BSA COMPETITION GUIDE

"BUILDING A BSA SHORT-TRACKER"

Forward:

The information contained in this booklet is based upon actual experience and short-track racing victories.

We have taken pains to include all of the necessary information required to prepare a BSA 250 for short track competition.

However, should you have any questions which cannot be answered by referring to the text, please write to:

Competition Department
BSA Incorporated
639 Passaic Avenue
Nutley, New Jersey 07110

in the Eastern U.S. or,

Competition Department
BSA Motorcycles-Western
2745 East Huntington Drive
Duarte, California 91010

if located in the Western U.S.

Be sure to include complete information required to specifically answer your question.

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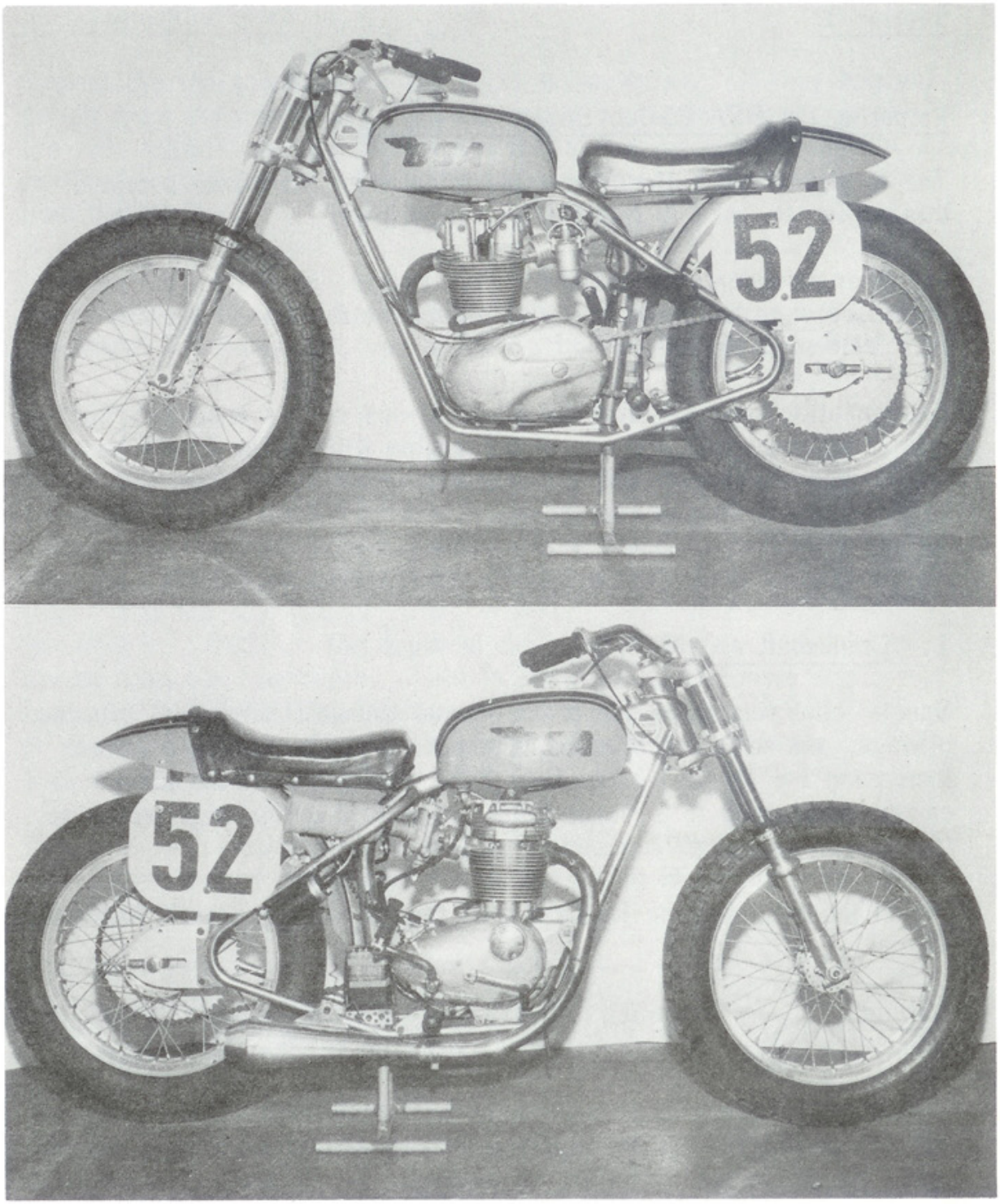

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Section 1

Preparing the BSA 250cc Engine for Racing

The following suggestions are made to increase the power output of this engine to make it suitable for competition.

All other procedures for rebuilding this engine, other than the below suggested changes, must be strictly made by the use of the BSA B25 Workshop Manual.

Extra caution must be taken on all build-ups of this engine. Final results obtained with the use of the engine will not be determined by the number of changes that are made but rather by the care and technique by which they are done.

PERFECT CLEANLINESS IS ESSENTIAL ALWAYS

1. Crankshaft and Flywheels.

Special care must be given to the journal to avoid scratches, plugged oilways, and to insure correct size, etc. Polish rod journal after increasing the oil feed holes from 3/32" to 1/8". If the journal cannot be cleaned to a mirror finish, regrind it to the next undersize (details in Workshop Manual).

Polish the main bearing journals until the main bearing push fits on the journal.

Warning: If any material is removed from the crankshaft assembly the entire assembly must be rebalanced, with the balance factor 65%

It is also necessary to check the flywheel bolts and torque them to 45 pounds per foot. Then loctite the flywheel bolts. If time and money permit, polish the entire assembly.

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2. Connecting Rod.

Inspect the rod carefully for any nicks or scratches. If they appear, polish them out completely. Never remove any weight from any part of the rod. Install new rod inserts and torque the rod bolt nut to 27 pounds per foot, using loctite. For a first class job use Carrillo steel rods from Sifton.

3. Main Bearings.

Standard main bearings are suitable for use providing they are in good condition. If necessary, you should install new bearings.

4. Piston.

Use Sifton special 12-1 Piston #C-25 which comes in oversize only, +.030" and +.040" over. The technical data on this piston is as follows: Piston Weight: 224 Grams, .0425 thick Stainless Steel Compression Ring, Bevel on I.D. is topside of ring. The top ring gap is .010" - .012". The side clearance is .002" - .003". The depth of the ring groove is .005" deeper than the ring depth. This is designed to overcome ring flutter at higher RPM's, insuring maximum sealing at all RPM's. If you are supplied with two stainless steel rings the details for both are the same as above.

If one stainless steel ring is supplied, use only the standard BSA part in the second groove and follow the fitting instructions in the Workshop Manual.

For the oil ring, use the standard BSA part. The oil ring gap is .008" - .012". The side clearance is .0015" - .0025". The depth of the oil ring groove is .005" - .008" deeper than the ring depth. This again is designed to overcome ring flutter.

The minimum measurement of the inlet valve to clear the piston is .040". The minimum measurement for the exhaust valve to clear the piston is .060".

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Valve cutaways on this piston are domed and special attention must be given when cutting the valve. Instructions for this operation are contained in Section I, Item 6 (c) of this guide. If the piston checks out higher than 12-1 (23cc), lower the compression by removing the metal at the top of the piston around the valve pockets.

Piston clearance should be .006", measuring the extreme bottom of the piston skirt.

The wrist pin should be free in the piston (slide fit). The wrist pin clearance in the connecting rod is .001" - .0013". Under no circumstances should you lighten the piston.

5. Cylinder.

Before reboring to fit the special piston, the cylinder liner must be removed to insure permanent bonding to the cylinder.

Heat the cylinder, press out the liner, and allow the cylinder and liner to cool. After cooling, clean the outside of the liner and the inside of the cylinder thoroughly by using Loctite "Clean 'N' Prime", Part Number 25-56.

To insure bonding, use Loctite "Hot Strength Adhesive 306", Part Number 306-18. Follow the instructions carefully that come with this adhesive. This is extremely important.

Commence reboring after completing the above steps. After rebore is completed, the top of the liner on the inlet side must be rounded out to clear any oversized inlet valve. (See sketch 1).

Use the standard head gasket sprayed with K & W Spray Copper Coat on both sides.

6. Cylinder Head.

Remove both valve guides and port both ports.

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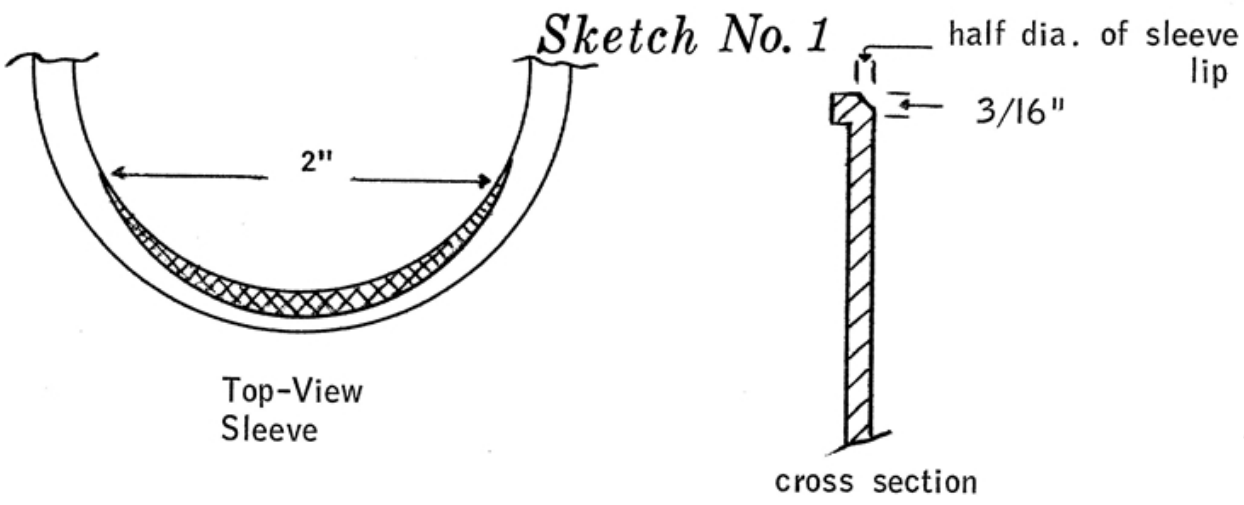

a) Inlet Port

If the machine is to be used for 1/2 Mile Dirt Track racing, or for ultra-high speed performance, open the port to 1 5/32" to match the same size GP carburetor. The port should be straight through to the center of the inlet guide hole. After that, blend out evenly to valve seat.

For 1/4 Mile Dirt Track racing, or for a quickly-accelerating engine, open the port to 30mm following identically the steps outlined above.

b) Exhaust Port

To realize maximum horsepower from your engine, open the exhaust pipe port to 1 1/2" to fit a large 1 1/2" exhaust pipe. Blend the port to this, starting from the exhaust valve seat in a funnel-type shape. The large part of the funnel will be the beginning of the I.D. of the exhaust pipe.

For a quickly-accelerating engine, leave the exhaust port standard, blending the port in the same funnel shape.

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c) Guides and Valves

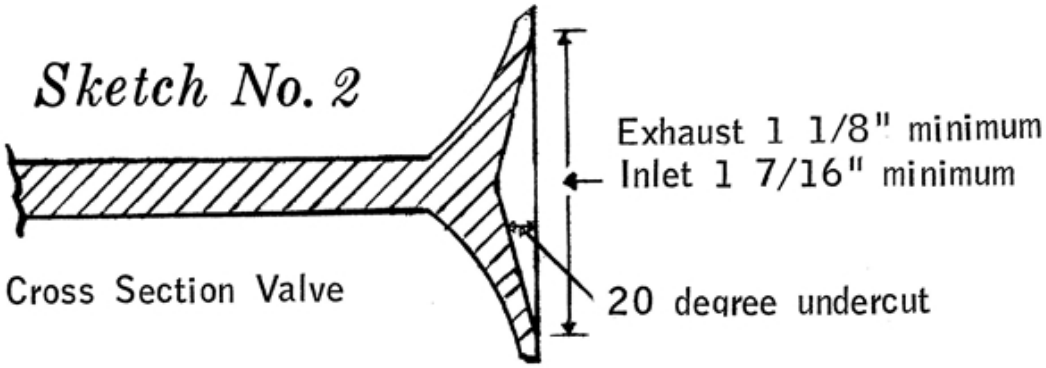
Shorten the exhaust guide by $\frac{1}{4}$" to a blunt end. No other work on this guide is necessary.

The inlet guide may be tapered and shortened by 1/8" depending upon the type of valve that is used.

The recommended valves are Sifton valves and guides. The inlet valve is oversized (39mm). The exhaust valve is standard. Both valve stems are altered to fit the Sifton collars and special keepers. The inlet valve stem is smaller than standard (.255").

If other than Sifton valves are used, the following changes must be made to clear the Sifton piston and valve pocket domes.

Sketch No. 2



Cross Section Valve

The piston valve pocket dome is 23 degrees, ensuring that the valve head is struck in the center, should over-revving or gear-miss occur. This also serves as a safety measure, designed to eliminate bending of the valve head.

d) Valve Springs, Collars and Keepers

Sifton special valve springs (1 3/32"O.D.), top and bottom collars and special keepers must be used.

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When installing these items, follow the supplied instructions very closely, in order to ensure proper clearances and the best possible RPM's.

Always grind the seats and valves. Lap the valves to each seat. When the oversized inlet valve is used, the valve lapping determines the seating and shows the excess material to be removed on the I.D. of the inlet seat. Blend all of this removed material to the foregoing reworked inlet port. Remember that the gain in horsepower will be directly related to the accuracy of the head work. All of these instructions and recommendations on the cylinder head are basic. You may alter these procedures to reflect your own experiences and needs.

7. Camshaft and Push Rods.

Use the Sifton high turnover camshaft only. (Part Number HT-C 25 hard-faced). This camshaft is available on an exchange basis only. Be sure not to remove the cam gear. This is part of the cam and must not be removed or switched. The cam is ground and timed as a one-piece assembly.

Two BSA C-15 radius-type tappets (BSA Part Number 40-392) must be used with this cam. The original tappets cannot be used.

The valve timing on this cam is as follows:

	Lift at valve	opens		closes	
Inlet Valve	.388"	15, 5 degree	BTD	45 degree	ABC
Exhaust Valve	.380"	47 "	BBC	5 "	ATC

Note: The valve timing is .113" off the low spot of the heel of the cam, at the tappet or the top of the push rod, not at the valve.

Tappet adjustment, when the engine is cold, is .004" inlet and .006" exhaust.

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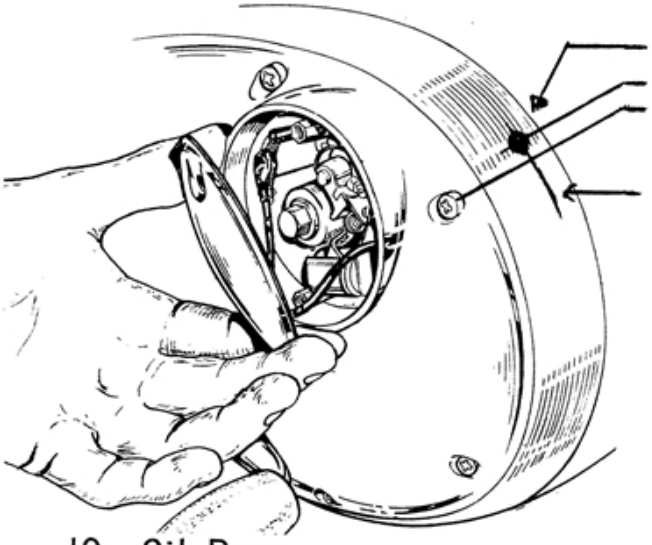
8. Rocker Arms.

Carefully lighten the rocker arm ends to reduce reciprocating weight and polish the entire rocker arm to increase its strength.

Caution: Do not use the standard 1967 rocker box. Obtain a 1968 rocker box. To identify a 1967 rocker box, look at the spacing of the rocker arms. If they are spaced with a double spring washer, this is a 1967 type. The 1968 type has only two flat steel washers, one on each end of the rocker arm. The rocker arms themselves are also longer. No compression release is needed.

9. Breathing.

For racing, a free engine breather must be installed according to the instructions in sketch #3.



Install 1/8" P.T. male to 5/16" male hose fitting (45 degrees) and vent hose around front of barrel and attach hose end near rear chain oiler.

Sketch No. 3

10. Oil Pump.

Special attention must be given to the oil pump. As an initial step disassemble the pump and examine all of the gears. Clean and lap all joint faces. Clean again, and reassemble with joint compound, making sure the pump turns freely after assembly. Secure all four of the oil pump screws with Loctite and center-punch the heads of the screws. Secure the pump to the engine.

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11. Gearbox.

Since more RPM's are expected from this engine, the following changes must be made to prevent your motorcycle from jumping out of gear.

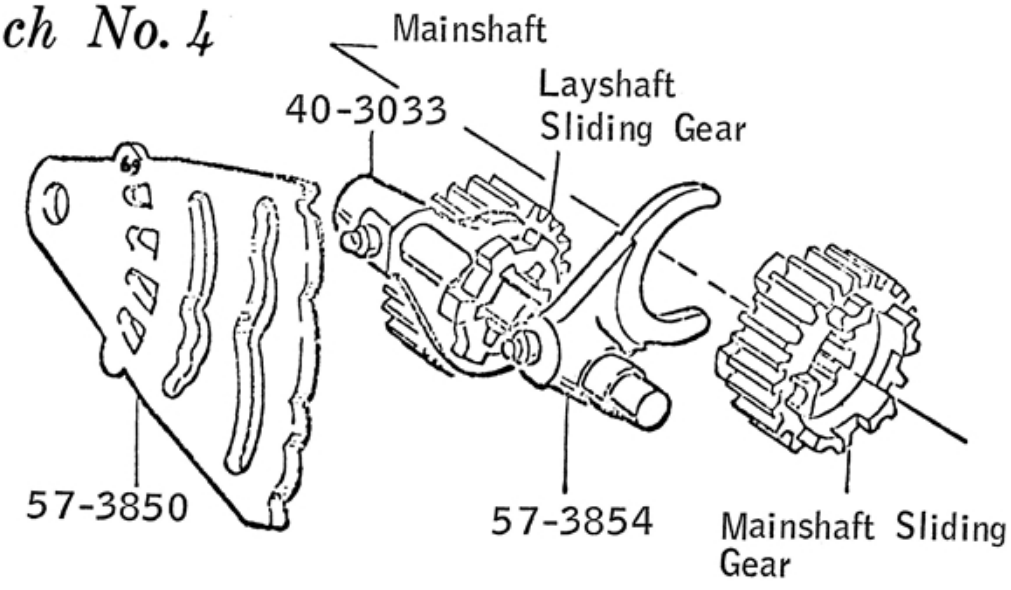
To provide more positive second and third gear engagement, the camplate and main shaft selector fork have been modified.

The new camplate (marked "69" in place of the "T") is interchangeable, but must be used with the new selector fork, which has a 7/16" turned witness on its spigot for identification.

Old Part Number	New Part Number	Description
40-3294	57-3850	Camplate
40-3033	57-3854	Mainshaft selector fork

Selector fork #40-3033 is still used on the layshaft.

Sketch No. 4



Change gearbox sprocket to either

14T BSA Part Number 41-3093 or 57-2776
15T BSA Part Number 41-3094

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In order to get low enough gearing for dirt track racing, the engine sprocket and clutch hub must also be changed.

Engine Sprocket	18T	BSA Part Number 40-582
Clutch hub	52T	BSA Part Number 40-3241

Note: Above clutch has same number of teeth as standard. Chain alignment is achieved by changing clutch hub.

12. Ignition Timing.

The recommended ignition timing is 37 degrees BTDC fully advanced. Modify the contact breaker cam, the sleeve and action plate to eliminate the auto advance.

Remove the alternator completely and use dead loss battery ignition only.

Summary:

All other work and build-up methods are the same as illustrated and described in the BSA B25 Workshop Manual. An important thing to remember is that this engine is built for speed and reliability, which means that careful attention must be given to every detail.

Strict adherence to this attention and detail, combined with the instructions and recommendations in this section, will result in a highly competitive BSA racing machine.

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Section 2

Setting Up the Motorcycle for Racing

The following suggestions are made to set up the motorcycle for Dirt Track Racing. These are the best available parts and the same used by BSA Incorporated in its testing.

Frame:	Track Master, Sonic or Swanson.
Fork:	Ceriani Small Road Racing Type with English Stem.
Wheels:	Alloy Sprockets Company 18" or 19" wheels with WM3 rims and assorted sprockets. For $\frac{1}{2}$ Mile - from 42T to 52T For $\frac{1}{4}$ Mile - from 56T to 68T
Handlebar:	To suit rider.
Seat:	To suit rider.
Rear Fender:	Cut down standard BSA Starfire 250 front fender for the rear (BSA Part #90-6580) or any other suitable make. Select a fender stay which has been manufactured with the highest strength standards.
Tires:	A variety of tires may be used depending on the surface of the track on which you are racing. Any type of 400 x 18 or 19 front and rear is recommended.

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Exhaust System:

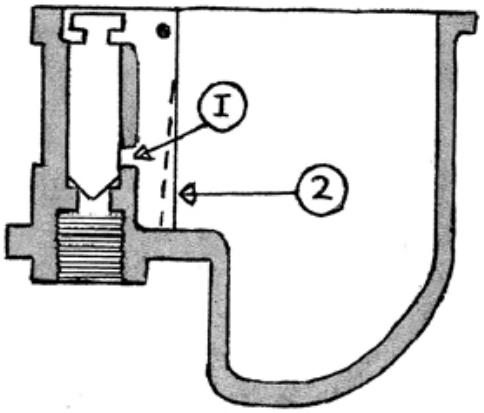
For $\frac{1}{2}$ mile use standard BSA A-65 right hand exhaust pipe and reshape to fit. Use Triumph Part #E-3479 R.H. racing megaphone. The overall length of the exhaust system is approximately 34" from the outside of the head. For $\frac{1}{4}$ mile use standard BSA Starfire 250 exhaust pipe and reshape to fit, with small Webco Megaphone (Part #1000). The overall length of the exhaust system is approximately $37\frac{1}{2}$" from the outside of the head.

Carburetion:

For $\frac{1}{2}$ mile use a 1 5/32" GP Amal carburetor with a Delorto remote float bowl. Start with a mainjet size of 240 and watch the float level.
For $\frac{1}{4}$ mile use a 30mm Amal concentric carburetor and drop the needle down to the last notch. The starting main jet size is 200. The following alterations must be made to the float and float bowl.

Sketch No. 5

Cross Section Float Bowl



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(1) Machine .100" - .125" slot, 1/16" above float needle seat

(2) Mill on taper about 1/16" to allow float to drop deeper

This alteration will cure the starvation of gas at higher RPM's.

Air Cleaner: The use of an air cleaner is a necessity.

Lubrication: It is a must to use Racing Oil R40 throughout, except in the chaincase, which should be filled with 40W green oil.

Gas Tank: To suit rider or tank and seat combination.

Ignition: A six volt dead loss battery ignition is recommended. You may use any coil or condenser providing they are of top quality. A six volt Nickel-Cadmium battery to ensure long-lasting quality is recommended from Edmund Scientific Company (Part#70942). Standard BSA points are recommended.

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Section 3

List of suppliers and companies where the recommended parts and equipment can be purchased.

Valves, Springs, Collars, Camshaft, Push Rods, Special Piston and Steel Connecting Rods.	Tom Sifton P.O. Box 3154 Stat. D San Jose, Cal. 95116 Tel. 408 258-3555
Frames	Track Master Frames 14646 Blythe #28 Van Nuys, Cal. 91402 Tel. 213-349-9024
	Swanson Cycle Center RD 3 Box 51 Geneva, New York 14456 Tel. 315 789-9135
	Sonic Welding Unit J 14547 Arminta Van Nuys, Cal. 91402 Tel. 213 785-2323
Wheels and Sprockets	Alloy Sprockets 10146 Staff Sun Valley, Cal. Tel. 213-767-6984
Seat and Tank Combination	A.C.E. 5046 Calmview Baldwin Park, Cal. 91706 Tel. 213 962-4319

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Tires	Dunlop	BSA Incorporated 639 Passaic Avenue Nutley, New Jersey 07110
	Pirelli	Cosmopolitan Motors Inc. 5521 Wayne Ave. Philadelphia, Pa. 19144 Tel. 215 438-3500
Forks		Accessory Distributors Inc. 602 West 52nd Street New York, N.Y. 10019 Tel. 212 582-5736
Air Cleaners		BSA Incorporated 639 Passaic Avenue Nutley, N.J. 07110 Tel. 667-5600
		Filtron Products Co. 15150 Raymer Street Van Nuys, California 91405 Tel. 213 988-4600
Nickel-Cad. Battery		Edmund Scientific Co. 150 Edscorp Building Barrington, N J. 08007 Tel. 609 547-3488
Loctite		BSA Incorporated 639 Passaic Avenue Nutley, N.J. 07110

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Section 4

Gear Chart (overall ratios)

	Rear Wheel	42	44	46	48	50	52	54
	Gearbox							
28 T Engine	14T	5.57	5.84	6.10	6.37	6.63	6.90	7.16
	15T	5.20	5.45	5.70	5.94	6.19	6.44	6.69
	16T	4.88	5.11	5.34	5.57	5.80	6.03	6.27
	17T	4.59	4.81	5.03	5.24	5.46	5.68	5.89
	18T	4.33	4.54	4.75	4.95	5.16	5.36	5.57
23 T Engine	14T	6.78	7.11	7.43	7.75	8.07	8.40	8.72
	15T	6.33	6.63	6.93	7.23	7.54	7.84	8.14
	16T	5.93	6.22	6.50	6.78	7.06	7.35	7.63
	17T	5.59	5.85	6.12	6.38	6.65	6.91	7.18
	18T	5.28	5.53	5.78	6.03	6.27	6.53	6.78
18 T Engine	14T	8.67	9.08	9.49	9.90	10.32	10.73	11.14
	15T	8.09	8.47	8.86	9.24	9.63	10.01	10.40
	16T	7.58	7.94	8.31	8.67	9.03	9.39	9.75
	17T	7.14	7.48	7.82	8.16	8.50	8.84	9.18
	18T	6.74	7.06	7.38	7.70	8.02	8.35	8.67

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56	58	60	62	64	66	68	70	72
7.43	7.69	7.96	8.22	8.49	8.76	9.02	9.26	9.55
6.93	7.18	7.43	7.68	7.92	8.17	8.42	8.67	8.91
6.50	6.73	6.96	7.20	7.43	7.66	7.89	8.13	8.36
6.12	6.33	6.55	6.77	6.99	7.21	7.43	7.63	7.86
5.77	5.98	6.19	6.39	6.60	6.80	7.01	7.22	7.43
9.04	9.37	9.69	10.01	10.34	10.66	10.98	11.30	11.63
8.44	8.74	9.04	9.34	9.65	9.95	10.25	10.55	10.85
7.91	8.19	8.48	8.76	9.04	9.32	9.61	9.89	10.17
7.44	7.71	7.96	8.24	8.51	8.77	9.04	9.28	9.57
7.03	7.28	7.53	7.78	8.03	8.29	8.54	8.79	9.04
11.56	11.97	12.38	12.79	13.21	13.62	14.03	14.44	14.86
10.79	11.17	11.56	11.94	12.33	12.71	13.10	13.48	13.87
10.11	10.47	10.83	11.19	11.56	11.92	12.28	12.64	13.00
9.52	9.86	10.20	10.54	10.88	11.22	11.56	11.90	12.24
8.99	9.31	9.63	9.95	10.27	10.59	10.91	11.23	11.56

If 18T engine sprocket (part #40-582) is used, clutch chain wheel (40-3241) must be used.

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