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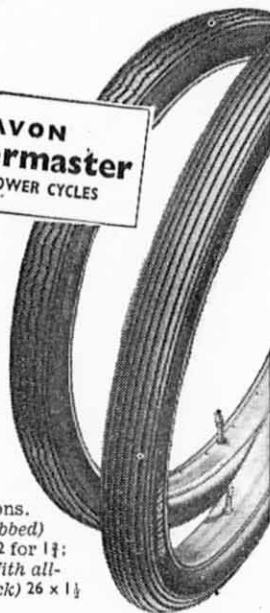
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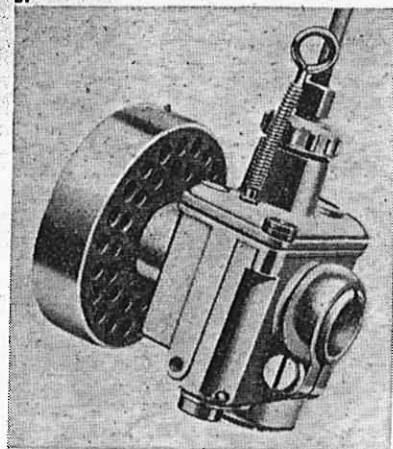
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THE POWER & PEDAL Cyclemotor and Autocycle HANDBOOK

By

G. M. DENTON

Edited by

FRANK L. FARR

ACKNOWLEDGEMENTS ARE MADE TO ALL THE MANUFACTURERS AND IMPORTERS OF MACHINES AND EQUIPMENT WHO HAVE PROVIDED MATERIAL AND ASSISTANCE IN THE COMPILATION OF THIS HANDBOOK.

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CONTENTS

	PAGE
CHAPTER 1—CYCLEMOTORS PAST & PRESENT ...	11
CHAPTER 2—THE CHOICE	15
CHAPTER 3—LICENCES, INSURANCE AND THE LAW	21
CHAPTER 4—MOTOR FITTING AND CYCLE MAINTENANCE	25
CHAPTER 5—COMFORT	31
CHAPTER 6—RIDING AND RUNNING IN	33
CHAPTER 7—LUBRICATION	41
CHAPTER 8—NAMES OF PARTS AND USE OF TOOLS	44
CHAPTER 9—FUEL AND FUEL SYSTEM	49
CHAPTER 10—ELECTRICS	55
CHAPTER 11—DECARBONISING	64
CHAPTER 12—ROADSIDE TROUBLES	72
CHAPTER 13—CLOTHING	75
CHAPTER 14—TOURING	78
TECHNICAL DATA TABLE	90
REFERENCE PUBLICATIONS	92
STOP PRESS: NEW AUTOCYCLES	93

LIST OF ILLUSTRATIONS

	PAGE
Engine positions	13
B.S.A. "Winged Wheel"	19
Checking steering head	26
Typical tyres	28
Teagle	35
Phillips' Motorised Cycle	40
Oiling cables	42
Parts of engine	45
Using spanners	47
Box spanner	48
Amal carburettor	50
B.E.C. carburettor	53
Typical lighting circuit	58
Miller flywheel magneto	60
Wipac magneto	62
Trojan Mini-Motor	81
Vincent Firefly	82
Itom Tourist	83
Cyclemaster	84
Mobylette	85
Excelsior	86
J.L.O.	87
N.S.U. "Quickly"	88
Berini M.21	89



THE AUTHOR

GEORGE DENTON, known as a competition motor-cyclist in pre-war days and a D.R. Instructor in the Royal Corps of Signals in the war years, returned to peace as General Manager of a small chain of cycle shops.

In the course of Continental tours in 1947 and 1948 he was profoundly impressed by the wide public of what he describes as "the non-motor-cycling type" who were cyclemotoring. His firm became main agents for the then new Trojan Minimotor, and in the next three years sold hundreds.

1952 found him at Mini-Motor (G.B.) Ltd. as Sales Manager and an active cyclemotor rider. He and another Mini-Motor staff man became the first cyclemotorists to get awards in the A.C.U. Rally, repeating this performance the next year on a prototype two-speeder when nearly half the entry retired owing to weather conditions. In the same year he got a premier award in the A.C.U. Cyclemotor Trial and tied for first place in that event in 1954. He also competed in the 50th Anniversary London-Edinburgh run, completing the 397 mile course inside 24 hours.

INTRODUCTION

THE object of this book is to offer, as it were, father-to-son advice on the use, maintenance, understanding and, indeed, enjoyment of power-assisted cycling. There are chapters describing the different machines and attachments on the market to-day, a "Buyers' Guide," some notes on suitable clothing for either sex, and touring at home and abroad.

This book is not a substitute for, nor does it quote great chunks from, two other publications which every cyclemotorist should have. One of these is the manufacturer's instruction book for the particular machine owned, or to be owned, by the reader; this will set out the precise sequence for dismantling, checking, etc. The other publication is the Highway Code, which tells how to do and be done by fellow road-users.

This book includes an index plus a list of manufacturers' technical publications and where and how to obtain them.

Croydon, 1955.

G.M.D.

CHAPTER I

CYCLEMOTORS—PAST AND PRESENT

Immediately after the war, an old idea for motorising the ordinary pedal cycle received fresh thought and development. Previous attempts had failed—they had proved a passing phase—mainly because the engines used had been too heavy, too "rough" and far too unreliable. Post-war cyclemotors were far smaller, smoother-running, and an average weight including fuel was under 30 lbs.

Nearly all the first cyclemotors were two-strokes of less than 50 c.c., which meant a working cylinder of one-twelfth of a pint, or about one-third the size of a pre-war lightweight motor-cycle engine. They ran on a mixture of petrol and oil and were clipped to the front or back of the bicycle, which they drove with a sort of flat pulley or roller pressing against a tyre.

These new cyclemotors spread across transport-hungry Europe like a swarm of buzzing insects. Holiday-makers from the U.K. were amazed to see and hear them singing their way through towns and villages and even up the mountain passes in Switzerland, France and Italy. But the thing that struck strangest to British eyes was this: whereas at home a motor-cyclist was a fairly clearly-recognisable type, clad in dirty mac, waders, goggles, etc. (no offence is meant and the description fits the writer anyway!) Continental cyclemotorists were ordinary men and women dressed in ordinary clothes. Here were the shopkeeper, the housewife, the clerk, the farmhand and the priest, each going about the daily round with a tiny motor doing the work. It was a minor revolution in transport.

In 1948, Trojans of Croydon made and pioneered the first Mini-Motor in England. It closely followed an Italian design and Continental practice generally. Since then others have come into the market. All have engines of less than 50 c.c., and the ways in which they are mounted and drive the cycle are shown in the diagram on p. 13.

Cycle attachments, as the name implies, are made to fit existing cycles—that is, any cycle which is in sufficiently good order to stand continuous use at what amounts to top touring speed. Quite recently there has been a further development towards a motorised bicycle sold as a complete vehicle. This is a pedal cycle specially designed to take the small cycle engine. The engine is built in rather than fastened on, yet it is still essentially a bicycle which can be pedalled home in an emergency and which may require pedal assistance on steep hills, and, of course, to start the motor. It should not, however, be confused with an autocycle nor a motor-cycle, from both of which it differs greatly in weight, simplicity and purchase price.

Just what will an engine of 49 c.c., or slightly less, do in terms of road performance? There is considerable variation in performance as between different units, some putting the accent on climbing power, others on average speed. In general, level roads and minor ups and downs are taken without any pedalling at all and at a speed of 20 m.p.h. or a little more. On long, gradual slopes, for which it is not worth the pedal-cyclist dismounting, the cyclemotorist will probably not pedal at all, but his speed will be reduced. The cyclemotor has almost unlimited stamina on long and otherwise tiring hills.

On the type of hill which forces the not-too-athletic type of pedal-cyclist to dismount or to put in some gruelling work in low gear, the cyclemotorist will be seen pedalling continuously but with comparatively little effort and at practically no reduction in speed; he will probably be putting out as much personal effort as the rider of a pedal-cycle on a level road against a breeze. And talking of breezes, the help of a cyclemotor against headwinds is similar to its help on hills; the motor does most of the work.

The effects of motorising a cycle vary with different users. For the daily go-to-worker—and here we quote a postman who starts work at some unearthly hour—it is an extra ten minutes in bed! For many other go-to-workers it is a means of steering clear of buses and trains during rush hours, and keeping that comparative freedom from the common cold experienced by people who travel outdoors in all weathers.

As a hobby, cyclemotoring will not appeal to the keen and enthusiastic cyclist who enjoys road burning and the exercise entailed, at least, not until he reaches middle age. Then, if *Power and Pedal* postbag is any guide, quite a proportion of these enthusiasts come

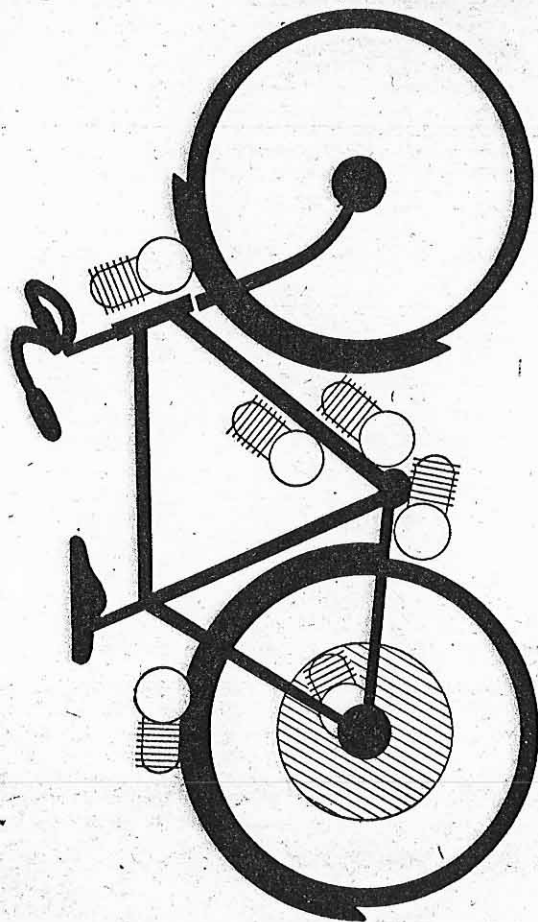


Diagram showing the various positions of attachment engines.

back to cycling in the knowledge that most of the hard graft will be done for them by motor.

The universal feature of cyclemotoring seems to be a widening of the horizon. People who hardly ever cycle out of the parish will cyclemotor all over the county. People who already enjoy travel go to the South of France and back in a fortnight's holiday. Peter Lee-Warner has ridden a Power-Pak round the world, so there are really no limits to cyclemotor travel other than those dictated by common sense and the money and time available.

CHAPTER II

THE CHOICE

"Which is the best cyclemotor to buy?" *Power & Pedal* is asked this constantly, and there is no simple answer. While there are numerous variations in motors, there are far greater differences in the kinds of use they will get, and it is the latter which so often determines the choice of motor. However, within the limits permitted to the published word, we will try to indicate some of the pros and cons of the different types.

How much money is available?

If there is £40 or more, then it is well worth considering one of the several motorised cycles complete.

These machines differ from ordinary pedal cycles in that they are specially designed for motor drive. The frame gives a lower riding position and in many cases is so shaped that a full-length coat can be buttoned well down so as to give maximum weather protection. Larger and more comfortable saddle and tyres and, in some cases, sprung forks are fitted. Most important of all, brakes are usually more powerful and of a type less affected by rain. Their cost is often no greater than a cycle and motor attachment bought separately. Both items are subject to purchase tax and there is no longer any advantage in purchasing separately as there was until March, 1955. Even so, the cheapest motorised cycle at the time of writing is priced at £38 odd, and if such an amount is not easily spared, then the new rider must choose a cyclemotor attachment which may cost less than half that figure.

New or Second-hand?

In the car world *Ford's* offer what to all intents and purposes is a new engine for the old car at a fraction of the price of a new car. It is an excellent scheme, and there are at least two cyclemotor

makers in Britain who offer similar facilities. Now just supposing the Dealer, instead of offering his customer this engine from Ford's, said: "Here's a second-hand engine going cheap. It's had only eighteen months' use and the owner learned to drive on it." No car owner in his right mind would entertain such a proposition, yet this is the sort of thing that happens daily with cyclemotors. Completely inexperienced people in need of cheap, reliable transport buy second-hand cyclemotors and buy trouble. When £5 to £10 have been spent on repairs and renewals on top of the second-hand price, the purchase becomes uneconomic and the motor is worth very little for subsequent re-sale anyway.

Power & Pedal, and those manufacturers with whom we have discussed this problem, continuously receive letters from disheartened owners of second-hand units who wish they had never heard of cyclemotors. If these correspondents re-purchase new, then their confidence and enthusiasm is revived: more often it is a case of once-bitten, and our hobby loses a recruit.

There must obviously be some good second-hand buys, but the odds are against the buyer. If you want to gamble, here are a few suggestions for shortening them:

Do not consider a motor that has been taken off a cycle and is offered in a box. The owner is unlikely to have taken it off his cycle if it was performing well; he may, indeed, have flogged it to death. Instead, you should see or try the engine on the road. It should start easily from cold and climb a hill as easily as any other cyclemotors that go by at the same time. Then, with the engine running and the cycle still, listen to the engine at tick-over and briefly with the throttle half open. If there is a hideous mechanical rattle, leave it for somebody else. Remove the clip-on cover of the flywheel magneto and try to rock the brass flywheel up and down by hand; there should be no shake, and if there is, then the main bearings are ending their useful life. Look at the nuts and bolts at various points on the unit. If the corners of the nuts are burred over and the ends of the threads worn or crossed, it is a sign that the machine has been "played with" too much for reliability. Watch out for oil leaks from the engine itself and petrol leaks from the tank seams and the carburettor.

Where makers offer exchange engine service or overhauls at all-in fixed prices in the neighbourhood of £4-5, these machines will always hold a fair second-hand value because they are backed by this service.

Motor Mountings

There is no unanimity among the manufacturers as to where to mount the engine or how to transmit the drive. There are four main schools of thought, as follows:—

Friction-drive on Front Wheel

This had the disadvantage that the front fork of the average bicycle is not the strongest member on which to hang an auxiliary engine. There is a further difficulty in keeping oil from the exhaust off the rider's clothes. The *Velo Solex* as a complete motorised bicycle avoids both these snags, but front-wheel "clip-on" auxiliary units are now going out of favour, at any rate in this country.

Roller-drive on Rear Wheel

Somewhat tail-heavy. Engine out of the way of rider and road dirt and very accessible for maintenance. Inclined to throw mud on rider and into free-wheel. There is also a motor similarly mounted which drives by belt.

Roller-drive Under Bottom Bracket

Somewhat exposed to the elements and not too handy for maintenance. Particularly good for balance (low centre of gravity for the whole machine) and leaves front and back end of cycle free to carry panniers, shopping basket, etc.

Chain- or Gear-drive Within Rear Wheel

Is sold as a complete wheel. Somewhat tail-heavy. Incorporates an effective rear brake. Accessibility differs as between the two makes in this type. There is no roller-slip problem and no special tyres are needed with these units.

Autocycles, with the exception of the *Velo Solex* referred to above, all have engines mounted near the bottom bracket and drive by chain.

Choosing a Cycle Attachment

It is worth taking time off one evening or week-end to compare the hill-climbing abilities of different makes on the hills you are going to use. Keep an eye on the probable weight of the riders, as the self-same motor which will call on a largish man to pedal-assist will rocket a feather-weight girl up with no assistance whatever!

For frequent travel through towns where slowing, stopping and re-starting in traffic are to be expected, then a machine fitted with a

clutch is advisable. A clutch enables the machine to be halted without stopping the engine; without one the engine has to be re-started by pedalling after each stop. On the outskirts of a town or in the country a clutch is a refinement (some even say a complication) which the cycle-motorist can do without; in cities a clutch is a "must," and it is perhaps significant that all the newest motorised cycles are so fitted.

For long-distance riders there are two other important points to be borne in mind: luggage-carrying, which is made particularly easy by motors with the bottom bracket mounting; and long periods between decarbonising operations, explained on p. 64 *et seq.*

The sports lightweight type of cycle, which most of the keenest cyclists favour, needs a sports lightweight type of engine, which is light, fast and fits under the bracket. This can, of course, become a somewhat daring combination unless the brakes are matched by the performance.

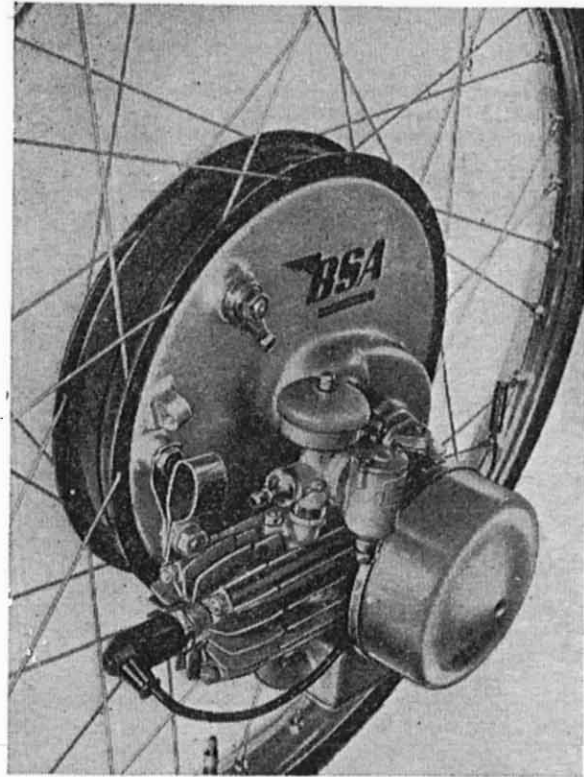
Incidentally, this raises the whole subject of what is a suitable cycle on which to mount a motor. It need not be built on the lines of a battleship! Providing it is in good order, an ordinary *touring* cycle is fine: the older ones having high frames and 28" wheels are not so good in that they are less stable than the modern ones fitted with 26" wheels, and the addition of a motor is not going to improve matters. The bottom bracket is the only place where the additional weight is no hindrance, but with most of these old machines this mounting is precluded by the brake positioning.

Tandem machines cannot usually accommodate bottom bracket mountings, either: they can manage almost anything else, however.

Choosing an Autocycle

Although there is still some confusion about nomenclature, the general tendency of the trade is to describe the separate cycle and engine as a cyclemotor and the built-in-one-piece machine as an autocycle. The name autocycle, however, covers a wide and still widening range of machines, varying in engine capacity from 32 c.c. to 98 c.c. and with single- or two- or three-speed gears. Nearly all of them have the engine positioned in front of the bottom bracket, but there resemblance ends and the choice of machine has to be made on a variety of factors.

Engine capacity, power output, gearing, control systems, weight, price and appearance will all affect choice, as well as less-easily dis-



B.S.A. Winged Wheel.

The large hub is the drum of a 9in. internal expanding brake and also contains the clutch and gear drive.

coverable virtues such as economy, accessibility, spares and service facilities, comfort and long life ; all these count in making the choice and, as with the attachment engines, the right machine is the one that is right for one buyer's purposes. Generally speaking, it is best to start with the lightest and simplest machine that will carry your weight at the speed you require in the kind of country over which you travel. There is no point in paying for a high-efficiency engine and a two- or three-speed gear-box if you will never use that performance ; and at the same time, there is a deal of pleasure in riding a quiet, light and simple machine that really gives the idea of cycling without the hard work.

The tabulated data on the list of machines on pages 90/91 of this book will help you to decide on the type of machine most suited to your needs.

The trend of development in autocycles is for them to divide again into a lightweight, single-speed type that retains the true characteristics of the motorised cycle on the one hand, and the more expensive and higher performance vehicle with gearbox and a considerable degree of enclosure on the other. This latter type, indeed, is moving towards the ultra-lightweight scooter class with full weather protection for rider and machine.

The 98 c.c. machines, which are relatively heavyweights and can by no means be classed as motor-assisted cycles, cater for a special market but still have a steady following in Britain.

Recommendation from one person to another often plays a big part in the choice of a cyclemotor, but be sure that the man who praises his motor with such enthusiasm has had it a reasonable time, and that the chap who condemns his has given it a chance. One canteen gossip can almost outlaw a particular motor in one factory, while there may be a group of satisfied riders of the same machine just up the road. One recommendation that is worth-while is the name of an enthusiastic, knowledgeable and honest Dealer.

Cycle and Motor-cycle Dealers who give good service on these small engines are becoming more numerous, and when continuously good reports are heard of one such firm locally it will probably pay to discuss the different makes and prices with him, and to listen to his advice.

CHAPTER III

LICENCES, INSURANCE AND THE LAW

In order to comply with the law, you require :

- (a) A driving licence for yourself.
- (b) An insurance against injuring other people.
- (c) A road licence for your cyclemotor.
- (d) Number plates, horn, licence holder, lighting, etc.

Driving Licence

Unless you already have a driving licence which says : " is licensed to drive Motor Vehicles of all groups " you need to take out a provisional licence in Group G. This can be obtained by post or call from the Motor Licensing Department of your County Council on presentation of a completed form D.L.1 (from a Motor Licensing Department or a Post Office) plus a fee of 5/-. This provisional licence lasts for three months only, and while it is in force your machine must carry " L " plates. After six weeks you may apply for a test (price 10/-, see form D.L. 26 from a Motor Licensing Department or a Post Office), and if successful, an annual driving licence (Group G), price 5/-, will replace the provisional one.

Insurance

The law requires that every rider of a mechanically-propelled vehicle be insured against 3rd Party claims, i.e. against injuring other people. The normal insurance policy, however, goes a little further than this and extends the cover to third parties' property as well as persons. A Certificate of Insurance has to be issued which must be presented to the Motor Licensing Department whenever a Road Licence renewal is required (see below) and to a Police Officer on request.

Apart from this compulsory insurance, the machine can be insured against accidental damage and loss by fire or theft. Insurance companies' rates vary, some charge more heavily for riders living in

densely-populated areas such as London and Glasgow, and some penalise riders under 21 years of age.

There are variations in cover provided as well as rates charged, and it is as well to check over the prospectus before taking out a policy. A point well worth checking is whether your cover extends to other licensed riders driving your machine. This is most important, as if you lend your machine to a friend, even for a brief try-out down the road, without legal cover both you and he are liable to very serious penalties.

A point to be borne in mind is that the cover is needed so long as the engine is attached to the vehicle, whether in use or not.

Ask your agent to see that all these points are covered when he arranges your insurance. If you prefer to arrange your cover yourself you can get very favourable rates, conditions and service from the *Power and Pedal* Insurance Agent, 197, Temple Chambers, London, E.C.4; FLEet Street 0040, who will advise the best cover for your requirements.

Road Fund Licence

If you are buying new, your Dealer will almost certainly offer to see to the formalities for you. He will help you complete form R.F. 1/2, will issue an insurance cover note and send or take these, together with evidence that your motor has never been registered before, to the local Motor Licensing Department; on paying the licence fee (17/6d. per year, 4/10d. per quarter, and pro rata) the registration number of your new machine will be decided and the licence disc issued. A Registration Book, often referred to as the machine's Log Book, will be sent to you later direct by post.

If you are buying second-hand, simply follow the instructions as to transfer of ownership and re-licensing set out in detail in the Registration Book.

There is a detailed difference between the registration of motorised cycles (autocycles) and attachments. The identity of the former is the frame number, which means that the owner may not take the number plates and tax disc and transfer to another machine. With the cycle attachment, the identity is the engine number; the engine is registered and taxed and it may be transferred from one bicycle to another. Sometimes riders having two machines take advantage of this, particularly when one is a tandem.

Number Plates

Two of these are required. One facing front, or a two-sided flat vertical surface. The rear plate must be illuminated at night. The distances between and thicknesses of letters and figures are legally defined and must be observed exactly.

Number plates may be painted white on black, or transfers (1d. each) can be stuck on and varnished. Or plates may be purchased in embossed aluminium at 14/6d. per pair. Your dealer or accessory shop will sell you transfers of the regulation size, but beware of using any intended for other purposes such as house numbers, as these are almost always insufficient to comply with the regulations.

Licence Holder

This is governed by regulation, too, so do not try to make your own. Regulations call for a glass front, so do *not* replace with plastic. The licence holder can be mounted anywhere between handlebar and near spindle, so long as it is visible to an observer standing on the near-side of the machine.

Horn

All mechanically-propelled vehicles are compelled to carry an audible warning of approach device which may NOT be a bell, gong, whistle or siren. Put simply, a bicycle bell is illegal on a cyclemotor, but a small bulb horn (about 5/-), an electric hooter (15/-) or a Klaxon (8/-) will meet all requirements.

Lighting

After dark, a cyclemotor must show a white light to the front and a red light (1½" diameter) and a red reflector (1½" diameter) to the rear. The rear number plate has to be illuminated, for which purpose the rear lamp usually has a clear window which allows a white light to shine on to the rear number plate on which the lamp is mounted. If a head-lamp bulb of more than 6 watts is used, a dipping device must be incorporated to avoid dazzle.

General

All riders must read and, indeed, learn the Highway Code. There is scarcely any road situation on which this little book will not put you right. The price is 1d., and it is available from Motor Tax Departments and booksellers.

It is a legal requirement that machine and tyres are in such condition that they cause no danger to rider or others, and that brakes

and steering are in order. Cyclists—a great many of them, anyway—are not terribly concerned with bald and splitting tyres, with having two brakes that really work, and about such details as broken spokes, slack wheel bearings and the like. They get away with this on short distances at ambling speeds. When a motor is fitted, these details, if neglected, might lead to a prosecution by Police, as well as endangering the rider and public.

Let it be said at once, in fairness to cyclemotorists, that such neglect is rare. On the contrary, this new form of transport seems to have attracted a careful body of road users whose comparative freedom from accident is reflected in very low rates for insurance.

Passenger-carrying

A cyclist may—and often does—carry a child on a seat on the top tube. A cyclemotorist may not: a solo machine may carry not more than one passenger, who must sit astride the cycle, *behind the rider*, on a properly constructed seat and with foot-rests firmly attached to the machine.

A Learner Driver (the holder of a provisional driving licence only) may not carry a passenger unless that passenger is qualified to hold a "full" driving licence in class G., except that the No. 2 on the tandem is not required to hold a driving licence of any sort.

CHAPTER IV

MOTOR-FITTING AND CYCLE MAINTENANCE

The actual fitting of a cyclemotor is best left to the Dealer who supplies it. It is not just a question of following the maker's instructions and being a good handyman, but of knowing what you are doing, and why. For some makes there is a recommended fitting charge of up to 15/-, while others are fitted free. The great advantage of the Dealer fitting is that the machine can be road-tested and demonstrated before the new owner takes possession.

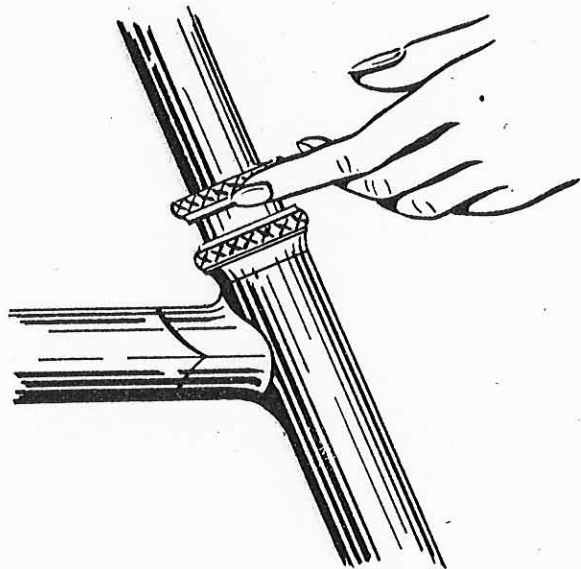
A cycle should be put in good mechanical trim before an engine is mounted onto it. If the auxiliary unit is to be purchased new, the Dealer will do this at the same time as he fixes the motor. His charge is usually of extra shillings rather than pounds. The cycle must then be maintained in good order and the points to watch particularly are these:

Steering

Check the steering head for play by applying the front brake and pushing the cycle forward and back. If there is a feeling of slack, place a finger on the steering head nut and see whether the handlebar stem is moving in relation to the cycle frame. If it is, slacken the steering head lock-nut and tighten the ring until play disappears. Then re-secure the lock-nut and check again. Having removed the unwanted play, make sure that the head is now not too tight. So lift the cycle by the top tube and see that the handlebar is quite free to swing from side to side. If it is not, then the steering head has been over-tightened and must be re-adjusted.

Brakes

Always replace rim-type brake blocks before they become completely worn out. If the rims have become greasy owing to contact with exhaust smoke or oil, de-grease with carbon tetrachloride or clean petrol—not petrol. Take up adjustment on cables or rods so that brakes are just free in the "off" position. See that brake levers are



Checking the steering head for play.

clear of all obstructions and, in particular, that their movement is free should absolute maximum pressure be required in an emergency.

Internal expanding brakes, already fitted to some machines, are likely to become more common on motorised cycles. Their great advantage is that they are relatively unaffected by wet. They require little maintenance, but the linings must be kept free from grease and oil. Among other things this means that the manufacturer's recommendations for greasing or oiling the hubs must not be exceeded, or the surplus lubricant may find its way past a felt excluding washer and on to the linings.

If this should happen, a slight penetration can be removed by scrubbing and dipping the brake linings in carbon tetrachloride. But once linings have become really saturated, it is usually necessary to re-

place them, having made certain, of course, that the oil leakage will not recur.

Where available, it is better to purchase service shoes with factory-fitted new linings (handing in the old shoes in exchange) rather than try to fix new linings. Incidentally, linings are fitted with countersunk rivets and are ready for replacement when the linings get down to the level of the rivets.

Wheels

Wheel alignment should be watched, as this adjustment is more likely to go "out" after a motor has been fitted than before. The easy way is to watch, or get somebody else to watch, the machine from the rear, running on a straight road. Thus viewed, any misalignment is obvious, and should be cured by altering the position of the chain adjusters.

This alignment can be accurately checked by two people stretching a piece of string and holding it against the sides of front and rear tyres. If the wheels are in line, it will touch both tyres twice; if they are not, it won't. If the frame is out of line, then the wheels cannot line up.

Slight frame misalignment does not matter greatly, but if there is doubt, take expert advice.

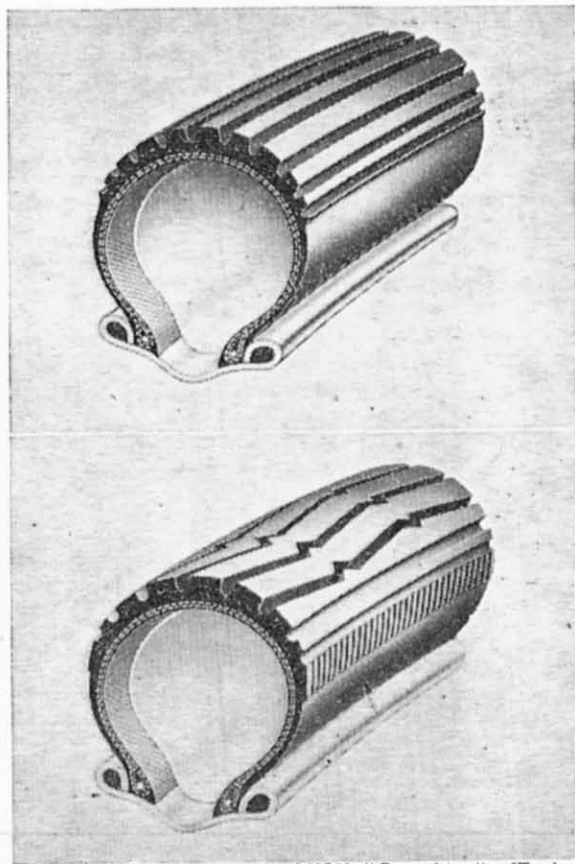
Spin both wheels to make certain each is round and true; this is particularly important for any wheel which is roller-driven. Strum on each spoke with a piece of wood. Each should "ping" with a musical note of much the same pitch. If some of the spokes are slack or missing, then a competent agent should be consulted. Wheel-building and spoke adjustment are *not* jobs for the amateur.

Check and adjust wheel cones so that no side play is perceptible at the rims, but the wheel should spin freely pendulum-fashion on the weight of the tyre valve alone.

Tyres

Look for bulges in the tyre walls such as might have been caused by knocking into curbs, etc. Such bulges are a warning of possible concussion bursts, and should be watched very carefully.

If the tyre is to be roller-driven, a sort of continuous pattern is to be preferred to a studded tread. If the latter is already fitted, it may pay to remove and store for future use on the other wheel. Replace with one of the types designed for roller-drive.



Typical cyclemotor tyres, the AVON "Powerdrive." (Top) Straight ribs for direct drive. (Bottom) Zig-zag tread for roller drive.

When "clip-ons" were first offered for sale, the average cyclist, having chosen a motor, had it fitted to his bicycle and rode away expecting all the ease and economy of the cycle with none of its labour. Unfortunately, his satisfaction was often short-lived, for after

riding a comparatively small mileage he found that his tyres—which before the motor was fitted, often lasted for years—were in a very sad state.

Even today, although many of the motorised wheels and special cyclemotors have suitable tyres fitted, a considerable number of motorised cyclists are using ordinary tyres. These tyres, made for normal pedal cycling, may have a short and unsatisfactory life on power machines.

Cyclemotors fall into two main categories: "roller-drive," where the motor drives via a roller pressed against the front or rear tyre, and "direct drive," where the power is transmitted to the wheel hub by gears, chain or belt.

When buying for cyclemotoring it is advisable to obtain tyres as large as possible within the limits imposed by the cycle forks, for by using a larger section, a lower pressure may be used which increases riding comfort and lengthens machine life.

The inflation pressure at which a tyre should be used is determined by the weight of the rider and machine, the tyre section and the speed of the machine. Cyclemotors rarely exceed 25 m.p.h., and thus speed is of no great consequence. The load and tyre section, however, must be carefully considered, plus the additional effects of the roller-drive, where applicable.

Such a wide range of variables makes it impracticable to give a table showing front and rear pressures for every model.

If your machine is somewhat choosy as to tyre pattern (and this applies chiefly to roller-drive machines which drive better with continuous as distinct from studded or broken tread patterns), consult a competent dealer. From his knowledge of the use it will have and the weight it will carry, he will also be able to recommend a suitable pressure. In order to obtain the best service from tyres, it is very important that the correct pressure should be maintained.

Tubes that are fitted with Schrader valves should be tested with a gauge at least once a week. Always replace the valve cap firmly; this is the final and most effective seal. Wheels should be correctly aligned and any stones which become embedded in tyre treads should be removed. Any oil or grease on the tyres should be wiped off immediately.

If these points are watched carefully and the cyclemotor is driven at reasonable speeds with moderate acceleration and braking, cycle-

motor tyres will not only give excellent service, they will cost the owner little more than on an ordinary touring pedal cycle.

Free-wheels

If the roller-drive is over the back wheel, grit and moisture will be thrown into the hub in wet weather, and some of this will find its way into the free-wheel and ruin it unless, of course, it is well protected by a chain case or guard.

Up to now, manufacturers of roller-drive attachments have not supplied free-wheel guards as original equipment, possibly because of the difficulty of making a guard which would fit and protect any and every bicycle. One firm market a separate guard for 5/-, or it is quite easy to shape and bend a piece of aluminium.

Some special free-wheels have been marketed, and many riders use coaster hubs to avoid free-wheel troubles with this type of engine fitting.

Lights

Finally, make certain that your lighting system is up to standard, and remains so. Most cyclemotors have a dynamo output which, when connected to suitable lamps, gives a good driving light for cyclemotor speeds. The point to watch is that somewhat rickety old lamps with duff reflectors may be alright for bobby-dodging at little over walking pace, but are downright dangerous and not bright enough to be seen by other road users at, say, 20 m.p.h. Don't clip a front lamp (or any other accessory) round the fork blade; vibration may loosen it and allow it to turn into the wheel.

Cleaning

If a machine is in regular use, it is a tedious and not very profitable business trying to keep it very clean. But it should be given a "once-over" every month.

Clean the engine and wheels first by going over them with paraffin, using an old shaving brush or swab of rag and an old tooth brush. This will shift a lot of the muck and soften the rest. (Petrol is equally good, but costs double; never dip a rag in the tank!). Clean off with rag, watching carefully for anything loose, parts extra shiny with wear, or rubbing or anything else which does not look quite right. Deal with any adjustments or tightening right away. Polish the cycle, petrol tank and magneto cover with Autobrite Silicone, Karpol, or any good liquid polish—these work more easily than wax or paste. By the way, leave the magneto cover on when cleaning the engine; it can come off for polishing, but no cleaning should be necessary under the cover.

CHAPTER V COMFORT

If the saddle was originally comfortable for pedalling, it should be lowered by $1\frac{1}{2}$ inches for motor-assistance. This is done by loosening the clinch-bolt and nut which goes through the cycle frame under the saddle: the saddle stem is then free to slide up and down. On older machines the saddle tube may be the shape of an inverted "L"; in which case, a further reduction in height may be wangled by loosening the bolt through the saddle and turning the saddle clip the other way up. Try different positions while balancing on the machine with the feet on the pedals at three and nine o'clock. Try sliding the saddle backwards and tilting it downwards at the rear. This is all rather tedious and fiddling, but time spent now will be repaid in comfort later. When you have settled on a comfortable "seat" you should find that both feet reach the ground.

There should be little or no weight on the hands. To achieve this, set the handlebars, probably downwards, so that when sitting normally the arms just kink at the elbows, and when sitting right back, the arms can be stretched out straight. The adjustment is made this way: if roller brakes are fitted, disconnect the rods at the little olive-shaped joints in front of the steering downtube; undo the steering bolt (it comes up through the steering stem) four whole turns; tap this bolt-head smartly with a hammer and the handlebars will be free to move up and down. They are re-secured by tightening the steering head bolt and re-connecting the brakes. The best position will have to be checked by road test; if your machine has a further adjustment to enable the bar to rotate, the trick here is to *slightly* loosen the clinch-bolt and determine the best wrist angle while actually free-wheeling.

If your pedals have "ears" to restrict shoe movement, these are best filed off, as a motor-assisted cyclist should be able to rest his feet in any position on the pedals.

Experiment next with controls. With the right hand comfortably resting on the grip, mount the throttle control so that the lever falls

comfortably in the gap between the thumb and forefinger. Then if thick gloves are worn, the control can be operated with a sort of rolling movement of the wrist. The clutch or engagement lever should be mounted comfortably within reach of the left hand and just about parallel to the ground. Make sure that it is always going to be clear of the brake lever. If a bulb horn is used, it should be mounted on the bar where the left thumb can plonk it without leaving the grip. If an electric hooter is used, the same applies to the thumb-button.

Having organised and tested the foregoing essentials, there are added comforts worthy of consideration. First thoughts turn to a soft-topped, medium-sized saddle, just wide enough to hold "both bottoms". For touring long distances, beware of a too wide saddle, as this will chafe the thighs after a few good spells of pedal assistance.

A twist grip throttle control is well worth while and will probably save its cost in longer glove life. Unless personal preference dictates otherwise, it is hardly worth buying a combined throttle and decompressor control twist grip. Instead, buy a single twist grip for the throttle and mount it on the right grip and mount the old decompressor lever half-way along the left handlebar. Separating these controls makes for the easiest possible starting.

For long distances, fatigue is reduced to a minimum when the knuckles are in line with the twist grip, and an almost straight handlebar is strongly recommended. Rather oddly, this is known as an "All-Rounder Bend". Something like a shopping bag is a useful adjunct for carrying every-day parcels. A bag which slings from the down-tube is very handy and is a more convenient repository for tools than the traditional little leather bag dangling from the saddle. For serious touring, panniers and frames are good on machines having the engine level or in front of the bottom bracket, but rear wheel jobs are inclined to be tail heavy already, without adding any more weight astern. Special pannier sets are available for most motorised cycles.

The added interest to be gained by having a speedometer and mileage recorder is considerable. The cyclemotor type costs 38/6d.

The more expensive motorised cycles have spring forks, and these can be fitted as an extra to almost any cycle frame. They add about 3lbs. in weight and their fitting usually has the effect of making the front braking more effective. The amount of movement is comparatively small, but the difference between a solid fork and one that "gives" on impact is very considerable, particularly on a long run.

CHAPTER VI

RIDING AND RUNNING-IN

Even though the engine is a tiddler, it is still a thrill the very first time anyone rides a motor-driven vehicle. There are detail differences in each make, so for the initial stages at any rate, the rider is referred to his manufacturer's instruction book and his dealer's good advice.

Starting

The first thing a new owner will want to find out is just how to start his engine within 10 yards of pushing off. This can be done with regularity, but the knack in doing so lies mainly in knowing the correct throttle-lever setting and in particular how *little* flooding of the carburettor will prove just enough to get the engine to fire from cold. Here are some suggestions for establishing this:

Study the effective range of the throttle lever or twist grip, and note where the slack (which is necessary) disappears from the throttle cable. Select the position which you estimate opens the throttle one-third the way. Leave it there—do not be tempted to tweak or vary it while trying to get a start—though you may later want to try a different setting.

Put the choke or other starting-from-cold control into the "start" position. Turn on the petrol and allow 15 seconds for it to find its correct level in the carburettor. If there is a "tickler" press it down once or twice gently, leaving it down for a second each time. Now pedal off and try to start the engine, releasing the decompressor (if fitted) as soon as you can. If the engine fires and keeps going, the problem has been solved the first time and the starting device should be put out of use as soon as the engine will permit it, which is usually almost at once in warm weather, and after about 100 yards in cold.

Next time it might be worth trying even less flooding; in fact, where the carburettor has the float chamber sticking out sideways in relation

to the cycle, instead of flooding, try leaning the whole cycle over, float chamber uppermost.

But if the engine did not fire, or fired and then dried up on this first experiment, remove and look at the sparking plug. If the end is dry, the flooding was not enough. Try flooding three times, but this time leave the tickler down rather longer. This should do the trick, though there are engines which seem to require a petrol bath to start, so you might need more flooding yet.

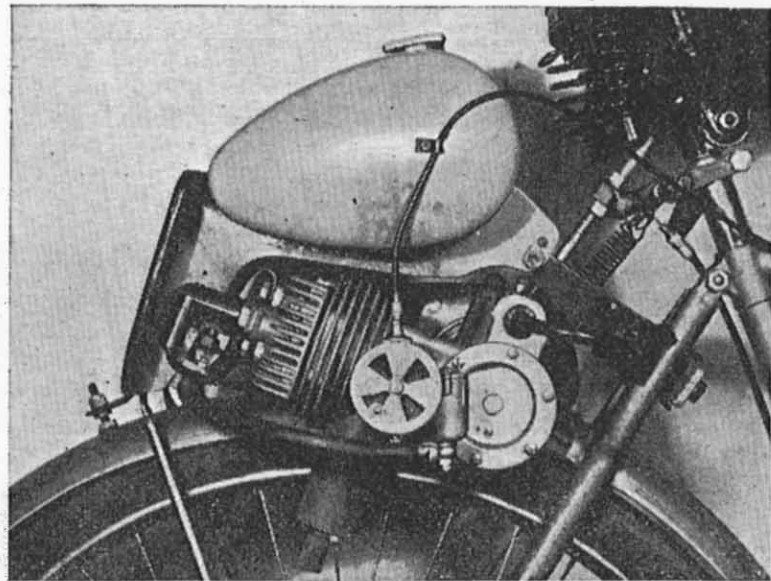
Difficulty in starting is far more likely to be caused by an over-rich mixture (too much petrol), which is shown up by a wet sparking plug. Where caught in this way, leave the plug out, temporarily secure the high-tension lead to the frame, turn off the petrol, put the starting device control to normal running position, open the throttle wide and pedal the cycle for 5 yards or so. This will clear the excess petrol and the experiment must be started again. The drowned plug can be effectively cleaned by heating the firing end in a gas flame. This is a real old motoring pioneer's standby, but it still works to-day.

Starting from hot usually requires no flooding whatever. Starting from warm usually requires almost as much flooding as from cold. If after depressing the tickler, the carburettor persists in flooding, turn off the petrol. When the engine has consumed some of its contents the flooding will probably stop.

Running-in

The new owner will want to go steadily as he builds up experience. This steadiness will also suit the new engine, and it will be found that each manufacturer lays down instructions to ride his product gently for the first few hundred miles and he may advise extra oil at this stage. The object of running-in carefully is two-fold. Firstly, it is to avoid local overheating and possibly distorting the piston thereby. Secondly, machined smooth parts can be made to polish like mirrors. The sensible thing is to restrict speed and "slogging" until all initial stiffness has gone. Then give the engine short bursts of really hard work, and pause to let it cool.

If at any time during running-in the engine develops a queer conking rattle, or if it appears to slow or labour, **DON'T HESITATE—STOP THE ENGINE AT ONCE.** There is time to wonder whether such panic is necessary or not, afterwards! If there is a strong smell of hot engine you will have just about stopped in time and in three



Teagle

An attachment engine by a firm widely experienced in engines for industrial and agricultural use. It has blower cooling, visible fuel filter and weighs only 15 lbs.

minutes you can resume your journey—but a little more gently, please. You will have just avoided a seizure, which in extreme cases means that the piston gets so hot it almost melts and sticks to the cylinder walls.

How hard should a cyclemotor engine be driven? A carefully run-in engine will take almost unlimited throttle without protest, providing the engine is kept going at reasonably high revs. It is not fair to make an engine slog at slow revs., and the moment it does so the pedals should be brought in to help it. Otherwise it is not until wear has set in and the piston has started to rattle that any nursing is necessary, and then only to postpone the day when renewals have to be made.

Somewhat surprisingly, perhaps, all engines (cars and motor-cycles, as well as cyclemotors) can be "underdriven" by a series of short journeys such as door-to-door calling, or from the Vicarage to the Church and back. The Motor Trade call it "taxi work". In journeys under two miles the engine does not reach its proper working temperature, and therefore does not get hot enough to drive off any water produced by combustion. (When petrol burns, hydrogen from the petrol combines with oxygen from the air, and water is formed). Cyclemotors, which seldom if ever get a good "hot-making" run, are inclined to hold this condensate and to rust internally as a result. In such circumstances an occasional dose of, really hard work will do the engine good.

Riding Hints

Open the throttle gently—avoid jerks—but close it more sharply. Any two-stroke hates light loads and protests by uneven firing or four-stroking. So make the engine pull or shut it off. On corners it is best to approach somewhat slowly and then put the engine under load so that it drives round the corner. This adds to stability, and it is actually faster than coming up to a corner more quickly and then proceeding round it in a series of jerks.

As soon as a hill is sighted, whip up all the speed you can—or you think you will want—at once, having due regard to other road users, of course. The faster the engine revs, the more power it will produce. Pedal early rather than late, so as to keep the engine near peak output.

Should you meet a hill so steep that it cannot be climbed, even with pedalling, the sensible thing is to travel as far up it as you can,

and walk the rest with the engine disconnected. If there should be a convenient side-road you may be able to take a breather and then follow it with a fresh rush at the hill; if this all sounds too strenuous, it is nice to think that without an engine you might have had to push up the whole hill. If your machine is fitted with a clutch, do not be tempted to ride or walk or run alongside with the clutch only partially engaged; if you do, the clutch will almost certainly burn out and become useless.

The good driver anticipates the need for reducing speed by throttling down early rather than driving on the brakes. This is an art worth cultivating, and it means also that if an emergency arises, full braking power is immediately available. It is also well worth practising the "crash-stop" for use in emergency, and also for the driving test, where a demonstration may well be asked for. Keep the cycle as straight as you can and use the front brake really hard.

When descending hills of any length, the engine should either be disconnected (as is only possible with some attachments) or else it should be given short bursts of throttle. As the engine is lubricated with petrol, the supply of fresh oil is cut off when the throttle is closed.

At the end of a run it is a good plan to turn off the petrol 200 yards or so before stopping. This will aid subsequent starting, as otherwise the latent heat of the engine will drive off the most easily-fired petrol fractions by evaporation. But if the carburettor is allowed to dry up, then a re-start will be made with "fresh" petrol.

If you have to start on a gradient, pedal downhill until the engine fires, and then—if this has taken you off in the opposite direction—just turn round. If this seems too obvious to mention, just see how often you can spot other riders doing it the hard way!

Always when riding, keep your ears cocked for unusual noises or rattles. A noise like a bicycle pump tested against the thumb denotes a gas leak somewhere. If a quick check is made, it is often possible to cure or reduce the leak before it gets serious. If a new rattle or squeak comes from engine or cycle, stop at once and see what is causing it. It may be something loose which is going to fall off, such as a petrol cap; or possibly break, such as a mudguard stay. Contrary to pious hope, rattles hardly ever cure themselves. Only when the cause has been found is it safe to decide to "let it rattle" until a more convenient time.

Extremes of Weather

Weather conditions have to be quite abnormal to keep a cyclemotor off the road. In bad conditions its light weight and manoeuvrability give it a great advantage. In really cold weather the cyclemotorist is at an advantage over the completely-motorised, as he can put in some extra pedalling to keep warm. In icy weather it is well worth remembering that the extreme edges of the road form a natural trap for grit and roughage generally, and it is often possible to keep going quite merrily in the gutters when the rest of the road surfaces are like a skating rink. Wet snow hardly ever prevents a roller-drive from gripping the tyre.

Flooded roads present a danger to all traffic, particularly when the water is deep enough to penetrate internal expanding brakes. There are two tips to follow after negotiating deep water. Ride with the brakes partially on until the water has been driven off and full braking action has been restored. Look out for the chap behind; whatever his vehicle, his brakes may still be wet, and therefore useless.

At the other weather extreme, sun-melted tar is as dangerous as ice, and as it usually occurs in patches on bends, it is easy to be caught unawares. Occasionally wet tar will bind into a roller, in which case it is fairly simple to clear it later with a nail or something sharply pointed.

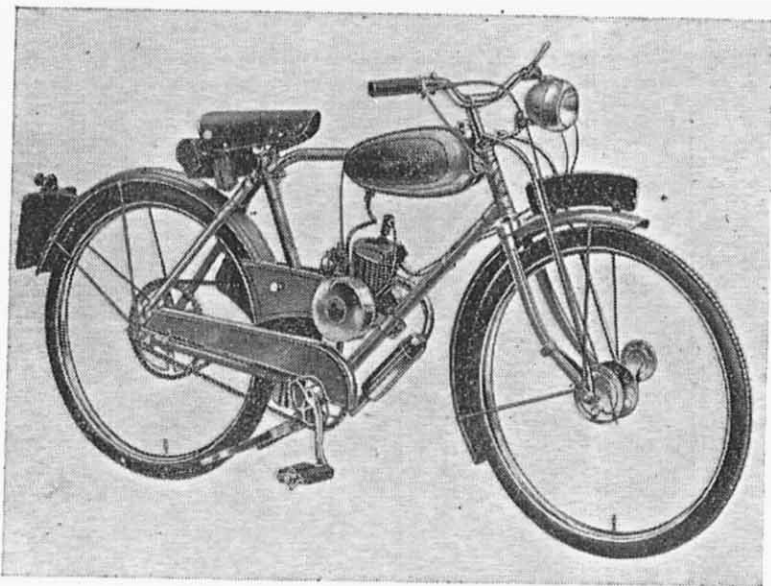
Finally, in the country in autumn, beware of what look like dry leaves on the ground. They may be dry on the top and as wet and slippery as a banana skin on the underside. They are a trap for the unwary!

Clutch and Roller Slip

As mentioned earlier, any tendency to ride or slip the clutch must be checked, or it can become a bad habit. When re-starting from rest, use the pedals as well as the engine and get the clutch home just as soon as you can. When braking to a halt, leave the clutch engaged until the speed is down to walking pace. There is less likelihood of skidding if the clutch is left in when braking, particularly on wet roads.

It is important to be able to recognise a clutch which is slipping because it is faulty, or a roller which is slipping (usually only in wet weather) through maladjustment. Both slips have the same symptoms and both are expensive, the former on clutch linings, the latter

on tyres. Their distinguishing feature is an increase in engine speed without a corresponding increase in road speed. In fact, road speed may slacken. The test is gradually to ease off the throttle; if slip is present there will be no corresponding diminution of road speed, in fact, there will be a momentary increase when the road speed, as it were, catches up with the engine speed. When speed is right down, open the throttle again, and if the engine speeds up without a corresponding increase from the cycle, then the way to reach home is with little throttle and plenty of pedal assistance. At the first convenient opportunity the cause of the slip must be found and cured.



Phillips Motorised Cycle

A complete machine with unusual engine positioning. The 1956 models have telescopic spring forks.

CHAPTER VII

LUBRICATION

Modern light two-stroke engines are almost all lubricated by what is called the "petrol system," that is, the oil is mixed with the petrol in the fuel tank and does its job of lubrication as it passes through the engine.

Makers' recommendations vary consistently as to the proportions of oil to petrol, but most European engines now run on a "standard" petrol/oil ratio of 25 to 1, using SAE 20 oil, and this proportion suits most of the engines now in use. Where a heavier or specially-treated oil is used, a smaller proportion of oil to petrol is required. The new "self-mixing" oils require a ratio of 16 to 1, the convenient quantities of $\frac{1}{4}$ pt. oil to each $\frac{1}{2}$ gallon of petrol. For running-in a new machine, the standard ratio should be increased by about 20% for the first 500 miles, and then decreased in steps.

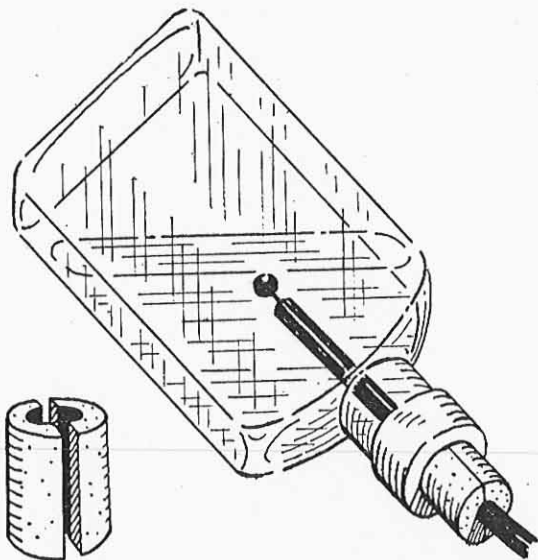
Where the manufacturer's instruction book gives figures greatly differing from the general advice given above, the rider may prefer to start by the book and find by experiment what oil/petrol ratio suits his engine and style of driving best.

An over-oiled engine will foul sparking plugs, gum up piston rings and block its ports with hard carbon. Under-oiling will show itself in a tendency to "tighten-up" and loose power when working really hard, such as climbing a long hill. BOTH are wrong—steer between them.

Getting oil and petrol to mix properly has been something of a problem until quite recently. Nowadays there are "instant-mix" oils which act as their name implies, also special dispensers which mix oil into the petrol as it leaves the petrol pump. The old method was to pre-mix in a can. The chief point to remember is that if none of these methods is available and you have to fill up, TURN OFF THE PETROL TAP. Then have the oil and petrol put into the tank in that order and give the bike a jolly good shake up before turning

the petrol tap on again. The object of the exercise is at all costs to prevent neat oil from entering the carburettor ; it wants mixing with petrol first.

Any time that oils are discussed by cyclemotorists the subject of graphited oils is almost certain to be raised. Few cyclemotor manufacturers actively recommend it ; nor do they discourage it. Independent tests are mostly very favourable, and from their reports it would seem that the minute particles of graphite, which enter the engine suspended in the oil, attach themselves to the walls of the cylinder and thereby enable oil to cling and lubricate better than if no graphite were present ; therefore less oil need be used and less carbon is formed by its combustion.



A device for oiling cables.

Oil-can Lubrication

The free-wheel is going to work overtime when a motor does the work, and it should be well oiled every week, or 100 miles, whichever comes first. At the same time, put a few drops in the hubs and a drop or two onto toggles, clutch pivots, brake levers, linkages and, in fact, any part that moves, except dynamo, magneto and brake linings.

The smooth working of control cables is almost entirely a matter of lubrication. They should, of course, be arranged so that they take the easiest possible bends and they must not be strapped or taped forcibly tight to the frame. Cable ends should be oiled regularly and if they have become stiff, steps should be taken to get oil all the way through.

One effective device is illustrated. A wide-mouthed bottle has the cork pierced with a sharp punch or a red-hot nail or similar "prod". The cable should then be disconnected at the handlebar end, put into the bottle as shown, and up-ended. The oil may take some time to appear at the other end, but with this method the entire cable is lubricated, not just the ends.

When oiling cables, keep a watch for broken strands, and as soon as one is observed, buy a replacement cable. Once a cable starts to fray, it usually fails altogether shortly afterwards.

CHAPTER VIII

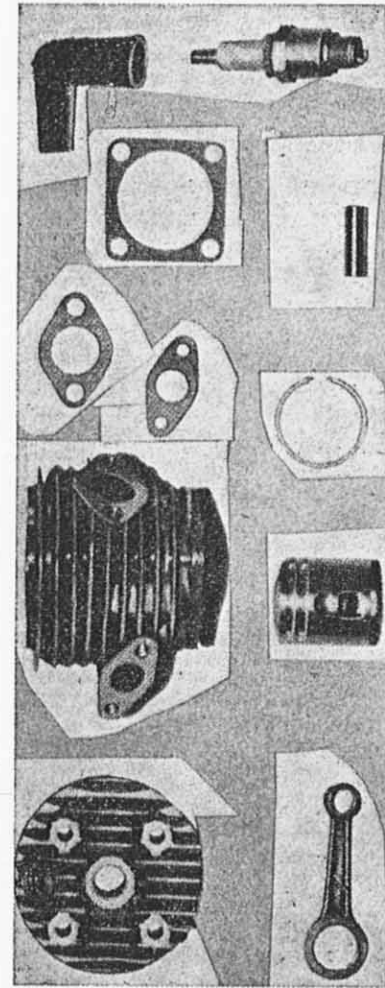
NAMES OF PARTS AND USE OF TOOLS

"Yes, but what is a gudgeon pin?" is the sort of question we are asked when we try to give advice in response to telephone enquiries. So at the risk of over-simplification here is a picture of a cyclomotor engine, "exploded" so as to show the principle parts which are referred to by name in this book. Each manufacturer publishes his own illustrated instruction book and/or spares list (see page 92) and these give all the more detailed information.

For the novice, here are a few points on doing simple jobs with simple tools. Sparking plugs have to be removed for cleaning. Use a box or tube spanner for this. If an open spanner is used for this job and it slips, it is possible to break the insulated pillar or centre of the plug. Having extracted the plug, it can be taken apart for cleaning (if it is the type shown, having *two* nuts) and the first time this is done it will be convenient if the smaller nut can be gripped gently in a vice. Unscrew the large hexagon with the box spanner. It will probably be tight! The plug will then come apart and the inner section should be cleaned with emery cloth and finished with a petrolly rag. The outer should have the carbon removed from inside and out by chipping with a pen-knife or similar tool. It is best to re-assemble with spanners out of the tool kit so that if it ever becomes necessary to dismantle by the roadside, the same spanners will have enough leverage to part it. The gap between the points should be adjusted as recommended by the engine manufacturer—usually to about 20 thousandths of an inch—by bending the outside point(s). The centre electrode is embedded in a ceramic substance and it will not therefore give, and no attempt should be made to bend it. If a feeler gauge or plug gauge is not supplied with the engine, the Champion one is priced 2/-.

Plugs with only one hexagon are not de-mountable and must be taken to a garage for cleaning by sand-blasting.

NAMES OF PARTS AND USE OF TOOLS



Top Row : Cylinder head, cylinder barrel, exhaust and inlet gaskets, cylinder base washer, plug lead cover with suppressor.

Bottom Row : Connecting rod, piston, piston rings, gudgeon pin, sparking plug.

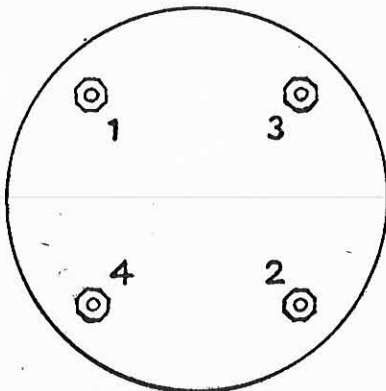
Never use an adjustable spanner when a correctly-sized fixed tool is available. And as far as turning nuts and bolts is concerned, never use pliers at all!

You will note that spanners with wide jaws (for the larger nuts) are longer than spanners with smaller jaws. This is deliberate, so that enough—but not too much—force can be applied to nuts and bolts of different sizes. It is most unwise to increase leverage by hooking on a piece of tube or another spanner, or by getting the full force of a boot behind the job! Given overmuch force, you will strip the thread or shear the bolt itself.

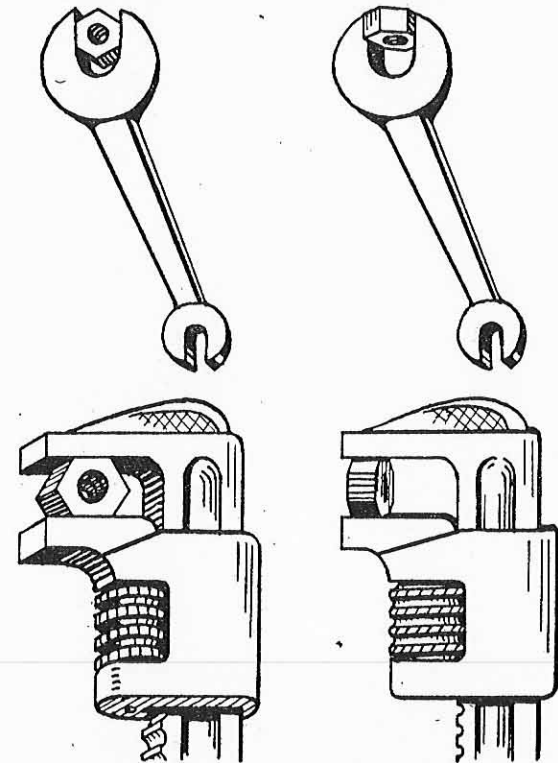
Beware, too, of the professional mechanic's long-handled ring spanners. These are delightful to use, but it is possible to exert too much pressure if due caution is not observed.

If you find two nuts on top of each other, the outer one, called the lock-nut, locks the inner one. They must be undone separately, so put separate spanners on each nut and squeeze together. Sometimes a nut has a keeper or locking tab to prevent it from turning. In this case the locking tab must be pushed back flat before the nut is free to turn.

The sequence and method of tightening flat surfaces held at their edges, such as cylinder-heads, cylinder-barrels, etc., is always stressed by manufacturers. In spite of this advice, it seems that there are always some amateur mechanics who take chances, with most expensive results to themselves. The sequence of tightening must be diagonal, like this:



Put a little thin oil on the bolts or studs. Then locate all nuts (or bolts) and tighten with fingers. Then use a small spanner and tighten each nut a little bit at a time. Try to make the nut you are on as tight as the one you have just done, but no tighter. When you get back to number one it will probably be loose, showing that the head



Right

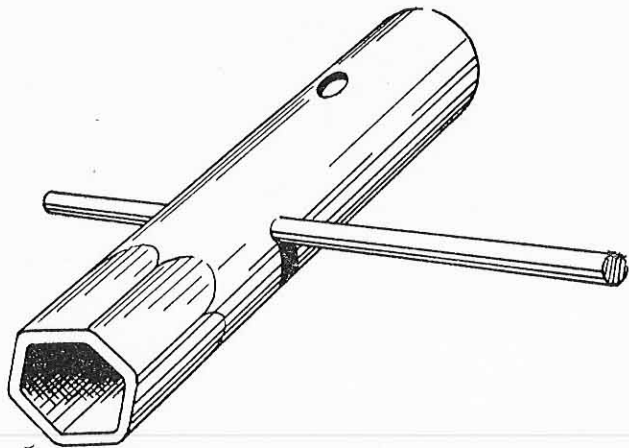
Wrong

The nut should be held *across* the jaws of the spanner.

is coming down evenly, and as it beds down you can use progressively a little more force each time, until finally each nut is fully tightened. Later, the engine should be run up to working temperatures and the nuts checked for a further tightening.

This technique of tightening nuts evenly applies to carburettor stubs, exhaust outlets and, in fact, the fitting together of any two flat surfaces.

If ever the flywheel, which is the revolving part or rotor of the magneto, has to come off, a special withdrawal tool **MUST** be used. Attempts to use levers almost always result in a bent crankshaft. The extent of the bend may be only a few thousandths of an inch and difficult to detect without special instruments, but the effect of a flywheel which is not running true is disastrous, and the expense of replacing the crankshaft is considerable.



Box spanner : The ideal tool for sparking plug.

CHAPTER IX

FUEL AND FUEL SYSTEM

When running-in has been completed and thereafter at intervals, clean the fuel lines and carburettor of accumulated dirt. Wait until the petrol tank is almost empty, then tip the machine away from the tap fixing and remove petrol pipe and tap. In doing so, watch for a very loseable thimble-shaped filter at the entry of the fuel pipe to the carburettor. There may be a filter gauze fitted to the tap itself—an excellent arrangement. If there is not, look for a partial blockage in the fuel pipe. Blow, shake or pick off any foreign matter sticking to the filters; use of a rag will only leave fluff behind.

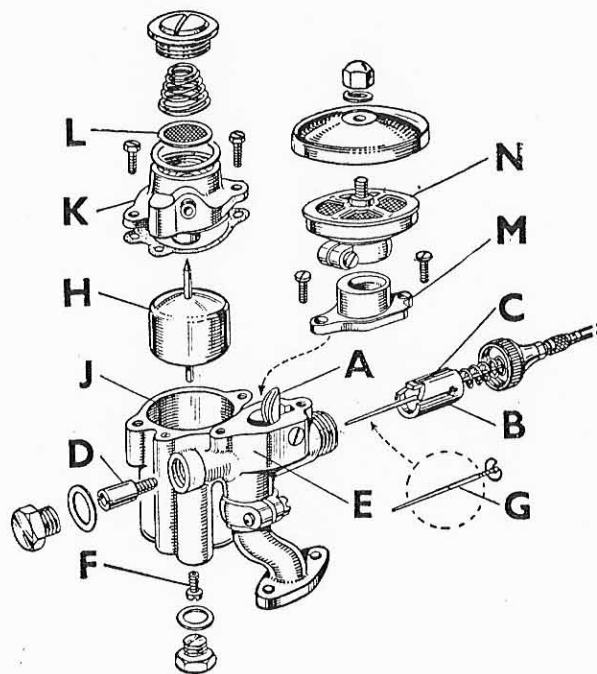
The carburettor bowl should be detached and any adhering dirt freed with a knife or finger nail and the bowl then swilled out with petrol several times. Half-a-pint of clean petrol in an old jug is very handy for this operation. Again, use no rag, as the minutest fragments of thread can find lodging in the jet.

How the Carburettor Works

Cyclemotor carburettors (*VeloSolex* excepted) work this way: Petrol flows downwards into a float chamber where a small quantity is kept at a pre-determined level by a float and valve mechanism very similar to the W.C. cistern at home. A short passage leads from the float chamber to a jet which is a tube with an internal diameter smaller than a pin-hole. Each jet is calibrated with a flow-meter by the carburettor manufacturer and the exact size is so critical that the jet must never subsequently be cleared by prodding with a needle or pin.

The jet is placed directly in the passage through which air is going to be sucked into the engine. The top of the jet is almost exactly on a level with the height of petrol in the float chamber. It therefore follows that as air enters the carburettor, it whips minute droplets of petrol off the top of the jet, and this feeds the engine with an inflammable mixture of petrol and air.

As the engine will be required to work under varying loads at varying speeds and in the control of the rider a throttle, or moving



AMAL CARBURETTOR

- | | |
|--------------------------------|-------------------------|
| A. Strangler. | H. Float. |
| B. Throttle Slide. | J. Float Chamber. |
| C. Strangler Operating Groove. | K. Float Chamber Cover. |
| D. Needle Jet. | L. Gauze Filter. |
| E. Mixing Chamber. | M. Carburettor. |
| F. Main Jet. | N. Air Filter. |
| G. Needle Jet. | |

slide, is placed at the entrance of the carburettor. This acts as a shutter and is connected to the throttle control on the right handlebar. As the rider opens his throttle control, he raises the slide which admits air which picks up petrol. And as the volume of petrol-air mixture going into the engine increases, the engine applies a corresponding increased urge to the cycle.

As running-in proceeds, the throttle cable will settle down and stretch. Unwanted slack should be taken up by unscrewing the adjuster through which the cable enters the carburettor. At the same time, check the friction device which is incorporated in most types of throttle lever and twist grip. This should be oiled and adjusted so that it moves freely, yet holds the control from closing when the rider's hand is away from the handlebar.

Air Choke and Filter

The mixture of air to petrol for normal running is approximately 17 : 1 by volume. A much richer mixture—nearer 4 : 1—is required for starting from cold, and in order to restrict the volume of air for this condition, most carburettors are fitted with an air strangler or choke. This should be placed in the "start" position until the engine fires, and the "normal running" position resumed just as soon as the engine will take it. If the engine is left at the "start" position too long, it will run in a "lumpy" and, incidentally, extravagant, manner in protest.

Air is usually admitted to the carburettor through a steel-wool gauze or mesh filter which holds back road dirt and rain. Periodical cleaning in petrol is advised at intervals of 500 miles, or more frequently in dusty weather. Dipping in oil afterwards is a refinement which is not essential in the case of a two-stroke engine, as the "breathing" from the carburettor will very soon wet the filter element with oil.

Carburettor Tuning

*Make no mistake about it, every cyclemotor is sent out from its factory with a jet size and setting most carefully chosen to give a good all-round performance with that type of engine. It is therefore quite possible that any subsequent changes will be for the worse! There is, however, no harm in experimenting, and one of the surest ways of telling whether a weaker or richer mixture might improve matters is to examine the sparking plug under actual working con-

ditions. In seeking better performance on the open road, for instance, give the engine a good burst of speed and/or a reasonably stiff climb on full throttle. Having done so, stop the engine, remove the sparking plug (it will be mighty hot, so use gloves, or let the engine cool down first!) and then look at its colour. Alternatively, if seeking more miles per gallon and assuming a fair amount of traffic driving (which is by far the most extravagant on fuel) do a slow journey with plenty of stops, starts and waiting, and examine the plug at the end of it.

If the carbon deposit is medium-brown, perhaps a little lighter near the points, the mixture is about right. A hard dry-looking deposit, biscuit-coloured and with white flecks round the points, denotes very hot running. In such circumstances it is worth trying a richer mixture; it may also be worth trying a premium grade of fuel if previously running on standard. A dark-coloured or black, and even sooty deposit indicates that the mixture is too rich, but before jumping to the conclusion that a smaller jet is required (as it well may be), make sure that the float and needle-valve mechanism is in order. If, for instance, the petrol pipe is securely connected, yet the outside of the carburettor is normally wet and even inclined to drip, then the petrol level is rising too high, and this is the cause of the rich mixture. The way to deal with this varies with different makes, so the reader is once again referred to the instruction book which deals with his particular machine; also, Amal's leaflet "Hints and Tips", if that make of carburettor is fitted. These books also give clear instructions on how to enrich or weaken the mixture, of which the following is a brief summary:

To make mixture richer—

Dell'orto. Fit larger jet.

B.E.C. Turn air-bleed screw anti-clockwise.

Amal. At small throttle openings, replace slide with one having smaller cutaway.

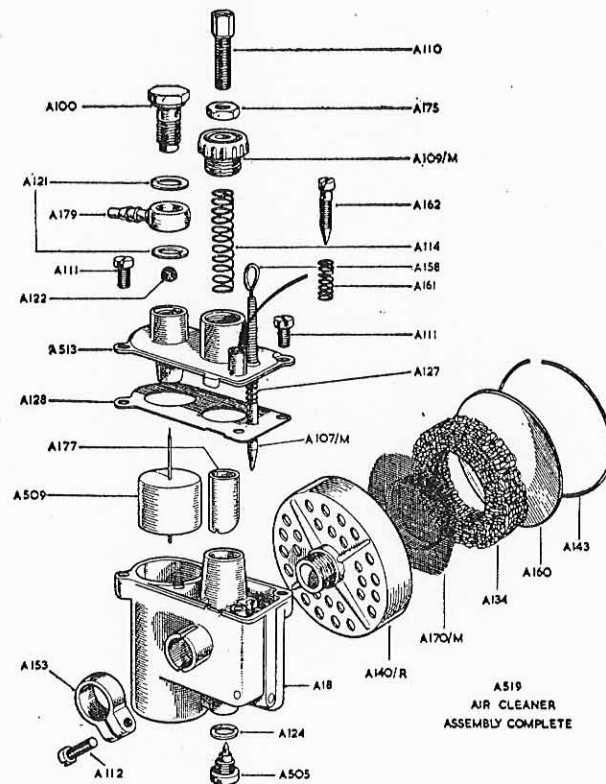
At half-throttle, raise the needle in the slide by putting copper clip in lower slot.

At full-throttle, increase jet size.

Villiers. Raise throttle needle.

To weaken mixture, reverse above.

FUEL AND FUEL SYSTEM



B.E.C. Carburettor (Key overleaf)

One last word on carburettor adjustment. Carburettors are die-cast and they should be handled with care. Petrol unions and other fittings are brass and many are cut with a fine thread, which means that great care must be taken to avoid cross-threading. When screwing-up a petrol union, make certain that at least three turns can be made with the fingers (thus ensuring correct threading), and do all final

tightening with a well-fitting spanner, as the edges of a brass hexagon are very easily damaged.

Fuel

There are several brands and grades of fuel on the market, and many and wonderful are the claims made for some of them! As cyclemotorists usually deal in half-gallons, it is neither difficult nor expensive to try each in turn.

The difference between standard and premium grades of fuel is not a matter of purity, filtration and goodness: any branded fuel has been properly refined and is safe to use in a small two-stroke. The more expensive grades have a higher octane value, or anti-knock quality, and their availability enables engine manufacturers to use higher compression ratios, and thereby make engines of higher performance. As flexibility and the need to pull well at low engine speeds are more important attributes than high performance, most cyclemotor engines are of low or medium compression. In the majority of cases, therefore, the cheapest grades of fuel will give similar results to the dearest.

B.E.C. Parts Key

A18	Carburettor Body.	A143	Air Filter Circlip.
A100	Bolt (Banjo) Petrol.	A153	Clamp (Split) Manifold.
A107M	Needle-Starting.	A158	Starting Needle-Eyelet.
A109M	Cap Throttle.	A160	Air Filter Disc—Plain.
A110	Screw—Cable adjusting.	A161	Spring-Mixture Control.
A111	.. Cover to Body.	A162	Screw ..
A112	.. Manifold Clamp	A170M	Gauze-Air Filter.
A114	Spring-Throttle.	A175	Locknut-cable adj'g.
A121	Washer-Banjo.	A177	Throttle.
A122	Petrol Filter Gauze.	A179	Banjo Union-Petrol.
A124	Jet Washer.	A505	Jet assembly—state size.
A127	Spring-Starting Needle.	A509	Float and Needle assembly.
A128	Gasket (cover to Body).	A513	Cover, Needle Seating and Starting assembly.
A134	Air Filter Pack.	A519	Air Cleaner complete.
A140R	.. Body.		

CHAPTER X

ELECTRICS

Most people shy off this subject. There are probably more wrong deductions made and more bad advice given on matters electrical than the rest of the engine put together. "Change the coil", says one, "Change the condenser", says another, and all too often such changes are not the answer. The fact is that coils and condensers are not infallible but they are difficult to test, and that makes them suspect.

Let us be simple—maybe, over-simple—in outlining an approach to lighting and ignition problems by starting with something as familiar as a battery-operated cycle lamp. The battery contains a store of electricity. That electricity will flow along any conductor (usually metal) from one terminal to another. In fact, the energy to do so is sufficient to light a lamp if a suitable one is placed in its path. Now there are just three factors which will stop that lamp from working, and these three same factors apply to other electrics to be discussed later. They are:

1. A flat battery or no electricity to start with.
2. An open or broken circuit: this means an actual break in the conducting surfaces which should continuously connect one battery terminal through the switch to the battery case, to the bulb-holder through the bulb, and "home" to the other battery terminal. Three common causes of failure are a broken filament in the bulb; switch failing to contact battery terminal; or the top of the lamp becoming insulated from the body by a layer of paint or rust. Note: These are all cases of open circuit.
3. A short or unwanted circuit: Imagine that rain has got into the torch and as a result the cardboard insulating cover of the battery has disintegrated at the bottom. If this happened the metal battery exterior would make direct contact with the lamp case and provide a direct metal pathway.

VITALITY BULBS

SPECIALLY FOR

Ask your Dealer for Vitality Bulbs, quote the Vitality reference number given against your make of set in this Chart and you will get bulbs that were specially made to give the best light and longest life in your particular set. If your dealer is out of stock, send us his name and we will arrange supplies.

NOTE TO THE TRADE

All bulbs recommended here are available through Wholesalers who can also supply copies of the Vitality Recommendation Chart. If not, write us.

VITALITY BULBS LTD., Neville House, Neville Place, London, N.22. Phone: BOWes Park 0016

CYCLE MOTOR SETS					
MAKE		REF. No.	CAP	EX. P.T.	PUL. TAX
B.S.A. WINGED WHEEL	HEAD	9	S.C.C.	1/4	3d
	HEAD TAIL	55	M.E.S.	9d	11d
CYCLEMASTER and CYCLEMATE	HEAD	944	S.C.C.	1/9	31d
	HEAD	945	M.E.S.	1/3	21d
	TAIL	425	M.E.S.	9d	11d
	TAIL	421	M.E.S.	9d	11d
DUCATI (CUCCILOLO)	HEAD	944	S.C.C.	1/9	31d
	TAIL	9	S.C.C.	1/4	3d
FIREFLY	HEAD	9	S.C.C.	1/4	3d
	HEAD TAIL	55	M.E.S.	9d	11d
	TAIL PILOT	445	M.E.S.	9d	11d
HORSY	HEAD	9	S.C.C.	1/4	3d
	HEAD TAIL	55	M.E.S.	9d	11d
ITOM	HEAD	9	S.C.C.	1/4	3d
	HEAD TAIL	55	M.E.S.	9d	11d
	TAIL	429	M.E.S.	9d	11d
MOBYLETTE	HEAD	9	S.C.C.	1/4	3d
	HEAD TAIL	55	M.E.S.	9d	11d
NORMAN AUTOCYCLES	HEAD	901	S.C.C.	2/6	5d
	TAIL PILOT	345	M.E.S.	9d	11d
PHILLIPS MOTORISED	HEAD	2	S.C.C.	1/4	3d
	HEAD TAIL	180	M.E.S.	9d	11d
POWER-PAK	HEAD	9	S.C.C.	1/4	3d
	HEAD TAIL	55	M.E.S.	9d	11d
TEAGLE	HEAD	9	S.C.C.	1/4	3d
	HEAD TAIL	55	M.E.S.	9d	11d
VELD-SOLEX	HEAD	9	S.C.C.	1/4	3d
	HEAD TAIL	55	M.E.S.	9d	11d
	TAIL PILOT	429	M.E.S.	9d	11d
OTHER MAKES FITTED WITH WIPAC SERIES 90 MAGNETO	HEAD	9	S.C.C.	1/4	3d
	HEAD TAIL	55	M.E.S.	9d	11d
OTHER MAKES FITTED WITH VILLIERS 2F UNIT	HEAD	901	S.C.C.	2/6	5d
	TAIL PILOT	345	M.E.S.	9d	11d

ELECTRICS

The intended circuit through the lamp bulb offers a higher electrical resistance than the pathway through the battery case. Electricity will always take the easier, or so-called, "short" circuit.

Lighting Units

Let us apply this simple approach to a supposed lighting fault on a cyclemotor fitted with a Wipac Series Ninety (serial number is prefixed IG) or Miller BS 19. Take the headlamp bulb, buy or improvise a lamp test prod, test the bulb on a battery to make certain it is working, and get the engine running slowly. Disconnect the lighting wire (the thinner one) and connect the lamp between the lighting terminal and any bright metal part of the engine.

If nothing happens, there is no electricity at source, which is equivalent to a dead battery. So stop the engine, remove the magneto cover and peer through the flywheel at the connections to the smaller of the two coils. It may be that the lead attached to the coil is broken (open circuit), or that it has become detached from its terminal (open circuit), or it is even possible that the whole body of the coil is no longer screwed up tight against the back-plate and is thereby causing at least a partial open circuit. Alternatively, the lead from the coil may have chafed and worn through the insulation thereby creating a metal short circuit to frame, in which case the exposed conductor should be carefully bound with insulating tape.

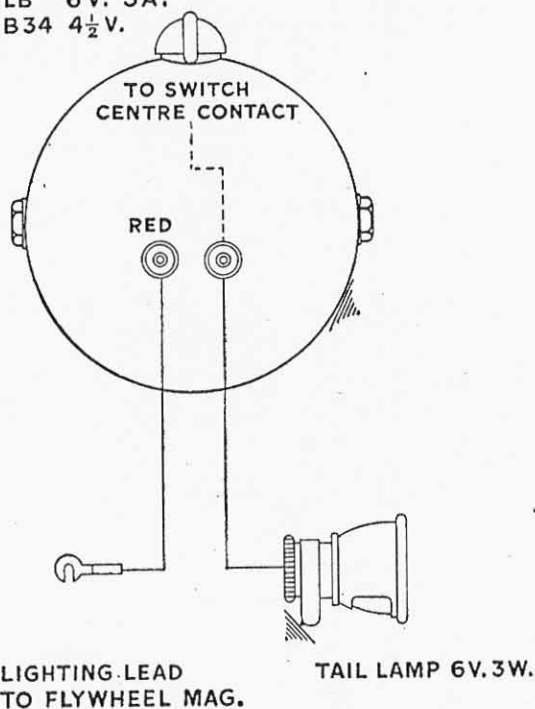
The above faults are comparatively easy to put right once found. If, however, the coil should be discoloured and, in particular, if a smell of burning can be detected, then the coil may have an internal short circuit and it will have to be replaced.

But if on our first test the lamp bulb lights, then there is a working source of electricity. So connect up the wiring previously disconnected. If this puts the test bulb out, there must be a short circuit in the wiring just connected. This must be found and rectified and if a number of wires radiate from this one or are connected to it through a switch, then it may be necessary to disconnect them one at a time in order to identify the culprit.

The above description covers the proving of the wiring from the generator to the switch. The same procedure must be used until the point is reached when the lamp ought to light but does not. It must, however, be remembered that just as in our first example the battery

HEADLAMP.
 MAIN BULB 6V. 6W.
 PILOT BULB 6V. 3A.
 BATTERY B34 4½V.

6 T.M. SET



A typical cyclemotor lighting circuit, The Miller 6TM.

case carried the electricity from switch to lamp, the cycle frame and engine carry the return current to the generator. The wiring from the live end of the generator may be good all the way to the tail lamp, but the tail lamp cannot light unless the return circuit from the brass cap of lamp to bulb-holder, to rear lamp, through screws, to

number plate, to mudguard, to frame, to engine and generator is complete. A layer of paint or rust will stop the metal-to-metal connection and cause an open circuit. In fact, with rear lamp trouble it is often quicker to test the return circuit first, by running a piece of wire from the rear lamp bulb-holder to the engine crankcase.

Ignition

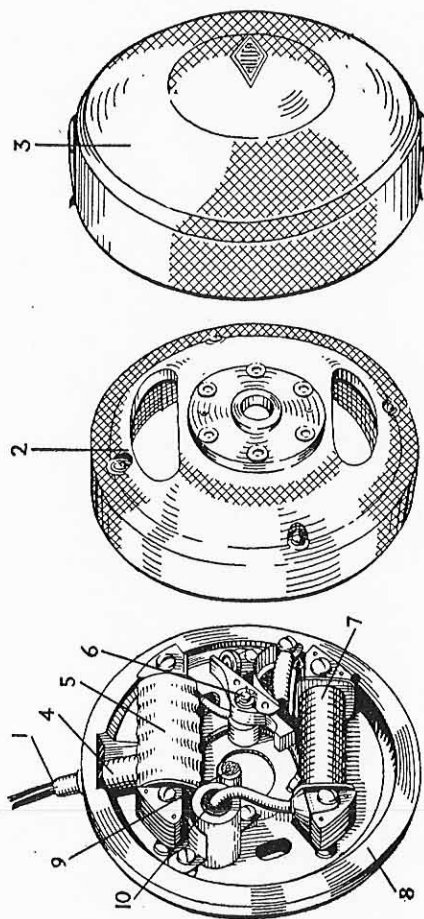
The ignition circuit is somewhat different from the lighting circuits just described. The revolving flywheel once again acts as a generator, but this time its output is interrupted or broken on each revolution of the engine. This interruption is transformed (by a physical change with is rather beyond the scope of this book) into a sort of electrical momentum which will cause a high-voltage spark to be available just when and where it is wanted, i.e., across the sparking plug in a dense concentration of petrol and air.

The first step to understanding is to identify and check the various working parts; then if trouble should be experienced later, at least it will not be in unexplored territory.

With the magneto cover removed and turning the flywheel by hand, two silver-coloured contacts will be seen making and breaking contact as the engine revolves. One point is fixed and the other pivoted with its movement dictated by a sort of fibre shoe which rides on a cam or bump on the engine shaft. This is the contact-breaker mechanism.

When the points are fully open, the gap should be such that an absolutely clean feeler gauge '018" (18-thousandths-of-an-inch) will just slide between them without forcing. Note now that perhaps the most common cause of subsequent spark failure of the "no spark at source" variety is a gradual closing together of this gap between points, owing to the settling down of the shoe as it rides on the cam. Each magneto has its own simple adjustment whereby the fixed point can be adjusted so as to restore the '018" gap. The points should never be forced or bent into position with pliers.

The contact points must be kept completely free from grease or oil. To part them for examination use a nail file or similarly oil-free instrument and, even so, do not touch the actual contact faces. Any traces of grease or oil can be removed by setting the magneto to a points-closed position and wangling a piece of clean notepaper or card (the un-printed inside of a cigarette package is excellent for



Miller Flywheel Magneto—Type B.S.9

- | | |
|--------------------------|----------------------|
| 1. High Tension Cable. | 6. Contact Breaker. |
| 2. Magnetic Flywheel. | 7. Lighting Coil. |
| 3. Magneto Cover. | 8. Stator Plate. |
| 4. High Tension Pick-up. | 9. Lubricating Felt. |
| 5. High Tension Coil. | 10. Condenser. |

this) between the points. This will absorb any contamination and should be continued until the clean card is no longer marked.

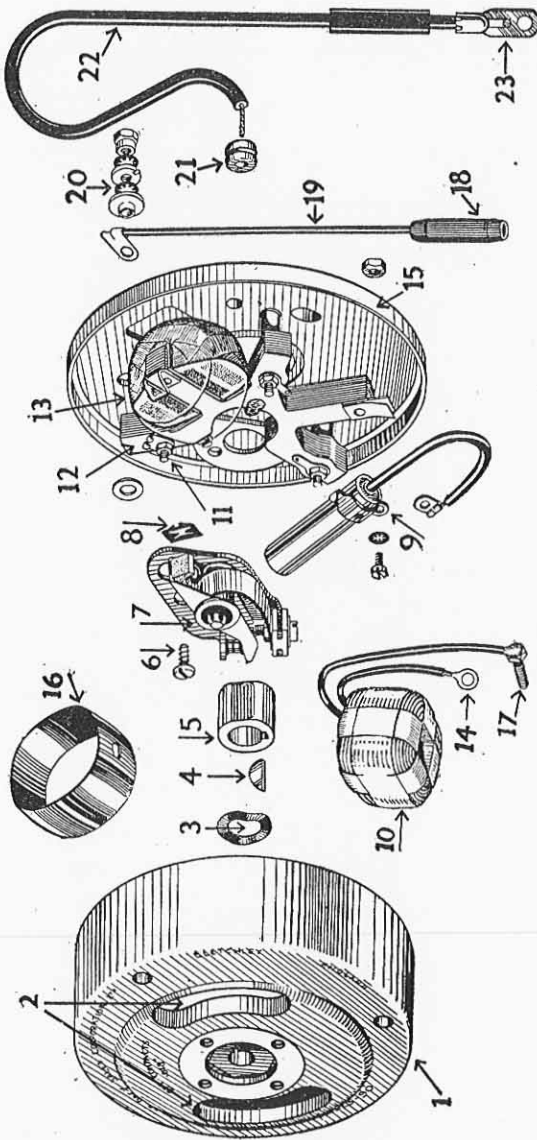
Leads and Coil

The high-tension lead is the thicker of the two. Where a lighting coil is not fitted it will be the only lead. It starts from the ignition coil and carries the spark current to the top of the plug, usually through a water-shielding type of cap which also contains an electrical resistance which suppresses interference to television. This lead is a possible source of trouble in that the pressure it carries is fierce enough to "fire" the engine and is strong enough to break through (short circuit) any crack or break in the insulation.

The way to check the lead and the effectiveness of the whole ignition system is to remove the plug, re-connect the lead and lay the plug on its side on some unpainted part of the engine. Rotate the flywheel by hand and a blue-tinted spark should jump across the gap between the plug points. It has already been suggested that these tests should first be made when the engine is in good order. After several months it might well be found that a minute crack through which the spark was short circuiting to frame, had developed in the rubber or plastic lead. The most likely points for this would be where the lead took any sharp turns or came into occasional contact with hot engine. If the lead had been clipped or taped to the frame, it would be as well to release it, as a pin-hole leak could have happened out of sight. If a leak should be found, it can be repaired temporarily with insulation tape, but the lead should be replaced at the first opportunity. It is most unlikely that a short circuit would have occurred in the coil itself, but if it did, there would be tell-tale signs of external charring and a lingering smell of burning.

It sometimes happens that a lead will carry a good enough spark to jump 3/16" and yet not fire a spark plug. It is possible that moving a lead to test it will hide a break in insulation by shifting it away from the point of short circuit. Another simple point to watch is that any throttle or clutch cable or, indeed, any metallic object that might trail across the cylinder-head could cause a short circuit, from the plug top to frame.

An open circuit in the H.T. lead itself is unlikely, as very stout cable is used. A break in the circuit can, however, occur where the lead joins the coil, particularly on those magnetos where the H.T. terminal of the coil is a sort of spike which sticks into the H.T. lead.



62

(1) Flywheel, made of a rustproof alloy. This unit includes permanent magnets and may be withdrawn from the stator plate without a keeper ring. (This is a feature of all Wipac-built magnetos). (2) Slots for adjusting "points." (3) Tension spring washer for cam. Some units employ a light coil spring instead. (4) Cam key. (5) Cam. (6) Self-tap screw. Engages with spring spire nut below, and is the screw to slacken off to adjust points. (7) Contact breaker set. This is made as a self-contained unit. (8) Spring spire nut. Actually fits on outside of stator plate, but shown here for clarity. (9) Condenser. (10) Lighting coil. 9 watt (7.8 watt coil employed on some units is slightly smaller). (11) Earth connection of H.T. coil. (12) Core. (13) Ghost view of ignition coil "in situ" on core. (14) Earth connection to core. (15) Stator plate. (16) Plastic band fitted around ignition coil (it is important that this is always replaced after removal). (17) Current for lights from this screw. (18) Snap connector. (19) H.T. lead. (20) Light terminal assembly. Attached to long screw of lighting coil. (21) Stator plug rubber grommet. (22) H.T. lead. (23) Spark plug terminal. (24) Protective sleeve for pushing over the spark plug terminal.

ELECTRICS

Corrosion seems to take place here, and while it is possible to re-make the contact by prodding it and thereby get home, the proper action is to withdraw the flywheel and re-make the connection.

The Condenser

With the magneto cover still off, start the engine and park machine in a poor light, at any rate, away from direct sunlight. Note that a small white spark flickers continuously across the points. Remember this—it is normal. The condenser is damping the spark across the points and should it ever give trouble, its failure is likely to be an open circuit, and this would cause bright-blue sparks to flash across the points and would very soon ruin them by burning. Should this happen, pause before rushing off to buy another condenser. The condenser looks like a bright metal tube, and it could be that the lead has become broken or disconnected, or even that the body of the condenser was no longer firmly clipped or bolted to the back-plate: either of these would produce an open circuit, with the same effect as condenser failure.

Suppressors

Television suppressors have been mentioned. These can only interfere with the spark if this is thoroughly weak and bad through some other cause. Suppressors can be obtained in a plastic rod inserted in the high-tension lead, or in the plastic plug connector, or actually within the plug itself, in which case the ceramic centre may look a little longer than usual and, in addition to the maker's usual type of markings, there will be the letter X. Only *one* suppressor is required per motor.

In conclusion, let us admit that the physics of electricity and magnetism are complex. But there is nothing "hit and miss" about the way they work. Electricity will find its way along a conductor as surely as water through a pipe. Three things will stop the flow of either: No electricity, or no water.

A short circuit, or leak.

An open circuit, or obstruction.

CHAPTER XI

DECARBONISING

As a result of burning petrol and oil, a hard, dark substance—carbon—is produced, with which the internals of the engine get coated. As the quantity of carbon builds up, the firing space becomes restricted and the heat-conducting properties of piston and cylinder head are reduced. These conditions in time cause the engine to “knock” or “pink” under full load. Even more important, the ports or holes through which the burnt gases leave the engine become obstructed by carbon, so that performance goes down; a further symptom of this is a gradual muffling of the exhaust noise.

Before any decarbonising is tackled, indeed as soon as the unit is purchased, it is a very wise plan indeed to buy a complete set of gaskets, a set of piston rings and circlip. When buying these ask your dealer to spare you an old or broken piston ring. Before starting any dismantling, see that you have a little paraffin, some well-washed and non-fluffy rag and a pair of cardboard boxes or tins to receive internal and external parts respectively.

There are three kinds of—or stages in—decarbonising. There is the “exhaust decoke” which clears the exhaust port, the exhaust pipe and silencer; then the “top decoke” which entails the removal of the cylinder head and cleaning it, the piston crown and the ports from within; the third stage is the “full decoke” in which the cylinder is removed and the piston taken out, its rings removed and the ring grooves and the underside of the piston cleaned.

The needs vary with different engines and different users, but in general it can be said that if the first operation is properly done as frequently as it is needed, the second will be less often called for and the third need be a very rare operation indeed. Some engines have been known to run for years with no attention other than the regular clearing of the exhaust system. If there is a falling-off in power and speed and a feeling that the last bit of throttle-opening is not produc-

DECARBONISING

ing any result in terms of power, then the exhaust decoke is called for. If these symptoms are accompanied by noises of distress, knocking or pinking (a tinny noise, like hitting the cylinder head with a small hammer), then the head is full of carbon and needs to come off. Both these operations are within the capacity of any non-technical person following the instruction book.

Only when the two first operations have failed to bring the engine back to life *and* there is a worsening of the petrol consumption figure is the full decoke necessary. This calls for a little more skill and care, and many cyclemotorists will prefer to leave it to the agent. This is not a bad idea if the agent is good, as he can at the same time check the cylinder bore for wear and see that the bearings and seals are in good condition.

Exhaust Decoke

First, remove the exhaust pipe and silencer complete. If the sparking plug is removed, sufficient light can then be thrown on the subject for the inside of the cylinder to be seen through the exhaust port by turning the engine until the piston is at the bottom of its stroke, i.e. leaving the port clear.

It will probably be seen that the port is partially blocked by hard carbon, and this has to be removed. The best tool for this job will be of hard wood or soft metal to avoid damage to the piston.

When the port is clear, turn the engine until the piston comes up over the port and look at the condition of the rings. If they are smooth and clean, press each one lightly with the end of the decoking tool. You should feel a slight springy movement which denotes that all is well and **IS BEST LEFT ALONE**. If, however, the rings are very dark in colour and appear stuck into the piston, or if there are scores (vertical scratches) on rings and piston, then the engine needs a full decoke and replacement parts.

Now turn to the pipe and silencer. On some makes these are designed to be taken apart so that the insides can be cleaned with the decoking tool or a long-handled screwdriver. Some, however, are all in one piece.

To clean the latter the best plan is to use boiling water and a strong solution of one of the modern detergents. Plug one end of the exhaust system with rag and fill up with the solution. Some shaking and tapping will help to dislodge the hard carbon. Let it cool and drain off, then repeat two or three times until no more carbon comes out.

In really stubborn cases "cooking the coke", heating up the whole system to nearly red heat with a gas ring or blow-lamp, will break up the deposits, but as it will also take all the plate or enamel off the pipe and silencer, it is only to be recommended as a last resort.

Each time you do an exhaust decoke, study the stuff you find in the system, as it will give some guide as to how your engine likes the treatment you give it. If there is a lot of very hard carbon about, you are probably using too much oil in the petrol—cut it down in future. If there is a lot of soft soot about, your mixture is too rich and you can save carbon and petrol by fitting a smaller jet.

Top Decoke

For this operation, in addition to the exhaust system, the cylinder head is removed. This may be stuck and it must never be levered or hammered free. Here is an easy way: undo all cylinder head holding-down nuts or bolts by two turns. Open the throttle and walk the engine against compression. In a few paces, the stuck joint will be freed and when the nuts or bolts are removed the head will lift off. In theory, a really stubborn head could be loosened by starting the engine instead of just pushing it; in practice this is seldom, if ever, necessary. The whole point is—no hammers, no levers.

The sequence of dismantling will be covered by the maker's instruction book. Our next stage is the removal of carbon. A stick of hardwood is advised by some makers for this; hardwood certainly makes a safe tool, but one which requires a fresh edge to be maintained. A stick of solder or a piece of old copper petrol pipe, hammered and shaped to a cutting edge is another safe weapon. The difficulty is that carbon is hard and the aluminium piston and cylinder head are both relatively soft. The knack is to flake rather than chip the carbon off without cutting or jabbing the soft metal beneath.

The cylinder, being cast iron, is a lot more robust, so that blunt steel tools are quite safe for dealing with exhaust and transfer ports. Peer into every nook and cranny here, as the carbon and metal surrounding it look remarkably alike. In fact, a really bad exhaust port can look rather like this:

When it ought to look like this:



As removal proceeds, loose carbon particles can be got out of the way with a dry brush, and finally with a bicycle pump or with a vacuum cleaner dusting tool attachment. The cylinder head can be washed in paraffin and re-assembly undertaken in the sequence laid down in the manufacturer's instruction book. The greatest possible care should be taken in tightening the nuts on the cylinder head and exhaust flange as described in detail on page 46. The carbon which collects in the exhaust pipe has at least as much, and sometimes more, effect on performance as carbon in the engine. So the silencing system should be dismantled and thoroughly cleaned before re-attaching to the engine.

Full Decoke

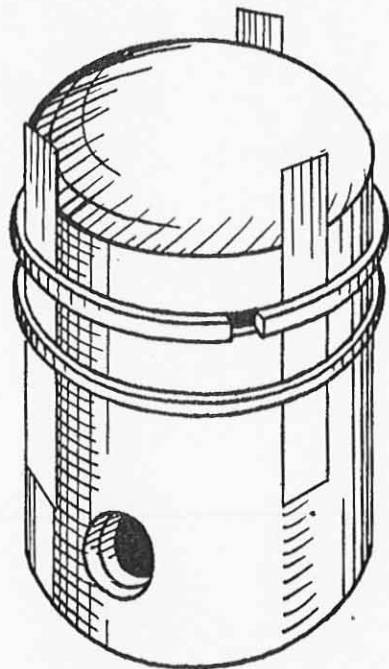
If a full decoke is being done, it may be easier to remove the cylinder barrel and head in one piece. At any rate, until experience has been gained, this operation is a lot easier with four hands instead of two. So the first time this job is tackled, try to get assistance for five minutes.

When carburettor (if in the way, tie it to one side with string), exhaust, cylinder nuts, etc., have been moved as per maker's instruction, one person should draw the barrel away from the crankcase without any deliberate twirling. A little circular motion is harmless, but resist the natural inclination to "unscrew" the barrel. As the barrel is raised the helper should watch for the connecting rod to come into sight so as to take a hold of it as soon as there is space for fingers, and immediately afterwards to grasp the piston. The latter is a delicate object and should be protected by a piece of rag wrapped round it so as to prevent anything falling into the crankcase.

The piston in the majority of engines is secured by a circlip which has to be dislodged with pliers or the tang of a file, according to type used. In case it springs off into the nowhere, a spare was added to the short list of necessities before starting. With the circlip removed, hold the piston upright with one hand and press the gudgeon pin out with the other, using a pencil or other convenient object as pusher. Do not allow the connecting rod to take any sideways thrust whatever, as it is very easily bent and the slightest distortion will cause wear. If the gudgeon pin is at all reluctant to move, heat the piston with a flat-iron or a rag that has been in very hot water. This will expand the piston and release the pin. Immediately after removal, the piston should be marked on the inside to indicate the front.

Now look carefully at the piston rings. Observe that they are prevented from rotating by pegs. They should be bright and shiny and perfectly free to move in their slots; if they are all these things, there will be no point in removing them. But if they are gummy or carboned into their grooves they should be taken off and the grooves cleaned. If the rings show any signs at all of discolouration on the outside surfaces which press against the barrel, they should be renewed.

Piston rings are very easily broken, but here is a simple way of removing them without breakage. Cut three thin strips of tin, say, 2" by 3/16"—the size is not critical—and slide them one at a time beneath the top ring as shown. It is then quite simple to ease the ring over the top, and the process can then be repeated for the lower



ring. Carefully set the rings on one side so that you can later replace them in the same order and the same way up.

Any carbon sticking to the inside of the rings can be flaked off. If a piece of broken ring can be ground against an emery wheel so as to present a square end, this is an ideal tool for cleaning carbon from ring grooves. Care must be taken that the grooves are not in any way widened during the scraping process. Carbon should be very carefully flaked from the top of the piston and also from the upper "land", which is the piece between the top ring and the crown. Beneath the rings the piston should have become a very dark brown (with carbon) or a dull, metallic grey; do not touch these surfaces, they are as they should be. But if there is any scoring, that is: longways ridging, or even any brightly polished "high-spots", these should be gently eased off with a very smooth file in the manner shown. Never, at any time during decarbonising be tempted to use emery or other abrasive, as minute particles would become embedded in the relatively soft metal, and thereby do much damage.

When everything is ready to go back, clean off any traces of old paper washer which may be sticking to the top face of the crankcase and the bottom face of the barrel. A new one should be fitted after every decoke. Most manufacturers include these in their gasket sets, but a few may not, as it is so easy for the owner to make new ones by holding a piece of stout brown paper against the end of the cylinder barrel and gently tapping out a new washer with a series of light hammer blows; a ball-ended hammer is best, but not essential.

Piston rings should be replaced with the metal strips in much the same way (and in the same positions) as they came off. The heated iron or rag will ease the entry of the gudgeon pin if this shows any reluctance. That second pair of hands will again come in useful when replacing the barrel. One person should gently lower the barrel over the piston while the other supports the connecting rod and piston and presses the ends of each ring together as it enters the barrel. A little oil round the rings will help matters and if the piston appears to jam, use no force; instead, withdraw the barrel and make quite certain that neither ring has ridden, or even been wrongly assembled, over its locating peg.

Follow the manufacturer's recommended sequence and instructions on re-assembly. When all is ready, start the engine (if it will not "play" immediately, suspect something daft like petrol off or plug not re-connected) and when the engine is thoroughly warm, try to

tighten further the holding-down nuts for barrel and cylinder head, once again taking care to pull them down evenly.

How the Engine Works

With the engine thus partially dismantled it is possible to see how it works.

There are, in effect, two compression chambers worked or pumped by the one piston. The lower one, the crankcase, sucks in mixture and then pumps it into the combustion chamber above. The mixture is accepted and fired in this top chamber and the resultant very rapid expansion of gas drives the piston downwards and the wheels go round and round.

If the piston is rotated to the bottom of the barrel it will be seen that the inlet port from the carburettor is blanked off by the piston: it may be noted further, that wherever the piston moves, this inlet port can only lead into the crankcase, never into the combustion chamber. As the engine is rotated and the piston moves up the barrel, the inlet port into the crankcase is uncovered and the underside of the piston creates a partial vacuum behind it which sucks a charge of mixture into the crankcase.

There is a passage connecting the crankcase to the firing chamber, known as the transfer port. The upper end is blocked by the piston as it travels upwards but is uncovered when the piston reaches bottom again. In travelling downwards, the underside of the piston pumps hard down onto the mixture so recently sucked in and as the transfer port is uncovered the mixture goes under pressure into the upper chamber.

As the piston moves upwards again, it closes all ports into the combustion chamber and compresses the mixture into the small space under the cylinder head; just as it reaches the summit a spark across the sparking plug points fires the mixture and sends the piston downwards with considerable force. As it nears the bottom of its travel, the piston uncovers the exhaust port through which the expanded and spent gases escape into the silencer and thence into the atmosphere. While this firing operation has been taking place at the top, a fresh charge of gas has been compressed below and as this shoots up through the transfer port, the front end of the new charge helps to expel the last of the spent gases through the exhaust.

The upward travel of the piston is called the compression stroke and the downward one the firing stroke, two strokes for each revolution of the flywheel, hence the term two-stroke. Incidentally, when owing to imperfect carburation the engine only fires the charge on each alternate stroke, it is said to be four-stroking.

There are minor variations on the above simple sequence. The *Mini-Motor*, for instance, does not have a transfer port as just described; instead, a deep groove in the cylinder barrel marries with a port cut in the side of the piston. In the *Cyclemaster*, the inlet port is controlled by a port cut in a revolving disc instead of by the piston. There are many such small variations.

Most two-strokes can be made to run backwards, though cycle-motors seldom, if ever, do. This contrasts favourably with a certain early motor-cycle which used to reverse direction in traffic with unexpected results to other road users—if not to the rider!

CHAPTER XII

ROADSIDE TROUBLES

The falling-off of power which indicates the need for decarbonising is a very gradual process and is most unlikely to be the cause of an involuntary stop by the roadside. If an engine will not run or start, there are three possible sources of trouble, namely: air-leaks, petrol and spark.

As will have been gathered from the previous chapter, the two-stroke engine is a sort of pump. It sucks in petrol-air vapour, explodes it and then expels the burnt remains. The compression as the piston comes to the top is very noticeable if the machine is walked with the engine engaged and the throttle open. If ever the compression disappears, the probability is that the decompressor valve (if fitted) has stuck open, or a leak has occurred between cylinder head and barrel (any tell-tale oil traces?). Also possible are a loose sparking plug, a loose decompressor assembly or broken piston ring(s). Air leaks or compression trouble are the *least* likely of the three sources, but it is so quick to test for this by walking the machine three or four paces that it seems pointless to look for admittedly more likely troubles without testing compression first.

The most likely cause of engine failure is lack of spark. The plug may be oiled or bridged. If there has been a marked drop in performance over the last half-mile or so, the plug is probably bridged or "whiskered". If so, change the plug or remove the whisker and proceed a little more gently. Whiskering is usually a sign of overheating. If, on the other hand, you have been pottering, perhaps through a town, with its inevitable stops and starts, and the engine goes dead, the chances are that on removal the plug will be seen to be wet and oily, or sooty. Just possibly too much oil is being used, but more probably the engine has not been getting hot enough to dispose of all oil by burning.

Before screwing in a replacement plug it is sensible to connect and hold it against the engine and see it spark as the flywheel is rotated by

hand. The spark should be clearly visible, slightly blue in colour. If the spark is only just perceptible and is yellowy-orange in colour, there is always the chance that a change to a better plug will get you home, but there is a weakness in the ignition section to be remedied (see Chapter 10). As a rough check, the contact-breaker points should part by at least the thickness of a visiting card. If the engine can be made to run, but only erratically, look for undue sparking at the points as an indication of a faulty condenser or connections thereto. If other things look well, suspect a leaky high-tension lead.

A golden rule with a replacement sparking plug is to put it into the engine after cleaning. Then use it to re-start from cold, do a few miles only, then take out and pack as a spare. The plug is then a known and tested quantity and can be relied on in any future need. Plugs should never be carried loose in the tool bag. They should be wrapped first in grease-proof paper and then in rag or, better still, in a proper plug-carrying tin or rubber container. It is not wise to carry spare plugs (or spanners) in pockets, as in the unfortunate event of a tumble, a plug is a mighty hard and unsympathetic object on which to fall!

Lack of Fuel

A sudden stop, perhaps with a few preliminary spits, could be lack of petrol. Have a look in the tank. If a sharp intake of air (as in opening vacuum-packed food or tobacco) is heard, the vent-hole in the petrol cap is blocked and this will have caused a hold-up in petrol supplies.

Try the carburettor tickler next. If petrol does not spurt out, there must be an obstruction between the tank and the float chamber. Start disconnecting the fuel feed from the carburettor and work upwards until the obstruction is found and can be cleared.

If petrol spurts out normally when the carburettor tickler is depressed, then the fuel has got as far as the float chamber. The jet may be blocked or partly blocked. Remove it and look in particular for a mere trace of stuff or hair. Suck rather than blow any obstruction clear, as you will want to avoid leaving a droplet of water in the jet. If, by any chance, air pressure will not clear the jet orifice (the cycle pump is worth trying) a thin strand from a control cable may be used as an absolute last resort as a pricker. Even using great care, the jet may be damaged and have to be replaced later.

Methodical Fault-finding

To re-cap on roadside troubles. It is a hundred-to-one that failure of an engine to go is due to :

1. No petrol mixture (or much too much) reaching the engine.
2. No spark to fire the petrol mixture.
3. No pumping action from the piston.

in that order of likelihood. Accept this as fact, and if in trouble, resist any temptation to panic. Don't, for instance, start heavily flooding the carburettor or pedalling desperately for hundreds of yards, as both these practices make the engine over-rich and harder to make go! Just take it easy. Look for the obvious things first. Petrol in tank, petrol turned on, lead to sparking plug still connected, and so on. You may not carry this book in the tool kit, but you will be wise to carry your manufacturer's instruction book. Look at the trouble-tracing chart you will almost certainly find therein, and—depending, of course, on the circumstances and time available—follow it through until you find the cause of the trouble. One great advantage of the cyclemotor is that if, after a quick check of compression, spark and fuel, there is still no joy in the engine, it is an easy matter to pedal home, or to professional assistance.

One thing after another!

One oddity of two-strokes must be mentioned. Well run-in engines have the habit of running on and on, and unless checked from time to time they will get more and more out of adjustment. Still they go on, until one day they refuse. In such circumstances one fault may hide another. A jet may be partially blocked, for instance. The resultant weak mixture may cause over-heating and a whiskered plug. The rider may not have noticed the diminished road performance from the starved engine, but he has to do something when the plug points become bridged. So he stops, changes plug and is amazed when the engine won't go, or will only just struggle. Such situations are very puzzling and can be rather more complicated than in this example. The first answer may well be to pedal home and tackle the problem later in a mood of logical and patient enquiry. The final answer, whether arrived at by owner or agent, will almost certainly be found to be in the no petrol, no spark, no compression routine already discussed—or just possibly in a combination of two, or even all three.

CHAPTER XIII**CLOTHING**

There is no need to look like a cross between a space-man and a golfer in order to be comfortable on a cyclemotor. The point the cyclemotorist must face, however, is that he may be outdoors for longer periods as a rider than he would be as a 'bus passenger, and will therefore require extra protection against rain at the neck, wrists and feet.

Starting from the top, a cap or hat with a stiff peak or brim is useful. The cap may require a few stitches and the hat a little padding underneath the sweat-band to avoid being blown off.

An effective scarf is essential, and two or more of the very best can be made by dividing a hand-towel lengthways. Towelling is easy to launder and dry, and on wet days one or more spares can be carried for the return or for an extended journey.

A full-length gabardine raincoat has the advantage that it looks fully civilised when the rider has become a pedestrian again. A dip in NEV will restore the water-repellant attributes of this and similarly closely-woven fabrics. Plastic and oiled nylon are waterproof, but some of them tear easily and all of them are inclined to hold condensation, particularly when body-heat is generated by pedalling. Modern plastic rainproofs can be rolled and stowed wet should the need arise.

Fairly stout gloves are needed for cycling or cyclemotoring. Horsehide wears very well, and this and leather can, to some extent, be waterproofed by treating with Melitol; so can shoes. Watertight bag-type gauntlets are available very cheaply, and with ordinary woollen gloves inside, keep hands warm and dry.

Feet are something of a problem in that in fair weather extra protection is more of an encumbrance than an asset. What is required, therefore, is something which will go over ordinary walking shoes

when required, yet be sufficiently compact to stow away in the corner of a pannier. One such protector is the *Aquaspat*, which clips over an ordinary shoe and shields the rider to a point just below the knee. Several firms offer rubber overboots at 6/6d. and an ex-W.D. oilskin ditto for 1/6d.; both these pack fairly small and are effective, but both are on the bulky side when worn.

Certain machines seem to have the vice of throwing road dirt in a particular direction, and in such cases it is worth trying to deflect the dirt at source rather than wear extra protection. A little ingenuity with valances or dress guards will often give most rewarding results.

Goggles should be light and well-ventilated, and there is a lot to be said for the cheapest one-piece celluloid type. These have to be replaced when they get too scratched, but they last surprisingly well.

Ladies' dress, for cyclemotoring no less than other pursuits, should receive specialised attention from designers.

CLOTHING FOR WOMEN

(Notes by Pauline Long)

A clothing manufacturing industry that can get the Hunt Expedition up Mount Everest, can send a team to North Greenland fully equipped to weather the Winter there, and provide for all the needs of the Forces on land, sea and in the air might, one would think, be able to cope with a hundred-thousand or so women on cyclemotors and scooters—but it needs a devil of a lot of pushing.

On the whole, women are not catered for, except at men's level—for example, two-piece suits and ski-caps. The campaign fought by *Power and Pedal* over the past three years for a strong, waterproof, conventional-looking full-length coat has had some results, notably the *Norvyde* and the *Cella*.

The plastics firm, Greenwich Plastics, Ltd., have produced some really lovely material, and Tidywear (of Croydon), for example, have made it up into attractive garments. Tidywear distribute through "trade channels"—you may have a stockist in your neighbourhood, or you may not—they cannot give us a list of stockists. However, the fact remains that there are light, strong, waterproof reinforced plastic garments, and very good-looking indeed, at reasonable prices—if you search far enough and long enough for them.

Overboots for women are available at ordinary shoe shops, but few of them are strong and durable enough for our purposes.

New-fashion garments in shower-proofed materials, coats, jackets and skirts, are available at reasonable prices by such firms as Telemac, Ltd. who, in particular, make one ensemble of gaily-coloured mac, waterproof pretty hat and bag for under £4.

Special treatments for various materials now available are of interest, in particular silicone proofing, not only of nylon and Terylene, but also of cotton and wool garments. It needs to be emphasised that silicone proofing allows the material to "breathe". Silicone proofing of suede shoes makes them water-repellent, a great advance with suede, which formerly spoiled easily when it got wet.

Strong but sheer stockings, 40-denier stretchables, are a welcome innovation by Charnos and Kayser Bondor, and will be available this Autumn. Still much needed, however, is attention to gloves, footwear and headwear.

CHAPTER XIV

TOURING

Touring is fun. For most of us the roads, particularly the by-roads and lanes, as near as 20 miles away can be new and interesting country. With a little care in planning, some very enjoyable weekends and extended annual holidays can be spent with a cyclemotor.

It is always tempting to plan over-long mileages. Unless there is a particular objective such as the South of France or the Edinburgh Festival, it is better to average, say, 50 miles a day and have time to spare to enjoy villages, scenery and people, rather than press on with a schedule calling for six to eight hours' riding a day, which can become a penance if the weather is bad. In a fortnight's tour it is a good plan to make two stops with more than one night in one place; apart from the relaxation, some quick home laundering can be effected, films developed, and so forth.

A comfortable riding position has already been stressed in Chapter V; it is vitally important on tour. Luggage carrying becomes a major problem and is best solved by distributing the load as evenly as possible. If, for instance, a rear wheel attachment engine is fitted, further tail weight is undesirable. Various specialists make excellent carriers and panniers to fit the front of the machine and to hang from the top tube. If the engine is within or under the frame, additional weight can be carried both fore and aft. Whatever arrangements are made, it is worth making a good full-load test before embarking on a holiday, as few things can be more maddening than having to worry about luggage, and maybe having to organise day-to-day rigging to keep loose ends out of the spokes.

It is very pleasant to have some un-travel-stained clothes into which to change of an evening. Flannel trousers travel best when wrapped around a piece of cardboard which is slightly smaller than the pack or pannier which carries them. Terylene trousers, which resist creasing, whether caused by wet or packing, seem made for the job. The properties of nylon shirts are now well known.

CLOTHING

The machine should be reasonably carbon-free and in general good order before starting on tour. As regards spares, it is worth buying spare throttle and clutch cables, thoroughly oiling, and then taping alongside the cables in use. Carry the set of gaskets, piston rings, circlip and plug already mentioned and add a puncture outfit or spare tube, a float and any other small part—such as a jet—that your dealer advises as perhaps likely to play up on your particular machine. If going abroad with a British unit it is reassuring to carry a complete magneto backplate and spare woodruffe key so as to have a spare coil, condenser and points. With Continental units this is less necessary, as spares will be more readily available abroad. If several members of the party use machines having the same type of magneto, then only one backplate need be carried.

A holiday tour on the Continent is more expensive than a similar trip in the British Isles—or maybe one is just more tempted to spend. Picnic lunches reduce costs and wayside accommodation is little, if any, dearer than at home. Hotel meals can be a facer!

Passports are obtained from the local Ministry of Labour and any Bank will provide travellers' cheques which can be cashed into foreign currency as required.

For foreign touring, members of the A.A. or R.A.C. are offered special foreign touring facilities. There are uniformed representatives at the ports on both sides of the Channel who assist members with Customs, papers, unloading, etc. For a fee of 35/- per machine they provide all necessary vehicle documents, G.B. plates, special lamp filters if required, routes and town plans. They also stock and sell all the worthwhile foreign maps and guides. They will airmail spares to a member in difficulty, and if his machine should become un-repairable, they will transport it free to the nearest port where it can be embarked and, in fact, will get it shipped over and into a garage in England.

The foreign touring charge is additional to the annual subscription of 31/6d. (25/- to members of A.C.U. affiliated clubs when joining the R.A.C.) plus an entrance or badge fee of 5/-. In exchange for this subscription, members are provided with keys to special telephone boxes, advice on touring whenever required, help on the roads by Patrol-men, technical advice on buying, selling, running and insuring cyclemotors and free legal defence in the event of a police prosecution for a motoring offence.

In addition, the R.A.C. provides at no extra charge, and the A.A. at 10/6d. a year extra, a "get-you-home" service." In case of a breakdown, a special voucher is sent by messenger to the nearest authorised repairer who will provide a car to run the member home or to a railway station, according to where the breakdown occurs.

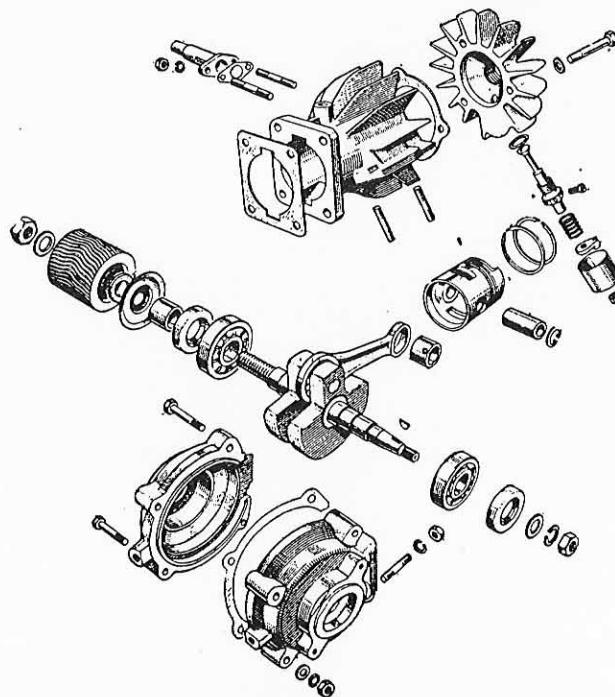
Full particulars of the services provided by these two motoring organisations may be obtained on application to :—

The General Manager,
Associate Section, Royal Automobile Club,
85 Pall Mall, London, S.W.1.

The Secretary,
Automobile Association,
Fanum House,
New Coventry Street, London, W.1.

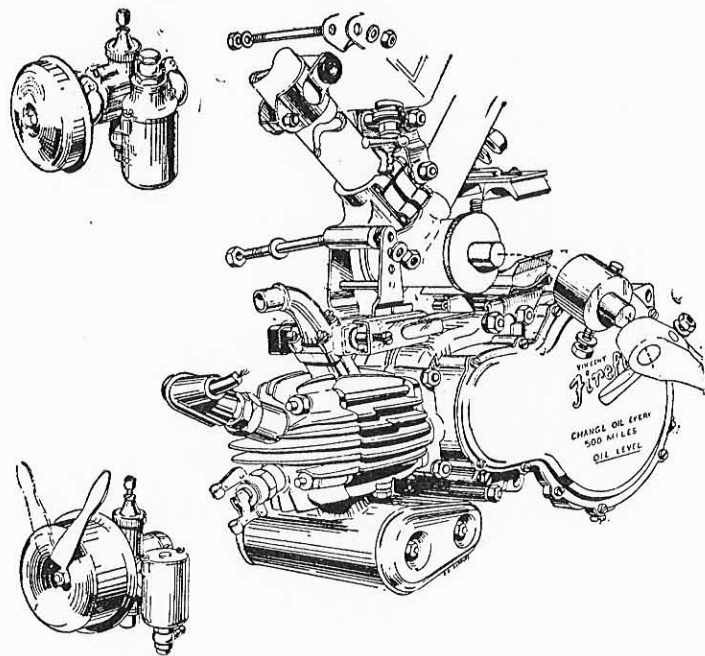
If interested in foreign touring, ask for full details of this service at the same time.

SOME WELL-KNOWN ENGINES



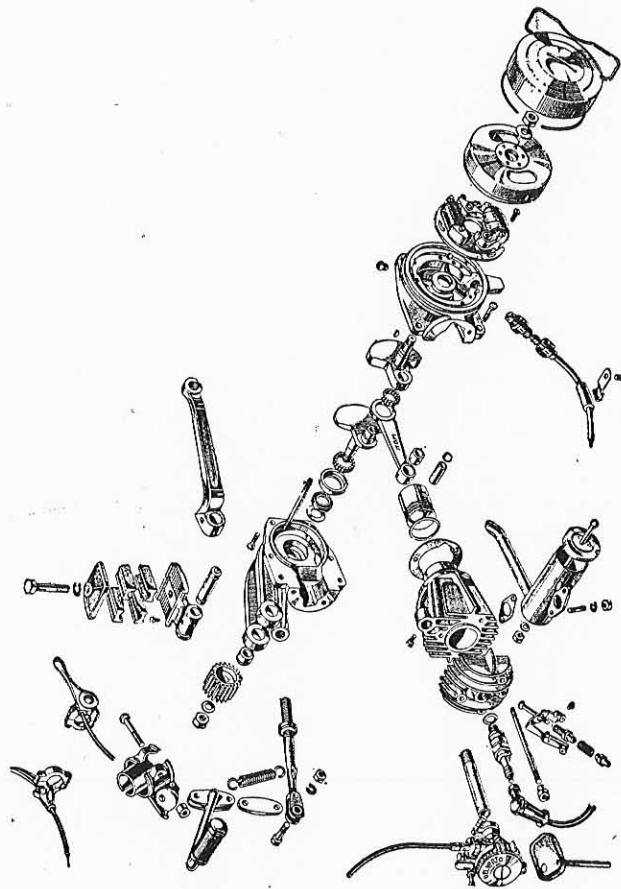
Trojan Mini-motor

First attachment engine introduced in Britain in 1948.
Roller drive, general-purpose unit, of robust construction.



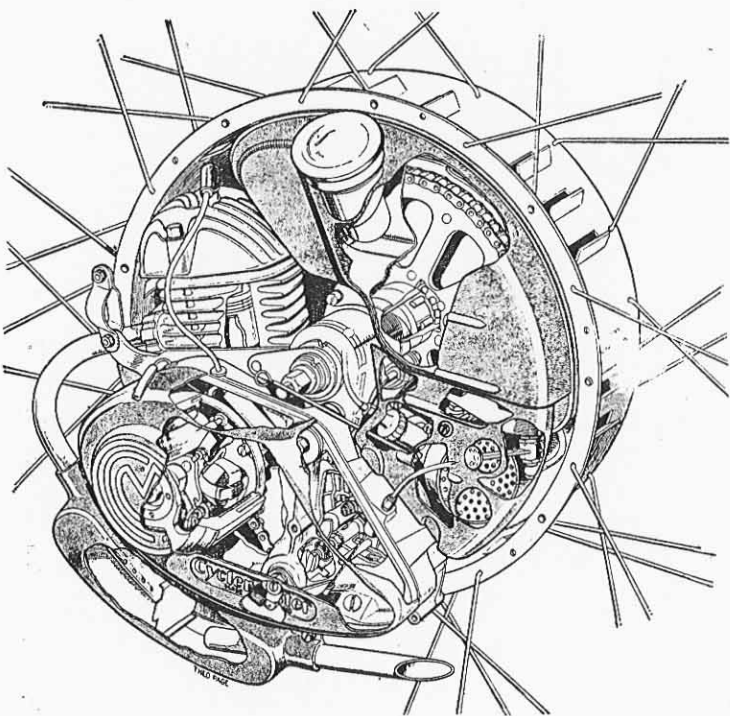
Vincent Firefly

A British under-the-bracket attachment, noted for fastish main-road cruising capacity.



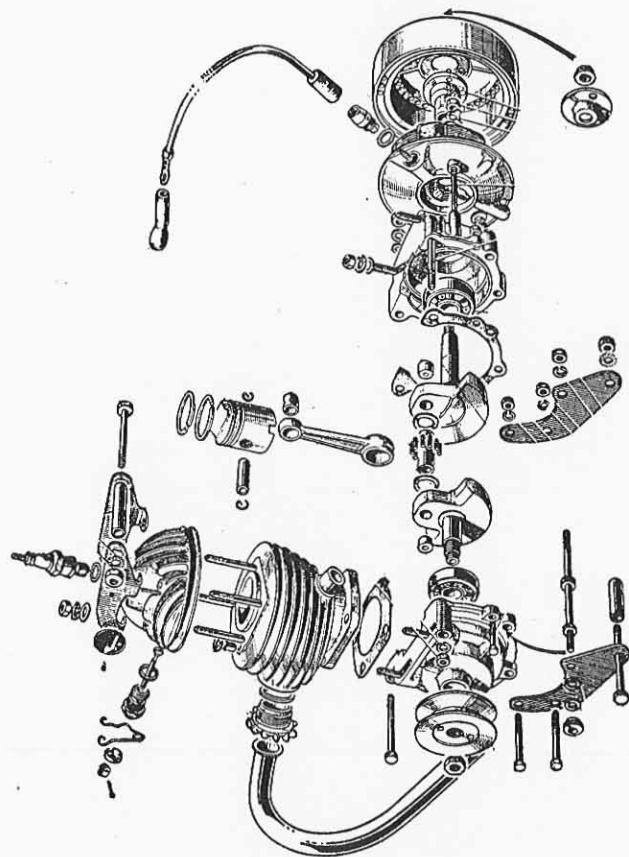
Iton Tourist

A high-performance lightweight Italian unit, specially suited for use with light sports cycles.



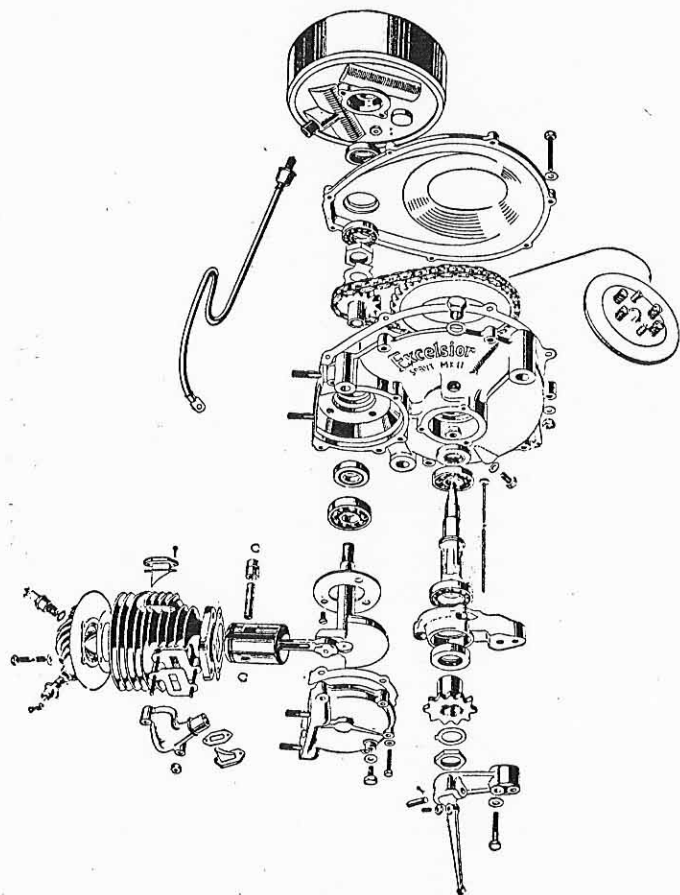
Cyclemaster

British-built, of Netherlands origin, the "original engine in a wheel" has been the most popular of all attachment units. It is designed to afford relatively modest speeds, good all-round handling and economy.



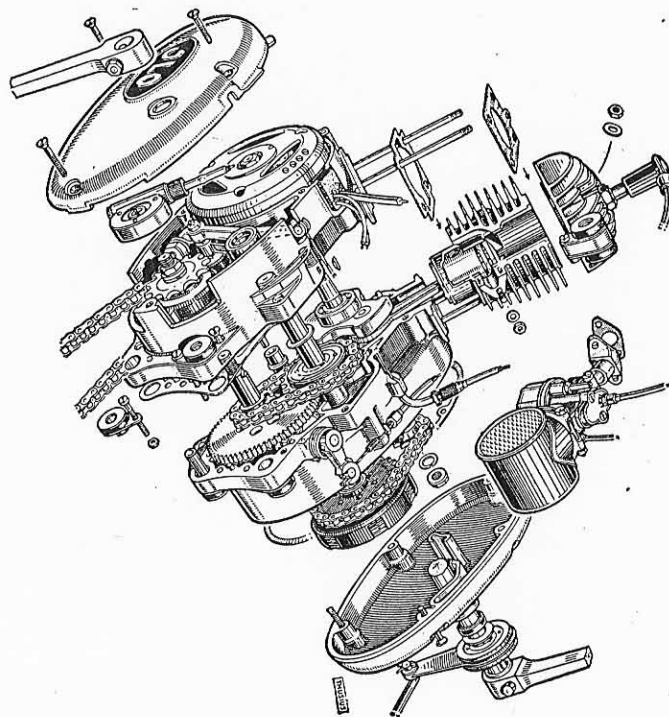
Mobylette

A French light autocycle with probably the largest sale in the world ; of modest performance, quietness, long life and low initial price.



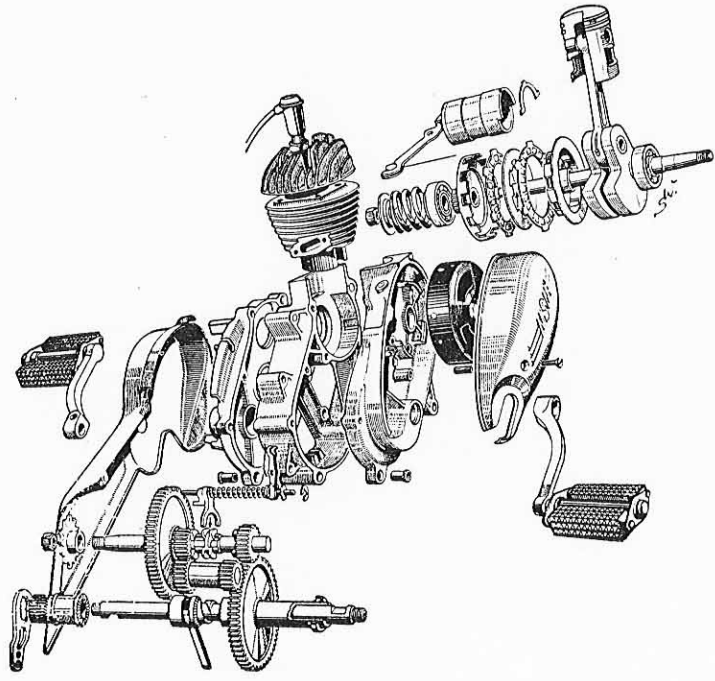
Excelsior

British representative of the 98 c.c. autocy-
cle class. Available in single
or two-speed forms.



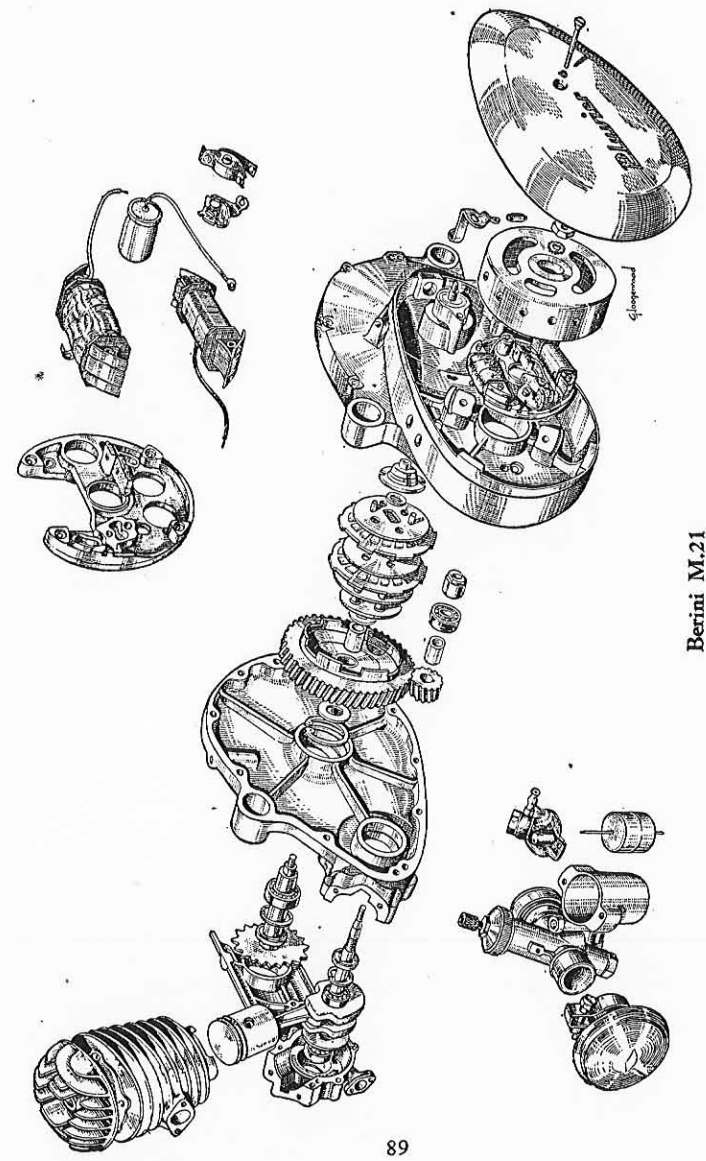
J.L.O.

A German proprietary engine featured in the Credette range of
machines, and many others. Single and two-speed models are avail-
able, noted for high power output.



N.S.U. "Quickly"

A highly-successful German auticycle with two-speed gear box. Noted for lively performance, reliability, compact design, and good appearance.



Berini M.21

A Netherlands machine handled here by Cyclomaster Ltd. An exceptionally powerful and flexible engine of the single-speed type.

Technical Data Table

	Capacity (c.c.)	Weight (lbs.)	Engine Mounted	How Engine Driven	B.H.P./R.P.M.	No. of Speeds	Clutch Fitted
Berini	49	92	Front of Bracket	Chain	1.8/4800	1	Yes
Britax-Ducati	48*	76	Under Bracket	Chain	1.35/5130	2	Yes
Ducati	48*	19	"	Chain	1.35/5130	2	Yes
B.S.A.	35	26½	In Rear Wheel	Gear	1/6000	1	Yes
Winged Wheel	35	—	"	Gear	1/6000	1	Yes
Cairns	49	—	Over F. Wheel	Friction Roller	—	1	No
Cairns Mocyce	49	20	"	Friction Roller	—	1	No
Combinette	49	65	Front of Bracket	Chain	1.5/4500	2	Yes
Credette I.	48	66	Front of Bracket	Chain	1.5/5000	1	Yes
Credette II.	48	75	"	Chain	1.5/5000	2	Yes
Credette III.	48	90	"	Chain	1.5/5000	2	Yes
Cyclemate	32	76	"	Chain	.8/4500	1	Yes
Cyclemaster	32	34	In Rear Wheel	Chain	.8/4500	1	Yes
Cyclaid	31	18-20	Over Rear Wheel	Belt	.7/3500	1	No
Itom "Astor"	49	—	Within Frame	Chain	2/5000	3	Yes
Itom "Tourist"	48	15½	Under Bracket	Roller	1.4/3500	1	No
Mini-Motor	49	26	Over R. Wheel	Roller	1/3400	1	No
Mobylette-Standard	49	64	Front of Bracket	Belt & Chain	.8/3800	1	—
Mobylette de Luxe	49	67	"	Belt & Chain	.8/3800	1	Yes Auto
Mosquito	38	15	Under Bracket	Roller	.8/4200	1	No
Mosquito	49	19	Under Bracket	Roller	1/4200	1	Yes
Mosquito	49	—	Under Bracket	Roller	1/4200	1	Yes
N.S.U.-Quickly	49	73	Within Frame	Chain	1.4/5200	2	Yes
Phillips P36x	49	69	To Downtube	Chain	1.5/5500	1	Yes
Power Pak-Standard	49	22	Over R. Wheel	Roller	.9/4200	1	No
Power Pak-Synchro	49	26	Over R. Wheel	Roller	.9/4200	1	Yes
Royal Nord	49	90	Within Frame	Chain	2.1/5000	2	Yes
Teagle	49½	14	Over R. Wheel	Roller	.9/4500	1	No
Velosolex	45	60	Over F. Wheel	Friction Roller	.4/2000	1	No
Vincent	48	—	Under Bracket	Roller	1/4200	1	No
Vincent Firefly	48	—	Under Bracket	Roller	1/4200	1	No

*O.H.V. Four-stroke engine

‡Blower cooler

★ Prices were those ruling at the time of going to press, and are varied by the Purchase Tax changes of the Autumn Budget.

Tank (Fuel) Capacity (pints)	Tyre Sizes	Spring Fork	Front Brake Type	Rear Brake Type	Prices (inc. P.T.)	Makers or Concessionaire's Name and Address
10	25x2	Yes	Int. Exp.	C'str Hub	£65 11 9	Cyclemaster Ltd., Tudor Wks., Byfleet, Surrey.
5	26x1½	Yes	Int. Exp.	Int. Exp.	£70 6 9	Britax, Ltd.
4			ATTACHMENT		£47 16 0	115-129 Carlton Vale, NW6
4			ATTACHMENT†		£31 4 2	B.S.A. Cycles, Ltd.,
4	26x1½	Yes	Caliper	Int. Exp.	£48 18 2	Waverley Wks., B'ham, 10
—	26x1½	No	Stirrup	Stirrup	£33 1 0	
2½			ATTACHMENT		£18 7 6	Cairns Cycle Co., Ltd., Todmorden, Lancs.
5	23x2	Yes	Int. Exp.	Coaster	£67 16 0	Ambassador Motor Cycles, Pontiac Wks., Ascot, B'ks.
8	26x2	Yes	Int. Exp.	Hub	£64 3 10	Beauship Trading & Ship- ping Co., Ltd.,
8	26x2	Yes	Int. Exp.	Int. Exp.	£70 11 4	25 Savage Gardens, EC.3
8	23x2	Yes	Int. Exp.	Int. Exp.	£76 19 3	
5½	26x2	No	Int. Exp.	Int. Exp.	£48 19 8	Cyclemaster, Ltd.,
2½	26x1½		ATTACHMENT†		£29 19 2	Tudor Wks., Byfleet, Surrey.
3			ATTACHMENT		£15 0 0	British Salmson Cyclaid, Ltd., 76 Victoria Street, SW.1.
12	x2 (F&R Yes)		Int. Exp.	Int. Exp.	£90 0 0	Messrs. Adimar, 61 Clapham Road, SW.9.
4			ATTACHMENT		£33 5 0	
5			ATTACHMENT		£21 0 0	Mini-Motor (G. B.), Ltd., Trojan Way Croydon.
3½	26x2	No	Caliper	Int. Exp.	£39 18 0	Motor Imports Ltd., 158 Stockwell Rd., SW.9.
3½	26x2	No	Caliper	Int. Exp.	£44 17 0	
4			ATTACHMENT		£31 10 0	Mosquito Motors, Ltd.,
5			ATTACHMENT		£39 0 0	Moorfields, Liverpool, 2.
5	26x1½	Yes	Int. Exp.	Int. Exp.	£57 0 0	
5½	23x2	Yes	Int. Exp.	Int. Exp.	£59 18 0	N.S.U. Distributors (G.B.) Ltd., 7 Chesterfield Gdns., W.1.
5	26x1½	Yes	Int. Exp.	Coaster	£55 12 10	Phillips Cycles, Ltd., Credenda Wks., Smethwick Birmingham.
3			ATTACHMENT		£27 10 11	Sinclair Goddard, Ltd.,
3			ATTACHMENT		£32 11 1	162 Queensway, W.2.
11½	24x2	Yes	Int. Exp.	Int. Exp.	£77 10 0	Archie E. Moss, Ltd., Woodgate, Loughborough, Leics.
5			ATTACHMENT		£19 0 10	W. T. Teagle, Ltd., Blackwater, Truro, C'wall.
1½	26x1½	No	Caliper	Caliper	£38 18 4	Solex Cycles, Ltd., 45 Crawford Place, NW.1.
5			ATTACHMENT		£25 9 8	Vincent Engineers (Steven- age) Ltd.,
5	26x1½	Yes	Caliper	C'str Hub	£38 19 3	Stevenage, Herts.

†Extra Brake fitted in hub

REFERENCE PUBLICATIONS

- BERINI—Cyclemaster Ltd., Tudor Works, Byfleet, Surrey.
 Instruction Book.
 Spares List.
 Service Manual (Trade only).
- B.S.A.—B.S.A. Cycles Ltd., Waverley Works, Birmingham 10.
 Winged Wheel Spares List (illustrated).
 Winged Wheel Servicing Data Sheet.
 Winged Wheel Instruction Manual (price 2/3d.).
 Winged Wheel Service Manual (price 2/9d.).
- COMBINETTE—Ambassador Motors Ltd., Pontiac Works, Ascot, Berks.
 Instruction Book.
- CREDETTE I, II, III—Beauship Trading & Shipping Co. Ltd., 25 Savage Gardens, E.C.3.
 Instruction Book.
- CYCLAID—British Salmson Cyclaid Ltd., 76 Victoria Street, London, S.W.1.
 Instruction Manual } Available to owners on request.
 Spare Parts Illustration } Quote engine number.
 Spare Parts Price List }
- CYCLEMASTER—Cyclemaster Ltd., Tudor Works, Byfleet, Surrey.
 Cyclemaster Owners' Instruction Book.
 Parts List (illustrated) price 1/6d. (post free).
 Workshop Manual price 5/- (4d. postage).
 Cyclemate Owners' Instruction Book.
 Cyclemate Parts List (illustrated).
 " Magic Wheel " magazine, published quarterly. 2/6d. per year.
- DUCATI—Britax (London) Ltd., 115/129 Carlton Vale, London, N.W.6.
 Cucciolo Instruction Book.
 Cucciolo Spare Parts List (price 9d.).
- ITOM—Adimar, 61 Clapham Road, London, S.W.9.
 Instruction Book.
 Illustration of Parts.
- MINI-MOTOR—Mini-Motor (Gt. Britain Ltd.), Trojan Way, Croydon, Surrey.
 Instruction Book. Price 6d. (postage 2½d.).
 Spare Parts List. Price 6d. (postage 2½d.).
- MOBYLETTE—Motor Imports Co. Ltd., 158 Stockwell Road, London, S.W.9.
 Standard. Instruction Book.
 De Luxe. Instruction Book.
- MOCYC—Cairns Cycle & Accessory Manufacturing Co. Ltd., Stonewood, Todmorton, Lancs.
 Instruction Book.
- MOSQUITO—Mosquito Motors Ltd., Moorfields, Liverpool 2.
 Owners' Instruction Book 1/6d.
 Illustrated Spares (not priced) 1/6d.
 Spare Part Prices 9d.
- N.S.U.—N.S.U. Distributors (Gt. Britain) Ltd., 7 Chesterfield Gardens, Curzon Street, London W.1.
 " Quickly " Instruction Book.
 Spare Parts List.
 Maintenance Manual (Trade only).
- PHILLIPS—Phillips Cycles Ltd., Smethwick, Birmingham 10.
 Owners' Instruction Book.
- POWER PAK—Sinclair Goddard & Co. Ltd., 162 Queensway, London, W.C.2.
 Power Pak Instruction Book (includes part numbers).
 Power Pak Synchronic Drive Spares List.
- ROYAL NORD—Archie E. Moss Ltd., Woodgate, Loughborough, Leics.
 Instruction Book.
- TEAGLE—W. T. Teagle (Machinery) Ltd., Brackwater, Truro, Cornwall.
 Instruction Manual and Spares List.
- VELOSOLEX—Solex Cycles Ltd., 45 Crawford Place, N.W.1.
 Instruction Book.
- VINCENT FIREFLY—Vincent Engineers (Stevenage) Ltd., Stevenage, Herts.
 Instructions for Fitting and Maintenance, 1/-.
 Firefly Parts Price List, 9d.
 Firefly Service Guide and Fault-finding Chart, 1/-.

STOP PRESS

As we go to press news has come in of a number of new autocyces likely to appear on the British market in 1956. Full details have not yet arrived. The autocyces are :

KIEFT : *Sachs* engine, two-speed. Semi-sprung forks (torsion bar), 23 x 2 wheels. *Concessionaires* : Kieft Cars Ltd., Derry Road, Wolverhampton, Staffs.

NORMAN NIPPY : British built. *Sachs* engine, two-speed, open pressed-steel frame, bottom link spring forks, very well valanced mudguards, full width hub brakes, 15-watt built-in lighting. *Manufacturers* : Norman Cycles Ltd., Ashford, Kent.

MISTRAL : A group of *Mistral* engined machines, 49 c.c., a single-speeder at £58 4s. 0d. inc. tax, and two-speeder at £64 8s. 0d. Winsmith (Finchley) Ltd., Albert Place, N.3.

POWER PAK : 49 c.c., under-bracket, roller drive, single-speed, clutchless, fitted with spring forks, hub brakes front and rear. *Concessionaires* : Sinclair Goddard, Ltd., 162 Queensway, W.2.

PUCH : 49 c.c., blower cooled, two-speed, beam frame, telescopic front and rear suspension. Price, £87 0s. 0d. *Importers* : Ryder's Autoservice, Bootle, Liverpool.

SHERPA : 49 c.c., and larger alternatives. *Manufacturers* : Harold Holt, 399/401 Ilford Lane, Ilford, Essex.

TORPEDO : *Sachs* engine machine, two-speed, spring forks, choice of 26" or 23" tyres, £72 9s. 0d. Three Dee Radio & Television Co. Ltd., 193 Mare Street, E.8.

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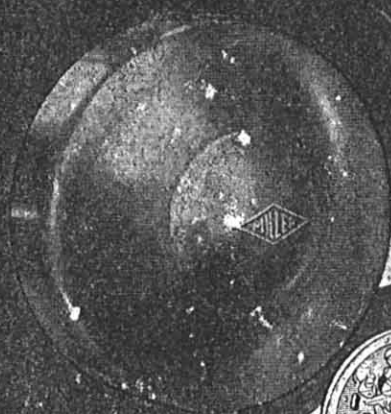
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