RECEIVE :

$f_4 + f_5 \leftarrow$  NORMAL  
 $f_4 + f_6 \leftarrow$  PHASE 'A'  
 $f_5 + f_6 \leftarrow$  PHASE 'B'