

9th Sept. 1900

Page 106. BENTLEY.

Page 107. BENTLEY.

Page 108.

Page 1.	AL CHIEF.
Page 2.	AL CHIEF.
Page 3.	BENTLEY.
Page 4.	BENTLEY.
Page 5.	BENTLEY.
Page 6.	BENTLEY.
Page 7.	BENTLEY.
Page 8.	BENTLEY.
Page 9.	BENTLEY.
Page 10.	BENTLEY.
Page 11.	BENTLEY.
Page 12.	BENTLEY.
Page 13.	BENTLEY.
Page 14.	BENTLEY.
Page 15.	BENTLEY.
Page 16.	BENTLEY.
Page 17.	BENTLEY.
Page 18.	BENTLEY.
Page 19.	BENTLEY.
Page 20.	BENTLEY.
Page 21.	BENTLEY.
Page 22.	BENTLEY.
Page 23.	BENTLEY.
Page 24.	BENTLEY.
Page 25.	BENTLEY.
Page 26.	BENTLEY.
Page 27.	BENTLEY.
Page 28.	BENTLEY.
Page 29.	BENTLEY.
Page 30.	BENTLEY.
Page 31.	BENTLEY.
Page 32.	BENTLEY.
Page 33.	BENTLEY.
Page 34.	BENTLEY.
Page 35.	BENTLEY.
Page 36.	BENTLEY.
Page 37.	BENTLEY.
Page 38.	BENTLEY.
Page 39.	BENTLEY.
Page 40.	BENTLEY.
Page 41.	BENTLEY.
Page 42.	BENTLEY.
Page 43.	BENTLEY.
Page 44.	BENTLEY.
Page 45.	BENTLEY.
Page 46.	BENTLEY.
Page 47.	BENTLEY.
Page 48.	BENTLEY.
Page 49.	BENTLEY.
Page 50.	BENTLEY.
Page 51.	BENTLEY.
Page 52.	BENTLEY.
Page 53.	BENTLEY.
Page 54.	BENTLEY.
Page 55.	BENTLEY.
Page 56.	BENTLEY.
Page 57.	BENTLEY.
Page 58.	BENTLEY.
Page 59.	BENTLEY.
Page 60.	BENTLEY.
Page 61.	BENTLEY.
Page 62.	BENTLEY.
Page 63.	BENTLEY.
Page 64.	BENTLEY.
Page 65.	BENTLEY.
Page 66.	BENTLEY.
Page 67.	BENTLEY.
Page 68.	BENTLEY.
Page 69.	BENTLEY.
Page 70.	BENTLEY.
Page 71.	BENTLEY.
Page 72.	BENTLEY.
Page 73.	BENTLEY.
Page 74.	BENTLEY.
Page 75.	BENTLEY.
Page 76.	BENTLEY.
Page 77.	BENTLEY.
Page 78.	BENTLEY.
Page 79.	BENTLEY.
Page 80.	BENTLEY.
Page 81.	BENTLEY.
Page 82.	BENTLEY.
Page 83.	BENTLEY.
Page 84.	BENTLEY.
Page 85.	BENTLEY.
Page 86.	BENTLEY.
Page 87.	BENTLEY.
Page 88.	BENTLEY.
Page 89.	BENTLEY.
Page 90.	BENTLEY.
Page 91.	BENTLEY.
Page 92.	BENTLEY.
Page 93.	BENTLEY.
Page 94.	BENTLEY.
Page 95.	BENTLEY.
Page 96.	BENTLEY.
Page 97.	BENTLEY.
Page 98.	BENTLEY.
Page 99.	BENTLEY.
Page 100.	BENTLEY.

Alley

This is a fine type of structure in the
in the case.

1. 100 ft.

Alley

Single row: - a single row of structure in the case.

Double row: - a double row of structure in the case.

After every adjustment made the amount of strain on the dam must be noted.

1. 100 ft.

This is similar in design to the 100 ft. with the following points added to the design: (a) the design of the structure, (b) the comparison of the structure, (c) the design of the main spring, (d) methods of adjusting the initial tension, (e) the amount of strain on the dam.

Alley

Same as for the 100 ft. but less difficult adjustment for the main spring, the adjusting row being in the base of the structure.

6. 100 ft.

Temperature compensation is by means of a bimetallic helix in the pointer spindle.

PAR. VIII.

To avoid conflict across the instrument is mounted - a coiled wire which is connected to the static side of the H.T. system.

Insulation varies, some with H.T. insulation but more general types have a H.T. insulation with a gradient of fine material of a wire down.

Temperature compensation is provided by means of a bimetallic & a stud on the end of the bar engaging in a slot on the gradient helix.

As for H.T. & H.T. etc.

PAR. IX.

The mechanism consists of a triple, length provided bar mounted on the body & connected by means of a link to an arm passing through a pivoted bar. A large gradient is mounted at the end of the bar & makes with a fine & a second large gear which engages a pinion on the pointer spindle. A hair spring is fitted from the shaft of the second gear. Little the weight of the one part of the bar all

hangs on final. coupled to the bar by a second arm & link is a spring loaded, weighted bar which increases the vibration period of the system & so prevents it getting into phase with the engine vibration. The spring also acts in part as a control spring.

Temperature compensation

Like the springs are self lengthening both compensation is required. Temperature for the control spring is provided by a bimetallic "W" spring which is fitted below & around the bar & is connected to the other bar by a adjustable pin. The removal of the effect of temperature on the control spring.

Bimetallic & adjustment

Together with vary the length of the rod similarly the first link to the pivoted bar. After the adjustment a similar adjustment must be made on the bar connected to the weighted bar, so vary the spring distance the first of the weighted bar as he adjusted. After the above adjustment the spring must be raised or lowered by adjustment in the bottom bar of the bar to set the bar angle.

Bimetallic & adjustment (general)

In all instrument it will be found that the movement of the controlling member is exaggerated in such a manner that an approximately even scale results. This is done by varying the angle between the

have a like change & say the magnification is desired

Rate of Curve

May be calibrated in bathwater or tank.
A is employed in conjunction with the R.C.I.
The general principle is that of measuring
the pressure difference on either side of a
calibrated orifice.

Notes. When the air climbs the vertical
pressure being lowered the capsule readily
contracts & tends to contract the vessel
being transmitted to the pointer. The pressure
within the capsule owing to the restriction of
the orifice does not increase as rapidly but it
was predetermined that the movement of
the capsule is determined by the rate of
pressure difference & the faster the current the
faster the rate is. Larger pipes required.

Variation of the viscosity as a compensated for by
hyperfixing one side with a variable back cover
by a before for rate of flow & a glass.
The inside of the valve being against a cold
spring with a perfectly fine rate in a
bathwater tank.

Calibration

Apply a pressure to the water to 100' of water.
Pressure should not fall more than 1' in 10' area.

Place instrument in portable calibration for attention
a constant up to portable instrument. Pressure pressure
gradually rising that the pointer did not move
beyond the limit of the scale. Exposed relief valve
in chamber a high point starting at 1000 ft./min.
low marks with stop valve measure the time taken
for the survey to rise the equivalent of 1000 ft.
The time should be one minute. Above 1000
should not exceed 200 ft./min.

Coast gauge 118-B-2

The type in general can be obtained in 2 forms one being fitted with an automatic differential capsule designed to act as its own spring, the other being similar to the 118-B-1 structure.

Calibration adjustments

On the double capsule type:

1. For a regular wave the length of the waves are not to exceed approximately 4 inches in position.
2. For irregular waves or waves that is 1 in one part of the wave only the length of the connecting link must be varied with irregularity is desired. Any regular wave the measuring is more or less.

To avoid damage to the lens is the case of washed & safety device is fitted consisting of two lead strips one of which is adjustable & as the expansion of the lens may be varied & the regular movement of the pointer controlled. The second strip limit the contraction of the lens & is fitted inside.

The second type is in the form of a modified standard unit is constructed to the 118-B-1 alteration. The movement has two live springs & all screws are locked with shillies except the pointer and wave which has a small lock nut.

Calibration adjustments are identical with the 118-B-1 structure.

Safety strips are fitted. The main spring body consists of an auxiliary spring bridge which is not a screw over the base of the movement & is fast to the expansion. The movement of the recording bar is also controlled. Lead strips are fitted in an "X" shaped end & is adjustable or locked in position.

118-B-2 type Coast gauge (C.G.) works at a high speed up to nearly a high speed up.

118-B-2 calibration adjustments

Regular wave has length on graduated length wave wave on a fixed bar

118-B-2 calibration adjustments

All adjustments made on movement links & capsule lens

Pressure Gauge

The capacity of pressure gauges used is the same with a Bourdon tube principle.

Action of the Bourdon Tube

When pressure inside the tube is increased the oval section is endeavouring to overcome the increase in pressure & will tend to become circular. This action will try to straighten out the Bourdon shell with some movement of the free end. This end being connected to a link mechanism, the movement will be magnified & transmitted to the pointer. Standard Bourdon gauges are indicated to withstand 100% overload.

Leakage Types

These include fuel, oil, air & high pressure oxygen systems & range from 0.2 lb/sq ft to 1000 lb/sq ft.

Oil Pressure Gauge (Leak Type) - consisting of the indicator, capillary & capsule fitting containing the capsule. The capillary is of annealed copper covered with cotton linter & also a packed covering treated with an oil proof compound. One end is led into the indicator using a high pressure hose fitting & is connected into the block carrying the Bourdon Tube. The other end is led into the capsule fitting through an oil tight

head & is connected into the capsule. The whole of the upper bracket capillary & capsule is filled with some suitable liquid e.g. ethyl alcohol.

The capsule fitting consists of two intercommunicating chambers having check-valves. The larger containing the oil side of the capsule, the smaller called the large fitting is drilled for a hollow standard bolt by which the engine oil is allowed to enter. In action the oil under pressure surrounds the capsule which it compresses causing displacement of liquid through the system to the Bourdon tube in the indicator causing movement of the pointer.

The new pressureable calibration was 10 lb. After applying new load for 8 minutes any additional rise was not more than 50% of the initial rise & each end was not actually dropping setting 20 hours after removal of pressure.

Thermometers.

1. Liquid is glass consisting of a glass capillary with a bulb at one end, the bulb is part of the capillary containing liquid, the empty space being a vacuum. Liquid used commonly and is mercury for the following reasons:-

- (a) High coefficient of expansion.
- (b) Good conductor.
- (c) Does not wet the glass.
- (d) Expands easily over a long range.
- (e) Low F.P.
- (f) Easily visible without dyeing.

Thermometer designed to indicate abnormally low temperatures contains alcohol. The liquid is usually dyed red and is placed in a space within the bulb.

Resistor Thermometer (Wheatstone)

Gas Thermometer (Jolly)

Gas Radiator Thermometer

This is used for obtaining the intensity of the sun's radiation. The bulb is on one end of the stem is coated with dark lamp black, the whole is enclosed in a glass cover which is evacuated of air. The difference between the mass of the instrument & the standard mass reading is regarded as a index of the intensity of solar radiation. There are four scales (1) Blackbody gas -273°C (2) Celsius $0^{\circ}-100^{\circ}$ (3) Fahrenheit $0^{\circ}-212^{\circ}$ (4) Rankine $0^{\circ}-273^{\circ}$

5. Thermistor

6. Thermopile

Source Types of Thermometers.

1. Standard Thermometer (Mercury - glass)
2. Radiation Thermometer (Vapor Pressure)
3. Gas Thermometer
4. Gas Thermometer (Standard type)
5. Gas Thermometer (Vapor type) (Mercury - steel)
6. Gas Thermometer

1. Radiation Thermometer of the resistance type
+ indicates by indirectly measure - pressure of a vapor & is connected with its point liquid as the temperature is raised.
Calibration adjustments as for normal standard type instruments.

Known at light as constructed by the bulb being coated with constant boiling points.

Gas Thermometer (Mercury - steel) known as type with a steel Bourdon tube & the form of a double spiral. Bulb is for normal level gauge.

No calibration adjustments. The only means of setting is by calibration. A temp comparison is provided in the form of a Bourdon tube & the top of the spiral.

Bio. Safe Thermometer (Biot type)

Of the liquid in glass type but of larger construction than a normal thermometer.

Mercury in steel type.

Same as for oil leaf thermometers. The bulb portion being larger and in a special fitting on the side.

Engine Speed Indicator

All mechanical types are based on the principle of the centrifugal governor. The pointer's weight is carried on a rotating spindle the nuttall movement being controlled by a spring spring, this being a definite portion of the weight per unit speed of the shaft. Movement of the weight is caused by a link to a sliding sleeve & there to the pointer by a graduated tapered rod.

Calibration.

On the new modern types there are no hand screw calibration adjustment. On the older type type is a sliding the control spring pin with Allen the effect of tension of the spring & so decrease or increase the dial reading.

Altitude Calibration.

1. Note temperature of barometer & barometer pressure (Baro should be 15.0°C).
2. Close & seal the chamber.
3. Close valve to atmosphere & open depress in each.
4. Operate vacuum pump until mercury has fallen about 10". Allow to stand for 5 minutes to ensure system is not leaking.
5. Read in by atmospheric read & open chamber.
6. Set instrument to height coincident with the barometer reading. (Height necessary record of the pointer.)
7. Insert instrument in the chamber, close & seal chamber & bring mercury column to zero. (Dependent upon the pressure of the dry pressure or depression is applied.)
8. Note the instrument reading & if not at zero make necessary adjustments.
9. Having set barometer & instrument to zero pressure is now calculated at the rate of 1000 feet per inch & readings of indicated barometer at each 1000 ft up to 10000 ft above full scale.

11. After one minute valves are adjusted to measure the pressure at the same rate (1000 ft/min). & instrument readings are noted.
12. Calibration adjustments are carried out in accordance with the above instructions. After each adjustment repeat the above sequence of operations.

Calibration of Pressure Gauge

Standard instrument used is the Deverux tester. The device consists of an oil containing syringe into which is forced a plunger carried on a shaft which is of such a diameter as to occupy nearly the whole of the syringe. A hole is drilled through the plunger allowing oil to pass freely, the by restriction of the hole the volume of the syringe & the pressure of the oil in it can be varied. In the upper end of the syringe is a screw union to which is connected the gauge under test while at the other end is a vertical extension in which slides a piston capable of being weight loaded. With gauge attached forcing the plunger forward will cause the piston to lift due to the oil pressure & since (a) the pressure of a fluid in the case is all distributed the force exerted on a piston is $\propto$ to the vertical area of that piston, then we are enabled to overcome the actual pressure in the syringe & check the accuracy of the gauge connected to it.

With a piston whose vertical area

is 150' if a ship is right up to it.
The pressure of the 150 lbs would be against
to lift it with other pressure in the same
cylinder.

Method of Procedure

1. Remove piston from vertical cylinder &
insert funnel into gauge under the foot.
2. Fill with heavy oil with level with
top of the union. Remove funnel &
blow off union.
3. Turn horizontal machine, until oil
is at top of cylinder & free from
air bubbles. Replace piston in cylinder.
4. Fit gauge, turn horizontal sufficiently for
the right platform to be just before
ballcock & now connected by fingers
only, emptying the platform & forcing the hot
oil, comparing the right with the gauge
reading.

Charging equipment for 110 Oxygen cylinders

The oxygen tank is filled at high pressure in large
transport cylinders connected by a.c. piping to a regulator
which consists of a reducing valve, & stop valve, &
two pressure gauges. One gauge indicates the pressure
in the transport cylinder & the other the reduced
pressure at the outlet of the regulator. The regulator
outlet is connected by H.C. piping to a single cylinder
& charging rack or into an air charging panel.
Transport cylinders

Construction: alloy steel, seamless solid bar.

Volume: 2.5 cu ft.

Pressure: 3,600 lbs/sq" (should not be discharged below 1,000)

Capacity: 18,000 cubic feet, sufficient to charge 12 H.C. cylinders.

Regulator

Consists of inlet & outlet union, & reducing valve,
relief valve, stop valve & 2 pressure gauges. Inlet
pressure gauge 0-4,000 lbs/sq" outlet gauge 0-2,000 lbs/sq".
Relief valve set at 2,300 lbs/sq".

Charging rack

Recommendation for 12-72" cylinders & incorporate
a combined inlet union & main stop valve, & pressure
gauge (0-3,000 or 0-4,000 lbs/sq") & 2 stop valves. The hand
union of each bottle connects five hoses &
one return valve (one to each bottle).

Operation Before setting up slides for changing the hole should be covered a this contact taken for above.

1. Having connected up slides on each, close the stop valve. Turn on upslide or pressure with the control by the gauge (not if 0.002 psi).
 2. Test all connections on each for leaks.
 3. Having connected up slides & all pipelanes, open valves slightly & test for leaks.
 4. Below stop valve & after up slide valve by one full turn. The main gauge should read 2500 lbs/sq in.
 5. Open stop valve & note that reduced pressure does not exceed 2,200 lbs/sq in.
 6. Open main valve on each gradually over a period of 3-4 min. Reduced pressure on upslide should not exceed 1000 lbs/sq in.
 7. When each gauge indicates 1000 lbs/sq in. turn off main valve on each & close up slide valve. Allow upslide to cool off for 15 to 20 minutes during which the pressure should fall to about 1000 lbs/sq in. When there is no further fall in pressure, recharge up to 1000 lbs/sq in. again. Test one upslide from each batch.
- Delivery valve should never be disconnected. Safety valves may be taken down for cleaning.

Compass

There are two types in service use - "P" type & "D" type. The "P" type is used to give the heading or course of the ship & the "D" type for obtaining a regular bearing of any object in relation to the ship.

A compass can be said to consist of a part.

1. The Magnetic system consisting of hard steel or cobalt magnets mounted in pairs, & damping wires. There are four of the wires indicating the cardinal points, one being wholly horizontal & 3 have horizontal points. The weight of the system must be within tolerance of an ounce & the weight must be as even as possible around it. The magnets must not be very high & must be very low. The centre of gravity of the system is displaced to the of an inch below the point in order to bend the ship to within 3° of the horizontal. (Dip - 67° in the British Isles).
2. The bowl is of brass & filled with alcohol 82.91. ('D' & 'P' type compasses 82.93 & 82.94) to the bottom is fixed a damper or gyroscope tube which must be capable of taking 12% increase in volume of the bowl. Higher temp. of oil & the bowl will expand.
3. The gimbal or floating ring permits movement in all directions except rotation. There are two other parts fitted to act as stop checkers.

- 14) The bearing plate is marked off in divisions of 2° from 0° to 360° . It hangs at 10° intervals on vertical pins & better than we imagined, there are two horizontal grid wires to help a little for taking readings.

Other Requirements of a compass.

1. Magnetic north must be very high compared with north. Should not be south of 45° .
2. Magnetic axis must take up position quickly without oscillate.
3. Center of gravity must be below pivot (30° inch).
4. There must be no liquid seal.
5. Drying liquid must work over range of -50° to $+100^\circ$ & have suitability of alcohol.
6. Compass chamber capable of holding 15% increase of volume must be fitted.

Compass Swing

Swinging is necessary when:-

1. A new compass is fitted.
2. When compasses are added to a vessel from a/s.
3. If a/s has stood in ice for a long time.
4. If a/s has been to L.R. or H.R. or a/s up after.
5. If a/s is moved from one latitude to another for a length of time.
6. If compass position is changed.
7. If any other error at the G.C.I. is detected.

Compass Errors

Compass errors are caused by

1. Local Attraction due to iron magnetic body in the vicinity of the a/s.
2. Variation due to the angle between the true north pole & the magnetic north pole.
3. Deviation due to the angle between the compass needle & the magnetic north.

Remove battery BracketRemove & Replace Battery Plate & Compensator

1. Turn looking down to look
2. With the slip provided raise the coil under the north point of the battery plate.
3. Holding the compensator control block rotate the battery plate anticlockwise 90°. Having a slight board it can now be lifted off taking care not to damage the drift wire.
4. Lift out the compensator.
5. When replacing the battery plate ensure that the slot under the north point is not associated with the slot under the flange before lowering into position.
6. Turn clockwise until notch engages.

To change the battery plate glass

1. Remove the inner window & frame the bag.
2. Remove the old glass & rubber window & when having plate.
3. Place new rubber window in position & place new glass window on the window.
4. Replace the absorber ring taking care that the wedge has coincided with the hole in the battery plate.
5. Replace the inner window by fitting opposite side in turn to avoid working the glass.

To change the spring target attachment

Remove the drift wire by unscrewing the screws below the hole in the plate.

Remove the attachment bar.

Remove the collar, fix a bar screw & from the connector below the drift bar & wind around bracket. Bring a stiff wire back, disconnect the spring attached to the exterior on the spring window ring.

Remove the 4 screws securing the attachment to the body & carefully remove the attachment taking care not to damage the drift wires of a spring.

Place the new attachment approximately in position & connect the spring.

Fit the attachment in position with the 4 screws.

Replace attachment bar.

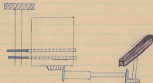
Replace the drift wire.

Method of checking the 2203

1. Drift wire for tension.
2. Drift bar for bands.
3. Sighting plate for alignment in the drift bar groove.
4. All setting screws for alignment.
5. Compass for accuracy.
6. Wind gauge bar for alignment.
7. Levels for accuracy & condition of bubble.
8. Spirit level bracket & spirit for fly.
9. Density of compass corrector bar & adjustable corrector.
10. Reading plate bar for focus & reading.
11. All wiring facts for hookback.
12. If the eye is set to view the wind speed the pointer should register 30° drift on both sides.
13. Select a number of sights of similar type & move that they are back & is aligned. Then that all bars are parallel & all sights at the same go to the light from the line of all bars & see that they line up correctly for use. But they line up & test at various angles of 15° & 30° they sight that appear out of alignment should be returned to align. Latent alignment of flight bar can be tested by using a spirit level. Check the horizontality at the front of the wind speed bar & that the wind gauge bar is assembled correctly & that the wind arrow is parallel to a point in the same direction as the wind speed bar.

77X-18

1. It has only the viewing target attached.
2. The range is selected by drift bar has a vertical rotation.
3. All 77X-18 models are included in 77X-18.
 - (a) Stronger drift bar.
 - (b) Improved clamp to hold sight bar vertical.
 - (c) Stronger view sight.
 - (d) No engraved viewing plate glass.
 - (e) Brimstone drift bar.
 - (f) Parallel & alignment.



Light Truck Overhaul.

Inspection every week.

1. Remove the bridge cover & inspect the bed
cover & guide bars of the upper carriage
for signs of rust or corrosion.
Lubricate with oil grease.
2. Examine the trailing straps of the upper
carriage for signs of backlash on the bed
cover. If backlash is present exchange the washers
for one thinner.
3. Inspect all electrical connections for cleanliness.
4. Check the tension of the upper seating straps
& adjust as necessary by the tensioning screw.
5. Inspect the guide bars of the light axle
carriage for slackness & signs of corrosion. Lubricate
with oil grease.
6. When the light seating screw is lubricated.
7. When a lubricate the tension adjuster & check
over bearing surfaces.
8. Inspect the wire brake for damage.
9. Remove the bridge from the table under the
vertical clamping screw & place the table spindle
down on a flat surface.
10. When the base of the table is examined for

signs of corrosion paying special attention to the
balling screws.

Bedding.

1. Remove special units placed in storage.
2. Remove bridge & strap to false floor in
padding area.
3. Remove table & place in case.
4. Fold up top of & strap in position in case.
5. Fold up cover & strap in position in case.

Accumulation (Lead acid type)

Principle: A means of converting chemical energy into electrical energy.

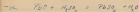
Construction: Consists of two dissimilar metals called electrodes immersed in a liquid called the electrolyte. The electrolyte is sulphuric acid (H_2SO_4) & the positive electrode is cast iron or lead (PbO_2) & the -ve is spongy lead (Pb). Each cell of an accumulator is joined in series with the next; also each cell has more area plate than the next.

Behaviour: If the circuit is closed, that is electrodes joined together, a current will flow, due to difference of potential as long as chemical action takes place. The action of the electrolyte causes hydrogen & sulphate ions to flow to the plates & this flow of ions constitutes the passage of the current through the cell.

Chemical Action

Discharge

Recharge



Internal resistance: The IR depends upon the surface area of the plates, the distance between the plates, the IR of the electrolyte, & any other materials between the plates.

Terminal P.D. = $E - IR$

The EMF depends on the materials used & is constant for any particular combination of materials. The IR at the terminals depends upon the internal resistance & the current flowing through the cell. Voltage is lost internally too.

The terminal P.D. = EMF - IR (loss in cell)

The EMF is IR - an open circuit.



$$I = \frac{E}{R} = \frac{1.5}{1.5} = 1 \text{ amp.}$$

$$E = IR \text{ (loss in cell)} = 1 \times 0.5 = 0.5 \text{ volts.}$$

$$\therefore \text{Terminal P.D.} = 1.5 - 0.5 \text{ volts} \\ = 1.0 \text{ volt.}$$

Sulphur is caused by too heavy a discharge & being a cell in a discharged condition, runs low of capacity, however in internal resistance, holding in excess of temperature through passage of current. Rarely has discharge.

Cracking is caused by uneven expansion & contraction of the plates. Plates probably covered with sulphate or electrolyte. Rate of charge & discharge too rapid.

Hydric bubbles of moisture in the plate has much acid from back of charging, giving a bluish yellow appearance. Rarely by too slow charging.

Condition of fully charged cell - charge.

1. Voltage should read approx 2.0 volts
2. The 20% of acid should be as laid down (1870-1875)
3. Both plates should be going fully
4. The plate should be a rich chocolate red color & should be a dark grey.

General

Voltage of a cell with not deep below 1.75 volts off load or 1.5 volts on load.

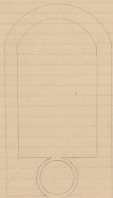
Voltage of a cell fully charged off load 2.2 volts, on load 2.0 volts or above to be 2.

S.G. of discharged cell approx 1.200

Specific of a cell about 1.2 after being for 9 ft of 1 on plate

S.G. of commercial 1.250 - 1.260

When mixing acid charge of new distilled water a charge with the acid in small quantities at a time to the water, otherwise excessive heat is generated & damage to the container is probable. Always top off an accumulator with distilled water if low, unless it is known that the electrolyte has been spilled. The top off with dilute acid.



Camera of 22 (Photo Pattern)

This gun, intended for fixed gun training, is so arranged to have the controls similar to that of a fixed machine gun.

The camera consists of 2 main units -

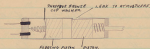
1. The body consisting of (a) the base, (b) the protective flaps, (c) the shutter unit, (d) the wheel, battery & lamp, (e) the film holder.
2. The mounting consisting of (a) the base steel member (b) the head containing the mechanism for changing the film & setting the shutter.
3. The loading handle.

The camera body is approx 1 rectangular in shape of aluminum alloy, & carries all the sub-units.

It can be stowed without disturbing the sight as called by moving the two rotating handle bolts on the right of the camera.

(a) The base is a flat-angled bar of 1" galvanized iron & is set at infinity so that all objects at over 100 yds distance are in focus.

(b) The protective flaps consist of two strips each mounted at right angles at each end to two circular pitted plates. The right hand plate has slots in



Shutter flaps.

in this, one which engages a peg in the forked end of the rotating bar & the other connects to the second peg.

- (c) The shutter unit (fig. 5) is of the lever type & is at such the leading handle is down back. The unit is mounted in the center of the right hand side of the body by four screws & contains a inter-connected lever system as described below.

The shutter system, by means of the mechanism in the lever, that setting lever is pulled forward & an internal actuator in the same shaft inside the mechanism moves back, being with a horizontal bar against the action of a spring. The horizontal bar is connected to a spring loaded bar which is in turn linked to the shutter rotating bar (the link). Before the shutter is set, the horizontal lever is forward, after down back a shot in the connecting link to the shutter bar moves down in a "Z" shaped path & so does not operate the shutter.

When the shot bar is forward to fire the gun, the top portion of the release lever forces the shutter wheel away from a projection on the horizontal bar & allows the spring to return it to the forward position.

Position of the shot bar at the end of the lever is at the end of the lever.

The shot bar in the connecting lever however being in the shot arm of the "Z" shaped shot lever the shutter rotating bar of. This is the bar engaging with pegs on the shutter frame, blades, from this to open the shutter, through a movement of 90°.

When the horizontal bar has returned fully forward due to the action of its spring, the shutter is closed by means of a spring between the shutter bar & the roller in the connecting link.

The time of exposure being governed by the rate at which the horizontal bar moves forward, can be varied by altering the tension of the controlling spring. This is done by means of a triangular shaped arm. This gives three speeds of the shutter, marked on the outside of the mechanism near by the letters F, T, B (fast, still & bright).

- 3/ The shutter system, is operated by the release lever & has not more when the trigger is "cocked". When the gun is fired the top of the release lever, being forward causes a shot to hit the side of a "W" frame pivoted on a "Z" shaped bar moving the latter to move clockwise in its pivot & so operate the shutter wheel giving a short illumination off the wheel.

Operation of the shutter wheel. When the piston is down back it only compresses the return spring

situated inside the duct. When the "i" shaped bar is released the piston is returned by its spring & the air pressure forces a secondary piston forward. This brings a phosphor bronze washer in the secondary piston in contact with the wire, making electrical contact, when it remains until the air pressure has leaked away through a hole in the casing allowing a second spring to return the secondary piston to its starting position. The arrangement shows that the time of illumination does not depend upon the speed at which the light is operated but only on the speed with which the "i" returns. The two pistons can leak away. When the trigger is released the switch is again operated by means of the "H" bar & "i" shaped bar.

(d) The film holder

This is held in the hip of the body by a spring holder passing through a plate which forms part of the body. The plate carries the dark valve for the film aperture & has hinged to it at right angles a round plate which carries guide rollers & also (pointing to the rear) two small plates, one carrying a spring loaded dog catch for the first stop & the other the driving dog for the second stop. A ratchet & pawl prevent backward rotation of the dog.

Sliding in grooves in front of the apert hole is a glass plate coated with the target granulate.

Positioned below the body are two gears, one meshing with the gear in the operating head & the other meshing with the first gear & connected by a spring from which to the slotted spindle which drives the dog of the "main" apert.

The forward plate permits the gear to move back without moving the film.

The mounting tube here is a casting of aluminium alloy having four drilled holes. Attached to the front is a large gear wheel to which is connected a strong shock-type spring, the inner end being secured to a steel spindle hinged to the head. The ripples of the leading cable engage a hole in this gear so that when the leading handle is pulled up it rotates the gear & so winds up a fresh portion of film. Near the end of its travel a roller on a screw & spring loaded plate, on one of which is hinged a lever through the head carrying an adjustable screw which engages the latter stop bar. When the leading handle is released the spring turns it & the gear, & the plate is forced to return under the pull of its own spring. Fitted to the side of the head is a screw

spring loaded plate which is free to rotate horizontally & has a vertical leg. This plate is connected to the "finger" ratchet & works like a lever when the thumb lever on the left control column is pressed.

The loading handle

This consists of a cylinder with two shapes by which it is fitted to the left column. In the cylinder is a rod with a slotted handle. The loading ratchet forces through the cylinder head & ratchet engages a plate in the ratchet. Mounted on the cylinder is a counter. Raising loaded bar forces on the counter & moves counter a roller which fits into a small slot in the cylinder & as the handle is down of a cammed shape on the rod drops the bar. On the other end of the bar is a pawl which moves a ratchet wheel a short pawl also being fitted. A drum

Control gun G. 22 (Chassis)

The gunner is similar in general principle to the G. 22, but the shape of the body has been altered & dummy loads, apart a pistol grips have been added so that the dimensions & weight of the gunner is similar to those of the first design.

Anatomical details.

1. The base is the same as the G. 22 but there are no protective flaps.
2. The elbow and finger are similar to that of the G. 22 but the flap extending has a slot & serves only as a rest for the elbow loading lever.
3. The loading.
4. The finger handle.
5. Down finger connects with the usual markings & fitted below & behind the finger handle. The drum is practically connected to a ratchet wheel.
6. The pistol grip carrying the body & release lever, the loading mechanism being fitted above it in the body.
7. The back grip.
8. The thumb.
9. The leg.
10. The elbow.

The Mechanical Operation

When the working handle is pulled back, a friction trigger chain is pulled off a pulley, rotating it & turning a spring loaded in the frame down. At the same time a rack moved to the working handle rotates a pinion which is connected to the driving coupling of the incense spoon & so into the film.

As the working handle moves further back, it depresses a long 'i' shaped bar, the rear end of which engages the rotated bolt on the counter assembly & moves it round & down. At the end of its travel the working handle moves back on end of a bar, the other end of which is connected to an adjustable cylindrical bar which is free to slide & is too hinged to the body, the bar pushes forward the setting bar & so sets the shutter. The working handle is then drawn further back & is locked by the rear.

When the trigger is forced the rear advances the working handle which is returned by the spring. During this movement the film film is not moved because of the friction in the film winding pinion.

The shutter setting bar is also not moved because the end which engages the working handle has friction as it is a spring loaded steel plate, which is free to pivot only in the forward

direction. At the same time that the rear is depressed another bar linked to the trigger moves back to operate the shutter unit.

Type 5a - ground base

This is a standard camera used for general ground photography. It consists of 4 main parts:—

1. The Stand.
2. The Base.
3. The Base Unit
4. The Shutter Unit

1. The Stand is a telescopic structure which is carried in cylindrical carriers & better only used.
2. The Base is a structure which is carried in the stand either vertically or horizontally.
3. The Base Unit is a square frame provided with a carrier which engages edge shaped edges which are in the base. It is able to tilt through about 15° . The carrier has a built in a carrier for the frame, forming the frame carrier the "changers", a built in carrier, & a ground glass carrier, which can be swung about to point parts of the plate holder. These are built into the plate holder & are provided with half plate slides. The carrier plate holder fits into a bracket frame which can be swung to the main frame so that either side is reached.
4. The Shutter Unit is of the angle, rotating plate type & is not self supporting. It is fitted

behind the base. A two-instantaneous change lens is fitted.

4. The Shutter Unit carries the lens & shutter. It is fitted to a carrier in the base & has a carrier that its height can be varied.

For transportation the base, unit & shutter are fitted into a carrier & better case. The unit can rotate through 90° in this carrier & can be locked mounted on the base.

For lenses a carrier, a focusing slide & the focusing screw are carried in the carrier.

The plate holder being carried in separate carrier of its own.

Shutter Operation

- (a) With lens set at "Instantaneous"

The shutter is set by rotating the blades by the hand in front of the unit. The slide is in the blade stop lever & the last of them is locked by the lever. When the release is pressed it is released by "B" & the plate is returned by spring "B".

- (b) With lens set to "Geo"

The movement of the change lever moves control "B" & the lever "B" is free. The shutter is set as before. When the release is pressed "B" is pulled by the spring "B" so that it catches the carrier slide. When pressure

a camera from D. It shows ranging "D" both as
 a the shot range with it against D. to be
 found used for the camera is operated. The camera
 is of the automatic type.

The 724

The 724 camera is a film camera used for all
 purposes. The photographs taken are 5" x 7" in image
 of either a vertical or horizontal may be registered on the
 corner of each photograph. The lengths of film used
 are (1) 25 exposures, (2) 30 exposures (3) 40 exposures
 (all dark room loading) (4) 8 exposures (5) 16 exposures
 (daylight loading).

The camera consists of interchangeable units as
 follows:—

1. The magazine
2. The shutter.
3. The Body.
4. The film base.
5. Bellows counter.
6. Lens cover.

Lenses of various focal length are available including

6", 8", 10", 16" & 20" lenses & a 5" wide angle

lens. The following equipment is also provided:—

1. A metal protective cover for the optical glass
2. Various camera mounts so that the camera
 may be secured both in land planes & in
 flying boats
3. A land mounting for the camera.
4. A camera case or carrying bag.
5. A focusing target
6. A storage frame.

The Magazine

This consists of 2 main parts (1) the apert. carrier, which contains the mechanism by which

(1) the film is flattened against the negative plate during exposure. (2) the film is reeled for each exposure (3) an exposure counter (4) film and indicator are operated.

(5) the magazine cover, which renders the hole light tight except for the exposure aperture.

The film spools are mounted in the apert. carrier. The one end engaging the dog catch. The other running on a wheel axle, attached to a fixed bar.

The same size apert. are used for all lengths of film.

The Mousing roller grips the film by a small point at each end, & is driven directly by the dog on the gear bar. The roller makes two revs & is prevented from rotating backward by a check pawl.

It carries the disc via two idler gears to a gear, fixedly mounted on the exposed apert. drive. The friction drive is obtained by making the gear between two flexible large friction wheels. The pressure is varied by means of a spring loaded bellows act. This drive enables the mousing roller to contact the increased effective diameter of the main apert. as the film winds onto it.

This carrying a constant length of film being wound onto each apert. apert.

The exposure counter consists of a drum with a gear wheel fixedly mounted to its hub.

This gear wheel is driven by an intermediate gear meshing with a pinion mounted on the axis of the above idler wheel. The rim of the drum is engraved in even gradations from 0-100 & the gear ratio is arranged so that the drum makes 1 rev & half a gradation for each apert. of operation. The drum registers against an index on the gear case & a dotted line projects through the cover & catches the drum to be set at zero when necessary.

The unexposed apert. is fixedly locked & a gear on it drives the film wind indicator.

A rectangular plate called the pressure pad, is carried between the side members of the apert. carrier. It is attached at its center to the pressure pad bar, which is pivoted at one end, the other projecting through the apert. carrier cover plate & sitting in the gear bar mounting bar. Two large wheels separated by a small spring & a felt washer makes light tight the plate through which the lever passes. The lever is held down by a spring loaded ballcock which is pivoted above it. The same spring loads the lever carrying the stop watch. When the

When the hair is turned the pad is flattened against the skin. Lift it flat against the opposite leg. The foreman pad under the egg. Right-left when it is raised for the same; a small spring loaded plate sliding down the foreman pad back, in front against the skin. B. Winding the egg. Right-left. It is unlikely that any fault will occur in the egg. But the spiritual driver should be satisfied occasionally. The foreman pad. The unspined spiral (foot).

When the hair is of the spirit. The at right angles to the tube with the wing against the lower collar. Each both right & left. Place both tubes between the first spiral. The that for the upper is finished & project.

When the hair is of the spirit. The at right angles to the tube with the wing against the lower collar. Each both right & left. Place both tubes between the first spiral. The that for the upper is finished & project.

When the hair is of the spirit. The at right angles to the tube with the wing against the lower collar. Each both right & left. Place both tubes between the first spiral. The that for the upper is finished & project.

The exposed spiral

- a) Lift the hair up the back with the right against the upper collar.
- b) 4.5 tubes: the place of the upper spiral at the same as the lower.
- c) Lift the hair by the wing for a moment and the hair should be left long to lift the right.
- d) The leading spiral against the back of the hair plate.
- e) A spiral pair of wood and glass should be used to show these.

The white

The white is of the first all first plane of the type 2. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.

The upper that is the white & hair. The hair is of the first all first plane of the type 2. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.

The hair is of the first all first plane of the type 2. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.

spoke not only partially round in the lower corner
but the former occupies the gap which.

Before the shutter is set the ruffed bird
in the lower part of the main block with the old
one round in the lower corner. Take account of the
new bird around the exposure aperture.

When the shutter is being set both birds are
down over the ruffed bird being again a bird
in that it makes the upper. When the shutter is round
possible shutter the ruffed bird is found at once
round in the lower corner. That is after the first
first backgrounded shot against round with the white
which in the lower corner is obtained.

The height of exposure depends upon the
aperture of the shutter around the aperture can be
adjusted by altering the initial tension of the wire
being pulled across. There is a way by using the
hand of the shutter on the exposure. The shutter
aperture which projects through a long exposure
to be the shutter open.

The time of the exposure - position of
round in above through an aperture in the side of
the above.

A bird's down is found to find out
of the old. After shot - down by a power should
to be the old first with round in a new which
is exposed by a lens connected by a flexible

shot before to a spring should be at the other
end of the shutter from the exposure which
the new down is the shutter between the lens and
finds the exposed showing effect to keep the exposed
round. The initial tension of the shutter spring is found
to end the exposure by a power on the lens. The
lens with the aperture, which engages a gear at the head of
the spring down line and with the spring force and
is attached to the down of the gear. The other end
is attached to the lens.

Before is. Reproduce the only part of the shutter
likely to not open as the shutter there should be
examined by holding them up to a strong light &
must be changed if the smallest bit above.

Only

Before examining the shutter all bearings should
be checked a very light oil will not set down of soap
before the spring shot.

10) After setting the film through the end of the aperture
and the shutter into the lower corner.

11) By means of the film, with the aperture &
the shutter.

12) Look for the film.

Apply the film.

This is done in following steps. The
anti-rubrication device is fitted on the down of the shutter
aperture is locked to the frame. Holding the

head. back on the transverse axis of the vertebrae
the above with the indicated mark 20.

(a) Bend the third and transverse
(b) Rotate head & above together for 8 turns
anticlockwise.

(c) Loosely above to form.

Settle 200 times.

(a) To device to form eggs of the year in place.

(b) Let white of egg indicate at head.

(c) Bend now head on the transverse axis with the
body, side of the head on 90° past the left of
the middle.

(d) Let the head, having the front corner of the
ear give a diagonal to the year, but the ear with
the back has been in the next to the front
corner.

(e) Place the head to round.

(f) Have front corner of spring down & diagonal to year.

(g) Release the spring down & stretch with the top of the ear
tether by turning the year through 20° still in
the anticlockwise direction. The head the year & the
year & tighten the front corner.

Note: The object of all this is to set the white of the
of front corner of the spring to work a line away

The Lower Body

This is an anterior ally casting. The white
film at the 2nd bend by the head, and
round into a stud which projects from the white
through the body.

The spring is round in top of the body
by a bracket in the body - a spring stiff in the
year line.

A frame forming the surface of the front
from the spring, flat for a distance the spring
glass, against which the film is flattened by
the pressure of the film.

A partition in one corner of the object, which
is a frame for the image of a white or white.

The two corners round to the body by 3
hinges bent into the body.

Round has rounded in the body is used
when setting the corner in its own way.

The Gas Box

This part of the camera contains 3 systems:-

(1) The Mechanical System

This can be operated by an electric motor or by hand & performs the following functions:-

- (a). The shutter is act.
- (b). The pressure pad is raised & lowered.
- (c). The film is wound.
- (d). The shutter can be released.
- (e). The exposure counter (if fitted) is operated.

(2) The Electrical System

This performs the following operations:-

- (a). Two lamps are lit to illuminate the subject.
- (b). The shutter timing motor is started or stopped.
- (c). A motor signal lamp is operated with the motor is running.
- (d). A mark exposure counter is operated if fitted.
- (e). The shutter can be released.

3) The Optical System provides the means by which the subject or counter is photographed.

The whole of the mechanical & electrical systems except the timing lamp & timing mechanism, are housed in the main body which is closed by the cover. The operating

handle projects through the cover. A small access to the left of the viewing window the optical system is the timing lamp. The subject & counter are held on a small round plate which may be fitted over the access. The counter is operated by the timing lamp through a connecting link.

by cycle of operation

The cycle of operation takes five runs of the handle. Starting with the shuttle set in the following:

- 1) The wheel is engaged & slowly has rotated.
- 2) The handle is lifted.
- 3) The shuttle is released.
- 4) The gap wheel is thrown into mesh & into state.
- 5) Shuttle has started to run.
- 6) Lifting block pin starts to turn (i.e. no of handle)
- 7) The lift pin starts to turn & no.
- 8) Release feed fully raised by working lever
- 9) "Ladder" counter operated.
- 10) The wind pin starts to turn (18 rev)
- 11) Release counter operated. (checked) (22 rev)
- 12) Lifting block released. (24 rev)
- 13) The lifting block drops into gap wheel slot & the feed engages with the pin.
- 14) The handle goes on. (30 rev of 48 rev)
- 15) The lift pin released & locked. (32 rev)
- 16) The wind pin feed & locked. (38 rev)
- 17) Release feed lowered.
- 18) Gap wheel, feed from driving pin, is rotated by roller on right side with the aid of working lever in it and of slot. (40 rev)
- 19) Shuttle stops - all in mesh & shut.

Disassembling the gear box.

The gear box must be stripped in the following order:-

- 1) Remove the drive mechanism & with draw the bottom cover (a punch may be necessary) The top cover may be moved by moving the fly & driving the cover from the rising.
2. (a) Lift the handle, cover which is driving pin together off this spindle.
- 3) Slide the two covers which enter the handle on the pinion spindle & ring a punch if necessary separate the parts.
- 4) If the pinion is turned so as to mesh the spring it can be moved from the cover side.
- 5) Disconnect & remove the lower gear.
- 6) Turn the fly to its locked position, then work the working lever & lift out the wheel.
- 7) Disconnect the spring & remove the working lever.
- 8) Remove the release block girth.
- 9) Remove the top contact block & move it also.
- 10) Remove the release block, spring & the plate.
- 11) Disconnect the working lever from the spring.
- 12) Remove the split pin which enters the working

have a after tapping the spindle through the
bar, move the bar, finish, set under, correct
a l.b.

70) Check position of locking bar spindle flange
relative to the wing. Release the 3 screw setting
spindle

- a) Remove the screw from the back of the
locking bar spindle & move bar & spring.
- b) Drive out fine screw, file and plug to
the fine end spindle. Drive the spindle through
the bar & move both.
- c) If necessary disassemble & move the sub-rod.

Assembly

The gear box is assembled by moving the
above parts one by one to see that all
parts are clear. The following points must be
noted & adjusted as follows:

1. The locking bar spindle must be fitted
into its position locked against the corresponding
rod - the gear box.
2. The screw in the handle adjust must
engage the plate in the neck of the wing
spring.
3. The wire stop must be adjusted between the
leaf contact block & the wing.

- a) Correction must be made in accordance
with the diagram.

Adjusting the locking bar.

- (a) Temporarily fit the bar spindle, file and finish -
f.l.t.
- (b) Note how the spring tooth engages the pinion.
- (c) It should just rise one tooth & engage the
next correctly.
- (d) If it enters incorrectly shake off the screw setting
the locking bar spindle & turn the spindle
until the wheel engages correctly.
- (e) Tighten setting screw & try and that the spindle
is not loose.

Adjusting the sliding bar.

This adjustment may be necessary if a new f.l.t.
1 setting bar is back or new is fitted. And
as follows:-

- (a) Turn f.l.t. into its locked position.
- (b) Force the bar back as far as it will setting
the roller. If the roller runs up the vertical
slip of the cam adjustment is necessary.
- (c) This is carried out by turning the bar until the
bar is at its highest position. If necessary, a new
bar should be fitted in the flange of the back.

extended from the front and off the
internal cable is a little disc, provided to
give visual indication that the control is in operation.
Two Internal Mechanisms.

The escapement is complicated through the action
of an intermediate wheel to one of the timing
wheels whilst the other timing wheel is
driven by a second relay gear. These two gear
wheels with the timing wheels in opposite direction
at a constant speed. Between these two timing
wheels a mounted on the same axis is a gear
which carries the spring for making & breaking the
loop contacts (arming), & also the spring pin for
closing the common arming contacts. After
the common commencement of rotation of the
timing wheels, the back also engages in one
of the teeth of the back timing wheel & is
consequently pulled round with it in a clockwise direction
along the cam with it. This action continues until
interrupted by a pin provided for the internal safety
lock. The position of the pin can be varied by so
that the time taken by the cam can be altered from
out to meet it may be any interval between
2 1/2 & 30 sec for the half cycle. Thus the control
is adjustable to make any time interval between 2 1/2 & 30 sec.
When making the half cycle the back wheel is
tripped over engaging the back timing wheel &

engaging the front one. The engaging of the other
wheel the front wheel which is driving is in anti-
clockwise direction, causes the cam can to move
into that direction & to be carried back at
the uniform rate of travel. Should the internal
timing wheel be tripped in an anti direction to meet
it can over the latter will travel freely back
resting on the cam disc.

Timing Light & Arming Contact. Upon making the
plate timing light contact, the arming happens where the
circuit is closed it is, for arming is made until
the main contacts have been closed. Two
sec. after the timing light has commenced
flashing the back wheel can make its own travel
& is tripped over by a small slide block & a
new one is commenced. The common arming contacts
are now closed before the plate is
contacts are released still then closed for 1 sec. This
cycle of events by the internal control & contact
control until the current is switched off from
the coils.

The Switch

The main switch is provided with a
slight action to enable the cam can to
return to its zero position before making its next
over though the main switch has been cut
off. This feature has been provided so that

a exposure may be made immediately the control is switched on.

The delayed action switch operates as follows: The control rotates a P shaped cam which is the "off" position forces a sliding cam forward towards the center of the control. The air switch contacts are closed when the sliding cam is in the "On" or "Off" position as only for the when the edge of the cam comes opposite the sliding cam segments, when the cam cam is rotating a new contact. When the mechanism comes to a stop at the point of making contact on the cam which controls regardless of the position it happens to be in at the moment of starting, off. A contact is made & in consequence later at the instant of switching on after which exposure is made automatically at the set time interval & with the control is switched off.

The magnet.

The magnet when energized pulls the shutter against the tension of a spring. When the magnet is deenergized, this spring returns the shutter & the shutter is forced closed once more. The hub may be reset by turning the knob in either direction.

Stopping

1. Release the auto rising by unscrewing 2 screws at the top & bottom of the auto rise.
2. Lifting contact, air switch, & camera are moved by these screws marked A & B respectively.
3. A should be moved so that auto rise can be taken with the air switch, a slight contact diff. action being employed.
4. To displace mechanism the 2 screws at the back & remove the 20 fiber washers.

Maintenance

All electrical contacts are self cleaning & will not require cleaning. All screws should be tight in order to keep tension for a good contact with their spring loaded contacts. All moving parts of the control must be lubricated sparingly with A.T. grease oil.

The G.S.C.

The camera employing 16 mm film has been designed primarily to assist in air firing training. The taking speed which is electrically operated can be adjusted to the appropriate firing speed of the a/c gun, & in this way each picture on the finished film can be regarded as the centre of a particular pattern of fire or in the case of a single gun a bullet of a burst of fire. The film used is 20 ft in length & so each foot of film represents 20 exposures. This length of film corresponds to 200 rounds of ammunition.

The camera consists of the following parts:-

1. The body.
2. The mechanism.
3. The magazine.
4. The winding.
5. The following components are for use with the camera:-
 - 1) The footage indicator & exposure control
 - 2) Firing Unit.
 - 3) Projector
 - 4) Red Book.

5. Firing unit.
6. Firing unit.
7. Keys adjusting for a/c winding.

The Body:- is a rectangular light alloy casting with an inspection flap, & a shaft for access to the magazine compartment, & houses the mechanism.

The magazine:- is a light tight container which itself is loaded with film. The dark room but may then be loaded & the camera during the daylight. It contains a bracket for moving & guiding the film. In the front edge is the gate aperture through which the film passes the exposure. The body & is made of light metal alloy & its magazine is shaped thus moving the magazine can be loaded in the correct position. It is fitted around to the mechanism base bracket is a hole drilled in the casting. The hole is fitted with a locking handle which when turned to the locked position engages a lug on each of the two metal plates in the hole in the magazine body.

Loading:-

The film which is wound on a reel is cut out on a special case is loaded on the

left hand feed of the spindle. The latter is spring controlled so that a definite pull from the film is required to rotate it thus ensuring that the film does not over-run. The film winds in a clockwise direction & passes over a guide post at the top of the magazine & from there it passes under the 2 bevelled sprockets & round a free roller mounted at the top right hand corner. It then passes through the stirrer which gets which has sufficient tension to keep the film stationary while the exposure is being taken but light enough to allow the film to be drawn through without undue strain on the sprocket holes. After leaving the gate the film passes round the 2 bevelled sprockets & up over a guide pulley (to keep correct tension in film) & as to the main feed spindle.

The 2 bevelled sprockets is driven directly from the camera mechanism by means of a rubber band & gears intermediate movement. The main feed spindle is driven from the 2 bevelled sprockets by a spring belt which provides a friction slip. The latter is necessary as the gear covering diameter of the camera feed would tend to increase the rate of travel of the film & so cause damage

to the sprocket holes. A spring mounted on the outside edge of the camera body keeps the magazine spindle stationary during the operation of the camera.

Main Drive.

The source of power is a 12 volt 2400 motor, of the standard wound type. The motor rotation is adjustable, & may be set to drive the camera at 10, 15 or 20 frames/sec by connecting the motor leads to the appropriate slip on the resistance body.

The motor is connected to the main driving spindle through a spring & friction friction slip. This is provided primarily to allow the motor to overrun slightly when the mechanism is stopped thereby reducing the strain on the moving parts, and also to prevent the motor from being burned out should the mechanism fail to turn. In fact with the friction slip down is a reduction giving of approximately motor 1 to 4.

On the main driving spindle is a helical pinion which drives at a reduction of 1:2 the helical gear, neither screw & fly mounted gear intermediate gear, & also drives through a second reduction giving 1:2

the water shutter.

Step 2 Start Mechanism

Operation of the gun trigger completes the circuit of the main operating mechanism, the water shutter door is actuated the operating spindle is tripped the operating lever out of the hollow door. At the same time the water operating lever makes the water contacts, also the shutter flap lever actuates the shutter flaps bringing the latter close of the camera aperture.

When the gun trigger is released the main operating mechanism circuit is broken & the operating lever falls into the periphery of the door. When the leading edge of the gate comes beneath the roller of the operating lever the latter falls into the door & comes up against the spring loaded finger, holding it against the roller of the door. At the same time the water contacts are moved with broken, but immediately returned by the action of the water, also the shutter flap lever is released bringing the shutter flap in front of the camera aperture. It is possible for the door to make one more revolution during which one unexposed frame is wound

over. After a complete revolution the spring loaded finger comes up against the stop head actuating into the inner surface of the door, the tripping the door. At the same time the roller on the water operating lever falls into the notch in the cam & the water contacts are broken. Operation of the water is taken up in the friction slip.

The above arrangement means that one blank frame is exposed between bursts of fire, & that the camera mechanism is stopped in a definite position each time.

Intermittent Mechanism

Although the main driving spindle is rotating continuously the movement of the film must be intermittent. A change of motion is brought about by one of the maltese cross & dog movement. The dog has two diametrically opposed slots in its upper surface, & meshes at a constant speed. As it revolves one of the slots engages in one of the four slots of the maltese cross, & drives it through 90° before disengaging. The maltese cross is the third in the gear train with one of its curved sides bearing on the camera wind pattern on the dog. The next slot of the cross

is now occupying the position originally held by the first tablet. While the m.c. is held stationary the dry matter through a further gate in the upper sheet is the dry engage in the second sheet of the m.c. already prepared to receive it, or the cover is separated again. The dry thin matter continuously with these cover alternately.

The design of the sheet is such that as the sheet to move mostly from rest, is rapidly accelerated & then gently slowed down before finally being brought to a halt. The m.c. is connected by a short shaft through the body running through 2 wheels - a big wheel, engage with 1 wheel - on the magazine (a tooth sprocket).

Main section sheet & its working.

The main section consists of a large gear wheel which has 2-45° sector shaped apertures cut in its plate at opposite ends of a diameter. The wheel revolves about a vertical perpendicular to a set on one side of the gate aperture & exposure we make as the 45° wheel portion of the wheel pass successively in front of the film.

Mounted above the main rotating wheel is a second & smaller wheel controlled by a pinion in the plate coupled. When the wheel is placed

to "swing" the wheel is engaged, which moves the rotating sheet plate across the aperture of the main section. The apertures are closed by 180°. This is accomplished by a chain which at the sheet spindle. A pin in this chain projects through & engages a sector wheel cut in the sheet spindle. A second pin secured to one of the flanges of the chain bracket is a hole in the main section plate. One end of a lever is connected to the wheel with the other rests between the flanges of the chain. The lever is pushed out at its center.

Footage Indicator.

The exposure control & footage indicator are mounted on a single instrument on a ridge plate in the ap. Aperture is by means of a small wheel & a 5:1 reduction gearing.

The wheel is connected to the film footage contact in the room, & the chain of these contacts runs 5 times / ft. of film. To the base of the & toothed sprocket in the magazine is fitted a flange a sector being 180°. As the film passes over the sprocket, the latter is rotated. Once per revolution the driving peg strikes on double on wheel holds the wheel contact

away from the fixed contact this one/now the contact is closed. So the speed has a tooth the wheel with the speed - every 8 ft. is every 8 ft. The footage indicator wheel is graduated - for the points of the indicator with one 5 turn / small graduation.

Driving Motor

The camera driving motor is a 12 or 24 volt about round type & has attached to it one a resistance cut out.

The object of this is to ensure that the motor will start at speed with the minimum of delay - essential for a camera only as a gun.

Since the motor has reached its speed the cut out circuit is broken by centrifugal force & the motor runs & then through the resistance which limits the speed as per setting.

Camera Housing

The motor wheel is arranged so that the two levers will move "On" with the two the one circuit is made, but the body lever only sets "in" when the trip drops sufficiently to operate the thermostat.

A bimetallic strip is arranged at one end & moves one lever off the body circuit, the other end carries a contact. The other

lead & wind contact are attached to a contact strip which is provided with an adjustment at the end and end. The thermostat closes when the trip falls below 50°C (120°F).

Camera Mounting Page 272

The mounting is built & fixed in the air by a firing bolt taken through the base plate.

It provides adjustment mount for the camera in 2 directions, approx 3° each way, the camera is carried in a channel on the top plate & is moved by two clamping weights. The adjustment are locked by a vertically placed hand clamping wheel. When illumination has been carried out, the hand wheel is locked in position with locking wire, & the camera moved by turning off the two camera running bolts. These have a slight spring loading to assist the operation.

Stuffing the 6220

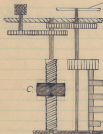
- 1) Remove the magazine & the camera body using sp. (a) release body
- 2) Remove the two lens photo covers, & cover the lens. (When lens connected to light)
- 3) Remove the 2 covers covering the rear plate
- 4) It is essential that the front cover should not be displaced otherwise there will be difficulty when assembly is commenced.
 Note: It is not necessary to over-tighten the back when they are finally, adjustments should be taken to when the lens strongly with the rear plate is affixed.
- 5) Remove the camera film gate buffer (2 covers)
- 6) Remove the picture plate from its spring mounting
 The gate assembly can now be moved (forward)
- 7) With the camera mechanism at 250 position carefully mark the position of the following:
 (a) 12.5, 250 behind gear & behind plate.
 (b) shutter & driving gear
- 8) Remove the metal film drive coupling cover (this is needed as this is spring loaded)
- 9) Remove retaining screws - Maltese retaining driving chain, & the nut & its driving screw can now be moved together (leave big hole not to lose the short nut washer)

- 10) Remove two supporting brackets for lens again. Lens again complete with rear retained can be lifted also
- 11) Remove front & rear main shaft supporting brackets, disengaging the spring and remove the shaft assembly can be lifted out (check cover & reaction)
- 12) Remove the main shutter unit by withdrawing front bracket screws, a screwdriver was needed & screw. It is not necessary to remove exposure wheel which can be finally

The assembly is carried out in the reverse sequence

RIGHT SETTING SHAFT

SHIPPING SETTING SHAFT



Same operation as
SHIPPING SETTING SHAFT

WAGE



COF B.



Shipping shaft

The automatic Bombight (cont.)

This consists of 2 main parts (1) the automatic bombight (2) the gyro of azimuth.

The automatic bombight

The sight is designed to perform automatically the operation that previously was performed manually by the bombaimer i.e. the two major controls i.e. course & range control, are effected automatically the former in conjunction with the gyro azimuth.

Because of line control controls & compasses for drift & order that the ship makes a straight track towards the target. With an automatic bombight a drift setting is effected automatically during a run to the target without necessity of further knowledge of a wind vector.

Range control involves an assumed determination of the drifting angle & with this sight when the light in the air of full has been set maintenance of the righting line - the target will automatically position the ship. The release of the bomb then follows automatically & the results are corrected.

Description. The sight consists of a motor driving the righting line through a variable gear, the speed of the motor being determined by a governor driven from the motor through another variable gear. The settings of the variable gears are made

by the O.R.

The first setting V.S.1 is made by the light setting wheel when setting the computed height and the height height scale is approximately with the V.S.1 wheel V.S.2 is set by (1) the speed setting wheel or (2) the range control wheel when the magnetic azimuth is made.

But when it is necessary to operate the azimuth control wheel or setting control to correct for drift (line control) & then the range control wheel to maintain the target in the center of the quadrant.

Driven also from V.S.2 is a spindle carrying the righting angle pointer & to the pointer movement & correction is made to allow for the true angle. The righting angle pointer setting is a ring carrying the $\frac{1}{2}$ inch the displacement of which is effected when V.S.3 is set, i.e. by the range control wheel when the magnetic azimuth is made.

When the S.A. & D.A. are coincident the release circuit is completed through two contacts, one on the S.A.C. the other on the S.A.C. bushings of the 2nd set light beam as the release signal lamp. A third pointer is fitted & driven from the S.A.C. through a reduction gear of 3:1. This pointer the displacement setting of the S.A.C.

Operation of the range control wheel when

The backlight is milled off within the SAE
 & the optical axis. With the backlight milled
 on the same central wheel also within the SAE
 & made like through the requests, which in many
 the SAE & rightly line, the central wheel drives
 a toothed wheel on the same of a differential
 gear which is set into the shaft driven from the
 output roller of SAE. The differential gear makes
 the SAE & rightly line to be driven by either the
 central wheel or the motor or both, but the
 motor cannot drive the central wheel as the central
 wheel the motor.

The rightly line is driven through the tangent
 cone from a lead screw, on the lead screw
 is a nut & engaging the nut is the tangent cone
 attached to the quadrant. The quadrant works
 with a toothed wheel on the telescopic
 telescope being of lead to take up backlash
 in the gear & to keep the tangent cone
 in contact with the tangent nut. In the telescope
 is a quadrant glass on one side of which is a
 lens which reflects the quadrant into a reflection
 fitted at the far end of the telescope. The
 body of the right is pivoted on a ring (guided ring)
 with its axis four & a half (lead screw). This ring runs in
 a large ball race in the guide ring which is

mounted in the air on brackets

A toothed quadrant fitted to the guided
 ring is operated by the optical axis through a wheel
 gear, this turns the backlight to effect a drift setting.
 Mounted on the guide ring is the lead setting
 mechanism. This consists of a drum graduated in true
 R/R with a different scale for each type of
 bank. The bank types are numbered these numbers
 being engraved on an integral drum by which
 the drum is rotated when the type of bank
 is selected. An index is set against the requests
 scale by means of a bracket wheel, this wheel
 is attached to a second rod on one side of which
 is the air feed valve the other side carrying a
 trunnion nut operating a pivoted lever four feet
 off. This arm is pivoted in the guide ring the
 axis being vertical & extending to the bottom of the
 shaft, when the second lever arm is fitted
 which extends to the center of the right. A ball
 & socket assembly on this arm moves in a
 slot in the right wheel & out in the air off a
 wind which from the front of the lever arm,
 the slot has four & a half when the drift pointer
 is set at zero. The ball & socket applies
 correction to the rightly right pointer (for the
 range component of trail. The line component of
 trail is effected by tilting the right about a trail

axis. This is done by the ball & socket assembly when the slot is rolled for its face & aft points, in when drift is made.

When the night is fitted in place, a ball the right hand side of the gimbal ring fixed to the trunnion and separated by an aperture wheel on a bracket (rotated bearing screw) on the left hand side of the gimbal ring is at hand, which rests on a screw of another bracket & is retained by a spring loaded screw. The wheel is adjustable fore & aft to effect an adjustment for aligning the gyroscope in the air when the drift is set to zero. Pilot adjustment is made by a bearing screw carried on a plate fitted to the frame holding the T bars & engaging the screw is a toothed gear wheel (the left hand), the left hand of the gimbal ring.

The Gyro Gyro 11005

Purpose. The gyro is designed to enable the pilot to lead the ship so that his track towards his target will be a straight line, & also to operate the autopilot motor (on the bearing) in order to align the sighting line along the trunnion and the drift angle. The operator releases the CR of flying land ahead & direction prior to going on the target.

Description. The gyro consists of an relatively a perfect gyroscope having 3 degrees of freedom. The axis of spin is horizontal, the axis of the rate bearing horizontal & the axis of the gimballed vertical (vertical axis). The gyro is pivoted in a frame (inner frame) which is turn & pivoted vertically in an outer frame and in the air on a lead structure. At the bottom of the vertical ring is a spring loaded plunger which makes contact by means of a screw with segments on the base of the inner ring. When the gyro is controlled by means of an autopilot system with a buffer device & the two mechanisms, the screw makes contact with a small vertical segment at a distance two degrees segments.

On the left plate of the outer frame is a wheel which drives through a reduction gear a drive of a mechanical warning switch. When the switch is made

a key shaft is operated which rotates the mirror frame by a worm drive - constitutes a follow up system.

The key shaft also drives a cam shaft which lifts the contacts to allow impulses to the reflector motor. The mechanical switch is controlled by electro-magnets in order to remove the vibration of the key shaft. The electro-magnets consist of coils connected by the same a large magnet off the mirror long frame.

Current is drawn from the 6 pin plug & sent to the mirror frame by a slip ring connection. These connections to slip rings of the type contacts are related to the top plate.

When the a/c turns the frame moves round the gear & as a large magnet passes under the shoe

it is completed and electro-magnets consist of the mechanical switch. The key shaft turns & moves the mirror frame back towards its original position. At the same time the contacts are tripped & the reflector motor operated. This action takes place until the mutual magnet is once more under the shoe. If the a/c turns in the opposite direction the action is similar but reversed.

Installation

The sight is installed in an approved position on the bracket previously mentioned so that the sighting line when viewed is following the frame off the top of the a/c when the shaft setting is zero. Allowance must be allowed for an unobstructed view throughout the full range of the sighting line, being angled to the effect of $\pm 20^\circ$ pitch adjustment, $\pm 20^\circ$ azimuth adjustment & $\pm 20^\circ$ about the track axis.

The G.P. is mounted in a convenient position without hindrance to the crew & yet accessible for inspection. It is supported on three anti-vibration supports & must be fitted so that the plane of the mounting plate is horizontal in level flight & stable.

The control panel is fitted on the left hand side of the sight to have the R.A.'s right hand free from the operation of the sight control wheel. Access to the sight & G.P. must be short & straight but not obstruct the free movement of the sight or mirror frame.

The Filter Box is fitted in a convenient position below the mirror of supply & the control panel.

Maintenance.Inspection.

1. Check visual defects. ensure correct fitting & check any cable at left hand supporting brack.
2. Check engaged. Lubricate the following if necessary.
 - a) Lubricate supporting wires.
 - b) Rollers.
 - c) Repetitive roller shaft & tested gearwheel.
 - d) Test wire frame.
 - e) Test down in case head cover.
3. Test operation of control cable & setting brack over their full range. They should function freely & smoothly.
4. Ensure the overhead system is free from restriction.
5. Test Test Run & guarantee lamps for security & contact.
6. Test switches & lamps for correct functioning. Check binding (cables) for damage.
7. Insulated on G.P. & right & ensure correct functioning.
8. Apply the test.
9. Ensure switches are left in "off" position.

180 hrs. (or 3-monthly if not in use).

1. Remove all covers & inspect & clean electrical contacts.
2. Inspect brack for security & corrosion. Reorder if necessary.
3. Lubricate every part.
4. Test simulation. This should not fall below 100% (less motor).
5. Timing Test.

Monthly Inspection when in service.

1. Lubricate external parts.
2. Timing Test.

Tests - G.P.

1. Ensure correct fitting.
2. Test running & P.V. system.
3. Inspect roller vibration mountings.

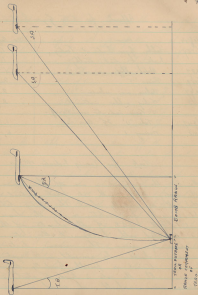
180 hrs.

1. Remove covers & inspect & clean electrical contacts.
2. Inspect brack & reorder if necessary.
3. Test running of gears motor & P.V. system.
4. Test contact cleanliness. (as above).
5. Test timing of spray contacts. (as per again).

Long Lead.

Place the sight on the ground & connect up with gyro-azimuth control panel & (24 or 250) accumulator. Allow wire switch & note that gyro runs up & also that the track down, dead, & horizontal lamps are illuminated. Test to see that the repetition rate required by turning the drift setting knob (the knob should be infinitely loaded) allows beamlight with a fast repetition rate by moving θ knob. The sight should respond to the rate knob in the opposite direction. When beamlight available.

1. Set θ to zero.
2. " Drift.
3. Rotate the θ knob until red index is set zero.
4. Set height to 10,000 feet.
5. Set θ to 100 mph.
6. Rotate range control wheel until the run up pointer coincides with θ . The θ should now be slightly to the right.
7. Allow beamlight switch.
8. Take the θ off watch for 1 sec. of θ , starting the watch when the θ & θ are coincident. Time should be θ sec. to 1 sec.



Operational Bombing Procedure.

Before Take Off.

- ①. With drum switch set to "single & salvo" check that the light shows on the selector switch box as each bomb is selected.
- ②. With drum switch set on "distributor" & switches selected, check that the distribution light comes on as the arm touches each segment to which a bomb is connected. The test plunger is used for this operation.
- ③. Satisfied with the above operations all switches should be put to the "off" position.

F24 CAMERA.

Focal length of lens.

$3\frac{1}{4}"$, $5"$, $8"$, $14"$, $20"$

Wide angle lens.

The shorter the F.L. the
larger the area photographed.
 $14"$ & $20"$ used for single pin points.

PHOTOGRAPHY.

01. VERTICAL PINPOINT. Single exposure of an object when the a/c is vertically above it.
2. LINE OVERLAP. is a series of pinpoints 60% overlap. (1). Stereoscopic photographs.
(2). If single exposure is a fault there is still a complete record of area.
3. MOSAIC. is a series of overlaps strips overlap by 30%.

INFORMATION.

- (1) Strategic.
- (2) Tactical.
- (3) Topographical.

Oblique Photography.

Panoramic overlaps

Type 21 mounting. F24 camera.

After Ensuring Bombs have Gone.

- (1) Close bomb doors.
- (2) Put master switch, firing switch & all selector switches to the "off" position.

MK VI AUTO-DISTRIBUTOR.

See Sheet B.7.

Appendix for testing Gyro Unit 1.

Ref No.	Case	No. Read
22/209	Table Gyro Unit 1	1
	Instrument test only.	1
22/209	Water ship.	1
22/209	Pass. T.	2
22/209	Water, air, shore	2
22/209	Table, water, instrument	2 ft.
	Pass. indicator correctly off.	
22/209	Table, "D" of Case	1
22/209	Passing 1	2 ft.

Check for Turning Indicator, M.E.

About the indicator is one of the frames of the testing table with its label vertical & so that it is laterally level. The testing table should be arranged for rotation & not the heavily motor. If all details of the operation of the table are dispatched with it, however the instrument to a source of rotation. The vacuum indicator (vacuum indicator) should be connected to the system as near to the instrument as possible. Gradually turn on the vacuum until the motor is hard to start. This starting vacuum should not exceed an equivalent

of a depression of 2 in. Hg. Increase the vacuum to 2 in. Hg. & run the instrument for 10 minutes. Start the table rotating & adjust the rate of turn so that the rate pointer mark (2) is at the rate of turn of the table by means of a stop watch.

Rate of Turn & Vacuum allowed.

No.	Rate of Turn	Vacuum
1	170°/min	78%
2	360°/min	10%
3	660°/min	13%
4	1080°/min	15%

With the table stationary turn off the vacuum & the motor must continue to revolve for at least 10 minutes.

The rate pointer may be checked for accuracy by rotating the instrument about its fore & aft axis. During the operation the pointer should revolve without sticking. Should the accuracy of this pointer be suspected, it may be checked by a rate mark & a specially cut very jig which will fit along the top of the instrument case. If the rate pointer is found inaccurate, it is most probable that the base is not correctly adjusted to the pendulum & has become unbalanced.

Tests for Spring Type Indicator.

Before the instrument is removed from the eye. Mark & convert it up to the testing table as for the timing indicator tests. Rotate the cage lock so as to turn the dial through 360° several times in each direction. This insures that the entire ring bearings are evenly lubricated by the oil soaked pads provided. Turn on the vacuum to the instrument & adjust it to 36 ± 2 Hg.

Run the instrument for 5 minutes, measure & record δ° & note the drift during a period of 15 min. Repeat the operation on each of the cardinal headings. The drift on any of these headings should not exceed 5° .

Stop off the vacuum & the motor must not cease to make for at least 5 min. before the instrument is removed from the testing table.

The Spring Compensation Test

This test is similar to the RRE test outlined above except that the instrument is run for 30 min on each of the cardinal headings & the drift noted every 5 min. The drift allowed on any of these headings during any 5 min. period is $\pm 3^\circ$. A drift of not exceeding 5° is allowed on each heading provided that the total drift on the 4 headings does not exceed 12° .

An interval should elapse between these tolerances in 2 out of 3 tests.

Tests for Self-aligning Design RRE

Before removal from the eye cage the instrument is in position of the long locking screw. Rotate the glass & attach a strip of paper marked "a" above & below the eye image. Mark & convert the instrument as for the timing indicator tests.

Change the instrument by replacing the long screw by a short blanking off screw. Turn on the vacuum supply, adjust it to 36 ± 2 Hg. Note the time taken for the horizon bar to settle. The instrument should not exceed 15 min. in case the 1 test out of 3. In the settled position the end of the horizon bar should be within $1/8$ " of the corresponding marks on the fixed scale & the pointer within $1/8$ " of the zero mark. Allow the instrument to run with the correct value of vacuum for at least 10 min. Then the focusing device at the bottom of the IR view must be operating such that it will accept the gibal aperture from any position where either of the gibal rings is tilted at exactly 30° . At the settled position, (in case of a perfectly working)

is 3 to 6 in. 30° all of the T.R. is inclined before the hinge has is 70° above or below the angle of the sp. The hinge has may be moved from the settled position is. The T.R. may be produced by gently rotating the instrument base about its pivot until the steps are touching the O.R. This will apply a torque to the O.R. & so forces the T.R. The tilt the produced on the T.R. may be transferred to the O.R. by turning the instrument around through 90° in the horizontal plane.

When the instrument has been moving for 10 min & the vacuum is shut off the note must continue to recede for at least 2 min before the instrument before moved from the testing table.

Not if the girdle system of the superficial hinge is tilted it may take up to 2 min to reset to the settled position.

Colour balance for T.R.

Goggles - blue & white
 Screen - black & white
 Rot. controls - brown (a band . . 5.0-6).
 Fuel - red.
 Oil - black.
 coolant - blue.
 Broken (exposed) - yellow.
 CO. (light) - greenish white.

Wing
 Card gear - white.
 Spindles - green. (a blue)
 Gear (light) - yellow.
 Washers - red.
 Intermediate - green.
 Underwings - grey.

WorkshopsTempering

below method used for high grade steel only.

hot steel - purple.

Spring steel - flash method (oil)

Mild steel - case hardened only.

Tougher steel - slowly heat to brick red & then rapidly until white heat transfer plate out.

Tests for Water on Heavy Steel

N/S hot steel - Dark red fire points.

hot iron - as above but only under pressure.

Mild steel - No yellow fire points.

hot steel - Shows slowly a long distance.

Lubricants

hot iron - dry.

Brass - dry - lapping use hard oil.

Aluminum - with.

Wrought iron - under.

Tool steel - oil.

Mild steel - under.

Aluminum - specific.

Some Threads

O.P. - 47 1/2°

Whitworth B.S.F. - 55°

Helixpropagator - 60°

Outlines - 46°

Acme - 29 1/2°

Lead of screw = pitch & number of threads.

Lead diameter of thread = 0.00125 of pitch.

Depth of thread = 0.00125 of pitch.

Some Notes

No. of threads on lead screw per inch.

No. of threads driven per inch.

Wheels: 20-120 & 52.

eg. 12 = 22

16 20.

In lead screw any intermediate steel on brass.

eg. 12 = 22 & 52 drive.

17 20 60 drive.

25.



60 & 12 with a lead screw of 2 threads per inch
the combination also would give 17 threads per inch

Back of a hammer.

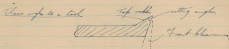
1. Head & tail steel.
2. Saddle's spine.
3. Top & cross blades.

Taper turning

Set angle is 60°

Head center always in Tail steel. Draft under a job.
 Offset $1/2$ for center for nearly long taper only.

Tools



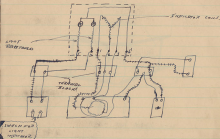
Setting Angles for Different Metals.

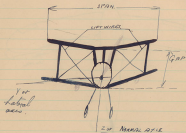
Metal.	S.P.	Foot clearance
Steel iron	80°	10°
Brass	85°	5°
Aluminum	60°	5°
Wrought iron } Mild steel }	$60^\circ-65^\circ$	$5^\circ-10^\circ$
Tool steel	$70^\circ-75^\circ$	$3^\circ-5^\circ$

Steel is an alloy of iron & carbon.
 It consists of 3 groups:

1. Mild steel containing up to .2% carbon.
 2. Medium steel containing from .2% up to .5% carbon.
 3. High carbon steel
- High carbon steel is divided by carbon content as follows:
 .5% to .6% carbon is called "medium" .2% to .5% carbon is called "low" .6% to .8% carbon is called "high"

1	2037	✓	1022	✓	Willy	✓	Willy	✓
2	2038	✓	1023	✓	Willy	✓	Willy	✓
3	2039	✓	1024	✓	Willy	✓	Willy	✓
4	2040	✓	1025	✓	Willy	✓	Willy	✓
5	2041	✓	1026	✓	Willy	✓	Willy	✓
6	2042	✓	1027	✓	Willy	✓	Willy	✓
7	2043	✓	1028	✓	Willy	✓	Willy	✓
8	2044	✓	1029	✓	Willy	✓	Willy	✓
9	2045	✓	1030	✓	Willy	✓	Willy	✓
10	2046	✓	1031	✓	Willy	✓	Willy	✓
11	2047	✓	1032	✓	Willy	✓	Willy	✓
12	2048	✓	1033	✓	Willy	✓	Willy	✓
13	2049	✓	1034	✓	Willy	✓	Willy	✓
14	2050	✓	1035	✓	Willy	✓	Willy	✓
15	2051	✓	1036	✓	Willy	✓	Willy	✓
16	2052	✓	1037	✓	Willy	✓	Willy	✓
17	2053	✓	1038	✓	Willy	✓	Willy	✓
18	2054	✓	1039	✓	Willy	✓	Willy	✓
19	2055	✓	1040	✓	Willy	✓	Willy	✓
20	2056	✓	1041	✓	Willy	✓	Willy	✓
21	2057	✓	1042	✓	Willy	✓	Willy	✓
22	2058	✓	1043	✓	Willy	✓	Willy	✓
23	2059	✓	1044	✓	Willy	✓	Willy	✓
24	2060	✓	1045	✓	Willy	✓	Willy	✓
25	2061	✓	1046	✓	Willy	✓	Willy	✓
26	2062	✓	1047	✓	Willy	✓	Willy	✓
27	2063	✓	1048	✓	Willy	✓	Willy	✓
28	2064	✓	1049	✓	Willy	✓	Willy	✓
29	2065	✓	1050	✓	Willy	✓	Willy	✓
30	2066	✓	1051	✓	Willy	✓	Willy	✓
31	2067	✓	1052	✓	Willy	✓	Willy	✓
32	2068	✓	1053	✓	Willy	✓	Willy	✓
33	2069	✓	1054	✓	Willy	✓	Willy	✓
34	2070	✓	1055	✓	Willy	✓	Willy	✓
35	2071	✓	1056	✓	Willy	✓	Willy	✓
36	2072	✓	1057	✓	Willy	✓	Willy	✓
37	2073	✓	1058	✓	Willy	✓	Willy	✓
38	2074	✓	1059	✓	Willy	✓	Willy	✓
39	2075	✓	1060	✓	Willy	✓	Willy	✓
40	2076	✓	1061	✓	Willy	✓	Willy	✓
41	2077	✓	1062	✓	Willy	✓	Willy	✓
42	2078	✓	1063	✓	Willy	✓	Willy	✓
43	2079	✓	1064	✓	Willy	✓	Willy	✓
44	2080	✓	1065	✓	Willy	✓	Willy	✓
45	2081	✓	1066	✓	Willy	✓	Willy	✓
46	2082	✓	1067	✓	Willy	✓	Willy	✓
47	2083	✓	1068	✓	Willy	✓	Willy	✓
48	2084	✓	1069	✓	Willy	✓	Willy	✓
49	2085	✓	1070	✓	Willy	✓	Willy	✓
50	2086	✓	1071	✓	Willy	✓	Willy	✓
51	2087	✓	1072	✓	Willy	✓	Willy	✓
52	2088	✓	1073	✓	Willy	✓	Willy	✓
53	2089	✓	1074	✓	Willy	✓	Willy	✓
54	2090	✓	1075	✓	Willy	✓	Willy	✓
55	2091	✓	1076	✓	Willy	✓	Willy	✓
56	2092	✓	1077	✓	Willy	✓	Willy	✓
57	2093	✓	1078	✓	Willy	✓	Willy	✓
58	2094	✓	1079	✓	Willy	✓	Willy	✓
59	2095	✓	1080	✓	Willy	✓	Willy	✓
60	2096	✓	1081	✓	Willy	✓	Willy	✓
61	2097	✓	1082	✓	Willy	✓	Willy	✓
62	2098	✓	1083	✓	Willy	✓	Willy	✓
63	2099	✓	1084	✓	Willy	✓	Willy	✓
64	2100	✓	1085	✓	Willy	✓	Willy	✓
65	2101	✓	1086	✓	Willy	✓	Willy	✓
66	2102	✓	1087	✓	Willy	✓	Willy	✓
67	2103	✓	1088	✓	Willy	✓	Willy	✓
68	2104	✓	1089	✓	Willy	✓	Willy	✓
69	2105	✓	1090	✓	Willy	✓	Willy	✓
70	2106	✓	1091	✓	Willy	✓	Willy	✓
71	2107	✓	1092	✓	Willy	✓	Willy	✓
72	2108	✓	1093	✓	Willy	✓	Willy	✓
73	2109	✓	1094	✓	Willy	✓	Willy	✓
74	2110	✓	1095	✓	Willy	✓	Willy	✓
75	2111	✓	1096	✓	Willy	✓	Willy	✓
76	2112	✓	1097	✓	Willy	✓	Willy	✓
77	2113	✓	1098	✓	Willy	✓	Willy	✓
78	2114	✓	1099	✓	Willy	✓	Willy	✓
79	2115	✓	1100	✓	Willy	✓	Willy	✓
80	2116	✓	1101	✓	Willy	✓	Willy	✓
81	2117	✓	1102	✓	Willy	✓	Willy	✓
82	2118	✓	1103	✓	Willy	✓	Willy	✓
83	2119	✓	1104	✓	Willy	✓	Willy	✓
84	2120	✓	1105	✓	Willy	✓	Willy	✓
85	2121	✓	1106	✓	Willy	✓	Willy	✓
86	2122	✓	1107	✓	Willy	✓	Willy	✓
87	2123	✓	1108	✓	Willy	✓	Willy	✓
88	2124	✓	1109	✓	Willy	✓	Willy	✓
89	2125	✓	1110	✓	Willy	✓	Willy	✓
90	2126	✓	1111	✓	Willy	✓	Willy	✓
91	2127	✓	1112	✓	Willy	✓	Willy	✓
92	2128	✓	1113	✓	Willy	✓	Willy	✓
93	2129	✓	1114	✓	Willy	✓	Willy	✓
94	2130	✓	1115	✓	Willy	✓	Willy	✓
95	2131	✓	1116	✓	Willy	✓	Willy	✓
96	2132	✓	1117	✓	Willy	✓	Willy	✓
97	2133	✓	1118	✓	Willy	✓	Willy	✓
98	2134	✓	1119	✓	Willy	✓	Willy	✓
99	2135	✓	1120	✓	Willy	✓	Willy	✓
100	2136	✓	1121	✓	Willy	✓	Willy	✓







Rigging Definitions.

Angle of Incidence. The Rigging ~~or~~ angle of incidence is the angle between the chord line & the relative wind in the horizontal when the a/c is in true flying position.

Span is the overall distance from wing tip to wing tip.

Chord The length of chord is the distance between the center of curvature between the leading & trailing edges.

Wing or wingfoil which has a long span in comparison with its chord will, and for area, be more efficient than one which is compactly shaped & wide.

Dihedral is the angle formed by the spanwise ribbing plane to the horizontal. It is arranged to give additional stability in flight (usually 2°-6°). As a negative dihedral would detract from the inherent stability of the a/c it is never employed.

Wing Reflexed is the distance one plane is brought forward in respect to the other, measured from leading edges. This is done to increase the

circumference due to air flow over the plane & also to improve the field of vision of the pilot.

Gap is the distance between one plane & the next immediately above or below it.

Wingflaps the amount which the wingflaps are moved inward backward. They are swept back to give better longitudinal stability.

Control structures analogous to the wing of a bird designed to obtain reaction from the air opposite or at right to the direction of motion. This reaction is composed of a force known as lift & drag, the result of characteristics of the wingfoil.

Lift that component of the resultant force which is perpendicular to the direction of the wind.

Total Drag the resistance offered by the a/c to motion along line of flight.

Aspect Ratio The ratio of span of a/c to the chord. Officially is highest when P.R. is highest.

Span is the name given to the complicated wind of the a/c.

Fuselage - main body of a/c in which load is carried.

Powerline - component in which the engine is carried.

Wing leading - the ratio of the right of a/c to
total area of lifting surfaces.

Canopy - the method of holding against the body
spars of the a/c are the fuselage, etc. open
by means of wire placed diagonally & tightened
by means of ratchet or screw ends.

Wing bracing - the method of bracing the
fuselage in the fuselage to
prevent the fuselage twisting thereby affecting
the stability of the tail plane.

(Powerline) is the name given to the type of
construction in which the main strength is
in the skin is made of sheet metal and is
reinforced between the frames by stiffeners.

Algebraic formulae is the abstract laws joining two facts
together on a mixed surface. Proportion notation
is analogous to a pair of letters mixed
into a half equation & then elongated. It

clashes and requires careful inspection on
both sides of the plane which reduces the
body of a/c when brought into position.

"D" also held in charge

from 37 weeks.

"D" also.

F. 67. 1st. College vouchers.

F. 67. 2nd. Demand voucher.

F. 67. 3rd. Receipt voucher.

188. 1st. 1st.

20. 1st. 1st.

22. 1st.

188. 1st.



Expenditure

"D" also stores inventory of these articles which
may be changed & moved & replaced except
by return to the stores which when deposited
is beyond capacity or attempt of return
to capital must be covered by a technical officer
or W.O.

"D" also stores in this held in charge that
cannot be replaced except by return
to stores but which might be obtained
& if necessary condensed & be the W.O. will
be the assistance of a specialist officer
"C" also stores in this concerned in use
such as notes, notes & bills etc.

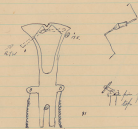
BP 1256 & 1257 (1257) 1st. 1st.

BP 1258 & 1259 (1259) 1st. 1st.

F 1221. 1st. 1st.

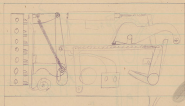
F 1222. 3. 1st. 1st. (1222) 1st. 1st.

C. Allen



Keep for find into
H. L. Allen

Slater Machine Type F



q/c built to R. for the - in Woff dr.
then sp by th. base double to th.

10813

015

Aug.

1/2 p. hour.

Drift rising 1/2 m. early July 1890

Drift - Black sand - the - located near
Woff. Photography.

Drift. + 1841 - 1842

100 000000

100 000000

Aug 10 100



Drift 700

100 11100

100 97000

100 on way back

100 Drift

100 by Drift - 1000000

100 30000 100000 100000

100 1000

100 300000

100 1000

200 100



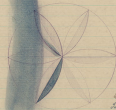
$$\begin{array}{r} 10 \\ + \\ 10 \\ \hline 20 \end{array}$$

2



60

2/1
 2/1



1/1 16
 2/1 15
 3/1 14
 4/1 13
 5/1 12
 6/1 11
 7/1 10
 8/1 9
 9/1 8
 10/1 7
 11/1 6
 12/1 5
 13/1 4
 14/1 3
 15/1 2
 16/1 1

76