MY BICYCLE

VAR

OUTILLAGE «CYCLES»

PARIS

MADE IN FRANCE

le petit livre jaune

86

PREFACE

It seems that at the present time, only the motorised vehicle has its own technical handbook with details of how to use and maintain it to the user's advantage.

With the aim of adding further to the popularity of the bicycle I consulted Daniel Rebour, journalist, talented artist and fervent cyclotourist and the result is this modest little handbook designed to advise you similarly about your beloved mount.

Dare I hope that novices and experts alike will benefit in some measure from the illuminating counsel of this talented man, so greatly esteemed in the cycling world.

We have come a long way technically from the draisienne of 1818 to the machines used in the most recent Tour de France, but modern refinements call for a high degree of knowledge about their maintenance and adjustment if they are to be used to the best advantage.

I wish you, my cycling friends of all kinds, long and happy journeying and the healthy life that the bicycle bestows.

Claude JOURDREN
VAR CHAIRMAN

« ... and if he's no better there is only one remedy, « he must take up cycling. »

Translated and augmented by Harry ASPDEN

le petit livre jaune de

WHAT KIND OF BICYCLE ?

If you already own a bicycle, perhaps more than one, if you have a certain amount of experience in adjusting and maintaining it, you will probably have little to learn from the following pages. All the same, passing on this information to beginners of whatever age could render them considerable service.

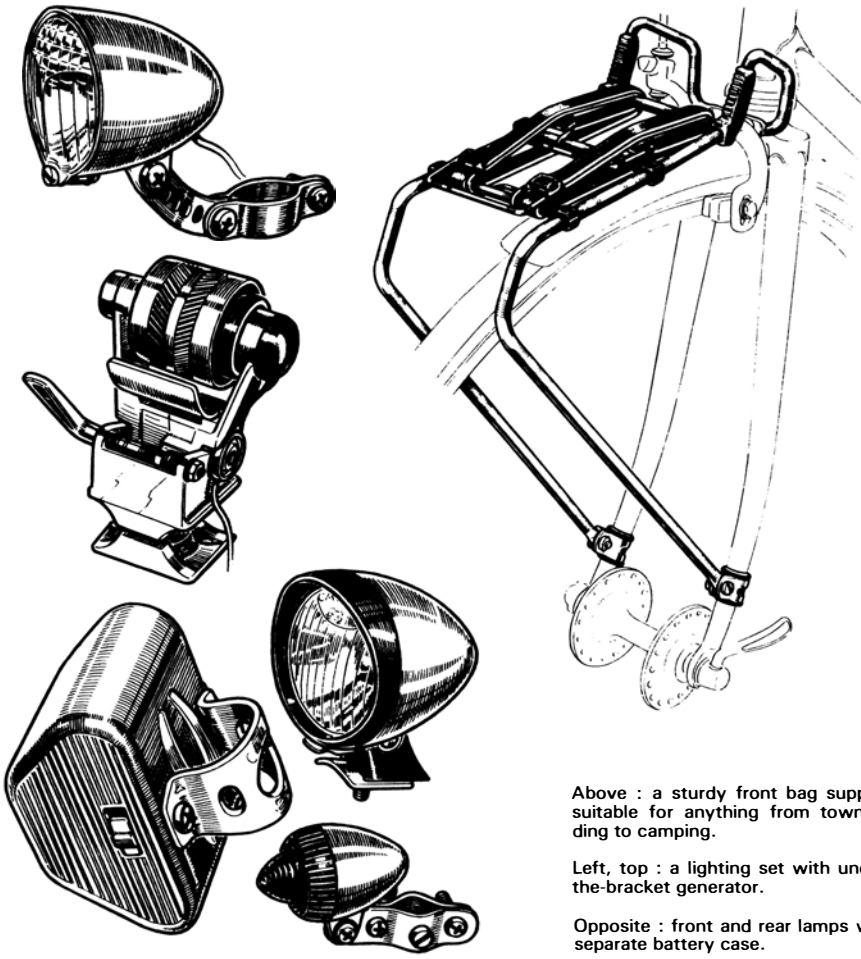
We are really writing for those who are about to acquire their first ''real'' bicycle and who wish to get the maximum amount of pleasure out of it. But we also wish to help those who, for one reason or another, cannot readily call upon the services of a competent mechanic and who might have to tackle certain jobs for the first time. And as we are writing for the beginner, we should first of all discuss what kind of bicycle to buy. That should be governed by what use is going to be made of it.

THE ''TOWN'' OR ''CLUB'' MODEL

This is the sort you use for riding to work or to school every day. A town bicycle should be equipped to cope with all weather conditions and mudguards, two good brakes and efficient lighting are essentials. If your normal routes include hills, then some form of gearing will be necessary, while a good, strong rear carrier will be useful for transporting heavy articles. This advice applies to machines for men and women although the type of frame may differ. Some ladies prefer a step-through frame with a looped top-tube, or a ''mixte'' type with a straight, lowered top-tube, but whichever type is chosen it must be suited to the user's physique. We will discuss this further at the end of the chapter...

And of course the town bicycle can have or dropped handlebars as the user wishes, although one with dropped racing-type bars and light wheels with high-pressure tyres is generally referred to as a ''sports'' or ''semi-racing'' model.

Texte et illustrations de Daniel REBOUR



Above : a sturdy front bag support suitable for anything from town riding to camping.

Left, top : a lighting set with under-the-bracket generator.

Opposite : front and rear lamps with separate battery case.

THE TOURING BICYCLE

While a touring machine can cope with the same jobs as a town bicycle, it is more suitable for longer rides in more varied terrain, and for use in ''trials'' and ''brevets'' where after riding over a set route in a certain time, the rider gains a medal or other souvenir. The most popular ''brevets'' generally include mountain climbs, so that the main difference between a ''town'' and a touring bicycle is in the transmission.

The freewheel will have at least five sprockets, usually spaced with two teeth difference, 14, 16, 18, 20, 22 (or even 24) for instance and this means that the rear derailleur must be capable of handling chain tension over a wide range. There will be two chainwheels, the outside one with 46, 48 or 50 teeth and the inner with from 32 to 38 according to the gradients the rider expects to encounter. Three chainwheels can be fitted, and this allows you to have a very low gear for the steepest slopes.

A tourer generally has a front carrier additional to the rear one and this is fixed to either the fork crown or fork blades and used to support a handlebar bag strapped to the handlebars. It can also accommodate the bicycle headlamp.

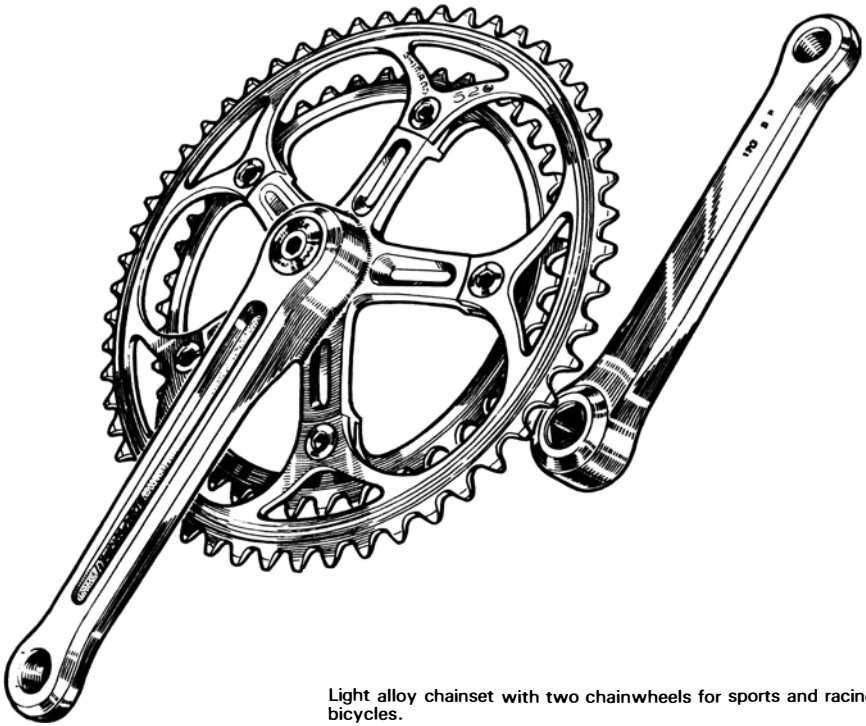
In this category of machine, prices can vary enormously but using low-cost components and an off-the-peg frame, they can be kept down. On the other hand the touring specialists use bicycles which are just as classy – and just as costly – as those of the professional racers, with light, hand-built frames, alloy accessories and light tyres. We cannot dictate to you in this respect, probably your wallet will influence your final choice !

Another activity which cycletourists enjoy is camping and for this the appropriate bicycle will be of sturdy construction and fitted with especially low gears to cope with the extra loads. It should have strong carriers so arranged as to keep the baggage weight low down and to carry an appreciable amount at the front.

Finally, a word on tyres. There are two possible choices, either 700C which are the same diameter as racing wheels with tyres perhaps 28 mm or 30 mm wide, and there are the semi-balloon type of a slightly smaller diameter, with wider rims and tyres of 32 mm to 38 mm. Again it is a question of choice, the 700C being lighter and more responsive with the semi-balloon tyres more comfortable on rough roads. My own preference is for 700C unless a lot of rough riding is envisaged,

RACING

Much of what we have said about the touring bicycle can be applied to one intended for racing. Here again, there is a wide choice from a vast range. From the model built with



Light alloy chainset with two chainwheels for sports and racing bicycles.

ordinary tubing and fitted with steel accessories, heavy tubular tyres (no scope for wired-on covers here) with fully-rubbered walls, you can go to the other extreme of a complete machine weighing less than 19 lbs. It will have a frame built with special tubing, the highest quality fittings in light alloy and open-sided tubulars, often hand-made. More about the characteristics of racing bicycles in later chapters.

CARRIER BICYCLES

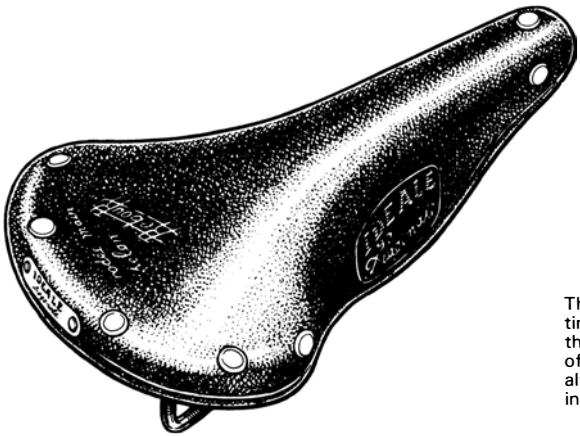
There is yet another type of bicycle which is becoming quite rare, that used in urban situations exclusively for the transporting of goods over short distances. The carrier bicycle will have semi-balloon tyres, a back-pedalling brake with a single gear, front rim brake, rubber pedals without toeclips, flat or slightly raised handlebars, a lighting set and sometimes a gearcase. It is sometimes used by those wishing to travel in ordinary clothes, but nowadays mainly by postmen and newspaper delivery boys.

BMX

While our remarks are directed mainly at youngsters who are about to acquire an orthodox bicycle, this new breed with its fat tyres, upturned handlebars and specially strengthened frame should not be overlooked, designed as it is to go anywhere.

GENERAL ADVICE

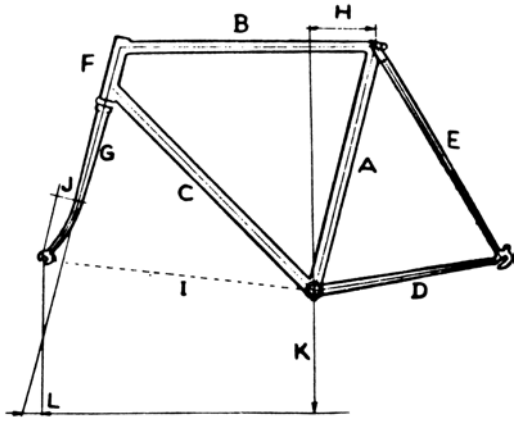
A prime consideration, whichever type of bicycle you decide upon, is the quality of the saddle. Certain makers, alas ! pay more attention to low price than to quality and this is reflected in what you get for your money. Even if you have to pay a little extra, insist upon



The fairly wide leather saddle, sometimes fitted with a hand-worked top that obviates the need for a long and often painful breaking-in period is always preferable unless the ultimate in lightness is required.

having a top quality saddle, preferably of leather, wide enough to afford a comfortable seat and not too hard. It should cause you no problems right from the first few miles, and be just as forgettable at the end of a hundred or so. Nothing is more discouraging to a beginner than to find himself on a saddle that is too hard, too narrow, and badly shaped.

One other thing : unless there is some very good reason for not doing so, fit toeclips and straps. You might have been told that they are dangerous or of no practical use, but quite to the contrary, they add greatly to efficiency and comfort, and serious riding is impossible without them.



(measurements are taken from CENTRE to CENTRE)

Refer to the drawing for the names of the various frame components.

A = seat tube.
B = top tube.
C = down tube.
D = chainstays (2).
E = seatstays (2).
F = headtube.
G = Fork blades (2).
H = distance between seattube and a perpendicular through the bracket.
I = front hub to bracket distance.
J = fork rake.
K = bracket height.
L = fork trail.

The main measurement is obviously the ''size'', and this is measured along the seat-tube generally from the centre of the bottom bracket axle to the top of the seat lug (this is the one which holds the seat pillar). Such a measurement gives the ''overall'' size but nowadays it is often taken from the centre of the bracket axle to a point where a line along the centre of the top tube would intersect one along the centre of the seat tube. Specify whether you are referring to an ''overall'' or a ''between centres'' measurement when ordering a frame. The first is easier to take (and more usual in Britain) and the second is more precise. The difference between the two can be around 15 mm.

How to decide on the size ? It all depends upon the length of your legs and not so much on your height. To find your leg length for this purpose, get someone to measure between a horizontal ruler which you straddle while standing erect in bare feet, and the floor.

An adult should deduct 25 cm from this measurement to arrive at a suitable frame size.

Why 25 cm ? This is made up of the depths of various accessories added to the frame to make a complete bicycle. They are the depth of the saddle, 5 cm of seat pillar, the length of the crank from which should be deducted half the depth of the pedal, plus the thickness of the shoe sole. Of course any of these dimensions can be varied but they serve as a good average and in any case the effective frame size can be varied by means of the seat pillar.

So, in millimetres, the various measurements might be :

Saddle	50
Seat pillar	50
Crank	170
	270
From which we deduct	
Shoe sole	5
Pedal depth above spindle	15
	20

To arrive at : 250

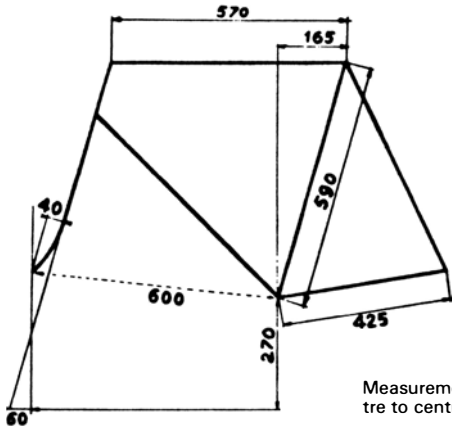
From this it will be seen that it is somewhat misleading to set up a table of frame sizes corresponding to various heights, although it is true that a rider of less than average height could reduce the deduction to 22-24 cm by having less seat pillar showing. And if you are young enough to be still growing, deduct 18-20 cm, but not less than that.

For the very tall, the recommendation is not to go any larger than a 60 cm frame. It is difficult to build a frame any larger than that and at the same time have it rigid enough, above all for competition.

Some builders try to relate the length of the top tube to the length of the rider's arms, but fortunately different lengths of handlebar extensions take care of all that – except in the case of a top tube being too long. It could be said that the notion of a frame made to measure is not strictly realisable except concerning the size. All the other measurements depend upon what the bicycle is to be used for, or upon the personal wishes of the owner. For riding to work or club riding, an off-the-peg frame can be quite satisfactory, and for fast touring or competition, dimensions which give stability and the best return for effort expended should be sought.

RACING FRAMES

The size should be determined as previously explained and the bracket height should not be less than 270 mm or even 275 mm if the rider expects to use longer than usual cranks in hill-climbs or time trials.
The back should be short so as to obtain maximum transmission efficiency, perhaps between 400 and 415 mm, measured from the centre of the bracket axle to the centre of the rear wheel spindle. The front too should be fairly short, 590 mm is reasonable provided the fork ''trail'' is around 60-65 mm with 35-40 mm rake on the fork blades.



EDDY MERCKX'S FRAME.

Measurements are from centre to centre.

Three examples of racing frames

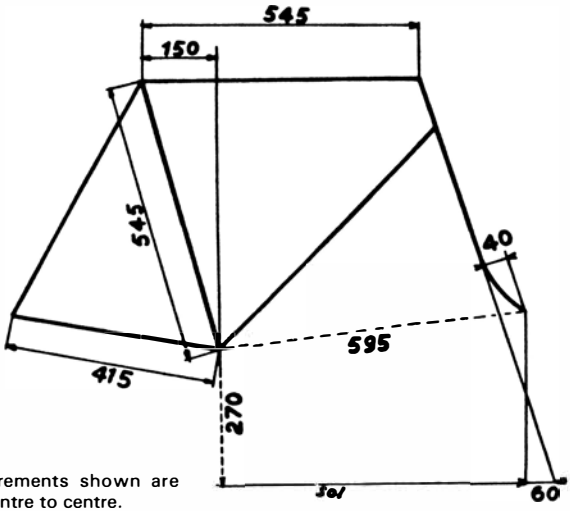
Above, Eddy Merckx's made for a tall man. Note that this is far from being a ''square'' frame in which the top and seat tubes are of equal length. Also that the cranks are 175 mm long.

The other two have 170 mm cranks, which conflicts with the idea that there is a link between length of crank and height of rider.

Also note that the bracket height on all three is 270 mm and the fork trail is 60 mm, excellent for stability and manouverability.

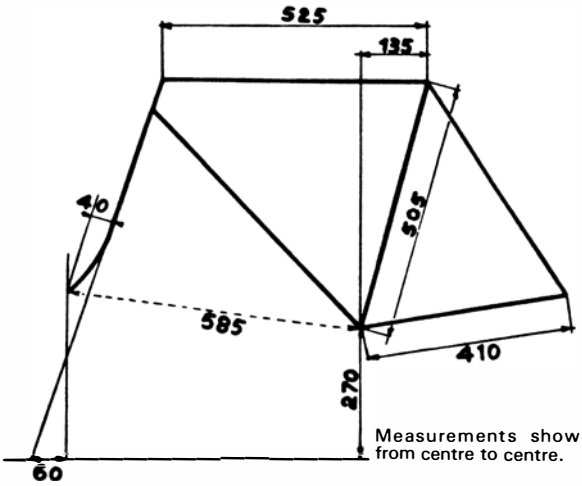
In the VAR catalogue under reference 170 is a ''trail'' gauge which enables the measurement to be read instantly. VAR tool 171 measures the slope of the seat tube, an important measurement on any frame.

ZOETEMELK'S FRAME



Measurements shown are from centre to centre.

VAN IMPE'S FRAME



Measurements shown are from centre to centre.

THREE EXAMPLES

A typical example of a big frame is one used by Eddy Merckx. It will be seen from the dimensions that it is far from being ''square'', that is with the seat tube equalling the length of the top tube. Note that the cranks are 175 mm, but all three machines were used with 170 mm cranks which negates the view that there should be some relation between the length of cranks and the height of rider. Note also that the bracket height of all three is 270 mm and the fork trail is 60 mm which gives good handling with stability.

In the VAR catalogue, reference 170 is a fork trail gauge and 171 measures the seat tube angle, both vital factors in frame design.

With the improvement of road surfaces and the higher speeds at which races are run, the riders are sitting more over the bracket than before and seat tubes have become more and more upright. A linear indication of the slope of the seat tube can be obtained by measuring the distance from the point where a perpendicular from the centre of the bracket cuts

the line of the top tube, to the centre of the seat lug. Obviously for a given seat tube angle, the larger the frame, the greater this distance will be. In the drawing on page 5 the measurement is indicated by the letter H,

On a 52 cm frame, H should be 120-130 mm, and on a 60 cm frame 140-150 mm.

As to what sort of tubing is recommended, steel is the most popular, generally in a thickness of 5/10 mns, with cutout lugs brazed up. Lighter tubing of 3/10 mns wall thickness is sometimes used, as is duralumin and carbon fibre but obviously these are much more expensive – and sometimes not quite sor rigid.

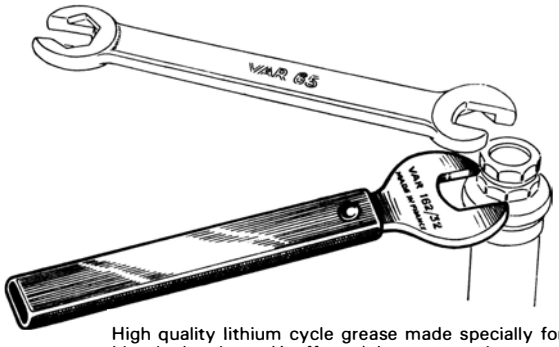
For sports and club use, a frame can be based on the foregoing but with a slightly longer rear end because of the space needed for a mudguard, and a fork rake around 40 mm. For long distance touring, a rear of 420 mm, a front end (bracket to front hub) of 595-600 mm and a fork rake of 40-45 mm would seem reasonable.

And now, let us imagine you have your bicycle and wish to keep it as efficient as possible and to get all the pleasure you can cut of riding it. We will discuss all the different parts which go to make the complete machine and tell you how to maintain and adjust them.

THE STEERING

First of all, then, let us consider the head bearings designed as they are to allow the front fork to turn to the left or right and so maintain the balance of the bicycle and enable it to be ridden in a straight line. It is important that the bearings should move freely, yet without any play. The head bearings comprise a hard, steel race firmly driven on to a seating just above the fork crown, which has a ball-track ground into its circumference. The ball-track either carries enough steel balls to fill it completely, or a cage holding about half the number of balls, spaced out and held captive, the latter mainly for ease of assembly.

A cupped ball-race is driven into the lower end of the head-tube and held by its upper sleeved portion, and this accepts the crown race and the balls which it carries, all of which should be packed with grease (VAR 159-160-161).



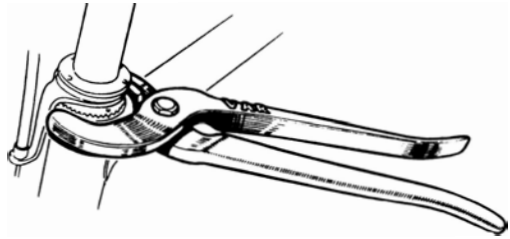
Thin 32 mm spanner to fit the upper screwed race of a racing headset. Head 4 mm thick, length 320 mm, weight 400 grammes.

VAR reference number **162.**

High quality lithium cycle grease made specially for all bicycle bearings. Unaffected by water, gives utmost protection against rust. Heat-resistant (melting point 180° C). Usable temperature range from - 35° to 120° C. Long lasting and does not break down. Contains anti-corrosion additives.

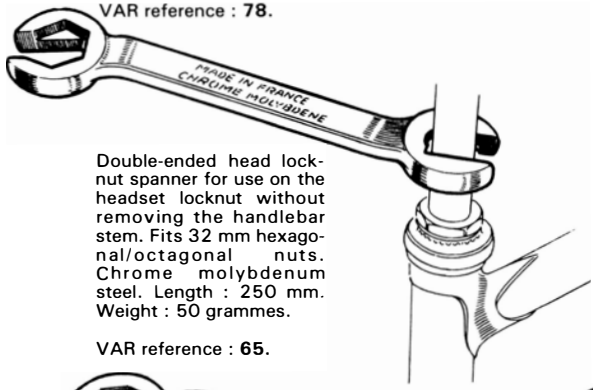
VAR references
159 - 100 gramme tin.
160 - 250 gramme tin.
161 - 500 gramme tin.

The upper bearing is similar, except that the upper cup race is threaded and screws on to the threaded portion of the steering column. It is topped by a locking washer with either serrations which fit into matching ones on top of the upper head race, or smooth faces which bind together when the final tightening is done by the lock-nut. The washer is prevented from turning, sometimes by a ''flat'' which corresponds to a flatted part of the fork column, or by a ''pip'' which engages a shallow groove in the column.



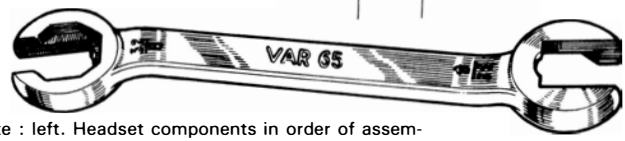
Head-race pliers for steering head adjustment. In chrome-molybdenum steel with serrated jaws chromium plated.
Length : 250 mm. Weight : 300 grammes.

VAR reference : **78.**



Double-ended head locknut spanner for use on the headset locknut without removing the handlebar stem. Fits 32 mm hexagonal/octagonal nuts. Chrome molybdenum steel. Length : 250 mm. Weight : 50 grammes.

VAR reference : **65.**

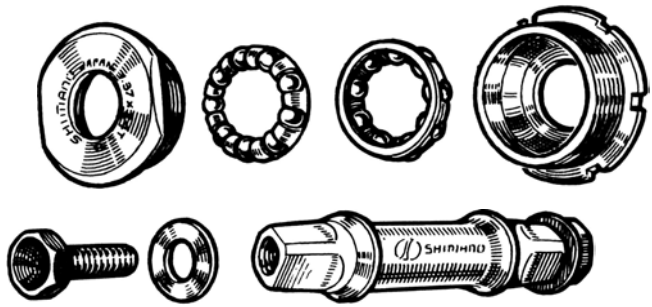


Opposite : left. Headset components in order of assembly. From bottom to top, crown race, steel balls, bottom frame race, upper frame race, steel balls, adjusting race, adjusting washer and locknut.

It is essential that both upper and lower races should be kept well greased and the whole bearing adjusted so that it turns freely but without shake.

And how to do that ? Well, while there should be no binding in any part of the bearing's rotation – if there is it is due either to faulty adjustment or faulty machining and fitting of the parts – after a period of use a slight play will probably develop. The lock-nut should be slackened off, the locking washer raised slightly, the upper threaded race screwed down slightly and the lock-nut retightened. For this operation it is best to use a fixed spanner, VAR 65 and 162 are suitable, as an adjustable spanner can slip and round the corners of the lock-nut.

Take care not to overtighten the bearing as this will lead to difficult steering and premature wear. To test for shake, push the front wheel against something immovable, and try to move the handlebars back and forth. If there is any play, or if the bearing is too tight, go over the procedure until all is well.



Standard bottom bracket set for alloy cranks.
Above, from the left, the fixet cup, the ball bearings (shown caged) and the adjusting cup with lockring.
Below, the square-ended axle with crank fixing bolts and washers.

THE BOTTOM BRACKET

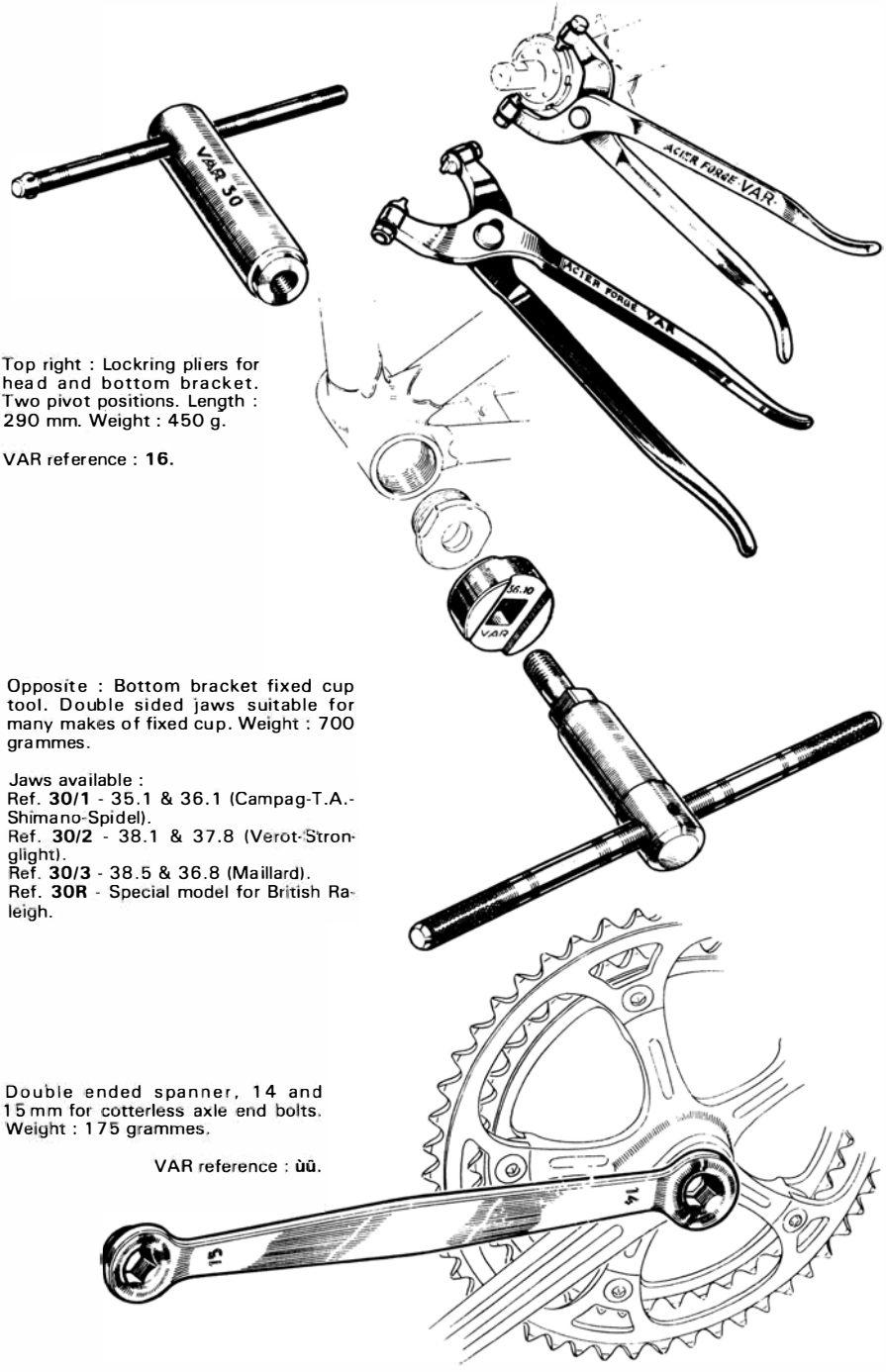
This is a simple bearing housed in the bracket shell which is a short length of large diameter tubing fitting athwart the bicycle frame where the down-tube, seat-tube and chain stays converge. On British machines, the width of the shell is between 66-68 mm and the ends are threaded internally at 24 threads per inch at a diameter of 1.370''. Into the ends are screwed bearing cups, the one on the chainwheel side having a left-hand (anti-clockwise) thread and intended to be a semi-permanent fixture, while its opposite number has an ordinary right-hand thread, blocked by a locking ring, and is intended to provide for adjustment as wear takes place in the bearing. Continental bicycles have both cups with right-hand threads and the one on the chainwheel side should be fixed very firmly : VAR tool No. 30 is suitable and can be used with British cups.

Each ball-cup accepts 11 ball bearings of 1/4'' diameter, or a caged ball race holding seven steel balls. Both types should be grease-packed when fitting. Sealed bearing units which can be slipped into the bracket shell and held by various types of locking rings are becoming popular because they are so easily fitted, need no adjustment and are almost completely weatherproof.

The bracket axle is longer on one side than the other, in relation to the position of the ball-tracks, and the longer side is intended to accommodate the chainwheel and its crank.

Two tools are needed for the adjustment of an orthodox bracket bearing, a spanner to turn the locking ring, and another to move the bearing cup. A ''C'' spanner or a large pincer-type tool with specially hardened teeth to fit the notches on the edge of the lock ring can be used, while the cup can be adjusted by a peg-spanner or a very thin one if the cup has a hexagonal outer face. To arrive at an adjustment that gives free running, without shake, takes time and patience but it should be done as this is a very important part of the bicycle.

At least once a year the bearing should be stripped down, well cleaned and filled with a good, waterproof grease, VAR 160, especially if the bicycle is ridden through a lot of bad weather.



Top right : Lockring pliers for head and bottom bracket. Two pivot positions. Length : 290 mm. Weight : 450 g.

VAR reference : **16.**

Opposite : Bottom bracket fixed cup tool. Double sided jaws suitable for many makes of fixed cup. Weight : 700 grammes.

Jaws available :
Ref. **30/1** - 35.1 & 36.1 (Campag-T.A.-Shimano-Spidel).
Ref. **30/2** - 38.1 & 37.8 (Verot-Stronglight).
Ref. **30/3** - 38.5 & 36.8 (Maillard).
Ref. **30R** - Special model for British Raleigh.

Double ended spanner, 14 and 15 mm for cotterless axle end bolts. Weight : 175 grammes.

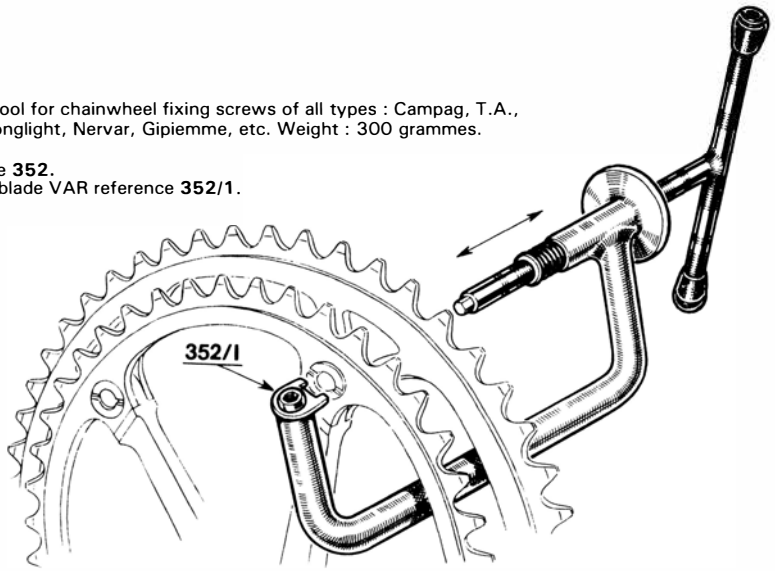
VAR reference : **ùû.**

Chrome-vanadium steel pedal spanner, double ended 15.25 and 17 mm (Lyotard). Length : 330 mm. Weight : 200 grammes.

VAR reference **18.**

Combination tool for chainwheel fixing screws of all types : Campag, T.A., Shimano, Stronglight, Nervar, Gipiemme, etc. Weight : 300 grammes.

VAR reference **352.**
Replacement blade VAR reference **352/1.**



CHAINWHEEL AND CRANKS

Steel cranks are generally fixed to the bracket axle by cotter pins, short round-section wedges threaded at one end to accept a nut and washer. A flat is ground or filed on the pin to match those on the bracket axle, so that when the crank is in place and the cotter pin is passed through the hole in the crank boss the flats engage when the pin is driven home and held by the nut.

To remove a crank, the cotter-pin nut and washer are removed and the pin driven out by a hammer and punch of brass or copper that will not damage the cotter-pin threads.

When fitting or removing a cotter-pin, the boss of the relevant crank should be supported so that the shock of the hammer blows is not transmitted to the bearing surfaces. Cotter-pin nuts should be kept tight or play may develop between the crank and the bracket axle.

The method of fitting light alloy cranks is quite different. The bracket axle has squared ends with a slight taper over a length of 20 mm on the chainwheel side and 15 mm on the other. The axle is drilled through its centre with both ends tapped to take bolts with large hexagon heads. The cranks are slipped on to the axle ends, tapped lightly with a mallet so as to drive them home (the opposite end of the axle should be held against something solid) and the bolts with washers under the heads, screwed tightly down. It is essential that the squared ends of the axle and the faces of the squared holes in the cranks should be clean and dry. After a first-time fitting, the bolts should be checked for tightness after about 200 miles. If appearance is important, the bolt covers of metal or plastic can be screwed into the crank bosses, using the threads which also serve to hold the extractor tool when cranks have to be removed. Remenber to remove the axle end bolts and to screw the removing tool fully home before turning the bolt which pushes the crank from the axle.

The right-hand crank carries the chainwheel which is fixed to it by a form of brazing, by rivetting or by three, five or six screws, depending upon the make and style, and upon how many chainwheels are fitted. It is important that they should run ''true'' and rotate without deviation from the correct plane : if they do not, they can be trued with VAR tool N° 158.
Cranks can be bent as the result of a tumble and straightening them is really a job for a mechanic, using VAR 373.

One more word about cranks. Even if you are not very tall, do not use them shorter than 170 mm, and the same applies to ladies. Children are in a special category.

Many technicians say that crank length is governed by the height of the rider, but this is not so. A crank is a lever designed to transmit effort, and if the length does depend upon any one factor, it is the weight rather than the height of the user. But the gear and the nature of the gradients also influence choice. Proof of this can be had from the racing men who use 165 mm on the track (so that the legs can be turned quicker), 170 or 175 mm on the road, and 175 or 180 mm in the mountains. If the same rider changes from 165 mm on the track to 180 mm in the hills it is hardly because his leg length has altered ! So start with 170 mm and if later you think it necessary, go up to 172.5 or even 175 mm.

PEDALS

The ends of pedal spindles differ in their threading, that of the right-hand pedal screwing into the crank with a clockwise motion while the left-hand one goes in anti-clockwise. It is easy to remember — right-hand pedal right-hand thread : left-hand pedal left-hand thread.

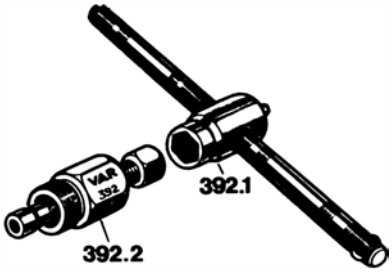
For fitting and removal a special extra-long ''fixed'' spanner is much the best as extra leverage is necessary sometimes to move a spindle which has been in place for a long time. VAR 18 is made for the job.

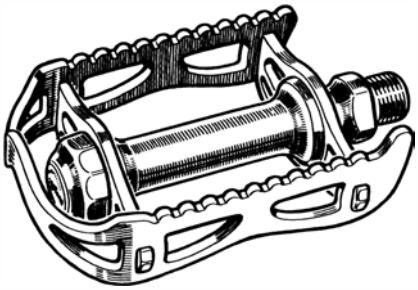
There are many shapes and sizes of pedal, but mainly they consist of a steel spindle threaded at its larger end to screw into the crank, and at its smaller tapered end to carry a cone, washer and locknut. Also at the thicker end is a fixed conical portion with a polished ball-track, designed to form part of the bearing, along with the adjustable cone. The pedal cage fits over the spindle and in its ends are ball cups holding steel ball bearings that run on the two cones.

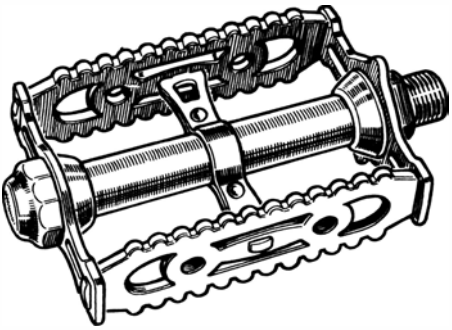
Cages are of steel or alloy with serrated edges to the end-plates, or sometimes blocks of rubber, all intended to keep the foot from slipping. Toe-clips and straps can be fitted to the first-mentioned types and these are a great aid to efficient pedalling. We strongly recommend their use, in a size appropriate for the rider's foot, although they are sometimes decried as being dangerous for beginners. If a little care is taken at first, this is not so. Never use the very small size of clip and for a shoe size of 41 (British 7) upwards, use the ''long'' size.

Extractor tool for Campagnolo cranks, comprising 15 mm box spanner with tommy bar, and screw-type extractor. Weight : 500 grammes.

VAR reference **392/1** - 15 mm box spanner.
VAR reference **392/2** Crank extractor 22 x 100.
VAR reference **392C.**







Two standard pedals.

Above - sports and fast touring type.

Opposite - town and utility riding.

As with all bearings, those of the pedal need maintenance and adjustment. When the cap at the end of the pedal barrel is removed — use gland-nut pliers, a toothed ring-spanner or for some makes, a screwdriver — the lock-nut is revealed. Unscrewed with a flat or tubular spanner, the toothed locking washer can be lifted with a knife blade or small screwdriver and then the cone can be unscrewed. Hold the pedal over a clean cloth and lift the cage from the spindle so that the bearings fall into the cloth. The inner bearing needs frequent lubrication so the steel balls should be preserved. Clean out the old grease from the ball cups and wipe the cones and spindle clean. Then fill the cups with clean grease, stick the bearings in place and slip the pedal cage over its spindle. Screw down the cone, replace the washer and the locknut. Adjust the cone with the tip of a small screwdriver so that when the locknut is tightened the cage turns on the spindle, freely but without play. Then fill the pedal cap with grease and screw it tightly in place.

Some top of the range bicycles have pedals with annular bearings, sometimes with needle roller bearings and generally speaking these do not need such frequent greasing as the ordinary type, although some of them do have grease nipples in the end caps.

THE TRANSMISSION

As generally understood, this comprises the chainwheel/s, chain and one or more sprockets.

Chains are nowadays almost invariably 1/2'' between bearing-pins (rivets) and either 1/8'' or 3/32'' between the insides plates, the former being used when there is only one sprocket on the rear hub, and the latter when multi sprocket free-wheels are employed.

The chain needs regular lubrication, preferably with a fairly thick oil such as car engine or gearbox oil if in daily use, and perhaps something slightly thinner on a racing bicycle or long-distance tourer. Thorough cleaning can be accomplished only by removing the chain,

using VAR 303 chain pliers to drive out the bearing-pin, and soaking it in a solvent. It should then be dried thoroughly and immersed for a time in an oil bath.

A quicker method is to brush the chain without removing it from the bicycle and then re-lubricate it with a penetrating oil such as VAR 593.

Broadly speaking, there are three classes of transmission ; the fixed wheel, the single freewheel or hub gear, and the multi-speed derailleur.

The British system of calculating the ''gear'' calls for the diameter of the rear wheel in inches to be multiplied by the number of teeth on the chainwheel and the result divided by the number of teeth on the rear sprocket. E.g. 27 x 48 divided by 16 would give 81''. Multiplying 81'' by 3.1416 (pi) gives 254.47'' and that is the distance travelled for one complete revolution of the cranks on a bicycle so equipped. On the Continent, gear tables do show this distance metrically and a French cyclist using the abovementioned combination would say his gear was 5.69 metres.

Use of the fixed wheel is nowadays almost entirely confined to the track, although a few short-distance time trial riders make use of it, as do some enthusiasts during the winter months.

The single freewheel gives only one ''gear'' but permits of relaxation on descents while if a back-pedalling (coaster) brake is incorporated, the bicycle can be controlled by one hand. The hub gear has its devotees, giving nowadays three or five gears with the mechanism fully protected.

But by far the most popular system of variable gearing, giving 3, 4, 5, 6 or 7 speeds, and double or even triple those numbers if two or three chainwheels are used, is that employing the derailleur. Let us see what that system consists of.

THE REAR DERAILLEUR

An essential is that the rear hub should be able to accommodate a multi sprocket free wheel. The smallest outer sprocket can have as few as 12 teeth while the largest, on the inside, can be almost as big as one wishes. Best results come from having the small sprocket between 13, 14, 15 or 16 teeth, and the largest 24, 26 or 28 teeth.

The rear derailleur mechanism serves to move the chain from one sprocket to another and, as will have been realised from previous mention, this affects the distance travelled for one revolution of the cranks. So on a climb, thanks to the derailleur, we are enabled to move the chain to a large sprocket and so to reduce the gear.

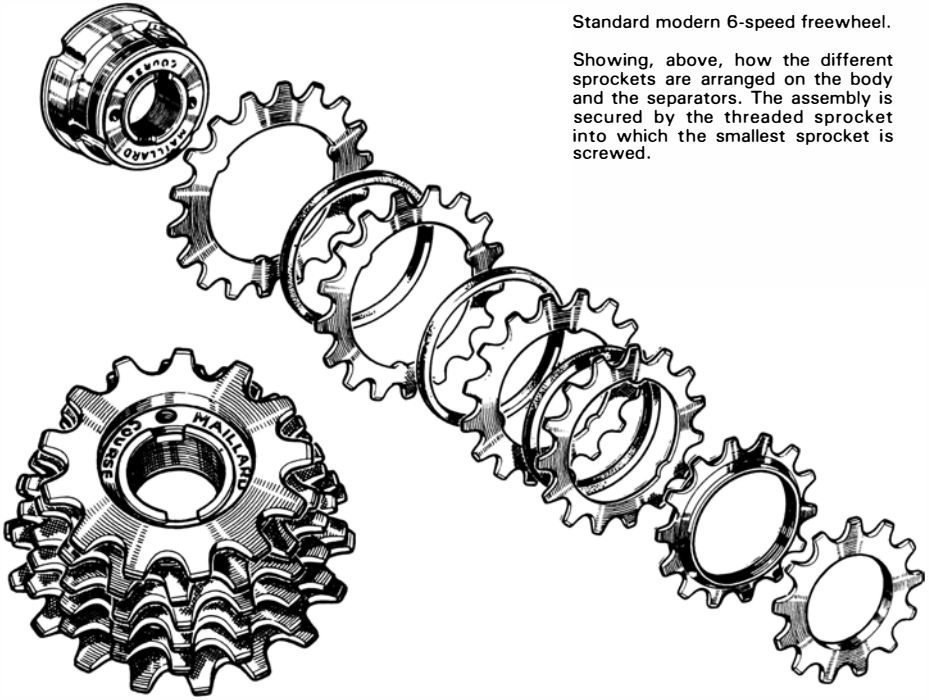
On a level road or a slight descent the chain can be switched to a smaller sprocket and a higher gear obtained.

The rear mechanism is fixed below the rear fork-end and close to the rear hub and it has two functions. It moves the chain from one sprocket to another and thanks to its system of double rollers keeps the chain at a reasonably constant tension whether it is on a small sprocket or a large one. The sideways movement is controlled by the rider via a cable and a lever fixed either to the down tube or to the end of the handlebar ; sometimes to the handlebar stem.

Maintenance consists of keeping the rollers and pivot points lightly greased, likewise the control wire where it runs through outer casing. The cable should be kept taut but not excessively so or the derailleur cage will not be able to move to the outermost sprocket. On the other hand, a too slack cable will mean that the lever comes to the end of its travel before the cage has moved the necessary distance.

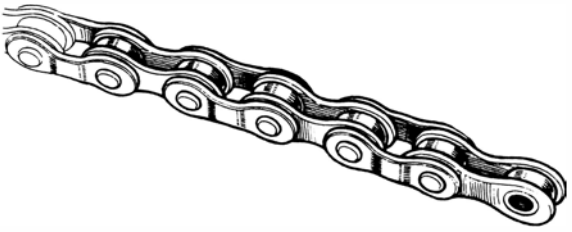
A broken cable can be easily replaced and a new cable should be thoroughly greased. See that it is pulled sufficiently tight and screw up the drawbolt at the mechanism end very firmly. You will need a pair of pliers and a suitable spanner such as VAR 233.

With a rear derailleur only you can have anything from three to seven speeds but with double or triple chainwheels and a suitable front changer, those can be doubled or tripled.

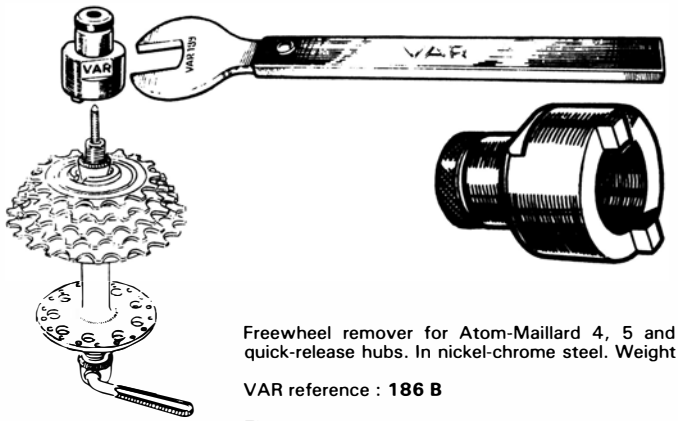


Standard modern 6-speed freewheel.

Showing, above, how the different sprockets are arranged on the body and the separators. The assembly is secured by the threaded sprocket into which the smallest sprocket is screwed.



Five-speed freewheel and chain.



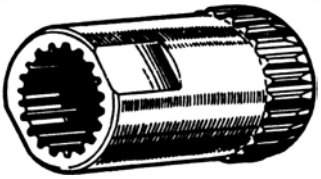
Freewheel remover for Atom-Maillard 4, 5 and 6-speed blocks on quick-release hubs. In nickel-chrome steel. Weight : 150 grammes.

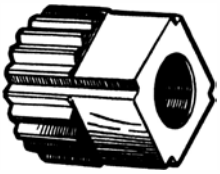
VAR reference : **186 B**

Three types :
186 BC - for Campagnolo quick-release 5 mm x 0.8 mm.
186 BA - for Atom-Maillard quick-release 5 mm x 0.9 mm.
186 BS - for Simplex quick-release 5 mm x 0.75 mm.

Freewheel remover for Normandy splined blocks without need to remove cones/locknuts. Plated. Weight : 80 grammes.

VAR reference : **405**



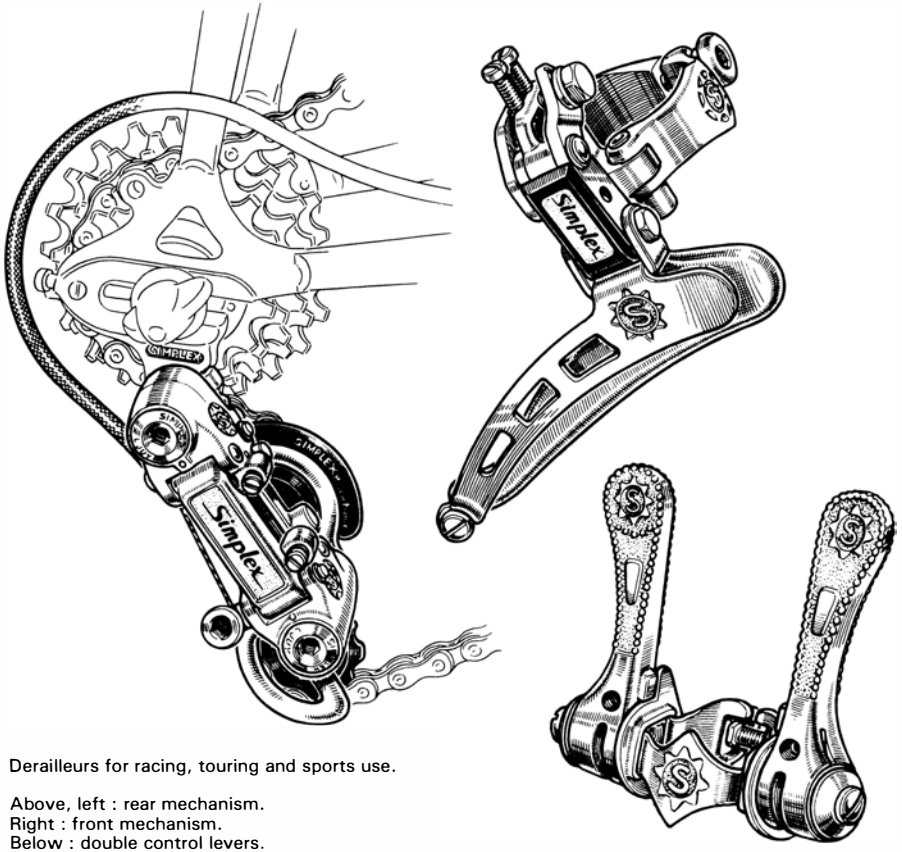


Freewheel remover for splined Atom blocks. Weight : 50 grammes.

VAR reference : **407**

Freewheel remover for 5 and 6-speed blocks Maillard course 700 and Sun Tour. Weight : 70 grammes.

VAR reference : **413**



Derailleurs for racing, touring and sports use.

Above, left : rear mechanism.
Right : front mechanism.
Below : double control levers.

THE FRONT DERAILLEUR

The inner ring of a double chainwheel is fixed inside the larger one by being bolted directly on to the outer, or more generally on to the crank arms by three or five bolts so that both rings are perfectly concentric and parallel to each other.

The difference in size between the two rings is widely variable and should be in accordance with what the bicycle is to be used for. For racing, the tooth difference is generally about 10, but for touring is something bigger. In the mountains for example, the rings could be 48 and say, 36, 32 or even 28 if camping kit is to be carried.

The front mechanism shifts the chain exactly as the rear one does, although by means of a simpler cage without tensioning function, and is controlled by a lever and cable as before. This cable should also be kept taut and the sideways travel of the cage carefully adjusted by the two control screws. Too much travel could mean the chain coming off the small ring and falling between it and the frame tubes, or off the large ring and being trapped between it and the crank.

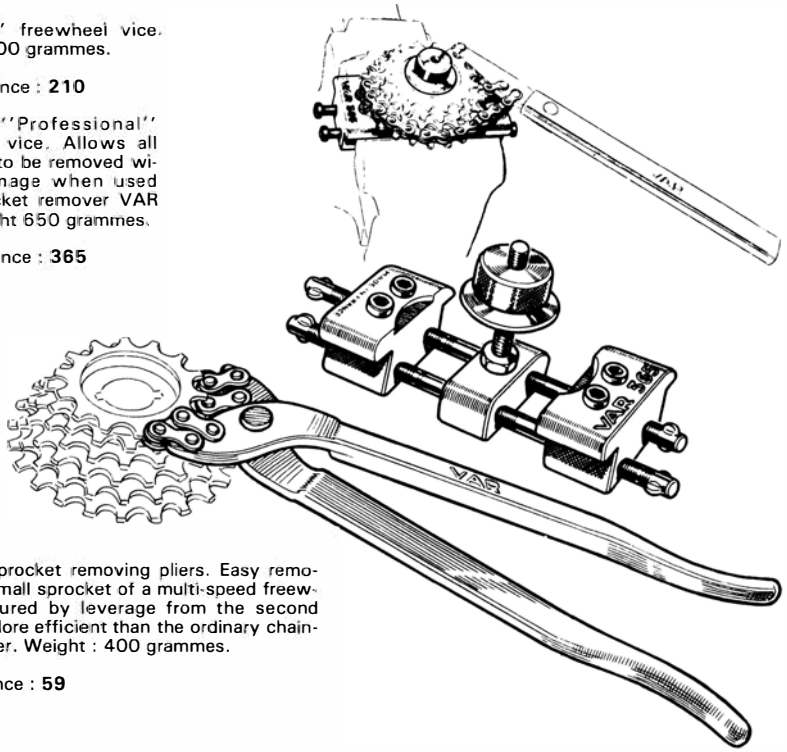
On some touring bicycles three chainwheels are used so that a wide choice of gear ratios is available, but although on paper 12 or 18 gears can be obtained, in practice only two or three sprockets are used with each chainwheel.

Top :
''Amateur'' freewheel vice. Weight : 200 grammes.

VAR reference : **210**

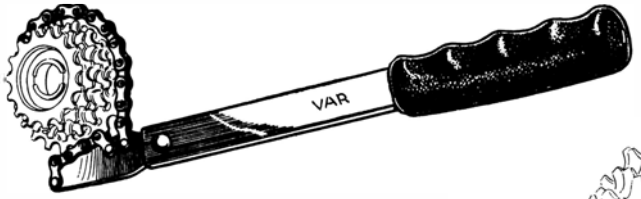
Middle : ''Professional'' freewheel vice. Allows all sprockets to be removed without damage when used with sprocket remover VAR 266. Weight 650 grammes.

VAR reference : **365**

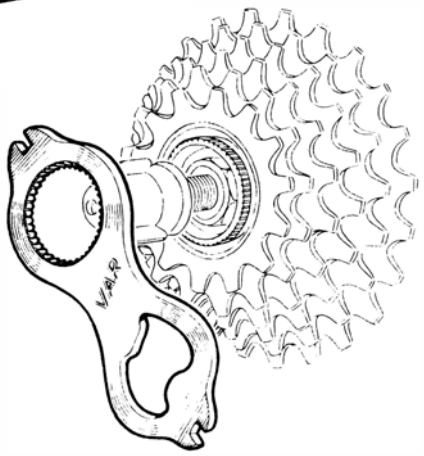


Bottom : Sprocket removing pliers. Easy removal of the small sprocket of a multi-speed freewheel is assured by leverage from the second sprocket. More efficient than the ordinary chain-type remover. Weight : 400 grammes.

VAR reference : **59**



Chain-type sprocket remover. Enables fixed and freewheel sprockets to be removed without damage to teeth, thanks to long chain-wrap. Length ; 300 mm. Weight : 450 grammes.
VAR reference : **266**



Spanner for removing the knurled lockring on Maillard ''Helicomatic'' freewheels. Weight : 30 grammes.

VAR reference : **524**

NOMBRE DE DENTS DU PLATEAU AVANT	NOMBRE DE DENTS DU PIGNON ARRIERE (roues de 700 C)																
	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
28	4.35	4.52	4.20	3.92	3.67	3.46	3.26	3.09	2.94	2.86	2.67	2.55	2.45	2.38	2.26	2.18	2.10
29	5.08	4.69	4.35	4.07	3.81	3.59	3.39	3.22	3.25	2.96	2.76	2.68	2.53	2.47	2.37	2.29	2.17
30	5.26	4.84	4.50	4.20	3.93	3.70	3.50	3.31	3.15	3.06	2.86	2.73	2.62	2.55	2.42	2.36	2.25
31	5.42	5.00	4.65	4.35	4.07	3.83	3.62	3.43	3.26	3.13	2.96	2.86	2.71	2.63	2.50	2.44	2.32
32	5.60	5.16	4.80	4.48	4.20	3.95	3.73	3.53	3.36	3.20	3.05	2.91	2.80	2.73	2.58	2.52	2.40
33	5.78	5.33	4.96	4.63	4.34	4.09	3.86	3.66	3.47	3.30	3.15	3.05	2.89	2.81	2.69	2.60	2.48
34	5.96	5.49	5.10	4.76	4.46	4.20	3.97	3.75	3.57	3.40	3.24	3.10	2.97	2.89	2.74	2.67	2.55
35	6.13	5.66	5.26	4.92	4.59	4.33	4.09	3.87	3.68	3.50	3.34	3.19	3.05	2.97	2.82	2.75	2.63
36	6.30	5.81	5.40	5.04	4.72	4.44	4.20	3.97	3.78	3.60	3.43	3.28	3.10	3.05	2.90	2.83	2.70
37	6.48	5.98	5.56	5.20	4.86	4.58	4.32	4.10	3.80	3.70	3.52	3.37	3.21	3.14	2.98	2.91	2.77
38	6.65	6.13	5.70	5.32	4.98	4.69	4.43	4.20	3.99	3.80	3.62	3.46	3.32	3.23	3.06	3.00	2.85
39	6.83	6.31	5.85	5.47	5.12	4.83	4.55	4.32	4.12	3.93	3.76	3.58	3.44	3.32	3.17	3.08	2.93
40	7.12	6.57	6.10	5.69	5.34	5.02	4.74	4.50	4.27	4.07	3.88	3.71	3.56	3.42	3.28	3.20	3.00
41	7.30	6.73	6.25	5.84	5.47	5.15	4.86	4.60	4.37	4.17	3.98	3.80	3.64	3.50	3.36	3.28	3.08
42	7.47	6.90	6.40	5.98	5.60	5.27	4.98	4.72	4.48	4.27	4.07	3.90	3.73	3.58	3.45	3.37	3.15

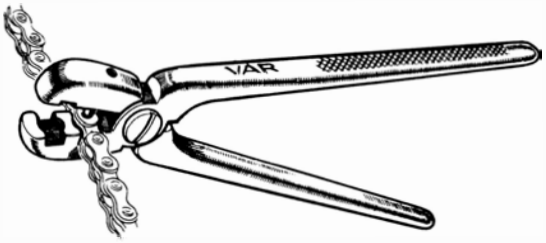
NOMBRE DE DENTS DU PLATEAU AVANT	NOMBRE DE DENTS DU PIGNON ARRIERE (roues de 700 C)																
	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
43	7.65	7.06	6.56	6.12	5.74	5.40	5.10	4.83	4.59	4.37	4.17	3.99	3.82	3.67	3.53	3.44	3.23
44	7.83	7.23	6.71	6.26	5.87	5.52	5.22	4.94	4.70	4.47	4.27	4.08	3.91	3.76	3.61	3.52	3.30
45	8.01	7.39	6.86	6.40	6.00	5.65	5.34	5.05	4.80	4.57	4.37	4.18	4.00	3.84	3.69	3.60	3.37
46	8.18	7.55	7.01	6.55	6.14	5.78	5.45	5.17	4.91	4.67	4.46	4.27	4.09	3.93	3.78	3.69	3.45
47	8.36	7.72	7.17	6.69	6.27	5.90	5.57	5.28	5.02	4.78	4.56	4.36	4.18	4.01	3.86	3.76	3.52
48	8.54	7.88	7.32	6.83	6.40	6.03	5.69	5.39	5.12	4.88	4.66	4.45	4.27	4.10	3.94	3.84	3.60
49	8.72	8.05	7.47	6.97	6.54	6.15	5.81	5.50	5.23	4.98	4.75	4.55	4.36	4.18	4.02	3.92	3.67
50	8.90	8.21	7.63	7.12	6.67	6.28	5.93	5.62	5.34	5.08	4.85	4.64	4.45	4.27	4.10	4.00	3.75
51	9.07	8.38	7.78	7.26	6.81	6.40	6.05	5.73	5.44	5.18	4.95	4.73	4.54	4.35	4.19	4.08	3.82
52	9.25	8.54	7.93	7.40	6.94	6.53	6.17	5.84	5.55	5.29	5.04	4.83	4.62	4.44	4.27	4.16	3.90
53	9.43	8.70	8.08	7.54	7.07	6.66	6.29	5.95	5.66	5.39	5.14	4.92	4.71	4.52	4.35	4.24	3.98
54	9.61	8.87	8.23	7.69	7.20	6.78	6.40	6.07	5.76	5.49	5.24	5.01	4.80	4.61	4.43	4.32	4.06
55	9.78	8.99	7.38	7.82	7.35	6.90	6.52	6.18	5.82	5.59	5.33	5.10	4.89	4.70	4.51	4.39	4.13
56	9.97	9.20	8.54	7.97	7.47	7.03	6.64	6.29	5.98	5.69	5%43	5.20	4.98	4.78	4.60	4.48	4.21

Avec des roues de 650, les développements sont légèrement inférieurs, mais il est alors difficile de donner des chiffres précis en raison des nombreuses différences de section des pneus de 650, ce qui évidemment modifie ces longueurs.

Chain-rivet pliers for removing and replacing chain bearing pins : replaceable punch. Suitable for 1/8'' and 3/32'' chains. Length : 240 mm. Weight : 500 grammes.

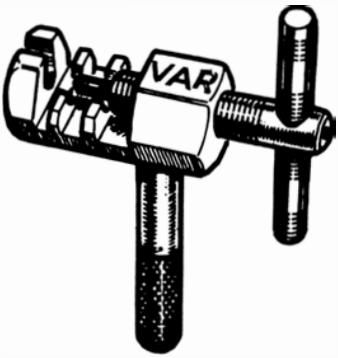
VAR reference : **303**

VAR reference **303/1** Spare punches in packets of 10.



S.O.S. anti-seize spray. Protects against corrosion : repels moisture : suitable for motor-cycle chains, cycle brake cables. Assures easy starting engines in cold or damp conditions. Aerosol cans 212 grammes.

VAR reference : **593**



''Amateur'' chain rivet extractor. All steel with hardened punch. Supplied to wholesalers on cards of 12. Weight : 100 grammes.

VAR reference : **53**

VAR reference : **53/1** - spare punch.

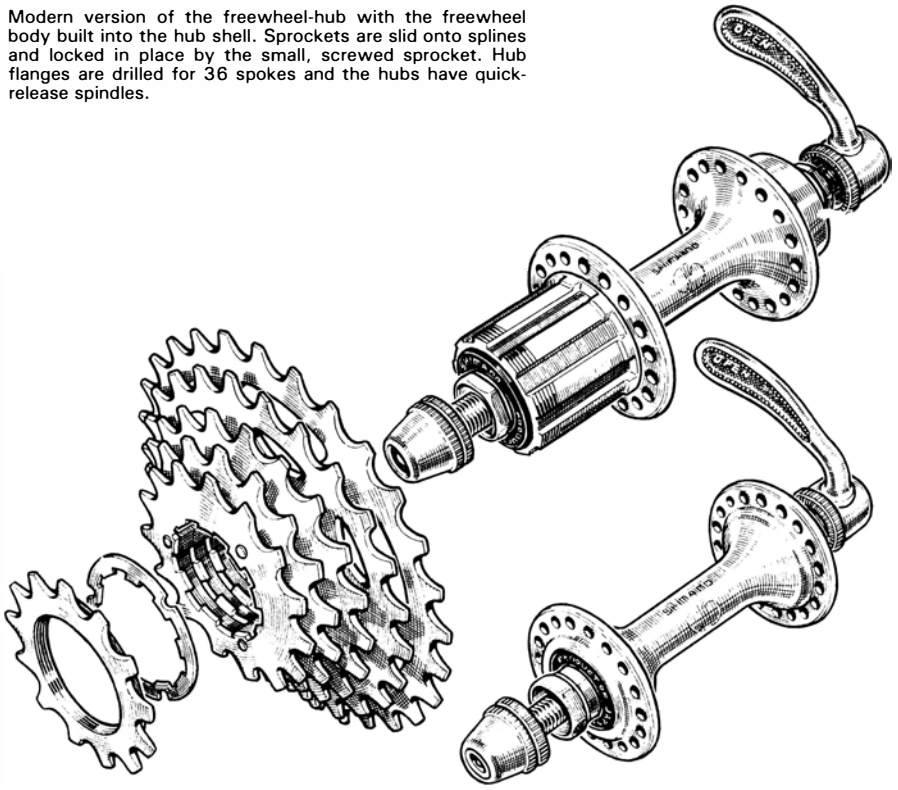
WHEELS

We have seen that the freewheel, or the fixed sprocket, screws on to the right hand side of the rear hub so let us now discuss hubs, front and rear.

Briefly a hub consists of a cylindrical body with flanges at both ends which are pierced to accept a certain number of spokes. The body or barrel turns on ball bearings around a spindle that is held firmly in the fork ends by either hexagon nuts, wing nuts, or by a quick-release system.

The flanges of the front hub are spaced equally from the centre : those of the rear hub have the right hand one set nearer to the centre so as to provide a threaded portion for the fixed sprocket or freewheel. Medium-priced bicycles have steel-bodied hubs ; high-class bicycles have hubs with alloy bodies and flanges. British drillings used to be 32 holes front and 40 rear, but the continental norm of 36 holes front and rear is becoming more and more popular. Drillings for racing wheels can be as low as 28 and even 24 in the interests of light weight and reduced wind resistance.

Modern version of the freewheel-hub with the freewheel body built into the hub shell. Sprockets are slid onto splines and locked in place by the small, screwed sprocket. Hub flanges are drilled for 36 spokes and the hubs have quick-release spindles.

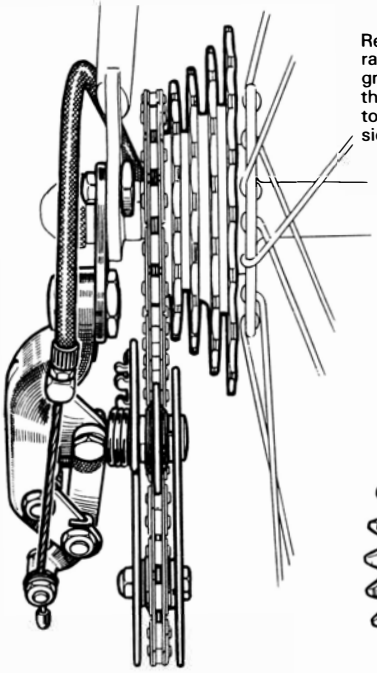


At each end of the hub barrel is a ball cup designed to hold a number of ball bearings. On the hub spindle are two hardened steel cones, held by a locking washer and locknut although one cone is generally screwed up against a boss on the spindle, leaving all adjustment to be made by the opposite one.

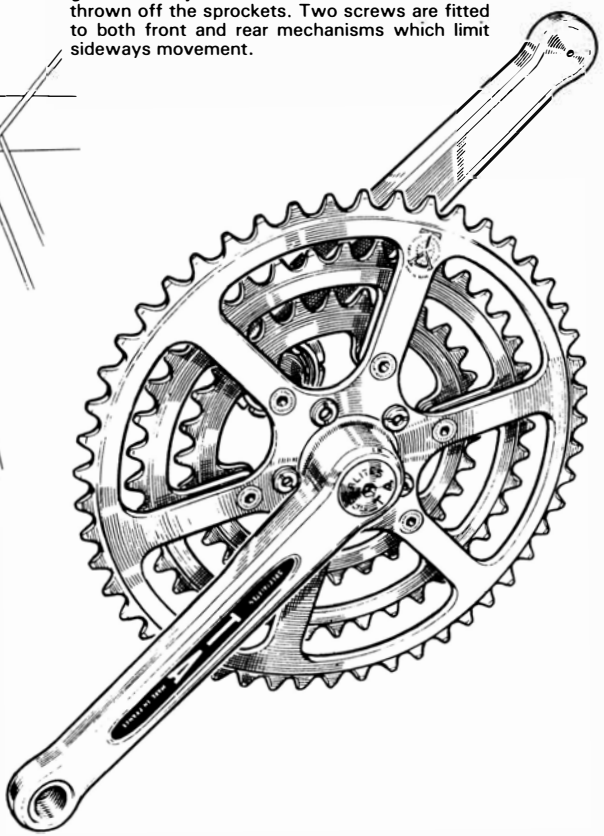
The ball bearings are set into the grease-packed cups, the spindle is passed through the hub barrel and the adjusting cone screwed home.

We already know how to adjust a ball bearing by means of the cone and locknut so that there is free movement but no play, but there are also hubs which have annular bearings which need no adjustment and need lubricating only at long intervals.

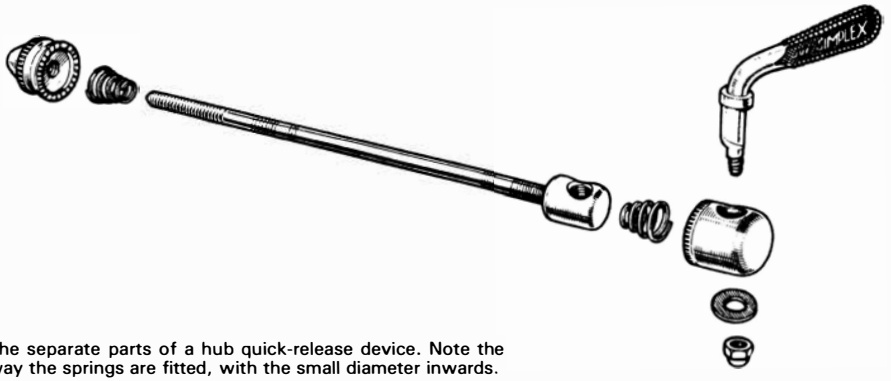
Wing nuts used to be very popular on racing machines but nowadays the quick-release is universal and almost so on touring bicycles. It consists of a 4 mm diameter rod which passes through the drilled-out hub spindle ; the rod has at one end a domed housing which carries a cam that can be turned by a protruding lever. At the other end is a threaded portion along which can be screwed a matching dome and when the lever at the end of the spindle is in the closed position, the cam pulls one dome and pushes the other towards the hub centre so that the forkends are gripped between the faces of the domes and the locknuts. A 90° movement of the lever opens the domes and the wheel is released, the opening being helped by two conical compression springs set around the 4 mm rod and between the locking faces. The screwed dome can be set to accommodate various thicknesses of forkend.



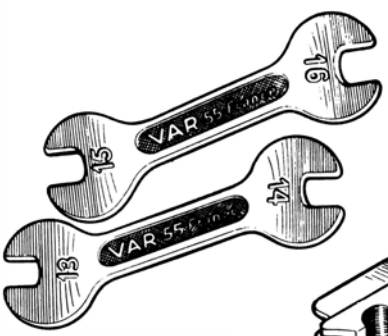
Rear view of multi-sprocket freewheel and derailleur mechanism. They should be correctly aligned, and adjusted so that the chain cannot be thrown off the sprockets. Two screws are fitted to both front and rear mechanisms which limit sideways movement.



Triple chainwheel suitable for touring in mountainous country.

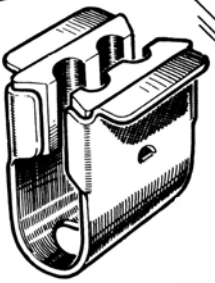


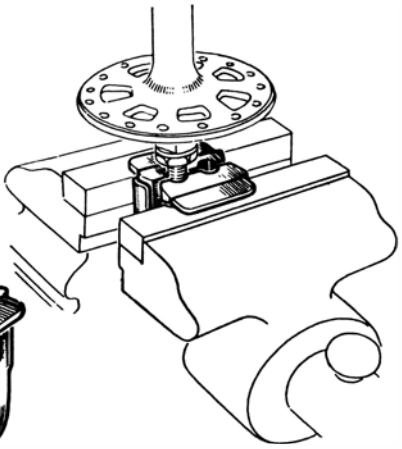
The separate parts of a hub quick-release device. Note the way the springs are fitted, with the small diameter inwards.



Hub cone keys in 2 mm, thick tempered steel. Set of two, 13-14 mm and 15-16 mm. Weight 110 grammes.

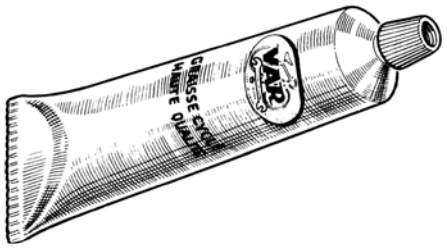
VAR reference : **55**





Alloy vice-jaws for holding hub spindles of 8-12 mm diameter. Can be firmly tightened without damaging spindle threads. Weight : 120 grammes.

VAR reference : **14**



White grease for bearings : zinc-oxide based and non staining. Water resistant. Effective at high temperatures and in adverse mechanical situations. Usable from - 20° C to 200°c.

VAR reference : **151**

RIMS

The two main types are for tubular tyres or wired-on tyres, the latter type being made in many sizes to cater for all manner of bicycles from children's to adults'. But for adults there are two main sizes, 650 and 700 mm, corresponding to British sizes 26'' and 27'' although the actual 700 size is becoming widely used on lightweights. 26'' comes in two widths, $1\frac{1}{4}$'' and $1\frac{3}{8}$'' approximating to the continental 28 and 32 mm or ''demi-ballon'' of 35 mm and larger.

Formerly the 700 was made only in the $1\frac{1}{4}$'' width, but now there are some very narrow section covers which are almost as light and speedy as tubulars. There are also rims which will accept either a tubular or a wired-on tyre.

Steel rims are strong but rather heavy : alloy ones much lighter and only slightly more delicate so that once again the choice depends upon how the bicycle is to be used.

For tubulars, rims are always of light alloy with the weight depending upon how thick the metal is, and choice has to be made between extra strength or very light weight. Light wheels give a better return for energy expended.

Certain manufacturers have put grooves or dimples in the sides of their rims with the laudable aim of increasing friction and so improving the braking. But when mud or rainwater fills these depressions braking is practically non-existent so our advice is that you should always insist on smooth-sided rims.

Inspection of a wheel will show that each spoke crosses over or under a certain number of others and we recommend that in a 36-spoke wheel whether for racing or touring the pattern should be ''crossing four''. There is no particular significance in the figure 4, but it does mean that the spokes will be truly tangential to the hub flanges. That is to say two spokes from adjacent holes in the same flange will form a straight line so that they will be submitted only to a pulling force (tension) and not to a shearing force.

The head of a spoke is fixed into the hub flange while the other end is threaded to take a nipple that fits through a hole in the rim and can be turned with a spoke key to tension the spoke. In this way a wheel is built and trued so that it turns perfectly ''round'' with the rim central over the cone locknuts.

If an accident distorts the wheel it can be trued by turning the bicycle over or suspending it so that the wheel can turn in the frame or forks. Then by tightening some spokes and slackening others the rim can be made to run true again, always remembering that spokes always pull and cannot be made to ''push''. So if a rim is over to the right in one place, a spoke coming from the left would be the one to tighten. The ideal wheel would have all its spokes at the same tension. Building wheels and trueing them is made much easier by using a wheel-building stand and an efficient nipple key — see VAR 163 and VAR 74 or VAR 485.

If a rear wheel spoke breaks on the freewheel side, the freewheel will have to be removed by means of a special tool designed for that particular make. To change a spoke it is best to take off the tyre and fit a new nipple, lacing the new spoke under and over its neighbours to match the others. When the new spoke is correctly tensioned take care to file off any part of it that protrudes through the head of the nipple.

FOUR-CROSS SPOKING

All bicycle wheels whether used for racing, touring or ordinary riding should be built with spokes ''crossing four'' (4X) if they have the usual 36 spokes.

Those who propose to build their own wheels will find they need patience and precision, and having the correct tools will certainly help. VAR tool references in respect of nipple keys, trueing stands, special screwdrivers and wheel gauges will be given later. Of course the following information may be of interest to those who use wheels with 24, 28, 32 or 40 spokes.

Let us establish what we mean by ''four-cross'' or ''crossing four'' spoking. It simply indicates the number of spokes crossed by any other spoke on the same side of the wheel. Thus the figure four means that every spoke crosses four others.

WHY FOUR ?

For every spoke to be at a true tangent so that it is in tension only and is not subjected to any shearing force, any two spokes going in opposite directions from the same hub flange should form a straight line. They are at a more or less obtuse angle if they cross only three as on mass-produced machines, and are at an even greater mechanical disadvantage if they cross only two.

In a Tour de France of 20 years ago there was an epidemic of spoke breakage among the three-cross wheels. Chief mechanic Paul Delay had them all re-spoked in the four-cross pattern and the breakages immediately ceased : one reason why we propose to recommend only that method.

BUILDING CROSS-FOUR

First of all, let us stress that spokes should always be threaded through hub flanges from the ''plain'' side, that is, from the side opposite the countersink which is intended to accommodate the neck of the spoke and not its head.

Take a front wheel which has spokes that are 305 mm long. The first two spokes should be threaded through the same flange from opposite sides with eight empty holes between them. The left-hand spoke with its head on the outside of the flange should enter the rim by the hole immediately to the left of the valve-hole. Screw on the nipple just two turns.

The right-hand spoke, with its head on the inside, should enter the rim with one empty hole between it and the valve-hole, and the two spokes should thus be parallel.

Turn the wheel over and in a hole on the left, opposite the one in the opposite flange, thread a spoke and take it to the empty hole next to the valve-hole : fit a nipple and give it a couple of turns : as this instruction applies to all subsequent spoking operations we will not repeat it.

Complete the pattern of nine spokes, spaced with one empty hole between them at the flange and three at the rim so that every fourth hole will receive a spoke.

Turn over the wheel again and thread the other set of spokes through the same flange so that the spoke heads are on the inside. Then reverse the wheel and lace the spokes under three and over one, as before.

Repeat the process with the opposite flange, spacing and crossing the spokes as before. Briefly, a four-cross wheel has two lacings (one on each side) each of nine pairs of parallel spokes with heads alternately inside and outside the flange, spaced eight holes apart. At the rim they are obviously one hole apart, the spokes from the other flange filling the spaces.

We now have to tension the spokes, using either a special bit held in a drill chuck (VAR 265) or a spiral screwdriver, again with the bit which has a ''pilot'' at the middle of the blade (VAR 263). With spokes all of the same length they will all be given the same tension as the pilot will push the turnscrew blade out of contact with the nipple when this has been reached.

After this operation the wheel should be fairly true, any slight deviation being made apparent by the VAR wheelbuilding stand 485. With a nipple key, (VAR 51, 54 or 255) tighten or slacken spokes as indicated by pointers on the stand.

The wheel should be checked with the gauge 143 to make sure that the rim is central over the cones and the spokes should be bedded in by holding the rim and pushing the hub against something solid. You may hear the spokes ''ping'' slightly and the wheel should again be checked for truth, and any deviation corrected. Check that no spoke ends protrude above the nipples : if any do, cut them off with VAR 230 or file them flat.

THE REAR WHEEL

The building procedure is repeated for a rear wheel but 303 mm spokes should be used on the freewheel side and 305 mm ones on the other because the wheel is dished to accommodate the freewheel.

There is another method of building a wheel which is perhaps slightly quicker than the foregoing, usable on front and rear wheels, always remembering 303 mm on the freewheel side and 305 mm on the other.

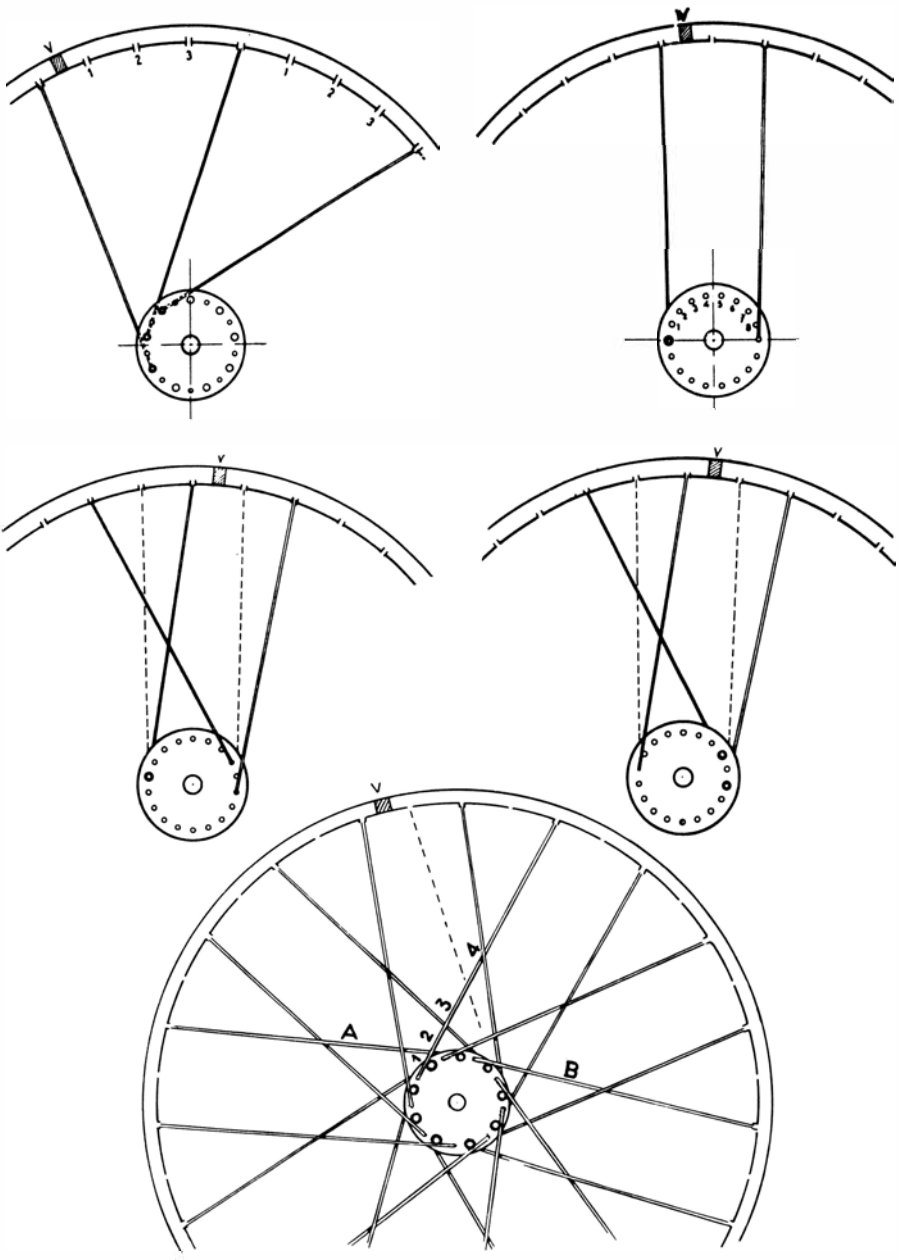
You thread nine spokes through one flange with one empty hole between each. Take one spoke to the hole to the left of the valve-hole, fit the nipple and lead the remaining eight to the rim with three empty holes between them. Then twist the hub to the right in relation to the rim so as to give the correct line to the spokes.

Turn the wheel over and still working on the same flange, put nine more spokes through the empty holes letting them hang free.

On the other flange, fit nine more spokes again leaving one empty hole between each and starting opposite the first spoke that was put in the first flange. This one goes to the left of that first spoke and is thus almost parallel to it. Continue in similar fashion with the other eight spokes, always with three holes between them at the rim.

Turn over the wheel and lead the nine loose spokes to the rim, beginning with the one that is eight holes away from the first. It should fit the hole to the right of the valve-hole, with one hole between. Then fit the other eight spokes.
Reverse the wheel once more and fit the final nine spokes which lead to the available holes in the rim. Every spoke should cross four others, passing under three and over one, or inversely over three and under one.

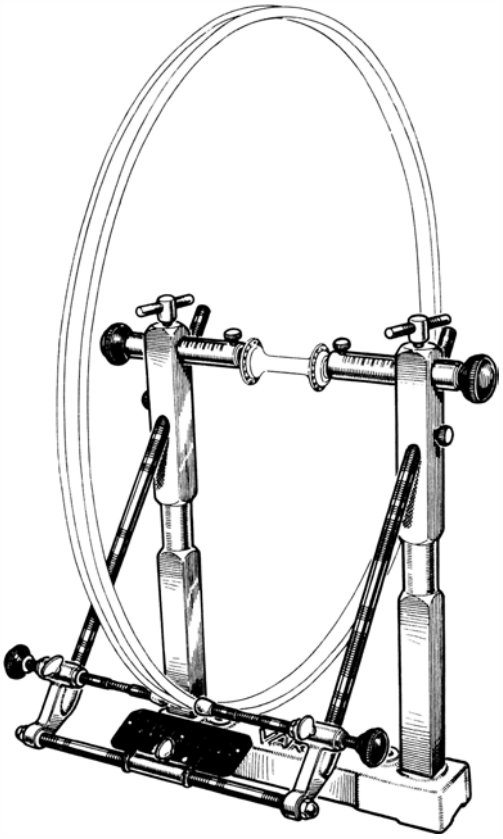
Reading these instructions for the first time, they might appear to be complicated and difficult to follow, but after one or two attempts and given a little patience the novice will be entitled to be proud of a fine pair of wheels with truly tangential spokes.



In this pattern of spoking, we see how each spoke crosses four others - numbered 1-2-3-4 - under three and over one or vice-versa. Note the feature of this pattern which is that two adjacent spokes going in opposite directions (see A and B) are in an almost straight line and thus truly tengential.

The ''Monteur'' wheel-trueing stand for the quick and precise trueing of motor-cycle and cycle wheels of all kinds. Supplied with coned spindles to take quick-release cycle-hub spindles and hollow spindles for motor-cycles. Weight : 10 kg.

VAR reference : **74.**



''Professional'' spoke-key in forged steel with machined slots. For 3.30 mm, 3.50 mm, 3.85 mm or 4 mm nipples. State which when ordering. Weight : 50 grammes.

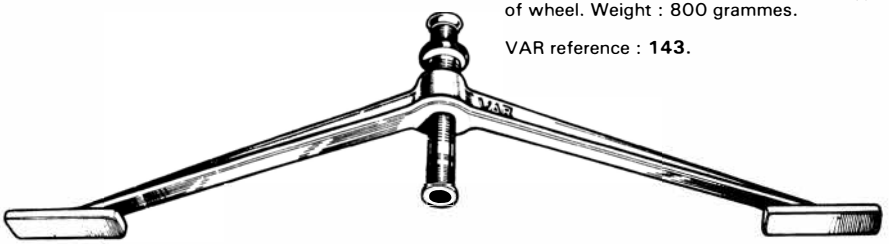
VAR reference : **51.**

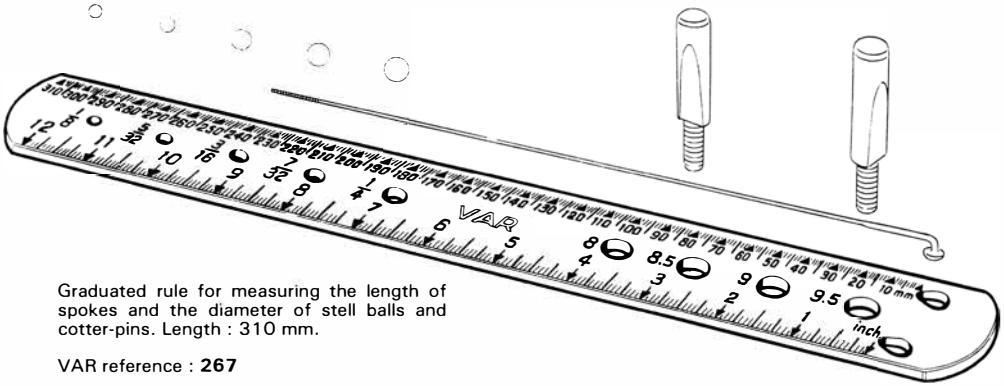
''Universal'' spoke-key in forged steel for five nipple sizes. Weight : 40 grammes.

VAR reference : **54.**

Wheel centreing gauge to check the rim being central over the cones. Usable with one hand, and suitable for all sizes and types of wheel. Weight : 800 grammes.

VAR reference : **143.**





Graduated rule for measuring the length of spokes and the diameter of stell balls and cotter-pins. Length : 310 mm.

VAR reference : **267**

TYRES

The wired-on tyre has three components. Firstly the rim-tape which can be of cotton or of rubber strip about 12 mm wide. Both will have a hole through which the valve is passed and care should be taken to see that they fit snugly into the well of the rim.

Secondly there is the inner-tube, a long cylinder of rubber with the ends vulcanised to form an airtight ring and having a valve fitted so that it can be inflated. It fills the space between the rim and the outer cover.

The latter is either wholly or partially covered by a layer of rubber and is formed by two layers of threads crossing at an angle to give flexibility to the fabric. Along the edges of the cover are inextensible wires of an exact size which serve to hold the tyre on to the rim.

CARE AND TREATMENT

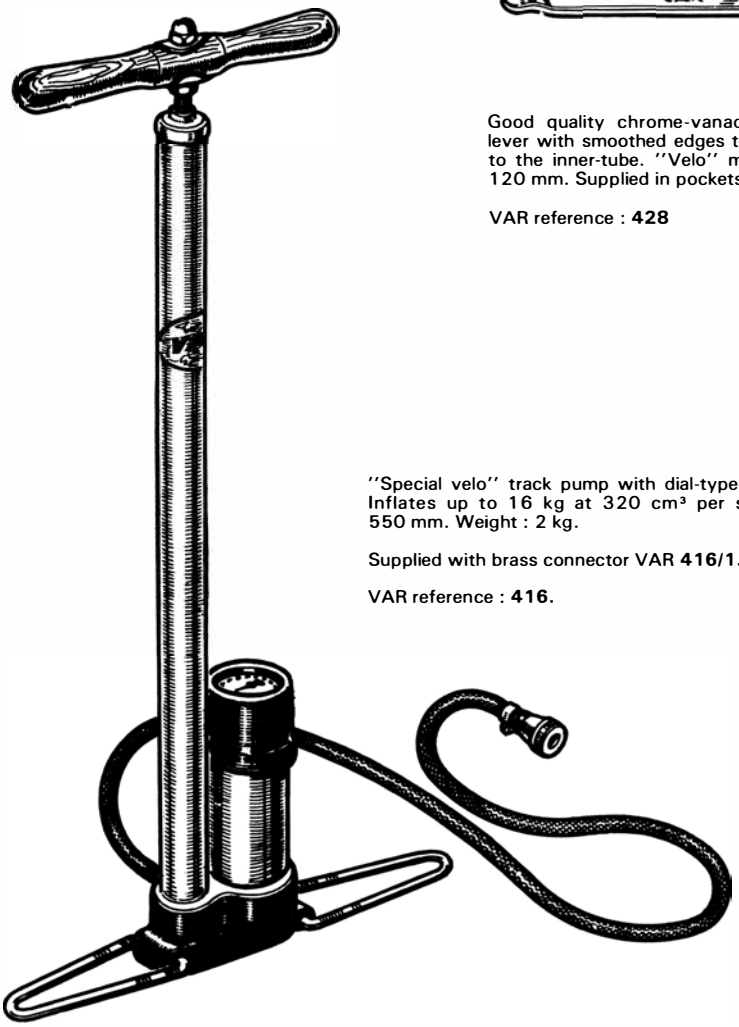
It is essential that tyres should always be properly inflated. Without going into figures such as those available for motor vehicles, pressures should be such as will prevent the tyre from flexing more than one quarter of its diameter when the bicycle is being ridden. Otherwise the cover will be damaged, and possibly the rim, while pedalling will certainly be made more difficult. When a nail or other sharp object pierces the cover and punctures the inner tube, the outer cover has to be removed. Do this by lifting one of the wired edges over the lip of the rim by means of those indispensible tools known as tyre levers. Remove the milled nut which holds the valve to the rim and take out the inner tube. If the puncture is not immediately apparent, lightly inflate the tube and immerse it bit by bit in a bowl of water when a stream of bubbles will locate the leakage.

Thoroughly dry the tube and clean the area with benzine if possible : at the roadside use a small piece of sandpaper and then apply a thin coating of rubber solution. When it is quite dry, remove the protective covering from a prepared patch and stick the patch squarely over the hole. Apply pressure for a few moments and after having made sure that the object which caused the puncture has been removed from the outer cover, lightly inflate the tube. Put the valve through the valve hole and push the tube inside the cover. Then starting opposite the valve, work the wired edge of the cover into place pushing it well into the bed of the rim so that the last few inches near the valve can be rolled over the edge of the rim adjacent to the valve. Work the valve up and down a few times to ensure that it is not preventing the tyre from bedding down, replace the milled nut against the rim and inflate the tyre.

Most valves are vulcanised into place nowadays, but if yours has a thin hexagon nut holding it to the seating, make sure that this is tight. Then if whatever caused the puncture has made a sizeable hole in the outer cover, this should be patched from the inside following the procedure as above using a rubber patch or preferably a piece of prepared canvas. Dusting the inside of the cover with French chalk makes for ease of fitting and prevents the inner tube from sticking to it.

Good quality chrome-vanadium steel tyre lever with smoothed edges to avoid damage to the inner-tube. ''Velo'' model. Length : 120 mm. Supplied in pockets of three.

VAR reference : **428**

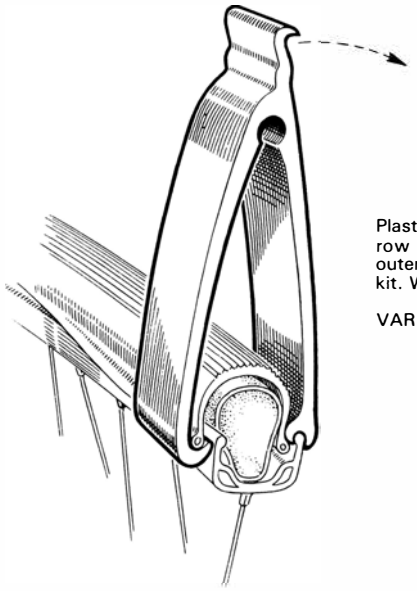


''Special velo'' track pump with dial-type pressure gauge. Inflates up to 16 kg at 320 cm^3 per stroke. Length : 550 mm. Weight : 2 kg.

Supplied with brass connector VAR **416/1.**

VAR reference : **416.**

For utility riding, a standard tyre with a butyl inner tube is quite satisfactory, but for fast long-distance riding it is better to have a light opensided cover with a pure rubber inner tube. Tyres of very small section, some of them as light as tubular tyres, are available but it is doubtful if they are as comfortable to ride, or as fast, as a true tubular.



Plastic tyre lever/s for removing AND REPLACING narrow section wired-on covers. No risk of damage to outer cover or inner-tube. Recommended for the tool-kit. Weight : 60 grammes.

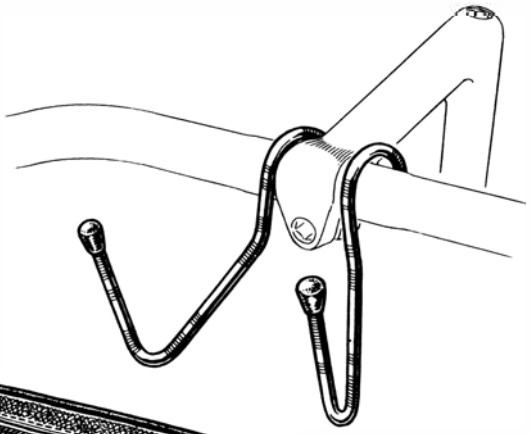
VAR reference : **425**

TUBULARS

They differ from ordinary tyres in not having wires and in having the inner tube completely enclosed within the outer cover, the edges of which are sewn together and protected by a stuck-on tape. They are generally lighter and much more flexible than ordinary tyres, in fact for use on the track they can be had as light as 100 grammes. Road-racing tubulars go from 150 to 250 grammes. The great advantage of a tubular is that it can be changed after a puncture quickly and easily, but obviously one must carry a spare. As a tubular has no wires and its rim has but a very shallow bed, the two have to be stuck together and it is important that this should be properly done. Cornering sharply on a descent could cause a badly secured tubular to roll off its rim with possibly disastrous results.

One way of fixing tubulars is by a rim tape that is sticky on both sides : one side adheres to the rim and the tubular sticks to the other. After a tubular has been removed and replaced a few times, the sticky tape should be renewed. On racing wheels, the tubular is stuck directly on to the rim by means of a special cement. A new rim should have the bed thoroughly cleaned by solvent and a thin coating of cement applied : this should be allowed to dry for 24 hours and a second coating applied. When fairly tacky, the tubular should be fitted, lightly inflated and centred on the rim, and then pumped hard. When punctures occur during a race the entire wheel is changed rather than just the tubular.

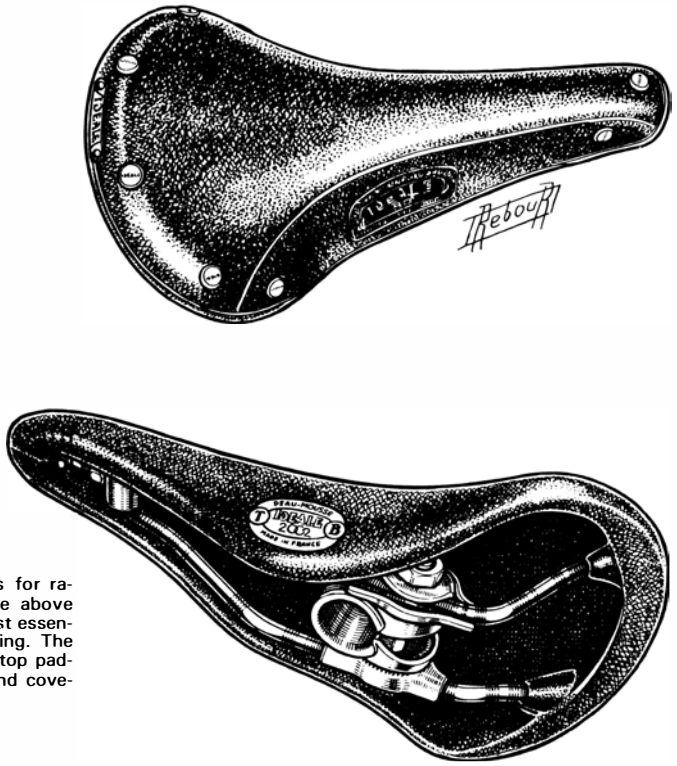
It is always advisable to carry a spare tubular or inner-tube, along with a few essential tools and a tyre repair outfit. These can best be accommodated in a small bag such as the one shown here.



HOW TO REPAIR

First of all the perforation has to be located and this can best be done by running the inflated tubular through water as with a punctured inner tube. A tubular can be inflated to a higher pressure if it is fitted to a rim and this is advisable if the puncture is a very ''slow'' one. Mark the side of the tyre where bubbling occurs and lift the base tape in that area for four or fives inches. With top quality tubulars this is not easy and some patience is needed ; a thin knife blade heated over a flame can facilitate the operation but care should be taken not to damage the fabric.

With a length of base tape removed, cut the stitching for about three inches and remove the severed threads. Then carefully withdraw the section of inner tube carrying the puncture and repair it in the manner previously indicated. If the tyre casing needs patching, do that from the inside, then dust the tube with French chalk and replace it. Stitch up the opening using the original needle holes if possible. Special linen thread and triangular-section needles are available and should be used. Begin the stitching about quarter of an inch into the original and end it similarly with two or three locking stitches. Coat the new stitching and the lifted base tape with solution and press together, taking care to see that the tape follows the original line.



Two top-quality saddles for racing or touring, the one above with a leather top, almost essential for long-distance riding. The lower one has a plastic top padded with foam rubber and cove-

SADDLES

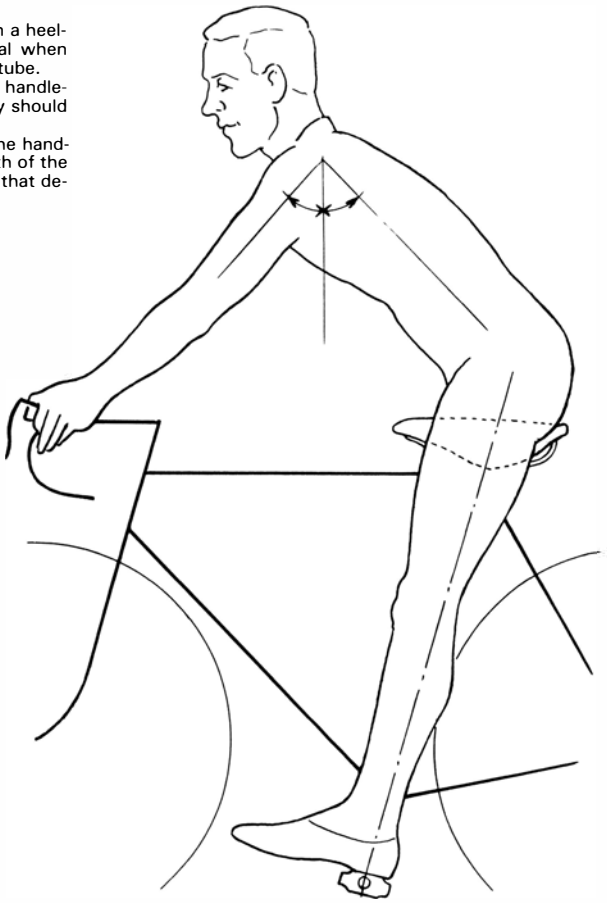
We cannot stress too strongly how necessary it is that your saddle should be of the very best. Bicycle makers do not always share this view and some of them go for the cheapest possible, often of foreign make and lacking, alas ! any degree of comfort. Do not hesitate to order the best saddle available, even if it means paying extra. There is nothing more annoying than having to cut short an otherwise pleasant ride because, while the bicycle is in good order and you are quite fit, your seat is too painful to continue.

If you are reasonably well trained and if you have a good saddle, you will never suffer from saddle soreness. How then to choose. For touring and even business riding choose a saddle with a leather top that has been already broken-in. For racing over distances up to 200 kilometres a ''plastic'' top can be used, preferably covered with rubber foam and a natural skin of some sort.

And having arrived at saddles, we should discuss how they should be positioned. There is no absolute rule and position can vary within narrow limits according to ones physical make-up, but take care not to stray very far from the following recommendations.

To begin with, place the saddle so that the seat pillar is in the centre of it. Then, if a plumb-line is dropped from the saddle peak it should pass from 4 to 7 cms behind the centre of the bracket axle : the bicycle should be standing on a level surface, and the top of

This is how to fix saddle height.
The leg is straight and the foot in a heelless shoe should touch the pedal when the crank is in line with the seat-tube.
With the hands on top of the handlebars, the slope of the upper body should match that of the arms.
It is obvious that the length of the handlebar extension and not the length of the top-tube or the build of the rider that determines position.



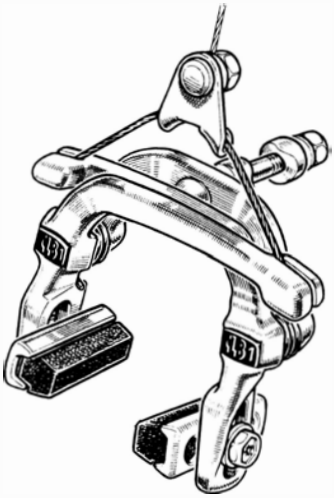
the saddle should be perfectly horizontal. If your saddle is one of those made fashionable by a certain champion cyclist and has a raised rear portion, allow for this even if the peak is lower than the black – always provided that there is no sensation of slipping forward. As for a saddle with a raised peak, that could be the source of serious injury.

How high should the saddle be ? It is easy enough to find out, by sitting on the saddle and while wearing shoes or slippers without heels, stretch the leg fully with the heel on the pedal and the crank in line with the seat tube. Raise or lower the saddle until you can comfortably do this.

The ordinary saddle-clip has serrations which lock into place when the desired tilt has been obtained, as well as provision for backward and forward adjustment. On more expensive saddle pillars, this device is replaced by a simpler fitting built into the pillar and with the use of light alloy, these are very light and neat.

No maintenance is needed for plastic saddles, and if it of leather, it is best not to grease the top or to stretch it by means of the adjusting screw in the nose. All that is necessary is to reshape the leather if it has become saturated on a wet ride, to stuff the underside with newspaper and to let it dry naturally.

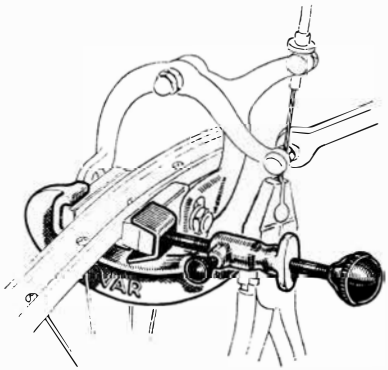
It is the length of the handlebar extension by which body position in adjusted. Do not choose one that is too short.



Centre-pull brake.

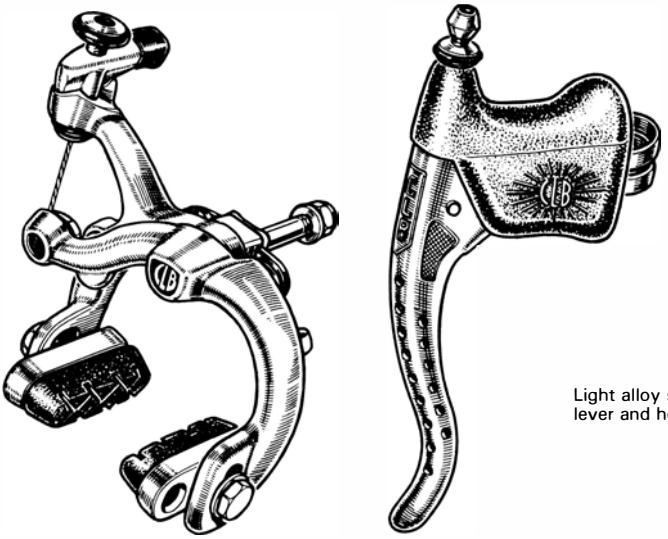
The ''Third hand'' brake-shoe clamp will hold the shoes in position leaving both hands free for adjusting the cable. Length : 300 mm. Weight : 200 grammes.

VAR reference : **02**



HANDLEBARS

Whatever shape of handlebar you have, make sure that the extension is long enough. It should not be too long, of course, but the cyclist's trunk should lean forward at an angle of about 50° and it is the length of the extension which governs this. On a racing machine for a height of 5'3'' use 80 mm : for 5'7'', about 90 mm, and for 5'11'' use 110-120 as a guide.



Light alloy side-pull racing brake with lever and hood.

How high ? The top of the handlebar should be slightly lower than the top of the saddle but a lot depends upon the length of the arms.

Set the grips of the handlebars almost level both for town riding and for competition.

Avoid having an escessively wide handlebar. It has been said that breathing is easier with a wide bar but this is hardly true as the arms are seldom parallel with the elbows pointing slightly outwards. Also, one can manœuvre more readily in a peloton.

Steel bars and stems used to be the rule but alloy ones are now so good that we advise them unreservedly, especially as they are so light and do not rust. A little more expensive, per haps, but well worth the difference.

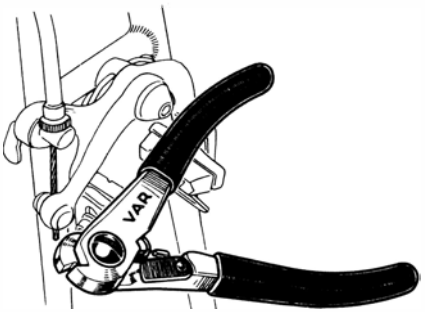
BRAKES

These too can be had in steel and light alloy and our conclusions are the same. Steel is cheaper but it rusts : dural is more expensive but lighter and rustless. There are two sorts of dural, forged and moulded and we strongly advise use of the former.

Brakes themselves can be divided into two types, side-pull and centre-pull and while the former are the more widely used, the latter are more efficient because their leverage is more effective. Side-pulls are lighter and easier to fit and so are now used by all racing men.

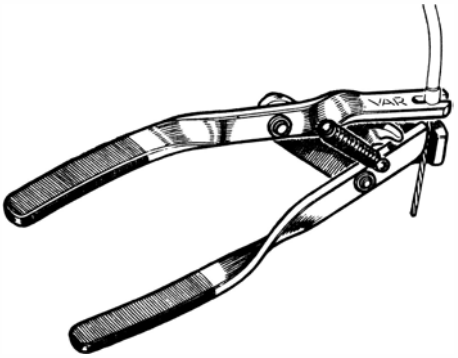
The centre-pull needs to have a cable-stop somewhere on the frame. The front one is usually an extension of the locking washer under the head-nut : it is usually slotted so that the cable can be slipped in and out. At the rear the stop is usually fixed by the seat-lug bolt or brazed to the lug itself or to the seat stays.

A stirrup is bolted to the frame, through the fork-crown at the front and the seat-stay bridge at the rear. At the ends of the stirrup, two pivots are fixed around which the brake arms move. The bottom of each arm carries a brake shoe and brake block. The tops of the arms are linked by a wire V or metal wedge. Different types of centre-pull have different arrangments and it is not possible to describe all of them here.



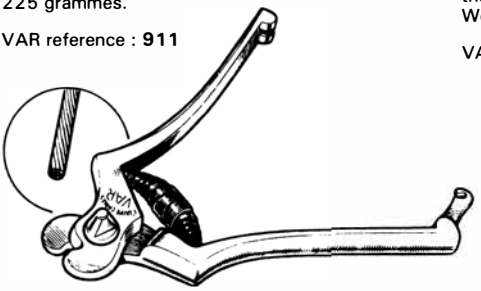
Left :
Powerful cable cutter with triangular jaws which cut without crushing or distorting the cable. For cycles and motor-cycles. Weight : 225 grammes.

VAR reference : **911**



Right :
Cable pulling pliers. One jaw grips the cable, the other pushes back the casing or adjuster so that the cable can be clamped in the correct position. Weight : 200 grammes.

VAR reference : **233**



Below :
Cable cutter again with jaws that cut without spreading the cable strands, thanks to the triangular jaws. For cycles and motor-cycles. Length : 180 mm. Weight : 250 grammes.

VAR reference : **84**

84/1 - nickel finish.
84/2 - bronze finish.

The side-pull needs no cable-stop on the frame as the stop forms part of one of the arms, the other arm carrying an eye-bolt which clamps the end of the brake cable. Brake shoes are bolted to the lower ends of each stirrup arm and when the lever is squeezed they grip the rim on both sides.

Obviously the lever fixed to the handlebars controls the braking via the cable. The body of the lever is fixed by means of a band-clip tightened by a screw below the pivot and if the lever tends to slip around the handlebar this screw should be further tightened. On a town machine the clips are of the open type with bolts at one side.

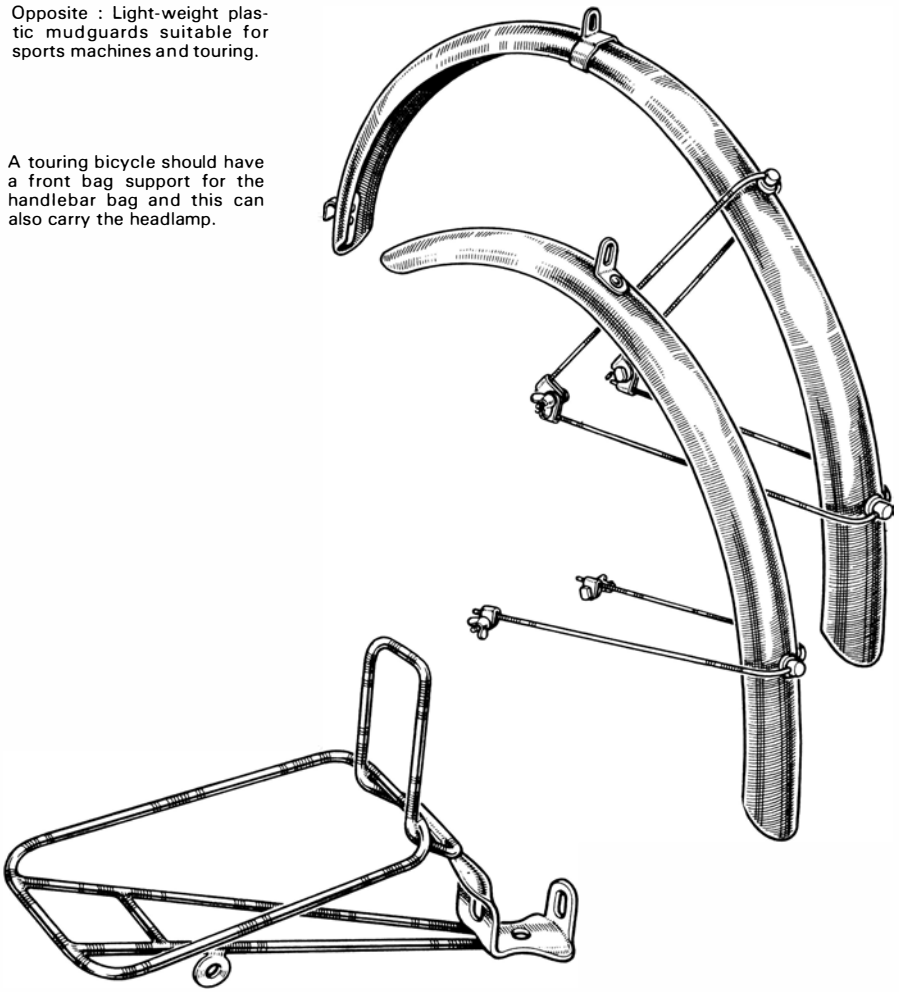
Either on the lever or the brake itself there is generally a small adjuster by which the tension of the cable can be adjusted : sometimes a quick-release device which allows the blocks to spring apart when a wheel has to be changed. The ''hood'' portion of the brake lever is often sheathed in rubber to give greater comfort when the hands are rested thereon.

Brake cables should be kept lightly greased and not allowed to go slack. The cable tension controls the distance between the brake blocks and the rim, and should be so arranged as to allow a short lever movement before the blocks touch the rim. If the lever movement is excessive even with the adjusters screwed right out, then the slack in the cable should be taken up at the clamp. Screw down the adjusters, slacken the cable-clamp nut, pull the cable through the clamp until the desired tension is attained and re-clamp the cable. There is a tool which holds the blocks against the rim while all this is being done.

Brake blocks should be parallel to the rim on which they act or perhaps set slightly inwards at their front ends — ''toed in''. They should also be central to the wall of the rim, neither too high in which case they might damage the tyre after being used for some time, or too low which means that all the contact surface of the rim is not being used.

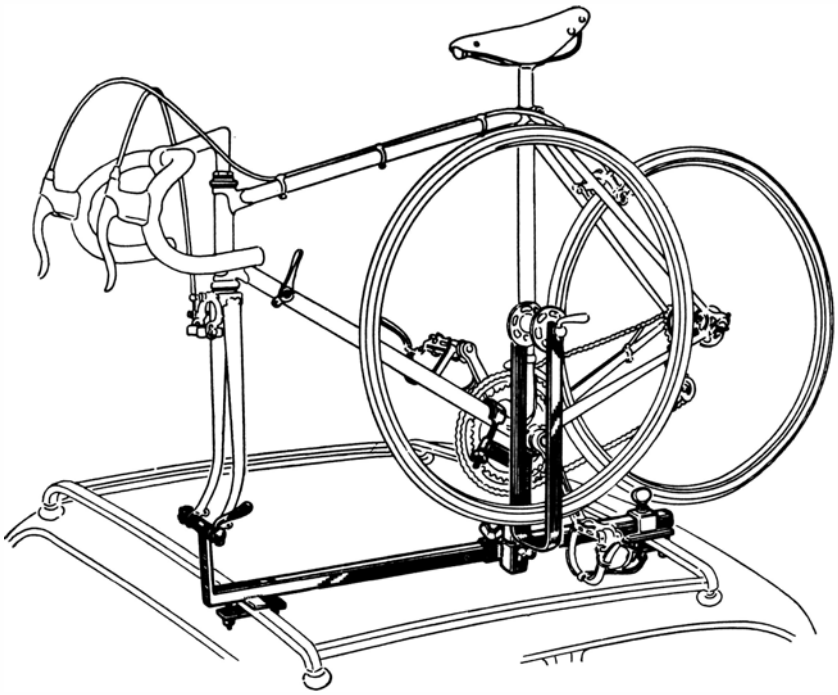
Opposite : Light-weight plastic mudguards suitable for sports machines and touring.

A touring bicycle should have a front bag support for the handlebar bag and this can also carry the headlamp.



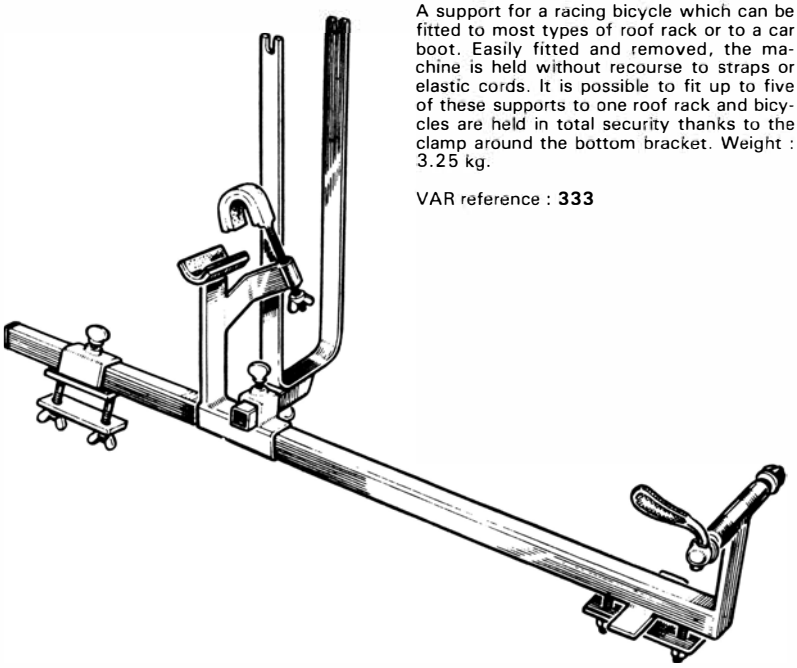
ACCESSORIES

Apart from the inflator which needs grease or a few drops of oil on the leather washer very occasionally, and perhaps replacement of the rubber washer in the push-on connector, we seem to have mentioned all the bits and pieces on a racing bicycle. As for a town bicycle or a semi-sports, there are mudguards and lighting to be considered. Mudguard nuts should be checked and tightened when slack. The dynamo should also have its fixing regularly checked and the alignment of its axle must be in line with a radius of the wheel which drives it. Check the insulation and fixing of the wiring, and the fixings of any bag or pannier carriers that may be fitted.



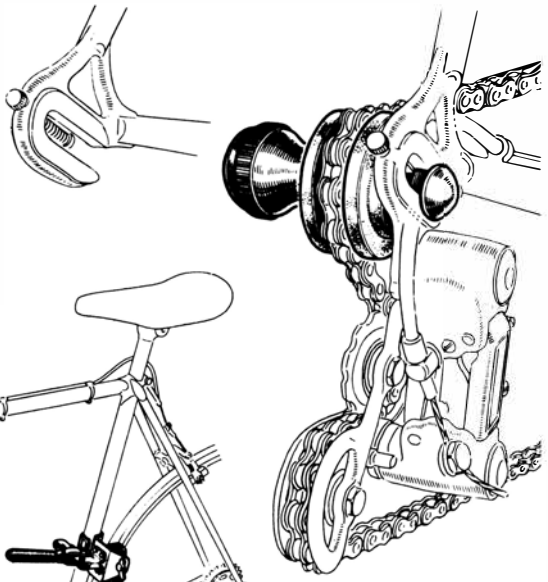
A support for a racing bicycle which can be fitted to most types of roof rack or to a car boot. Easily fitted and removed, the machine is held without recourse to straps or elastic cords. It is possible to fit up to five of these supports to one roof rack and bicycles are held in total security thanks to the clamp around the bottom bracket. Weight : 3.25 kg.

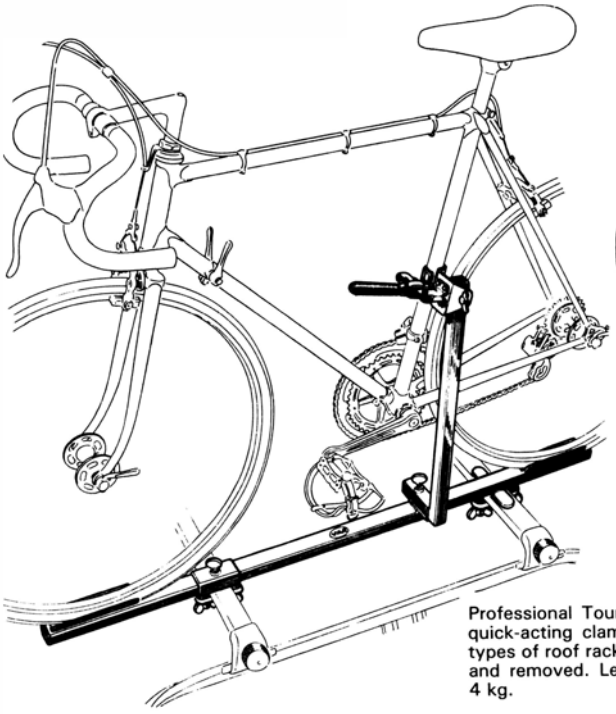
VAR reference : **333**



Light alloy chain-rest to hold the chain in its normal position when the rear wheel is removed. Fits to the right-hand rear dropout. The chain cannot damage or soil the bicycle when carried on a roof-rack or inside a car. Weight : 70 grammes.

VAR reference : **907**



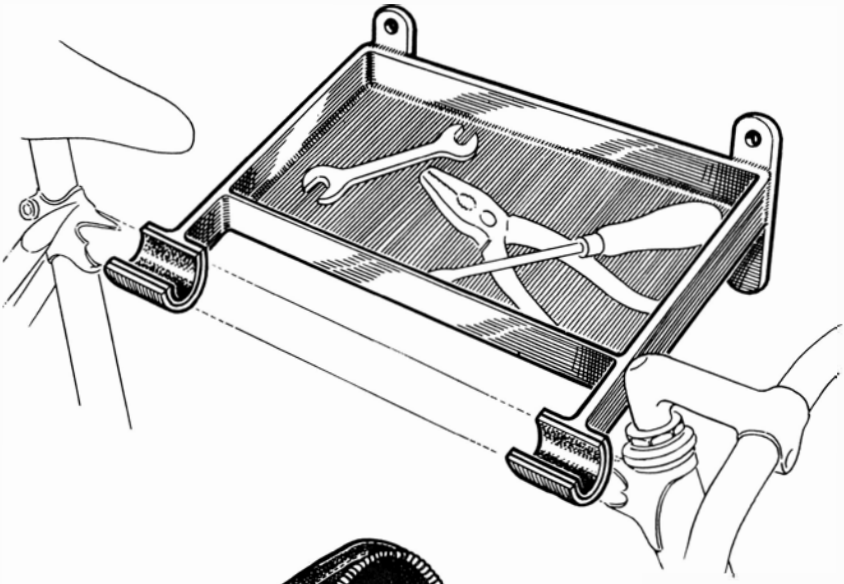


Professional Tour de France type support with quick-acting clamp that can be locked. Fits all types of roof rack, fully adjustable, quickly fitted and removed. Length : 1.25 mètres. Weight : 4 kg.

VAR reference : **716**

A WORKSHOP ?

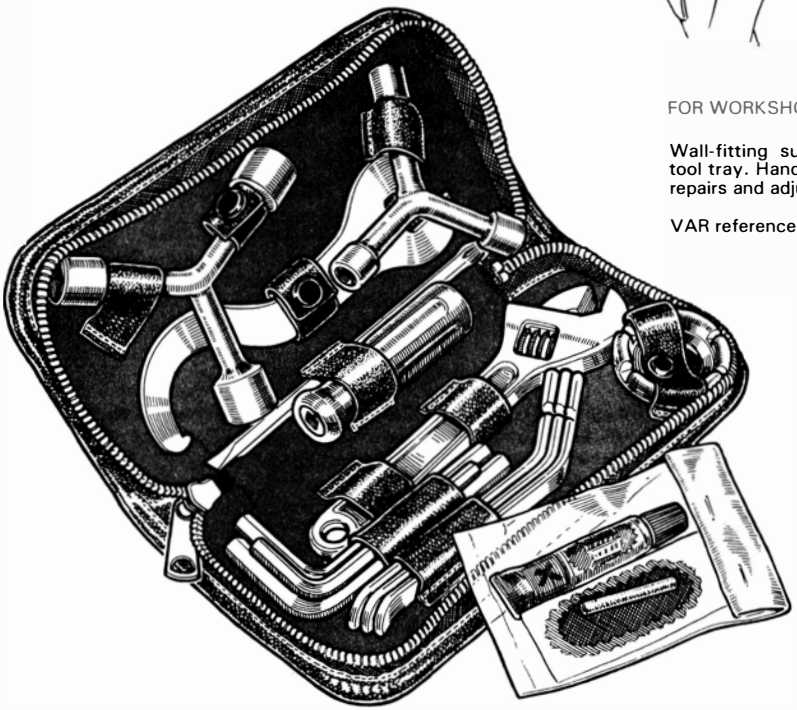
It is possible that you will develop a liking for assembling, maintaining and repairing bicycles. If you have space available you could set up a small workshop at moderate cost that will have great practical value. A stout table or two large planks fixed along one wall : a vice with an overhead electric lamp : two stout cords with hooks at the end can suspend a bicycle by its saddle and handlebars if you do not have a repair-stand : a board nailed to the wall above the bench for holding tools as you acquire them, and you are equipped for dealing with simple repairs. And then as you gain experience you will find that the mechanism of the bicycle is not all that complicated and that there is great satisfaction to be had from dealing with it on your own account.



FOR WORKSHOP REPAIRS

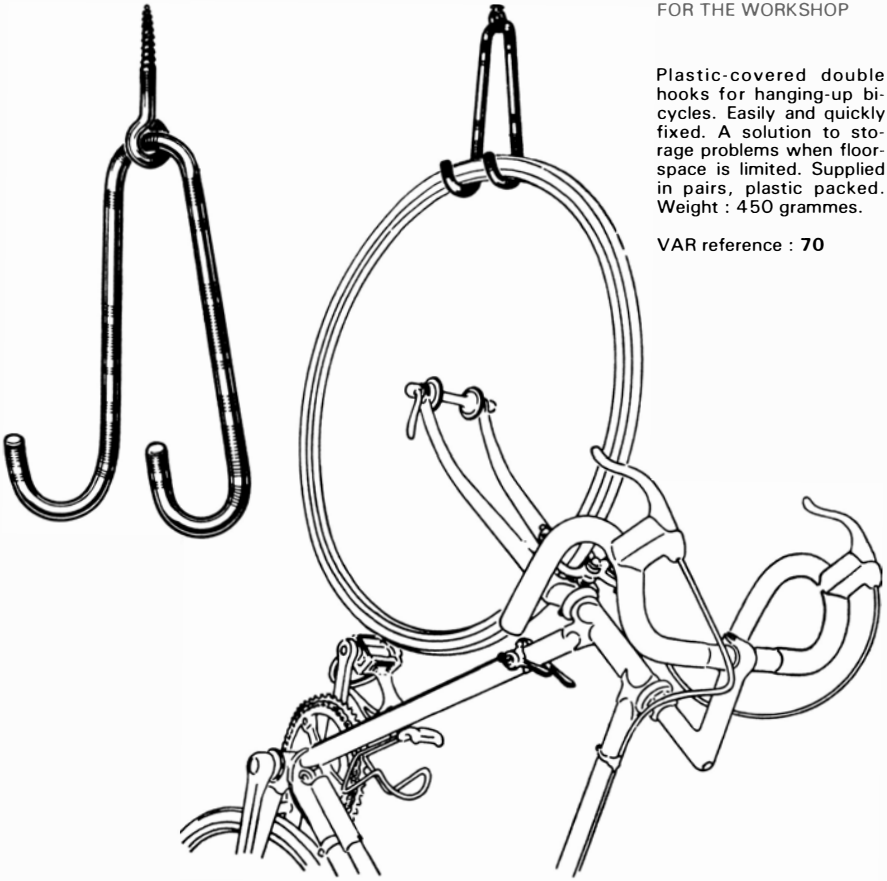
Wall-fitting support with tool tray. Handy for minor repairs and adjustments.

VAR reference : **69**



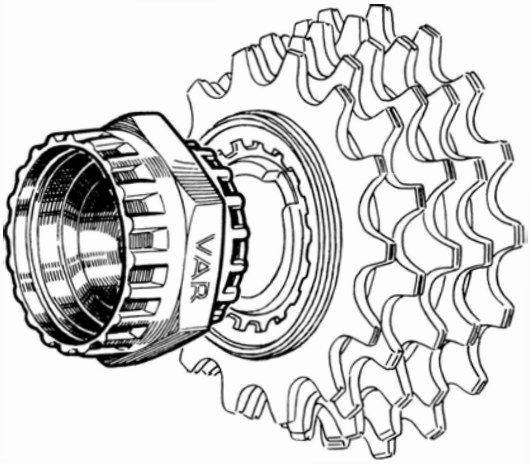
''Velo'' tool kit comprising tyre repair outfit, three tyre-levers, one reversible screwdriver, one spoke-key, three Allen keys 5, 6 and 7 mm, two three-way box keys 8, 9 and 10 mm and 11, 13 and 14 mm, one adjustable 6'' spanner, one pedal and lock-ring spanner : ideal touring kit. Weight : 760 grammes.

VAR reference : **704**



Plastic-covered double hooks for hanging-up bicycles. Easily and quickly fixed. A solution to storage problems when floor-space is limited. Supplied in pairs, plastic packed. Weight : 450 grammes.

VAR reference : **70**

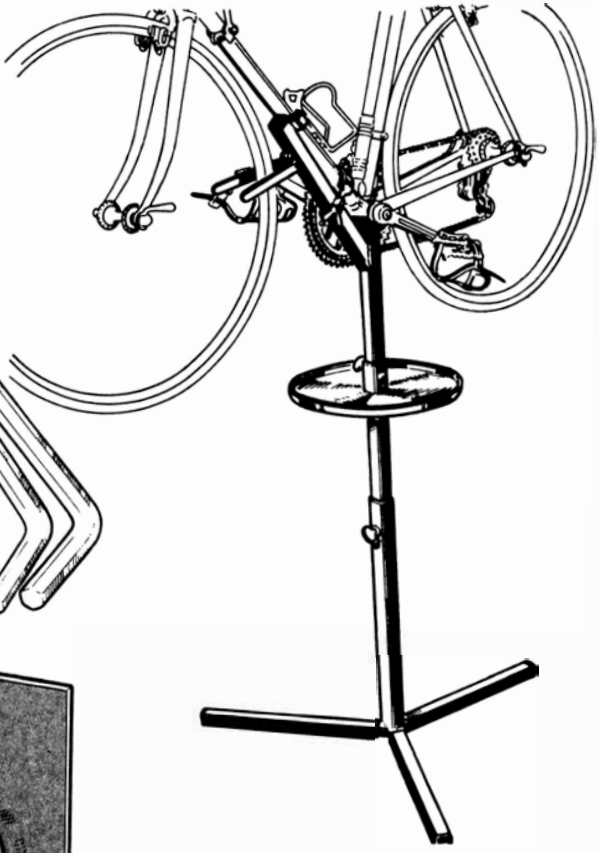


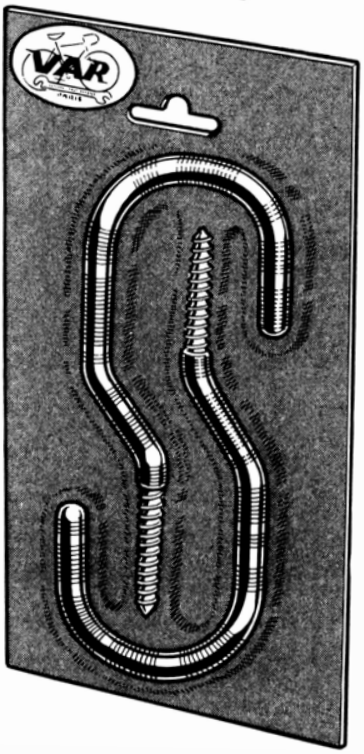
Double-sided splined remover for Maillard ''Helicomatic'' and ''Super Plus'' freewheel locking rings. Weight : 80 grammes.

VAR reference : **417**

Set of 8 Allen keys on ring. Sizes 2, 2.5, 3, 3.5, 4, 5, 6 and 8 mm.

VAR reference : **909**





FOR THE WORKSHOP

''Amateur'' repair stand : adjustable height, easily moved about. Parts in contact with the bicycle frame are lined with plastic foam. Circular tool tray keeps tools handy. Weight : 5 kg.

VAR reference : **801**

Bicycle storage hooks with plastic coating. In ''Skinpacks'' of two hooks per pack. Weight : 160 grammes the pair.

VAR reference : **703**

NOTES

VAR 6, rue Pasteur - 75011 PARIS. ☎ (1) 47.00.03.88

Imp. Rouen-Offset