2.5 Carburettors and Controls

THE SCOTT CARBURETTOR
1912-1914

by *Stan Greenway*

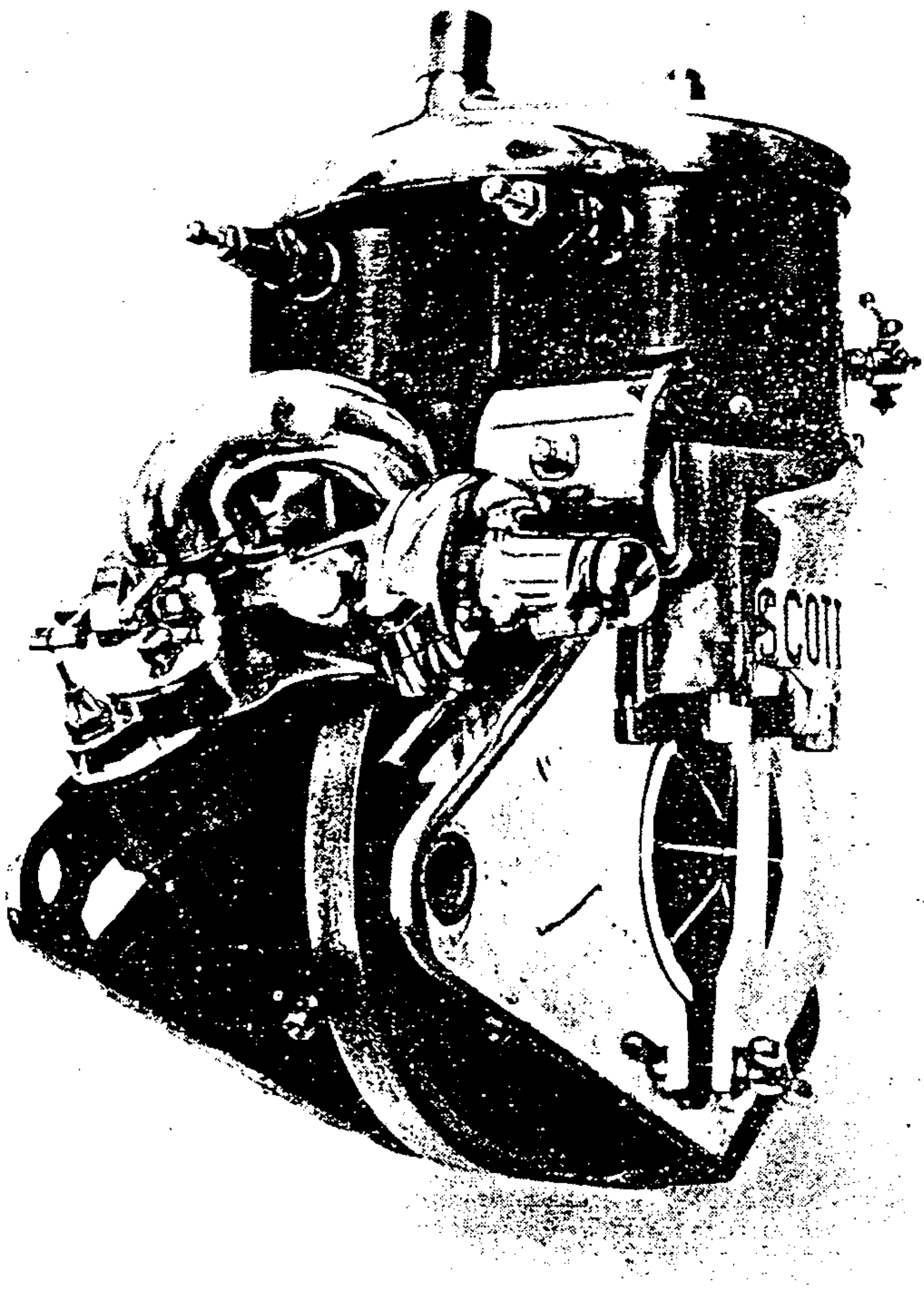
From the earliest days Alfred Scott manufactured and patented his own design of carburettor. His final development of the original design and the subject of this article was first produced with the 1912 model and was discontinued after 1914.

As will be seen from the accompanying illustration, besides the functional design of the instrument itself, close attention was given to the general neatness and maintenance of clean lines of the complete engine, together with the simplicity of control and the use of warm air from the vicinity of the crankcase.

The carburettor consists basically of two units:—

(*a*) the mixing chamber.
(*b*) the Automatic Air Valve.

Within the mixing chamber the throttle valve comprises a pair of contra-rotating sleeves (14a) and (14b) operated by the actuating crank (15) (i.e. a disc plate with two protruding pegs) via the throttle lever (17). This gives an excellent iris opening throttle, directly in line with the jet (13) and also enables a right-angle turn to be achieved within the carburettor; a necessary, although by modern standards, undesirable design feature.



1912 AND THE SCOTT CARBURETTOR
Shown mounted to engine.

Cast integral with the mixing chamber are the float and needle chambers and here lies the design "bogey" which has given rise to criticism of the carburettor as a whole, and earned for it the reputation of relying on a "delicate equi-poise of springs." Although true from the design point of view, providing care is exercised in tuning, the whole thing can be both accurate and reliable as proved on the winning 1912 T.T. Scott where, owing to the position of the rotary valves, it was necessary to fit the carburettor outboard on the nearside and connect to the engine with a rubber hose.

Referring to the drawing it will be observed that the "float" needle (4) is housed in a separate chamber, and is held down on to the needle valve seating nipple (6) by the needle spring (5). The needle is lifted by the weight of the float (8) acting upon the float rocking lever (2) (via the 5 to 1 advantage). Obviously the more weight required to counteract the needle spring, the lower the petrol level must fall and a weak mixture will result. Hence the instruction to fit a weaker spring to obtain a richer mixture.

It is interesting to note, the needle must be lifted to flood the carburettor for starting, and that the float chamber is vented by a saw-slot across the base of the float guide milled nut (10).

The final fitting on the mixing chamber—the jet cover (12) is used solely to gain access to the jet for cleaning. The cover is swung through 60 degrees to permit the cut-away to line up with the port, and the jet removed with a special key of "turn and grip" design provided with the carburettor. (Incidentally, this key was one of the first items manufactured by Tom Ward on contract for the SCOTT Engineering Company).

Within the automatic air valve (in its closed position as shown on the plan view) the grid seating (23) seals against the front face of the mixing chamber, therefore air entering the carburettor via the slot in the air valve body (21) passes through the cut-outs in the grid seating and lifts the dash pot spring loaded air valve (24). This acts as an automatic choke when the engine is cold and compensates the jet over the lower throttle opening when the engine is hot.

For normal cruising the air valve lever (28) is operated. As the grid seating is rotated it is moved away from the front face of the mixing chamber, via the air control screw (30) thereby permitting the incoming air to by-pass the valve (as shown on section A-A).

The carburettor cost £1 19*s*. 0*d*. (without cables etc.), at a time when the complete engine (without carburettor) sold for £15 15*s*. 0*d*. the complete machine was 59 guineas and a ploughman was paid 4*d*. per hour.

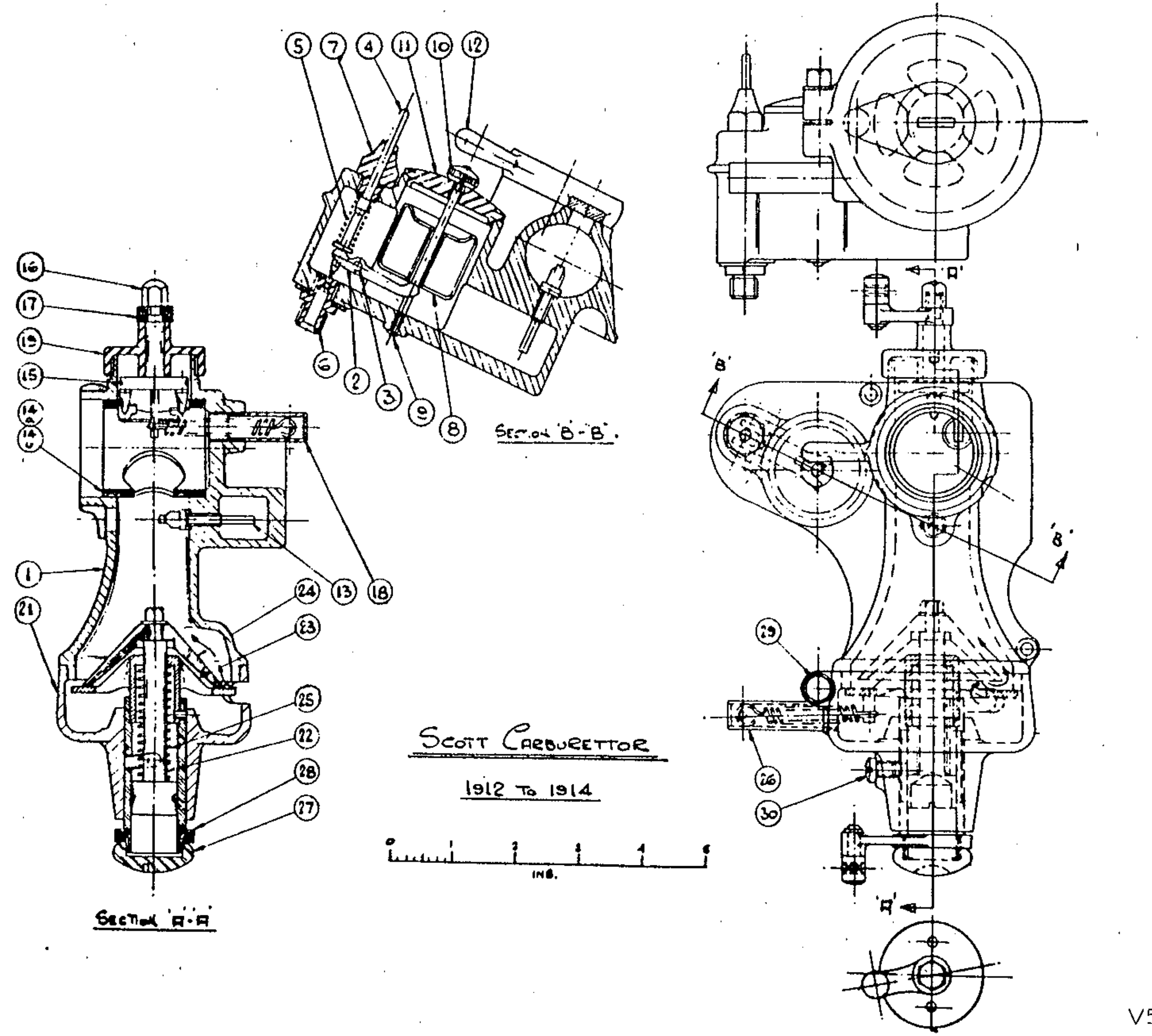
Contemporary specifications quote a maximum speed of 55 miles per hour and a petrol consumption of 60-70 miles per gallon. Like present day specifications, the speed is realistic, the fuel consumption optimistic.

Experience shows that the use of a proprietory carburettor of the time would improve the m.p.g. considerably, but tractability at lower speeds would be seriously impaired.

On criticism of the carburettor for the credit side, it was Alfred's intention according to his patent specifications of February 1904, to mount the float rocking lever above, and attached to, the float. This would obviously have given the positive action required in the float chamber, but doubtless proved too intricate and costly.

In all design principles, as his contemporaries tell us, he was a stubborn man, prepared to bend, but not give way. Despite criticism from his own competition riders in the matter of the carburettor he made no exception as shown on the 1914 T.T. machine where he retained the "Scott" carburettor but cut-away the float chamber and fitted a conventional bottom feed one, replaced the contra-rotating throttle with a conventional slide, and mounted the finished instrument on the "straight-thro" principle.

In conclusion it can be said—despite the fact that Alfred was attempting to perfect the obsolete in following the "controlled vacuum" principle of carburation ; he can certainly be credited with yet another original and never to be repeated design concept in regarding the carburettor as an INTEGRAL part of the engine.



1	CARBURETTOR BODY
2	FLOAT ROCKING LEVER
3	FLOAT ROCKING LEVER PIN
4	NEEDLE WITH STOP & WASHER
5	NEEDLE SPRING
6	NEEDLE VALVE SEATING NIPPLE
7	NEEDLE GUIDE
8	FLOAT
9	FLOAT GUIDE
10	FLOAT GUIDE MILLED NUT
11	FLOAT CHAMBER LID
12	JET COVER
13	JET WITH WASHER
14a, 14b	THROTTLE SLEEVES
15	ACTUATING CRANK
16	LEVER CAP
17	LEVER WITH BOWDEN STOP
18	PULL-OFF SPRING WITH CASING
19	THROTTLE CHAMBER END CAP
20	AIR VALVE COMPLETE
21	AIR VALVE BODY
22	AIR VALVE PLUNGER NUT & WASHER
23	GRID SEATING WITH BARREL
24	AIR VALVE ONLY
25	DASH POT PISTON SPRING
26	PULL OFF SPRING WITH CASING
27	DASH POT SCREWED CAP
28	AIR LEVER WITH BOWDEN STOP
29	AIR VALVE CLAMPING SCREW
30	AIR CONTROL SCREW

V5/9 Dec.1967

THE BINKS 3-JET CARBURETTOR FOR SCOTT MOTORCYCLES 1929-31

(From "Motorcycle Repair and Upkeep" - E. Malloy & J. Earnley. circa 1932)

This carburettor should not be confused with the earlier Binks 3-Jet Damping Carb. This model is an elaboration of the later 2- Jet Binks carb.

The jets are arranged as follows, taken from the engine end:- The Pilot Jet (30), The Power Jet (50) and The Main Jet (110). Idling is controlled solely by the pilot jet, and the smallest size to give even tickover when the engine is warm should be used. Up to half throttle the mixture is fixed by the pilot and main jets, and the main jet size should be used that gives good pick-up and regular two-stroking from idle to half throttle. From there on to full throttle the power jet comes into use, so that all three jets supply fuel at full throttle.

In selecting the power jet, care should be taken when considering the question of fuel consumption as too small a power jet will cause overheating and plug trouble.

The jets are of "short pattern" (as per 2 jet) and the tubes permanently fixed in the mixing chamber.

Take care when tightening the flange, not to distort same.

ERNIE SCOTT'S OBSERVATIONS ON 3-JET BINKS CARB. AS ON SCOTTS

There appears to be at least two different types, the mixing chambers being marked 9/121 and 49/121, — presumably the type 9 being earlier, and parts not being readily interchangeable. BUT, according to George Stevens, in April *Yowl*, Amal Type 6 jet block and probably throttle valve fit type 49.

The Type 9 body has one drain hole drilled in the mixing chamber body on the left hand side looking down the choke; the type 49 has three holes drilled, one on the left and two on the right hand side, (but different dimensions to the holes in Type 9). The throttle valves are different too.

The Type 49 valve has two small cutaway portions on the base of the valve; one above the pilot jet, the other on the right hand side of the valve (I cannot see the reason for this one; it looks as if it was put there to coincide with a throttle stop, but one is not provided; also it does not line up with any drilled holes in the mixing chamber).

The leading edge of these valves also are cut away much the same way as Amal Type 6, the valve top being marked 49/x (1,2, etc) Type 9 valves are stamped 9 on the top.

I would like to know if these cutaway ratios are the same as Amal, and for the same reason, ie. the number of sixteenths of an inch in depth of cutaway, - to richen or weaken the mixture at the opening of throttle.

Further to George Stevens' remarks about the mixing chamber he has, marked 49/121, and the fitting of Amal innards, the drill holes in the mixing chamber are not in the same place, nor are they the same size as the Type 6 which I compared it with. I cannot throw any light on the number following 49/121 on George's mixing chamber, as my 49/121 has 2002 after the part number.

Leaving Binks and Amal behind for a moment, an AMAC booklet (1925) which I recently acquired quotes the following carb, details for Scott, "Type 15 HY SPORTING, using jet No. 31, valve standard (2) or No. 3, the number being stamped on the base."

These settings may refer to 532cc engines so one could need a larger jet with a 596cc engine; certainly my two-speeder has a 32 jet (596cc).

Ernie Scott

Ed: I wonder how many of you have read "Radco's" (Frank Farrington) excellent book "The Vintage Motorcyclists' Workshop" which devotes no less than 28 pages to the repair and setting up of various vintage era and later carburettors, including AMAC, Amal, Binks, B & B, etc. It has some Scott-specific notes, particularly for the earlier 2-JET Binks. It also has an excellent article on the Scott two-speed gear, approximately half of which was cribbed (with due acknowledgement) from Yowl articles by Ernie Scott & George Reeves!

B.M.

Dear Mr. Stevens,

As a loyal member of "The Egg Boiling Brigade" (S.O.C.), I apologise for not submitting any material, useful or otherwise, for *Yowl*. Later in the year I hope to rectify this matter, but meanwhile, the following may be of use, these being modifications which I have found worthwhile for my 1961 Scott.

(1) To enable the distributor drive skew gears on coil ignition models to be topped up with oil more conveniently, the casting was drilled and tapped 3/8 ins. B.S.F, and fitted with a short bolt (approx. 3/8 ins. in length), just below the distributor locating screw at the rear of the casting. By using a "Wesco" type squirt oilcan, lubricant may be injected into the combined filler-cum-level plug hole, without disturbing the distributor and hence the timing.

N.B.—Care should be exercised throughout the operations, since the casting in question is only about ¼ ins thick.

(2) After some internal engine modifications had been completed to my 1961 Flying Squirrel, 110 M.P.H., a I 1/16 ins Amal 10TT9 carburetter was fitted, together with a remote type 302 float chamber.

An adaptor is required to mount the 10TT9 two stud flange onto the Scott three stud crankcase, this adaptor being not more than ½ ins. thick, if the carburetter is to clear the rear tank mounting bracket and rectifier. This last statement only applies to a 10TT9 fitted with the short air intake. (Approx. 7/8 ins. from outer face of locking ring to bellmouth).

The adaptor I constructed from a 3 ins. length of 2½ ins. by ½ ins. L.72 Dural bar ; bored I.1/16 ins. and flaring out elliptically I. 1/16 ins. by 1.3/16 ins. to match the contour of the induction tract. The adaptor was drilled to pick up on the existing 3 stud positions ; but it was necessary to remove the bottom two studs, and fit ones ½ ins. longer due to the width of the adaptor. The top stud was replaced by a ¼ ins. BSW countersunk set screw, the head of which is partially covered by the TT Carb. flange, when fitted to the already mounted adaptor. Since any air leaks, however slight, cannot be tolerated, the head of the countersunk set screw must lie flush with the top face of the adaptor.

It should also be noted that the 3 Scott carburettor studs, in common with general engineering practice, have threads ¼ ins. BSF one end and ¼ ins BSW the other, the latter screwing into the aluminium crankcase.

For mounting the new carburettor, the two studs were similar to those described above ; (BSF/BSW) differing only in diameter, this being 5/16 ins., and the material, Bright Mild Steel.

After constructing the necessary gaskets, the adaptor and carburettor less air intake may be fitted to the machine. When replacing the air intake, it is necessary, in some cases, to line the bore of this up with the carburettor bore, since these two components are machined by Amals in position.

For the remote float mounting, I attached one end of a *short* length of 1 ins. by 1 ins. by ⅛ ins. thick dural. angle under the left hand petrol tap, and to the other a proprietory rubber remote float mounting ; the float chamber being suspended on a length of 3/16 ins. BSF screwed rod, passing through the rubber mounting and into the banjo nut on top of the float chamber. This assembly provides suitable adjustment in height for the float chamber, whilst it is light enough to avoid causing a fatigue failure around the petrol tap boss.

Since my own engine is not exactly standard, the following carburettor settings can only be used as a guide.

The initial settings were :—

NEEDLE JET—.109.

THROTTLE VALVE CUTAWAY—No. 5.

NEEDLE POSITION—4th GROOVE (from top).

MAIN JET—330.

A series of trial runs were then carried out, and the following alterations made :—

1st Alteration—390 MAIN JET.

2nd Alteration—NEEDLE POSITION 3rd GROOVE.

3rd Alteration—THROTTLE VALVE CUTAWAY No. 3.

4th Alteration—THROTTLE VALVE CUTAWAY No. 4. (NEEDLE 3rd GROOVE).

(Expensive business this, at nigh on £1 for each Throttle Valve).

Hence the final settings were:—

NEEDLE JET—.109.

THROTTLE VALVE CUTAWAY—No. 4.

NEEDLE POSITION—3rd GROOVE.

MAIN JET—390.

(Note—The Induction System is 7.375 ins. long, from Carb. Bellmouth to centre of Crankcase Induction Tract., i.e., 4th Bridge of Inlet Port from Transfer side).

With these last settings, acceleration is vastly improved, compared with that of the 151/206 Amal, throughout the entire engine range, and a slight bonus in top speed has also been observed.

Rev. Counter readings indicate a minimum smooth tickover of 2,150 rev per min.; the engine pulling extremely well from 2,400 rev/min. upwards.

I can quote no values at present for fuel consumption, on a long run, but my weekly mileage to the "Salt Mines" consists of 86-90 miles through London traffic on two gallons of 5/3*d*.

Incidentally, the only drawback which I have encountered so far concerns starting on cold mornings; a feat which is nigh impossible unless the pint-and-a-half sized float chamber is filled till petrol gushes forth from the top, (a painful sight), after which 4 to 5 swinging kicks infuse life into the brute.

Finally, enough clearance exists around the carburettor to enable removal of either the throttle valve/needle assemblies, or the main and needle jets, without disturbing other ancillary fixtures.

Yours sincerely,

H. C. HARRISON,

(Hon. Sec. Alperton-Wembley, D.M.C.C.)

V5/11 Apr.1968

OUTLETS AND INLETS

Member Brent Scholes has had a further flush of Scott inspired enthusiasm, and has found a useful supply of silencers suitable for Scotts (and other machines, including some of those cute shrunken Burgesses for Mark Douglases). It looks as if the Burgess silencer company have had a clear out of old stock, as these silencers have appeared in various parts of the country simultaneously. The range of sizes is as follows: 1⅜", 1½", 1⅝" and 1¾" and can be obtained from Motor-World, 56 Bounces Road, Edmonton. London, N.9 who also can supply some of those rather non 'u' adapton brackets and clamps to enable one to fit them nearly anywhere. The end of the aforementioned flush resulted in the acquisition of the Amal Carburettor table given below. I believe they emmanate from Amal Service sheets.

	98*cc Cyc-Auto Mk II* 1945-52	596*cc Flying Squirrel* 1940-52	*Flying Squirrel* 1935-40	596*cc Racing* 1935-40
Carb. type No.	265/2	206/151R	6/151	29/005
Mix. chbr. body No.	265/002	206/151R	—	—
Int. bore	0.475"	1 1/16"	1 1/16"	1 3/32"
Jet block pt. No.	—	206/059R	—	—
Jet block sz. No.	—	51	—	—
Jet size	60	170	170	200
Throttle vlv.	3	6/3	6/3	29/3
Needle pos.	3	3	4	3
Needle jet	107	Std.	—	—
Float chbr. type No.	—	14/092	14/092	14/092 or 92
Float chbr. bdy pt. No.	—	14/111	—	—
Spare pt. list No.	422R	440	—	—

TWO-STROKE CARBURATION AND A CHALLENGE FROM MR. BINKS

from *The Motor Cycle*, circa 2nd September, 1920.

(Many thanks to Brian Scholes for sending the following 'Letters to the Editor').

The Two-Stroke as a Tell-Tale

Sir,—I was interested in "Notes for the Novice" on carburettors (chapter III),and have derived some benefit therefrom. In his remarks *re* perfect mixture, however, I presume the writer was referring to four-strokes. I saw no reference to two-strokes. This is a common fallacy; the two types perform differently. Regarding the sooted plug test, this will not apply to a two-stroke; the latter, if correctly lubricated, consumes too much oil to allow any dry soot to accumulate. One of the advantages of a two-stroke (usual three-port type) is that it automatically regulates the correct mixture. If the mixture is too rich the engine rebels by four-stroking, while if too weak it will spit back through the carburettor — this is, of course, provided the ignition and other factors are right.

I have a W.S.R. variable jet fitted to my Amac double-lever carburettor. and I can descend a gentle gradient without four-stroking. I can also run along at 3 mph (on low) with the engine two-stroking constantly, and am able to paddle away from cold inside three feet (measured).

I should like to testify to the efficiency of the L-M plug; the porcelain is magnificent. I have already run 2,000 miles on one, and it has never given me the slightest trouble. It is perfectly clear every time I inspect it, and it is still going strong, although the electrode is slightly burnt.

In conclusion, I think the two stroke a delightful machine—*if taken care of*. In my opinion the four-stroke is doomed to extinction as soon as the two-stroke is perfected. The advantage of the more constant torque is at once apparent.

Manchester. **Two-Stroke Enthusiast**

A Petrol Consumption Challenge

Sir,—Referring to A. K. Gordon's letter relative to petrol consumption on the "Scott," the correct way to tune up a Binks carburettor is to fit three jets of the correct size. If when running on the first pilot jet the machine accelerates permanently when the extra air lever is opened slightly, this jet is too large, and the same applies to the second jet and to the main jet. When the carburettor is correctly jetted when running on any or all of the jets the machine should not accelerate, but rather ease up if the extra air lever is opened. This proves that you are then running on a correct mixture and the most economical mixture possible, and when riding the machine and you are only using one of the three jets the other two are damped out and no petrol can be spilled out of them: consequently, when a machine is so jetted no further advantage is possible.

We get scores of letters from users saying they are getting from 50 to 70 miles to the gallon. It is quite possible to exceed this amount by what I call freak riding. One of my customers once wrote me saying he had achieved a 25 mile journey at the rate of 155 mpg; but I am open to challenge any other carburettor or rider to get as many miles to the gallon as I can get with my carburettor. The test journey that I would suggest would be from Manchester to Preston, over Belmont Hills, about 40 miles; the condition being that I will take my Scott out with a standard Binks carburettor in competition with any other standard Scott machine with any other carburettor, and I will set the pace, and when on arriving at Preston the competing machine will have used as little petrol as I have done, I will give £10 to any charity the editor likes to mention, provided my competitor will do likewise, but a condition would have to be that the competitor keeps within ten yards of me through the entire journey.

C. Binks

TECHNICAL TOPIC

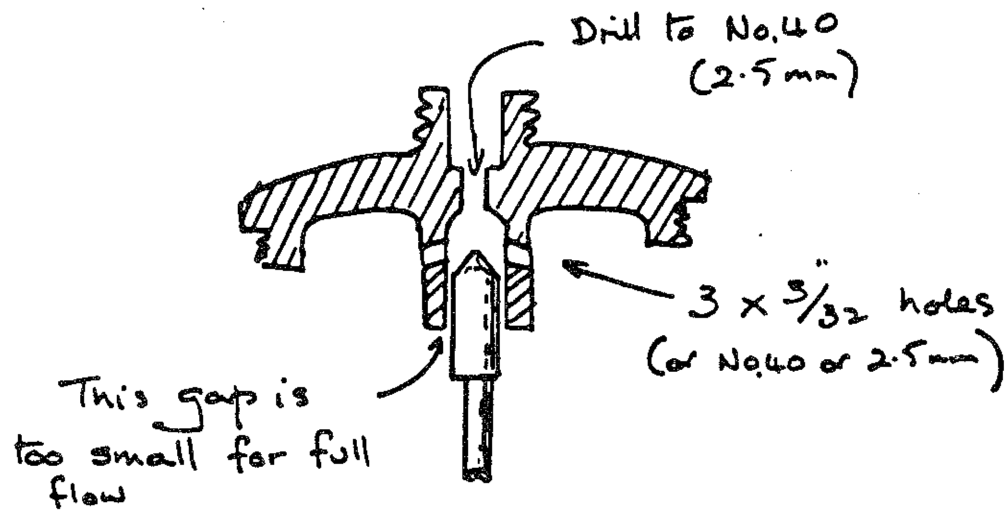
Potty

Carburettors (Potty mod. no. 11)

While the 'Nail' (my 500cc short-stroke Flyer) was having its piston gudgeon-pin holes rebushed I borrowed a 600cc block and pistons to keep my favourite Scott mobile. I was surprised to find it almost as smooth while power and acceleration were much better. I really like the power characteristics of short-stroke Flyers with front expansion boxes and silencer at the rear (in my case a smaller than standard Burgess).

However, hard acceleration caused misfiring and 'hot spots' in a classic fuel starvation way and I rightly (as it worked out) assumed that as a 600 it needed more fuel on acceleration. I carried out some fuel flow checks and found the problem to be the float chamber top. First I noticed that the hole letting the petrol through is very small, so Potty mod. no. 11(a) was to increase this by $^1/_{64}$". You can't go any more or there is no seat left for the needle. Road test showed that I was on the right lines but starvation had not quite gone.

Further tests on the bench showed the needle guide to needle clearance in the top was restricting flow. So Potty mod. no. 11(b) — drill three holes (not two or four, or you will find you will break the drill) equally spaced just below the needle seat but above the needle when it is in its lowest position (see diagram). Road test proved the point.



Potty Mod 11 increase flow thro' Amal/Binks (top feed)

HINTS AND TIPS SECTION

Carburettor on Fire.

On one or two occasions the author has had the carburettor catch on fire both when riding and when preparing to start. In these circumstances, if the fire cannot be immediately be got under control, no time should be lost in getting the engine running, either on the stand or along the road, the petrol tap having been closed at the first possible moment and before anything else whatever is attempted. If only the engine can be started the petrol in the float chamber will quickly be exhausted, and there is an end of the fire. In the meantime throw sand, road dust, or a mat over the machine, and beat the flames with your cap or anything else that is handy. Water only spreads the flames; therefore, in no circumstances should it be employed. If the engine cannot be started up the supply of petrol, to feed the flames, lasts longer, and in case the reader may be a little sceptical as to the possibility of starting the engine under such circumstances, the author can bear testimony to the fact that, on at least three occasions, this has been done either by himself or others in his presence, and, once in particular, after all hope had been abandoned of saving the machine. His advice, therefore, is at all costs get the engine going.
Taken from How to Drive a Motorcycle *by 'Phoenix', c.1920. Kindly sent by David Waring.*