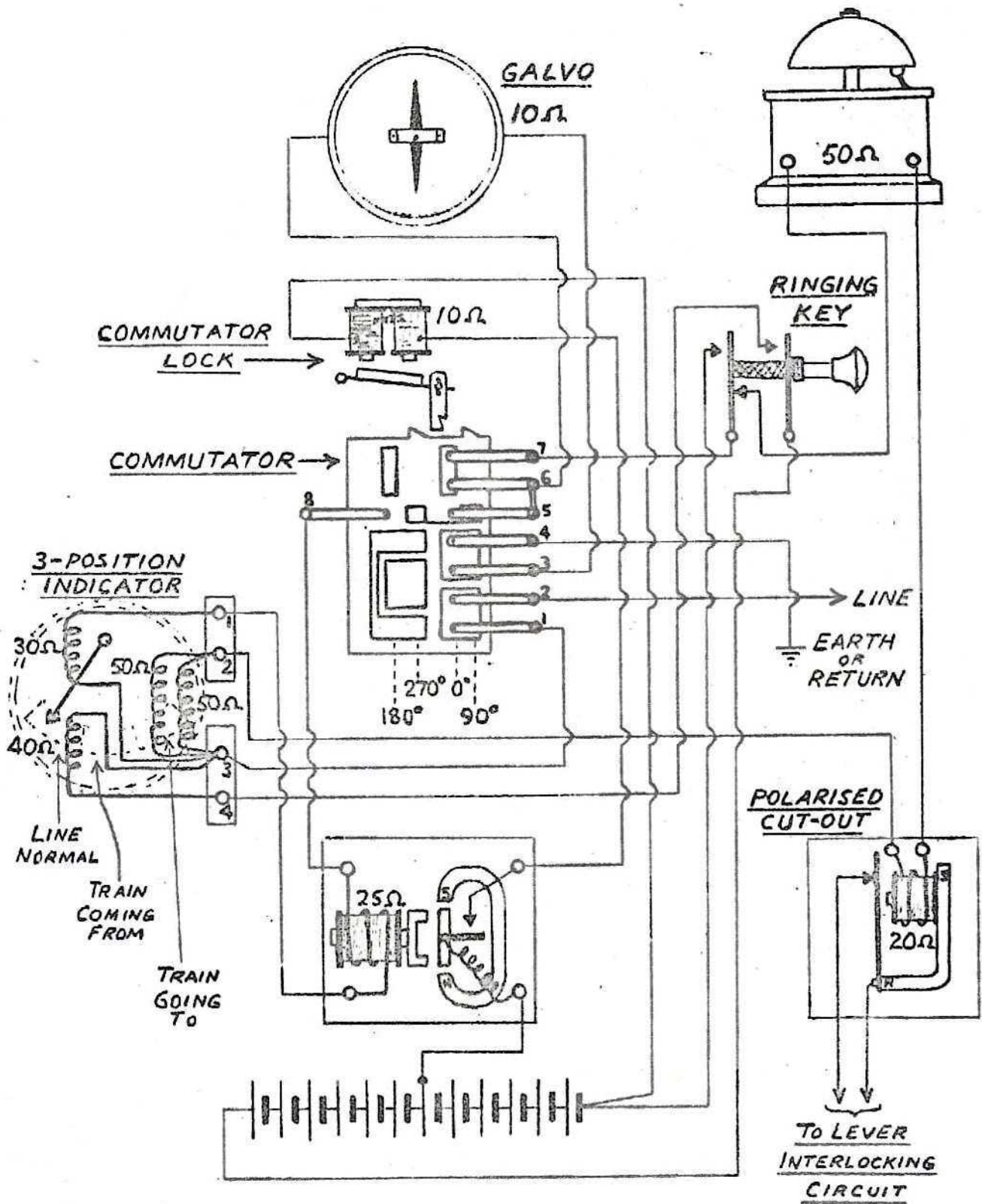


TYER'S KEY-TOKEN INSTRUMENT WIRING



The instrument has the following mechanisms:-

Commutator having four positions, i.e. 0° 90° 180° 270° which is rotated by turning of a key token when withdrawing or returning it to the instrument magazine.

Electric lock on the commutator energised by the operation of a polarised relay by the correct release current at the other end of the key token section. This lock only energises at 90° or 270° .

Three position indicator showing "Normal" "Train going to" or "Train coming from". (See later description of working)

Token Instrument Galvanometer in series with the line when the commutator is 0° or 180° .

Polarised Circuit Breaker in series with the 12 ohm. bell.

Ringling Key

Signal section lock relay independent of the instrument with 1 ohm. pick up and 1800 ohm. hold up coils.

Preliminary

It must be first understood that it is essential that the commutators at both ends of the section when installed are both at 0° or both at 180° . To check this, at 0° the first pair of contacts on the commutator are making, but at 180° contacts 2 and 3 are making. Otherwise, the correct polarities are not maintained.

Operation

Assuming both instruments are at 0° then the operation for the movement of a train from "A" to "B" is:-

OFFERING TRAIN

"A" will ask "is line clear" by using the ringling key, to operate bell at "B" as follows:-

With commutator at "A" at 0° ringling key will put positive to line, in at "B" on line, then commutator contacts 2/1, then indicator terminals 3/2 holding pointer to the left at "Normal", then via polarised circuit breaker breaking the contact. This will break the hold up circuit of the section relay if still energised. Then to 12 ohm. bell, key normal to contacts 6 on commutator, to Galvo, to commutator contacts 3/4, to return to box "A" to commutator contacts 4/3, to Galvo, commutator contacts 7, to ringling key depressed, to negative battery. We thus have bell rung at "B" and both "A" and "B" galvos deflected.

LINE CLEAR FROM "B"

If "B" is able to accept he will reply and hold down on the last ring.

TAKING KEY OUT AT "A"

"A" watches his Galvo, and while it is deflected he will lift one key up to the aperture to engage on the barrel of the commutator and turn it anti-clockwise 90° .

This will cause commutator contacts 6 to break, but 5 to make. 1/2, 3/4 still making.

Circuit will thus be line, commutator contacts 2/1, indicator terminals 3/1, then through polarised relay, commutator contacts 5, Galvo, commutator contacts 3/4 to return.

TAKING KEY OUT AT "A" (cont.)

Polarised relay energised gives:- local battery positive, contacts of polar relay, commutator lock coil, section lever contact normal, pick up of 1 ohm. relay, then to negative.

1/1800 ohm. relay holds thus:-

Hold battery positive, polarised circuit breaker, special contact "X" in instrument (described later), lever contact (shown DB), through relay contact 1, 1800 ohm. coil of relay to battery negative.

KEY OUT AT "A"

Commutator would be turned from 90° to 180° to enable key to be withdrawn. Indicator now "train going to".

The section lever can now be pulled.

Note now the position of the commutators:-

At "B" the position is 0° , at "A" - at 180° . This is called "out of phase". At "A", commutator contacts 1/4, 2/3 are made and any further ringing from "B" would, via commutator contact 5 be the wrong polarity for the polarised relay to operate.

Current Polarity

Note. When commutator at "A" at 90° positive on line from "B" gives positive at relay.

When commutator at "A" at 270° positive on return from "B" gives positive at relay.

KEY ON TRAIN

The key token is now delivered to the driver of the train to "B". The restoration of the section signal at "A" will cut the feed to the hold up coil of the section relay which will now drop. Lever contact is:-

passing contact broken when lever is replaced, shown as "DB".

At "B", the key token is inserted into the instrument, turned clockwise through 180 degrees and allowed to drop into the magazine.

INSTRUMENTS "IN PHASE"

This means that the commutators at "A" and "B" are at 180° or "in phase" and any ringing will put negative to line, but the position of the commutator at the receiving signal box will change the polarity for correctly releasing the commutator lock.

"T.O.S."

When "B" gives "Train out of section", the ring with commutator at 180° will give positive to return and with the commutator at "A" at 180° , through contacts 4/1, indicator terms 3/2, (to show "LINE NORMAL"), picking up polarised circuit breaker, via bell, key, commutator contacts 6, Galvo, commutator contacts 3/2, to line to "B" Box.

Polarised circuit breaker contacts breaking will drop section signal relay if the signal lever has not been replaced.

Cancelling

Should the train have been shunted back into a Siding at "A" or for some other reason not gone through the section, when the token is replaced in the instrument at "A", a contact will break dropping the section signal relay.

The contact is marked on drawing:- "contact in main instrument broken momentarily when replacing key in main instrument".

This contact will also break on taking a key out of the instrument before reaching the commutator lock position, but this is by the way.

INDICATOR WORKING

For the sake of brevity the working of the 3 position indicator was omitted but the effect of currents through the coils connected to the terminals is as follows:-

POINTER POSITIONS

<u>LEFT</u>	<u>CENTRE</u>	<u>RIGHT</u>
"Line Normal"	"Train coming from"	"Train going to"

Terminals 2 and 3

The two 50 ohm. operating coils are connected in parallel between terminals 2 and 3 thus giving a joint resistance of 25 ohm.

Current through the coils from terminals 2 to 3 moves indicator pointer to the right, current from terms 3 to terms 2 moves or holds the pointer to the left.

Residual magnetism holds the pointer at the operated position when current ceases.

Terminals 4 and 3

Current through the 40 ohm stop coil from terminals 4 to 3, turns the stop armature counter clockwise and sets the stop so that the indicator pointer, when moved by current through the operating coils, is arrested on the half-deflection position i.e., at the "Train Coming From" indication.

Terminals 3 and 1

Current through the 30 ohm stop coil from terms 3 to 1, turns the stop armature clockwise, thus clearing the stop and allowing a full deflection of the pointer to the "Train going to" indication.

The sequence at "A" box sending a train is:-

1. Ring out, terms 4 to 3 sets stop for "train coming from"
2. Ring in, terms 3 to 2 No action
3. Commutator 90°, terms 3 to 1, - sets stop for "train going to"
4. Commutator 180°, terms 2 to 3, - operates indicator to "train going to"
5. Receive "T.O.S.", " 3 to 2, - " " " " "Line normal"

The sequence at "B" Box receiving a train is:-

1. Hold Ringing Key, terms 4 to 3 sets stop for "train coming from"
2. Token out at "A" Box, one beat on bell from "A" to "B" (positive to return) terms 2/3, operates indicator to "train coming from"
3. "T.O.S." to "A", terms 3 to 2, operates indicator to "line normal"

4

The usual form of section signal relay is 1 ohm/1800 ohm. "SYX" pattern with terminals 1 to 7 as follows:-

		<u>On Diagram</u>
1.	+) 1 ohm. coil pick-up	R.H.
2.	- } 1 ohm. coil pick-up	L.H.
3.	- of 1800 ohm. coil	L.H.
4.	to plate of relay and lever contact A position.	Arm
5.	+ from "DB" contact	Front
6.	to key	Arm
7.	+ from battery	Front

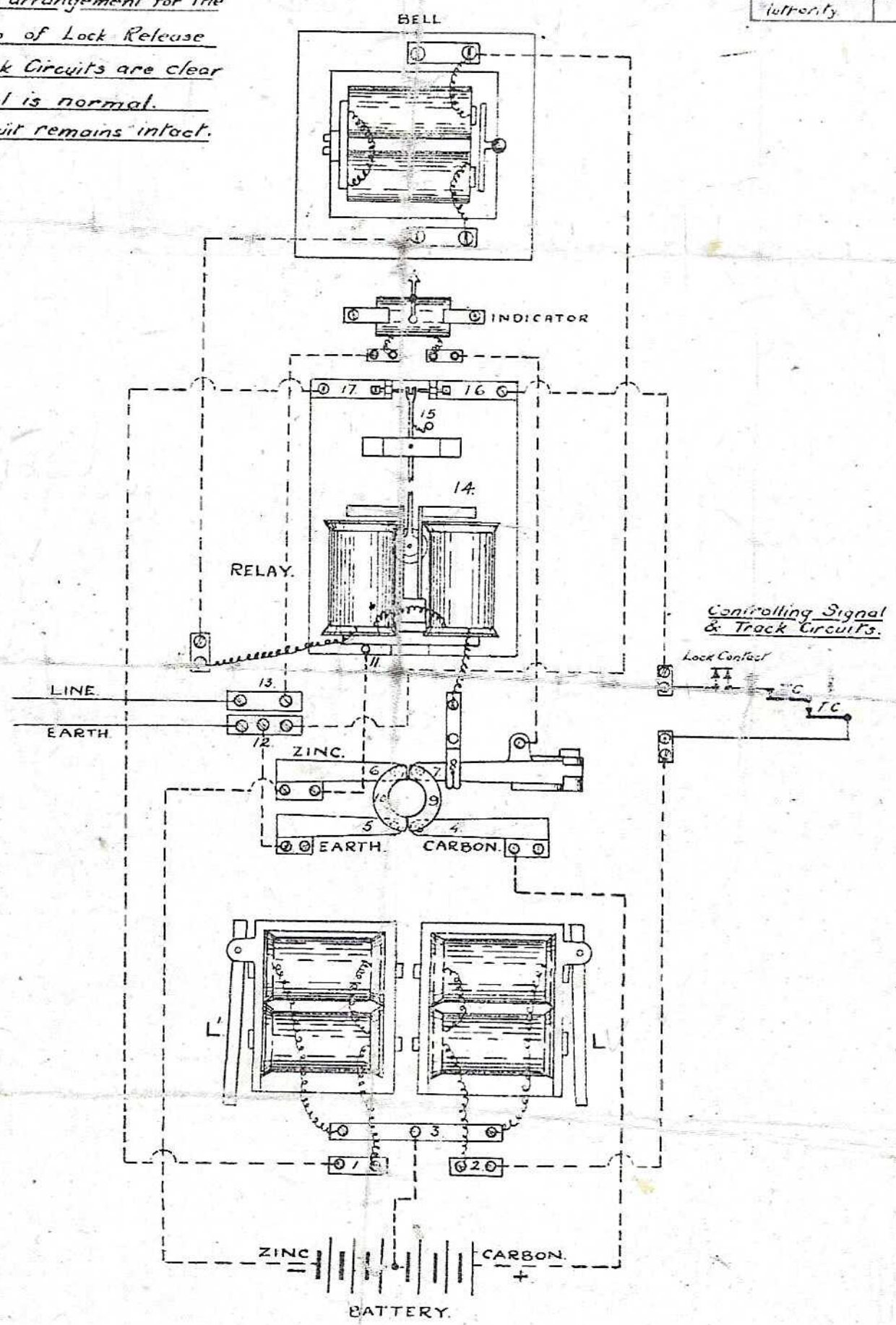
The above description only applies to instruments and relays of the particular type and should be varied appropriately to suit earlier or later models.

Similarly, the description is a basis for the understanding of Auxiliary Key token instruments and long and short section working.

Reference and acknowledgment

Paper by Mr. R.O. Willmott - "Single line instruments on the S.R."
S.R. Technical Society 10.4.1951.

Standard arrangement for the prevention of Lock Release until Track Circuits are clear & Signal is normal. Bell Circuit remains intact.



[Signature]
Approved
Assistant Engineer
Date 27/1/28

Approved *[Signature]*
Signal Engineer
Date 28.7.28

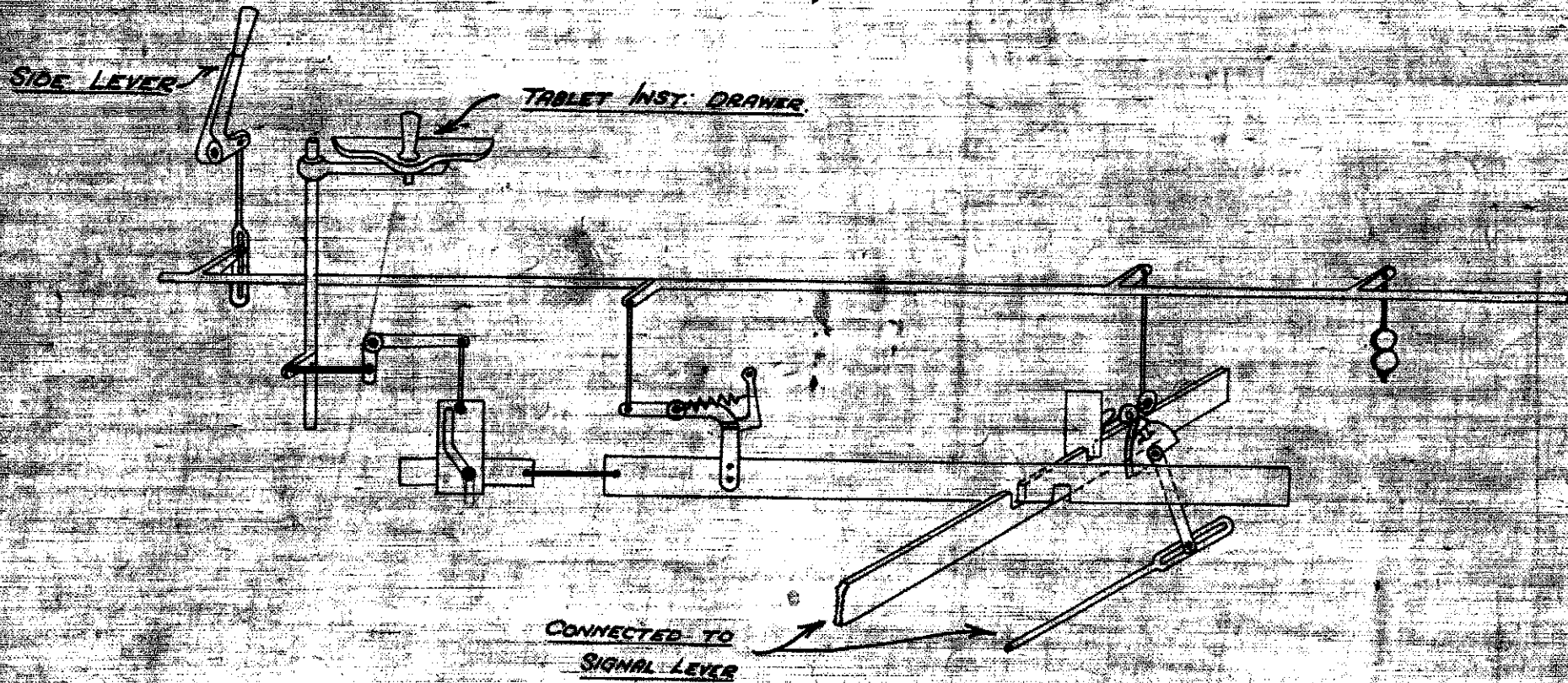
Approved *[Signature]*
Engineer
Date 11/1/28

LNER. - N.E. AREA.
Train Tablet Apparatus N° 6.
Track Circuit & Signal Control.

DRAWING N° 28 ES 192

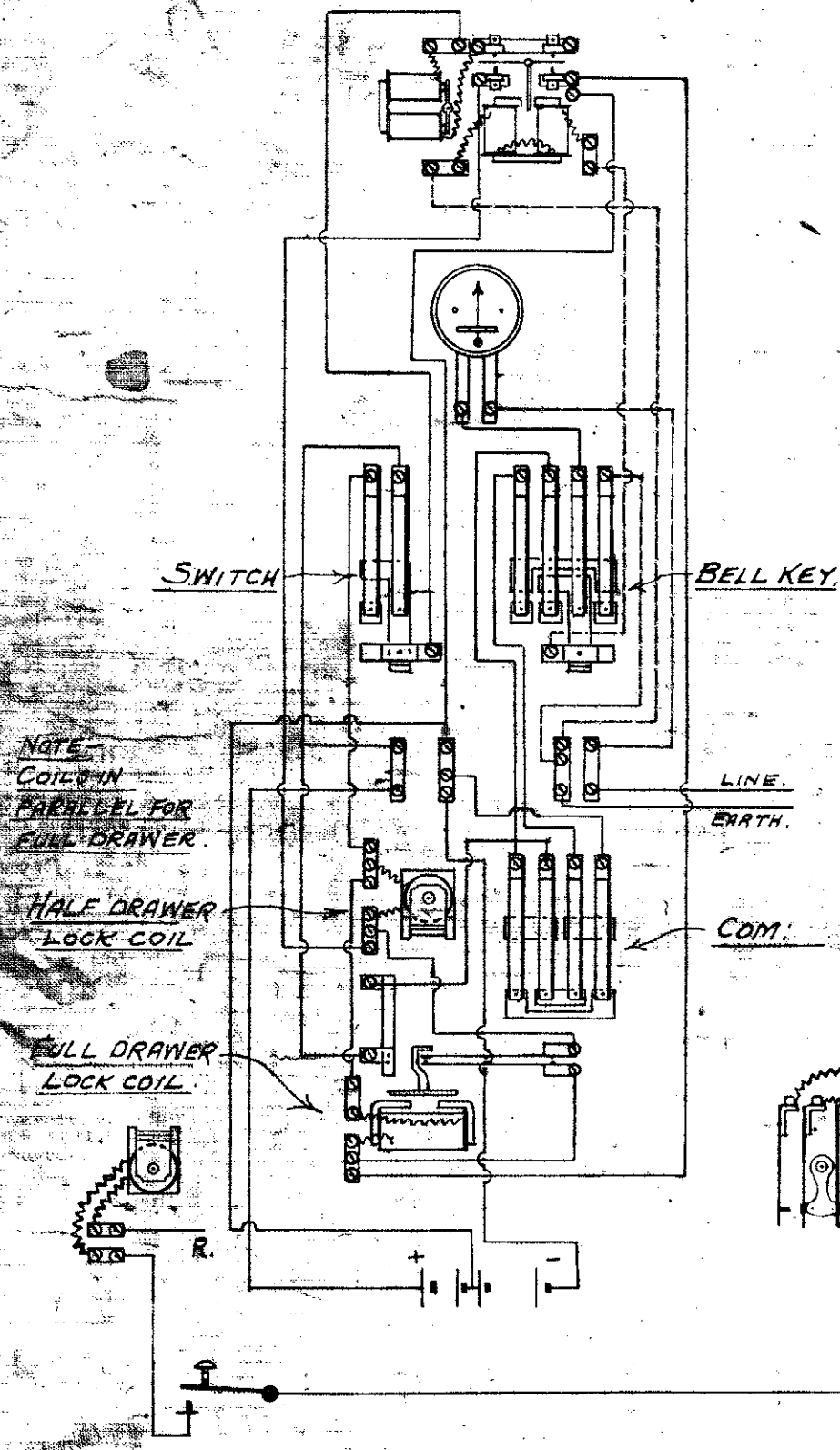
Drawn by	E.O. Gordon	Correct
Traced by	A.U. [Signature]	
Checked by	[Signature]	

MECHANICAL INTERLOCKING BETWEEN NO 6 TABLET INSTRUMENT &
THE SIGNAL LEVER.



E29.12

No 7 TABLET INSTRUMENT & ELECTRICAL LOCKING DIAGRAM OF CONNECTIONS.



*Note:-
Electric Lock on Signal lever
to have $\frac{1}{4}$ " clearance, both front
& back when all slack taken up.
Lock on Tablet slide to have a
clearance of $\frac{1}{16}$ " when slide pushed
in tight against ordinary backlock.*

