# DEPARTMENT OF TRANSPORT

## RADIO DIVISION

# REFERENCE DIAGRAMS

AND

# OPERATING INSTRUCTIONS

FOR

MARCONI AUTOMATIC ALARM

# THE MARCONI AUTO-ALARM

The complete installation consists of receiver, type 332, selector, type 333, and switch, type 272, charging board, type 242, and three alarm bells.

## THE RECEIVER, type 332.

Combined tuner and three valve amplifier. The first valve, type DER, is used as a detector with regeneration. The second valve, also type DER, an audio-frequency amplifier and the third, a type DE7, four electrode valve, is used as a relay circuit control.

The aerial is connected through a small condenser (to bring all probable ships aerials within range of the tuning limits) to an A.T.I., having five taps for coarse adjustment and a variometer for fine adjustment. The aerial condenser is shunted by a resistance to prevent the accumulation of static charges. The blocking condenser between earth and filament prevents short circuit of the L.T. battery. The coupling between primary and secondary inductances is fixed. The closed circuit is permanently adjusted to correct wave-length, but the fixed condenser can be adjusted to small variations if necessary. The coupling and damping of the circuit is arranged so that the receiver will be equally sensitive throughout its wave-length range, 585 to 615 meters.

The anode of the 1st. valve is connected through the reaction coil to the medium resistance winding of the 1st. inter-valve transformer. The low-resistance winding to telephone terminals is used for testing purposes only. The high-resistance winding is connected between grid and filament of the 2nd. valve in the usual manner. The anode of the 2nd. valve is choke-capacity coupled to grid of 3rd. valve. A low-resistance winding on this choke is also used for testing with telephones. The inner anode of the 3rd. valve is connected through a large variable resistance to the medium resistance winding of the last transformer, thence through a shunted galvanometer to No. 2 output terminal, which is connected to coils of main relay (in selector) returning via No. 1 terminal to H.T. positive. The outer anode of the 3rd. valve is connected through the high resistance winding to its own grid.

The filaments of all valves are connected in series through a fixed and a variable resistance and a "no-volt" relay to the 24 volt L.T. supply. The resistances are on the positive side, the negative side being earthed. The total anode voltage is 36 volts, made up of 24 volt L.T. and 12 volt H.T. supply, a total of 36 volts above the negative point. Should the filament current through any valve drop below normal or cease, the "no-volt" relay will operate and ring the alarm bells.

The valves require 2 volts on each filament. The DER type filament current .35 amperes, the DE7 .4 amperes.

## ACTION OF RECEIVER.

The action of the 1st. and 2nd. valves is quite normal. With no signal being received a steady current of .7 milliamperes (which is equivalent to a reading of 20 on the galvanometer scale) flows from filament to inner anode of the 3rd. valve, through last inter-valve transformer and output terminals to relay coils, where relay tongue is held against front stop, in opposition to the bias of the relay. The arrival of an incoming signal makes grid of

third valve more negative, reducing inner anode filament current and releasing relay tongue if signal is strong enough, the tongue will then be pulled back against back stop by bias of relay. This sudden reduction in current through last transformer will cause a momentary voltage across the high resistance winding, which is so connected as to make the grid still more negative, intensifying the action of the incoming signal. To prevent the grid of the third valve becoming paralysed (there being no grid leak), the grid is connected through "G" terminal to the back stop of main relay, so that the grid is discharged when tongue of relay falls over. The connection is made to a selected point in the filament circuit so that the grid is restored to its proper value.

ACTION OF SELECTOR, Type 333.

The action of the selector is governed primarily by the movement of the tongue of the main relay. Normal position is tongue against front stop, completing a circuit from positive L.T. battery through electro-magnet of primary arm to negative of battery via relay contacts. The current through this circuit is normally sufficient to hold the primary arm down against the action of the spring. If a signal of sufficient strength is received the tongue will be pulled away from the front stop and the selector can commence to work, but if the signal is too weak the relay tongue will fall back to normal position against front stop.

If a signal of proper strength is received the relay tongue will fall against back stop, the grid of the 3rd. valve will be discharged, the inner anode current will begin to increase again and tongue commence to return to front stop. If the signal continues the relay current will be reduced again and tongue returns to back stop. This continues while a signal is being received, the tongue will chatter against the back stop. Meanwhile the selector continues operation because the front stop circuit is open.

The action of the selector will now be considered, first assuming contacts "H" to be permanently closed and "I" contacts permanently open.

When the tongue of the main relay leaves the front stop the circuit through primary electro-magnet is open and the spring commences to pull arm up against the action of the dash pot. By adjustments of spring the contacts "D" will close three seconds after arm commences upward movement and "C" contacts two seconds after "D" contacts. When the "D" contacts are closed a circuit is completed from positive L.T., primary arm and driving pawl electro-magnet to negative L.T. which will energise the magnet and draw pawl wheel around by one tooth. The pawl wheel will be held by the action of a holding pawl.

If the primary arm closes "C" contacts, a circuit is completed from positive L.T., primary arm, "C" contacts to contact "Q", through re-setting magnet to negative of battery. This magnet will draw back both driving and holding pawls and allow the pawl wheel to be pulled back to normal starting position by the action of a spring. Normally "Q" contact is open, the contact being closed when pawl wheel commences to rotate, otherwise the re-setting magnet circuit would be closed through "Q" and "G" contacts.

From the above it will be seen that the pawl wheel will be advanced by one tooth if the signal consists of an unbroken dash of three seconds duration, but if it continues for five seconds the shaft (of pawl wheel) will be returned to starting position.

Therefore, a four second dash will allow the pawl wheel to move by one tooth.

When "D" contacts close a circuit is completed through electro-magnet of the secondary arm (via primary arm "D" contacts, magnet and negative battery). This pulls down the secondary arm against the action of a spring. When the circuit is open again by "D" contacts opening, the arm commences to rise against the action of a dash pot, which retards the motion so that "G" contacts are not closed until five seconds after the arm commences its upward movement.

Suppose a correctly made four second dash is being received, the primary arm rises and at the end of three seconds closes "D" contacts and secondary arm is pulled down, also pawl wheel is moved by one tooth. At the end of the four seconds dash, primary arm is pulled down again, opening "D" contacts, allowing secondary arm to commence its return motion, and will ordinarily close "G" contacts in five seconds.

Suppose that after a one second space another four second dash is started. When it has lasted three seconds the "D" contacts will again be closed and the secondary arm pulled back (before contacts "G" have closed). It has only been allowed four seconds to close "G" contacts, one second of space and three seconds of the second dash. Had the space lasted two seconds or more contacts "G" would have been closed and as they are in parallel with "C" contacts the re-setting magnet would have been energised and pawl wheel returned to its starting position.

SUMMARY OF ABOVE.

A dash of less than three seconds has no effect on the pawl wheel.

A dash of three seconds (or over) allows the pawl wheel to be advanced by one tooth.

A dash of five seconds will send the pawl wheel back to normal position.

A space of two or more seconds will send the pawl wheel back to normal also.

If the space is too short to allow selector to operate, the two dashes will be run into one and the pawl wheel will return to normal after a total of five seconds (dash, space and part of the next dash). An allowance of nearly one second is allowed either way in length of space. Anything less than two seconds and more than one-fifth of a second.

Presume three correctly made dashes and spaces to have been received. The pawl wheel has been moved three teeth. At the termination of the last dash, the contact "Z" will be closed, which is in series with the hold-on relay. Contacts "Z" close as soon as the last dash has lasted three seconds but ringing circuit is not completed until the relay tongue has returned to the front stop of completion of the last dash. If the last dash lasts five seconds the "C" contacts will be closed and pawl wheel returned to starting position, so that the alarm bells ring only on completion of the last correctly made dash.

When "Z" contact closes due to an alarm signal being received, the bell circuit is completed when relay tongue (of main

relay) returns to the front stop, on completion of the last dash. The circuit is then through front stop, "Z" contact and "Y" contact to alarm bells. The hold-on relay magnet is then energised closing "O" contacts which connects the bells directly across the L.T. battery via "Y" contacts.

If the filament current fails or falls too low, the novolt release magnet will allow "X" to close (due to pull of spring), and the alarm bell circuit is then completed. "Y" opens the hold-on relay circuit and bells will cease to ring when the filament current is restored to normal. Normally "X" contacts are open and "Y" closed.

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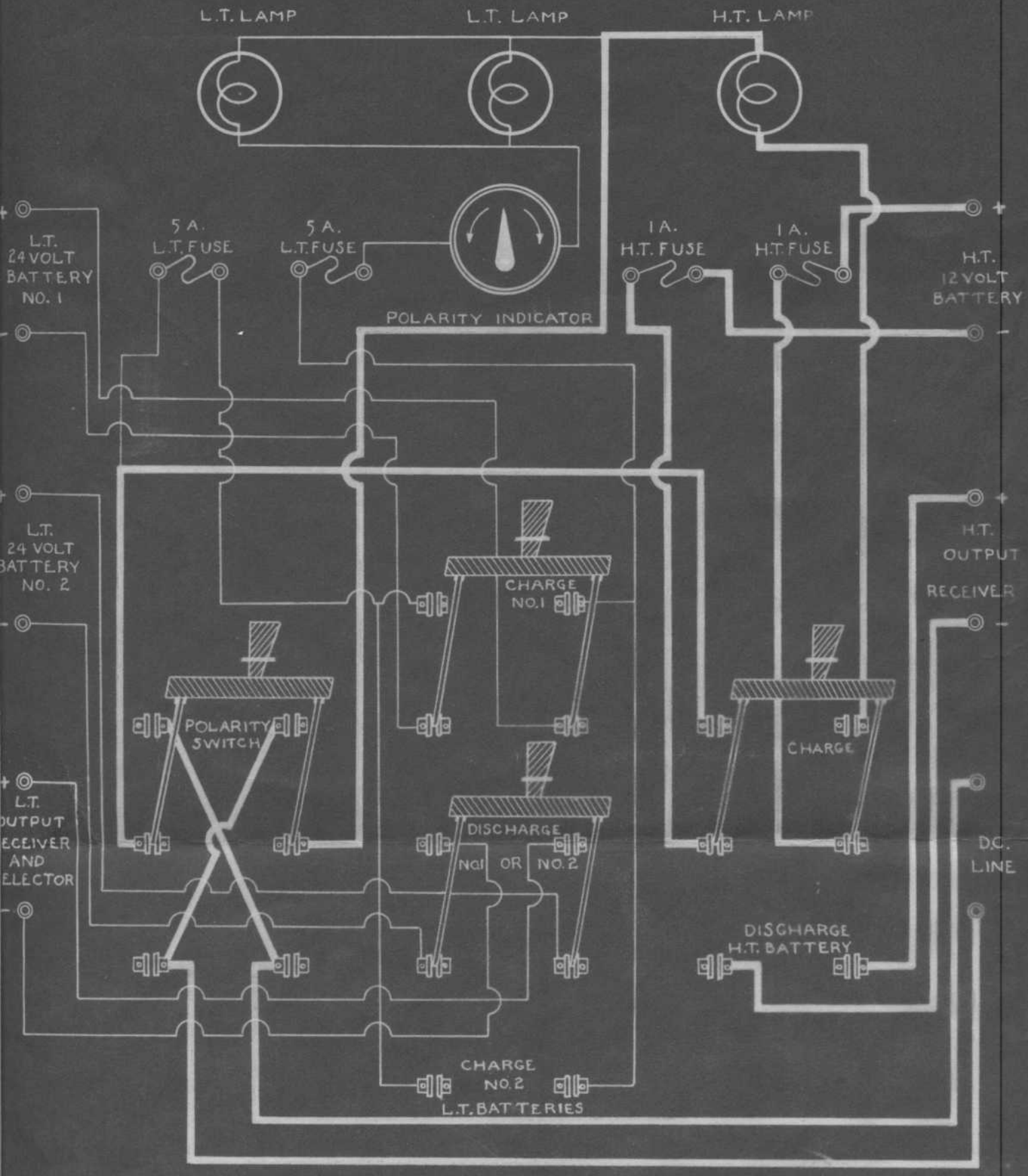
ACTION OF "H" AND "I" CONTACTS.

There remains the possibility of false calls by the reception of fast Morse or combination of two transmitters being received at once, resulting in very short spaces which might cause the primary arm to creep up and chatter against "D" contact, causing pawl wheel to move each time, giving a false alarm when moved three teeth.

This is prevented by two additional contacts. The "H" contacts fitted under the primary arm, open only when the primary arm is right down and closed as soon as the arm commences its upward movement. The "I" contacts are fitted under the driving pawl and are closed as soon as the driving pawl moves down.

When the primary arm starts upward the "H" contacts close, "D" contact is closed in 3 seconds and driving pawl magnet pulls down pawl, moving pawl wheel and at the same time closing "I" contacts. The driving pawl magnet circuit is now completed through "I" and "H" contacts whether "D" contacts are open or closed. The "I" contacts also keep the secondary arm magnet circuit complete. The driving pawl and the secondary arm are thus kept down once they have been pulled down, and are free to continue their proper action when the primary arm is right down, the "H" contacts are then opened, breaking the driving pawl circuit, (also "I" contact circuit) and the secondary arm magnet circuit, so that the secondary arm is free to commence its upward movement.

CANADIAN MARCONI COMPANY.
Montreal, Quebec.

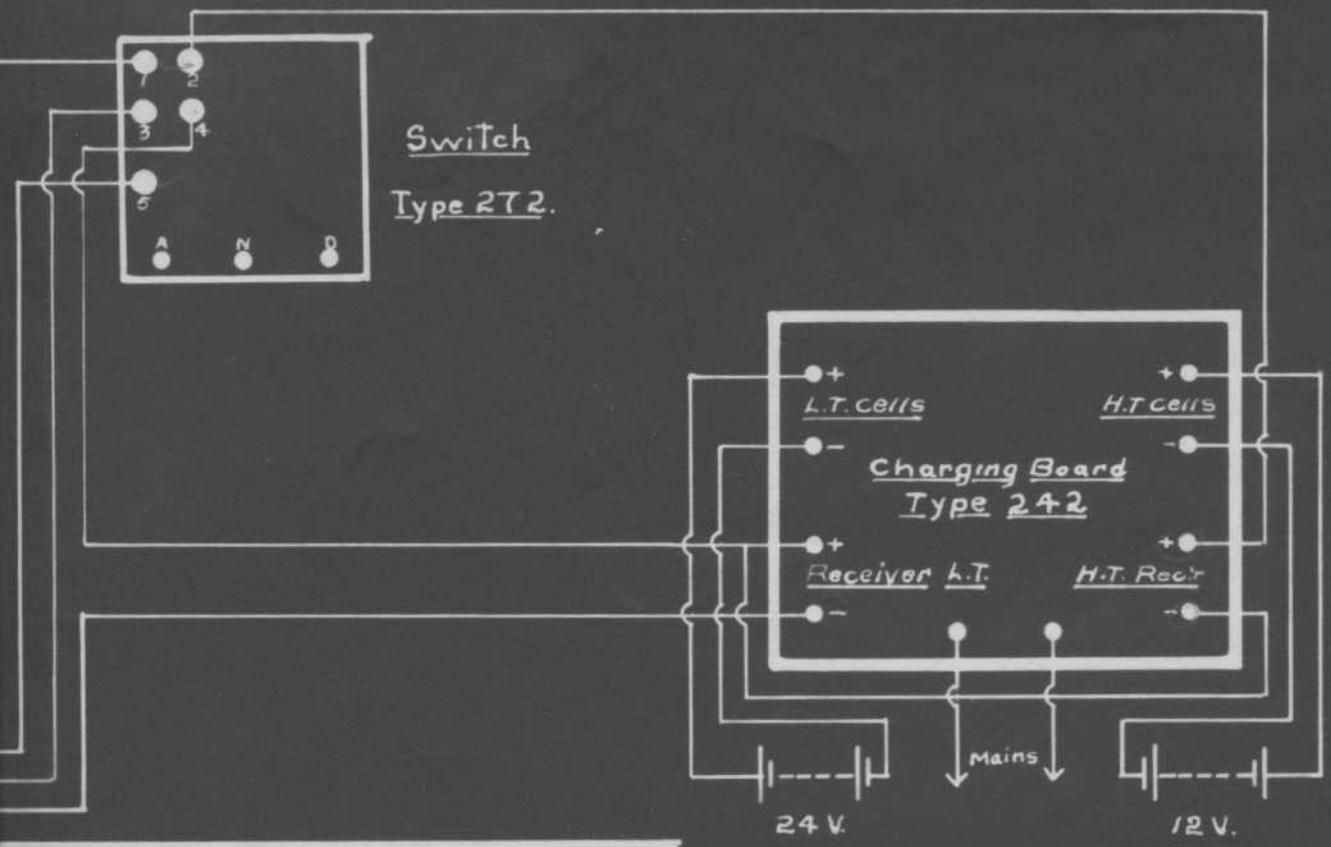


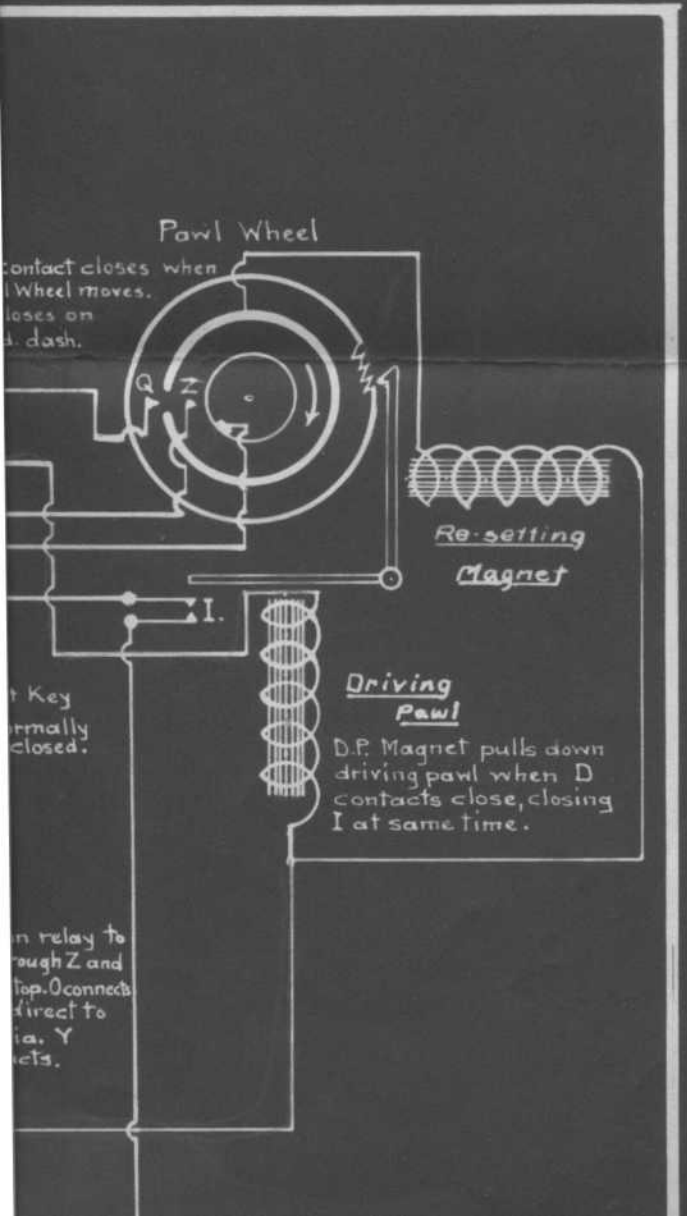

# CHARGING BOARD TYPE-242

## MARCONI AUTO-ALARM

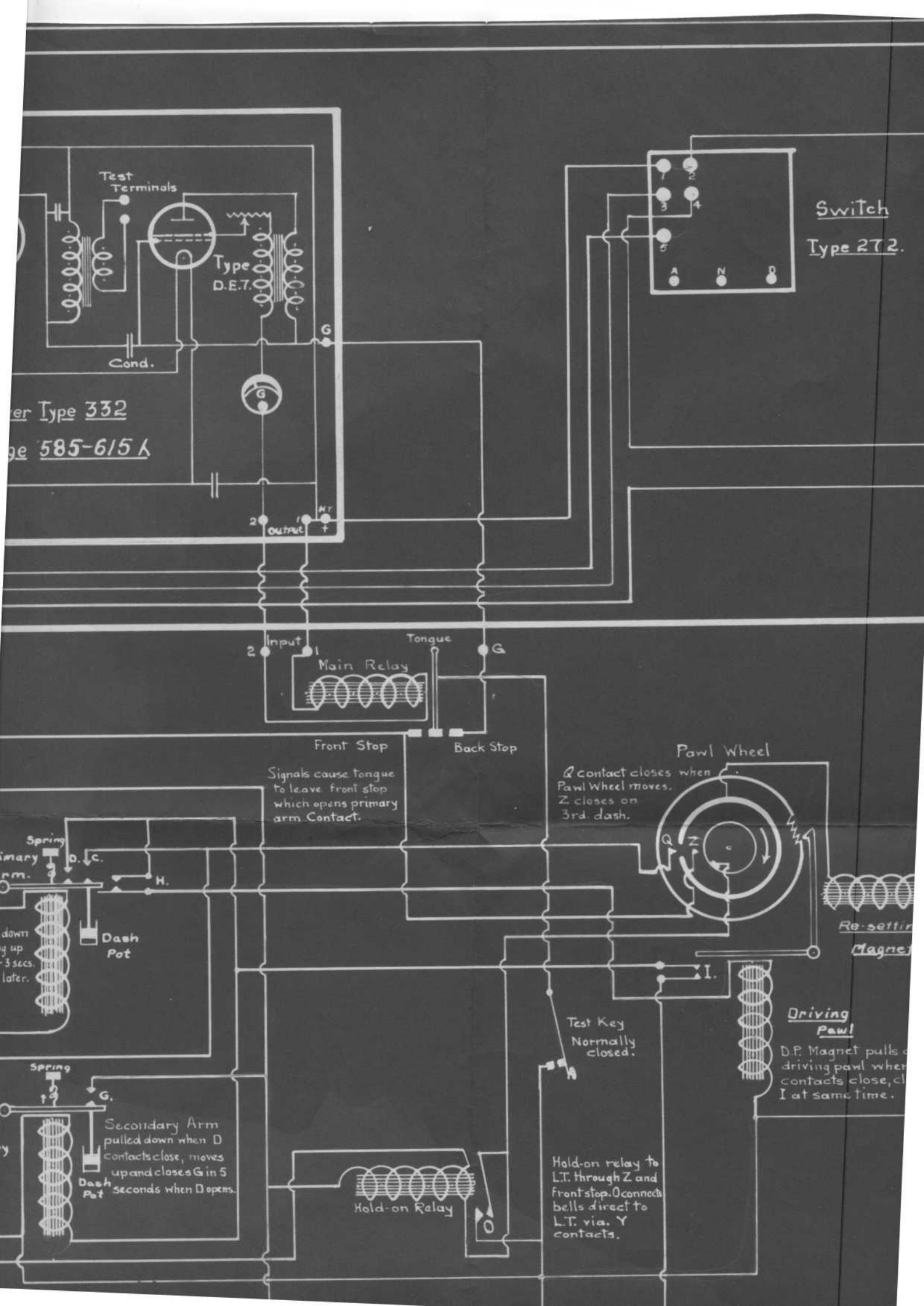
VOCATIONAL SCHOOL RADIO DEPARTMENT

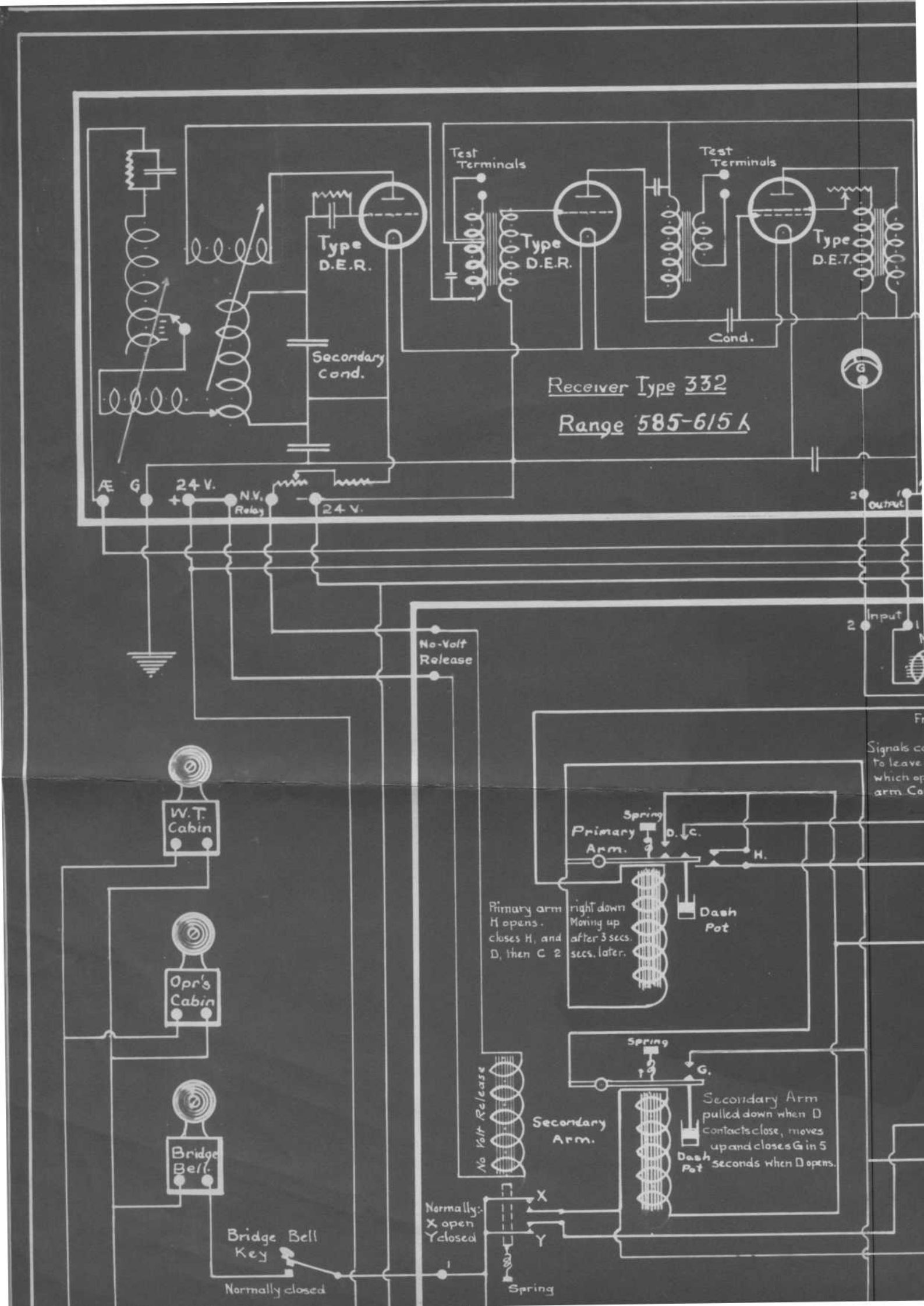
| DRAWN BY | TRACED BY | 16-12-39 |
|---|---|---|
| A.R. | G.J. | |

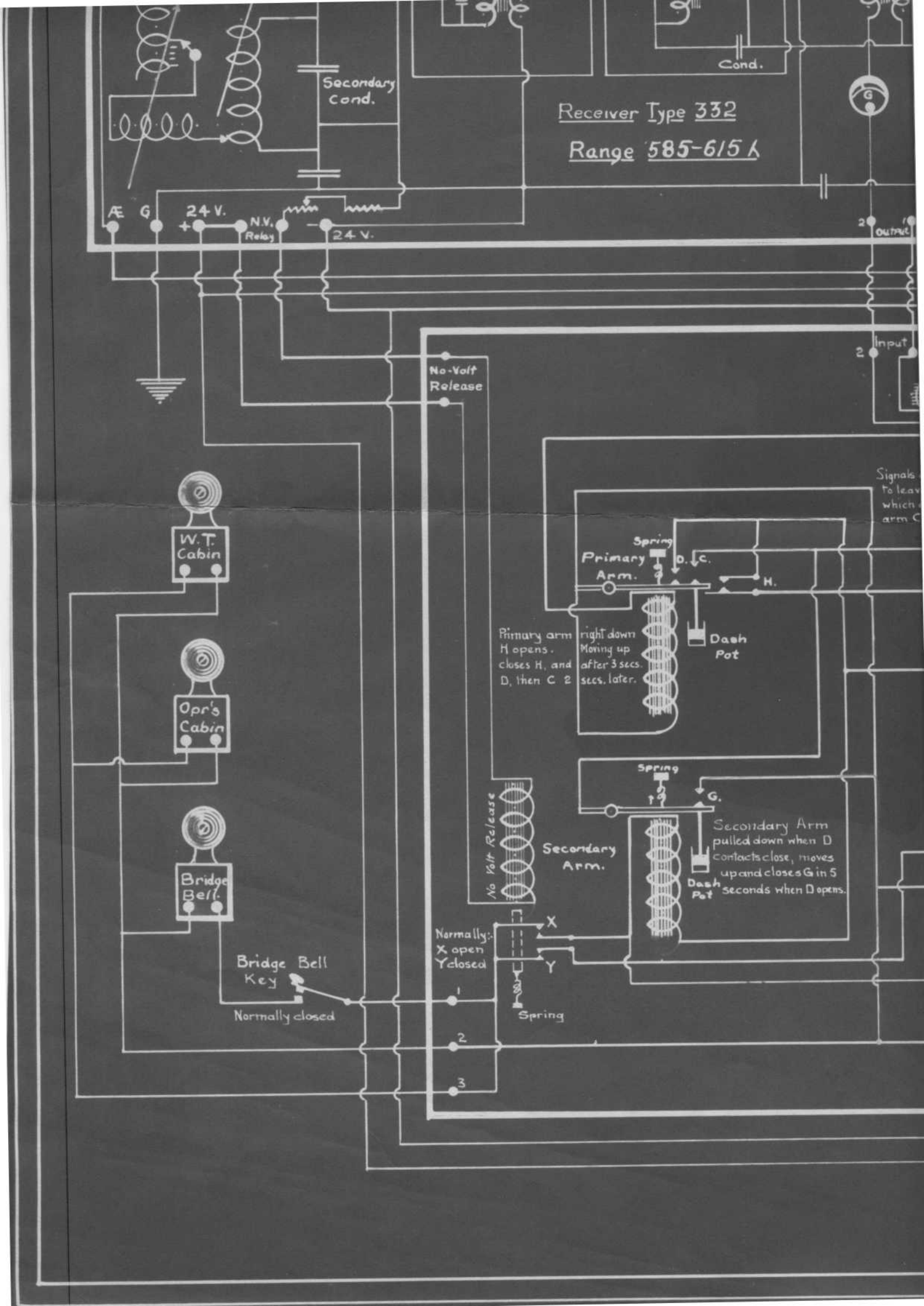


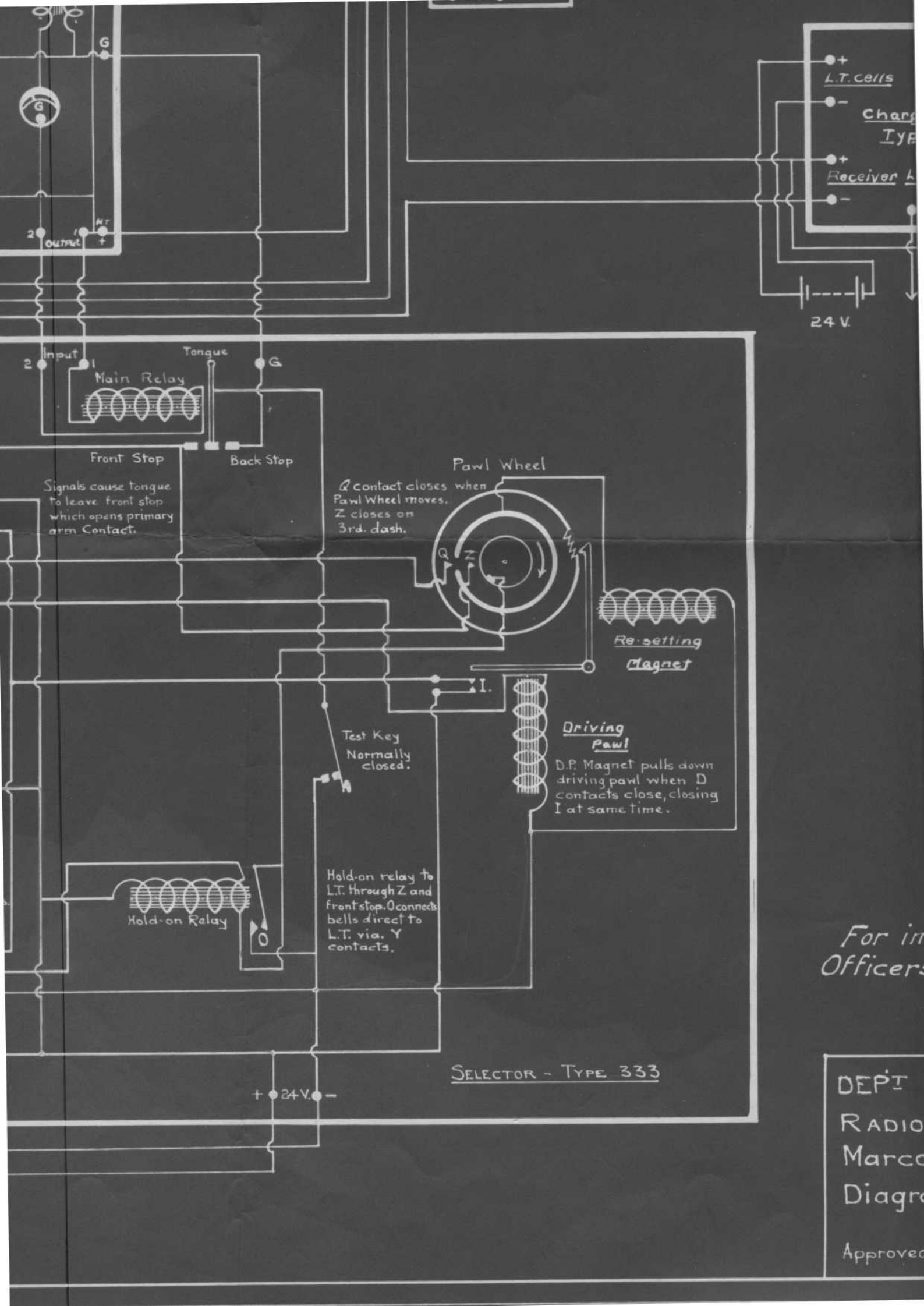



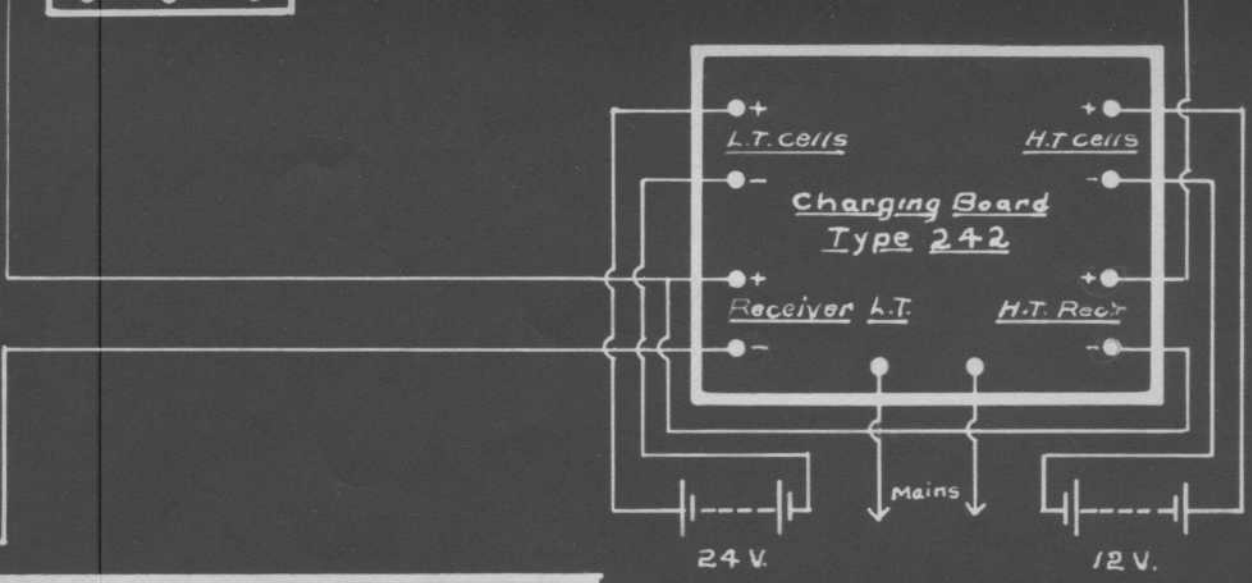

*For information of Examining Officers only.*

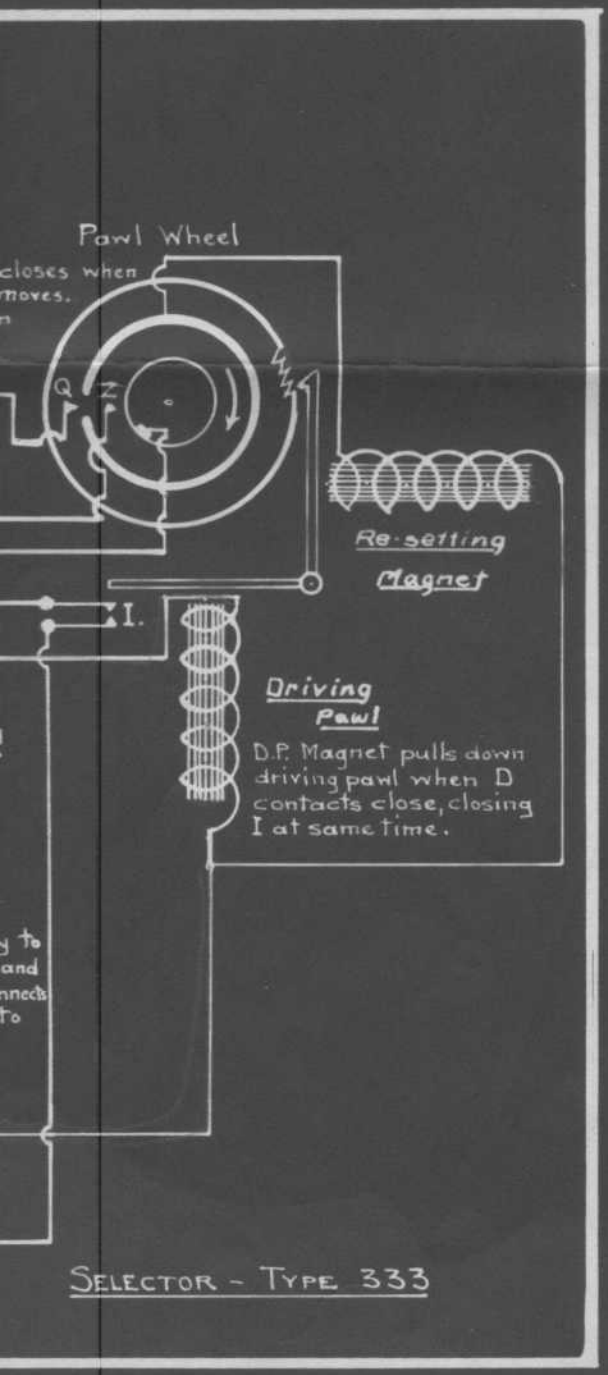

Test Terminals
Type D.E.T.
Cond.
G
er Type 332
ge 585-615 A
2
1
HT
+
Output
Switch
Type 272.
1
2
3
4
5
A
N
B
Input
Tongue
Main Relay
Front Stop
Back Stop
Signals cause tongue to leave front stop which opens primary arm Contact.
Pawl Wheel
Q contact closes when Pawl Wheel moves.
Z closes on 3rd. dash.
Q
Z
Spring
D.
C.
H.
Dash Pot
down
g up
3 secs.
later.
Re-settin
Magnet
I.
Driving Pawl
D.P. Magnet pulls
driving pawl when
contacts close, cl
I at same time.
Test Key
Normally closed.
Spring
G.
Secondary Arm
pulled down when D contacts close, moves up and closes G in 5 seconds when D opens.
Dash Pot
Hold-on Relay
Hold-on relay to L.T. through Z and Front stop. O connects bells direct to L.T. via. Y contacts.


Test Terminals
Test Terminals
Type D.E.R.
Type D.E.R.
Type D.E.T.
Cond.
Secondary cond.
Receiver Type 332
Range 585-615 K
Æ G
24 V.
+
N.V. Relay
−
24 V.
2
OUTPUT
2
Input
No-Volt Release
W.T. Cabin
Opr's Cabin
Bridge Bell
Bridge Bell Key
Normally closed
Spring
Primary Arm.
D.
C.
H.
Primary arm H opens. closes H, and D, then C 2 right down Moving up after 3 secs. secs. later.
Dash Pot
Spring
G.
No Volt Release
Secondary Arm.
Secondary Arm pulled down when D contacts close, moves up and closes G in 5 seconds when D opens.
Dash Pot
Normally: X open Y closed
X
Y
Spring


Secondary Cond.
Cond.
Receiver Type 332
Range 585-615 K
Æ G
24 V.
+
N.V. Relay
−
24 V.
2 Output 1
2 Input
No-Volt Release
W.T. Cabin
Opr's Cabin
Bridge Bell
Bridge Bell Key
Normally closed
Spring
Primary Arm.
D.
C.
H.
Primary arm H opens, closes H, and D, then C 2 secs. later.
right down Moving up after 3 secs.
Dash Pot
Spring
G.
No Volt Release
Secondary Arm.
Secondary Arm pulled down when D contacts close, moves up and closes G in 5 seconds when D opens.
Dash Pot
Normally: X open Y closed
X
Y
Spring
1
2
3


G
G
2
OUTPUT
1
H.T.
+
+
L.T. cells
-
Charg
Typ
+
Receiver L
-
24 V.
2
Input
1
Tongue
G
Main Relay
Front Stop
Back Stop
Signals cause tongue to leave front stop which opens primary arm Contact.
Pawl Wheel
Q contact closes when Pawl Wheel moves. Z closes on 3rd. dash.
Q
Z
Re-setting Magnet
I.
Driving Pawl
D.P. Magnet pulls down driving pawl when D contacts close, closing I at same time.
Test Key
Normally closed.
Hold-on Relay
O
Hold-on relay to L.T. through Z and front stop. O connects bells direct to L.T. via. Y contacts.
SELECTOR - TYPE 333
+ 24V. -
For in
Officers
DEPT
RADIO
Marco
Diagr
Approved




SELECTOR - TYPE 333

*For information of Examining Officers only.*

DEPT OF MARINE
RADIO BRANCH
Marconi Auto-Alarm
Diagram of Connections

Approved C.W.B.....

R.S. Mcw. XII-1929