

THIS BOOK BELONGS TO
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TECHNICAL KNOWLEDGE.

NATURE OF ELECTRICITY.

An electron revolves round the nucleus, the only difference with different materials is the no. of electrons and nuclei.

HYDROGEN ATOM.



FREE
ELECTRON



COPPER ATOM.

Other substances may have atoms consisting of many electrons revolving round many protons and in this case the outer electrons are easily moved from one atom to the next these are called free electrons.

If the free electrons are forced to move so that a flow of electrons occurs then the result is an electric current.

The force which is applied to remove these

Electrons is called EMF (ELECTRIC MOTIVE FORCE) AND CLOSED CIRCUIT.

In a circuit in which there is a complete path of conducting material.

OPEN CIRCUIT

In a circuit in which there is not a complete path of conducting material.



IS A COMPLETE CIRCUIT

A GOOD CONDUCTOR

(HAS MANY FREE ELECTRONS)

SILVER, COPPER, LEAD ETC. (A OPEN CIRCUIT)



RESISTANCE.

The thinner a piece of wire the more resistance.
The longer a piece of wire the more resistance.
The more free electrons the easier the path.

Least resistance.

silver

copper

lead

iron

carbon

Lot of resistance.

wood

ebonite

glass

Resistance of apparatus to be mounted below

The resistance of a conductor will be governed by:

Three things & the thinner the conductor the higher the resistance & the longer the conductor the higher its resistance & the substance of which the conductor is made, whether or not it has many free electrons.

ELECTRICAL UNITS

THE VOLT is the unit of Electrical Pressure (E.M.F.)

THE AMP. is the unit of Electron or Current flow 10^{18} or a flow 4,000,000,000,000,000,000. $1 = \text{milli}$

THE OHM is the unit of resistance. $1 = \text{mega}$

MEGA = 1 billion MILLI = $1,000,000,000^{\text{th}}$ = 10^{-9}

KILO = 1 thousand MICRO = $1,000,000^{\text{th}}$ = 10^{-6}

CHEMICAL EFFECT OF AN ELECTRIC CURRENT

Use a strip of copper and tin, connect the copper to the positive and the piece which is used for plating to the negative, when connected to the battery the two pieces dipped into the jar of copper sulphate the result is that the tin will turn copper.

THE CHEMICAL EFFECT ON ELECTRICITY

The chemical produce on (E.M.F.) but not if the materials in use are the same.

Electrolyte is a substance solution which conducts electricity. (necessary for variable resistance)

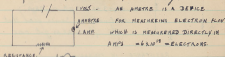
RESISTANCE

The resistance of a conductor is the one electron to

power the resistance, the thicker the wire the lower resistance.

THIN WIRE

made of iron, lead, or tin, low melting point.



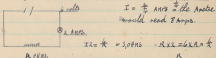
OHM LAW

states that in any circuit the current flow will be directly proportional to the voltage and inversible to the resistance. $I = \frac{V}{R}$

where $I =$ current in Amperes

$V =$ voltage in volts

$R =$ resistance in Ohms



$$R = \frac{V}{I} = 3$$

$$I = \frac{V}{R} \quad R = \frac{V}{I}$$

$$\frac{1}{2} = \frac{V}{3} \quad V = I R$$
$$\frac{1}{2} = \frac{V}{3} \quad = 4 \times 620$$
$$1.0 \text{ OHMS} = 2400 \text{ volts}$$

RESISTANCE IN SERIES



JOINS $R = R_1 + R_2$ etc
 $= 4 + 3 = 7 \text{ OHMS}$
 resistance in series means that
 the effective resistance got more

RESISTANCE IN PARALLEL



resistance in parallel means that
 the effective resistance got less

MEASURING INSTRUMENTS

THE HOT WIRE AMMETER



1. measures current flow in either direction equally well
2. hinged scale at zero end
3. pointer reads maximum if burnt out

Spring to keep hot wire at
 even tension

Wire becomes hot and expands
 when current flow through it.

MOVING COIL AMMETER

WHEN SCALE ZERO AND
 ARROW POINTS TO ZERO



$I = \frac{V}{R}$	I is current in AMPS.
$V = I \times R$	V is Voltage in Volts
$R = \frac{V}{I}$	R is Resistance in Ohms.



$V = I \times R = 6.20 \times 4$
 CURRENT FLOW = 4 AMPS. = 250 Volts

ANSWER = E.M.F. = 2480 VOLTS

conductors

Silver

Copper

Brass

Steel

Tin

Zinc

Aluminium

Carbon

Insulators

Wax

Fabric

Celluloid

Paraffin

Carbonite

Rubber

Wax + bar stand against feet
Paraffin + is used for insulators
on wireless niches.



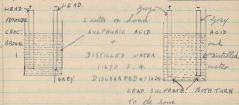
& primary cell converts chemical energy into electrical energy. During use the chemicals in the cell are consumed, so that when the cell is discharged new chemicals must be used. The cell will have a shelf life. When testing the voltage must always be measured "on load".

THE INERT CELL is a primary cell which has been assembled in a dry state when it will keep indefinitely. It has an (EMF) until it has been activated by adding tap water, when it becomes an ordinary cell. (I.E. it will have a shelf life).

THE RAE SECONDARY CELL

Lead acid accumulator

WHEN DISCHARGED



PAUL T.P. + 200 304 CHARGED

PA 304 + PASTORAL DISCHARGED

CELL REVER.

If you connect the voltmeter up to the positive end of the needle points to the right then the spike must be on positive, if it points to the left then the spike must be on negative.

Sq. is the ^{weight} of the ^{of the} solution divided by the ^{volume of} same volume of solution water.

SECONDARY CELL

Depend like primary cells on chemical action but can be recharged by passing a current through them in the opposite direction from some external supply.

ACCUMULATORS

or lead acid accumulators (type on I.E.M.C.) of various sizes. The larger the size the larger will be its capacity. Capacity of an acci. is the quantity of electricity (in amp hours) which is available when fully charged down to 1.9 volts on load. $1000 \text{ amp} \times 1 \text{ hour} = 1000 \text{ amp hours}$.

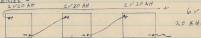
2V/20 AH

≈ 1000 amp hours but just a bit more if it is used if it is less than 10 then you take a bit off.

SECONDARY CELLS

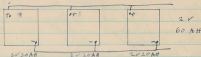
10 amp rate is the current flow in amps which will discharge the accumulator at 1.9 volts on load (i.e. down to 1.9 volts) in parallel or in series.

SERIES



when connected in series the voltage adds on but the capacity remains the same.

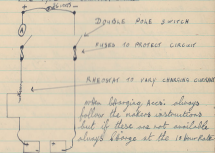
IN PARALLEL



when in parallel the capacity adds on and the voltage remains the same.

CHARGING ACCUMULATORS

THE TYPE B CHARGING BOARD



when charging acci. always follow the makers instructions but if these are not available always charge at the 10 amp rate.

WILL CHARGE UP TO 12 CELLS. USE ONE LEAD AS SHOWN ABOVE

VOLTAGES OF PLAIN H₂O CELL

1. voltage fully charged and still on charge = 2.5 volts.
 2. voltage fully charged and off charge = 2.1 volts to 2.2 volts
 3. voltage when fully charged on load = 2.0 volts.
 4. voltage discharged on load = 1.8 volts.
- when charging, the voltage of supply must be at least 3 volts for each cell.
- cells are considered fully charged when the plates are gassing freely and the voltage and the s.g. fluid remained constant for one hour.

THE PERMANENT MAGNET

Is a piece of iron or steel in which the molecules are so arranged that all their north poles are in one direction.

One end of the bar will have a north magnetic pole the other end a south magnetic pole, and lines of magnetic force will be present around the magnet.

Hard steel is difficult to magnetize because the molecules only change their formation with difficulty but once magnetized it tends to be a permanent magnet.

Soft iron is easily magnetized but quickly loses its magnetism.

Like magnetic poles repel similar poles attract.

INITIAL CHARGE

- Check manual for charge.
1. Read notes instructions
 2. Start first charge
 3. Break seals and fill with electrolyte, remove vents and note same they are clear.
 4. Fill cells to correct level with electrolyte s.g. 1.270 and allow to stand for 8 to 12 hours.
 5. Make good acid storage by topping up with some pure acid s.g. 1.270 to the above separator.
 6. Charge at normal rate for 16 hours (but nearly continuous the charge may be interrupted) and in this case until all plates are gassing freely and P.D. and S.G. have remained constant for 5 hours, if current has to be reduced, charge for proportionally longer time.
 7. Exchange electrolyte with fresh s.g. 1.270 and charge for about 1 hour
 8. Adjust s.g. to 1.270 if necessary by addition of distilled water or stronger (where concentrated) acid is required.

ACID MIXING

Take a receptacle which is unaffected by acids (or porcelain) fill it about half full of distilled water.

Iron or a rubber glass, zigzag and spoon must be used.

Add the concentrated acid slowly and stir with a

Upper rod, great heat is evolved and should the mixture tend to boil further additions of acid must be postponed until the liquid is cooled.

Use about 1 part of acid to 2 parts of water, the s.g. is tested with an hydrometer, if it is only 1.230 small additions of acid or water may be added to bring it up to the figures in case of fire we should use the carbon tetrachloride extingisher.

IF ACID IS SPILT.

- 1) on the floor - wipe up with sand or clean paint the damp spot with sodium bicarbonate.
- 2) on the clothes - wash.
- 3) in the aircraft - neutralize if possible, inform the pilot if during flight or the a.c. in charge of rigging if on the ground.
- 4) in the experiment - wash with water and eye solution and report sick.

REGULATOR CAUSE

SALVATION (Cause)

Discharging below 1.8 volts on load, allowing to stand in discharged condition, failing to charge completely.

RECOGNITION.

Cell goes out of its capacity, gets very hot on charge s.g. fails to rise on charge. (line doubtful)

very long charge at about 3 of the normal rate, if s.g. rises sulphation is being formed.

SHEDDING OF ACTIVE MATERIAL

Occurs to a slight extent in the normal life of a cell, will be greatly increased by vibrating or overcharging. The bath temperature should not exceed 110°F.

WATER

1 Horse power = 746 watts

TESTING CAPACITY OF AN ACC



If on Acc reads less than 60% of its capacity it is no further use for aircraft

PRELIMINARY INSPECTION

- 1) note since the Acc. is not charged or being recharged.
- 2) remove acid level to close inspection.

3) Test to ensure fully charged (12.6 - 13.70 voltage on load for 5 minutes = 2 volts

4) Test unspillable vent, blow through the hole, insert the bell for 2 minutes or leakage should occur.

5) Dry the bell from moisture, blow terminals and lightly sand them to prevent corrosion.

6) By consulting Record note some poor capacity is over half of its capacity.

Generator Law

If a conductor moves so that magnetic lines of force cut it an E.M.F. will be induced into the conductor.

The direction of the E.M.F. will depend upon the direction of cutting.

The transformer

Consists of a primary winding and a secondary winding on a soft iron core.

When an alternating current flows through the primary winding a changing magnetic field is produced which will induce an E.M.F. in the secondary coil.

The size of the E.M.F. will depend upon the ratio of secondary turns to primary turns i.e. if this is any turns on secondary the induced voltage will be twice the primary voltage.



THE GENERATOR

converts mechanical power into electrical power
(1 Horse power = 746 WATTS)

THE ALTERNATOR

Consists of a conductor wound upon a soft iron core, sometimes connected to slip rings. When the structure revolves on a laminated bar magnet (A.C.) is produced (By Faraday's law) which is fed via the slip rings and brushes to the output terminals.

THE DYNAMO

Construction similar to alternator except that a commutator converts the A.C. in the armature windings to D.C. at the output terminals.

ELECTRIC MOTOR

converts electrical power into mechanical power
Construction similar to dynamo in fact most single motor and dynamo will work in either

STARTERS (D.C. A.C.)

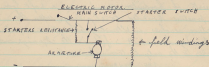
Any electrical motor when running at speed produces a back E.M.F. and it is this which keeps the current flow down to normal.

STARTERS

At the moment of starting there will be no back E.M.F. so a resistance must be placed in series

with the main windings to prevent an excessive
current flow.

When the machine speeds up, the resistance bar is
shorted out because the bar can't with ^{the} limit the current



AC GENERATOR

A petrol engine is used to blow the generator, motor
generator or used to change AC to DC for storage
services or to change DC of 1 voltage to another
voltage as in cover with 32-322405.

To economize weight and space the air circuits of
one pair of pole pieces and as structure, the rotor
winding is connected to the right commutator.
The structure also houses an or more addition winding
(insulated from rotor winding) which connect to
separate commutators.

MAINTENANCE

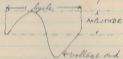
clean commutator with petrol rag, new brushes
brush gear and brush lead is not used to work
commutator

must be padded in with fire glass paper

AC WAVE

This means that the current in the circuit, first in
one direction then in the other and is produced by
reversing the polarity of the circuit. Each a certain
number of times per second.

The current will rise from zero to maximum and
returning to zero first in one direction, then in the
other this is known as one cycle.



→ voltage and current curve

The number of complete cycles occurring in a second
is known as the frequency and in Radio will occur many
millions of times per second.

1000 = 1,000 cycles per second

4000 = 4,000,000 cycles per second

The maximum value of the current or voltage in
the circuit is known as the peak value of amplitude

CONDENSERS

consists of two plates of conducting material
separated by a dielectric (any good insulator) etc.

Capacity of a condenser will depend upon

- ▷ size of plates
- ▷ closeness of plates
- ▷ nature of dielectric

condensers have an infinitely high resistance to D.C. but a fairly low reactance to A.C. thus they appear to conduct A.C. but not D.C.

INDUCTANCE.

limits of a coil wound upon a former, the size of an inductance is measured in (Henry's) and will depend upon the number of turns and the nature of the core, a soft iron core gives the largest inductance, an inductance has a low resistance but a high reactance thus it appears to conduct D.C. better than A.C.

TUNED OR RESONANT CIRCUIT.

limits of an inductance and a capacity. It has the property of responding to ac frequency much better than any other.

this frequency is known as the resonant frequency the longer the inductance or capacity the lower the frequency

tuned circuits are used in wireless receiving sets to pick out the required frequency, to the

exclusion of all others

▷ In wireless transmitters to produce the required frequency

AUDIO FREQUENCIES.

are frequencies which could be heard by the human ear (approx. 20 to 20,000 c.p.s.)

RADIO FREQUENCIES.

are frequencies too high for the human ear to hear such as those used for radio communication.

enable the wavelength and frequency into 500,000,000 the scale in the opposite wavelength and frequency

VALVES.

THE DIODE VALVE

limits of a glass bulb from which the air has been pumped and which contains two electrodes.



is a selector and amplifier

when sealed the cathode will give off electrons which will flow toward the filament in the form of a filament or (space charge) by the anode is partially changed the electrons

So, will be attracted across the valve to it (i.e. a current
 flow will take place) if the valve is negatively
 charged or electron flow will take place.
 When the Diode valve will conduct in one
 direction only and hence be used to change A.C. to
 D.C.

They
 are
 of
 size
 of
 an
 inch

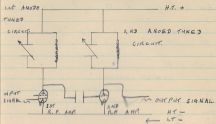
THE TRIODE



So an Amplifier
 and Rectifier

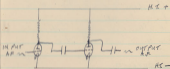
Similar to Diode but has a grid inserted, though
 still the electrons have to pass.
 If the grid is made negative the electron
 flow will decrease, if the grid is made positive
 the electron will increase, if an alternating voltage
 is applied to the grid the electron flow will rise
 and fall in step with the grid voltage
 due to amplification action of the triode the
 signal appearing in the anode circuit may be
 many times larger than the original signal applied
 to the grid, thus the triode valve is used to
 amplify weak signals.

A.P. COUPLINGS



So a circuit to give Radio frequency amplification
 and good selection.

A.P. COUPLINGS



a radio frequency does not have a tuned circuit
 because the signals will be varying in strength
 therefore you cannot tune to a certain frequency

- The condenser will prevent the DC positive being applied to the grid it will only conduct A.C. and not D.C.
- Two circuits are set up A.C. and D.C. the A.C. will take the easiest path through the condenser, and the D.C. will take place through the wirewound and then to earth.

REACTOR CONTROL.

The diagram is part of audio frequency reaction.

reaction is the feed back of reaction signal for further amplification so much feed back causes self



oscillation

The reaction is governed by the variable condenser. The reaction will perhaps give a 2 or 3 volt set the amplification of a 2 volt set reactions are not often used as when self reaction starts the receiver is overbuilt with other receiving sets.

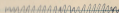

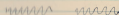
THE DETECTOR.

A detector separates the audio frequency from the radio frequency.

- a) 
- b) 

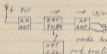
The grid voltage or a detector causes the change to be across in P.D.B.

CARRIER WAVES AND SPEECH.

- a)  A.C.
- b)  HIGH CARRIER WAVE + CONSTANT A.C.
- c)  LOW RP CARRIER WAVE ONLY

The same principle heterodyning is used to make a wave lower wave audible.

The same principal heterodyning states that when the oscillation of different frequency are suitably mixed a third oscillation is produced having a frequency equal to the difference between the two



Radio frequency is made audible by a detector and amplifier by mixing two frequencies by equaling the difference between the two

The condenser will prevent the H.F. positive being applied to the grid it will only conduct D.C. not A.C.

Two circuits are set up A.C. and D.C. the H.F. will take the easiest path through the condenser, and the D.C. will take place through the resistance and then to earth.

REACTION CONTROL

The signal is part of audio frequency reaction

reaction is the feed back of signal for further amplification to make feed back hence self



oscillation. The reaction is governed by the variable condenser. The reaction will perhaps give a 2 value set the amplification of a 2 value set reactions are not often used as often self reaction starts the receiver to transmit with other receiving sets.

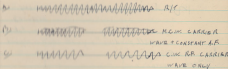
SEE DETECTOR

A detector separates the audio frequency from the radio frequency.



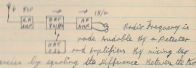
The grid voltage is a selector hence the change to the screen in p. odd.

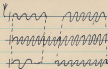
CARRIER WAVE AND SPEECH



The two principle heterodyning is used to make a wave louder more audible.

The three principle heterodyning states that when two oscillations of different frequencies are suitably mixed a third oscillation is produced having a frequency equal to the difference between the two





PRODUCED.

alterating your pitched oscillator will produce any note which is required

860 K/c/s

OSC. DVT	NOTE
860 K/c/s	VERY HIGH NOTE
300 K/c/s	MEDIUM NOTE
100 K/c/s	VERY LOW NOTE
0	DEAD SPACE
300 K/c/s	MEDIUM NOTE
860 K/c/s	VERY HIGH NOTE
860 K/c/s	SUPERSONIC FREQUENCY

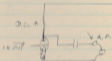
THE TELEPHONE TYPE A

The Telephone change on radio frequency into an audio sound wave.



If an audio frequency alternating current is passed round or through the windings, changes occur in the magnetic field which causes the Diaphragm to vibrate at the frequency of the alternating current & a sound wave, which is heard.

THE WAY TELEPHONES ARE CONSTRUCTED

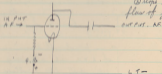


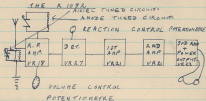
The D.C. will travel through the inductance and the A.C. will travel through the condenser and through the phone which acts up a sound wave

All A.C. PHONES are connected in parallel

ON THE LINE. (Unless the handset is connected)

It stops vibration due to flow of grid current





THE R 1072 is a general purpose aircraft receiver bearing 10 KHz to 16 mega cycles using 10 pairs of plug-in coils, power supply - a.c. 2 volt a.c. type 6X4 (1.05 amp) H.L. 120 volts 1.5 A. approx. 1000 ohm at 1000 volts on load) for \bar{v} or a/c reaction control. But be just off isolation.

POTENTIOMETER (moving voltage)



is to any voltage consists of fixed resistances in series in panel with source of a.c. and a moving wiper which taps a voltage from the resistance

5.9 VALVES



A screened grid valve is used for radio frequency amplification. Because the screening grid is between the control grid and the anode, it prevents feedback which would have self oscillation.

you have control by connecting it up to a potentiometer and when you move the wiper up and down the potentiometer thus controlling the volume.

VALVES BASES



200 pinode valve is used for a.c. amplification not suitable for r.f. owing to its inter electrode capacity.

100V

Right and leave right, as only the lower will be interference is about.

The limiter valve safeguards the receiver when you have got a transmitter very close to it and it absorbs too powerful signals to earth.

The screened grid valve is used to prevent signals getting in or out.

The mod. picks out the signal and rejects interference.

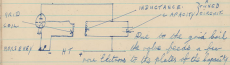
The Detector valve assembles the D.T. signal and is used to bring out stronger signal and is situated near the antenna or output terminals.

Test valve filament circuit 500 and put in an ammeter or use other scale on type 2. test valve you will get maximum resistance if filament is nearly out.

Just off relation for R.F.

THE SINGLE TRANSMITTER

The grid circuit must be made positive and negative alternately so that it will not be dropped out.



just as the plates are timing, thus if the plates were timing negative they would go a little but more negative by the valve and then the plates go positive there will be no electron flow.

If you want to transmit the capacity is changed for arrival and in earth.

If more is to be sent the more key must be inserted in the circuit.

The A.C. supply is to heat the filament.

The D.C. supply is to keep the valve positive.

When using the transmitter always check with your test fingers the H.T. positive = 1200 volts.

You can tell whether the transmitting signals are on or not that you are being heard by a meter in the aerial and if that is started out you can wait for a reply from the other operator.

In all transmitter there is an input valve to read H.T. current.

There is a H.C. and P.C. stage, the valves used in the H.C. are 1V, 25V which are triodes valves and have a 4 volt filament which take 2.2 amperes.

The H.T. are 4 volt 20 p.a. ones, and the H.T. in a motor generator which is 1200 volts, an aerial valve, and a input valve.

To transmit you must have a radio frequency alternating current.

The v.c. is to produce the frequency which is required on a steady note.

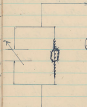
The P.A. is to translate the signal earth capacity from the v.c.

In amplifying value doesn't change a note other than its strength, but on oscillating value produces a oscillating frequency.

If the v.c. had broken you would not transmit anything at all.

NEED LOOP ABSORPTION CHARACTER.

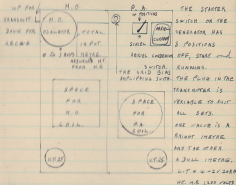
This note is used to receive frequency.



When the bulb lights up, the note is picking up energy from the transmitter.

When you tune to the first brilliance of the bulb, then you are on the exact frequency required, this note must be set close to the transmitter otherwise the bulb will get dimmer as the further you get away.

DEAD-SPRING SWITCH 10-33 TRANSMITTER



THE SWITCHER SWITCH ON THE GENERATOR HAS 3 POSITIONS OFF, START and RUNNING. THE PLUG IN THE TRANSMITTER IS VERIFIABLE TO RUN ALL SETS. THE VALUE IS A RIGHT INCREASE AND THE AREA A BULL INCREASE. WITH A 4-200000 HT. A.B. 1200 VOLTS

The one reading in the serial notes the further a field you are transmitting, on the serial serial ladder you use it to the letter of your coil you are using an sufficient serial but down the range to about a mile so it don't interfere so much with of stations. When the transmitter is out of tune the generator is in danger of running out, so when the spark plug is applied when at time the set or stop the P.A. value from

for tuning, then we don't look into the serial circuit
 meter but we look into the neutral circuit
 which is in the aerial at the side of the set.
 a pair of range coils P.S.B.

We vary the frequency by varying the inductance
 you can tell how much the inductance you are
 using by looking into the little window you can
 see the number.

There is also the fine tuning and coarse tuning
 and the amplifying valves will not amplify when it is
 not properly in tune.

We tune the P.A. by altering the grid bias.
 Always switch off H.F. before the filament
 you only need to switch off the generator so that you
 can receive on the receiver.

The block prevents the back E.M.F. going back into
 the generator.

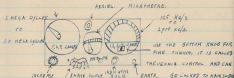
Don't aerial for high frequencies.
 when tuning see you have got the right aerial
 see grid bias is tuned.

Always put P.S. coil in first, a pair of coils.
 put neutral switch over to tune.

WILL HAVE MORE.

A micro-meter gives a deflection when a signal

is radiated by your own transmitter.
 A Detector valve and amplifier. H.F. = 120 V.H.T. BATTERY,
 5.2 volt T.A.B. ACC, 4-5 ACID BATTERY.



Pages 1, 2, 3, 4. go up to 2000 Kc/s

5, 6, 7. go up to 20 MEGA OHMS

so you tune on the tuning dial on the right hand side
 if you want a frequency up to 2000 Kc/s

on aerial and earth can be applied

If you have a too high a signal you can tune it down
 by the inductor knob.

The set must be near the transmitter to get full
 radiation, the transmitter must have the key down
 or have it on off, when tuning you must use the
 calibration chart with the same aerial unless
 the microphone.

The calibration chart has 5 ranges some with the
 large switch.

Behind the S.C.R. range knob there is an inductor which is tapped by a wire and these are letters which can be seen through the little window at top and when you set a certain range you can tell by the letter, then tune until you get maximum reading in the microscope.

The longer the inductance the lower the frequency
 a quartz crystal
 It is wired and is like frosted glass.

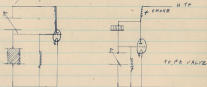


an alternating E.M.F.

If we connect one end across the plates, the plates will expand or contract depending in the way the E.M.F. is connected. But if you connect the plates on A.C. is set up only when the current flows the pressure is applied. The longer the crystal the lower its frequency

will be on the crystal oscillator the current is fed through the valve and is amplified and a feed back means.

If natural frequency gets the mode positive and however feed back and the crystal continues to operate at its natural frequency, there is no need for the P.A. or for a screening in however, because the series and earth capacity does not make any difference because H.C. is crystal controlled, the p.a. does the amplifying only in this case



CAPACITANCE MODIFIED TYPE 2

The purpose of the crystal oscillator is to tune up to certain frequency.

It is a 3 valve receiving set one valve is an oscillating detector and the other two audio frequency

amplifier.

6 different crystals are usually used but one extra crystal has its plug pulled in from the outside at the front of the set, use the plug hole as provided you can select any crystal by the reflector switch we have have an switch and on serial if we want a wider range from the transmitter.

Power amplifier ≈ 100 volts dry battery (Bogen or on 100)
-T. 2 volts 2000 ACC.

A.B. = 3 volt grid bias

MECHANICS

what are the fundamental frequency multiplied by any certain number but the further you get away from the fundamental the weaker the harmonic becomes.

The lower the crystal frequency the closer together the harmonics will be and will be harder to pick out.

When using a monitor for receiving you plug the antenna into the receiver and not into the monitor.

TUNING BACK

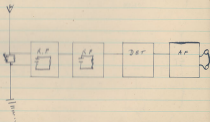
When you want to tune a transmitter and you haven't got any calibration light, you tune the receiver to the frequency from the station

wanted, then you tune the transmitter to your receiver and you should be dead on the frequency wanted when the signal is produced you switch off the transmitter to note what it is your signal you are receiving.

SUPER HETERODYNE RECEIVERS

In a super heterodyne receiver the frequency is adjusted to suit the local circuit.

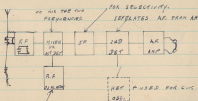
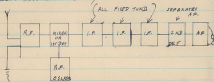
SIGNAL RECEIVING



SUPER HETERODYNE

The work of the A.F. modulator is to produce a frequency which is mixed with the incoming signal. I.F. = intermediate frequency is the frequency

to obtain all frequencies having down the serial one times
 The lower the intermediate frequency the higher the
 adjacent channel selectivity.



To isolate at a frequency which will mix with the
 incoming frequency giving the intermediate frequency
 may be crystal oscillator, typical super heterodyne
 receiver

when the signal gets to the mixer value it is mixed
 with another signal from the oscillator value and if
 your oscillator value is tuned properly we shall get
 when they are both mixed we shall get the intermediate
 frequency for which the i.f. value we tuned.

The badness which is in the oscillator is smaller than
 the serial and i.f. amplifier badness so it is the badness
 which governs the frequency which is fed into the i.f.
 when tuning the serial and i.f. badness one in step
 but the oscillator is slightly a head

↓ front frequency is a frequency close to the original
 frequency.

↓ superheterodyne receiver has a very high adjacent
 channel selectivity, there are circuits before second
 channel interference.

i.f. circuits reduce the interference.

The requirements of a pilot A/C and receiver is for
 short range work and for a remote control.

Ed. 4.96.

Frequency coverage = 4.3 to 6.7 mega cycles

Range = 30 miles air to air, and 50 miles air to ground

The set is designed to use R.F. and H.F. in

but H.F. is very rarely used.

Power amplifier = 24 + 40 A.C. line H.F. It has 3 channels

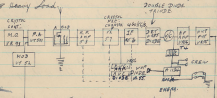
1 input

A.B.T. valve has P. ^{line} _{board}

1 output 6.3 volts for heating filaments

1 output 270 " for mode of receiver

this drops to 250 volts when transmitter is working due to heavy load



There is no tuning control on the H.O. & is crystal controlled the P.A. is tuned to the H.O.

The P.A. does not receive the H.O. from the aerial in the base, the P.A. is a detuning valve, the modulator amplifies the audio frequency and feeds it to the P.A.

There is a crystal and inductances.

There is no service in case, but one can know it shown by the pen lamp lighting up and you tune for maximum brilliance of the bulb.

A.V.C. automatic control

Inter-digit = 460K/s.

A mode control is situated near the Pilot, when you press the button for any particular frequency out of the four crystals you press the button with the appropriate letter worked on it and the step by step into then select the frequency by moving over to the right inductance, a separate fixed panel is used and all the same one or the same user.

The A.H.34 valve is in use and has nothing to do with the transmitter, it only amplifies the signal.

100.0	+ Pilot control
10.0	indicator light tells you which frequency
0.0	you are on.
1.00	3 position switch = T. Transmitter
0.00	= P.A. Receiver Attenuator
0.00	= R. Receiver

When receiver attenuator all broadcast mode is cut out, and signal can be heard in the phone but in my case, this position is used for listening out, as soon as the signal is heard having through the switch is put over to receiver.

to some putting switch to T. - a press the

press to speak bulb, or when speaking the button is
pressed.

When tuning first put all knobs to zero or as close
to get on on Harmonic.

Condenser on receiver has only 180° movement, tuned
by a small screwdriver.

A small screw can be adjusted with a screwdriver to
obtain volume by sound before flight but not when
into use when flying.

There is also a P.A. volume knob & with its
strength is about as

If the frequency is to be changed, or to change
the hospital and then return the P.A. to receiver
was on 180° receiver screw for receiver beyond
noise.

Close into the microphone for modulation, if possible
a tuning plate that will be a filter in the
lamp case you show.

When a suitable volume knob has been secured
the knob's should be locked by screwing down
the small screw attached.

The only time you have use of it without the
A.334 is when you put the sound and emergency
switch over to emergency.

If you want to find out what frequency you are on
check on transmitter hospital.

THE A.334.

Give us intercom system, it has two valves, but
one is a double grid, and the other is a triode.
The one is 2A and the double grid is a 2A5.

Light of signals come through the A.334, they are
the P.A. the intercom and the P.A. 2A5.

There is an A.P.C. switch, in the A. position the
v.c.p. and all the others are brought up so that
there is a disturbing night, kept all the time
and all the results of the show how poor that is
going on.

If the v.c.p. has given a signal, having over one
the P.A. we put the switch to A so that we have
over the message without interference from the
intercom, in the position we is but off from
the show altogether, but there is a small bulb in
the v.c.p. position, so that if the pilot has
got on emergency message, we light this bulb
then v.c.p. will put the switch back over to B.
position again, the used only in an emergency.

Power supplies: LT = 100V 2000/25 2 A.C.

HT = 120V A.C. 600W 2A 2/25.

BASE PINS AND VALVES.

1. 1082.

- VR 33. Limit valve = Diode
- VR 18. Radio frequency amp = Tetrode
- VR 27. Detector = Triode
- VR 21. 2. radio frequency amp = Triode
- VR 22. " " output = Triode

1083.

- M.C. VT 25 modulating = Triode
- P.A. VT 25 amplifier = Triode.

1084.

- VT 48. M.C. crystal oscillating = Triode
- VR 501. P.A. amplifier = Triode
- VT 52. modulator = Triode

Receiver.

- VR 53. A.F. amplifier = Tetrode
- VR 57. frequency changer
- VR 56. IF amplifier
- VR 55. 2nd Detector, AVC & output valve.
- VR 56. AVC AND

- VR 49. 2. mixing valve triode Heerde
- VR 100. A.F. amplifier tri. m. tetrode
- VR 99. frequency changer triode Heerde
- 2 VR 100. IF amplifier Tetrode

- VR 102. mixing valve Heerde 2 triode
- VR 101. 2nd Detector & output 2D triode
- VR 103. magic eye
- VR 101. Net. modulator. 2D triode

1085.

- 2 VT 104. P.A. in forward Pentode
- VT 105. M.O. (indirectly Heerde)
- VT 105. modulator triode

1086.

- VR 21. A.F. amplifier - triode
- VR 35. modulating - Double pentode

Crystal oscillator

- VT 50. oscillating triode = triode
- VT 50. A.F. amplifier = "
- VT 50. " " = "

1087.

- 2.V. 48. isolating = Tetrode
- 1.V. 36. voltmeter = triode

(Circular) Figure 2.

Multi Tuning

1928 T. Smith.

When on H.T. on fixed = bandpass in parallel with fixed coil = constant fixed.

3/4 = tuning in fixed coil and bandpass in series = Bandpass capacity of H.T. to transmitter because we is not tuning.

The 6.3 V and 200 V H.T. volts for receiver is distributed on coil and 200 V H.T. to generator is broken so that you have constant.

H.T. on tuning only the last 30 ft is used.

With all variable open flying into a storm and not in tuning variable, if brought in a storm fly not then with tuning variable then fly through the storm if necessary.

It is intended off that you have receive on the 3/4 loop.

With give to coupling from transmitter then to 1928 T. Smith

22 JAN 20 1931 112

a voltage on the probe drops due to electron falling back on to the screen grid. Higher potential appears on the screen grid than on

the radio beam outside receiver secondary in air.
Two separate filament in Diode triode.
magic eye is similar to Double triode.

R.F. A.S. = 10 signals, valve wire, magic eye will
just glow no deflection in eye.

B.F.C. will be heard if R.F. is us.

spin it 270 K/100 test you will hear B.F.C.
replace valve by its int I.F. valve and about
int I.F. wire to end I.F. valve on each top loop.

Frequency Manger valve wire, no signal, no deflection
in magic eye these will be at 1000 or 27000 test.
replace valve by one of 2/10 valves.

I.F. A.S. = one wire or other valves but you put
about out 240 I.F. out put first I.F. in its place
out out A.S. nothing will be heard in others.

magic eye will be working and flicking. test for
side tone, if this can be heard you know that
your stage are ok. replace by 200 valve but you
but receive a.w. because there is no relation to
receiving line of both I.F. can be taken off to test
up isolator but the system is not generally advised.
Signal will be on Loops in a bandpass for low and
but it out for High.

Deflection will be on Loops in a extra
bandpass and by power rose of beam voltage
no small or high bandpass are open.
Balance variable rotational rings in Dummy
loop.

with balance wire the current output on 100
to ordinary value.

with signal only loops in loop and not the
type 2 circuit.

Small finding (100)

1. thermal, maintenance, adjustment,
2. electrical connection,
3. power
4. valves
5. faulty manipulation.

A.S. is stage input

H.F. is A.S. input

200V 2.5 Amps

A. 200V

B. 200V

C. 200V

D. 200V = 200V

E. 200V = 200V

F. 200V = 200V

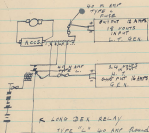
G. 200V = 200V



Simplest of disconnected plug of D/F = you build balance = or which you couldn't get any deflection on the scales. Power = signal will disappear, only see flash serial for rearing

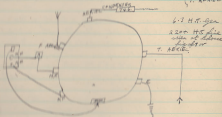
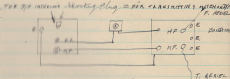
In case of complete failure, check all HT and L.T. leads to generator slot check fuses and type 52 resistor

TYPE 52 resistor
= 775 ohms



approx 300 uA fuse bonded on outside of gear and inside lower of transmitter.

SERIAL CONNECTIONS



now let disconnector part stand type position when using the plug board your receiver will have on if type I resistor is not on D/F and the receiver is at balance. 110v/200v receiver 6.3 volts go to type I unit but not 100 volts H.T.

THE 1PP SET.

Is used for identification purposes and also for joining every searchlight station.

This set works on very high frequencies

For this set to be effective you must not fly lower than 2000 feet. If below this height you must identify yourself on V/P/D/P.

A signal is returned every 2 records on A2 and A3 and every 6 records on B2.

For tuning purposes a 12 volt system = 1000 V. resistors and buttons must be set with electronic then with the readings in the meter should read 7 volts or 8 milliamperes. Then with set on wave up the readings should then read 4 volts or 4 milliamperes when it drops to the figure then the V resistors up with the reading is increased to 8 volts the milliamperes should read and fluctuate between .9 and 1.3 and 1.4 milliamperes these readings should be logged every 15 minutes.

If the set isn't working so well the reading should be between .6 milliamperes or 2 milliamperes.

If the readings read below .6 milliamperes or five above 2 milliamperes then the set is U.S.

For the 24 volt system just double the voltage the settings remain the same.

L. BEATIA.

at landing of a body to appear strings of direction open the hand switch prior to landing or take off and is not blue until the red lights are out because of the battery with a black die the lights will be on and the pilot must with the set to go off.

When using the tuning circuits = A1 = 2 ft between the transmitters and receiver before with frequencies. A2 = 1 ft between and 2.0 in apart.

When tuning up the slugs should be 2 studs off resolution after you have tuned it up one to cover the resolution.

FAULT FINDING (Continued).

There are 2 circuits in D/P interlocks = 63-25 and 63-26. If H.T. on D/P and both positions but there is on H/P on field normal and H/P on battery for transmitting purposes, these signals are available only on wave and H.V. only.

TYPE 5.

The top 3 positions are the only transmitting positions H/P on field a battery serial disconnected and H.V. on field condenser in panel with field shield power supply on normal.

H/F on trailing = Fixed serial Disconnected
only trailing serial in limit with is shorted
to 2 aft power implies as usual.

Loth position = All cables as could due to +5.
to receive only with the figure of 2 address
on the loop.

D/F position = Fixed serial only power implies
as usual to receiver but not to transmitter
because the 6V to the state limit is broken to
prevent transmission taking place either on D/F.

You also find in a 25 wire wire found hardware
in series with fixed serial to increase the capacity,
it is the signal being received with the strong
enough for a D/F reading to be obtained.



Gelsenkirchen Gets Heaviest Raid

Luftwaffe Avoids R.A.F. Armada

MORE than 500 R.A.F. heavy bombers, escorted by more than 500 fighters, gave Gelsenkirchen, fifth largest town in the Ruhr, its heaviest attack of the war yesterday and met an German plane.

Gelsenkirchen was the only large town in the Ruhr that had not previously been heavily damaged. It has large hydroelectric plants and its two large marshalling yards could handle more than 4,000 trains a day.

The disrupted phone wires, but they remained intact at the Ruhr's source.

Biggest blow at Ruhr city

Several hundred tons of incendiary bombs and 1,000 lb of high explosive were dropped on the city, which has a population of 100,000.

The American also hit several areas of Essen, a coal-mining town, and Dortmund, a steel-making town.

On the German side, the Luftwaffe sent up a number of fighters to meet the bombers, but they were driven off.

RAF Smother Gelsenkirchen In Daylight

GELSENKIRCHEN, important Ruhr town, had its heaviest air attack of the war yesterday afternoon.

Our non-stop air attacks

Flights, which started target indications and reported a good concentration of incendiary bombs, broke down up to a total of more than 1,000 lb. The war planes, but limited crews saw to enemy defenses.

It was the heaviest attack so far made on Gelsenkirchen, which has been hit before. Gelsenkirchen, which has been hit in the past, has not been so heavily damaged by the R.A.F. in the daylight hours.

It is the only town in the Ruhr that has not previously been severely damaged, and it has large hydroelectric plants and industrial marshalling yards capable of handling 4,000 trains every 24 hours—more of any town in the German Army.

RUHR TARGET IS GIVEN WORST ATTACK OF WAR

A FORCE of more than 500 R.A.F. bombers, escorted by 500 fighters, attacked Gelsenkirchen, in the Ruhr, yesterday afternoon.

It was the heaviest attack of the war on this target.

Cologne Twice Hit Last Night

LANCASTERS and Halifax of R.A.F. Bomber Command dropped about 2,000 tons of high explosives and incendiary bombs on Cologne last night, bringing the total to well over 4,000 tons in four days, since an Air Ministry News Service.

Two heavy bombers of the long range jet-powered fighters attack, squadrons of Mustangs had raided the city, and this may have misled the enemy into thinking that it was all over for the night.

For though this was at times hoped, no fighters were seen when the heaviest raid over Cologne promptly at 8 o'clock the same hour as on Monday. Before the attack was over

conditions were almost exactly the same as on Monday night. Thick cloud covered the city, sky markers were seen, and even signs that the bombing was well advanced and incendiary was the target indicator. Before the attack was over, the clouds had begun to clear from the town below.

'Noat Impression'

Prime Officer Peterman, a Halifax pilot, from Lancaster, and he said he could see the city and it was very impressive to see things that he had seen before.

At the point I saw a large building being built. The building was very tall and I saw the lights on the roof. It was like an electric light being put on.

The Cologne was built up and I saw from the lights that this was a factory or an office.

During the evening, flames of incendiary bombs had started on buildings. The fire at first looked small and the sound of about 100. The fire, which looked very big, was the ground level.

Eight fighters were in the air and a number of Mustangs appeared. The Mustangs were scattered in the air and started to fly in the air.

Although there is no attack on Cologne.

COLOGNE ABLAZE

Another Big Raid By R.A.F.

COLOGNE IS AGAIN THE target of the R.A.F.'s night attack, and reports it is worse than the raid on Lancaster and that the second night will be a success.

The new 'Battle of Cologne' began in darkness on Monday night, the heaviest raid since the war. Mustangs and Lancasters in three waves dropped bombs on the town between 8 and 11 p.m.

A great weight of bombs is expected to break Cologne into a shambles. The fire is expected to be a success and the ground is expected to be a success.

Knocking out Cologne

It is the first time that Cologne has been hit by a night raid since the R.A.F. last Monday night. The town is expected to be a success.

There is a large number of incendiary bombs and high explosives and incendiary bombs are expected to be a success.

The attack was carried out by Mustangs and Lancasters and it is expected that the town will be a success.

In all, Bomber Command sent out a force of 100 bombers during the night and they were expected to be a success.

Big oil tank hit
An oil tank was hit by a bomb during the night raid on Cologne. The tank was damaged and the oil was expected to be a success.

During the night raid on Cologne, a large number of incendiary bombs were dropped on the town. The fire is expected to be a success.

The town of Cologne was hit by a night raid on Monday night. The town is expected to be a success.

HARDLY A BUILDING AT KRUPPS HAS ESCAPED

AIR photographs show that Essen is now almost entirely destroyed. Hardly any of the buildings in Krupp's works has escaped destruction or severe blast damage.

Essen has been razed by repeated aerial attacks. The R.A.F. Bomber Command's attack on the night of Oct. 23 and 24 destroyed and badly damaged many of the city's buildings. The R.A.F. Bomber Command's attack on the night of Oct. 24 and 25 destroyed and badly damaged many of the city's buildings. The R.A.F. Bomber Command's attack on the night of Oct. 25 and 26 destroyed and badly damaged many of the city's buildings.

1,000 R.A.F. PLANES HIT RUHR BY DAY

ONLY 100 bombers are making their daily attack on the Ruhr. The R.A.F. Bomber Command's attack on the night of Oct. 23 and 24 destroyed and badly damaged many of the city's buildings. The R.A.F. Bomber Command's attack on the night of Oct. 24 and 25 destroyed and badly damaged many of the city's buildings. The R.A.F. Bomber Command's attack on the night of Oct. 25 and 26 destroyed and badly damaged many of the city's buildings.

2,200 BIG BOMBERS HIT REICH

BATTERED ESSEN BLAZING AGAIN

More than 2,200 four-engined bombers roared over western Germany yesterday—the largest air force ever to cross the North border. And they gave Germany its biggest pounding of the war.

The R.A.F. contributed more than 1,000 bombers for the post bombing and made their attack on a scale not to be seen since the war. The R.A.F. Bomber Command's attack on the night of Oct. 23 and 24 destroyed and badly damaged many of the city's buildings. The R.A.F. Bomber Command's attack on the night of Oct. 24 and 25 destroyed and badly damaged many of the city's buildings.

Four bombers lost

As the attack was directed, the loss of four bombers was reported. The R.A.F. Bomber Command's attack on the night of Oct. 23 and 24 destroyed and badly damaged many of the city's buildings. The R.A.F. Bomber Command's attack on the night of Oct. 24 and 25 destroyed and badly damaged many of the city's buildings.

R.A.F. Fire Cologne

COLOGNE was the target for a series of attacks by R.A.F. bombers. The R.A.F. Bomber Command's attack on the night of Oct. 23 and 24 destroyed and badly damaged many of the city's buildings. The R.A.F. Bomber Command's attack on the night of Oct. 24 and 25 destroyed and badly damaged many of the city's buildings. The R.A.F. Bomber Command's attack on the night of Oct. 25 and 26 destroyed and badly damaged many of the city's buildings.

Cologne Hit In Strength

Cologne was attacked in strength yesterday after being hit by bombers and fighters. The R.A.F. Bomber Command's attack on the night of Oct. 23 and 24 destroyed and badly damaged many of the city's buildings. The R.A.F. Bomber Command's attack on the night of Oct. 24 and 25 destroyed and badly damaged many of the city's buildings.

"Raid Destroy 80% of Cologne"

80% of Cologne has been destroyed by a series of attacks by R.A.F. bombers. The R.A.F. Bomber Command's attack on the night of Oct. 23 and 24 destroyed and badly damaged many of the city's buildings. The R.A.F. Bomber Command's attack on the night of Oct. 24 and 25 destroyed and badly damaged many of the city's buildings.

The R.A.F. Bomber Command's attack on the night of Oct. 23 and 24 destroyed and badly damaged many of the city's buildings. The R.A.F. Bomber Command's attack on the night of Oct. 24 and 25 destroyed and badly damaged many of the city's buildings.

Member R.A.F. Help

The assistance made by members of the R.A.F. in the Stuttgart area, during the night of 21/22 October 1944, was most kind. Many R.A.F. members, standing Stuttgart's burning streets and buildings, tried their utmost to bring help to those who were in need. This included, but was not limited to, the following: (1) bringing and distributing food, blankets, and other necessities; (2) bringing and distributing medicine; (3) bringing and distributing clothing; (4) bringing and distributing blankets; (5) bringing and distributing food; (6) bringing and distributing medicine; (7) bringing and distributing clothing; (8) bringing and distributing blankets; (9) bringing and distributing food; (10) bringing and distributing medicine; (11) bringing and distributing clothing; (12) bringing and distributing blankets; (13) bringing and distributing food; (14) bringing and distributing medicine; (15) bringing and distributing clothing; (16) bringing and distributing blankets; (17) bringing and distributing food; (18) bringing and distributing medicine; (19) bringing and distributing clothing; (20) bringing and distributing blankets; (21) bringing and distributing food; (22) bringing and distributing medicine; (23) bringing and distributing clothing; (24) bringing and distributing blankets; (25) bringing and distributing food; (26) bringing and distributing medicine; (27) bringing and distributing clothing; (28) bringing and distributing blankets; (29) bringing and distributing food; (30) bringing and distributing medicine; (31) bringing and distributing clothing; (32) bringing and distributing blankets; (33) bringing and distributing food; (34) bringing and distributing medicine; (35) bringing and distributing clothing; (36) bringing and distributing blankets; (37) bringing and distributing food; (38) bringing and distributing medicine; (39) bringing and distributing clothing; (40) bringing and distributing blankets; (41) bringing and distributing food; (42) bringing and distributing medicine; (43) bringing and distributing clothing; (44) bringing and distributing blankets; (45) bringing and distributing food; (46) bringing and distributing medicine; (47) bringing and distributing clothing; (48) bringing and distributing blankets; (49) bringing and distributing food; (50) bringing and distributing medicine; (51) bringing and distributing clothing; (52) bringing and distributing blankets; (53) bringing and distributing food; (54) bringing and distributing medicine; (55) bringing and distributing clothing; (56) bringing and distributing blankets; (57) bringing and distributing food; (58) bringing and distributing medicine; (59) bringing and distributing clothing; (60) bringing and distributing blankets; (61) bringing and distributing food; (62) bringing and distributing medicine; (63) bringing and distributing clothing; (64) bringing and distributing blankets; (65) bringing and distributing food; (66) bringing and distributing medicine; (67) bringing and distributing clothing; (68) bringing and distributing blankets; (69) bringing and distributing food; (70) bringing and distributing medicine; (71) bringing and distributing clothing; (72) bringing and distributing blankets; (73) bringing and distributing food; (74) bringing and distributing medicine; (75) bringing and distributing clothing; (76) bringing and distributing blankets; (77) bringing and distributing food; (78) bringing and distributing medicine; (79) bringing and distributing clothing; (80) bringing and distributing blankets; (81) bringing and distributing food; (82) bringing and distributing medicine; (83) bringing and distributing clothing; (84) bringing and distributing blankets; (85) bringing and distributing food; (86) bringing and distributing medicine; (87) bringing and distributing clothing; (88) bringing and distributing blankets; (89) bringing and distributing food; (90) bringing and distributing medicine; (91) bringing and distributing clothing; (92) bringing and distributing blankets; (93) bringing and distributing food; (94) bringing and distributing medicine; (95) bringing and distributing clothing; (96) bringing and distributing blankets; (97) bringing and distributing food; (98) bringing and distributing medicine; (99) bringing and distributing clothing; (100) bringing and distributing blankets.

Stuttgart Bombed Twice in Night

R.A.F. Bomber Command sent more than 1,000 planes to Stuttgart on Tuesday night, with Stuttgart and Weinstadt as the main targets. A further raid was made on Weinstadt.

Bombing had now started in 41 towns, and when the second wave of bombers started, 100 towns and villages were added to the list. Bombs from the night bombing force, and large quantities of incendiary bombs, were dropped on Stuttgart and on other towns in the area.

Stuttgart suffered twice and Weinstadt with the main objective. Firebombing and incendiary bombs were dropped on Stuttgart and Weinstadt.

R.A.F. FIRE ESSEN

ESSEN, the great Ruhr town and railway city, was hit tonight, and 10,000 to 150,000 of "Sonderauftrag" bombing was done.

The night in Essen was a double one. In the second wave, more than 1,000 planes were sent to Essen over 20 towns. It was destroyed by the main force of more than 1,000 bombers. The main force of 1,000 bombers and 1,000 planes hit the town.

This was one of a string of air attacks against the Ruhr. At least 1,000 bombers and 1,000 planes hit the town. It was destroyed by the main force of more than 1,000 bombers.

1,000 TONS

Probably at least 1,000 tons of high explosives were done. The main force of 1,000 bombers hit the town.

The main force of 1,000 bombers hit the town. It was destroyed by the main force of more than 1,000 bombers.

Another force of incendiary bombs was dropped on Essen. It was destroyed by the main force of more than 1,000 bombers.

Essen Virtually Destroyed

ESSEN, the great Ruhr town and railway city, was hit tonight, and 10,000 to 150,000 of "Sonderauftrag" bombing was done. The night in Essen was a double one. In the second wave, more than 1,000 planes were sent to Essen over 20 towns. It was destroyed by the main force of more than 1,000 bombers. The main force of 1,000 bombers and 1,000 planes hit the town.

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4,500-TONS RAID

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NEARLY 5,000 TONS IN NIGHT ON ESSEN

ESSEN, the great Ruhr town and railway city, was hit tonight, and 10,000 to 150,000 of "Sonderauftrag" bombing was done. The night in Essen was a double one. In the second wave, more than 1,000 planes were sent to Essen over 20 towns. It was destroyed by the main force of more than 1,000 bombers. The main force of 1,000 bombers and 1,000 planes hit the town.

This was one of a string of air attacks against the Ruhr. At least 1,000 bombers and 1,000 planes hit the town. It was destroyed by the main force of more than 1,000 bombers.

LIGHTER LOSSES ON PEAK RAIDS

R. A. F. Bomber Command
is making its greatest
ever attacks at very reduced
cost.

The second attack on Duisburg
last Saturday resulted in a loss of
only 10 out of over 1,000 aircraft
employed in 200 tons of bombs,
to the fields of Germany, the
R.A.F. is making deeper raids
now and that is possible only
because of the new tactics.

Saturday Night.—More than
1,000 Lancasters and Wellingtons
and a great force of Mosquitos
came over Duisburg. Bombers
dropped more than 1,000 tons of
bombs, a great weight on
Duisburg, 100 British bombers
on Berlin, Hamburg and Munich
and Mosquitos made heavy
attacks on the cities.

Sunday Morning.—More than
1,000 Lancasters and Wellingtons
attacked Hamburg with more than
4,000 tons and more than 1,000
Mosquitos and Wellingtons dropped
bombs into Berlin.

The destruction of Duisburg, if an
expanding business area, is an
other important one in the Ruhr
has been destroyed by such heavy
weights in such strength.

Bombing Record

The attack on Duisburg
last Saturday was the first
made in four hours. The record
was set by the R.A.F. and
the Mosquitos and Wellingtons
were used to drop more than
2,000 tons.

Losses by the German aircraft
Duisburg were 20 tons, a loss of
well over 2,000 heavy bombers and
well over 100 tons of bombs.
From yesterday's report, it
was in Duisburg and other cities
are making.