CHAPTER VIII.

THE CARBURETTER.

THE carburetter is the simple and ingenious device which performs the important function of feeding the engine with explosive mixture. The designs are many and varied. Just as the gasworks deliver a clean, properly manufactured supply of gas to our houses for burning, and to our factories to supply power, so the neat little carburetter supplies petrol gas to the engine properly mixed with air. Fortunately for our pockets, in these days of heavy taxation and consequently dear fuel, the proportion of petrol to air is only 2.15%. Petrol, as we know, is a volatile spirit of petroleum, usually sold having a specific gravity of .720 at 60° F. This specific gravity varies slightly according to the temperature. Petrol vaporises of its own accord, and if a large surface is exposed to the air, the vaporisation is fairly rapid. In actual practice, however, it has been found that the spirit now sold, which is of a fairly heavy specific gravity, does not vaporise regularly by this natural means, and the speed with which it evaporates under these conditions is largely affected by the temperature or condition of the atmosphere. This is the case with the surface carburetter, which is now obsolete. In consequence, petrol is now vaporised mechanically by forcing it through a narrow orifice in a minute stream, and thus dividing it into minute particles, which instantly turn into vapour.

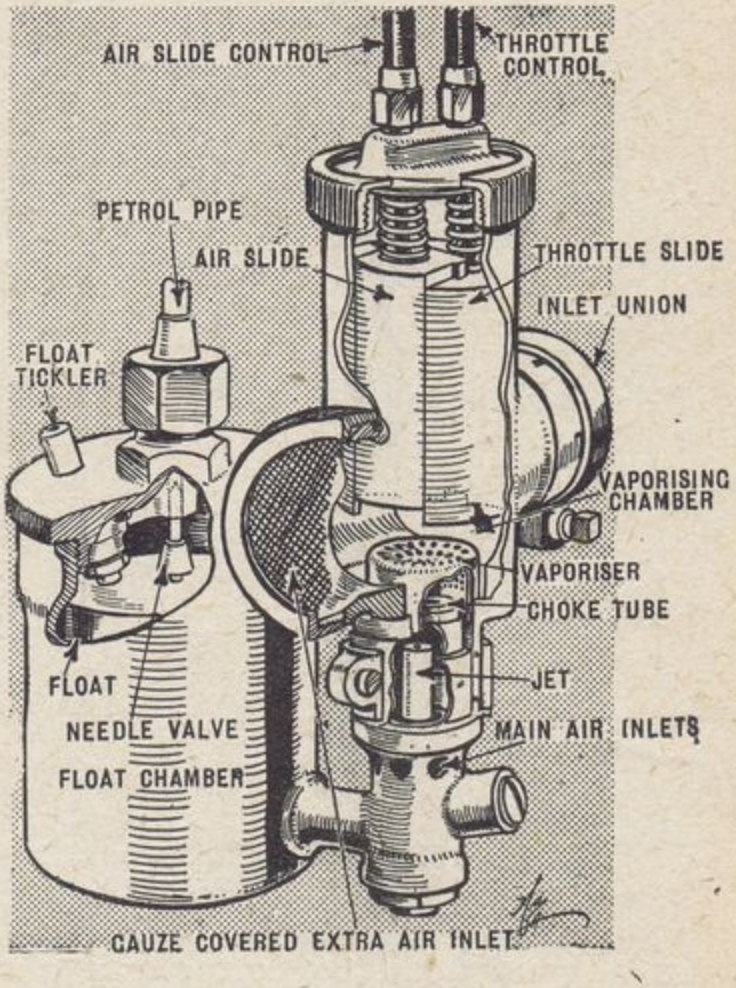

FIG. 1.—SECTION OF TWO-LEVER BROWN AND BARLOW CARBURETTER.

We will now turn to fig. 1, which shows a section of the deservedly popular Brown and Barlow carburetter. The type chosen for our description is the model with single jet and two-lever method of control, but an improved pattern is described further on. When the petrol tap is turned on the liquid flows in at the petrol pipe union into the float chamber, gradually filling it, and lifting as it does so the float until it presses up the needle valve into its seating. Meanwhile the petrol has also flowed into the jet, and stands there at a normal level about $\frac{3}{16}$in. from the top. To fill the float chamber quickly, the float tickler is pressed down, and the effect of this is to prevent the float from rising; the petrol, therefore, overflows through the

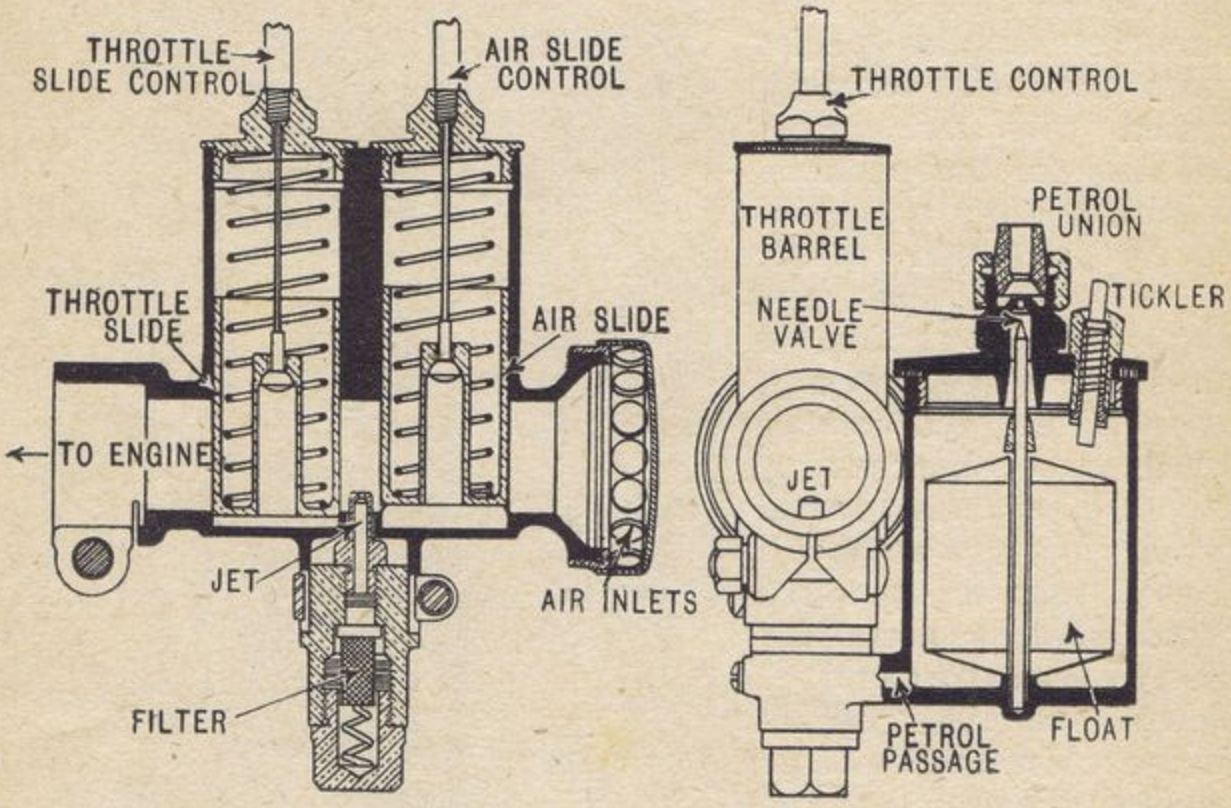

FIG. 2.—SECTION OF THE TRIUMPH CARBURETTER.

jet, and, splashing about inside the vaporising chamber, provides a good head of petrol and a rich mixture for starting. Now to start the engine from cold we require much petrol. So we close the D-shaped air slide by means of the small lever on the handle-bar, shutting off the auxiliary air inlet. When the engine is made to revolve, the descending piston creates a vacuum in the cylinder, to fill up which a certain amount of air flows past the jet through holes at the bottom of the vaporising chamber, and a stream of petrol issues from the jet. The throttle slide being partly open, air and petrol enter the cylinder to fill the vacuum left by the piston on its down or suction stroke. The air slide is next opened by lifting the auxiliary air inlet, with the result that the incoming draught tends further to

atomise the petrol. The supply in the float chamber is now reduced, so that the float sinks, the needle valve opens, and allows a fresh supply to enter. What takes place in the float chamber is best explained by asking the reader to study the action of the ball cock in a water cistern. This, then, is the

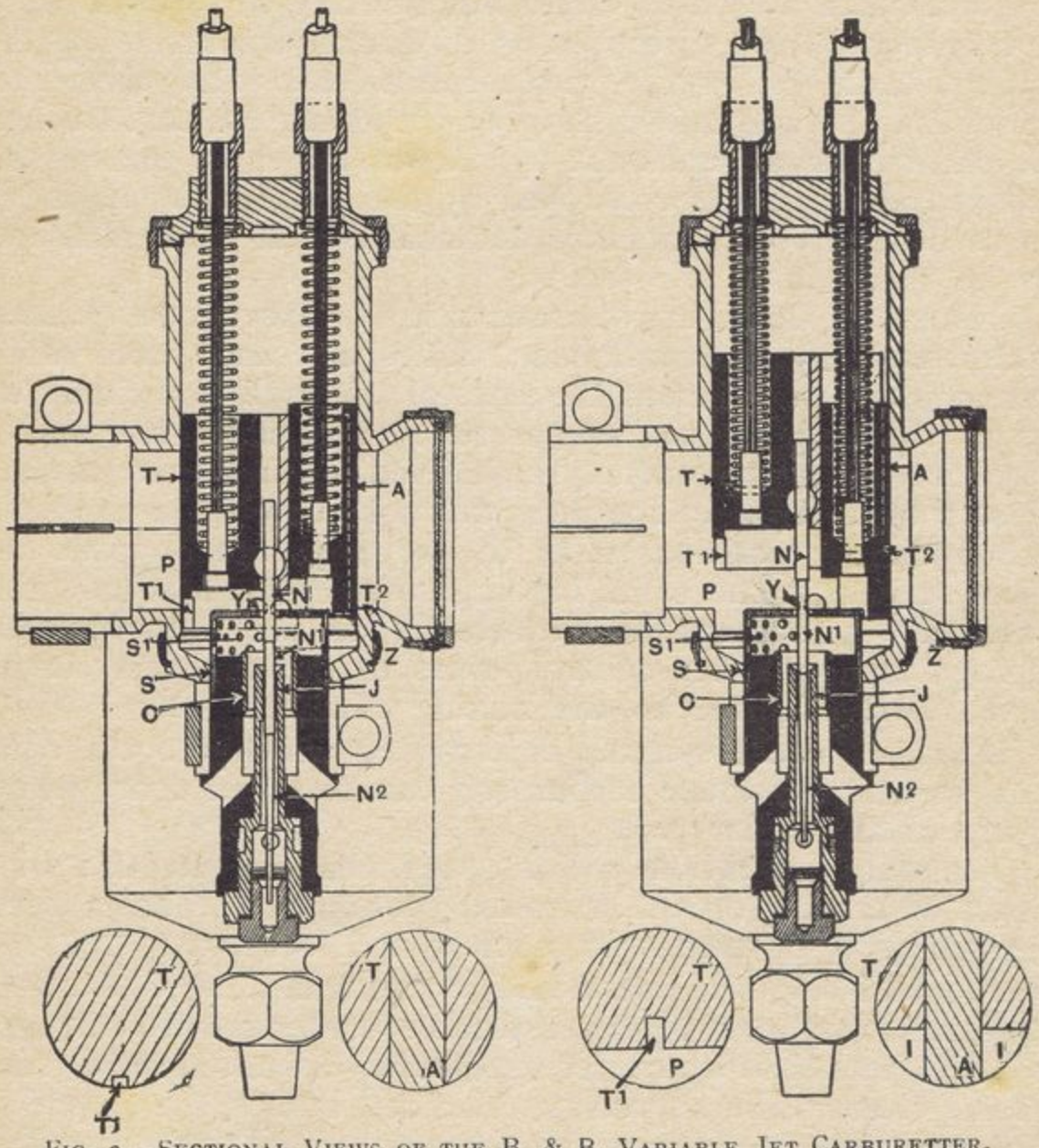

FIG. 3.—SECTIONAL VIEWS OF THE B. & B. VARIABLE JET CARBURETTER.
Left: Carburetter set for running dead slow at no load. Right: On the level at about 20 m.p.h.

A. Air inlet valve.
C. Choke tube.
J. Jet tube.
N. Needle.
N^1. Parallel portion of needle.
N^2. Taper portion of needle.
P. Outlet to engine.
S. Vaporising cap.
S^1. Holes in cap S.
T. Throttle valve.

principle on which the Brown and Barlow and most other carburetters work. The figure shows clearly what may fail in the carburetter. Dirt, fluff, or other foreign matter may cause obstruction: Firstly, in the tank or filter by blocking up the entrance to the petrol pipe; secondly, at the entrance to the float chamber; thirdly, in the passage between float chamber

and jet; and, fourthly, in the jet. The chief points about this carburetter are the detachability of the milled cap, allowing the throttle and air slides to be inspected or removed from the carburetter. The spraying chamber is fastened to the float chamber, and the entire carburetter to the inlet pipe, by means of registered clip joints, half a turn of either nut sufficing to turn the spraying chamber in any direction, or to detach it completely from the float chamber, or the whole carburetter from the engine. The jet may be withdrawn simply by undoing the screw beneath it to clean it or to replace it by one of larger or smaller size. The fixed air supply is controlled by the adapter or choke tube. The carburetter is so quickly detachable that these alterations may be made in a few seconds.

Among the detail improvements in the later model B. and B. carburetters may be mentioned: Slides machined from solid D brass bars, keyways cut at the sides of the slides coinciding with pegs in the body of the carburetter. The slides rise and fall truly, and cannot be wrongly assembled, as if a rider attempts to insert them wrongly the pegs will not allow them to descend to their correct positions until the keyways are opposite their respective pegs. The same binding screw, with a square head is used for attaching the carburetter to the induction pipe' clipping the handle-bar control levers to the bar, and connecting the float chamber to the mixing chamber.

A small pocket spanner is provided which fits the square heads, so that the whole carburetter can be taken apart without the use of any other tool.

The only alteration to the float chamber in this model consists of brazing on the threaded portion at the base, instead of attaching it by means of a screw and locknut.

The following is a brief description of the pilot jet B. and B. carburetters: The two newer models conform with the usual type of B. and B. carburetter except for the addition of a pilot jet lying close to the vaporising chamber, but on the engine side of the throttle. In one case this jet is only used as an easy starting device, and, once the engine is running, the jet is put out of action by a quarter turn of a small lever placed directly over it.

In the other case the operating lever is fitted with a very fine adjustment, so that the pilot jet may be left in action at all times, and can be relied on to keep the engine ticking over when the throttle is closed.

All the latest models are fitted with the air slide enveloped in the throttle slide and moving in dovetail grooves. This gives an easier action, and also, as the air slide is narrow, admits a certain amount of air when the throttle is opened, thus rendering the carburetter more automatic in action. The variable

jet carburetter may be set to be controlled entirely by the throttle lever, but the makers recommend the use of the air slide, as a wider range and better consumption can be obtained.

In all models the float arrangements have undergone considerable alteration, and a top feed is used with the float acting

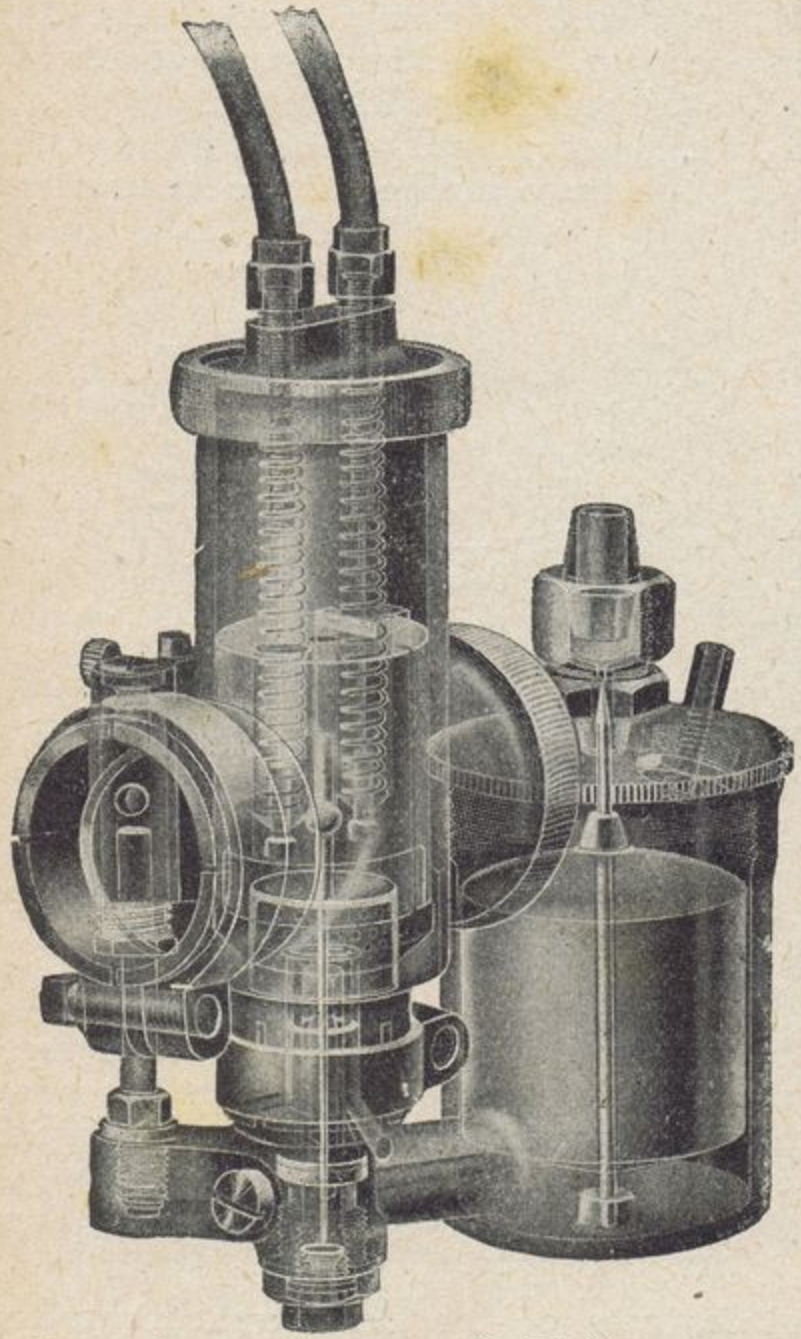

FIG. 4.—PHANTOM VIEW OF THE B. & B. CARBURETTER SHOWING PILOT JET.

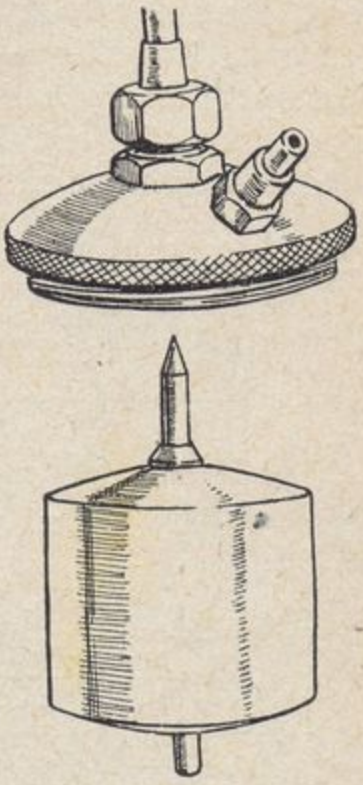

FIG. 5.—TOP FEED TO B. & B FLOAT CHAMBER.

direct on the needle, thus doing away with balance or toggle gear. Besides this an ingenious but simple arrangement allows the jet to be flooded without altering to any great extent the level in the float chamber, with its consequent uncertain mixture. The device is as follows : The usual air vents to the float chamber have been removed and a single hole in the centre of the float tickler takes their place. Consequently, when the finger is placed on this plunger with the purpose of agitating the float, the needle valve is dropped from its seating, but an air lock is formed in the chamber, and, consequently, the level cannot rise, though petrol can flow straight through the jet in a stream.

Except for the addition of a vaporising cap (fig. 1), which is pierced with holes in the top and sides, the single jet model is almost unaltered, and with this type, once the correct position for the air lever has been found, the driving is done almost entirely from the throttle.

The adoption of the idea of feeding the petrol into the float chamber from the top is not novel, and was seen in the Vaurs carburetter as early as 1903. The chief advantage derived therefrom is simplicity. In the Amac float chamber, the petrol, though introduced from below, is equally simple, as an inverted needle valve is employed, the mere action of the float rising

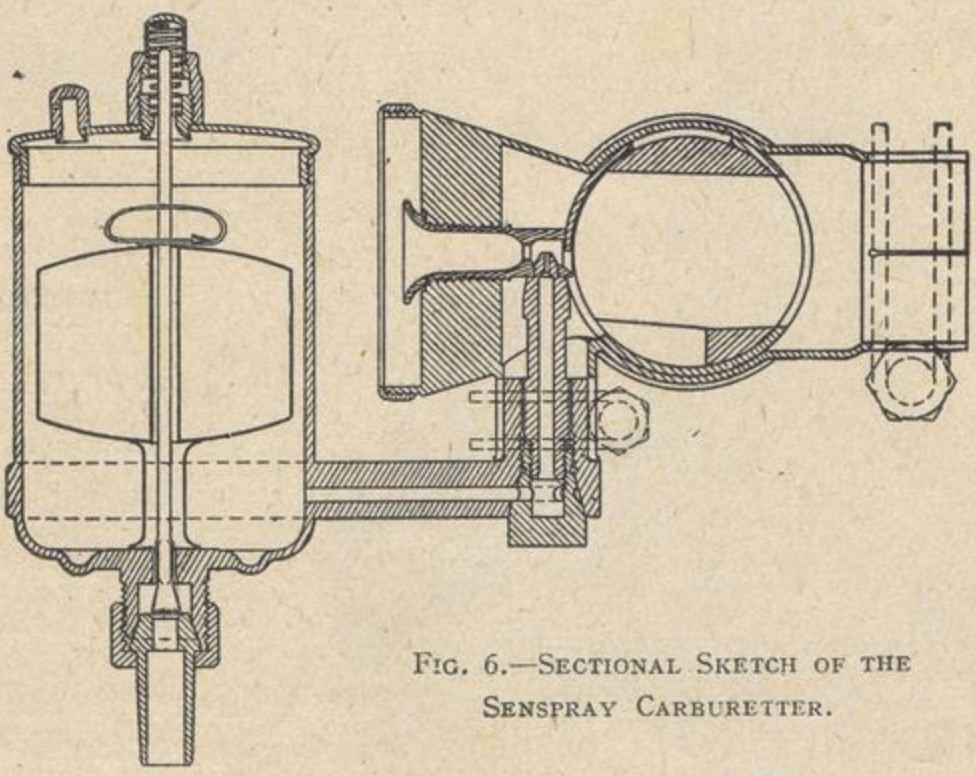

FIG. 6.—SECTIONAL SKETCH OF THE SENSPRAY CARBURETTER.

pulling up the needle valve on to its seating. If neither of these two arrangements is employed, the petrol flows in from below, and an ordinary needle valve is used to which balance weights are attached which rest on the float.

The Senspray.

One of the special features of the Senspray carburetter, made by C. H. Pugh, Ltd., is the duplex spraying jet, which is formed by fitting the nozzle proper into an air cone. This air cone has none of the attributes of a choke tube, but partakes of the nature of an injector, and its action is such that not only can the petrol be raised from practically any level in the jet—experiments having proved it to be possible to spray petrol perfectly with the level 5in. and more below the top of the nozzle—but also that the petrol is perfectly atomised, and emerges from the nozzle in the form of a mist or fog instead

of in liquid form. All the air passes through the back of the carburetter, and, passing across the petrol mist created by the sprayer, is formed into a perfect mixture at all speeds, therefore the charge enters the engine in the form of gas, *i.e.*, carburetted air.

Owing to the injector action of the duplex sprayer, the question of petrol level becomes absolutely of no account, and the level is set so low in this carburetter that flooding and consequent waste is impossible, and for this reason it is inadvisable to flood the carburetter too much before starting, or too rich a mixture will be obtained.

The Senspray carburetter is fitted with an air control lever, which must be opened only about one-quarter of its range of traverse when starting, but immediately after starting should be opened to its maximum and left there, all the driving being done on the throttle. It is in practice very rarely necessary to close the air lever, though it comes in useful for starting and for steep hills.

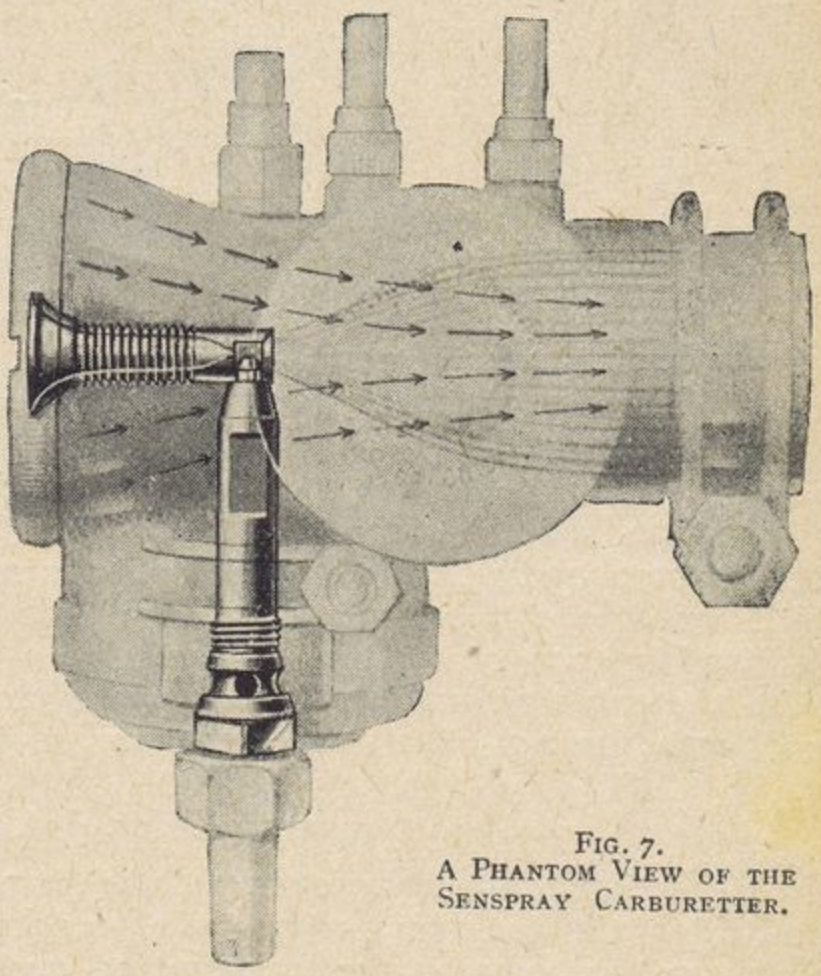

FIG. 7.
A PHANTOM VIEW OF THE SENSPRAY CARBURETTER.

The rack and pinion handle-bar control is worth mentioning, and the small spring clip on the needle valve, by means of which it is possible to vary the petrol level without soldering; also the system of adjusting the Bowden cables, and the fact that the cables may be detached from the carburetter without unscrewing any small nuts or screws, or unhooking or unsoldering nipples.

The later designs of the Senspray carburetter embody the following improvements: The float chamber is on the usual lines, though on the new type a screw top is fitted, and a neater and stronger form of float needle clip adopted, which cannot

be damaged by rough usage. The body of the carburetter consists of a horizontal tubular member, in which is carried a duplex barrel throttle supported in large bearings, and suitably cut away to allow a free passage of vapour to the jet at small throttle openings. The air valve consists of a saddle piece working on the outside of the throttle, and both valves are shut by a simple but ingenious adaptation of the drum spring. The control wires are fitted with eyelets, which are slipped over pegs protruding from the air and throttle valves respectively.

So simple is the mechanism that by merely detaching one cover of the throttle barrel the whole of the moving parts can be taken out for inspection, and this without the possibility of their being put back wrongly.

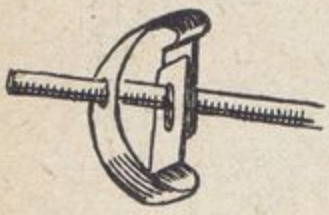

FIG. 8.—CLIP FOR FLOAT NEEDLE.

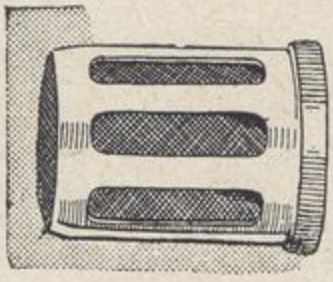

FIG. 9.—GAUZE-COVERED AIR INTAKE.

The bell mouth through which the air enters is so finished that a dust cap or long tube may be fitted at the option of the rider (a neat form of dust cap which can be supplied with the carburetter is shown in illustration fig. 9), and it is a simple matter to apply crank case pressure to the vaporising tube.

The usual Senspray induction pipe clip is retained, and a smaller one of the same type holds the float chamber to the carburetter body. The handle-bar control has been slightly modified, the clip being arranged so that it will suit any type of bar, and can be made to open either inwards or outwards. Also the cable adjustments can now be done at the handle-bar end with the aid of a small screwdriver.

Senspray Pilot Jet.

The Senspray carburetter is also fitted with a pilot jet, so as to obtain the slowest possible running from any engine. Between the body of the carburetter and the inlet pipe, and slightly to one side of the main pipe, lies a small chamber into which the pilot jet projects. The jet is fed from the main float chamber, and on its outer circumference a screw thread is formed. On this thread is mounted a small cone with a knurled edge for finger adjustment, a coil spring locking it in position when once set. This cone is, of course, an air adjustment, and when lowered allows a large amount of air to pass between it and the internal face of the aforementioned chamber. Thus a very fine adjustment can be obtained. This

new Senspray carburetter has been tested for some time. It will be observed from the illustration that the petrol is fed to the top of the float chamber.

The Amac.

Another popular carburetter is the Amac, made by the Aston Motor Accessories Co. There are no small screws whatever used in its manufacture, and no threads under $\frac{3}{16}$in. diameter. It is constructed wholly of brass. All the unions have the first thread turned off to ensure easy engagement, and

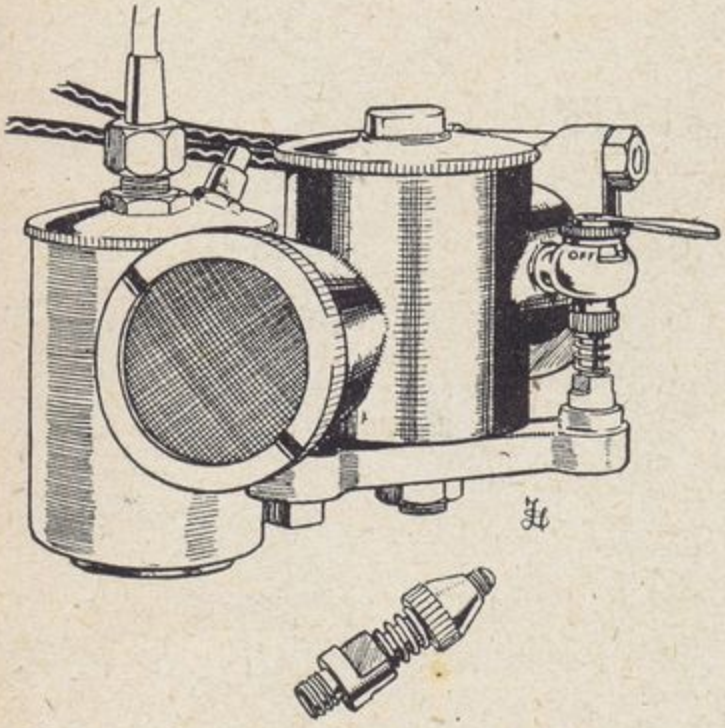

FIG. 10.—SENSPRAY CARBURETTER WITH PILOT JET ATTACHMENT. BELOW IS AN ENLARGED VIEW OF THE PILOT JET, ON WHICH SCREWS A CONE FOR AIR ADJUSTMENT.

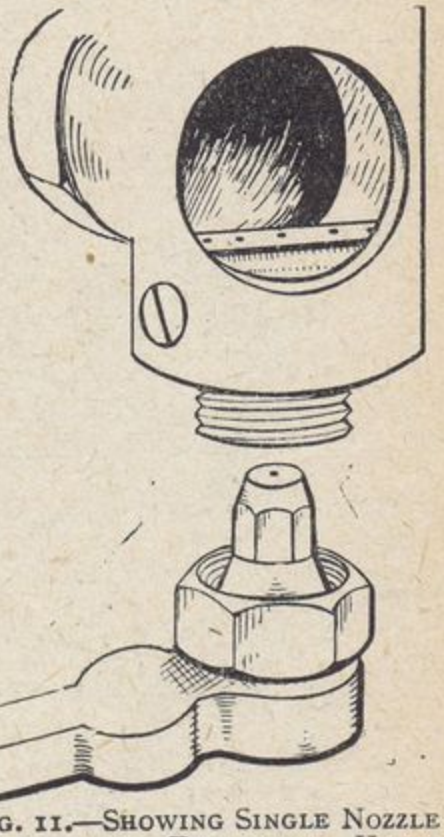

FIG. 11.—SHOWING SINGLE NOZZLE BELOW AND FIVE-SPRAY HOLES ABOVE ON THE AMAC.

the parts are absolutely standardised and interchangeable. The float chamber closely resembles that of the Brown and Barlow, but the needle valve is inverted, so that upward vibration aids the shutting off of the petrol and prevents flooding, and the float is reversible, so that it cannot be put back wrongly. One of the chief characteristics of the Amac carburetter is the multiple jet, the advantages of which are quite obvious, as it is, of course, better to divide up the petrol supply into several streams as evenly as possible amongst the air supply. By doing this a far more homogeneous mixture is produced than if the petrol were supplied in one single stream. This has, of course, been done previously in different ways, as, for instance, in the old Longuemare carburetters, but the Amac design is an improvement, as too small orifices are likely to get choked and

are difficult to regulate. The petrol supply is regulated through one single hole at the bottom of the mixing chamber, and is then split up through the sprayer.

By means of a straight-through arrangement, all the air passes just above the sprayer, thus making for good mixture and efficiency. All turns and bends in the air passages are bad practice.

In the latest Amac carburetter the float chamber, the principle of which remains unchanged, has its lid screwed inside the body instead of outside as in previous models. A slight

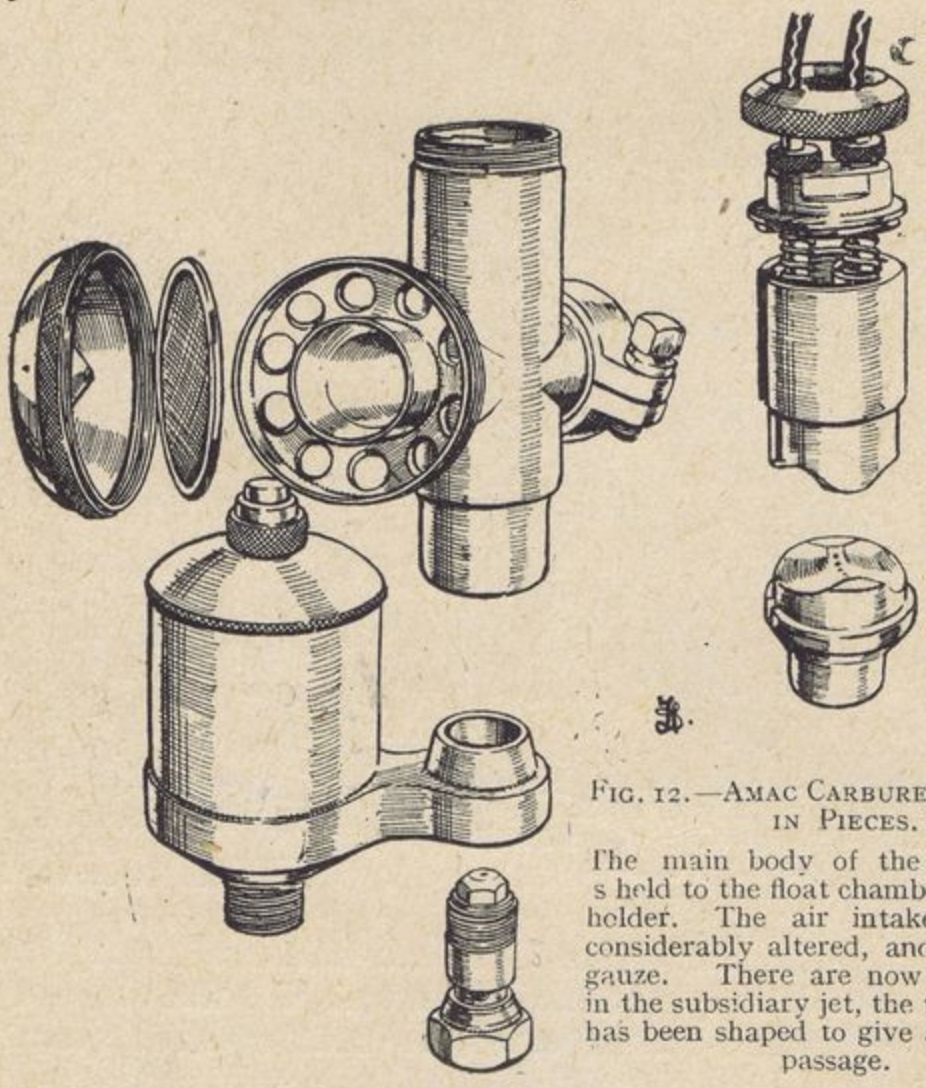

FIG. 12.—AMAC CARBURETTER SHOWN IN PIECES.

The main body of the carburetter s held to the float chamber by the jet holder. The air intake has been considerably altered, and includes a gauze. There are now seven holes in the subsidiary jet, the top of which has been shaped to give a better gas passage.

sump is formed in the base, which has the double advantage of strengthening the base and forming a well for the deposit of foreign matter, which is thus less likely to pass through to the jet.

The body of the carburetter is held to the float chamber by means of a special jet carrier, a double cone joint rendering leakage practically impossible. The upper of these cones has sufficient gripping surface to hold the body and cone together even after the jet has been detached, though the two parts can be separated with ease if desired. The curiously shaped inverted

cone air intake which has become such a well-known feature of Amac carburetters is now made in two parts, and screwed together at its maximum diameter so as to include a gauze, while the intake pipe proper extends to the same distance as the joint so as to come in contact with the gauze. Thus the air passes first through a series of holes, through the outer portion of the gauze where dust and foreign matter are trapped, thence past the inverted cone, and back into the intake pipe through the central part of the gauze. By this means a single thickness of gauze is thus made to do duty for two layers, and (particularly in the case of petroil two-strokes) the oily vapour blown back through the carburetter is separated from the dust drawn in from the outside, consequently the gauze is not so liable to clog up.

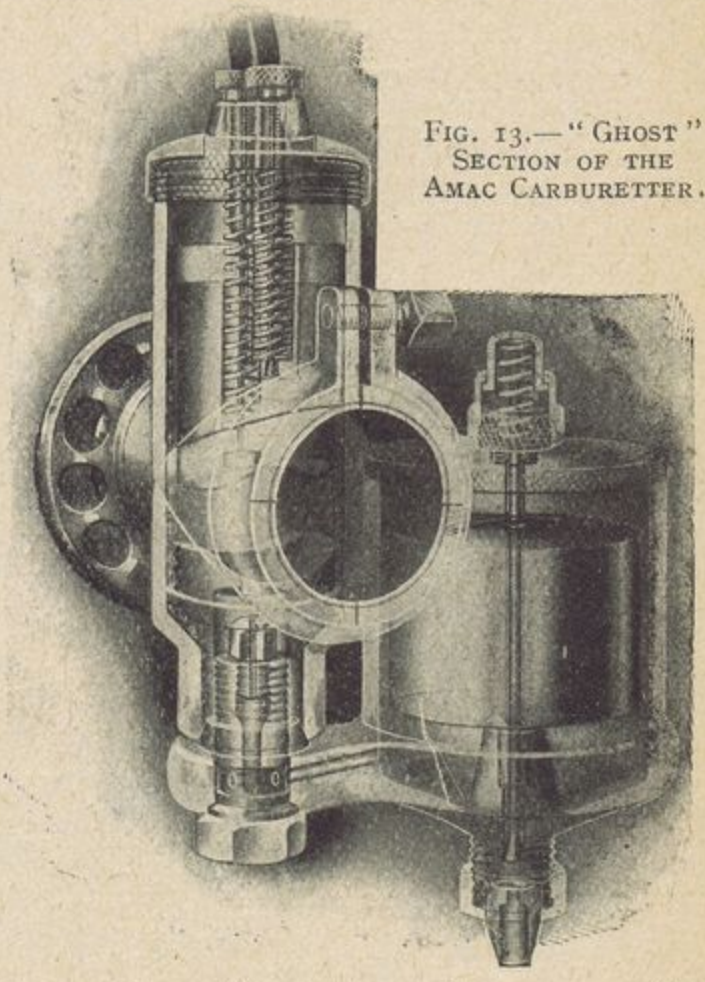

FIG. 13.—"GHOST" SECTION OF THE AMAC CARBURETTER.

The spraying or subsidiary jets are now seven in number, and the jet body has been shaped in a peculiar manner, which in combination with the specially shaped air valve provides an easy and regular flow for the gases. The only other alteration of interest lies in the removal of the operating wire adjusters from the control levers to the top of the carburetter, where they are easily accessible, and extensions which act as guides for the slide springs.

The Binks Three-jet.

The Binks three-jet carburetter has been designed with a view to efficiency, economy, and flexibility. The throttle barrel comprises dampers for closing the jets and two choke tubes which come into operation according to the extent of the throttle opening. When the throttle is closed, the dampers rest on the top of the jets, and prevent any petrol issuing therefrom. When the throttle is opened slightly, the small jet or first pilot jet is open only. Further opening of the throttle uncovers the second jet and choke tube until finally the main jet is opened, when the engine gives off full power. The carburetter is entirely

automatic, but air can be given at will through the extra slide, which can also be utilised as an air brake—that is to say, in descending a hill the throttle may be closed and cold air may be allowed to enter by means of the extra air inlet. This is an excellent feature, and makes for economy and rapid cooling.

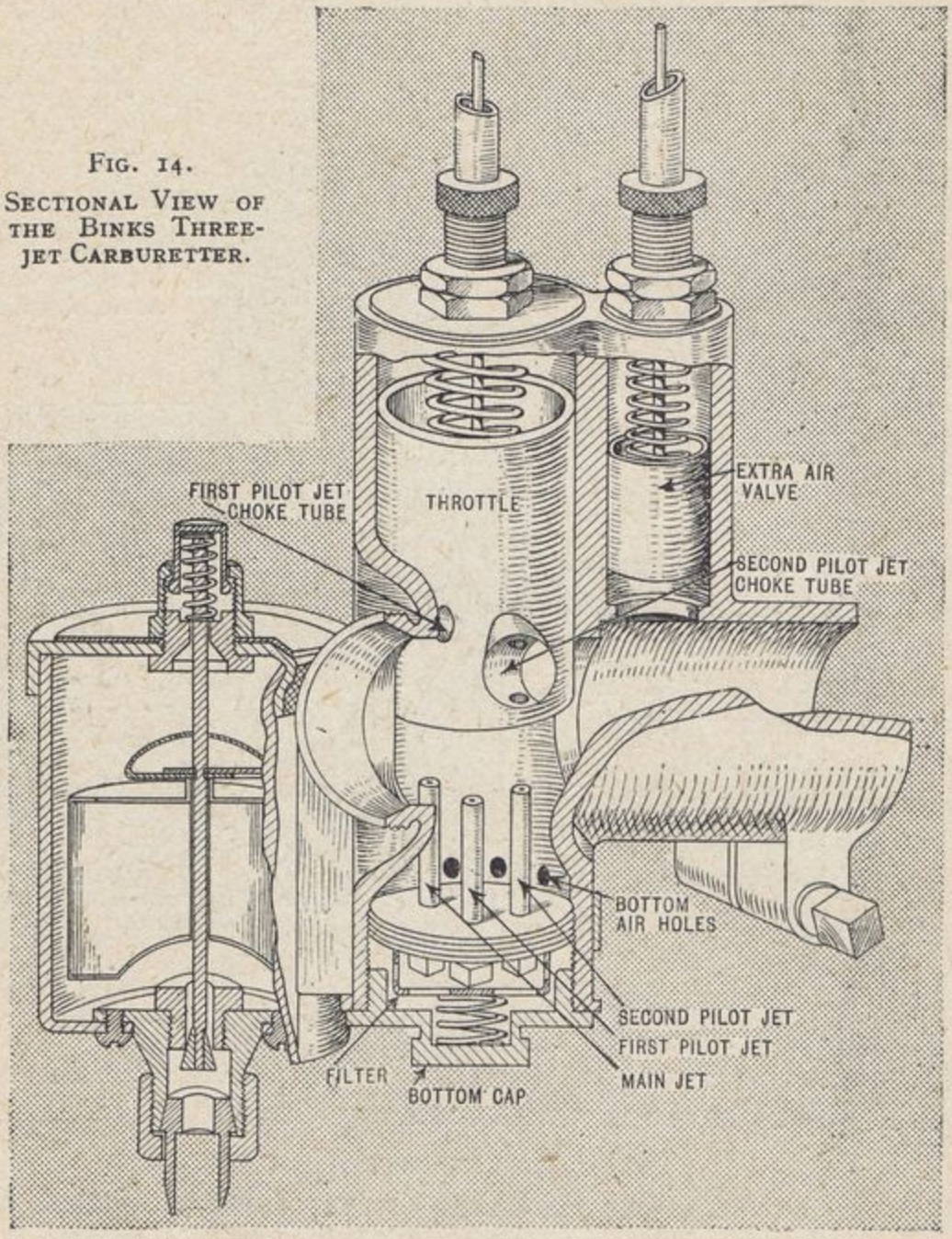

FIG. 14.
SECTIONAL VIEW OF THE BINKS THREE-JET CARBURETTER.

Great care has been taken in the design of the choke tubes, so that the air passes the jet at high velocity, and thus aids the vaporisation of the petrol. Every carburetter is supplied with a number of jets, so that there is no difficulty in selecting the best combination to suit each individual engine. Another good feature in this carburetter is that excellent slow running can be obtained, the engine just ticking over when the throttle is only a little way open. The sectional drawing gives a clear idea of

the interior. It will be noted that the needle valve is of the inverted type, and a spring clip regulates the height to which the float can rise up the needle valve. The carburetter is one which has met with considerable success on racing machines, as well as on touring mounts.

The Wolf.

A carburetter which differs somewhat from general practice is the gauze jet or wick type manufactured by Messrs. Wolf and Co. The main features closely follow standard practice. In the float chamber the needle valve is of the inverted cone type controlled directly by the movement of the float. The mixing chamber is of the straight-through pattern, the control being operated by a single lever. The jet is the feature where this instrument differs from the usual practice. In place of the usual type of spraying jet a wick is used constructed of wire gauze in the form of a tight roll, and inserted for a considerable portion of its length in a brass tube. This tube containing the wick is situated in the position where the jet of the ordinary carburetter would come, and is secured at its uppermost end by a screw, by means of which it is possible to adjust the position of the gauze. The petrol rises up the wick by capillary attraction, the amount of petrol supplied to the engine being regulated by varying the length of gauze exposed above the cross tube. The strength of the mixture while running is varied automatically by the throttle, which is shaped in such a manner that as it closes it causes a stronger draught of air to pass the gauze, so increasing the amount of petrol drawn from the wick, and keeping the quality of the mixture correct or if anything slightly on the rich side for slow running purposes.

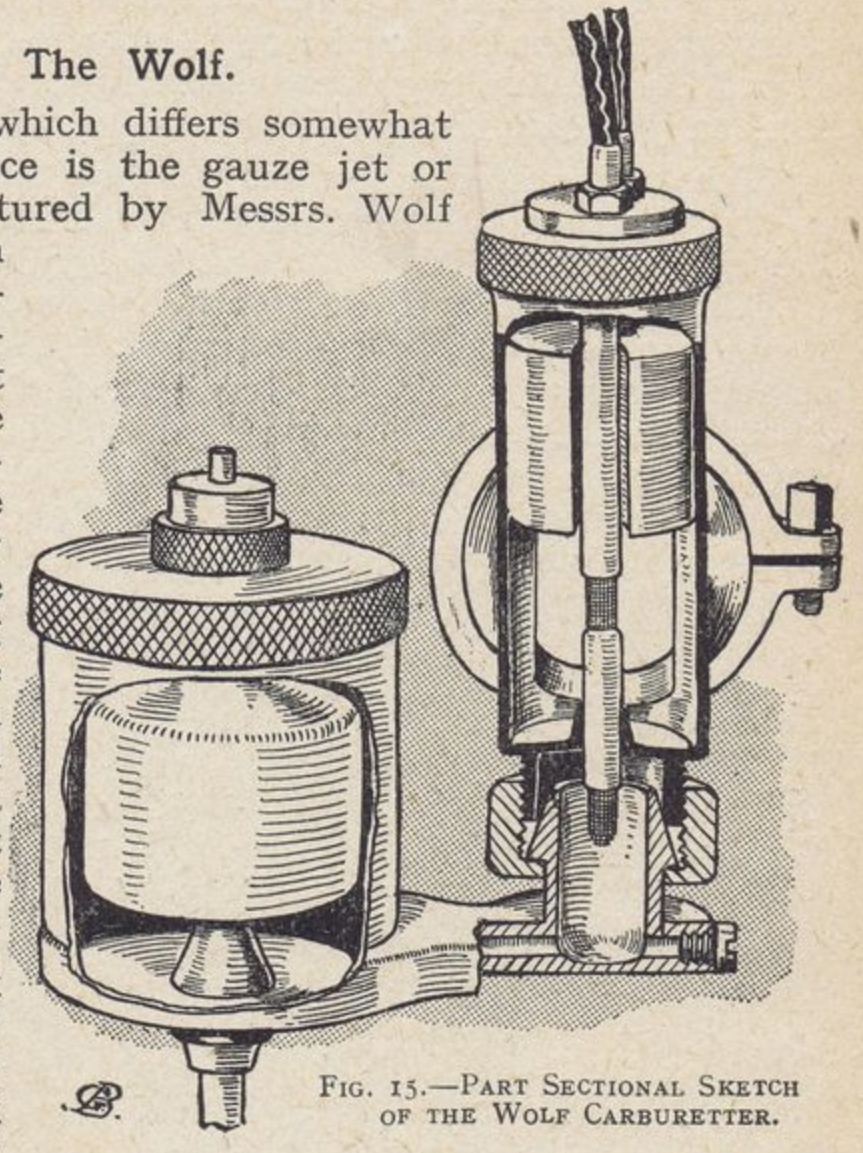

FIG. 15.—PART SECTIONAL SKETCH OF THE WOLF CARBURETTER.

The B.S.A.

The B.S.A. carburetter, the invention and design of Mr. Harold J. Cox, is a departure in motor cycle carburetter construction, the most important features being the horizontally arranged jet chamber and the absence of "bottom air." These features, combined with the adjustable jet, special valves, and general design, have proved themselves, after prolonged road tests, to give excellent results.

The carburetter is formed of two main parts: (1) The jet or vaporising chamber, and (2) the float or constant level chamber.

The jet chamber is of an entirely new construction (fig. 16). In the centre of its length is situated a combined adjustable jet and spraying cone. On each side of this, and placed equidistant, are the air and throttle valves. The main air intake is protected by a fine gauze of large diameter. Inside the valves, which are controlled in the usual way from the handle-bars, are placed the springs which return them to their closed positions, this position effectually protecting them from dust and wet. The valves are arranged so that they open in opposite directions, the air valve opening anti-clockwise, and the throttle valve opening clockwise. By this arrangement the gas current passing through to the engine is deflected over and towards the jet, thereby effecting good suction on partial throttle openings. The valves themselves are made in the form of tubes passing at right angles through another tube, so that when in the open position they virtually constitute a part of the tubular way through from atmosphere to engine. This is a very important point, and one worthy of special attention. With full air and throttle there is an absolutely straight, unobstructed passage from the atmosphere to the engine devoid of any turns.

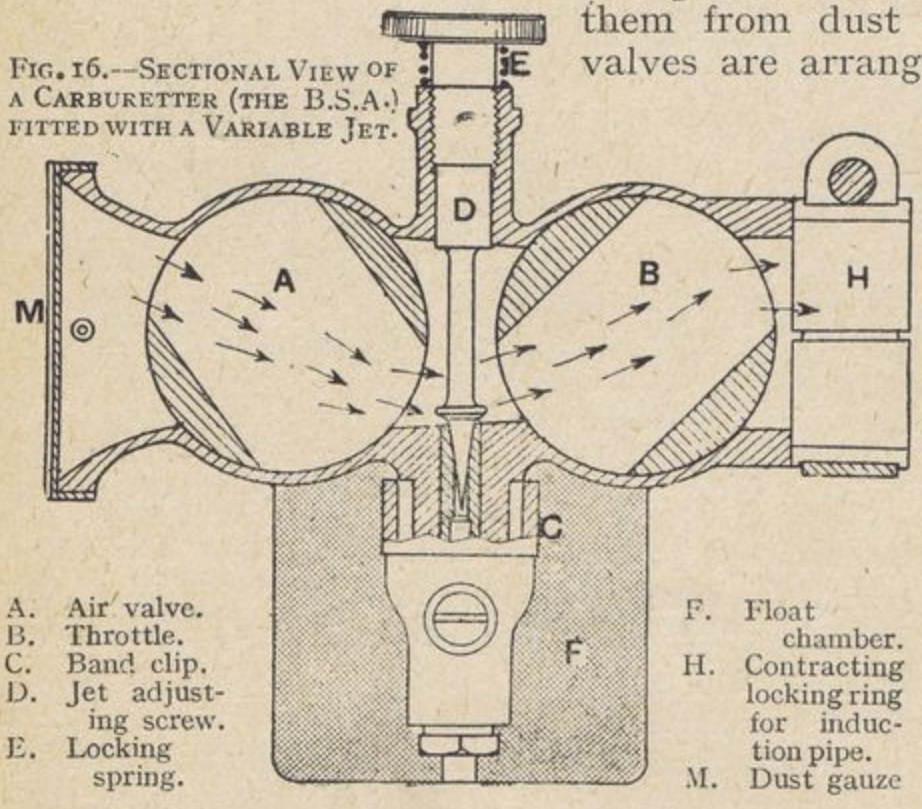

FIG. 16.—SECTIONAL VIEW OF A CARBURETTER (THE B.S.A.) FITTED WITH A VARIABLE JET.

A. Air valve.
B. Throttle.
C. Band clip.
D. Jet adjusting screw.
E. Locking spring.
F. Float chamber.
H. Contracting locking ring for induction pipe.
M. Dust gauze

The float chamber is secured to the jet chamber by means of a band clip, which allows the chamber to be moved into various positions, and makes it easily detachable from the body. The needle valve is of the inverted type, properly guided, and provided with a slot at one end for grinding purposes. The valve is all made in one piece, and the float, carefully designed to rise and fall vertically, is secured in position by a castle nut, which screws on to the valve, and is held in position by a split pin.

The adjustable jet is more easily understood by referring to fig. 16 than by a description. As will be seen, the mouth of the jet is trumpet shaped, the size of the small hole at the bottom of this being .04in. bore. Directly over the jet, and axially in line with it, is situated the jet-adjusting screw, with its conical point and spraying cone. The point of this screw fits right into the .04in. hole when screwed down. As this is unscrewed it allows petrol to flow into the conical space between the mouth of the jet and the point of the screw. These surfaces being parallel to one another, the petrol is split up more and more as it rises, until at last it emerges from the jet in the form of a mist, as can be seen by looking into the carburetter with the engine running. The jet itself is very easily removed by unscrewing one nut.

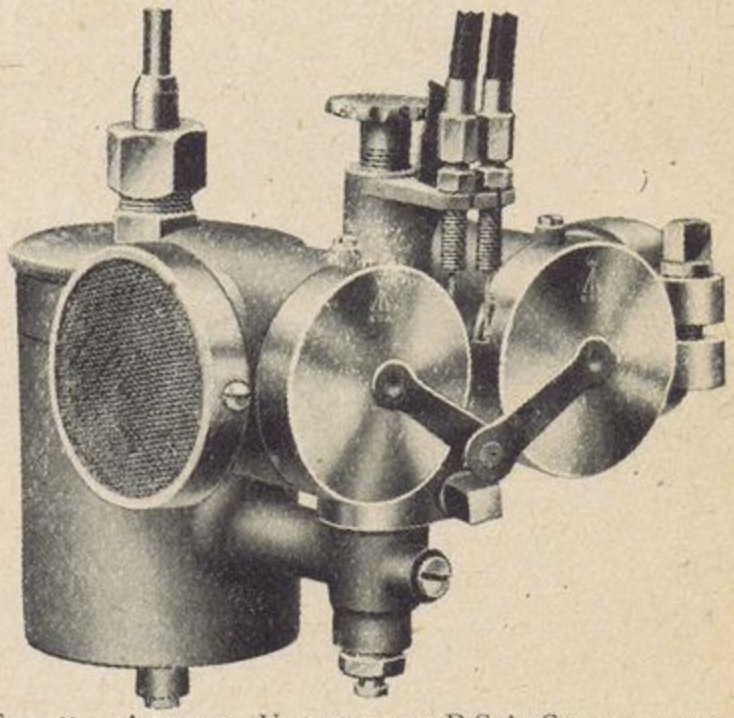

FIG. 17.—ANOTHER VIEW OF THE B.S.A. CARBURETTER, SHOWN IN SECTION IN FIG. 16. Among its many strong points are the quickly adjustable jet orifice, top feed float chamber, and arrangement of throttle and air barrels.

Automatic Carburetters.

It will be seen from the foregoing that the various carburetters have been classified according to make. Carburetters, however, are, it will be seen, of two main types, non-automatic and automatic; or, in simpler language, provided with air levers and without a means of controlling the air supply by hand. It is generally agreed that to get best results an air lever is desirable, but so perfect has the construction of the automatic carburetter become that the difference is so slight that, except for pure speed work, this type is rapidly coming into vogue,

and there seems every chance of its use becoming as universal on motor cycles as on cars. The advantages of the automatic carburetter in traffic and for the beginner are so evident that the day of the non-automatic type seems rapidly to be drawing to a close.

The Schebler Automatic Carburetter.

This automatic carburetter is fitted to a large number of motor cycles in the United States, and will be found on many American machines sold in this country. The outward appearance of this carburetter may lead to the impression that it is a little complicated, but its working is quite simple, and it is well provided with adjusting screws to enable the mixture to be adjusted to any engine and according to atmospheric changes. The cup-shaped float chamber contains an annular varnished cork float which is connected to the needle valve working in a separate compartment of the float chamber. The main air supply enters past the jet carrying the mixture into the mixing chamber above the jet, where it is diluted with air which enters through an automatic extra air valve controlled by a spring, the tension of which can be adjusted to allow the valve to open more or less.

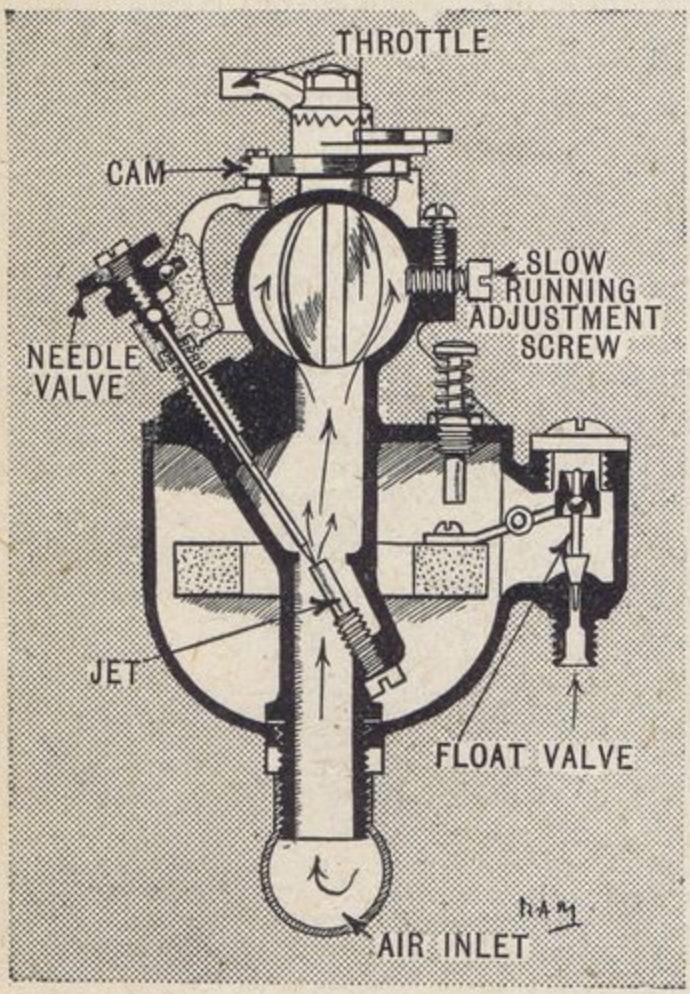

FIG. 18.—SECTIONAL VIEW OF THE SCHEBLER CARBURETTER.

The supply of petrol through the jet is controlled by the opening and closing of the throttle. This is brought about by the throttle being interconnected with the needle, so that when the throttle is opened, the needle is lifted out of the jet and more petrol can flow through. When the throttle is closed, the needle drops and partially closes the jet aperture. The movement of the throttle is communicated to the needle by the cam, and a pointer on the throttle mechanism enables the cam movement to be altered so that it lifts the needle more or less

in relation to the throttle opening. A screw on the needle also defines the throw of the needle in the jet aperture. The amount of extra air is controlled by turning the knurled screw on the extra air valve marked "Easy starting button," and by pulling out this button and turning it round it locks the valve to its seat, and prevents it from opening at slow engine speeds, thus providing a rich mixture for starting. The slow running adjustment is provided with a locking screw. When suitably adjusted, it allows a certain amount of gas to leak past the throttle, which

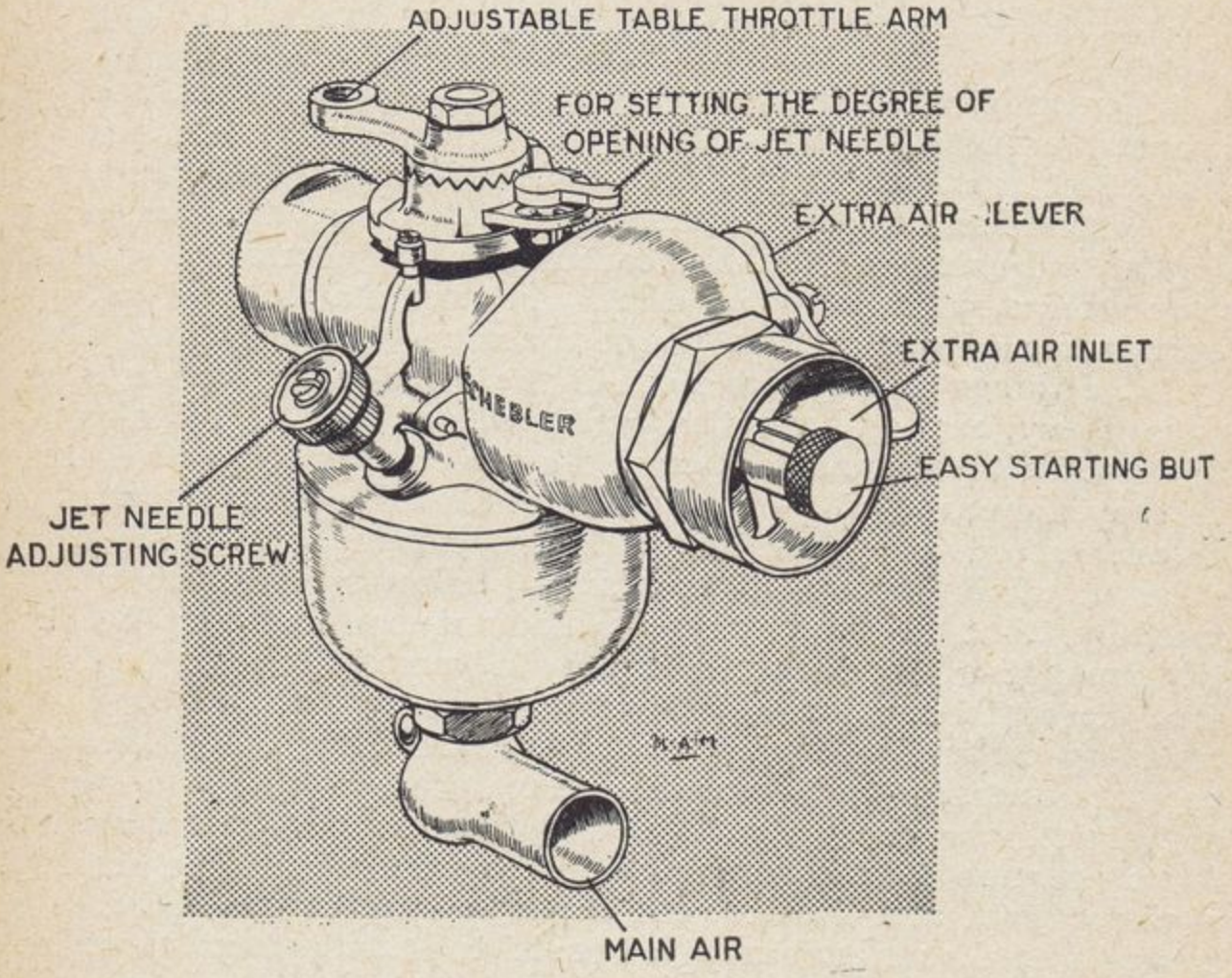

FIG. 19.—EXTERNAL VIEW OF THE AMERICAN SCHEBLER CARBURETTER.

is prevented by the screw from closing, thus permitting slow running with gear in the neutral position or when clutch is disengaged. On the right of the automatic extra air inlet there is a hand-controlled extra air lever which is intended for use on very hot days. The throttle lever can also be set at any angle to suit the particular make of machine to which the carburetter is applied.

Position on the Cycle.

It will not be out of place to mention here that it stands to reason that a carburetter so placed on a motor cycle that its float chamber lies behind the vaporising chamber is con-

siderably at a disadvantage when a steep gradient has to be surmounted, for, the spray chamber being then higher than the float chamber, the petrol is lower in the jet just at the moment at which it should be highest. Most manufacturers have therefore set their carburetters *across* the machine, or turn the vaporising chamber round so that the induction and air pipes face the rear of the cylinder when the carburetter is placed across the machine, so preventing the level being affected to the same extent when the machine is on a gradient.

Carburetter Adjustment.

Generally speaking, the carburetter on a new machine is properly adjusted before delivery; but this does not necessarily mean that it is incapable of further improvement. In the case of a second-hand machine, matters are often very different, and careful adjustment of the carburetter is necessary. The proper adjustment is by no means an easy matter, and so we warn those of our readers whose machines are travelling well to leave things as they are, even if the petrol consumption is a trifle heavy, if they have the least doubt about not being able to effect an improvement. One of the golden rules to be observed in the enjoyment of motor cycling is to leave matters alone, unless, firstly, any alteration which is effected will allow the state of affairs before it was made being reverted to, and, secondly, that no adjustment is made unless the rider has a fair amount of confidence about its ultimate success. In the first place, the novice will be glad to know what a properly tuned-up carburetter should do. It should allow the engine to be started easily (provided, of course, the ignition is in good order) with the air inlet closed and the throttle quarter open. It may require the air inlet to be open a trifle when the machine is under way, and should need more air still as the speed increases. If the air inlet may be opened to its fullest extent when the machine is travelling at its very fastest, the adjustment will be about correct, though to be on the safe side it is as well to arrange the setting so that an improvement in the power and speed is effected by very slightly closing the air lever when full throttle is being given. If this occurs it will indicate that the jet is not on the large side. The motor cyclist must be guided by the symptoms which the engine displays on the road. Black smoke, accompanied by a pungent odour, refusal to pick up speed when the throttle is opened, together with misfiring, or eight-stroking or four-stroking in a two-stroke engine, point to too large a jet or too little air. Difficult starting, the fact that the carburetter takes no extra air, even if the throttle is fully open, refusal to fire at slow speeds, or popping back through carburetter, and absence of

power, point to too small a jet or to too much air. Patience and careful experiment are the only cures. If it is found to be necessary to enlarge the jet of a single-jet carburetter—it must be borne in mind that a very small increase in area makes an enormous difference—it is safer to fit another jet of different size if possible. Bad starting, apart from ignition, generally means that too much air is being drawn in. This trouble is especially noticeable in cold weather, and often the true cause may be found to be air leaks at the carburetter or induction pipe unions. All places where air leaks may occur should therefore be carefully examined.

Hints on Economising.

These hints were given in *The Motor Cycle*, of which we herewith give a summary.

Waste of petrol through flooding: This may be caused by the needle valve requiring to be ground in, as in the case of a carburetter which has been in use for a long time. This is a tedious process, requiring patience, aided by a little oil and crocus powder. (See notes on Valve Grinding.) More often than not, however, flooding is caused by vibration due to the engine or the roughness of the road surface or to grit on the needle valve seating or a leaky float. Much petrol is often lost through filling the tank too full, when the precious fuel escapes through the filler caps, or to leaks at the petrol pipe unions.

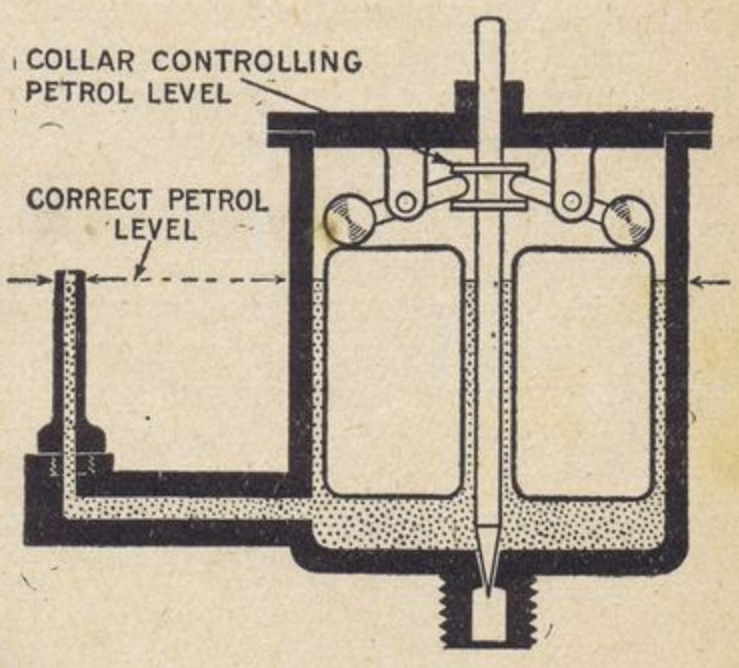

FIG. 20.—Section of carburetter showing how the position of collar and float levers affects the height of petrol level.

To find the normal level of the petrol in the jet, the vaporising chamber should be removed and the jet unscrewed. In its place should be fitted a dummy jet consisting of a tube of the same length. The petrol tap should next be turned on, and the height to which the liquid rises in the dummy jet should be noted. This may not always be correct at first sight, owing perhaps to the needle valve sticking. A small syringe, an ordinary oil injector (if clean), or even a fountain pen filler, may now be used to withdraw the petrol from the dummy jet. The liquid will immediately rise to the proper level, and after

it has been emptied out once or twice, its mean level can be found with certainty. The *correct* level should be about $\frac{3}{16}$in. below the top of the jet; and if it is above this point, it should be reduced in the following manner: The needle should be removed, and the brass collar, if soldered, should be unsoldered by holding it in a blow lamp or spirit lamp flame. It should then be placed with the collar resting on a nut or anything with a small enough hole through it which will allow the point to hang free. The position of the collar should then be marked, and a smart light blow may now be given to the top of the stem, and the collar will be shifted higher up. If the level of the petrol is too low, the collar must, of course, be lowered. After the alteration, the needle must be replaced, and the level of the petrol be again *carefully* tested. Occasionally some trouble may be experienced in finding the correct size jet; and if this is the case, the jet itself must be changed. The air inlets should be gauze-covered to exclude as much dust as possible; and when gauze is fitted to an air inlet not previously covered, it should be remembered that the gauze will cause obstruction to the passage of air, and the air space should, therefore, be first enlarged. If fine gauze is used, the intake should have three times the area of an unprotected intake. All carburetters should be warmed, by placing the carburetter close to the cylinder, by taking air through a funnel (the mouth of which is against the cylinder), or by hot air jacketing the vaporising chamber.

In case of fire, the correct thing to do is to *smother* the flames; use sawdust mixed with bicarbonate of soda, in the proportions of 10 lb. of the latter to 12 lb. of sawdust. If the carburetter catches fire, attempt to extinguish the flames with a cap, coat, or anything handy, but *first* shut off the supply.