THE "MAMBA" GAS TURBINE ENGINE

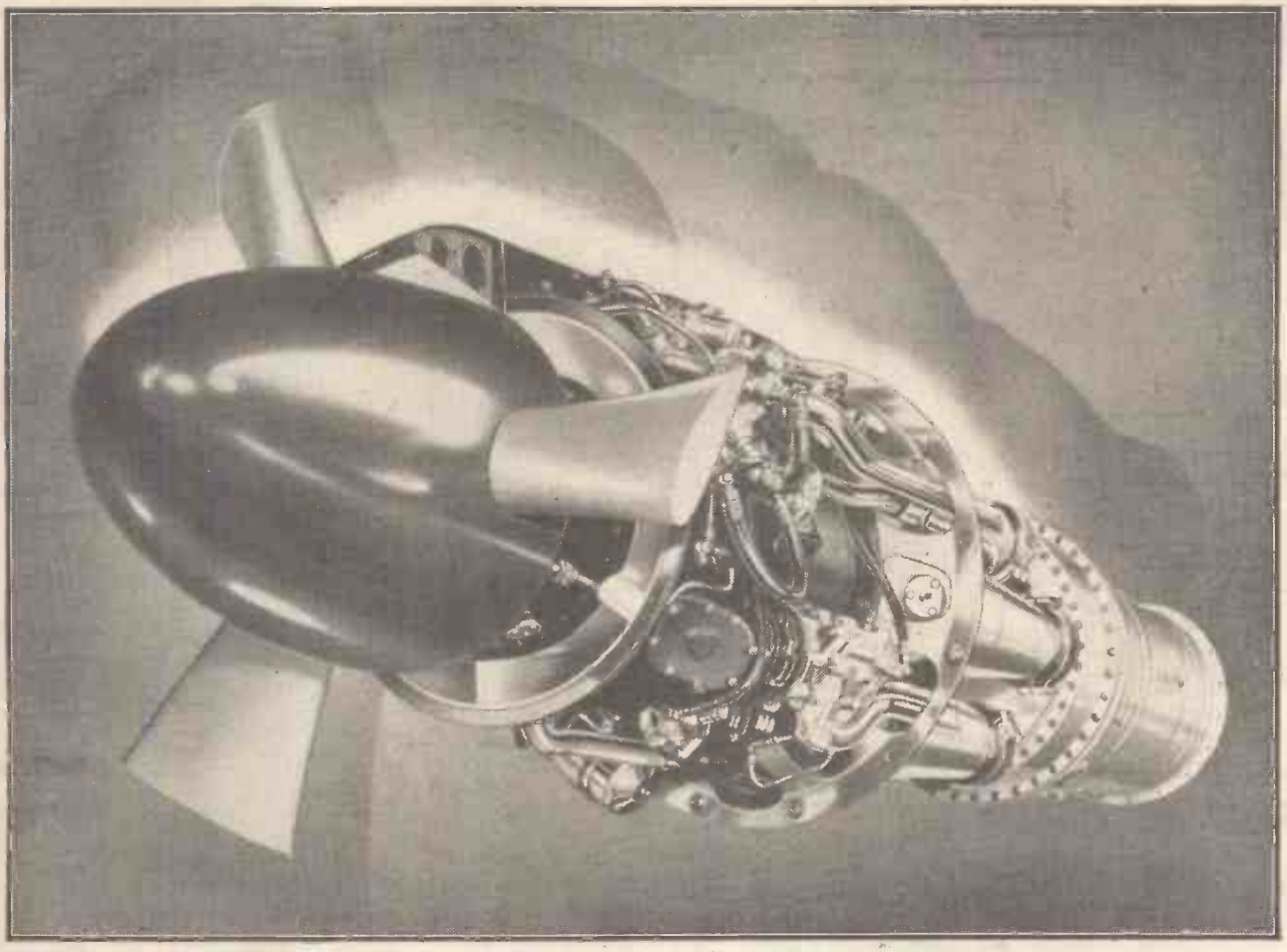
NEWNES

PRACTICAL MECHANICS

9D.

EDITOR: F. J. CAMM

JANUARY 1949



THE "MAMBA" GAS TURBINE PROPELLER ENGINE (See page 104)

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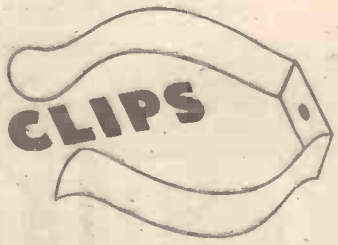
YOU NEED CLIPS



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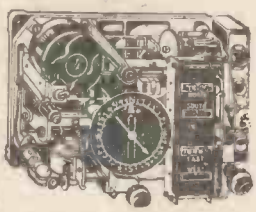

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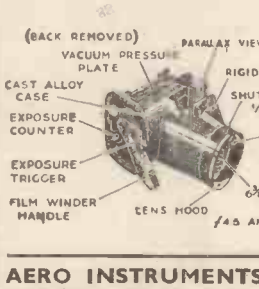

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PRACTICAL MECHANICS

Owing to the paper shortage "The Cyclist," "Practical Motorist," and "Home Movies" are temporarily incorporated.

Editor: F. J. CAMM

VOL. XVI JANUARY, 1949 No. 183

FAIR COMMENT

By THE EDITOR

Fog

IF it is possible to construct an apparatus which will photograph our insides, as the Röntgen apparatus, it should be possible to construct a car lighting system which will penetrate fog. Every time we have fog in this country serious accidents occur, traffic is disrupted, thousands of man-hours are lost, and people are stranded. Railway trains which have not the same problem as road transport, if they run at all, run hours late. Nothing is done to solve the problem. It is high time that our scientists got to work on it. Those who use the roads are entitled to expect some move from the Ministry of Transport, especially in view of the hundreds of millions of pounds which are extracted from motorists in the form of Road Funds and petrol taxation.

The newspapers devote a large amount of space to fog news and stories, so everyone should be well aware of the results of fog and its great cost to the nation.

The fact is that we do not have many foggy days in the year, and each year the problem is therefore allowed to pass by. We cannot afford in these difficult days to lose so much life nor so much productive time because of the apathy of those whose duty it is to keep the wheels of commerce turning. The nation organised during the war to meet contingencies and the Government to-day could organise fog squads to guide and direct traffic.

The plight of the road traveller during fog is not made any easier by unlighted stretches of road. The Bath Road, for example, between Cranford and the Colnbrook By-Pass is a scandal. Part of the road is lit and then you run into a blank wall of darkness, even more intense in fog. I drew the attention of the Ministry of Transport, which now controls all main roads to this problem some time ago, and Mr. Barnes promised to do something about it. That was several years ago, but nothing has been done.

In order to start something moving I invite my readers to submit suggestions for mastering the fog problem. The most interesting suggestions will be published in this journal and submitted to the Ministry of Transport, and to the railway companies.

Fountain Pens

I INVITED my readers last month to submit suggestions for improved fountain pens, pointing out that such pens as I had tried had one or more serious defects, such as leaking, insufficient ink capacity, and difficulty of knowing when the pen needed refilling. Existing methods of filling also leave much to be desired. Too much attention is given to styling, and too little to the practical purposes of a pen.

Evidently hundreds of my readers have thought about this problem too, because I have received quite a large entry for this competition and a preliminary examination exhibits many practicable improvements in fountain pen design.

Indeed, one pen originally marketed by Mr. Munro, a sample of which he sent to me, seems to fulfil all the functions of the perfect fountain pen. It contains a whole barrel of ink, it does not leak, it is entirely made of Perspex so that you can see when the ink supply is running out, it has a stainless steel iridium tipped nib, it is light in weight, nicely styled, easily filled, and easily manufactured.

I hope next month to publish a selection of the entries. I have also had correspondence from one or two fountain pen manufacturers who agree with my remarks in the main, and who have agreed if necessary to make arrangements with the winners for the manufacture of the winning design.

The Power of the Atom

I SHOULD have thought that those engaged at Scotland Yard were too busy with the crime wave, tracking down criminals, waiting for two hours beside a motor-car to prosecute a motorist "for obstruction" or other equally heinous offences, to be able to find time to write to the Press. I see, however, from the *Daily Mail* a columnist has received from a Scotland Yard man a cutting from one of our 1934 issues, although apparently this Scotland Yard man is unable to read the date of it since he gives it as January 4th, 1934.

As we have always been a monthly publication I presume that this individual at Scotland Yard with so much time on his hands is either careless or cannot read. The paragraph referred to was one in which we quoted the statement of a scientist of high standing who, at a meeting of the British Association, stated "there was no latent power in the Atom; hence vanishes one of the dreams of scientific cranks and other fantastic characters who for years past have regaled the public with ungarnished tosh."

This apparently redundant Scotland Yard man in sending this paragraph to the *Daily Mail* evidently implies that the scientist was wrong and that we have atomic power to-day. He evidently has the atomic bomb in view, and does not distinguish between an atomic bomb and atomic power. By atomic power the scientist was referring to power which could be put to useful work, which could be harnessed and controlled. Up to the present time his forecast has been proved accurate in that no one has yet been able to produce a single piece of apparatus actuated by atomic power which can be controlled and put to useful work. The atomic bomb merely produces a louder and more devastating bang than any other bomb.

The "Mamba" Gas Turbine

General Description, Constructional Details and Operating Notes

THE Armstrong Siddeley Mamba gas turbine propeller engine was announced on September 8th, 1946, and at once created great interest, for it is claimed to be the most powerful engine of its kind for its size in the world.

Since first announced the engine has been further developed and the power increased. It has satisfactorily accomplished many hours of test flying in a specially adapted Lancaster aircraft.

One of the most difficult design problems has been to build a reduction gear to reduce the high engine r.p.m., which is characteristic of a turbine, in this case, 14,000 or so, to a figure which can be usefully employed by the propeller, about 1,400 r.p.m., and to do this without increasing the small frontal area of the engine.

A three-blade constant speed fully feathering propeller is fitted. Due to basic differences between a gas-turbine propeller engine and an ordinary piston engine, new problems in relation to the interaction of engine and constant speed propeller have had to be overcome. The engine and propeller controls are linked by a single pilot's throttle lever. A separate constant speed control lever is not required. This arrangement has been found to provide very satisfactory handling characteristics in flight, as can be judged from the fact that, if necessary, under baulked landing conditions, the power can be increased from zero to maximum in under two seconds.

For starting purposes, the propeller is placed in zero pitch so that a minimum of power will be absorbed. When the engine has started, it will slow run at 8,000 r.p.m. and can be taken up on the throttle to cruise at 14,000 r.p.m. and then to full bore at 15,000 r.p.m.

The layout of this engine is as follows:

The Mamba engine consists of an axial flow compressor which handles a maximum of ½ ton of air per minute from a forward facing air intake and supplies it at a pressure of 60lb./sq. in. to six combustion chambers which are radially disposed round the axis of the rear main shaft. These combustion chambers were designed by Armstrong Siddeley Motors, and are of special interest in that they vaporise the fuel before burning instead of the more usual system of atomising the fuel in high-pressure spray jets.

The expansion of the hot gases through the turbine produces the power which drives both the propeller and the compressor, the compressor directly and the propeller through the reduction gear.

The foregoing paragraphs have dealt with the broader aspects of the Armstrong Siddeley Mamba, and the following notes will provide more detailed information concerning its construction and manner of operation:

Armstrong Siddeley's Chief Test Pilot Sqn./Ldr. Price-Owen, immediately before flying the Mamba gas turbine engined Balliol Trainer. The car bonnet housing a 16 h.p. engine is an interesting contrast in size with the nose of the aircraft housing the 1,000 h.p. Mamba, which incidentally weighs only 1,000lb. against the car's 3,000lb.

Brief Specification

Description.—Ten-stage axial flow compressor; two-stage turbine.

Dimensions.—Overall length (rear face of propeller fitting cone to rear face of turbine housing), 57in.; maximum diameter over circular cowling (at engine mounting position), 19 11/16in.

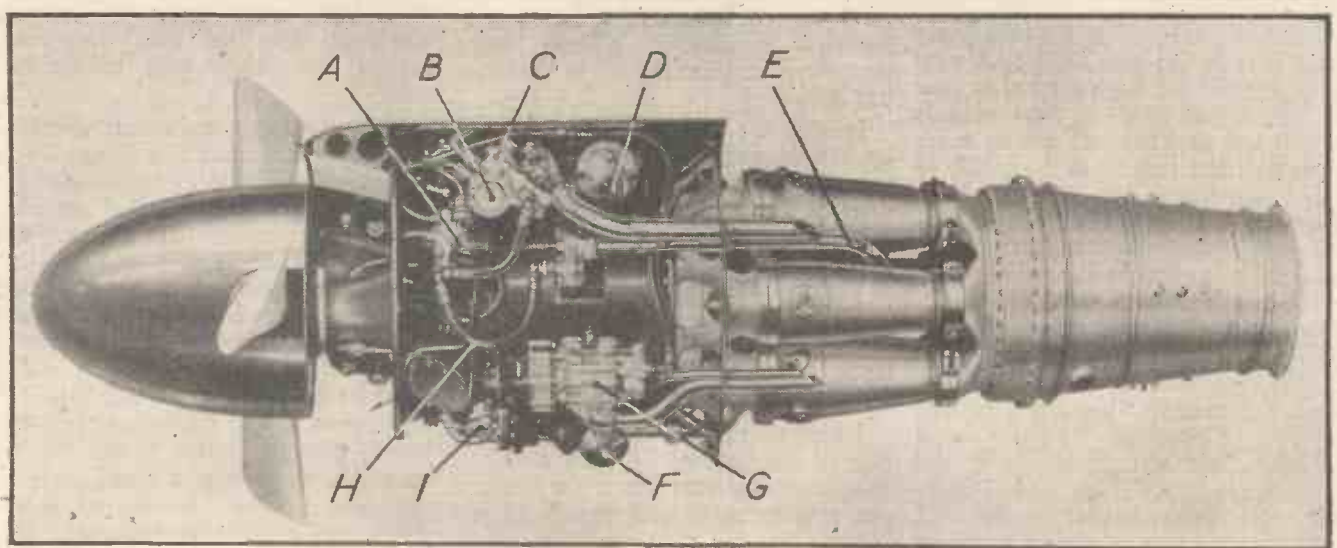
Weight.—Net dry weight, 760lb.

Mounting.—The engine is provided with six mounting lugs on the casting at the rear of the compressor casing.

Fuel.—Aviation turbine fuel to Specification DERD 2482, Issue No. 1.

Engine Performance (Sea Level)

Rating	r.p.m.	Aircraft speed m.p.h.	Prop. shaft horse-power	Net Jet thrust	Fuel consumption
Max. take-off...	15,000	0	1,010	307 lb.	102 gals./hr.
Max. emergency	15,000	100	1,032	248 lb.	104.1 gals./hr.
Max. climb....	14,500	200	935	170 lb.	94.8 gals./hr.
Max. continuous cruising ..	14,000	300	918	102 lb.	89.5 gals./hr.



Key diagram showing the disposition of the chief component parts. A. Oil distributor and high pressure relief valve; B. Main oil pressure filter; C. Main pressure and high pressure pump; D. Tachometer; E. Air cooling pipe to rear bearing; F. Fuel flow control filter; G. Gas starter; H. Air feed pipe to front bearing; I. Tecalemit micro pump for rear bearing.

Propeller Engine

Note.—The formula for converting thrust in pounds into horse-power is: Horse-power =

$$\frac{\text{thrust (in pounds)} \times \text{aircraft speed in m.p.h.}}{375}$$

except for the static condition where 2.6lb. of thrust are taken to be equivalent to 1 horse-power.

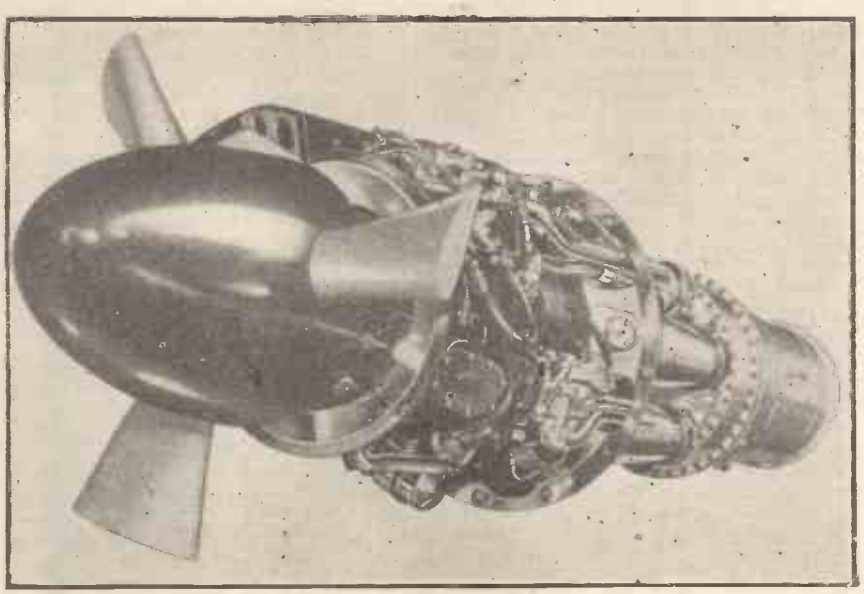
General

The engine viewed from the side is made up of the following components starting at the front:

The front cover enclosing the reduction gear and airscrew shaft. Immediately behind the front cover is the annular air intake, and behind this the compressor casing.

Above the compressor casing are mounted the auxiliaries. Behind the compressor is the diffuser casing which leads into the six combustion chambers surrounding the turbine shaft housing. The two-stage turbine is located in a housing at the rear of the combustion chambers.

Finally, the exhaust cone and propelling nozzle are fitted in this order at the rear of the engine.



General view of the "Mamba" with central casing removed.

The Reduction Gear and Front Cover

The reduction of speed required is from the compressor shaft speed of 15,000 r.p.m. down to a propeller shaft speed of 1,450 r.p.m. (.097 : 1 reduction).

The reduction is carried out by means of an epicyclic train. A helical sun gear is driven from the front of the compressor shaft and drives three helical planet gears. These three planet gears drive three further planet spur-gears on the same axis and the latter engage with a fixed annulus gear. The planet gears are attached to the propeller shaft by means of a carrier and, consequently, the propeller shaft revolves with the planet gears inside the stationary gear in an anti-clockwise direction as seen from the rear. (The same direction as the turbine and compressor.) Only the sun and planet gears of the first train are helical.

The stationary annulus gear is prevented from rotating by eight links connected to eight pistons. The pistons are automatically balanced in cylinders by oil pressure. They are mounted radially and form torquemeters. The pressure of the oil in the cylinders is recorded on a gauge in the pilot's cockpit. The formula for finding the b.h.p. of the engine at any given moment is as follows:

$$\text{B.H.P.} = \frac{\text{oil pressure in lb./sq. in.} \times \text{r.p.m.}}{1750}$$

The planet gears are mounted on roller bearings at the front and a ball and roller bearing at the back. The entire thrust from the propeller is taken by a ball bearing in the front cover. The radial and gyroscopic loads are taken by the same ball bearing and by a plain bearing at the rear of the propeller shaft.

Engine Auxiliaries

The auxiliaries are mounted parallel to the centre line of the engine to the front and rear of the auxiliaries case, which is integral with, and surrounds, half the circumference of the air intake body.

The drive is transmitted from the airscrew shaft reduction gear through a single inclined bevel shaft, which passes through one of the aerofoils in the annular air intake to a train of spur-gears housed in the auxiliaries case.

The engine can be turned through 180 degs. to bring the remote drive to the bottom by changing the air intake body to suit different aircraft requirements.

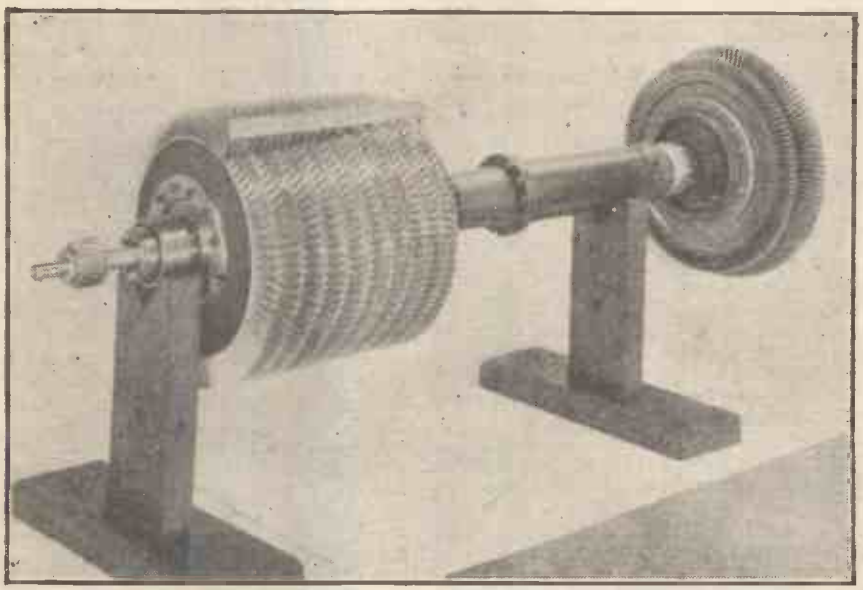
Starting in a clockwise direction from the rear, and with the engine turned so that the remote drive is at the top, the auxiliaries are arranged in the following sequence:

Pointing Forward.—1. The high-pressure oil pump, .18 engine speed; 2. The governor-operated ignition switch; 3. The electric tachometer, .25 engine speed.

Pointing Rearward.—1. The main pressure and scavenge pump, .18 engine speed; the Tecalemit micro-metering pump, .089 engine speed (these three pumps are all housed in one unit); 2. The airscrew constant speed unit, .18 engine speed; 3. The remote aircraft accessories gear-box drive, .18 engine speed; 4. The electric starter, 8 h.p. B.T.H. or 8 h.p. Rotax; 5. The fuel pump and engine over-speed governor, .25 engine speed Lucas "A" type.

The oil-pressure filter with pressure reducing valve and relief valve is mounted on the end of the auxiliaries case.

The remote aircraft accessories drive is taken from a universal coupling attached to a spur-gear drive housed in the auxiliaries case, and has a capacity of 50 h.p. at maximum cruise r.p.m.



The "Mamba" 10-stage axial flow compressor and two-stage turbine assembly. The small size of the compressor is noticeable in comparison with the 12in. rule. It handles over 20 tons of air per hour.

The Air Intake

The forward facing annular air intake at the front of the engine, to which the front cover is attached, is bolted to the compressor casing and is a magnesium casting. Provision can be made for anti-icing by drawing hot air from a point between the two turbine stages and delivering it to the air intake.

The Compressor

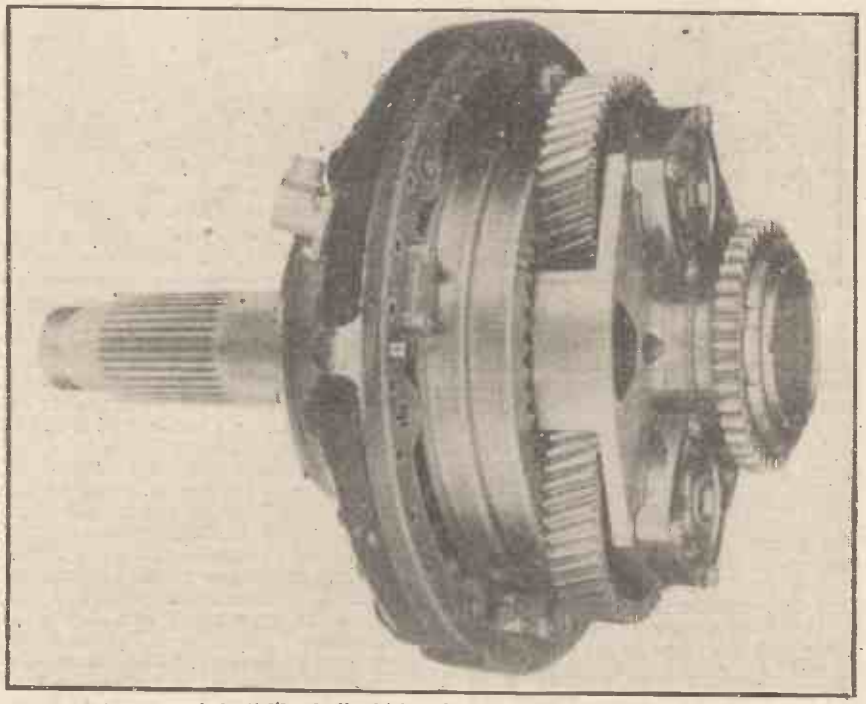
The 10-stage axial flow compressor has a compression ratio of 5 : 1 at maximum sea level static take-off r.p.m. and uses about one-third of a ton of air per minute, 13½lb./sec. Consequently, in one minute the Mamba consumes more than its own weight in air.

The compressor consists of a stainless steel drum to each end of which are attached steel

extension shafts. The front shaft is mounted on a pair of angular contact ball bearings. The rear shaft is mounted on a roller race. The turbine shaft is connected to the compressor shaft by a coupling and is supported on a roller bearing. The coupling incorporates a phosphor bronze spherical bearing to ensure self-alignment between the turbine and compressor assemblies.

The 10 rows of aerofoil section aluminium blades are attached to 10 twin-steel discs which are shrunk on to the steel compressor drum. The whole assembly is enclosed in a stator casing of forged aluminium. The casing is split on the horizontal line and contains nine rows of fixed aluminium stator blades.

A drive is taken from the compressor front extension shaft to the propeller reduction gear, and, via the propeller reduction gear and a bevel drive, to the auxiliary box.



The reduction gear of the "Mamba" which reduces the 15,000 r.p.m. of the compressor and turbine to a propeller speed of 1,450. The reduction gear ratio is .097 : 1. The annulus gear and two out of the three helical planet gears are visible. The gear at the rear of the planet carrier provides the drive for the engine auxiliaries.

The compressor exerts an axial thrust in a forward direction (opposite to the direction of the air entering the intake) and the turbine exerts a lesser thrust towards the rear of the engine; consequently, these two opposing forces largely neutralise each other, and any remaining thrust in a forward direction is taken by the front compressor bearings, the compressor shaft being placed under tension by the action of the two opposing forces. The front main bearing is oil cooled.

The Combustion System

The six combustion chambers are grouped symmetrically round the axis of the turbine housing at the rear of the compressor. They have been developed by Armstrong Siddeley Motors and differ from those used on other gas turbines in that a vaporising principle is employed. The fuel is vaporised and mixed with heated air before entering the combustion zone.

This gives many advantages over the more usual type in which the fuel is atomised necessitating a high-pressure pump and other complications. For instance, vapour injection allows better control of flame than spray injection, where the distribution is dependent on a sensitive high-pressure atomiser and the break-up of the fuel is dependent on fuel flow. Consequently, combustion chambers utilising the vapour injection principle do not suffer from the marked deterioration in efficiency at part throttle and altitude conditions associated with the spray injection type of combustion chamber. The flame tube walls are cooled by internal films of air.

The combustion chambers are connected by balance pipes. This is to equalise pressure and enables starting to be carried out by igniter plugs in any two combustion chambers.

The combustion chamber outer casings are of stainless steel, and the flame tubes of "Nimonic 75." Sliding joints on the outer casing allow for expansion.

The Turbine

The two-stage turbine consists of two discs of Jessops G18B austenitic steel. There are 115 blades on each disc secured by "fir tree" serrations. The blades are "Nimonic 80."

The rear main bearing is cooled by air fed from the fifth stage of the compressor which passes via an external pipe to the outside of the rear main bearing housing. It then passes over and under the bearing sleeves, finally escaping out of the forward end of the bearing into an external pipe which transfers it to the exhaust jet.

The outer face of the rear turbine disc is cooled by air that leaks past the high pressure labyrinth seal at the outlet of the compressor and is fed into the centre of the turbine clamp bolt. Air is tapped from the compressor and is drawn along inside the main shaft, and then travels between the turbine stub shaft and clamp bolt to cool the inner face of the twin turbine discs.

Air is bled from the combustion chamber feed manifold and is fed via an external pipeline to a point in front of the turbine stub shaft and is then transferred by holes to cool the outer face of the front turbine disc. This air is also used to pressurise a chamber which prevents leakage of hot gases from the turbine. An air-cooled roller bearer, lubricated by ½ pint of metered oil per hour, runs at some 120deg. C. and supports the turbine assembly.

Method of Operation

Air enters through an annular forward-facing air intake at the front of the engine and passes in a straight flow to the compressor.

After leaving the compressor the air, now at a temperature of 230 deg. C. and a pressure 60lb./sq. in., passes through a diffuser which reduces the velocity of the air. It is then directed into the combustion chamber manifold which feeds the six combustion chambers.

About 1/5 of the total mass of air enters the flame tube for primary combustion, the remaining air flowing between the flame tube and the outer casing.

The mixture burns inside the flame tube at a strength by weight of approximately 15 : 1 and at a temperature of approximately 2,000 deg. C., the overall mixture strength, that is, the weight of air entering the combustion chambers in relation to the fuel consumed, is about 55 : 1 at sea level take-off static r.p.m.

The gases pass from the combustion chambers into an annulus at the entry to the turbine. They now flow through the nozzles and blades of the two-stage turbine at a pressure on entry of approximately 57.5lb./sq. in., falling at the exit to a static pressure of 1¾lb./sq. in. below atmospheric pressure. It is, therefore, necessary to diffuse the pressure back to atmospheric, which is done by the increase in area of the exhaust cone.

The absolute gas velocity on the mean radius of the turbine disc at the first nozzle is 2,000ft./sec. and the axial velocity at the outlet into the exhaust cone 855ft./sec. at sea level take-off static r.p.m.

The turbine develops about 2,700 h.p. of which 1,650 h.p. is absorbed in driving the compressor, leaving a balance of 1,050 h.p.

After leaving the turbine, the gases pass to atmosphere via the exhaust cone and propelling nozzle at a velocity of about ¼ that of a plain jet engine. Details of the drive to the propeller will be seen under the heading, Reduction Gear and Front Cover.

The Fuel System

The Mamba fuel system consists of the following components:

1.—A submerged fuel tank pump.
2.—A low pressure filter.
3.—A fuel pump incorporating a maximum speed governor and a maximum pressure relief valve.
4.—A flow control incorporating a throttle control and an altitude control.
5.—An acceleration control.
6.—An isolator.
7.—A fuel distributor incorporating a pressure increasing valve.
8.—Six burners.
9.—Ignition system including two torch igniters, four spray jets and a solenoid-operated isolator.

The low pressure filter, flow control, isolator and dump valve are incorporated in one unit.

The submerged tank pump delivers fuel through the low-pressure filter to the engine pump, which delivers it to the throttle valve and flow control. After being metered by the throttle valve the fuel passes through the isolator and dump valve unit and the two-stage starting valve to the manifold and through the atomisers into the combustion chambers.

Taking the various components in the above order, we start with:

1.—The submerged fuel tank pump—this is of the electric pulsometer type.
2.—The low pressure filter—a cylindrical body containing a Tecalemit felt element.
3.—The fuel pump—Lucas "A" type variable stroke multi-plunger swashplate pump incorporating a maximum engine rotational speed governor and a maximum pressure relief valve.

The maximum speed governor is operated by fuel under centrifugal pressure which is generated by the rotation of the fuel pump rotor. If a certain prescribed r.p.m. is exceeded, this pressure operates a diaphragm. The diaphragm lifts a bleed valve which, by means of a servo piston in the pump, reduces the fuel pump cam-plate angle. A reduction of this angle reduces the plunger stroke with a consequent reduction of pump delivery and drop in r.p.m.

The Flow Control Unit

As altitude increases, less fuel is required by the engine. It is therefore necessary to reduce the fuel supply and this is done automatically by the capsule in the flow control unit to conform to the engine fuel requirements under altitude conditions.

The altitude capsule operates on the pressure drop across the throttle valve as the altitude varies. This pressure-sensitive capsule is housed in a chamber connected to the aircraft pitot head.

The Throttle Valve

The throttle valve, which meters the fuel to the engine, consists of a profiled pressure-balanced needle whose position in an orifice is set by the throttle lever through a rack and pinion. The pressure drop across the orifice is maintained constant at constant altitude by a piston sensitive to this pressure drop.

The Acceleration Control

The acceleration control is a means of limiting the engine speed in relation to the fuel flow during acceleration, and is achieved by the hydraulic control box. This contains a fuel cam and a speed cam which link the fuel and speed to the pilot's lever to suit the engine characteristic, the fuel cam being manually controlled by the pilot, the speed cam operating through a vane-type servo motor. This permits the oil flow to the servo to be controlled in such a way that the engine speed selection on the constant speed unit can be matched to the fuel flow at any instant to prevent surging or overshooting of the engine during acceleration periods, irrespective of the speed with which the pilot's lever is opened.

The Isolator Valve

This valve is for stopping the engine and consists of a pressure-balanced piston operated by a rack and pinion. The piston slides longitudinally in a cylinder and when closed covers the fuel control outlet port to the manifold and by-passes the fuel back to the pump inlet.

Fuel Distributor

Fuel is received from the flow control metered to suit the engine requirements. This is fed through the pressure-increasing valve which gives a back pressure on the system sufficient to maintain a satisfactory servo pressure under conditions where the pump outlet pressure would normally be too low. The fuel is then split by the distributor into six equal quantities to give an even combustion temperature, and then fed to the burners.

Burners

One of these is located in the centre of the flame tube nose-piece in each combustion chamber and consists of four simple jets which feed the vaporisers.

Starting System

A feed is taken from a point just above the pressure increasing valve so that the fuel is fed to the starting system before this valve opens to the main burners. This fuel is led through a solenoid-operated isolator, linked electrically to the ignition system, to two torch igniters in the combustion chambers and four spray jets, one in each of the other four chambers. The igniters light and fire the spray jets through the interconnections. The chambers warm up and the pressure increasing valve then opens steadily and permits fuel to enter the main burners.

When vaporisation has commenced, the ignition is switched off and the electric isolator closed, cutting off the starting system. All the fuel then passes through the distributor and the main burners in the usual way.

Lubrication System

A main pressure gear-type oil pump supplies oil at 70lb./sq. in. to:

1.—The propeller constant speed unit.
2.—The propeller reduction gear bearings and to the oil jets for the reduction gears.
3.—The Tecalemit metering pump.
4.—The high-pressure oil pump.
5.—The reducing valve with a 5 : 1 reduction which supplies oil at 14lb./sq. in. to:

(a) The front main compressor bearing.
(b) The auxiliary drive bearings.

The Tecalemit metering pump feeds the rear main turbine bearing with ½ pint of oil per hour, which runs to waste. The quantity of oil fed to the front main bearing is controlled by restrictor grooves.

Novel Lighting Effects in the Home

MAKING a focal point of otherwise useless wall space beneath and between two windows, a combination of incandescent and fluorescent type lighting in this new windowsill unit designed by Sylvania Electric Products Inc., of America, also serves to illuminate the painting on the wall above it. Two 40-watt fluorescent strip lighting fixtures are placed end to end in a continuous row across the top of the 7in.-deep wall unit to illuminate the flowers on the lower shelf and the knick-knacks on the top shelf, while a combination of both fluorescent and incandescent lighting behind a plastic panel at the left highlights the painting and furnishes additional illumination for the entire area.

The top half of the vertical panel contains a 200-watt incandescent bulb and adjustable louvres one inch deep which direct the light to the wall and permit it to reach the painting and illuminate it at the desired angle. A 20-watt fluorescent lamp is placed vertically along the lower half of the panel and, by means of a narrow slot in the wood panel perpendicular to the plastic shielding, distributes light into the hollow area along the wall for additional illumination of the plants.

Lighting for the bookcase at the right was designed by Sylvania Electric to serve three specific purposes. A completely separate shelf which fits on to the top of the bookcase, the lighting unit, which contains one 40-watt fluorescent lamp and one 20-watt fluorescent lamp set horizontally in a continuous row, distributes light on to the wall to illuminate the painting above and create a decorative effect in the room, while furnishing light for the books beneath so that the titles can be read easily. To provide reading light for the chair in front of it, the bookcase itself was built 4ft. 6in. high so that the shelf would be at a perfect level to furnish 20 foot-candles of illumination at reading level from a hidden source which allows no glare. Made of plastic strip to emphasise the horizontal line of the bookcase and painted the same grey colour as the wall, the 6ft.-long shelf is 2¼in. high and 8in. deep. A panel of frosted glass shields the lamps and diffuses the light.

Both windowsill and bookcase lighting are plugged into outlets behind the units.

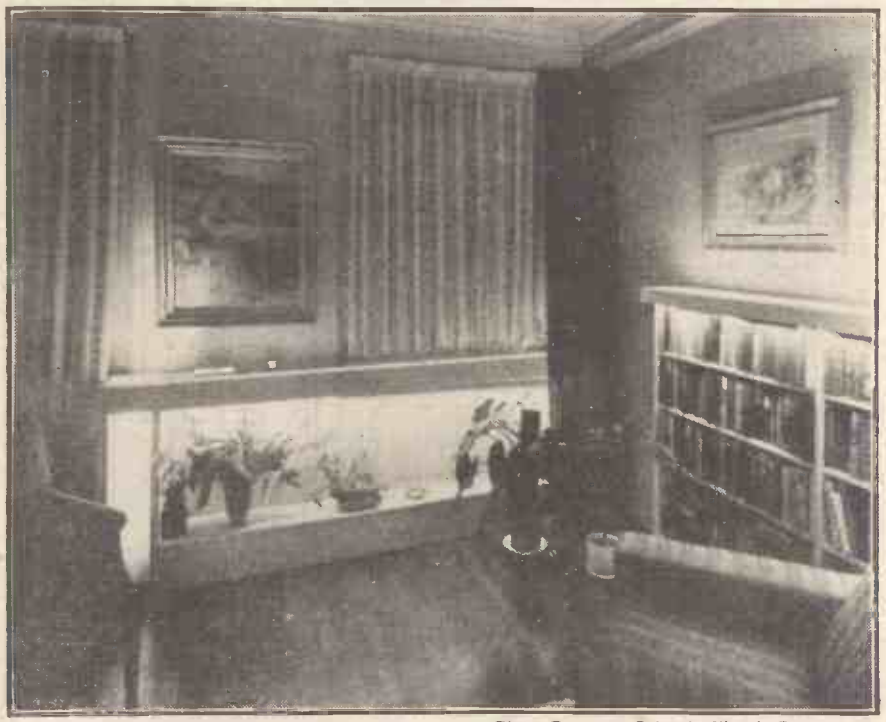


Photo Courtesy: Sylvania Electric Products Inc.

The pleasing effect of concealed fluorescent lighting in the corner of a room.

Simple Two-speed Cycle Gear

Constructional Details and Notes on Calculating Gears

By A. CRESSWELL

MOST cyclists will be familiar with the derailleur type of two, three or four-speed cycle gear, in which a number of different sized sprockets are fitted to the rear hub, according to the gear ratios required, and in which the chain is made to ride from one to the other of the sprockets by means of a device including a "jockey" pulley, which, being on a spring, takes up any slack in the chain.

The gear described here is a modification of the above, working on the crank instead of the rear hub. It can only be fitted to a machine which already has a normal hub derailleur, as the jockey pulley of the latter has to work for both, but, when fitted, it will double the gear ratios available from the rear hub. A three-speed gear, for example, will become a six-speed.

By suitable selection of sprockets and chainwheels a remarkable range of ratios can be obtained, from a "twiddler" in the forties to a delightful top in the hundreds, which is just right for a following wind. With the usual top gear, in these conditions, the machine seems to run faster than the pedals, but the extra drive of this high top is quite exhilarating.

First fit a double chainwheel. My two wheels are 52 and 44 teeth respectively, the larger being on the outside, where it is roughly in line with the smallest sprocket. This combination gives top gear. The smaller chainwheel on the inside is about in line with the largest sprocket, and this gives bottom gear (for which the maximum drive is wanted) with the least misalignment of the chain. The chainwheels *could* be fitted in the reverse order, as the chain drives perfectly well at the maximum crossover, but the order given is best.

There are several types of crank on the market which carry detachable chainwheels, so I will not go into detail about fitting the double wheel. Suffice it to say that mine is the six-pin type, and I found there was plenty of room for both wheels provided that I filed away a small flange inside the smaller wheel which tended to foul the rear forks. The main thing is to get the chainwheels to run in planes ⅜in. apart, with absolutely no wobble.

Details of Construction

The operating mechanism (Fig. 1) consists of a cage of two mild steel bars which encloses the chain, as shown in Fig. 2. Sliding sideways this cage guides the running chain from one chainwheel to the other, and its bars are chamfered on the inside leading edges to give the chain an easy run-in.

The inner bar is 4in. by ½in. by ⅛in., and has three holes drilled in the positions shown in Fig. 1. The larger holes are drilled 3/16in. and threaded 0 B.A., the smaller 1/16in. and threaded 8 B.A. The outer bar is thinner, of ½in. by 3/32in. metal, as there is not much clearance between the chain and the crank when the larger wheel is in use. Also, this bar is bent, the longer straight portion being 2⅜in. long, and the throw of the crank in it 7/16in., which is the distance the bars should be apart when assembled. There are two holes only. One, 3/16in. threaded 0 B.A., is at the end of the longer straight portion, while the other, a plain ¼in. hole, is drilled after the bar is bent, to come 3½in. from the centre of the first.

The bend in the outer bar is most important, as it is designed to offer an inclined face to the rising pedal-crank, should the cage be allowed to slide out too far. This ought *not* to happen, but if it did the sloping face would cause the cage merely to be pressed back against its spring until the crank was clear, whereas if the cage were a plain rectangle the crank would hit a solid obstruction and the whole mechanism might be wrecked.

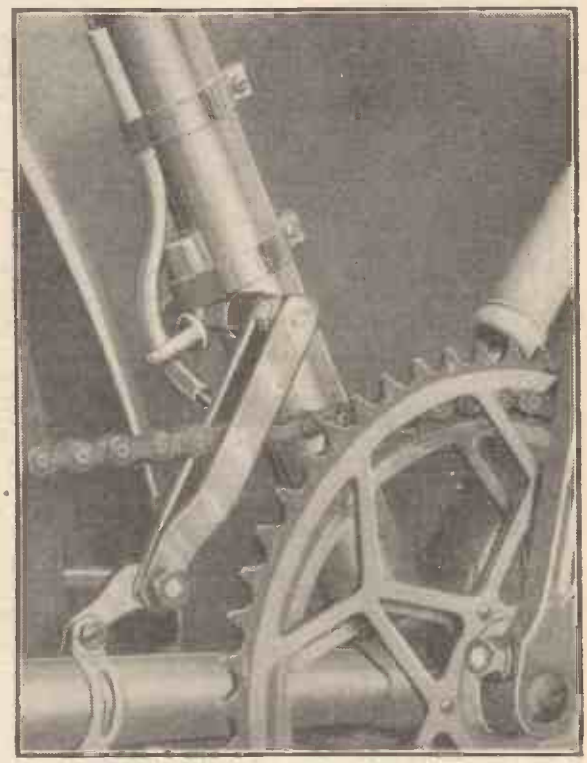


Fig. 2.—A close-up view of the two-speed gear fitted to a cycle.

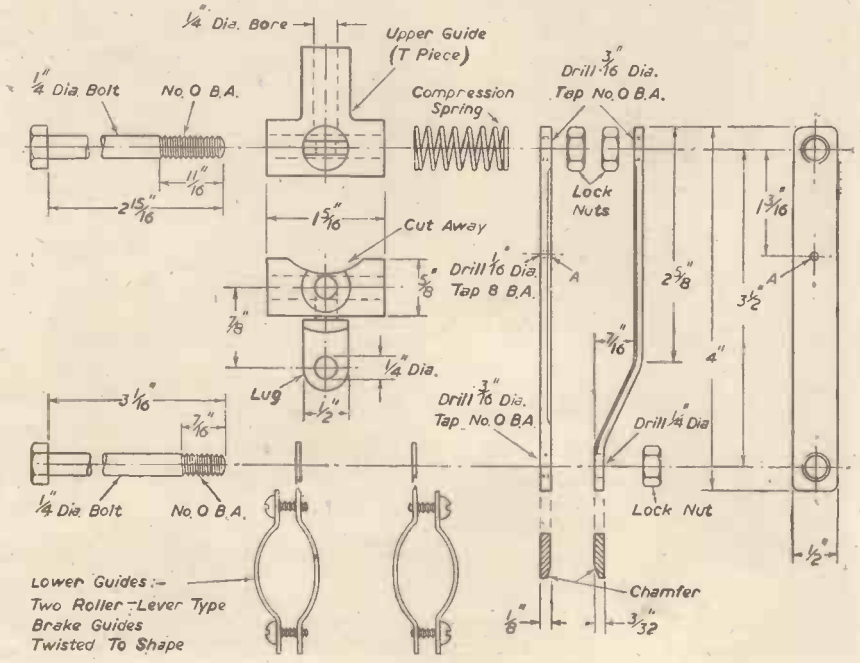


Fig. 1.—Details of the operating mechanism.

The slides for the cage consist of two ¼in. diameter bolts. The shank of the upper one is 2 15/16in. long, and it is threaded for 11/16in. with a 0 B.A. die. The lower one, which has to reach across the rear forks, is slightly longer (3 1/16in.), but is only threaded for 7/16in.

These bolts run in three guides, two for the lower, one for the upper. The lower guides (Fig. 3) are a pair of standard stirrup-guides for brakes of the roller-lever type, which, as supplied, have acute bends in them. These bends are straightened, and the holes made an easy fit for the ¼in. bolts. They are fitted on the rear forks so that the bolt runs between tyre and mudguard (see Fig. 2).

The upper guide is an aluminium T-tube (Figs. 1 and 3). For those who might prefer it, I would suggest brazing a bearing to the frame as a substitute for the T-tube illustrated, which is merely clipped to the seat pillar by a band round its stem, but at the time of construction I was not sure of ultimate success, and so hesitated to spoil the finish of my machine. However, the T-tube as fitted is perfectly rigid, and the upright hollow stem has turned out to be a very handy oil reservoir.

The slide bolts should be as nice a fit as possible in the bore of the tube by being ground in with valve paste. The front of the

T-tube is filed away to a hollow shape, which fits snugly to the curve of the seat pillar, where it is held by the clip mentioned above.

A lug which is to hold the cable guide-tube is screwed into the rear wall of the T-tube. This screwed lug was in my junk-box, and so I used it, but a similar lug could equally well be brazed or welded on. A suitable hole is drilled in the lug to hold a length of aluminium tube which guides the operating cable, and this tube is also clamped to the seat pillar, higher up, by a second clip.

Assembling the Parts

The mechanism is assembled as follows. With the lower guides loosely in place, lightly clamp the T-tube to the seat pillar. Push the shorter bolt through the T-tube towards the chainwheels, and, as it emerges, load it with a compression spring, whose strength must be found by experiment. It should just be strong enough to make the gear work, and no stronger, but, as a rough indication, it should be fairly easy to squeeze between finger and thumb.

Road wheel diameter, 26in.					
Teeth on rear sprockets	Teeth on chain wheel				
	52	50	48	46	44
26	52	50	48	46	44
25	54	52	50	47.9	45.8
24	56.2	54.2	52	49.8	47.7
23	58.8	56.7	54.4	52	49.8
22	61.5	59.1	56.7	54.5	52
21	64.5	62	59.5	57	54.5
20	67.6	65	62.4	59.8	57.2
19	71.2	68.5	65.7	63	60.2
18	75.1	72.2	69.2	66.5	63.6
17	79.5	76.6	73.4	70.4	67.3
16	84.5	81.5	78	74.8	71.5
15	90.1	86.8	83.2	79.8	76.3
14	96.5	93	89	85.5	81.7
13	104	100	96	92	88

Table of gear ratios.

Now screw the bolt right into the inner cage-bar (the straight one), using the hole nearest the small one. Thread on two lock nuts, and screw one down on the bar. Wind on the outer bar until the bolt end is flush, and screw the second lock nut back against it. The two bars should now be $\frac{7}{16}$in. apart. It is essential that the end of the bolt is absolutely flush with the outer face of the bar, so file it down if it protrudes.

Push the lower bolt through its guides, and screw right into the inner bar and through the plain hole of the outer bar, which is then secured by a nut. Washers can be inserted at this point to correct the spacing, but should not be needed if the crank is right.

Tighten the upper and lower guides, making sure that the cage slides smoothly and returns under the influence of its spring. When assembled correctly the cage should rest over the teeth of the outer chainwheel, and, by pressing it back, it should come over the inner wheel. It should jump out smartly when released. The chain may be enclosed in the cage when assembling or threaded through it afterwards, as preferred.

Operating Cable and Quadrant

The operating cable is a standard Sturmey-Archer three-speed cable. Thread one of the nipples with an 8 B.A. die, and lead the cable down through the guide-tube, which should be bent so that its lower end points straight at the $\frac{1}{16}$in. threaded hole in the inner bar. Screw the nipple into the bar, and

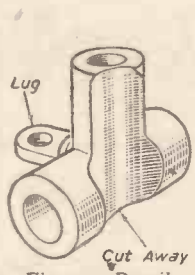


Fig. 3.—Detail of T-tube.

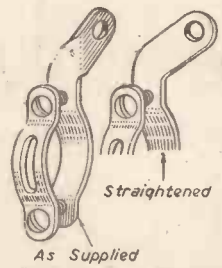


Fig. 4.—Lower guide brackets.

make sure that it does not protrude inside. Although these nipples are only lead, I have never yet had one pull out, but it will now be seen why the return spring should not be stronger than is necessary! Keep the guide tube full of grease, to reduce friction round the bends.

The operating quadrant is also Sturmey-Archer, which gives exactly the right travel. The catch on the lever is filed off, and the sides of the quadrant pinched in to create friction, as the lever must hold the cage in any position against the thrust of the spring.

To change gear, the lever (and so the cage) must be moved to the limit until the change is made, which happens, of course, only with the chain in motion. It is then moved back slowly until the chain is running freely. It may be necessary to adjust the position of the cage a little when the rear derallleur is used, as the chain will then alter its position slightly, and there is only $\frac{1}{32}$in. clearance on either side of it in the cage. However, so long as the chainwheels run true, the gear should give no trouble at all. Mine has made hundreds of changes without fail, and without ever losing the chain, which in fact is less likely to come off than if the gear were not fitted. As yet, the bars show no trace of wear, as they only bear on the chain for a second or two as the gear is changed, and for the rest of the time are quite free.

Calculating Gear Ratios

Now a word as to the choice of gear ratios. A cycle "gear" is calculated by the formula

$$\frac{D \times C}{S}$$

where D is the diameter of the road wheel in inches, C is the number of teeth on the chainwheel, and S is the number on the rear sprocket. The answer, strictly speaking, is only an index, but if multiplied by PI. (3.142) it will give the distance in inches which the machine will move for one turn of the pedals. For example, a machine with 26in. wheels, a 48 chainwheel and a 16 sprocket has a "gear" of 78, and will move 244in., or about 20ft., for one turn of the pedals.

The accompanying table gives most of the ratios which can be obtained with a 26in. wheel (not including hub gears). The difficulty in selecting a set of chainwheels and sprockets is to produce a set of ratios with proper intervals. After much research, I now use chainwheels of 52 and 44, with sprockets of 25, 18 and 13. These give ratios of 45.8, 54, 63.6, 75.1, 88 and 104, which make an ideal smooth curve when plotted as a graph (Fig. 5). I think this combination will be hard to beat, but try plotting others in a similar way. Chainwheels of 50 and 44, with sprockets of 20, 17 and 15, will, for example, give ratios of 57.2, 65, 67.3, 76.6, 76.3 and 86.8. When plotted, it will soon be seen that this is useless, as it gives only four really effective gears.

Sturmey-Archer Gears

By way of comparison, the dotted line in the graph is a representative range of gears as offered by a Sturmey-Archer hub gear, with a 48 chainwheel and an 18 sprocket. The way to work out a hub gear is first to find the "normal" gear in which sprocket and hub rotate together. This is obtained from the formula above. Then add one-third of the figure found, to get the "high" gear, and deduct one quarter of it to get the "low" gear. Other types may be obtained with different ratios, but this is by far the most common.

A derailleur triple sprocket, incidentally, can easily be screwed on to the splines of a hub gear and nine ratios obtained, but it is all very heavy. Also, it needs far too much thought on the road to remember the control settings. I *have* tried it, and find that sprockets of 20, 17, and 14, with a standard hub and a 48 chainwheel, are about the best, but it is really much too complicated for practical use. However, if a hub gear is already fitted, try a *two*-speed gear of the "Witmy" type, with 18 and 16 sprockets and a 46 chainwheel. This gives a useful range of 49.9, 56.1, 66.5, 74.8, 88.7, and 99.7, and is quite simple to handle in practice.

All hub and derailleur combinations are, however, difficult to adjust. My sprocket and chainwheel combination is child's play in comparison, and is also very easy to remember on the road, as each chainwheel change is halfway towards the next sprocket change—simple! In fact, I can recommend it as the best combination I have yet found.

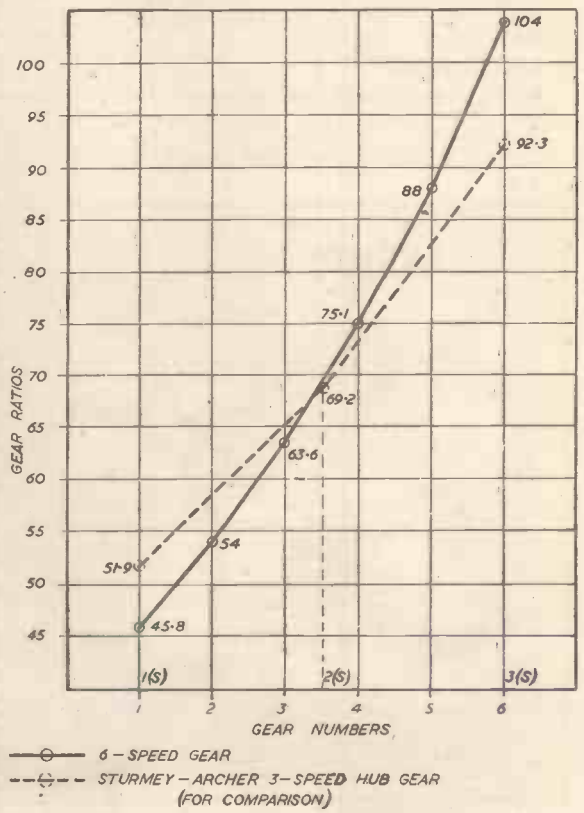


Fig. 5.—Graph indicating range of Sturmey-Archer hub gears.

The Cycle Show

A Review of the Fine Display of Machines and Accessories Which Were on Show at Earls Court

By R. L. JEFFERSON

TEN years is a long time to wait for anything, especially a cycle show. I think that the recent display has been a good thing, not necessarily because of the number of orders booked but because it has enabled us to see once again the trend of design, and the novelties and new ideas.

Emphasis was on colour. Most of the larger manufacturers were displaying machines of all shades and finishes, and the return of full flamboyant finishes on polished chromium or nickel was much in evidence. Panelling has now become almost an art, and most of the manufacturers, both large and small, were displaying machines finished with most elaborate panelling.

Coming to exhibits of complete machines, the "Continental" range of Armstrong cycles seemed sound and workmanlike productions. There was a choice of three models in this range: "The Super," "Land's End" and "North Road," all frames in double butted Reynolds "531" tubing throughout; lugs were extremely neat and well feathered. At a more modest price there was the well-known "Moth" range, which retain many of the features of the "Continental" models, including "531" tubing throughout.

Bates Bros. had a new model on display—"The Martinet," retailing at £15 15s. (including P.T.). It was an excellent attempt to supply a good class lightweight at a price within the reach of all. The well-known B.A.R., with all the exclusive Bates' features, including Cantiflex tubing and Diadrent forks, costs £37 2s. 6d. In between these two models were the "Vegrandis" at £29 19s. 6d., the "Volante," for path racing, at £38 14s. 6d., and the "Vendomes" at £32 19s. 6d., all prices including purchase tax.

B.S.A. Surprises

B.S.A. Cycles, as expected, had a few surprises. Three new models were featured—"The Gold Star," "Gold Flash" and "Gold Column"; all the machines were fitted with the new and neat B.S.A. calliper brakes. The new B.S.A. four-speed Derailleur was fitted to the "Gold Flash," and the spindle of the freewheel hub was carried on a row of 5/16in. diameter ball bearings on the driving side. The freewheel itself revolves on two rows of 3/16in. ball bearings, the pawls being of a special type, springless and three in number; a gear with a future, I think. It was good to see the detachable chainwheels with fluted cranks and one noted the new wide-flanged hubs and streamlined wingnuts.

Claud Butler was one of the few makers displaying tandems; these showed much ingenuity in overcoming the shortage of tandem spares. Lugs for these machines have been virtually non-existent since before the war. Another Claud Butler feature was the bi-laminated frame construction, combining the advantages of brazing and welding. The recently introduced C.B. chainwheel set was also on view; the cranks were of steel, fluted, and the chainwheel was of a non-aluminium alloy.

Dawes Cycles had a new model, "The Commando," retailing at £33 6s. (including P.T.), the specification including Williams or Granby alloy chainset, Dunlop alloy rims, Dunlop high-pressure tyres, Blumfield "Durolite" hubs, Brooks B17 saddle, Maes alloy bend on a 2in. steel stem, "G.B." alloy brakes, and Bluemels alloy or celluloid mudguards, built throughout of Reynolds "531." The machine was attractively finished in red or white lustre, with outlined lugs, two-colour box lining. Frame sizes were 22½in. and 23½in., the head and seat tube angles being 73 deg./71 deg. respectively. Tourists will be glad to see the return of the "Efficiency" tourist model, now resplendent in a lustre finish and retailing at £23 6s. 3d

The Bates "Vendomes," a lugless brazed lightweight.

Dayton Frame Jointing

The centre of attraction on the Dayton stand was the "Amalgam" frame jointing process, which has been fully dealt with in the technical Press; it has been tried and proven a distinct success. Production costs are much reduced by this method of frame jointing, as sandblasting, filing and polishing are all eliminated. All the standard range of Daytons was shown with frames made by this method. I particularly liked the ladies' "Classique"; the seat and down tubes for some distance from the bracket shell were split and formed into a double D section. These were welded to the extreme outer edges of the bracket shell, thereby adding rigidity at the point most needed.

The new Hercules coloured cycle.

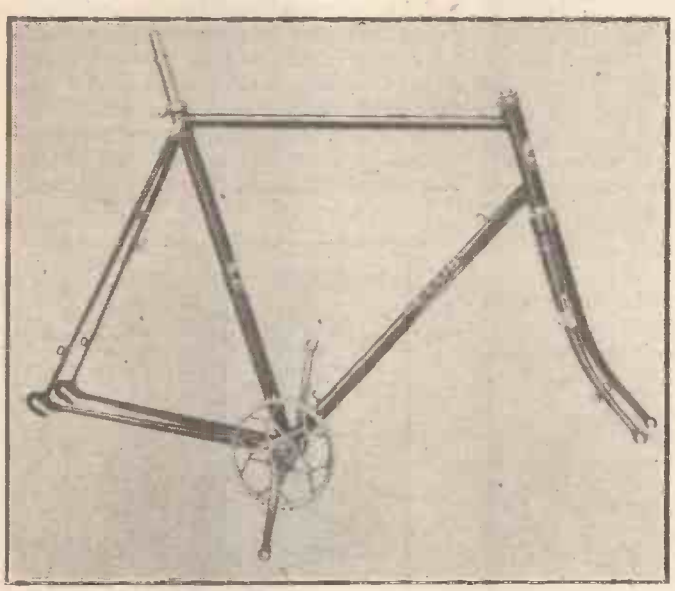
R. O. Harrison, the well-known Peckham lightweight specialist, displayed "The Shortwin," a welded frame in which the down tube is a double D from the head to the bracket. These two tubes are joined to the bracket shell at its extremities instead of in the middle, which is usual practice, and the machine, complete with steel high-pressure rims sells at £26 13s. 6d. retail; the frame alone costs £12 12s. A tandem, "The Rigide," with a number of original features, was also shown, and this sells at £46 5s. in single gear form.

Hercules Display

Colourful in the extreme was the Hercules display. Here nearly every shade was in evidence—pearl blue, princess blue, royal blue, pearl green, olive green, maroon and orange. In the ladies' range the new pearls and princess finishes have been specially designed to match the coming season's new dress shades. A new model, "The Kestrel Super Club," weighed only 23¾lb. in single speed form; the frame size is 22in. Angles are 73 deg. head and 71 deg. seat tubes. The

frame is built of Reynolds "531" tubing, 26in. by 1¼in. high-pressure steel rims are fitted, "Phillite" pedals, alloy handlebars and seat pillar; a pair of "G.B." brakes complete a specification which is very good value at £25 5s. The already popular "Kestrel Club" remains one of the best bargains in bicycles obtainable at £14 5s., including purchase tax.

Hobbs of Barbican were displaying a welded alloy frame, and Mr. Albert Hobbs told me that he has been experimenting with alloy frames for over two years and has marketed this model to test the pulse of the cycling public. He is also a little tired of



The Bates Club frame.

the people who are too Continental minded, and contends that British manufacturers can and do produce better stuff than anything made abroad, a sentiment with which I heartily agreed.

The name of Humber has stood for all that is best in quality bicycles for 80 years, and the present range worthily upholds that tradition. Hub dynamo lighting has proved so popular that the firm are now offering this desirable adjunct in combination with the Sturmey Archer four speed (F W) gear. In the Royal Dyno-luxe range, stainless steel rims combined with spokes of the same material will assist the all-weather rider to keep his machine in new condition.

The old-established firm of James have reintroduced their adult tricycles. Both the sexes are catered for in this range; a differential gear is fitted, and 26in. by 1½in. tyres, a gearcase and mudguards are standard equipment. The "Superlax" range of bicycles was shown for the first time and came in for its share of favourable comment.

The "Silver Ace"

New Hudson displayed a new model, the "Silver Ace G19." Retailing at £20 3s. 11d., it represents sound value; the frame is built of Reynolds "531" tubing in angles of 72 deg. head and 70 deg. seat. Sizes are 21½in. and 22½in., wheels are 26in. by 1¼in. Endrick rims shod with "Sprites," Maes handlebars on a 2in. steel stem, and a Brooks B15 saddle complete a machine that should prove popular with club folk. The newly introduced "Hublite" was fitted on several models and attracted much attention.

The display by Paris Cycles simply bristled with novelties. Mr. Rensch has given his artistic temperament full play, and the result seen in "The Tour de France," "Professional Road Racing" and "Galibier" models came under the critical eyes of the *cognoscenti* much to Mr. Rensch's credit.

Of the dozen models listed for 1949 by Parkes's lightweights, the "Massed Start" attracted me. This new model has cast lugs cut out in clover leaf design; the fork crown is of oval section, with finely tapered blades (optional angles of 73 deg./71 deg. or 72 deg./70 deg. are available); the wheelbase is sensible at 42in. Any combination of finish is obtainable to order. It is retailing at £33 6s. This new model should be much in evidence next season.

Raleigh Display

One can only describe the Raleigh display as superb. The R.R.A. shown in stripped form scaled under 20lb., and popular angles of 73 deg. head and 71 deg. seat are used. The frame is built throughout of Reynolds "531" tubing, and the specification is first class in every respect. The chainwheel set was a beautifully turned out component, and this is a model which I think will be much in evidence in road events. Alternative specifications on the same basic frame provide the ideal touring mount. The well-known Raleigh features of Dyno-Hub lighting, with a battery unit, and built-in front fork lock proved as popular as ever. Some of the Dyno units were shown running in both oil and water to demonstrate their waterproof qualities.

Good news from the Sun stand was that the firm are commencing to manufacture more tandem lugs and bracket interiors. This should help to fill one of the really bad gaps in the trade. All the well-known models have been further refined for 1949 in detail, cut out and specification, and large-flange hubs are standardised on the new "Wasps." This model retails at the attractive price of £27 15s.

The re-introduction of the "Wayfarer" model on the Sunbeam stand will gladden the tourist's heart. It is, of course, fitted with the "Little Oil Bath"; the angles of 68 deg., parallel seat and head tubes ensure comfort and easy steering. A further refinement is the fitting of 3/16in. ball races in the lower head lug; the frame is fully brazed up with tapered chain and seat stays.

Accessories Section

The accessories, tyre and component section at Earls Court attracted quite as much attention as the complete machines. I liked the "Highway" bag on the Bayclif stand; this was a large bag with detachable tool roll.

Dealers will welcome an innovation by Bayliss Wiley. On their Continental hubs the rear flange is wider in diameter than the front, thus permitting a spoke length of 11⅞in. for front and rear in conjunction with 27in. rims.

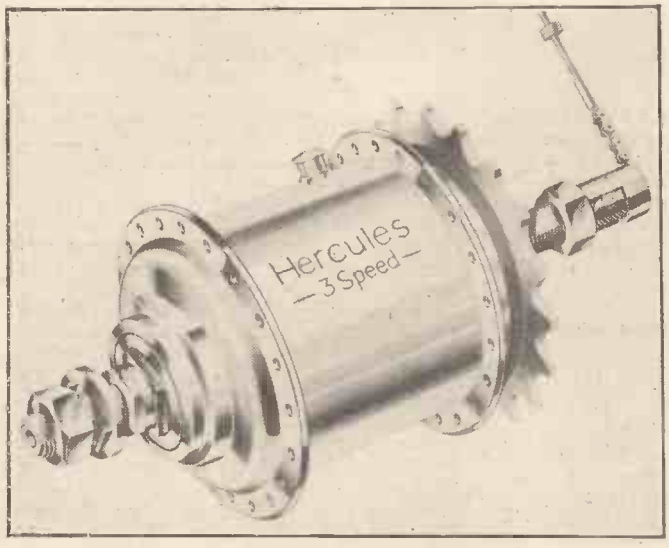
Clubmen will be pleased to see the new telescopic stays fitted on Bluemel mudguards; this enables perfect radius fitting of the guard, and allows for the fitting of either 26in. or 27in. wheels.

J. B. Brooks and Co., the well-known saddle manufacturers, were displaying their new range of saddles, which are based on the already popular champion range. The new B27 weighs 1lb. 4oz., and is similar to the old favourite B17 champion standard. The B37 weighs 1lb. 3oz. and is equivalent to the B17 narrow champion. The B47 is the new sprinter saddle and weighs 1lb. 2 oz. Up to 40 per cent. in weight reduction has been achieved by the use of alloy and stainless steel in the chassis of the saddles. A number of coloured saddles were also shown.

The old-established firm of Chater-Lea made a feature of their stainless steel pedal which won the C.T.C. silver plaque in 1946. In addition their very light cranks came in for much favourable comment; hubs in artistically coloured hiduminium were also displayed.

Constrictors can always be relied upon to produce something new; an entirely new Derailleur was shown in prototype form and will be on the market in the near future; using alloy rollers, it presents a number of interesting points and should prove popular. A new solid section Conloy rim weighing 1lb. 8oz. should be useful to the tourist, and the new "Asp" hollow rim weighing only 14oz. will fill the bill for the racing man; altogether a very interesting display.

The "Phillips" Phantom (Super Club Model).



The Hercules 3-speed hub.

brake lever incorporating a lock. Although the levers were shown fitted to Resilion brakes it should be noted that the levers incorporating the lock can be used with any type of cable brake. The lock itself is of the Yale type and compares favourably with the usual cycle padlock, which can be opened with a piece of wire. The price of the complete lever is 17s. 6d. retail. I think that this was one, if not the best, of the new ideas seen at Earls Court. The weight of the complete lever and lock in alloy is only 3½oz., which is actually ½oz. lighter than the lever only in steel.

New Dunlop Tubulars

The new Dunlop tubulars were the centre of interest for racing men. The tyres used by the competitors from 16 countries during the Olympic Games were shown. The new range of tubulars are based on these, the greatest thickness of rubber being on the centre of the treads. The new numbers of road tyres are: 3, 4, 5, 7, 9 and 10 in four distinct tread patterns; the new grass track tyre is now No. 6. The sewing of all these tyres is now done with real Irish linen, which materially strengthens them at a vital point.

One of the best and busiest stands at Earls Court was that of W. F. Holdsworth. This firm's well-known range of "Allez" Continental accessories in pedals, bells, chainsets, bottles, etc., was prominently displayed. It should be remembered that this firm also manufacture a really first-class line of lightweight cycles, tandems and tricycles. "The Cyclone" de luxe in the solo range, with its extended lugwork and unique fork crown with diamond pattern top plate was creating great interest. A feature of this crown is that it is constructed of mild steel plate which is, of course, immensely stronger than a casting of the same section. Holdsworth's have always believed in building up a large fillet for the joints on their welded frames, and it is the firm's boast that they have not yet had a breakage due to mechanical failure of a joint. A light tricycle with wood sprints and tubulars, and weighing only 27¾lb., was much admired. Finally, their new welded alloy frame came in for its share of favourable comment. In addition to a substantial alloy fillet the head tube is supported by two alloy webbing plates; the crown is a solid block of alloy and very neat in appearance. A director informed me that every trader who called at the stand wanted at least one, so its future is assured.

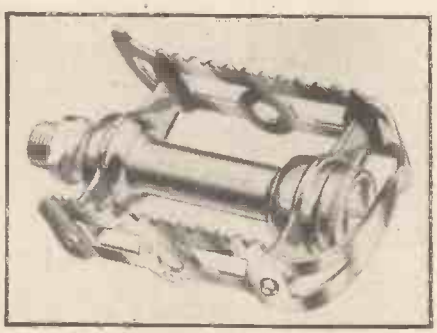
"Overhill" Gears

The Overhill Engineering Co., Ltd., were showing gears of an entirely new type. The self-change two-speed looked a very sound job; the change is effected by back pedalling, no control cable or lever being fitted. The fixed wheel three-speed Derailleur was creating the most interest; the tautness of the lower half of the chain was effected by fitting a ratchet below the chainwheel, which controlled the catch from an auxiliary control in the top tube. In addition, this firm displayed a three- or four-speed freewheel of the splined fitted type; a very enterprising firm indeed.

The Resilion people featured their new

Sturmey Archer

A saving of 4½oz. on the weight of a



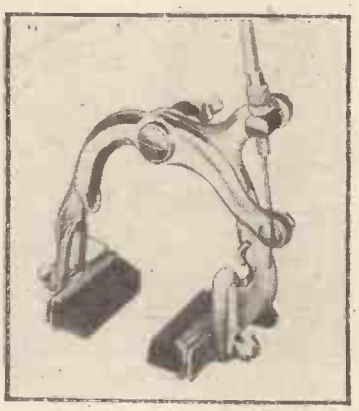
The Phillips "Phillite" pedal.

complete hub is effected by the use of an alloy shell shown by Sturmey Archer. These are featured in the (ASC) 3-speed fixed and (FC) close ratio four-speed models. The enlarged S.A. hubs, electrically-driven to show the working, attracted a good deal of attention.

H. C. Webb & Co. were showing their new eye-bolt fitting cables to their brakes, thus avoiding the possibility of a pulled off nipple. A rat-trap pedal fitted with Allen Key method of attachment was another good feature.

Lightweight Market

Summing up, this was a really good show, and as the figures show was the most successful ever held; no less than 70,000 attended on the Saturday. I think it can be said that the larger manufacturers have entered the lightweight market with a vengeance, and they show themselves *au fait* with all the latest trends. I should have welcomed more Continental models, not because I think they are better, but this would have emphasised the superiority of British products.



The "Phillite" gents. rear brake.

Club Notes

Urmston and District Model Engineering Society

A NEW model engineering society has been formed in Urmston, Lancashire, under the title of "The Urmston and District Model Engineering Society."

Activities will include the formation of an outdoor running track for passenger-hauling steam locomotives, and the Urmston Council look favourably upon allowing the use of a park for the purpose. A track for petrol-driven model racing cars and a pool for model sailing and power boats are also likely to be included.

The annual subscription is 12s. for members, 6s. for juniors (ages 16 to 21) and 3s. for ladies.

Secretary: W. Taylor, 31, Hastings Drive, Flixton, Lancs.

Southport Model and Engineering Club

THIS club's first exhibition held last October was a great success. The total attendance figure was 9,788, which included several hundred school children in organised parties. Apart from private exhibitors a dozen traders had stands.

In spite of very heavy expenses in connection with the hall, etc., a good profit was made, putting the club on a sound financial basis.

Hon Secretary: R. Bryan Petrie, 13, Chambres Road, Southport.

Sutton-in-Ashfield S.M.E.E

AT a meeting held on Thursday, November 18, at Corbett's (Lathes), 83, Outram Street, Sutton-in-Ashfield, there was a full attendance of members, and a questionnaire lecture on lathe work from all aspects, with practical demonstrations on a 5in. Atlas lathe, has been arranged to run concurrently over the next three meetings. Lecturers will be Mr. F. Pearson and Mr. A. Huffen. We can promise all members some interesting demonstrations, as the above persons are experts in this particular sphere.

A visit will be made to the Myford Engineering Works shortly and members interested should give their names in immedately so that the necessary arrangements can be made. Hon. Secretary: J. Corbett, Corbett's (Lathes), Stanton Hill, Mansfield.

The Elements of Mechanics and Mechanisms—15

Hydraulics (Continued)

By F. J. CAMM

CENTRE of Pressure.—This is the point of application of the resultant of the infinite number of parallel forces caused by the pressure of a liquid upon a containing surface at right-angles to it, and

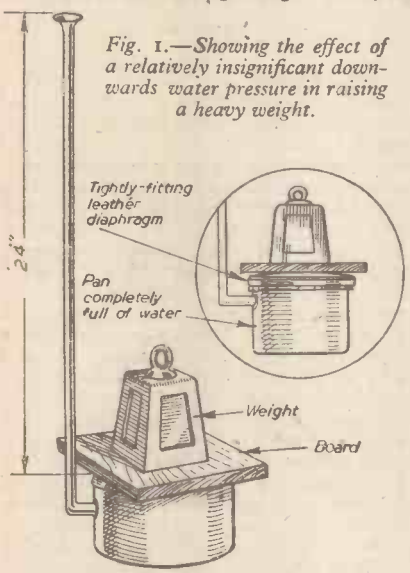


Fig. 1.—Showing the effect of a relatively insignificant downwards water pressure in raising a heavy weight.

increasing from the surface of the liquid downwards.

Shape of Containing Area	*Distance of Centre of Pressure from Surface*
Square or rectangle	½ height
Triangle, apex upwards ..	⅔ height
Triangle, apex downwards ..	½ height
Trapezium : Side a at surface, side b at base and parallel ..	$\frac{a + 3b}{a + 2b} \times \frac{h}{2}$
Circle	⅝ diameter

Note.—When the area considered is below the surface of the liquid the centre of pressure will be nearer the centre of gravity of the area, and at infinite depth will coincide with it.

General expression for depth of centre of pressure of any plane area $= \frac{\Sigma wz\,a\,z}{\Sigma wz\,a} = \frac{\Sigma (z^2\,a)}{\Sigma (z\,a)}$

where a = area of any small portion between horizontal lines and z its depth below the surface. The pressure on the whole area $= w\Sigma (z\,a)$.

Approximately the pressure on an immersed area = area × distance c. g. below surface × wt. cu. ft. liquid.

Buoyancy and flotation—Power of Water.—Buoyancy is the upward resultant pressure of the water against a floating body. The centre of buoyancy is the centre of gravity of the displaced water.

When a solid body floats on a liquid the weight of the liquid displaced is equal to the weight of the body.

When a solid body is immersed in water it displaces an equal bulk and loses weight equal to the weight of water displaced (Archimedes).

Specific gravity = $\frac{\text{weight of body in air}}{\text{weight of equal bulk in water.}}$

or $\frac{\text{weight of body in air}}{\text{weight in air} - \text{weight in water.}}$

Solid cast iron loses 14½ per cent. of its weight when immersed in water.

Some liquids, such as sodium silicate solution (waterglass), treacle, oil, etc., are not easy to pour and they take some time to adapt themselves to the shape of the vessel into which they are poured. Such liquids are said to be *viscous*, a relative term because all liquids to some extent are viscous. A thick liquid is on the borderline between liquid and solid; some of the tar distillates are so thick that they move exceedingly slowly. The question may be asked, therefore, whether the liquid bitumen is a soft solid or a thick liquid. The answer is that if the substance undergoes a spontaneous change of form under the action of gravity only, no matter how slowly, it must be considered as a viscous liquid.

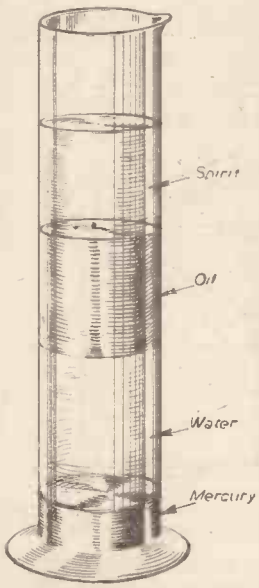


Fig. 2.—Showing the manner in which a four-layer column of non-miscible liquids can be formed, the liquids ranging themselves in order of gravity.

There are, however, a number of liquids that may be said to be borderline cases. Ethyl nitrite, $C_2H_5NO_2$, a constituent of the well-known medicinal "sweet spirit of nitre," is a liquid whose boiling point is 17 deg. C., that is to say, only 2 deg. above the average room temperature (15 deg. C.). Consequently, ethyl nitrite, existing as it does on the fringe, as it were, of the gaseous state, is excessively volatile, is almost completely lacking in all liquid viscosity, and needs to be stored under stringent conditions, in order to retard its ready change-over into gas or vapour.

Other similar liquids are acetaldehyde (B.P. = 20.8 deg. C.), and ethyl chloride (B.P. = 13.5 deg. C.), both of which are in common use in many modern laboratories, and which, on account of their extreme readiness to assume the gaseous condition, have to be maintained under conditions of slight pressure.

The Relative Weights of Liquids

Liquids vary in weight. We know that oil floats on water, and that mercury, which is a heavy liquid, will sink to the bottom when placed in a vessel of water. Now if two or more liquids of different relative weight are poured into a vessel, they will, provided that they are not intermiscible, automatically separate themselves, the lightest liquid rising to the top of the vessel and the heaviest falling to the bottom.

If mercury, paraffin oil and water are shaken up together, upon coming to rest they will at once separate, mercury falling to the bottom, paraffin rising to the top and the water being sandwiched between. If methylated spirit is poured on top of the paraffin oil it will form a fourth layer, provided that it does not come into contact with the water layer, when it will disappear because water and spirit are *miscible*.

If anything is done to lighten the heavier fluid it will rise in the vessel. For example, in the case of a two-layer liquid of water and oil, where the oil will normally float on the surface of the water, if we heat the water it will increase in volume and become lighter. It will consequently rise upwards and pass through the oil layer and float on the surface of the oil until the oil becomes heated, when this in its turn will rise through the water layer.

Liquid Balance

If two liquids of different relative weight are poured into a U-tube or any other type of bent tube so as to meet at the bottom or middle point of the bend, the liquids will balance each other, and the height which each liquid will take up will be in inverse proportion to its relative weight, the heavier liquid being the lower.

Mercury is 13½ times heavier than water, and if we insert mercury into a bent tube with water in the other limb a balance will be struck with 2in. of mercury in one limb and 27in. of water in the other. This relative height will be independent of the curvature of the tube or of their bores, that is to say, one limb could be ½in. bore and the other 2in. bore, but the relative heights of the two will be the same.

When a solid is immersed in a liquid it will do one of three things : sink, float or stay where it is placed. If it is heavier than the liquid it will sink ; if it is lighter it will float ;

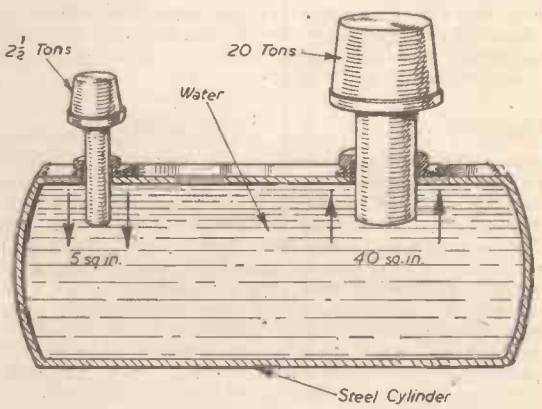


Fig. 3.—Illustrating the principle of the hydraulic press, as explained last month.

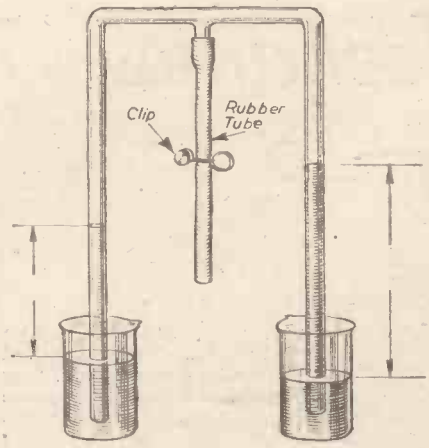


Fig. 4.—Hare's apparatus for comparing the gravities of liquids.

and if it is exactly as heavy as the liquid it will remain in any position in the liquid at which it may be placed.

It is, however, possible to make a lighter object sink in a heavier liquid, and also a heavier body float in a lighter liquid.

To take an example, a vessel has a perfectly flat bottom, and it is filled with a quantity of water. Now press on to the bottom of the vessel a piece of cork having a flat surface. The cork, although lighter than water, will not rise to the surface, provided that no film of water intervenes between the contacting surfaces. The cork is pressed down by the weight of the water on it.

If we place a small piece of lead in a small tube closed at its upper end and held vertically, at a depth of about 12ft. of water the lead will swim in the tube because the water pressure would be pressing the lead upwards with a greater pressure than the lead would be pressing itself downwards.

In general it may be stated that if a solid body which normally sinks in a liquid is plunged into that liquid to a depth as many times greater than its thickness as the solid body is heavier than the liquid, and if it is in that position protected by any means from the pressure of the fluid above it, it will swim, because the pressure on it from below will counterbalance the tendency of the body to sink.

Displacement

The weight of a solid body floating on the surface of a liquid is equal to the weight of the liquid which it displaces. So that it may float at rest and not merely roll round in an *unstable* manner, the centre of gravity of the solid must be in the perpendicular which runs through the centre of gravity of that part of the liquid which has been displaced. This is because the upward pressure of the liquid is in this line, and unless that pressure runs through the centre of gravity of the solid it cannot support the centre, hence the body must turn round and round.

Archimedes' Principle

When a solid is plunged into a liquid the amount of liquid which it displaces is exactly equal to the bulk of the solid. This was discovered by the Greek mathematician Archimedes. It will be obvious from this that by plunging a solid body into a known volume of water contained in a measuring cylinder and noting the upwards rise in the volume of liquid we have a simple means of measuring the bulk or the volume of an irregular shaped body such as a piece of concrete, nugget of gold, etc.

It should also be clear that if a solid is weighed in air and then weighed under water or, for that matter, in any other liquid it will *appear* to lose in weight as much as the weight of an equal bulk of water. This apparent loss is due to the upward pressure of the water.

Specific Gravity

Hence, by weighing bodies in air and then under water we can easily determine their relative weights or their specific gravities. The latter is the ratio of the weight of any given volume of the substance to the weight of the same volume of a *standard substance*. For liquids and solids this standard substance is usually water at a temperature of 0 deg. C. or 15 deg. C., which is ordinary room temperature. In the case of a gas the standard substance is usually dry air or hydrogen.

In order to determine the specific gravity of a liquid, we must know (a) the weight, W, of a given volume, V, of the liquid, and (b) the weight of the same volume of water.

Specific gravity, therefore, is clearly merely a simple ratio between two weights. Thus—

$$\text{Specific gravity} = \frac{W}{V}$$

In all cases of specific gravity determination, accurate temperature conditions must be observed. Usually, in practice, it is sufficient to carry out specific gravity determinations at room temperature.

A simple method of taking specific gravities of liquids is by means of the *specific gravity bottle*. The bottle has a definite capacity, usually of 50 ccs. of liquid. It has a glass stopper drilled with a fine aperture through it. The bottle is filled with the liquid whose

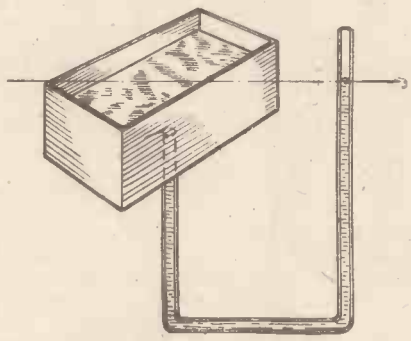


Fig. 5.—Illustrating the balancing of a large mass of water by a much smaller mass.

specific gravity is to be determined and the stopper is inserted, care being taken to avoid all air bubbles. Then the bottle is weighed. This weight we will call W^1. The same bottle is then cleaned out and filled with distilled water. It is again weighed. Let this weight be W^2. Also, let the weight of the bottle alone be W.

Under the above conditions, $W^1 - W$ represents the weight of the liquid whose specific gravity is under determination. $W^2 - W$ equals the weight of the same volume of water. Hence, the specific gravity is given by the expression:

$$\frac{W^1 - W}{W^2 - W}$$

Sprengel Tube

A Sprengel tube (Fig. 7) is sometimes used for determining specific gravity. As will be seen from the diagram, this consists of a U-tube of glass, one end of which is drawn out to form a capillary tube. The tube is filled with the liquid whose specific gravity (S.G. for short) it is desired to determine, merely by dipping the fine nozzle under the liquid and gently sucking the wider end of the tube until the liquid completely fills the tube to the scratch mark. The tube is then wiped and weighed. Next it is emptied and filled with distilled water and again weighed. From these two weights the specific gravity of the liquid may be very accurately determined.

Hare's Apparatus

Another simple method of comparing specific gravities is by means of Hare's Apparatus. As will be seen from the diagram Fig. 4, this consists of an inverted U-tube having a central downwards limb. The opposite tubes each dip into the liquids whose S.G.s are to be compared. On sucking gently at the middle limb while the clip is open, the respective liquids are drawn up into the tubes. The clip is then closed and the heights of the liquids compared. The heights of these liquids (above the levels of the liquids in their reservoirs) are inversely as their respective specific gravities. Thus, if one liquid rose in its tube 100 mm. and the other 90 mm., the ratio of the S.G.s of the liquids would be 0.9 to 1.0.

The Hydrometer

The hydrometer is an instrument which sinks to different depths in liquids of different gravities. They are termed *hydrometers of variable immersion*. They are also known as *lactometers*, *urinometers*, *alcoholmeters*, *areometers*, according to the nature of the liquid whose specific gravity it is desired to estimate.

In principle, the hydrometer comprises a hollow glass or brass tube which is weighted at the bottom (usually with lead shot) and is provided at the top with a long graduated scale upon which specific gravities can be read off directly. The hydrometer is merely placed in the liquid as gently as possible and allowed to come to rest. The scale reading at the portion of its stem which just makes contact with the liquid surface represents the specific gravity of the liquid under test.

It is usual to employ these hydrometers in sets. Thus, one instrument is graduated from 1.000 to 1.050, another from 0.950 to 1.000 (for liquids lighter than water), and so on. This is necessary in view of the fact that a hydrometer giving all possible readings would be a relatively inaccurate instrument.

All these hydrometer sets are usually graduated for temperatures of 15.5 deg. C. (or 60 deg. F.), and in works testing it is, for the sake of reasonable accuracy, essential to see that the liquids under test at least fairly closely approach these prescribed temperatures when the determination is made.

Summary of the Laws of Fluids

Boyle's Law.—The volume of a gas varies inversely as the pressure or the pressure of a gas is proportional to its density. In other words, the pressure on a given mass of gas at

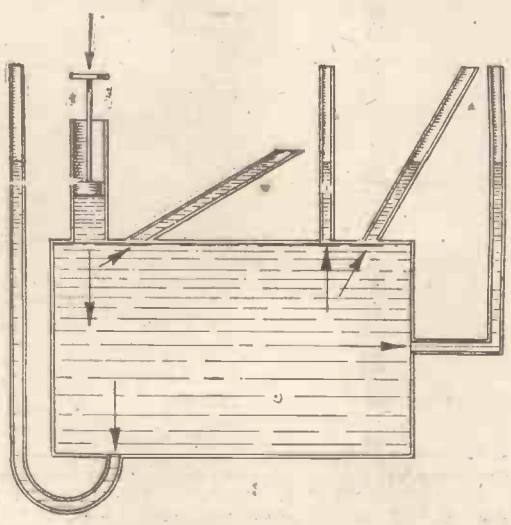


Fig. 6.—Apparatus demonstrating the fact that a liquid transmits an applied pressure in all directions.

constant temperature is inversely proportional to its volume.

It has been found that Boyle's Law is not true in every case. While being nearly accurate for the so-called permanent gases, such as oxygen, hydrogen, etc., it varies for gases capable of condensation to a liquid at ordinary temperatures by the application of pressure; such a gas is carbonic acid. The law is most nearly fulfilled when the temperature of the gas is farthest removed from its point of condensation.

Charles' Law.—All gases expand equally, and the volume varies directly as the absolute temperature.

Boyle's is sometimes called the first law of gases and Charles' the second law.

Dalton.—A gas at any temperature increases in volume for a rise of 1 deg. by a constant fraction of its volume at that temperature.

Gay-Lussac.—The augmentation of volume which a gas receives when the temperature increases 1 deg. is a certain fixed proportion of its initial volume at 0 deg. C.

Under a constant pressure all gases expand uniformly with equal additions of heat, and with a constant volume all gases increase equally in pressure for equal increments of heat.

Avogadro's Law (also attributed to Ampere and Gay-Lussac).—Equal volumes of all substances, when in the gaseous state and under like conditions of pressure and temperature, contain the same number of molecules.

Graham's Law.—The diffusion of gases is inversely as the square root of their densities.

Poisson's Law.—If air is suddenly compressed it rises proportionally in temperature, and if suddenly allowed to expand it falls in temperature.

Henry's Law.—The quantity of a gas taken up by a given quantity of a liquid is proportional to the pressure under which the adsorption takes place.

Combination of Boyle's and Charles' Law.—Relation between volume, pressure, and temperature when changes occur.

P = original pressure in inches of mercury or other unit.

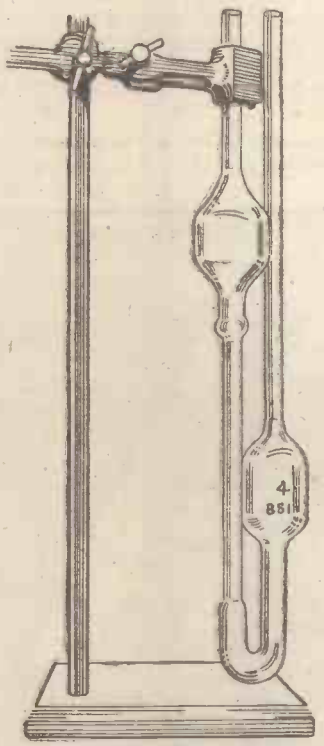


Fig. 10.—A capillary-tube viscosimeter used for "fine" determinations of viscosity in absolute units.

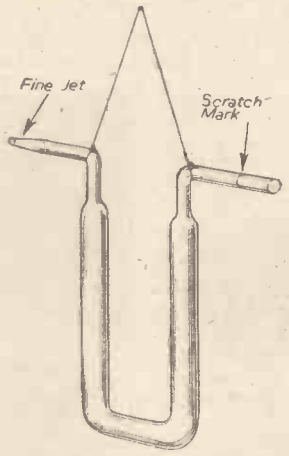


Fig. 7.—A Sprengel tube for the determination of liquid specific gravities.

P′ = new pressure in same units.
V = original volume in cubic inches or other units.
V′ = new volume in same units.
C = original temperature in centigrade units.
C′ = new temperature in same units.

Note.—For Fahrenheit units the constant will be 459.

Boyle's Law: PV = a constant.

$$\frac{P}{V}=\frac{P'}{V'};\ P'=P\frac{V'}{V};\ V'=V\frac{P'}{P}$$

Charles' Law:

$$\frac{V}{273+C}=\frac{V}{273+C'}$$

$$V=V'\frac{273+C'}{273+C}\qquad C'=\frac{V'}{V}(273+C)-273$$

Combined Formulæ:

$$P'=P\frac{V}{V'}\left(\frac{273+C'}{273+C}\right)$$

$$V'=V\frac{P}{P'}\left(\frac{273+C'}{273+C}\right)$$

$$C'=\frac{P'V'(273+C)-273PV}{PV}$$

Diffusion of Gases.—Gases diffuse inversely as the square root of their densities. The atoms of a gas repel each other as the fifth power of the distance between them diminishes.

Summary of Hydraulics.—The quantities discharged from different apertures of similar character vary directly as the areas, and as $\sqrt{}$head.

On account of friction, a small orifice discharges proportionally less water; and of several orifices having the same area that with the smallest perimeter discharges most—hence a circular orifice is most advantageous.

Water issuing from a sharp-edged circular aperture is contracted in area at distance of ½ diameter from orifice, from 1 to

$$\begin{pmatrix}\text{Bossut} & 0.666\\ \text{Venturi} & 0.631\\ \text{Eytelwein} & 0.64\end{pmatrix}$$

This is called "Vena contracta"; the vein contracts more with greater head, therefore discharge is slightly diminished below theoretical discharge due to altitude or head. When the orifice is not sharp-edged, the contraction is partially suppressed and the flow increased. Water flowing from pipe sectional area A into one of less sectional area *a* will have a coefficient of contraction

$$=\sqrt{-(2.618-1.618\tfrac{a^2}{A^2})}=0.618$$

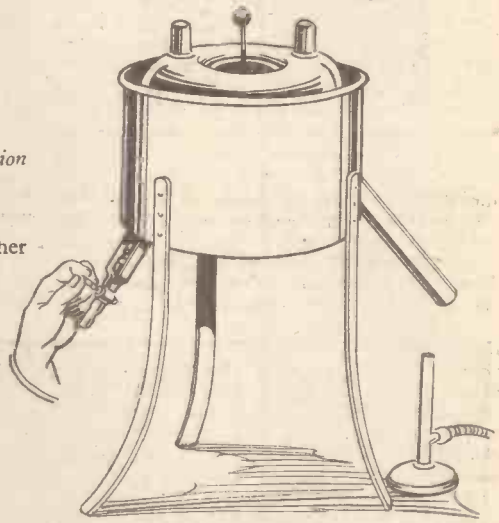


Fig. 9.—An industrial viscosimeter used for the purpose of determining oil viscosities.

when A is infinite, say, a large tank.

The discharge through a tube of diameter length is the same as through a simple orifice of equal diameter. The discharge increases up to a length of four diameters.

The discharges through horizontal conduit pipes are directly as the $\sqrt{}$head and inversely as $\sqrt{}$length. To have perceptible and continuous discharge, head must not be less than $\frac{\text{length}}{1{,}300}$. Vertical bends discharge less water than horizontal, and horizontal bends less than straight pipes.

The discharge through pipes varies approximately as dia.^{2}.

In prismatic vessels twice as much is discharged from the same orifice if the vessel be kept full during the time it would take to empty itself.

Note.—The formula which appeared in the caption under a lever of the first order on page 356 of our August issue is incorrect. Owing to a printer's error it was given as $W=\frac{Fl+Qx}{1}$; it should read $W=\frac{FL+Qx}{l}$.

(To be continued)

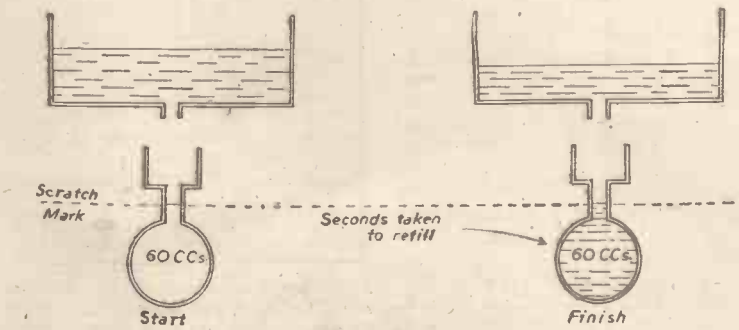


Fig. 8.—Diagram illustrating the principle of the modern industrial viscosimeter. The time taken to discharge a given volume of liquid is noted.

Power Model Aircraft—4

Engines : Building a Monocoque Model : Flying Technique

By C. E. BOWDEN, A.I.Mech.E.

(*Concluded from Page 83, December issue*)

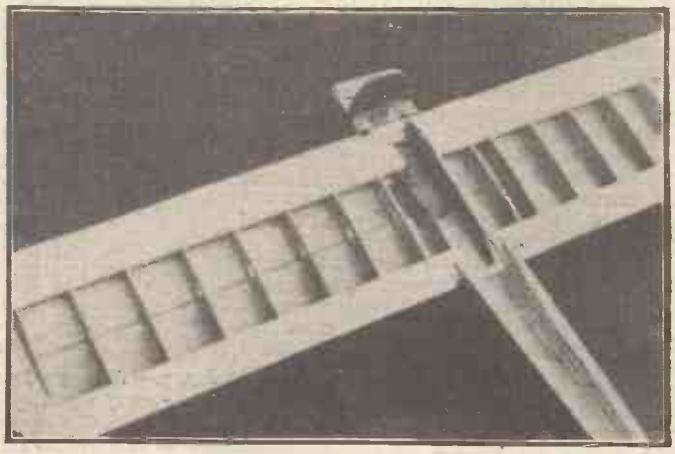


Fig. 28.—The control plate and connecting wires to wing tip and elevator are now fitted internally on this model in order to reduce drag. The pivot bolt is very well reinforced with plastic wood to resist the pull of centrifugal force which may be considerable on a fast model.

THE connecting wire can be 12 s.w.g. spring steel. The triangular plate is 3in. across from wing tip wire to wire, and 2in. deep to where the horn for the main control wire is situated. This can just be seen in the photograph. The two wires to the wing tip should be nearer the front than the rear of the wing. The important thing is that *the C.G. point shall be only just behind the leading edge of the wing.* In other words, balance the model on the finger tips so that the fingers are just behind the leading edge and *not* one-third or one-half the chord from the leading edge as in the case of a free-flight model. A control line model has to be what is termed nose heavy.

I have fitted the control plate on its pivot bolt and *very thoroughly reinforced it with plastic wood and cement* because the control plate and its pivot take the very considerable load of centrifugal force when flying. The two wires can be seen going out to the wing tip. The fuselage wire in this model is run internally to connect up the tail-plane elevator horn. This is to reduce drag as the model in question is of the fast-stunt type. The hollowed-out block balsa can be seen, although this model has also been made up on the planking system in one case. The top half of the fuselage is a similarly hollowed-out block, which is eventually cemented in position. It should be realised that the front of the two control wires is hidden in the photograph by the leading edge sheet covering.

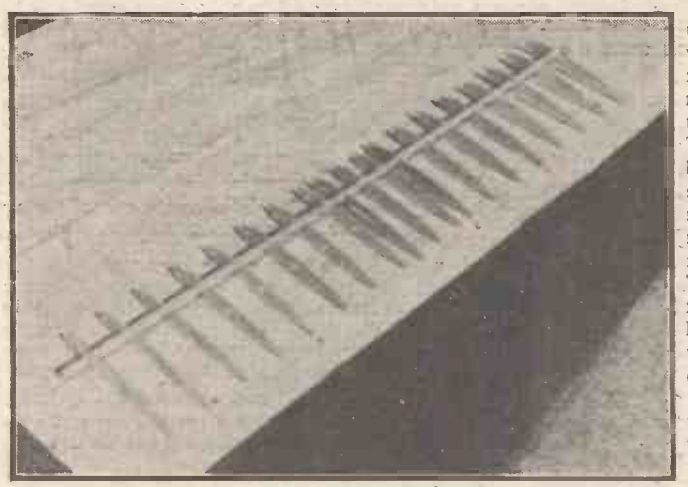


Fig. 25.—The first stage is to cement in the ribs to the bottom spar over the plan, and then add the top spar. A piece of grease-proof paper is interposed to prevent cement damaging the plan.

Rectangular Control-line Wing

As has already been remarked, the rectangular wing with symmetrical stream-lined section is the most popular for stunt models. It suits all types where smooth flying is required. Many modellers will therefore wish to fit this type, although it is not absolutely necessary to keep to the rectangular shape. It is best to visualise building in four stages.

Stage 1.—Fig. 25 shows my "Bowden Stunt Bus" plan laid out on a building board or flat surface with the ⅛in. balsa ribs cemented in position over the plan on to the bottom of the two central 3/16in. spars. The top spar is then added. Note that the control gear goes inside the wing, therefore the ribs with holes to accommodate the wires are located on the left, because being right-handed I fly my models in an anti-clockwise direction. Some people fly clockwise.

Stage 2.—Now we add the two-sheet balsa laminated wing tips. These are made of three layers of ⅛in. sheet laminated with two brass guide tubes cemented in the centre left-hand lamination.

Stage 3.—The leading edge is next covered top and bottom with 1/16in. sheet balsa of the lightweight kind. The trailing edge is similarly treated top and bottom.

Stage 4.—It will be noticed in Fig. 28 that

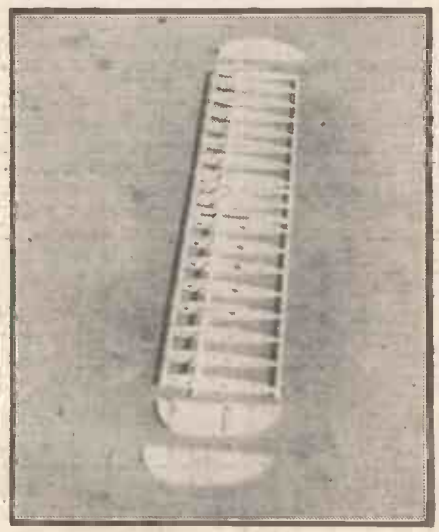


Fig. 26.—The laminated sheet balsa wing tips are fitted with two brass guide tubes cemented in the left lamination. These guide tubes are for the wing control wires. The control lines are attached to the ends of these wires.

Engines for Control-line Models

Diesel engines are very suitable for the smaller type model because they cut out the weight of ignition gear and incidentally save a great deal of trouble.

The Americans have developed the glow-plug motor, which has no ignition batteries or coil when the model is in flight. We in this country are now following suit with an excellent glow-plug made by the famous K.L.G. firm, and several other firms are entering this field. A special fuel is required and a normal petrol engine having a suitable compression ratio. It is most intriguing to have a petrol motor start up with only a battery (and no coil) which is disconnected as soon as the engine gets going. The engine then runs without any aid other than a glowing plug in the cylinder head, which is kept glowing by the heat of gas combustion. Like the diesel, the elimination of electrical gear weight is most advantageous for flying models.

Then there is the spark-ignition type of large engine of 10 c.c., with its huge power,

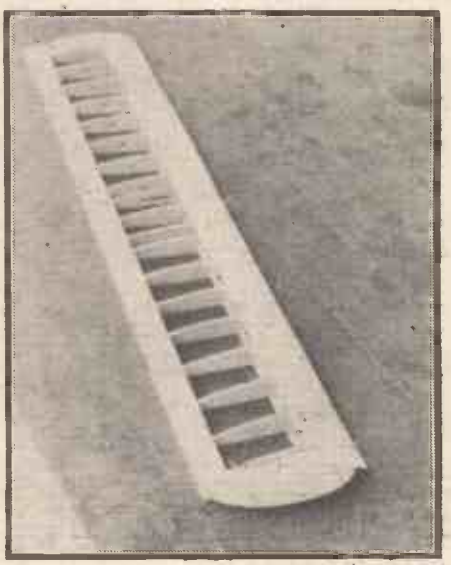


Fig. 27.—The leading edge and trailing edge are covered on top and bottom with sheet balsa.

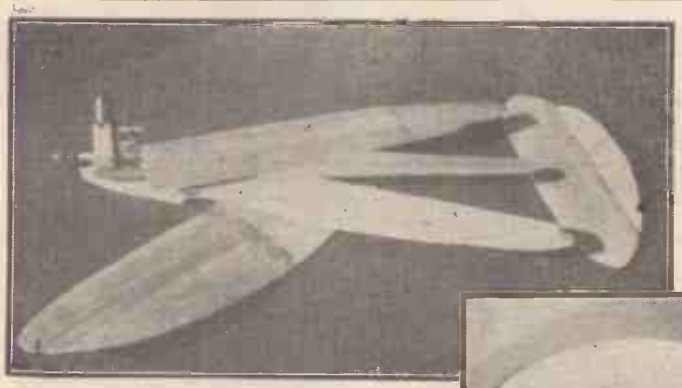


Fig. 29.—Solid block balsa is used for this little model's fuselage. Top and bottom are cemented on to a central crutch.

and with its complication and weight of ignition gear, necessitating a large model. Recently a 10 c.c. hot petrol motor on American lines has been developed in Britain called the "Nordec." This motor will fill a long-felt want for the speed enthusiasts.

Perhaps it is best to recommend the complete novice to power modelling to start off with a model of small to medium size, around 18in. to 24in. wing span, fitted with the simple diesel engine from 1 c.c. to about 2 c.c. I feel sure larger models will follow as experience is gained. I personally keep the lot in my hangar, including jet-motor models.

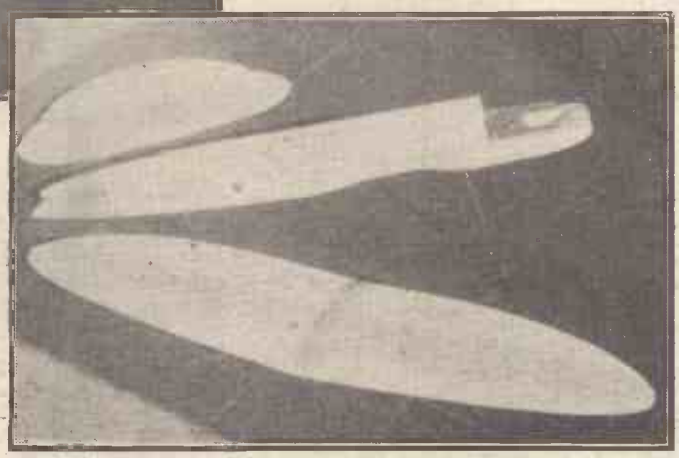


Fig. 30.—The fuselage is glued together and the block balsa is carved to an oval form, being finally sanded smooth.

Building a Monocoque Model

The three illustrations, Figs. 29 to 31, show how very simple the stages of building a small model from two layers of solid balsa block on a central crutch can be. The method comes out rather heavy for large models, in which case the planked or rectangular sheet fuselage is preferable.

The first stage can be seen in Fig. 29. A central crutch of sheet balsa is cut to the plan shape of the fuselage. The bottom and top are then cut out to the outline side elevation of the fuselage from soft block balsa, as seen in the photograph. The tail and wing on this little model of 18in. span were also made of solid sheet balsa.

In Fig. 30 the rounded-off fuselage, carved by a sharp knife and sanded down smooth, can be seen. The wire undercarriage with plastic wood reinforcement to take landing shocks is fitted to the crutch. The final stage is to cement in the wing, tail and fin, and then to thoroughly fillet these components with plastic wood and cement. The whole can then either be covered with silk or fabric and doped with clear glider dope followed by coloured dope, which process makes a very strong job; or the fuselage, etc., can be given a coat of filler direct to the wood, rubbed down and finished with coloured dope.

Flying the Model

I remember when I first decided to try control-line flying I had read several early articles from abroad and at home telling one of the dire consequences of taking the model off in any position of the circle except down wind. Consequently I believed the business must be fraught with much danger to the model if I did not get it off before it came into the up-wind part of the circle. Like many people I therefore set about my first flight with many mental difficulties!

Most of this advice is pure bunk. The real thing that matters is to have the model properly balanced, a bit nose heavy, and with a tendency to turn outwards. Then let it fly itself off and do not over-move the handle until you have got the feel of the thing. Just keep the arm steadily out to start with and the control handle more or less central, with the model flying round *low down*. If the model tries to climb at the beginning, *gently* nose it down, but above all things do not pull on the "stick" wildly. A decently lined-up model will fly itself. When the feel of the thing is obtained you can start putting over the stunt stuff. Remember to keep the engine going at full bore, as a good pull and speed keeps the lines taut and under control. If the lines come in on one because of a violent cross wind or because the right offsets of fin and engine are not given, or because the motor dies, then one must step smartly back to tauten the lines and regain control. Connect up the lines so that a pull back on the top of the control handle causes the elevator to go up and therefore makes the model climb. A pulling back of the bottom of the handle should pull the elevator down and so dive the model.

Choose a calm day to try the first flight, and you can then take off where you like. As you get used to trimming your model and flying it you will not worry about reasonable winds. You will get in the automatic habit of not ballooning the model up in a stalled position up wind. In actual fact, my garden circuit has a nasty funnel or two of wind coming through lanes of trees, and yet I fly in all weathers and always take off for convenience sake *from the same spot* where the trip line is permanently situated. Trim the model as I have previously described and choose a calm day for the first flight. The rest will come with a little practice. Remember, lateral stability is automatically looked after for you, and all you have to do is to keep the speed up and look after longitudinal trim. If you want a bit of extra speed for a manœuvre just lead a little with the wrist in a whipping action. This will speed up the model by added centrifugal force.

Recently the motor cut on my "Stunt Bus" when I was giving a demonstration flight in front of a fair crowd of locals. As the model is very streamlined and slips through the air easily, I "whipped" her around with a slight lead of the wrist for four or five laps before I decided to land. Someone in the crowd said, "Why have a motor at all!" In fact, Jim Walker, the American father of control-lining, has recently introduced a "training ship" without engine that can be stunted in almost any manœuvres. The control lines go through the end of a short fishing-type rod which gives the extra "whipping" action required.

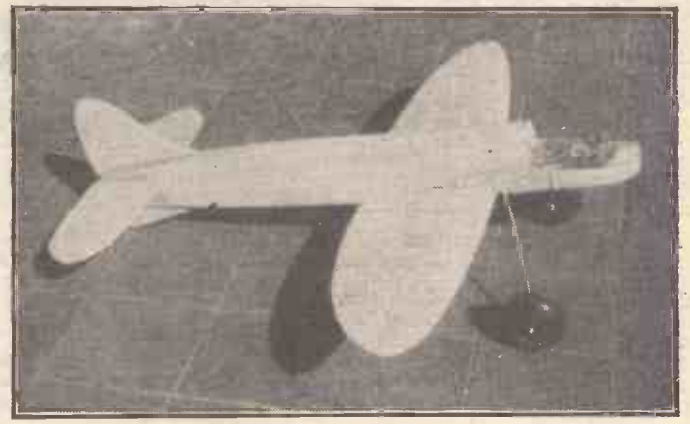


Fig. 31.—The model now has wing, tail and fin cemented in. Fillets of plastic wood strengthen and improve appearance. The fin should be laminated or of three-ply to withstand possible blows from landing turnovers!

In conclusion, it is hoped that many readers of these notes will have become sufficiently interested for them to take part in this fascinating pastime of control-line flying.

New Series

World Air News

New Hawker Jet-fighters : The Nene-Viking : Rocket Motors for Models

By KENNETH W. GATLAND

WHEN the prototype of a new fighter is ready for testing, two to three years have elapsed since the initial design. Many months of exacting flight trials then lie ahead, and it is a time of continuous anxiety.

For the experimental design staff, the aircraft is already a thing of the past. There may be modifications necessary in the light of its trials, but largely the job is off their hands and thoughts turn to the next project. It is left to the production drawing office—in conjunction with the planning and process departments — to "productionise" the machine and get it into service. Sheet-metal parts that were manufactured by hand for the prototype will be blanked out in quantity and certain fittings originally machined from solid bar will be cast. Everything possible will be done to reduce man-hours in the construction.

There will be no contract, however, until the specification has been thoroughly proved in flight, and discrepancy in any branch of the performance will be sufficient to set production back, due to modification and retesting of the prototype, or even to foreclose it altogether. The machine must also come fully up to operational standards, and if it happens to be a naval fighter, these standards include folding wings and facilities for deck-landing and accelerated take-off. The design in this case is far more critical because *range* is all-important, and yet obviously this must not be allowed to impair speed and combat efficiency.

Even more acute are the problems if the machine is jet-powered, for whilst the turbo-jet permits exceptionally high speeds and fast rate of climb, it does so only at the penalty of a high fuel consumption. To bring the range up to that of a modern propeller-driven fighter, such as the Sea Fury, will require more than *double* the fuel load.

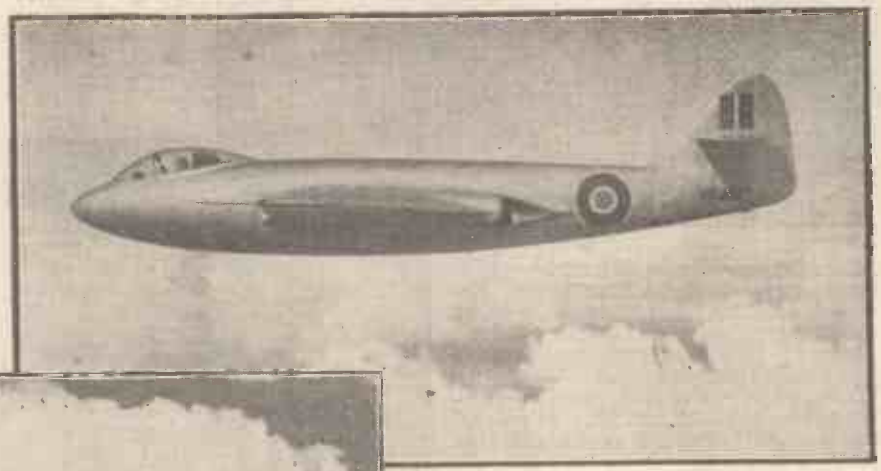


Fig. 2.—Britain's newest naval fighter, the Hawker N7/46. It is probably the fastest and longest ranging of its kind in the world.

The Hawker N.7/46

In the Hawker N.7/46, we have the example of a fully "navalised" aircraft which not only retains the high-speed performance characteristics of contemporary land-based jet-fighters, but offers substantially improved range.

Fig. 1.—A side view of the Hawker N7/46 above the clouds. These fine studies of the N7/46 were taken by Mr. Cyril Peckham, Hawker Siddeley chief photographer.

First photographs to be released (Figs. 1, 2 and 3) indicate that the salient points of the design are a mid-wing, a circular-section fuselage that becomes elliptical towards the tail, and a short divided intake and exhaust system. These features blend together in a way that is pleasing to the eye and highly efficient both aerodynamically and in the internal capacity for fuel and equipment. Air intakes for the Nene II turbo-jet, installed in the fuselage, are situated in the wing roots, and the exhaust is divided to eject from twin nozzles, one on each side of the fuselage in the wing trailing edge. Elimination of the customary tail-pipe has thus afforded valuable space aft of the engine for fuel besides decreasing frictional losses (due to the shorter duct system) and improving the over-all aerodynamic effect. For all that, the leading dimensions are practically the same as the Hawker Sea Fury—the 'N.7" has a span of 36ft. 6in. and a length of 38ft. 4in.—and will

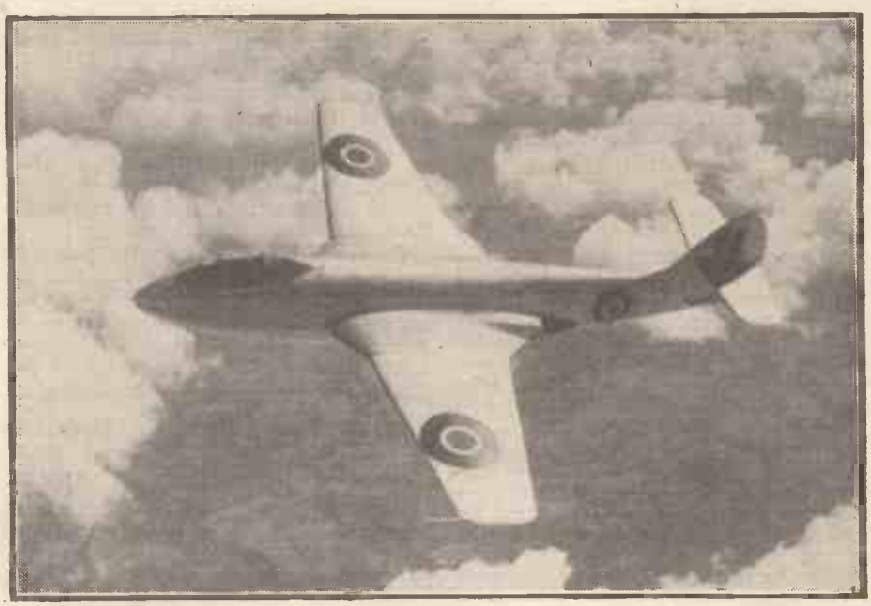


Fig. 3.—Seen against a cloud background, the Hawker N7/46 expresses both grace and speed.

Fig. 4.—The Nene-powered experimental Viking.

therefore not impair present facilities of deck-handling and stowage.

The aircraft has folding wings, is equipped for deck landing and accelerated take-off, and, as in the case of Sea Fury, will have a land-based companion, which omits these features. An experimental version with swept-back wings, known as the E.38/46, is also being produced.

The Nene-Viking

To Britain—and the house of Vickers-Armstrong, in particular—falls the honour of producing the first all-jet airliner, the Nene-Viking (Fig. 4). The machine made its first public appearance on July 25th, and broke all records for the London-Paris run with an average speed of nearly 400 m.p.h. Though the adaptation is purely experimental, much valuable data will be provided to bring forward the day when British jet-liners operate along the air routes. Several turbo-jet and prop-jet commercial aircraft are nearing completion in this country and this is assuredly one field in which we are far in advance of our American friends.

Model Rocket Motor

The solid-fuel rocket propellant for models, referred to in the September issue, is now obtainable in kits manufactured by Wilmot, Mansour and Co., Ltd., of Salisbury Road, Totton, Hants, and developed by I.C.I., from starter cartridges used in aircraft. These guanidine nitrate pellet charges burn slowly and when used in the special combustion chambers provided, give consistent thrust for periods up to 40 to 50 seconds. An aluminium-alloy motor is supplied complete with mounting clip, a quantity of fuel pellets, igniter wicks and accessories, and there are three sizes.

(1) "Jetex 100," weight (complete with charge)	¾oz.
Thrust	1¼oz.
Duration	15 secs.
Motor length	2½in.
(2) "Jetex 200," weight (complete with charge)	1½oz.
Thrust	2oz.
Duration	39 secs.
Motor length	2⅞in.
(3) "Jetex 350" weight (complete with charge)	3½oz.
Thrust	3½oz.
Duration	50 secs.
Motor length	4½in.

The average jet-velocity is 4,000 ft./sec., and should for any reason the combustion pressure exceed a certain maximum, the motors incorporate a safety device which is guarantee against explosion.

In comparison with the ordinary black-powder rocket with its rapid, inconsistent and often dangerous combustion, the "Jetex" pellet is infinitely more effective and safe in use. Its special virtue for the aeromodeller is the length of powered flight that can be obtained from a single charge. Even the smallest pellet, weighing ½oz., will thrust for 15 seconds and with a properly designed model this may easily result in flights of over a minute.

The compact motor units are equally adaptable to flying scale models as to duration. The De Havilland "Vampire" is one example that might usefully be attempted whilst twin-engine designs are certainly not precluded. There is, of course, no torque reaction and so long as both motors are properly ignited before release of the model, troubles should be few.

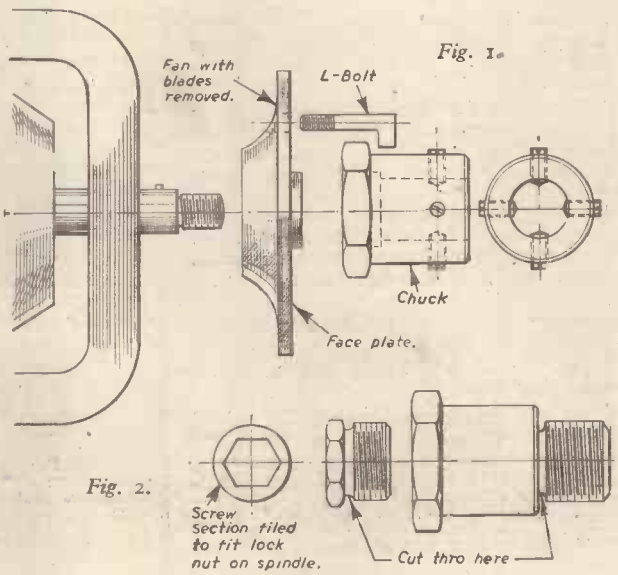
A Simple Chuck

By R. E. BEALL

WISHING to utilise a rotary converter as an electric lathe, I devised a simply made chuck from parts of an old sparking plug. My converter had one extending spindle on which a cooling fan was keyed and secured by a hexagon lock-nut. The cooling fan I reversed and, by the aid of my new power, the blades were removed, the remaining portion being left to make a faceplate, as shown in Fig. 1.

For a chuck I dismantled an old sparking plug, the two parts I required being the body and lock-nut. The latter part I tackled first by filing an hexagonal hole to correspond to the lock-nut on the converter spindle. A good fit was essential to ensure true running of the chuck. Having done this, the motor was used to cut away the hexagon portion, leaving only the treaded part (Fig. 2), which has to just disappear inside the body of the chuck.

With the body now attached, the screwed portion of the main part of the plug was removed back to the flange. The internal diameter was then opened out to 9/16in., and four grub screws fitted with tapered points. Finally, L-section bolts to secure the chuck to the faceplate were fitted in three places, so as to ensure positive drive should it be required to reverse the rotation of the motor. This is done by simply changing over the series leads.



Details of a simple chuck.

"Bristol" Aircraft in Berlin Air Lift

TWO "Bristol" Type 170 aircraft, operated by Silver City Airways, are working in the Berlin air lift, carrying coal and newsprint from Wunsdorf to the German capital and returning with varying loads of freight.

Three complete crews, under Capt. C. I. Hopkins, have been allocated to operate the two aircraft, each crew doing two days' duty followed by a day's rest. Each Type 170 operates three round trips in a day's flying, a typical working day extending from 0730 hours (take-off from Wunsdorf) to 2030 hours (final touch-down at Wunsdorf).

Aircraft leave for Gatow from Wunsdorf in waves every four hours throughout the twenty-four hours, Mr. A. G. Langfield (B.A.C. Technical Sales), stated. The complete cycle for each aircraft is four hours. Waves of aircraft using Gatow come from three fields, and at both Gatow and Wunsdorf the "Bristol" aircraft often wait for twenty minutes or more in a line of aircraft, motors running, awaiting take-off. The route follows a "dog-legged" course over the British zone and down the northern air corridor to Berlin, a distance of 200 miles. Height is maintained at 1,000 feet and the aircraft have to avoid flying directly over Russian airfields. The return route to Wunsdorf is rather shorter, the journey consisting of flying practically due west down the central corridor.

"Bristol" Freighter aircraft are now under consideration, it is understood, for the job of carrying heavy freight such as new machinery, lathes, guillotines and profilers, manufactured in Berlin, to other parts of Germany.

Letters from Readers

"Another Mechanical Paradox"

SIR,—I am obliged to Mr. Good, of Edinburgh, for calling my attention to an error in the drawing illustrating my article "Another Mechanical Paradox" in the October issue of PRACTICAL MECHANICS.

The gears "e" and "f" should be rather smaller than shown in the drawing and should not mesh with one another.

An intermediate gearwheel should then be placed on a stud fixed to the cage at the rear of these "e" and "f" gearwheels.

The intermediate gearwheel, meshing with gears "e" and "f" makes the rotation of the shaft "k" anti-clockwise and thus gives the stated results at the terminal shaft "j."—H. J. ANDREW (Oldham).

Glazing Photo Prints

SIR,—With reference to your answer to the photographic query on glossy prints (page 28 of the October issue of PRACTICAL MECHANICS), I would like to make one or two suggestions.

I invariably glaze my own prints and enlargements, and I am quite sure that the use of chemicals is not required.

I take the print whilst wet from the final wash and place it on a mirror or piece of plate glass that has been polished.

For polishing I use a soft cloth and french chalk or any fine powder (proprietary insecticide powders are just as good!).

The wet print is squeegeed to remove excess water and air bubbles.

By this means I have excellent results from V.P. film prints to whole plate enlargements.—P. D. FOULKES (Manchester).

Re-cellulosing a Car

SIR,—With reference to the reply about cellulosing a car, given by F. Dawber to J. Jacklin, of Grimsby.

I note that he mentions rubbing down broken paintwork to the bare metal and then spraying on one coat of primer.

I am very much afraid that his broken patches would still show through the final coat. Surely the proper method would be to fill up the bare metal parts that he has rubbed down with knife stopper to slightly above the surface of his old coat of cellulose, then rub down to the same level.

Then if he sprays a coat of filler over the whole car and rubs down again before applying colour he will fill up any scratches on the old paintwork and get a much better finish.—J. A. CARR (Horley).

New Coil-spring Wire Motor

SIR,—With reference to the articles on the above motor, I suggest that for the same weight such a motor can be made about twice as powerful by dispensing altogether with the long screw and threaded sleeve and fitting another and larger diameter coil spring outside the existing spring, with a tube "floating" between the two springs; join together, say, the left-ends of the two springs, fit ratchet and handle on right-hand end of the smaller spring, and driving spur wheel on the right-hand end of the larger spring, whose diameter is such that its axial motion is about equal to that of the smaller spring.

I should like to point out, however, that a spring of rectangular section can store more energy per unit weight of spring steel than one of circular section, because the portions of the circular section near the neutral axis are comparatively useless as regards bending.—G. H. CHILD (Hove).

"Elements of Mechanics"

SIR,—Your series "Elements of Mechanics" is one of the most delightful and useful that I have ever read, and I am moved to put forward a rather interesting theory.

It concerns the screwdriver. Is it true or not that a long handle helps leverage? On the face of it the diameter of the handle is always stated to be the sole factor, but I am not so sure that this is true.

A long handle enables the blade to be tilted, without leaving the slot, until a leverage is obtained by using the driver as if it were placed horizontally. Would you consider this proposition to be reasonable?—PROF. A. M. LOW (London, W.).

Lost Power-driven Model Aeroplane

SIR,—Since the middle of September I have been trying to locate the owner of a power-driven model aeroplane which I recovered from the incoming tide on the shores of Morecambe Bay.

It is a good model and hardly damaged, containing a small motor which also appears to be in good condition, and I feel sure the owner would welcome an opportunity to regain possession of his model. I know many modellers read your articles on model aeroplanes, and the design of this craft is similar to models I have seen described and photographed in PRACTICAL MECHANICS.

I have a feeling this model may have come from the Isle of Man, for a display was held there at the time I found this model, but this has no supporting evidence.—J. OCKLESHAW (Jnr.), (Holly Bank, 25, Tarbock Road, Huyton, nr. Liverpool).

Columbium (Niobium) Metal

SIR,—We should like to refer to the reply given to an inquirer printed in your "Queries" column on page 61 of the November issue of PRACTICAL MECHANICS. In reply to your correspondent, it is stated that niobium metal was not available in this country. We hasten to correct this impression as this company is able to give immediate delivery from stock of columbium (niobium) metal in powder form and also the pure columbium (niobium) oxide. We are enclosing a booklet showing the rarer metals and chemicals in the supply of which we specialise, and trust that you will find this booklet useful for reference purposes. We are specialists in dealing with all the compounds of the rarer metals, and we shall be happy to give you, or any of your inquirers, any further information on this subject.—NEW METALS & CHEMICALS, LTD. (16, Northumberland Avenue, London, W.C.2.).

Hot-air Engines

SIR,—I am glad to know that your readers are interested in hot-air engines, for I am convinced that the hot-air engine in its latest form will replace the spark ignition internal combustion engine. It is more efficient, simpler, silent, and can burn any fuel. When conventional engines fail it is generally ignition, carburation, or valves that are faulty. Ignition on the hot-air engine can be got with a match. Carburation is no problem since combustion is outside the engine, not in it. Finally, there are no valves to burn out.

The engine uses the well-known principle of compressing air in a cold cylinder and allowing it to expand in a hot one, thus releasing a balance of mechanical energy. In the latest development all the knowledge of heat transfer gained in the last generation has been applied so that the maximum heat transfer to, or from, the working fluid is done in the shortest possible time. This makes a small high-speed engine a possibility. A further saving of fuel is obtained by a regenerator, which stores heat abstracted from the working fluid on its way from the hot cylinder to the cold, and gives it up again on the reverse stroke.

A theoretical account of the engine is given in "Phillips Technical Review," Vol. 8, No. 5, May, 1946, in a paper by Rinia entitled "Air Engines." I understand that some motor manufacturers in this country are interested, but according to the *Daily Graphic* recently, the Ford company have a model on road test at Dearborn, U.S.A.—C. H. BUCK, Birmingham.

Books Received

Toys You Can Make of Wood. By Lawry Turpin. Published by Sir Isaac Pitman and Sons, Ltd., 152 pages. Price 7s. 6d. net.

THIS useful and instructive book contains many easy to follow designs for making a variety of toys including dolls' furniture, tanks, trains, boats, games, and many other playthings for the youngsters. Odd scraps of wood are the chief materials used, and the toys can be made with the minimum of tools. To help the constructor there are numerous diagrams and half-tone illustrations.

Johnson "Wellcome" Photographic Year Book, 1949. Published by Johnson and Sons, Hendon. Price 4s., plus 1s. purchase tax.

ALL the familiar features of this valued pocket diary have been retained. The diary itself, the pages for recording exposure data, and the "Wellcome" Exposure Calculator with the accompanying pages giving the hour-by-hour light variations for every month in the year are, of course, included. There is a new section in which are described some of the popular Johnson photographic chemical preparations and equipment, with notes on their characteristics.

Jewellery Repairing. By W. A. Jackson. Published by Heywood and Coy., Ltd., 142 pages. Price 17s. 6d. net.

THE author of this book is a craftsman who has spent a lifetime on jewellery repair work. The book covers the processes of soldering, casting, gilding, plating, cleaning and polishing and, in addition, it includes practical information on the repair of many types of jewellery such as brooches, rings and necklaces. A feature of the book is the excellent line and half-tone illustrations.

THE WORLD OF MODELS

Harrow and Wembley Models Exhibition : Display of Canal and River Craft Models

By "MOTILUS"

THE Midland town of Northampton had a distinguished visitor last autumn in the person of the Rt. Hon. Sir Basil Brooke, Bart., C.B.E., M.C., D.L., M.P., Prime Minister of Northern Ireland. During his short stay, Sir Basil took the opportunity of seeing something of the various industries for which Northampton is famous ; he included in his tour a tannery, shoe factory, the Northampton branch of British Timken roller-bearing works, and also the craft model works of Bassett-Lowke, Ltd., While at this last port of call, Sir Basil was fortunate in being able to see a huge scale model of the famous Cunard White Star liner, *Queen Elizabeth*, nearing completion. This model was being built to the order of the builders of the ship, Messrs. John Brown and Co., of Clydebank, and to a scale of 3/16in. to 1ft., or 1/64th actual size. It was a full-hull model, over 17ft. long and complete with all external details. Sir Basil was fascinated with the work of the craftsmen concerned and was very pleased to be presented (by Mr. W. J. Bassett-Lowke) with a miniature, waterline model of the *Queen Elizabeth* as a souvenir of his visit (Fig. 1). A still larger model of the same ship is now in course of construction for the Cunard White Star offices in New York, U.S.A., where it will proudly fill a place as the largest model of the largest ship in the world.

Fig. 1.—Sir Basil Brooke, Prime Minister of Northern Ireland, on his visit to see the large-scale model of the "Queen Elizabeth," nearing completion.

Model Display at Wembley

The Harrow and Wembley Society of Model Engineers is a very active body, with nearly a hundred members. Their exhibition at Wesley Hall, Wembley, contained many high standard exhibits, which have now come to be expected from this accomplished society. Such an exhibition is usually regarded as a stimulus for membership, and at Wembley many potential new members were contacted and it is hoped that as a result membership will attain and surpass the hundred mark.

There was a large variety of exhibits, with working models well to the fore. Altogether, there were some hundred and twenty models, divided into six sections : locomotives, petrol engines, general, marine, miniature railways and handicrafts. Among them were several loan models, and the Kodak Society of Experimental Engineers and Craftsmen, who always keep in close touch with the Harrow and Wembley Society, had a special display devoted to work of their members.

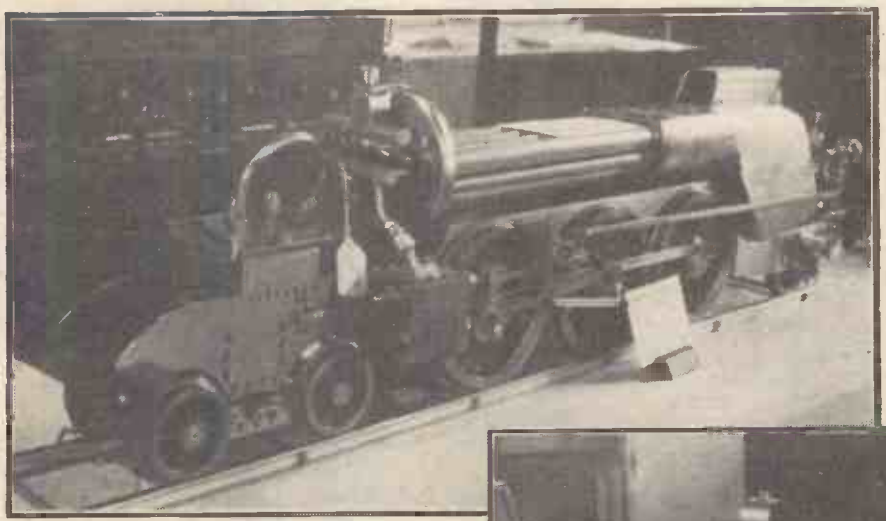


Fig. 2 (Above).—An excellent model at the Harrow and Wembley Exhibition : an L.N.E.R. 3½in. gauge "Pacific" locomotive, unfinished. This was awarded a silver medal in the Locomotive Section.

Fig. 3 (Right).—Mr. S. A. Walter's 1in. to 1ft. scale model fire engine and escape, which won the Open and Challenge cups in the General Section.

Photos by C. R. L. Coles.

A Fine Model "Pacific" Loco.

The number of working models seemed unusually high for an exhibition of this kind. Locomotive models, of course, are included in this category, and in this section an outstanding entry was Mr. F. Cottam's now well-known 3½in. gauge "King" class Great Western locomotive (Fig. 2). Readers

Fig. 4.—Models of various types of barges in use on British canals.

will remember that Mr. Cottam won a silver medal and also the "Curwen" Cup for this model at the 1948 Model Engineer Exhibition, and he won further well-deserved awards at the Wembley exhibition, gaining the Open Cup and the Challenge Cup in the Locomotive Section. Another attraction in this section was Mr. W. Herridge's 5in. gauge locomotive which was working under steam and jacked up to enable onlookers to examine interior details. Several other models were kept running under compressed air.

An out-of-the-ordinary model in the general section was Mr. S. A. Walter's 1in. scale extending Bayley fire engine (Fig. 3), for which he was awarded the Open Cup and Challenge Cup for the section: a just reward for an outstanding model.

A novel change from the usual "precision" models was afforded by two fine toys made by Mr. C. R. Fox (exhibition manager). One of these was a road roller motored by clockwork, and the other an automatic sand tipper which conveyed sand tidily down a sharp ramp. Petrol engines were well represented, of varying sizes and capacities, the Open Cup being given to Mr. M. C. Payne, of the Edgware Society of Model and Experimental Engineers, for his 15 cc. petrol engine. A high standard of efficiency and good workmanship seems to have been attained in this section.

In the marine section, honours went to the Kodak Society, an Open Cup and silver medal being won by Mr. T. W. Karran for models of a naval cutter and naval schooner. As Mr. Karran is descended from a line of sea captains, he is no doubt able to add that indefinable yet so essential "atmosphere" to his craftsmanship.

The Harrow Model Railway Society contributed some interesting exhibits in the miniature railway section, with some good examples of precision work.

An unusual award given by the Harrow and Wembley Society is the "Walter" Cup, which is offered for the work of a non-prizewinner on any previous occasion. This time the cup went to Mr. L. J. Lawrance, for his 3½in. gauge 0-4-0 tank locomotive. I am also indebted to Mr. Lawrance for some comprehensive notes on the prize-winners, etc., at this successful exhibition.

A Unique Exhibition

During the past twelve months or so, a unique exhibition has been touring the country, connected with our canals and waterways. Opening in London in October, 1947, and sponsored by the Inland Waterways Association, the exhibition moved to many provincial towns and cities. It is designed to represent life on our canals and rivers to-day, and contains a large collection of photographs and paintings as well as maps both ancient and modern. There are specimens of boat furniture, utensils and gear, painted in the traditional style with its bold designs and bright colours, so beloved by all the boatmen; also examples of their elaborately decorated crockery and intricate crochetwork. Included in the furniture exhibits is an ancient after cabin stove, lent by Mr. F. Nurser, of Braunston; it is the type of stove used in the boats until replaced by the modern range. Among the accoutrements of this tall, narrow, heating device are a brass poker, "horse" and ash box and also a pair of brass plates, one larger than the other; the larger one was used to draw up the fire, while the smaller was used for "keeping the fire in."

Several models are included in the exhibition, showing various types of canal and river craft (Fig. 4). Some have been made in the dockyards of boat companies and others fashioned by boatmen themselves. One ancient wooden model represents a Severn tug of about 1840 and was carved by a Mr. Thomas Drinkwater, who used to ply his barge between Bristol and Bewdley; he had made the model during enforced idleness, awaiting cargo.

In addition to the boat models, there is also an excellent example of a perspective model, representing Cosgrove Lock on the Grand

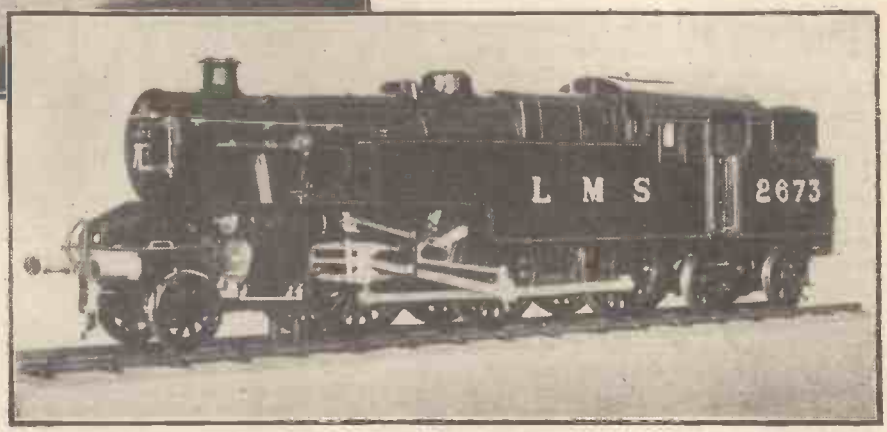


Fig. 5.—An excellent glass-case display model of a 2-6-4 class 4P tank locomotive, operating on the London and Midland Region of British Railways. Scale: ½in. to 1ft.

Fig. 6.—Skilled Modelmakers in a Northampton factory assembling Trix oo gauge locomotives for model railways. These are all American type models being specially made for export to the U.S.A.

Photo by courtesy of the Northamptonshire Evening Telegraph.

Junction Canal (now the Grand Union Canal). Perspective modelling is an art as well as a craft, and requires much skill, patience and good judgment; some fine specimens are to be found nowadays in the South Kensington Science Museum. The model of Cosgrove Lock was built by the late Mr. J. Ivester Lloyd and lent to the exhibition by Lt.-Cdr. J. Ivester Lloyd, D.S.C., R.N.V.R.

The whole exhibition achieves its purpose very well: that is, to give an insight into the life around our waterways, which have been so sadly neglected as a means of transport and which have, in many cases, been allowed to become dilapidated and unsafe for water traffic. Properly maintained, they could be used to relieve road and rail traffic for goods that are not urgently required and which could be carried by this slow but cheap method of transport.

Much spadework is being done towards this end by the Inland Waterways Association, which is also doing all it can to inform the general public of the possibilities of this form of transport, and to endeavour to have the waterways restored for river and canal cruising at holiday-times. The British canals are a very important asset to our transport system. Thirty years ago there were nearly five thousand miles of waterways in Britain, but to-day there are about half that number of miles navigable, although water transport is still responsible for 12½ million tons of goods in a year.

A Royal Commission was appointed in 1906 to consider the future of our waterways, and the Commission recommended that we should follow the example of France and Germany and rescue our canals from disuse and decay. The scheme included joining up the Rivers Humber, Mersey, Severn and Thames, and provided for new canals being built to complete this system. Nothing was done then, but with a view to the post-war reconstruction of the country, the late Mr. Frank Pick prepared a report on the present condition of canals and the improvement necessary to enable them again to occupy a position in the transport facilities of this country. The report is now being considered by the Rivers and Canals Section of the Ministry of Transport, and there is every hope that our waterways may come into their own again, both as a commercial asset to relieve road and rail traffic, and as a means of recreation.

Show-case Model Locomotives

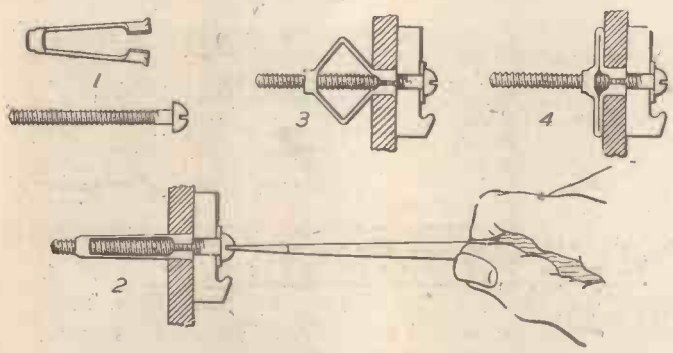
Before the advent of nationalisation of the railways in this country, Messrs. Bassett-Lowke, Ltd. were engaged in making some scale-model locomotives for the L.M.S. Railway Co., now the London & Midland Region of British Railways. The series is being continued, as planned, and will represent some of the best-known locomotives used on this section of the railway. They include the re-built "Royal Scot," with taper boiler; the latest "Pacific" type, and several goods and tank locomotives. All the models are to a uniform scale of ½in. to 1ft. 2½in. gauge, and they include all external detail, being finished in the style of the L.M.S. Railway as it was immediately prior to nationalisation. Being specially made for display purposes at railway stations, exhibitions, etc., they are all working models and are operated by electrical mechanism installed in the base of the glass showcase. I am sure these models will prove a great attraction to young and old, as models of this kind always have done when on display. Our illustration, Fig. 5, shows one of the model tank locomotives before insertion in its showcase.

I feel sure that all lovers of table railways are wondering when there will be sufficient supplies of Trix and Dublo trains on the market to satisfy their ever-increasing urgent requirements, either to install new railways or to add to existing pre-war layouts. I am afraid that from the information I have received the drive for export is still an important priority for earning dollars. The illustration, Fig. 6, shows some of the American type Trix locomotives being assembled "for export only"!

Trade Notes

Masonite Rawl Anchor

THIS new device, for fixing surface fitments to Masonite panelling, fibre boards, sheet metal, plastic boards, etc., is marketed by Stedall and Company, Ltd., Charles Street, Manchester. Operating on the bolt and nut principle it is adaptable to any material ½in. or less in thickness, in which ordinary screws will not hold, and where the back of the material is not accessible. The accompanying sketches show how the anchor device is fitted: The anchor and screw (1) are pushed through a pre-drilled hole in the board or panel (2). By the use of a collapsing tool, or a screwdriver, the anchor is then drawn inwards to form a wing nut (3 and 4) which becomes permanently fitted to the board.



Method of fitting a Masonite Rawl Anchor

Masonite Rawl Anchors are obtainable in London from Farmer, Stedall and Company, 147, St. John Street, E.C.1.

Progress of Scales and Slide Rules

REMARKABLE improvements in the dimensional stability of scales and slide rules are foreshadowed by the results of tests carried out at the National Physical Laboratory on scales produced from bakelite laminated, compared with examples made from traditional materials such as boxwood and mahogany. A series of scales and slide rules using bakelite laminated is now in production by Blundell Rules, Ltd., of Luton, and one of the standard 12in. scales was submitted to the National Physical Laboratory for comparative test to determine the dimensional change when subjected to extreme conditions of humidity.

The tests extended over a period of three weeks, and in addition to the Blundell scale, good straight grain specimens of new boxwood, old boxwood and a boxwood-ivorine scale were included. For one week the scales were subjected to an atmosphere of 95 per cent. humidity, being then immediately transferred to an atmosphere of 25 per cent. humidity for twelve days, returning to the original 95 per cent. humidity for one day. Dimensional changes on each type of scale were recorded daily, and the results summarised by totalling the range of variation. Disparity in the resulting figures was remarkable in that the range of variation shown by the bakelite laminated scale was only 0.003 inch, the comparative results for the remaining test specimens being new boxwood 0.017 inch, old boxwood 0.014 inch and boxwood-ivorine 0.033 inch. The summing up of the National Physical Laboratory test on this points out that it will readily be seen that the Blundell scale is considerably superior, particularly as the small changes which occurred in it took place in the course of a day or two.

On the grounds of stability, which may reasonably be considered as the outstanding requirement for scales and measuring devices, bakelite laminated has been established by an independent authority of the standing of the National Physical Laboratory as superior to natural materials. The other factors to be considered are its all-round strength and durability. On these counts, too, the laminated plastics material is superior. It has a specific tensile strength comparable with steel, a high cross-breaking strength, and is non-brittle. More important still, it is consistent in its properties and does not require ageing to achieve stability. Being impervious to rot, attacks of insects and corrosion, the durability of the rule is indefinite.

In the production of Blundell scales and slide rules many interesting design features may be noted. The graduations appear on a pure white ground which is itself based on synthetic resin permanently fused to the bakelite laminated blank, providing a dense, hard surface which is resistant to knocks, grease and water.

In the slide rules a neat tensioning device has been incorporated. This patented feature allows for the tension to be adjusted by means of two springs which are readily accessible. In the 6in. slide rule, the over-all dimensions of which are too small to allow for the incorporation of the device, small brass studs are fitted where necessary to ensure correct grip between body and slide.

QUERIES and ENQUIRIES

A stamped addressed envelope, three penny stamps, and the query coupon from the current issue, which appears on page 32 (THE CYCLIST), must be enclosed with every letter containing a query. Every query and drawing which is sent must bear the name and address of the reader. Send your queries to the Editor, PRACTICAL MECHANICS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

Bleaching Ivory

COULD you please inform me how I can re-whiten ivory that has yellowed with age? I am making a miniature piano and would like to use ivory for the keyboard.

If there is no way of whitening ivory, such as by bleaching, could you suggest a substitute for the keyboard?—J. E. Veale (Newquay).

BY far the best way of bleaching ivory is to place the pieces on the grass where they will get plenty of brilliant sunshine together with the night dews. This will bring them within two or three weeks to a very good whiteness.

Alternatively, make up a mixture of strong ammonia, 1 part; hydrogen peroxide, 2 parts. Brush this over the ivory surface whilst the ivory is exposed to sunlight. Indeed, this treatment may be very well combined with the slower "grass" method described above, particularly when the ivory is very much yellowed.

A much quicker method is to lay over the ivory material a paste of chloride of lime and water. After this has almost dried, sprinkle on the surface a solution of acetic acid, 1 part; water, 3 parts. Again, this method is more effective if conducted in full sunlight. The method can be repeated over and over again, but it is likely to roughen the ivory surface.

There is no real substitute for good ivory. White celluloid may be used, and would, doubtless, be effective in the case of a miniature piano such as you describe. There are also white plastic materials which have been used by pianoforte key manufacturers. You might be able to obtain supplies of such materials from the following manufacturers of pianoforte keys:

Messrs. Thomas Paine & Sons, Ltd., 32 and 41, Camden Mews, Camden Square, London, N.W.1; Messrs. Pinder & Harris, Ltd., 5 and 6, Workshops, Grosvenor Rise East, Walthamstow, London, E.17; Messrs. W. & C. Stevenson, Ltd., Lawrence Road, South Tottenham, London, N.15.

Cleaning Old Brass Band Instruments

COULD you please supply me with a formula for cleaning old brass band instruments which have been in storage for a considerable time, and are very much discoloured by a dark brown film?—L. Churchill (Stepney).

BRASS band instruments are always lacquered for the protecion of the brasswork, and, unfortunately, any cleaning agent would remove the lacquer so that the instruments would have to be re-lacquered, either professionally or by yourself.

We take it that you have tried ordinary means of removing the dirt from the instruments, means such as soap and water washing. It would appear from what you say that the lacquer itself has discoloured. This being the case, it will have to be removed if the instruments are to be brightened up.

The best method of going about the job is to wipe the instruments over with a cloth charged with a 50 : 50 mixture of strong ammonia and water. This may be found very effective. Alternatively, you can use a solution made by dissolving 5 parts of caustic soda in 95 parts of water. Either (or both) of these liquids will remove most of the dirt and discoloration. The treatment should be followed up by a rubbing down with methylated spirit, and finally by rubbing over with a soft cloth charged with putty powder or whiting damped with water to put a final polish on the brasswork. The brass will then want re-lacquering. If you wish to do this for yourself, you can use a clear cellulose lacquer obtained from a paint shop. Put it on very thinly, and have the instrument slightly warmed before doing so.

Remember, of course, that every trace of the caustic soda or ammonia solution must be got rid of before proceeding any further. This is best done by immersing the whole instrument in running water for about an hour.

Green Patina on Copper Articles

CAN you give me a chemical formula which will guarantee an antique green patina on articles formed from pure copper sheet? I have in mind the verdigris effect produced by the surface corrosion seen on copper flashings exposed to the atmosphere over a period.

I might mention that I have tried many recipes, but none has been even a partial success.—M. C. Connor (Killiney Village, Eire).

METALLIC copper sprayed with dilute acetic acid and suspended in an atmosphere of moist carbon dioxide will patinise very readily, the colour of the patina being a rather full green.

A bluer green patina is produced in the following manner:

Ammonium acetate ..	30	parts (by weight)
Common salt ..	10	,, ,,
Magnesium chloride ..	3	,, ,,
Cream of tartar ..	10	,, ,,
Copper acetate ..	10	,, ,,
Dilute acetic acid (1 in 3)	100	,, ,,

The above solution is mopped on to the copper sheet and the latter is then suspended for between 24 and 40 hours. The surface will become covered with varying tints. It should then be lightly brushed with a fine wire brush. When the desired shade of coating has been obtained it should be painted over lightly with a solution of paraffin wax in white spirit.

To a large extent, the chemical patinising of copper is unreliable. One can never obtain any pre-determined shade, which, we think, forms the underlying reason for the ill-success of so many formulæ given for this purpose.

Flash Powder : Touch Papers

(1) I shall be grateful if you could inform me of the composition of professional flash powder for use in flashlight photography. The powder I have been buying does not seem intensive enough for photographing large groups, and appears to be very temperamental when touching off. (2) Also, could you tell me how to make the touch or flash paper?—J. Seal (Birmingham).

(1) FLASH powder has become obsolete for a large amount of flashlight photography; its place has been taken by the "safe" flash bulbs in which thin aluminium foil is ignited in a low-pressure atmosphere of oxygen, a small battery being sufficient to achieve this end. Intense light without smoke is thus obtained.

However, since you require an actual powder, here is a good formula:

Potassium nitrate ..	12	parts (by weight)
Potassium perchlorate	12	,, ,,
Magnesium powder ..	16	,, ,,

Grind and sieve each ingredient separately to the finest powder. Then mix carefully, using a feather to stir the mixture. All the ingredients must be perfectly dry and the mixed flash powder must be stored in a dry bottle having a well-fitting stopper.

All flash powders are somewhat temperamental in performance. This is mainly because they absorb moisture, which has a potent depressing effect on the rapidity of their combustion.

(2) You can make a slow touch paper by dissolving two parts of potassium nitrate and half part of potassium perchlorate in four parts of water and by soaking thin tissue paper in this solution. The solution will keep indefinitely and may be used again and again. The paper is dried without heat, and then touched off with a match.

Readers are asked to note that we have discontinued our electrical query service. Replies that appear in these pages from time to time are old ones, and are published as being of general interest. Will readers requiring information on other subjects please be as brief as possible with their enquiries.

To make a quick touch paper, soak thin paper or cotton wool for from five to 10 minutes (not more) in the following acid mixture:

Nitric acid, conc.	40 c.c.
Sulphuric acid, conc. ..	50 c.c.

The acid mixture should be at a temperature of 65 deg. C. to 70 deg. C. (149 deg. F. to 158 deg. F.). Wash the treated paper for an hour in running water in order to get rid of every trace of acid. Then dry slowly. Cotton wool may be used instead of paper, if desired. It is most essential to give the material a thorough washing after the acid treatment, otherwise it may tend to detonate. It is quite safe, however, if it is free from acid traces, and when ignited it burns almost instantaneously.

Hard Baking Varnish

COULD you please give me a formula for a good hard baking insulating varnish suitable for newly wound armatures, wound with enamel covered wire? I find that shellac and methylated spirit is unsuitable owing to the spirit attacking the enamel covering.—R. Withington (Doncaster).

IF you paint the enamel-wound armatures with a cellulose solution you will find that the spirit of a thick shellac solution will not attack them. These cellulose solutions can now be purchased from paint supply shops, or you can make up such a solution by dissolving scrap celluloid in a mixture of equal parts of acetone and amyl acetate.

A black baking varnish can be made by dissolving a mixture of equal parts of hard bitumen and stearine pitch in naphtha. Stearine pitch may be used alone, if desired. On baking for four or five hours, it hardens and becomes infusible.

You might also care to make use of one of the synthetic resin varnishes which have high insulative properties, particularly after baking. You should inquire for particulars of these from Bakelite, Ltd., 18, Grosvenor Gardens, London, S.W.1. It is possible that Catalin, Ltd., Waltham Abbey, Essex, may also be able to supply a ready-prepared varnish suitable for your needs.

Other makers of hard stoving enamels are Titanine, Ltd., Colindale, London, N.W.9.

Anti-freezing Liquids

CAN you give me a formula for making an inexpensive anti-freezing mixture for use in stationary engines?

I have heard that diesel oil and some other fluid make a successful mixture, but am rather dubious about this.—J. Johnson (Liphook).

THE following liquid has good anti-freezing properties:

Glycerine	85 parts
Methylated spirits ..	2 ,,
Water	14 ,,
Urea	4 ,,
Tertiary butyl alcohol	4 ,,
Sodium carbonate ..	1 part

Another liquid, as under, which is based on mixed solutions of chemical salts has a freezing-point of minus 37 deg. C.

(a)	Di-potassium phosphate ..	70	parts
	Mono-potassium phosphate	21	,,
	Water	100	,,
(b)	Potassium carbonate ..	5	parts
	Sodium pyrophosphate ..	2	,,
	Boric acid	1.5	,,
	Potassium hydroxide ..	2.8	,,

Dissolve (b) in the solution (a).

A very simple anti-freeze solution may be made up by mixing two parts of diethylene glycol and one part

of water. Diethylene glycol can be obtained from General Metallurgical and Chemical, Ltd., 120, Moorgate, London, E.C.2.

Gold-Plating Solution

I HAVE procured a small quantity of gold cyanide of potassium (40 per cent.) for the purpose of gold electro-plating small articles. Could you please tell me what is the correct strength of solution to make up, and whether such a solution would keep?—G. H. Drew (Lytham).

THE working strength of a gold-plating solution is, within reasonable limits, quite immaterial As an average, a good working strength is a solution which contains about 3.4 grams fine gold per litre. Such a solution should have a total KCN content of 19 grams per litre.

The addition of about 1 per cent. of sodium phosphate to the solution is advantageous, since this gives rise to complex gold salts which reduce the number of metallic ions-in solution at any given time and thereby increase the density of the gold deposit.

The solution is best worked at a temperature of around 60 deg. C. (140 deg. F.). Below this temperature, the deposited gold is inclined to be somewhat "cold" and yellowish, but between 60-70 deg. C. the shade of the metal warms up considerably and becomes "fuller."

The anode should be of platinum, which remains insoluble in the solution, and small additions of the gold-potassium cyanide should be made from time to time. The voltage should not exceed 1.5. Only a few milliamps of current are required. If the current is too heavy, it produces "burning" of the gold, with a sort of rust-red appearance. It may also give rise o a powdery deposit.

All gold salts are very easily reduced to the metallic state. Hence gold solution should only be made up in distilled water and should be kept in perfectly clean, glass-stoppered amber bottles which are kept away from light in a dark cupboard. Given this treatment, a gold solution can be used over and over again, a little of the fresh gold cyanide being added from time to time to make up for the gold abstracted from the solution by deposition.

The Camera Lucida

CAN you give me any assistance in the method of using a "Camera Lucida." The one I have is of French manufacture, and swivels. It is telescopic and is provided with a small prism, and has a carrier for magnifying and reducing lenses of which there are 12.

I understand its use is for copying objects, the images of which apparently appear on drawing paper underneath.—H. R. Simmons (Rochester).

THE instrument you have seems to be an elaborate type of camera lucida, such as was popular on the Continent during the latter half of the last century.

The camera lucida in its original form was the invention of Dr. Wollaston, a London chemist and physician, at the beginning of the last century. Its use, as you surmise is for making direct copies of landscapes and other objects which are projected on to a sheet of paper or card by means of the lens of the instrument. The lens is focused either on a back screen or on a flat surface. In the former case, the screen is covered with transparent paper; in the latter instance, a sheet of white drawing paper is pinned down. By means of a pencil or pen an outline and as many details as may be desired of the projected image is inscribed on the paper. The different lenses which your instrument has are for the purpose of giving different angles of view and for making objects look bigger or smaller. Similarly, the reducing lens and the magnifying lens are for the same purpose. The prism is to project images through a right angle.

The instrument is very simple to use, although there is little demand for it at the present day. However, yours appears to be a very good type of camera lucida, and if you are interested in drawing and sketching from nature, it should be of great assistance to you.

Cork "Composition" Flooring

COULD you advise me regarding the converting of granulated cork into a suitable covering for the floors of kitchens and bathrooms? Is the size of the particles of cork of importance, also could a complete floor be laid or one made up of blocks? Would the covering be suitable for smooth concrete or wood floorboard bases?—R. Georgeson (Southport)

GRANULATED cork may be mixed with ordinary cement for use as a flooring material, but a better method would be to make it an ingredient of a "composition" floor. It can be done in this way:—

Mix together equal parts of the granulated cork and calcined magnesite. Slake the mixture to mortar consistency with a solution made by dissolving 40 parts of magnesium chloride in 60 parts of water. The product is then trowelled into position. If desired, you can colour it permanently by incorporating some red oxide or other mineral colour with it. The material hardens in about 30 hours and may be walked on after two days. Sawdust may be mixed with the cork material if desired.

The cork granules should NOT be all of the same size. They should be fairly fine so that they will interlock well when mixed with the magnesite. An actual powder is not required. The granules should be ¼in. downwards.

This material could be laid as a complete floor, and, also, in the form of pre-cast blocks. If you lay it as a complete floor, do NOT place it around metal objects, such as iron waterpipes, since it is apt to set up corrosion and to become discoloured in such areas.

The material can be laid on any type of firm foundation—concrete, wood, asphalte, etc.

Unfortunately, all magnesium materials are difficult to get at the present day. You might try Messrs. James S. Beard, Ltd., 16, Great Ancoats Street, Manchester, or alternatively, Messrs. J. W. Towers and Co., Ltd., Victoria House, Widnes. It is possible, also, that magnesite may be obtainable from Messrs. A. M. Maccarthy, 37, Sandford Road, Moseley, Birmingham, 13.

Acetylene Lighting

I HAVE fitted up an acetylene generator in my workshop and the burner jet is a motor cycle type. I want a better light and shall be glad if you could advise me how to purify this gas so that I can fit a gas mantle?—A. Dunn (Kelty).

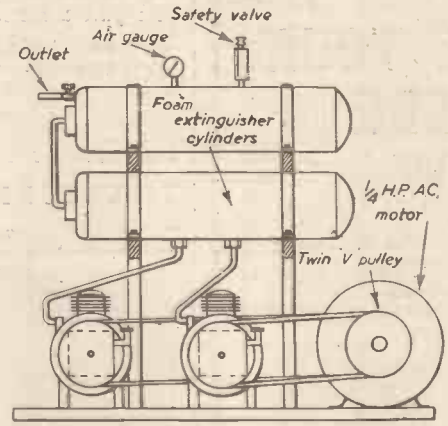
YOU cannot use acetylene with an incandescent mantle for the reason that the gas burns with a smoky flame. Also, you cannot purify acetylene chemically without running the risk of forming explosive compounds. As a matter of fact, the acetylene gas generated from ordinary calcium carbide is of a fairly high standard of purity and is suitable for all illuminating purposes.

Normally, acetylene gives a very brilliant flame when burnt in a properly-designed burner. If you cannot get this flame there must be something wrong with your burner. It would be best for you to discard the old burner and to procure a new one from your nearest cycle depot.

Do not dabble with acetylene by trying to purify it. The gas is poisonous and, under certain conditions can be explosive. Even if you used the purest acetylene made by chemical methods, it would not give any better light. It is the burner which counts.

Small Air-Compressor Plant

THE accompanying sketch shows a compressor I have constructed employing two ex-R.A.F. air compressors (capable of up to 200 lb. pressure), using two foam extinguishers as air tanks coupled together with ¼in. bore copper tube.



Small Air-compressor Plant (J. Hoult).

The ¼ h.p. A.C. motor (1,400 r.p.m.), is fitted with a twin 3½in. pulley and the compressors are fitted with 4in. pulleys. The two compressors with this coupling produce 55 lb. pressure at peak. I wish to obtain 60 lb. pressure, constant, for operating a paint-spray gun.

Can you tell me how to obtain this pressure? The reservoirs are approximately 22in. long and 7in. diameter.—J. Hoult (Edmonton).

YOUR letter does not give details of the size of the air compressors nor the quantity of air required. It is evident, however, that the two compressors are not delivering sufficient air to maintain the pressure at the spray-gun. You may be able to increase the output sufficiently by raising the speed of the compressors provided their mechanical construction is sufficiently robust to permit running at a higher speed. The power required to drive the compressors will be increased at a higher speed, and it is possible that a larger motor may be required. It is, of course, also possible that the compressors are not large enough to deliver the required amount of air at any practical speed.

Fishsilver Essence

CAN you inform me regarding the procedure for making fishsilver (essence d'orient) as used in manufacturing artificial pearls?—O. Blum (London, N.).

THE fishsilver essence which you name is a product based on fish scales, usually herring scales. It is made in the following way:

Norwegian herring scales ..	100	parts (by weight).
Ethyl propionate	150	,,
Nitrocellulose	1.5	,,

The above charge is placed in a slow-stirring apparatus and stirred therein for 30 minutes. The liquid containing suspended matter is then poured off and retained. The fish scales are similarly treated twice more. The combined liquids containing the suspended matter from this fish scale treatment now contain all the "fish silver" removed from the scales. The liquid is then revolved at very high speed to remove the supended fish silver from the liquid by means of centrifugal force. For this purpose, a laboratory centrifuge is necessary.

"Satin"-finish Paint

VARIOUS wooden toys, such as animal cut-outs and play bricks are finished with a "satin" like coloured surface. I believe this is a vegetable dye which is non-injurious to children.

I shall be greatly obliged to you if you can supply details of this particular finish, together with the possible source of supply of the necessary materials.—S. J. R. Allery (Horley).

THE "satin" finish on toy blocks which you describe is merely a sprayed-on cellulose paint. The paint is specially formulated. It is lacking in cellulose and it has a high speed of evaporation. Consequently, it dries "rough" and non-glossy. Ordinary mineral colours (non-poisonous) are used—that is to say, the ordinary colours of the "paint-box" type. These can be obtained (in large amounts) from Messrs. Cowan Brothers, Ltd., Stratford, London, E.15. For smaller amounts, try Dryad Handicrafts, Ltd., St. Nicholas Street, Leicester, and also Messrs. Reeves and Sons, Ltd., 18, Ashwin Street, London, E.8.

For a suitable clear cellulose lacquer (satin finish) to mix with the colours, apply to Messrs. Nobles and Hoare, Ltd., 3, Cromwell Road, London, S.E.1.

Darkening Pewter

WILL you please inform me how to darken pewter to give it an antique appearance, as some new pieces I have bought have been polished and clash with my old pieces.—S. E. Cox (Peterborough).

A GOOD way of darkening modern pewter is to bury it 4ft. deep in ordinary soil for 8-12 weeks.

Another method—a quicker one—is to boil together equal amounts of lime and sulphur in a saucepan with sufficient water to cover them amply. After five minutes' gentle simmering, a yellow liquid will be formed. Filter this off, and dilute it with about six or seven times its bulk of water. Mop this solution on to the pewter. It will quickly darken the metal. If the action is too intense, dilute the yellow liquid further. If it is not strong enough, use the yellow liquid at greater strength. The pewter must, of course, be quite free from grease and oil before this treatment is applied, otherwise patchy results may be obtained.

Recovering Silver from Hypo Bath

I AM trying to recover silver from a used hypo fixing-bath. I have added a solution of sodium sulphide to the hypo and have obtained a precipitate of silver-sulphide in the form of a black mud which is supposed to contain about 50 per cent. of metallic silver.

Could you please let me know how to obtain the pure silver from this mud? I have tried heating a little of it in a crucible over a bunsen burner, but have obtained only a grey ash.—G. Bashford (Havre-des-Pas, Jersey, C.I.).

TAKE the mud-like black precipitate of silver sulphide and stir it into a large basin of hot water. Then allow the precipitate to settle to the bottom of the basin, and afterwards syphon off the water. Do this half a dozen times, the object being to dissolve away all the soluble impurities clinging to the precipitate. After the final washing, heat the sulphide mud to bright red heat in a crucible for several hours. The residue will consist of metallic silver (in powder form). This will be contaminated with a little silver oxide and a little unchanged silver sulphide. If you wish to obtain absolutely pure silver from it, dissolve the residue above named in warm dilute nitric acid (one in four). A solution of silver nitrate will be formed. Filter this; allow it to cool and then suspend strips of pure zinc in the solution. Pure silver will be precipitated on the zinc. It may then be brushed off, washed in water and then very gently dried (without undue heat). It will take the form of a fine grey powder.

In order to obtain silver in coherent metallic form, you will have to heat the powder very strongly under a 1in. layer of a mixture of equal parts of sodium carbonate and charcoal.

Pyroxylin-based Filler

CAN you give me some information regarding pyroxylin-based filler?

It is used as a bond between canvas and cedar wood in small boat work, and I would like to know a little of its composition.

Is it obtainable in England?—L. Patterson (Auckland, N.Z.).

PYROXYLIN is gun-cotton or cellulose nitrate. Actually, it is a mixture of cellulose nitrates. When dissolved in a mixture of about equal parts of ether and alcohol it forms the liquid known as "collodion." This is the "pyroxylin-based filler" which you mention. Collodion is water-resistant, it can be used (with or without admixture of wood flour or other fine material) for wood-filling purposes, or it can be used directly as a cement or adhesive. It is expensive, and it has the disadvantage of drying very rapidly, so much so that it is difficult to manipulate. Under the name of "collodion" you should be able to get it from any wholesale chemical firm. English supply firms are: Messrs. Griffin and Tatlock, Ltd., Kemble Street, Kingsway, London, W.C.2, or Messrs. J. W. Towers, Ltd., Victoria House, Widnes, Lancs.

You should be able to make an equally good cement or filler (and a slower-drying one by dissolving scrap celluloid in a mixture of approximately equal parts (by volume) of acetone and amyl acetate.

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Editor: F. J. CAMM

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Comments of the Month

By F. J. C.

The Cycle Show

AFTER a hiatus of 10 years it was to be expected that the Cycle Show would be an outstanding success and so it has proved to be, for the total attendance was 177,223 compared with the previous record of 117,319. Export orders flowed in from over 36 countries, and a delegation from the U.S.S.R. asked for a quotation for 7,000 bicycles. It undoubtedly, in the words of the president, Mr. George Wilson, "was the most successful and colourful show of our whole series since 1911."

Everyone was anxious to examine the development of British bicycles during the past 10 years. The great change in the finishes was most notable, and bicycles generally were brighter and lighter. The demand by buyers was for a complete range of colours, although in Switzerland a black or a green bicycle is still regarded as a sign of quality.

Gears are more generally favoured than they were in 1938, and we observe a notable advance in lighting equipment. It is hoped that the Government will consult trade organisations in regard to the negotiations of any commercial treaties in view of the possible competition from ex-enemy countries such as Japan and Germany. In France to-day it is almost impossible to introduce new goods and it is difficult to obtain permission to supply sufficient spares to service United Kingdom bicycles which have been in the hands of the French public for many years.

The Minister of Supply, Mr. Strauss, speaking at a luncheon given by the British Cycle and Motor Cycle Manufacturers' and Traders' Union during the run of the Show, emphasised the difficulties of steel allocation, in reply to Mr. George Wilson, the President, who had stated that the threatened cut in steel supplies would undermine the great efforts made by the cycle industry.

Mr. Strauss said that while he could not announce any immediate increase in the allocations of steel to the cycle and motor-cycle industries their claims for extra supplies would have sympathetic consideration as soon as the position improved. In the last 10 years British bicycles had moved from third place in world production to a firm first place. In 1938, when the last exhibition was held, the country produced 1,500,000 bicycles; of which about 500,000 went overseas. In 1946 more than 2,000,000 cycles were produced, and this year Britain was making them at an annual rate of 2,750,000 machines; all but 1,000,000 of these were going abroad to swell Britain's foreign currency resources.

The motor-cycle industry now held first place in world production, compared with second in 1938. We were sending 75,000 motor-cycles overseas this year, each one of them a tribute to British workmanship and engineering skill.

There was a nicer atmosphere about the Show than hitherto. There were more parties with the party spirit, all delighted that once again they can look forward to this high spot in the cycling calendar. There was little to criticise. The organisation and general arrangement of the exhibits were on a high level, and an example to the organisers of other exhibitions. The Show catalogue was something more than a catalogue. It is almost a miniature textbook on the industry as well as a guide to the industry, and as such it will be kept by all those who visited the Show. For ourselves we think that Wednesday is a bad opening and closing day, but no doubt the organisers have to fit in with other exhibitions. It would have been wiser to have got in two Saturdays, that is to say, to have opened on the Wednesday and closed on the Saturday week.

There was a noteworthy increase in the number of women visitors, and manufacturers reported a growing demand for ladies' models.

The Paris-London Race

AT the N.C.U. General Council meeting last year the Paris-London race came in for a good deal of comment, and the Racing and Records Committee's report was attacked by one of the delegates, who after considerable argument secured a vote in favour of substituting "News Chronicle" for R.T.T.C. in the report.

It was stated that it had not been found possible to arrange with the R.T.T.C. conditions for the race. We think, however, this is not so much a question of conditions of the race but of N.C.U.—R.T.T.C. jealousies and the clash of personalities.

The dispute which led to the cancellation of the race indicates more clearly than ever the need for only one controlling body. As the R.T.T.C. is the only body controlling racing on the road, we fail to see why the N.C.U. should be permitted to have a finger in the pie. It is *ultra vires* and *non-locus standi*—as the N.C.U. love such terms as "proclaimed," "amnesty," etc.

It was also stated at the meeting that Mr. E. J. Southcott will not seek re-election as President this year. He received the Union's Gold Badge of honour. The subject of the doping of riders was the basis of a resolution calling for action, and it is proposed to prepare a plan for presentation to the Union Cycliste Internationale on the subject of the use of dangerous drugs.

Sir Alfred Bower

SIR ALFRED BOWER, the late Lord Mayor of London, had been a cyclist all his life if we can call a cyclist one who rides a tricycle as well as a bicycle. Sir Alfred Bower achieved fame on the three-wheeler, and it was a subject in which he remained keenly interested all his life. Certainly as a nonagenarian he was a good advertisement for the health-promoting qualities of cycling. He originally rode a "bone shaker"; indeed, there was nothing else when he first took to two wheels. He served his apprenticeship, in fact, on almost every make of bicycle and tricycle. He was also a keen member of several clubs. In looking through the files of *Bicycling News* I find that he was a member of the Ripley Road Club, the Tandem Wheelers, The Crescent B.C., and a number of others.

He raced on the ordinary at the Crystal Palace towards the end of the eighties. As the result of a cycling accident he was incapacitated for a time and upon recovery adopted the three-wheeler. By 1887 he attacked the world's tricycle records and many of them fell to his onslaught. They were at distances from 25 miles to 150 miles, and it says much for his great ability that his times exceeded those for what should have been the faster two-wheeler. Bower was a genial man and quite an authority on cycle sport. He frequently attended the Dinners of the Fellowship of Old Time Cyclists of which he was a member.

Changes at the B.L.R.C.

AS we go to press we learn that steps are being taken to remodel the London section of the B.L.R.C., which has been the cause of most of the trouble within the movement. A member of this section informed us "not to be surprised if drastic changes are made at the A.G.M."

Whether these changes take place or not they are long overdue. At least one of their officials writes offensive letters in answer to criticism, whilst many others have done their best to alienate the sympathies of their most ardent supporters and of the Press. This is not healthy for the B.L.R.C. within whose ranks a struggle is going on for domination, mastery, and proprietorship. It is these things which have caused trouble within the N.C.U. and other bodies, and reduced them to a state of weakness. The B.L.R.C. is a new body which should have profited by the mistakes of these other organisations. It is not too late for them to do so. The conduct at some of their meetings is unconstitutional and undemocratic. We doubt, in fact, whether they could be upheld in law, notwithstanding the fact that they are merely domestic tribunals. Some of their "decisions" could undoubtedly be set aside. We are unwavering in our belief in massed-start racing, and we have given it our unstinted support from the very start, but we certainly cannot be expected to support internecine conflicts and the methods to which we have drawn attention on more than one occasion.

The MERMAID
Rye. Sussex

One of the loviest and most well known of our English country inns, rich in old timber and carved stone chimney pieces. The sketch shows the beautiful windows and the fine oak beams of the building, seen from the courtyard.

Paragrams.

Cyclists Do It Free!

"I WOULD like to see the idea extended to cover the bicycle, as I don't see why the man who provides himself with his own internal combustion engine should be excluded," said a member of Huntingdon Rural District Council when the council considered payments to be made to councillors travelling to meetings from a distance. The council decided upon scales of payments to be made for travelling for private cars according to the size of the cars, but refused to pay anything to councillors who cycle to meetings.

Training Them Young

TODDLERS at the Kesteven County Council nursery school at Wyndham Park, Grantham, are being taught the rules of the road almost as soon as they can walk. The paths in the park are used as roads and model traffic lights that really do change colour give added fun to the lessons on road sense. The father of one of the children is now setting to work to make a Belisha beacon and by the time the children get their first cycles they should be perfectly trained.

Road Race!

WHEN March (Cambs) Magistrates' Court heard a summons against a local cyclist for riding without a rear light, a police constable told them he chased the offender on his own bicycle and eventually ran him to earth, completely exhausted. When the lightless cyclist had recovered his breath, he gasped out to his pursuer: "There's no doubt about it. There's no messing about with you chaps!" A fine of 30s. was imposed, which will probably make the offender decide to keep himself in proper training in future.

Dirt Track Cycling

BRISTOL TOWN COUNCIL have received for their consideration an application from "a pioneer of the new sport of dirt track cycle racing" for permission to use a piece of waste ground for weekly meetings. The application has been approved by the appropriate committee of the council, and a track is to be laid out on top of a rubbish tip, using as a surface waste materials. The sport has also become popular at Bradford, where teams taking part in races have formed their own board of control, and have organised an insurance scheme to cover any possible injuries to riders.

Earn As You Ride!

NORTHAMPTONSHIRE Education authority has decided to offer ten-shilling prizes to children attending schools in the county who have the best-kept cycle during the winter months, ending on March 31st. Good running order of the cycles will be considered as well as mere outward cleanliness.

Fairyland!

AMERICAN roads will soon look like fairyland if a suggested scheme for using a new type of lamp for obstructions and warnings is adopted. The lamps look like the old-fashioned type of round beehive and the bulbs used are filled with neon gas. A special switching arrangement makes them blink on and off 120 times a minute. Red will, of course, be the colour used for obstructions on the road, but gold, green, blue and white lamps will also be available for other warning purposes.

For Crazy Motorists

THERE are few cyclists who have not, at one time or another, been almost flung into the road by the careless opening of a car door just as they drew level. Thinking things over, Mr. Sidney W. Nobbs, a Norwich insurance official, decided that a car with a sliding door would be less of a menace on the road, so he set to work and designed such a door. Now his car has a door which slides back in the same way as a motor-coach door and is a menace to no one, while making it much easier to get into and out of the car in a confined space.

East Midlands "25"

WINNER of the East Midlands Clarion Club's "25" held on September 26th, was a Doncaster visitor, A. Martin, of Doncaster Wheelers, with a time of 1 hr. 3 mins. 56 secs. Leicestershire riders G. Porter (Forest), J. Clarke (Forest) and T. Bird (Leicestershire R.C.) were respectively first, second and third in the handicap section of the event. R. Cassey put up the best show of the Clarion Club riders, tieing for third place.

Hinckley Road Race

THERE was very good support from cycling enthusiasts for the first 60-mile road race over a 10-mile circuit round Hinckley, Leics, organised by Hinckley Cycling Club. The event, known as the South Leicestershire Road Race, is the first of its kind to be held in the district and 40 riders from seven well-known clubs in the Midlands took part, including nine from the local club. The winner was E. Furniss, a young Nottingham rider, with a time of 2 hrs. 38 mins. 3 secs. and an average speed of 24 miles an hour over the course. Second came E. S. Pitcher, of Stonebridge Club, while third was F. Parker, of Trent Olympic, the club of which Furniss is a member. A true continental touch to the proceedings was added by Pat Bradley, of the Hinckley Club, who greeted Furniss at the end of the race with a bouquet of flowers and a kiss.

Value For Money

BECAUSE of the difficulty of obtaining spares to fit, a 40-year-old bicycle has just had to be taken off the road by a Hull cyclist. The machine was made in 1899 and was ridden regularly by the present owner's father-in-law right up to the beginning of the last war. Then the present owner took it over and has ridden it every day right up to a few weeks ago, and if only spares were obtainable the machine would still be on the road and a credit to the old-time craftsmen—but not doing much to keep present-day manufacturers in business.

Adjustable Handlebars

M. DUFAUX, a Swiss inventor who lives in Geneva, has taken out a patent for adjustable handlebars for bicycles. Instead of being firmly fixed at the centre, the handlebars are meshed at the steering column with two gears, so enabling the handlebars to be raised or lowered quickly to suit the tastes of the rider. A finger control releases a catch and allows the handlebars to be adjusted and when they are set they automatically lock in whatever position they are put.

Twisting Old Man River

THE bulb growing district around Spalding is to be given a new look by the diversion of the River Welland at a cost of some £750,000. A new cut, two miles long, is to be made to divert the river, and over this new length of river eight bridges will be built to carry road and rail traffic.

Wayward Youth!

A CYCLIST who appeared before Peterborough magistrates was asked how long he had been riding a bicycle, and replied: "Ever since they came out. I am 68 and this is the first time I have seen a place like this!" For failing to observe a halt sign he was fined 5s.

His Lucky Day

THE guardian angel of a North Lincolnshire farmer must have been on duty the other day, with all buttons polished and an alert and angelic expression. The farmer was cycling home, at peace with the world and having forgotten for a time all about controls and shortages, when an overtaking car knocked him down. His machine was completely smashed and he himself was pinned beneath the car without any of the wheels touching him. Rescuers who got him out found he was completely unhurt. The cycle's only use was to swell the local scrap metal collection.

More Cycle Parks

MEMBERS of Stamford (Lincs) Town Council have agreed that cycle parks are a necessity for the town, and the council's next annual estimates include the sum of £45 to cover the cost of cycle stands on one of the town's car parks. In addition, the council are asking for suggestions from owners of property in the town regarding the provision of additional cycle parks.

Thriving Club

THE report presented to members of Peterborough Clarion Cycling Club covering the past year show that during the past twelve months the membership of the club has practically doubled. There is much keenness among the members, both on the road, and in social affairs. The new general secretary of the club is Mr. H. Berridge, of Peterborough, with Mr. P. W. Goodale, the former secretary, as assistant secretary.

Poor Salesman

A MAN who appeared before Hinckley (Leics) magistrates on a charge of receiving a stolen cycle was stated by the police to have tried to sell the machine to a detective. The detective was in a Nuneaton cycle shop when the man asked him: "Do you want to buy a bike? You can have it for 15s." This bargain offer aroused the detective's suspicions and when he made enquiries he found that the man's girl friend had stolen the machine. It also came to light that the man had five previous convictions, and had only been out of prison for three weeks.

Cycle Agent's Move

MR. GORDON DRAPER, cycle agent, Great Barford, Bedfordshire, has transferred his business, as from November 1st, to more convenient premises in Bedford Hill, Great Barford, adjoining his house.

Boston Council Gives In

AFTER more lively argument, Boston Town Council decided, at their November meeting, to reverse the decision of their October meeting and to provide cycle stands in the Market Place. The stands are to be of the sunken type, which are flush with the carriageway, in spite of the suggestions of a few diehards that they will collect rubbish, form death traps for pedestrians and similar horrors. Supporters of the scheme said the council catered for motorists so why not for cyclists, and pointed out that most of the congestion in the Market Place was due to the careless parking of cars. One supporter said he had "never heard such blarney in his life" at the suggestion that the stands would "clutter up" the Market Place, and added that the opposers of the scheme would be the first to grumble if they had nowhere to park their cars.

Lucky Break!

A MEMBER of an East Midlands cycling club had visions of a long and weary walk back home when a spindle broke many miles from home. It was a Sunday and all the shops were closed but he decided to have a look round one of those dumps of scrap which decorate most villages, and there his luck changed. Among the scrap were the remains of an ancient bicycle and in the bicycle was a spindle which, when cleaned up, made a satisfactory temporary repair.

More Support Wanted

STRENUOUS efforts are being made to revive the Walton Athletic and Cycling Club, whose headquarters are at Walton, Peterborough, and to restore it to its old place among the clubs of the Eastern Counties. It was formed in 1934 and prospered until the outbreak of the war when, like the majority of other clubs, it passed into a state of what the War Office is pleased to call "suspended animation." Somehow, since the war, the club has never really come to life again.

Another 21st

BRODSWORTH (Yorks) Racing Cycling Club have celebrated their 21st birthday by holding a dinner and dance in conjunction with their prize presentation at Doncaster Corn Exchange. Various

(*Continued on page* 32).

Around the Wheelworld

By ICARUS

R.T.T.C. Championships

ACCORDING to the report of the National Committee of the R.T.T.C. the championships, whilst they have produced sterling performances, have given the Committee serious concern. The present-day difficulties, such as the cost of transport, do not encourage riders to travel long distances, and as a result the representative character of the championships may be reduced.

It is thought that condition 8 of the B.A.R. Competition prevents men riding in non-championship events at the championship distance on the same days to gain some advantage over the men who are riding in the National cycle events. This, however, is only part of the difficulty.

In the meantime, the National Committee has decided to abandon for next year its original scheme of offering the championships in turn to every area of the country. This is a pity, because I feel, with the Committee, that this would have had an effect in stimulating interest in the titles.

It has been decided to keep the 1949 championships in a general central area of the country, thus minimising the amount of travel necessary from all the populous districts.

There has been a widespread demand to have the championships regularly on certain fixed courses and dates each year.

Measurement of Courses

THE R.T.T.C. also expresses concern at the number of cases this season in in which courses have been found short of the correct measurement after the events have taken place. I am convinced that the present system of measurement is wrong. Every course should be measured by an approved instrument such as an Odometer by a member of the R.T.T.C. Council. It should not be left to local individuals. The present system leaves the door wide open to those dishonest individuals anxious to secure some advantage over the others.

It is not so many years ago since this journal undertook an independent measurement of the Paddington track; only to find that the official measurement was much out. This upsets a record which, thanks to us, was restored to its rightful owner.

It is time that the R.T.T.C. purchased some accurate apparatus and employed the services of a competent surveyor in each area. That is the only real solution.

Ivor Thomas, M.P., at the Roadfarers' Club

MR. IVOR THOMAS, M.P., gave an interesting lecture on the Future of Civil Aviation at the Roadfarers' Club Luncheon at the Savoy Hotel on November 26th. He amused his listeners by stating, as a Socialist M.P., that so far from people being surprised that he had left the Party he was surprised that he had ever joined it!

Over 120 members and guests were present, under the chairmanship of the president, Lord Brabazon of Tara.

N.C.U. at the Crossroads

THERE were many severe criticisms of Headquarters at the N.C.U. General Council meeting recently. There were complaints that expenditure continues to rise, queries from Centres were not fully answered and that the councillors' expenses were on the generous side. There was also bitter criticism of the cancellation of the Paris-London race. A proposal that the Racing and Records Committee be censured for reinstating Harris over the heads of the Olympic Committee and for dropping Marshall without a trial was defeated 31-18.

A three-man sub-committee was formed to negotiate a new agreement with the R.T.T.C. in an effort to avoid a schism between the two bodies.

A resolution calling for the termination of the existing agreement between the two bodies was dropped in favour of an amendment which read: "The N.C.U. and R.T.T.C. mutually agree to lapse the current agreement and to negotiate a new agreement on the basis of that submitted to the N.C.U. Council and initialled by the president."

It is a pity that someone did not propose the liquidation of the N.C.U. in order to reconstruct. It seems incapable of handling the management of track racing or of expressing the views of the cycling movement. Instead, it seeks to adopt a dictatorial attitude, and to impose its will against the views of the majority.

Mr. Ivor Thomas, M.P., giving his lecture at the recent Roadfarers' Club luncheon at the Savoy Hotel.

Cycling in America

I WAS interested to receive some comments on the position of cycling and the cycling industry in America from a correspondent who lives in that country. Here are some of them:

"Practically every American worker owns and drives a motor-car. . . . Very few adults ride bicycles. . . . Motor-car traffic on the highways moves at speeds of from 50 to 70 miles an hour, and on holidays the roads are jammed with motor-cars. The roads are first-class. . . . Distances are great, hence the use of the motor-car. The highways are not a comfortable place for cyclists; for most of them it is tantamount to suicide. It is difficult to find a place in which to ride a bicycle with safety or comfort. . . . We have nothing to speak of in the way of law to protect the cyclist, no cycling organisations to fight for their rights . . . We have a pitifully small group of enthusiasts who carry on. . . . The bulk of cycling is in the toy class, strong heavy machines to convey children to school, and will withstand the abuse resulting from the thoughtlessness of kids. They ride on the side walks and pavements. . . . When a boy or girl reaches the age of 14 he or she graduates automatically to the family motor-car, and by the age of 17 usually manage to have a car of their own."

The "Ostrich"

THERE are many inns in this country bearing the name "Ostrich," but the original title of most of them was Hospice. Such houses have descended from the great hostelries of the Middle Ages, which were originally attached to monasteries, abbeys, and other religious foundations, and were devoted to the refreshment and entertainment of pilgrims and wayfarers generally. The guest house of the modern abbey or priory takes the place of these old hospices. One of the hostelries of this name is situated in the sleepy little village of Colnbrook, Bucks, and I have known it for many years. It was once the headquarters of my club, and I have often visited it as a guest of other clubs who hold their meetings there.

I was therefore interested to notice that Mr. F. J. Camm has just written an interesting little monograph on the history of this old inn, which was built in the year 1106, and not 1117 as claimed by the brewers. It achieved fame mostly because of the murders (60 of them). I was also astonished to learn that this old inn was the subject of the very first novel to be written in the English language, namely, "Thomas of Reading," by Thomas Deloney, who deals with the murder of a rich clothier named Thomas Cole, of Reading, in the famous Blue Room of the Ostrich, which had a tilting bed and a boiling cauldron beneath. I was also interested to learn that a full length novel entitled "At the Sign of the Ostrich" was written by Charles James and published by Chapman and Hall in 1895. I wish I could find a copy of this book.

James also wrote another book entitled "Two on a Tandem," and if any reader has a copy I should like to borrow it. The booklet on the Ostrich is published at 1s.

Wayside Thoughts

By F. J. URRY

The Best Of It

THE summer has gone into history—and what a summer! Yet I've no complaints to offer, for it has given to me renewed health and vigour and some happy days along the road. When a man feels the fitness of well-being growing within him the weather is of very minor importance to his immediate outlook, and that is exactly how I felt one hot day in August—the last day of that too short spell—when riding coatless with a younger companion along A5, where the little blobs of melted tar sucked at the passing wheels. We had the luck of the road, a light breeze abaft, a satisfactory tea at a well-known spot, and in the cooler evening, with thunder clouds gathering on the horizon, a welcome meal and a comfortable bed to end an afternoon journey to the Welsh Borders, with the prospect of four days' idle pottering. We were using Church Stretton as a harbour from which to make excursions, for I was supposed to be a convalescent still and limit the mileage to fit the state. But it was all nonsense, for when a man can ride 65 miles in a trifle over six hours, including the tea interlude, there is nothing much the matter with him. That afternoon of palpitating heat with the air trembling in tiny waves was the last of the series for the time being, for the next morning we woke to the beat of rain and a greatly lowered temperature. But what did that matter? We were among the hills of Salop, with food in our bags and a primus stove, and all the ways of a delectable county to choose from. Before 10 o'clock the rain had ceased, and the storm clouds went smoking over the hills as we took the way to Marshbrook and quietly climbed the long slope to Plowden and the Onny valley, where half a dozen thunderstorms crowded round, sending us to shelter in the thick hedges while the threshing rain went over.

Over the Top

THE storm rolled away, but the rain persisted for another hour or so, and capes became necessary long before Bishop's Castle, that curious old burg on the slope of a hill. We passed through for Bishop's Moat, a long climb from whence the great views stretch widely; but half-way up that acclivity the rain became vicious, so we borrowed a cottage and in its sheltered porch cooked our lamb chops and tomatoes and made our tea, changed cigarettes with the occupier, and wore the storm out in comforting the appetites all cyclists acquire. The Moat views were vignetted greyly in the rain clouds, but there was compensation in the freshness of the air and the scent of good earth drinking the rain. It ceased but ever threatened, so the macs were festooned round the bars ready for immediate action, although they were not required until after we had taken our tea on the banks of the tiny West Onny near Linley. Those lanes that run, or rather trickle, round the flanks of the Longmynd possess a charm and beauty far more intimate than the main roads, and we lingered along them so that it was late afternoon when we came to Bridges and decided, despite a drizzle, to storm the ridge of the Longmynd once more. It is a long pull up from Ratlinghope, and long before we gained the Keeper's Hut the drizzle had developed into a thick, soaking mist, shutting out all but the near visions and completely eliminating the fine view of the Stiperstones and Caradoc. Still I enjoyed the long ascent, for I was fit once more, and that delight wiped away every other little disappointment. As we dropped out of the clouds on the rough descent of the Burway, so the rain ceased and we were rid of the macks once more. Up that hard climb we cheered on numerous cyclists making the last leg of their journey over the mountain to the Youth Hostel at Bridges, and it was good to see youth and beauty making light of the long trail and charging the air with their banter.

Easy Miles

IT was better next day. The hills emerged from the mist and Caradoc was limed against a blue-grey sky, while the great Severn Plain showed its well-loved features of the Wrekin and the tiny ridge of Rockall. We went over the green roads across the Betchcott Hills under the flanks of the Longmynd, a drover's road of old time with its weather-worn milestones, and beneath the carpet of turf the hard metal of its ancient construction. It was lovely. Very little sun, but a kind of pearly light with an easy breeze and a promise of warmth if the sun could only break through. In a little hollow where a stream emerged we cooked our lunch and made our tea, and thereafter lay on the heather with the long ridge of the Stiperstones as the bordering picture; and we were very happy and worried nothing of the fact that probably less than seven miles had occupied the morning, mostly walking. It was so good indeed and so delightfully quiet that we found another knoll and stream but a couple of miles away and nursed it until teatime, after which we slid over the grass tracks down Plush Hill, past the combe of Jinlye to All Stretton and a satisfactory dinner. That was a good day of less than 20 miles, proof indeed that distance is the least counting factor in pleasant touring; it is what you see and remember. We were due to meet part of the family for a picnic lunch on the Monday, the venue under the brow of Brown Clees. It did not actually rain, but all the hills were under cloud and the mists spread moisture everywhere. We elected to take the lanes. Crossing ridge after ridge through Rushbury, Lower and Upper Stanway, Hungerford, and over the Corve Vale road for Tugford, and then the long ascent by Heath (with its beautiful Norman chapel) and Abdon for Hillside. And there was the lunch, spread beneath a great oak to keep it dry, and the provender was compensation for the mist-filled valleys we had expected to see under the August sunshine. Yet it was all good, including a gallop back to Church Stretton by way of Ditton Priors, Brockton and Longville, with a wind to help and rather a better promise for the morrow, when we had to depart.

More Rain and Wind

THE promise did not materialise, for a south-wester came loaded with water, and all our little plans for a twisting journey through the lanes went west, so it was the old way home, and for 20 miles we sailed into that watery air. Then by Atcham Bridge, almost without warning the rain ceased and the wind went north, coming with some strength right into our laps, and making the long Wellington slopes a grade stiffer. Ten miles beyond the industrial smother of Oakengates, we took our last meal of the little tour under a laneside fence by Ivetsey Bank, and in 30 more miles came home. And with what satisfaction? I can only tell you that the experience made me gay with the knowledge there were years of riding in me yet, given reasonable luck, and a threat of a change in my personal mode of locomotion was indefinitely postponed, for which a prayer went up of real thankfulness. For I love this cycling game—it is so free and so active, so changeful in its outlook with time to note the changes and appreciate them, and so personally controlled that you can fit it precisely into the mood of the moment, and finally the sense of satisfaction is among the most desirable acquisitions in the human make-up. And withal, it is everybody's game if they care to play it, with all the land their own as they pass its beauty by.

New Ground

A WEEK later, full of confidence in my ability to push the wind away or climb respectable gradients without hurt, I was entraining for Lancaster with a good friend and his 14-year-old hopeful, with a view of crossing the land to York to attend the great rally of the C.T.C. (70 years old), and the A.I.T. (50 years old). I had never been through the Trough of Bowland, for my journeys north had always been a hurried passage to the Border, the Lakes, the East Riding or the Northumbrian countryside, and mostly in the way of train assistance to those delectable lands. It was new country to me, and I had reckoned on a full two days' journey to see and absorb it, to sit on banks and smoke while the August sunshine flowed over me and the warm winds fanned my brow. But the weather had a say in the matter. After a railway tea of buns and weak liquid we left Lancaster in the teeth of a north-wester as wet as a mountain stream, and for miles it seemed to me we climbed towards the moors, up unridable hills into that gale, with flapping macs, and stung eyes as we glared into the loud and rain-shattered air. We were nearly two hours making Marshaw, and our feeble tea had by then worn thin. But Marshaw would have nothing to do with us (probably because we did not know where to go), so it was Dunsop Bridge seven miles away. Ah! what a pity the awful weather limited our vision and the gale—the fag-end of the storms that devastated the N.E. Border—kept us bent and bowed up the long slopes before the startling drop to the river Ribble. For it is a great land through which the walloping road reels and winds, wide spaces of rock and moor and mountain torrent to delight the townsman, with all around the comely ridges of the Pennines, at our passing seen only for a moment as the smoke of storm drifted over their ridges. That cafe at Dunsop Bridge told us in definite Yorkshire phraseology we were too late for tea and there was no accommodation short of Newton, four miles ahead over the waving land.

Foolish Fellows

HUNGER by now was the predominating feeling; a crust of dry bread would have been welcome. What fools we were not to pack iron rations. My burly friend from Bournemouth offered to haste his way to Newton and test its resources. My shouted instruction was "Leave your bicycle on our road, so that we shall know." He didn't or we didn't see it; so on we went to Slaidburn, a couple of miles consisting of two long hills up and down. No companion to cheer us in Slaidburn, and he had the route maps. The one hotel would not take pity on our plight, and the rain still came at us in a 45 degree angle. Then I spotted a well-known sign and the luck changed. The good man knew me and gave us food and tea and a meed of sympathy in our predicament, so that we could think clearly again. After sustenance I sent our young scout back to Newton to search for his parent, and in the meantime partly dried myself out and completely satisfied an erstwhile aching appetite. In due course the courier returned; there was a bed awaiting at Newton and a fire, and the promise of breakfast on the morrow. So we went joyfully back on the wings of the storm, and nothing mattered that our strategy had badly slipped up and made lamp-lighting necessary. It certainly was a hopeless evening, and as we dried out in that comfortable cottage we consoled ourselves with the thought that August weather could not long sustain this rough and damp temper.

With Slight Improvement

BUT it was raining fiercely enough the next morning as we climbed into damp macs after a breakfast of pre-war quality, and the wind was still N.E., with a bite in it. We passed again through Slaidburn, rode the long hill on the Settle road, turned right for Bolton by Bowland, and there saw a gleam in the grey clouds that almost promised sunshine. It came too as we glissaded into Gisburn and took aboard a little drink and food to comfort us, for the wind was still wild and cold. A fleck of sunshine here and there lit the way for us, and a very lovely way too, but better still the breeze went north, and before we found Skipton and lunch it had veered a trifle west of that point and we were running freely with it. Once more I saw Bolton Abbey by the swollen Wharf under storm clouds, climbed the long moorland road to the head of Blubberhouses and sailed down to the tiny village and a first-class tea at Lower Lane, and then the easy, wind-assisted ride to Harrogate. But there were no rests on the way, for the wind had the temper of October in its teeth and the sunshine would not stay long with us.

And So Home

NEXT morning we came to Knaresborough and walked through its gorge and by its Dripping Wall, what time the rain threshed fiercely, so we spent an hour taking coffee. At Green Hammerton we found lunch and lingered to let the storms blow out; and they did, so we came to the noble city of York dry as an old bone and ready for the celebrations of which you have heard long ago. I had to be home on the Monday evening, and would like to have crossed the Trough from east to west, but half a gale from the S.W. persuaded me that a straight run back was wisdom and would give me the chance to see if I could still ride a decent mileage into the wind without flagging. It is a featureless journey by Doncaster, Bawtry and Nottingham to Birmingham, yet I enjoyed every yard of it, for the farther I went the fitter I felt. I made the 87 miles to Nottingham very comfortably, lingering only on the last leg where the road runs by the verges of Sherwood Forest, and was home for an early tea the next day. The 145 miles of good riding gave me the complete satisfaction that I'm still a respectable, if rather ancient, cyclist, with sufficient miles in my legs to carry the badge of a tourist with comfort and happiness.

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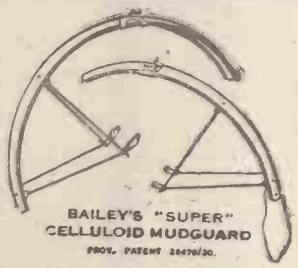

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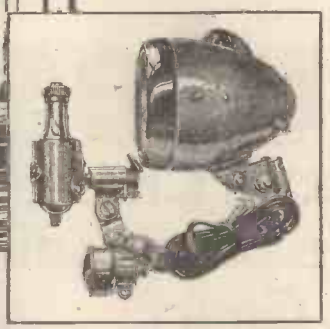

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CYCLORAMA

By H. W. ELEY

A picturesque view of Virginia Water

"Roadfarers" Again

A FEW days ago I had the pleasure of attending a "Roadfarers' Club" luncheon, and listened with intense interest to an informative address by Mr. Ivor Thomas, M.P., who has expert knowledge of civil aviation and this was his subject. An unusually large audience was kept enthralled by a comprehensive review of the general position, the place which civil aviation should rightly hold in the national economy, and a survey of the future possibilities. Mr. Thomas did not paint too rosy a picture, and it was evident that he realised the dark tunnel through which civil aviation in this country is unfortunately passing; but he did give his audience hope for the future; and though, possibly, few of his hearers were "flying-minded," the topicality, and the sincerity of the speakers' words made a deep impression, and I felt that it was all to the good that so vital a subject should be ventilated at a Roadfarers' gathering. Again . . . warm congratulations to "Chief Roadfarer Camm" and the able secretary, Mr. West, for organising such a function.

New Year Resolutions

WE all make them . . . and break them! But for the ardent cyclist there are always one or two excellent New Year resolutions which should appeal. In the first place, how good to resolve, in the very early days of the year, to give a little more attention to tyres! How neglected they still are by a great number of quite keen riders! And yet, to obtain maximum efficiency from cycle tyres, very little trouble is needed. . . . "Under-inflation" is still the chief cause of premature wear, despite the constant concentration of the tyre manufacturers on this subject. Again, I would commend another New Year resolution . . . give a little more attention to the saddle! Broken springs, sagging tops . . . these do not make for riding comfort! Thirdly, I often think it quite amazing that so many riders are so sparing of oil. So . . . for New Year resolution No. 3, I suggest the wording, "I will use the oil-can more regularly." Now, in case I may be accused of "preaching," I will leave New Year resolutions alone!

Festive Windows

WE are not quite back to the "Christmassy" windows of old, but there is a distinct advance over the past year or two. This last Christmas I was overjoyed to see so many cycle-dealers' windows wearing a festive air and a Yuletide atmosphere: it was wonderful what a bit of coloured crêpe paper could accomplish, and several windows I inspected with care deserved high praise for ingenious display ideas and methods. The streets of most of our towns do need brightening up, and I believe that the retail trader can do much to impart a more cheerful air . . . and it should never be forgotten that colour is a real aid to sales!

Looking Back at the Cycle Show

IN retrospect, I think that the show was good . . . very good. It afforded definite proof, if proof were needed, that the British cycle industry is very much alive: the ranges of models were impressive, and if we have now reached a stage when we cannot legitimately expect fundamental revolutionary changes in design, or really startling new developments, the machines nevertheless showed that our designers still have many bright ideas, and that, working on the accepted and proved designs, they can impose numerous and beneficial "refinements" of real value to the rider. Colour was one of the dominant notes of the show, and I could not help thinking, as I toured the various stands, how bright and gay were the bikes of to-day, as compared with the models of my youth . . . usually a sombre black, relieved only by fine lines of red or gold. I welcome this "colour age," as I welcome the more sensible cycling garb of the present generation. . . .

Nocturne in January

EVERY month is a good cycling month to the true lover of the countryside. I am very fond of a night ride in January, when there is just a trace of frost, and the road is iron hard, and the moon is up. Good, on such a night, to ride out into the quiet world, and feel the pleasant nip of the night air on one's cheeks, and observe the stern beauty of the bare trees, and the welcoming twinkle of lights from cottage windows . . . and, particularly, the red blinds of the inn windows, beckoning one to warmth and cheer and comfort inside. Maybe the pool by Bracken Farm is frozen over, and one may look forward joyously to some skating. As one rides along, a stray rabbit darts across the road by Coppice End, and from a ruined barn comes the hoot of a wakeful owl. Yes! salute to January . . . and all the joys of the road which are to come. . . .

The Oldest Cycle Dealer

NO! I cannot give his name, and it may well be that there are many claimants to the proud title. But I do think that it would be intensely interesting if we could hear from some of the veterans in the retail end of the business, and endeavour to ascertain who actually is the oldest working dealer to-day. It is quite certain that there are many retail businesses, still actively engaged in the selling of cycles, which were established in the very earliest pioneer days. I know of several, but I would commend the idea that a correspondence on this subject would be of real interest to many cyclists, and to many men who have spent their lives in the industry. Now . . . what about it?

An Invitation from Southgate Again

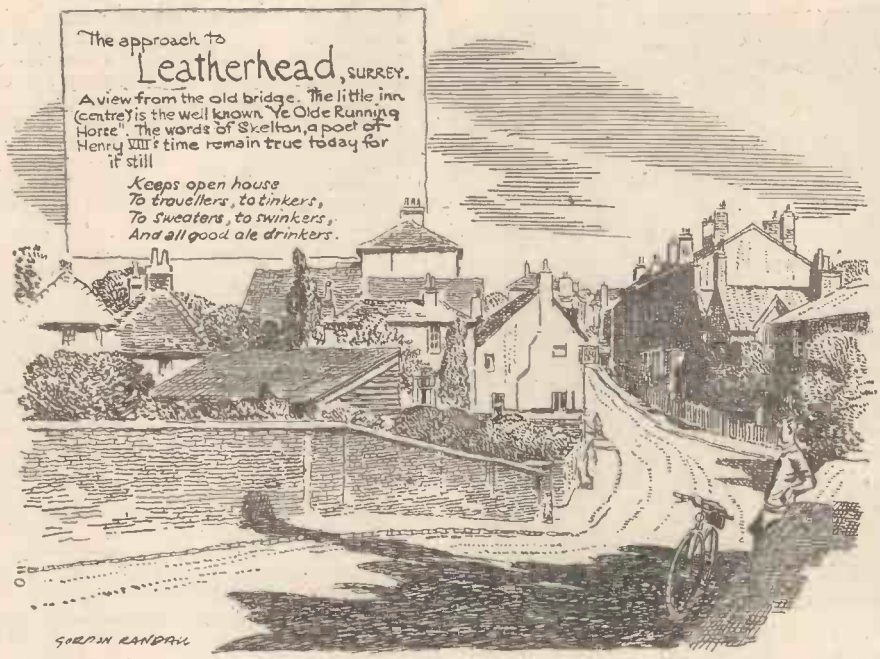
IT is always a pleasure when a speaker at club gatherings and social functions connected with cycling gets a request for a return visit! The Southgate Club, which has a long and honoured history, again kindly invited me to speak at their annual meeting, but most unfortunately I could not accept, owing to a prior engagement. What good memories I have of my last visit, in November of 1947! A cheery crowd, a great distribution of handsome prizes, some excellent speeches . . . and a most enjoyable repast! Nothing like a crowd of ardent cycling boys to ensure a pleasant evening round a festive board! I shall look forward to my Southgate visit next year . . . if I am invited! Meanwhile, all good luck to a great and thriving club.

A Pleasure Ahead

HAVE just fixed up with an old cycling friend to tour with him in Norfolk some time in the spring. Now, I love Norfolk . . . its good coast-line, its old villages, its numerous ancient churches, its little inns . . . and I love, too, that wild, untamed part known as Breckland, where the birds know they have sanctuary. So, some day maybe in April or May, I shall journey forth into Norfolk, where King Coal has no dominion, and where life is still rural and even primitive . . . for one must go to East Anglia to find the true essential England of our forefathers, defying the march of noisy industrialism, content with the tilling of the immemorial land.

My Point of View

By "WAYFARER"



Mountain-moving

THE Weather Correspondent of *The Times* wrote the other day of snow "covering the higher slopes of Skiddaw in the Isle of Man." Is this an example of that faith which can move mountains—or is it just "Pure ignorance, Madam," as Dr. Johnson would say? Those of us who have cycled round the T.T. course, in competition or for sheer pleasure, know only too well that it is Snaefell, and not Skiddaw, which gives us something to think about on the climb out of Ramsey and a feeling akin to delirium during the subsequent long swoop down to Governor's Bridge.

Nodding

ONE day last August I left the little farm at which I was staying in the Dysynni Valley, Mid-Wales, and set forth to do a day's ride of 60 or 70 miles, having as company for the first hour a west country boy who was also a temporary inhabitant of the said farm. (Digression: He occupied a large bed in the single guest-room which the farmhouse has to offer. I, from choice, and in accordance with custom, slept in the little wooden hut standing on the hillside about 30 yards from the house. At this point it would be irrelevant to say—as I am now going to say—that I prefer going to bed in that little wooden hut, because of the sense of solitude and remoteness and isolation it provides. On occasion, too, it has almost imbued me with a sense of fear, for on tempestuous nights the possibility of the whole outfit being blown away and deposited in the next valley has impressed itself on my mind. What a nuisance it would be to have to walk back, unshaven and unwashed, to the farm for breakfast! End of digression.)

My temporary companion and I made our way through that slit in the mountains whereby, curiously enough, the River Dysynni travels in order to quit the valley in which it was born to reach the valley to which it gives its name. After crossing the low ridge of that route through the gap, the lane—and it is no more than a lane, and rough at that—divides, the right branch plunging abruptly into the grey village of Abergynolyn, while the left branch strikes off in the direction of Tal-y-llyn, joining the main road along the floor of the valley near a picturesque cottage which almost sits in the River Dysynni. My intention had been, as usual, to take the left fork, there being no purpose in traversing two sides of a vague triangle when one would suffice, but my young friend (who, as it transpired later, wanted to buy and despatch a picture-postcard) took the right fork, and I followed. He floated serenely down the hill on his free-wheel, and disappeared from sight. He did not see the next act in what might very well have been a tragedy. On the other hand, I had a "close-up" of the affair, which intimately concerned me. The unexpected change of route must have caught me on the wrong foot, and, before I could say "Jack Robinson," my bicycle was running beyond my control.

I have the reputation of being a quick thinker. Certainly, on that occasion, I thought with extreme rapidity—and the indecision which often enough characterises my cycling movements vanished into thin air. I realised like lightning that I must "get out" somehow. Being no longer sufficiently agile to jump backwards off a bicycle going at speed, I deliberately crashed into the roadside bank, and—with much less deliberation!—lay down. My head banged on a bit of Wales which, fortunately, happened to be very soft. I was on my feet in a jiffy and found myself apparently sound in wind and limb. My fork lamp bracket, which had taken part of the bump, was crumpled, and my ice-cream jacket was even less white than usual; and that was the extent of my "injuries." Walking soberly—very soberly—down the hill into Abergynolyn, I rejoined my companion, who was blissfully ignorant that anything untoward had occurred; nor did I enlighten him.

If this incident was a case of "Jove nodding," then it must not recur. There can be no safe encores to such a proceeding!

Old Hands at the Game

I NEVER did set much store by the psalmist's arbitrary suggestion that "three score years and ten" is the maximum age of man—especially when I recall the vast number of human beings who die in middle age, though they still walk about, and go through the motions of earning their keep! And I was very interested to learn the other day of an old Cheshire friend of mine (now living in the Isle of Man) who, at the age of 77, has just bought a new bicycle. Then, almost simultaneously, I was reminded of the case of the president of my first-claim cycling club. Bert Green is secretive on the subject of age, but he admits that his years are not quite the same number as his gear—76. He is very nimble on a bicycle. The Anfield Bicycle Club holds a maximum of 52 or 53 runs a year—the total is governed by the number of Saturdays—and for the last 36 years Green has achieved an average attendance of 50 runs a year.

Again, we must not forget the case of Sid Capener, an ex-president of the Speedwell B.C., which is still to be seen regularly cluttering up the roads of Warwickshire at week-ends, and who puts up wonderful rides in order to attend old timers' rallies. Another of the "old gang" is our own F.J.U., who, though a mere chicken compared with the three above-mentioned, is a most regular and consistent (and persistent) trundler of bicycles. And yet another—but my innate modesty calls a halt at this point! Our pastime, however, is a grand game, but the pity of it is that so many potential old-time cyclists throw in their hand before they reach the age of 30. What a tremendous loss is theirs!

Misplaced Delight

THE very reliable dramatic critic of the *Birmingham Post* is filled with righteous indignation on account of the reception accorded at one of the local picture-houses to the showing of the Crown Unit Film production dealing with road safety. "At each narrow escape of a thoughtless walker, a howl of laughter went up from the audience; and when a cyclist with his head down crashed into a vehicle they shouted with delight and drowned the voice of the commentator for at least 15 seconds. *This was an official film designed to help in keeping death off the road.*" (My italics.)

The writer returns to the point, finding some possible explanation in the circumstance that the exhibition took place on a Sunday night, "when the city cinemas are visited by a large number of suburban adolescents who are ready to laugh at anything," and he deplores the fact that 2,000 young people roared at the sight of a man's head crashing into a wagon, "and the laughter continued even when he fell, a crumpled heap, into the road." I share this condemnation of a mentality which makes well-nigh hopeless any organised attempt to "keep death off the road." If all these tragedies which disfigure our national life, which strongly deny our much-vaunted culture, and which (as to an immense percentage) are totally unnecessary, are but the occasion for laughter with the nit-wits who frequent Sunday cinemas, then it is a poor look-out for the future of humanity.

True is it that "the empty vessel makes the most sound," the proof of which saying any cyclist can discover by riding a bicycle with a flat back tyre through suburbia. The loud guffaws which proceed from the open-mouthed idiots (as yet uncertified, of course) on the side-walk tell their own story. To them such a sight is excruciatingly funny.

Forgotten Again

A BRITISH RAILWAYS advertisement says: "Autumn is fast fading. There's only the prospect of Christmas to brighten the drab, daily round of winter." Just fancy that! Yet thousands of cyclists, who are to be found awheel each week-end all the year round, know that Christmas is not the only ray of light during this so-called "drab" season. With the aid of a bicycle, winter can indeed be bright and cheerful and full of colour, and along the road there await the cyclist a hundred-and-one pleasures. Try it, and see for yourself!

There Are Others

IN the course of an article about the Yukon, which I was reading in a Scottish periodical the other day, I came across this fragment: "The best hotel, the White Horse Inn, is expensive and uncomfortable; the others have little to commend them." There is no need, however, to travel some 6,000 miles in order to parallel that state of affairs, as we cyclists know full well!

Paragrams

(*Continued from page* 26).

speakers traced the progress of the club since it was formed in 1927 and guests included riders from Birmingham, Leicester and Middlesbrough, as well as from neighbouring clubs. Considerable progress has been made during the past three years, particularly in track racing, and over £1,000 worth of prizes, with many trophies, have been won during the period.

Tests Too Easy?

MEMBERS of Leicester and County Accidents Prevention Council have suggested that the safe cycling scheme for boys and girls attending Leicester schools is not as successful as it might be. The Chief Constable, as the Council's secretary, said the boy cyclist was one of the biggest dangers on the road to-day and should be taught to use his cycle properly, and it was generally considered that the tests are too easy. The opinion of several local schoolteachers is that the safety medal is too easy to win and not worth having when won, and it is now proposed that the tests shall be made harder, and shall be held on the unopened roads of a new housing estate.

Bigger Rear Lights?

IN his report of road accidents in the Isle of Ely up to the end of October this year, the Chief Constable comments on the fact that several accidents have been caused by faulty rearlights. He suggests that rearlights on all vehicles, including bicycles, should not be less than two inches in diameter and ought to be clearly visible for a distance of at least 300 yards. He also says that car sidelights are too small and they also ought to be two inches in diameter. The County Road Safety Committee agreed with the Chief Constable's remarks regarding vehicle lighting and decided to send a resolution on the subject to the Ministry of Transport.

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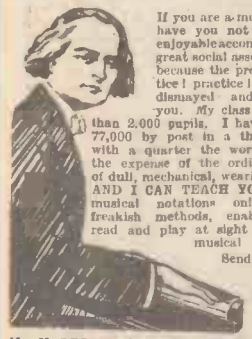

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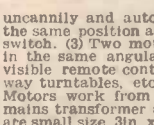

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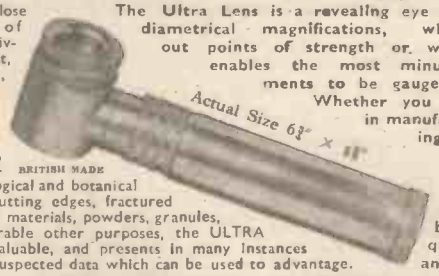

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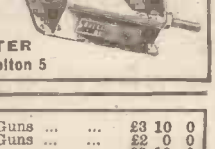

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