CARBURETION

IN

RELATION TO SERVICE

How to Overhaul a Marvel Carbureter

MARVEL CARBURETER CO.
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What Is Carburetion ?

I would like to say a few words with respect to service men as a whole. We in the service department too often fail to take advantage of the many opportunities to learn things which are presented to us. Many of us refuse to accept these opportunities. The Service Department as a whole is today much better than it ever has been in the past, but we still have a long way to go in accepting the knowledge that has been brought to us.

The average service man of today is much better in his work than he was in the old days, but he does not yet work to any standards, **If** an automobile comes in to him for service work with some particular trouble, he almost invariably starts experimenting. His first point of view is to see why that car was made wrong by the engineers, instead of finding out why it failed to reach the proper standards for that particular make of automobile,

When anything goes wrong in a great many cars of the same make and model (what we know as a chronic complaint) , the factory is always immediately following same, and sends the necessary bulletins and corrective information as soon as possible.

Usually a service man will take an automobile and instead of trying to find out what is below standard in that particular car, he will try to change the standard. That is exactly what is occurring in most (If the service departments all over the country, and if service men do not get on the job to study the information that is sent to them, there is only one or two things that can happen; either they will be classed as giving "rotten" service in their particular place, so that eventually that dealer will have to go out of business, or these service men will wake up some day to find other men in their jobs.

When it comes to the case of carburation, Service Departments are very far behind the times in their knowledge of this particular part of engine work. It will be my endeavour to give you a clearer understanding of this subject.

Most of us look at an object and say, "That is a carbureter", or "valve", but we do not say "why a carbureter and why a valve". "Why is that valve there?" What is the real function of it? What is the real function of a carbureter, or the function of a gasoline engine?

In order to understand carburetion, it is necessary to study the purpose for which the gasoline engine is designed. There is only one thing that a gasoline engine is designed to do, and that is to burn gasoline mixed with air, and by burning convert this mixture into power.

There are three major factors of a gasoline engine which control the change of gasoline and air into power. 1. Compression. 2. Ignition. 3. Carburetion.

We want to call your attention to the fact that we have mentioned carburetion last, and it is rightfully placed in that position. You can all see that you can completely remove the carbureter from the engine, yet in no way will you effect the compression or the ignition of that engine. On the other hand, you cannot change, in the slightest, either the compression or the ignition without up-setting the carburetion.

When you consider these facts, you must realize that anything which changes the power which an engine will give at a certain speed and load must then automatically affect the amount of gasoline used by that engine.

In a great many shops today orders are still being written to "adjust carbureter." This may be an utter impossibility, since you cannot properly adjust a carbureter when the compression and ignition are wrong. While the owner, in a great many cases, asks for a carbureter adjustment, what he really requires is an engine tune-up and what the service salesman should do is to sell the customer a complete engine tune-up rather than to uselessly take money from him for a so- called carbureter adjustment which cannot possibly give the owner the car performance he expects to receive when he asks for the carbureter adjustment. The reason for this is that all three things, namely: Compression, Ignition and Carburetion must ALL be correct in order to produce the desired results.

Generally when a service man thinks of carburetion he immediately thinks of a carbureter. We are going to define the words "Carburetion" and "Carbureter", so that it will be clearly understood that carburetion is not made up of the function of the carbureter alone.

The carbureter, regardless of make, is nothing more or less than a mixing chamber in which gasoline and air are mixed, so that the mixture will burn in the engine, and the carbureter measures the 'gasoline so that the proper mixtures are obtained with the air passing through it. Carburetion is the combined function of valves, manifolds, camshaft and carbureter. By this definition it is clearly seen that "Carburetion" is a far deeper subject than consideration of the carbureter alone.

Most of us expect to hear a lot about gasoline mileage, or miles per gallon of gasoline. Do you realize that in the Engineering Department when a new engine is being tested, the engineers at that time know nothing about "miles per gallon". They have an engine attached to a dynamometer and what they are interested in is not miles per gallon, but the greatest amount of horsepower that can be developed on the least amount of fuel, and that is exactly what you service men are really interested in. After these engine tests have been completed the engine is placed in a chassis, and they then find out how many miles per gallon the automobile will deliver. You can readily see from the last statement that miles per gallon comes from the engine and chassis as a unit. To cite an example that you all know about-Passenger Car Engines are used in both passenger cars and trucks. No one would demand that this same engine deliver as many miles per gallon of gasoline in the truck as it does in the passenger cars, because the demand for power is not the same. Neither could you expect a truck owner carrying twice the load that another truck owner is carrying to get the same miles per gallon.

"Miles per gallon" is a question of car speed, wind velocity and direction, and load. Practically all car manufacturers today give figures to their dealers showing the average miles per gallon on a given model at the various car speeds, and this should be the standard for all mechanics to work to.

Service men should realize that there is only one reason why any cars of the same model and make, and in proper condition, should show any great variation in miles per gallon, and that reason is the difference in car speeds and conditions under which they are driven. When all conditions are identically the same, it has been proven time and time again that the mileage will be substantially the same on all cars of the same model.

One important thing, however, that should always be taken into consideration is that new cars cannot possibly give their standard mileage until thoroughly run in, as new engines are tight and stiff.

It would be very easy to design a carbureter for a gasoline engine of constant speed and load. It would only require a simple carbureter with one jet and one venturi, with a bowl for constant supply of gasoline. You would not even need a throttle.

However, such a condition naturally does not exist on present day engines used in passenger cars and trucks. The carbureter on the present day automobile must be a compound carbureter that gives smooth low speed performance, high top speed, fast acceleration and power, as well as the greatest economy possible. By a compound carbureter we mean one that not only varies the volume of gasoline and air that enters the engine, but also varies the proportion of gasoline that goes in with a given amount of air, in order to produce the proper mixture proportions for the conditions under which the engine is operating. :

Since, as stated before, the engineers are primarily interested in the power derived from an engine from a given amount of gasoline, you can therefore understand that they must know how much gasoline they are using to produce the desired power, Instruments are used in dynamometer rooms that definitely measure the amount of air anti gasoline going into an engine. :

A different mixture proportion is required to idle a car than is required to produce the most power, and neither of these mixture proportions would produce the best economy, Therefore, the proportions of fuel and air on which a gasoline engine will operate most efficiently for all loads and speeds must be known, and all engineers work toward this end to establish their standards.

As we weigh all gasoline and air used by an engine, the following figures show just how many pounds of air is required with each pound of fuel to secure proper operation of the engine under the four distinct conditions found in the operation of the present day automobile.

	Air	**Gasoline**
Starting-Zero Fahrenheit	1 lb.	2.5 lbs.
Idle	11Ibs.	1 lb.
Power and Speed	12 lbs.	1 lb.
Economy	15.5 lbs.	1 lb.
Richest firing mixture	7.75 lbs.	1 lb.
Leanest firing mixture	17.15lbs.	1 lb.

In order to give you some idea of the volume mentioned in the above figures, one gallon of gasoline weighs 6.6 lbs., and with every gallon of gasoline that is used in an engine approximately 10,000 gallons of air is used. You can readily see that the mixing of this fuel and air is a rather delicate operation to do and do accurately.

We know a great many mechanics sometimes feel the engineers try to see how much power they can get, regardless of fuel used, but believe that if you will consider carefully all the facts, you must realize that all car manufacturers are vitally interested in producing the greatest amount of power on the least amount of fuel possible to keep up with their competitors.

Study the above figures and you will see that it is impossible to use a much leaner mixture in an engine than the economy mixture proportions because it simply will not burn in the present type of gasoline engine.

The serious part of servicing a gasoline engine is that while it is impossible for an engine to run on much less fuel than the economy mixture proportions, from the above figures it will be seen that the same engines will still fire on mixture proportions twice as rich. In other words, a gasoline engine is a "gasoline hog", and the more gasoline you give it the more it will take up, to this limit, and still produce fairly good power.

Inability to properly handle this problem is the reason why so many mechanics change from standard, instead of locating and correcting the trouble that has caused the engine to go below standard. All that any of you can hope to do in service work is to make that particular engine as good as the manufacturer intended it to be, **but you can make it a lot worse.** We are convinced that far too many cars are running way below their standard in service today.

Now let us see how these various ratios are secured in a Marvel carbureter.

As we mentioned before, a carbureter must control the volume as well as the mixture proportions and the throttle of any carbureter controls this volume, because no more volume can pass into the manifold than this throttle opening will allow. All adjustments, regardless of type, control the amount of gasoline that goes in with a given amount of air. Most mechanics believe on a Marvel carbureter that when they are adjusting the air screw that they are changing the amount of air going into the engine, but you can readily see this is wrong, as it is impossible to let more air into the engine until the position of the throttle has been changed. (See Fig. 1.)

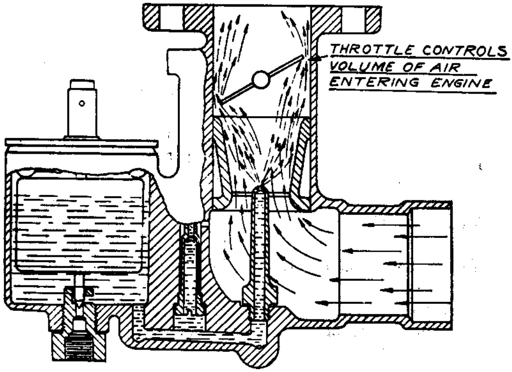

Figure 1

In carbureter work we hear a lot about gasoline being sucked out of the jets, and we believe very few mechanics understand this action. We are going to try and show what suction really is. Suction results from the creation of air pressure lower than atmospheric pressure. Actually gasoline is forced or pumped out of the jets. Now let us try and explain this action to you.

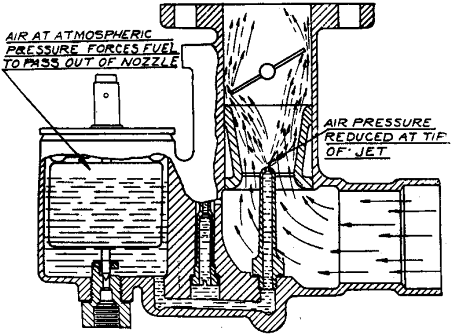

Figure 2

Atmospheric pressure is the actual weight of the air, and at sea level one square inch sustains the weight of about 14.7 pounds of air, which at higher points in the atmosphere is of course less.

In an engine the piston goes down on the intake stroke with the intake valve open. While most mechanics know that the piston sucks the mixture in, what actually happens is that the piston in its downward motion leaves an empty chamber or a space in which the air is lower than atmospheric pressure, and the air at atmospheric pressure rushes in thru the carbureter air intake to fill this space. The amount allowed to enter is controlled by the amount of throttle opening, hence the statement that the throttle controls the amount of air entering the engine.

During the passing of this air thru the carbureter, the air must pass thru a restricted air opening, the venturi, and in order to pass thru this restricted opening in the given length of time controlled by the cylinder intake valve, it must pass thru this opening at a rapid speed, or at an increased air velocity, and as the air velocity is increased the air pressure is correspondingly reduced below atmospheric pressure in the venturi.

In the venturi, or low pressure area, is located a jet or gasoline opening. For an example, we are going to say that the pressure at the venturi around the jet is only three pounds, and I am sure you can see that if the pressure on the liquid in the carbureter bowl is atmospheric, or 14.7 pounds, and the pressure on the liquid in the jet is only three pounds, liquid must be forced or pumped from the bowl out thru the jet. (See Fig. 2).

Now let us suppose, that you do what is being done allover the field, namely, reduce the air pressure on the gasoline at the jet to

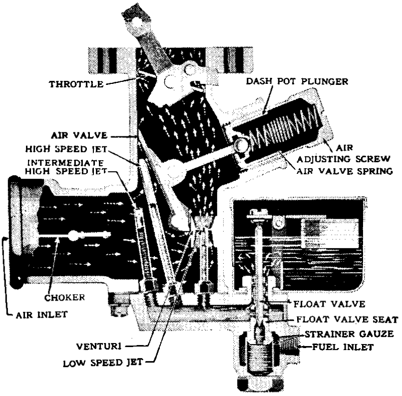

Figure 3

two pounds instead of three pounds. Then, since you can't reduce the pressure on the liquid on the bowl, there will be a greater difference in pressure between the bowl and the jet and more gasoline will be forced out of this jet in a given length of time than before.

Naturally, you want to know how you can reduce the pressure from three pounds to two pounds and we will show you how simple it is. All you have to do is to turn the air screw in slightly and the pressure is reduced. Now let us see how this is accomplished.

One of the theories that is quite prevalent in the field is that the air valve rests against the side of the carbureter body when the engine is idling. This is all wrong. If you will consider for just a moment, you will see that it would be impossible to 'change the conditions in the carbureter with reference to making a richer mixture by screwing in on the air screw, if the air valve did lay against the side of the carbureter. If the carbureter is properly adjusted, the air valve leaves the side of the carbureter body slightly the instant the engine is started and remains there while idling. When idling, there are three passages thru which air approaches the throttle. First, some air goes past the side~ of the air valve. Second, some passes between the tail of the air valve and the venturi block thru the opening called "tail clearance", and third, all the rest of the air passes thru the venturi around the low speed jet. (See Fig. 3). Now, let us assume the engine is running with a certain slight throttle opening, and therefore requiring a certain amount of air in a given length of time. If you turn in on the air screw, you force the air valve a little closer to the carbureter body leaving a smaller opening for the air to pass thru around the valve. Air is like electricity, and follows the path of least resistance. When the space around the air valve is reduced the air immediately hunts another place to go thru. Most of it goes thru the venturi around the low speed jet, and since more air is then passing thru, it must be traveling faster, as the engine still requires the same amount of air as it did. Since we haven't changed the throttle opening, the increased air speed thru the venturi further reduces the air pressure, therefore more gasoline is forced out of the low speed jet. During the idle speeds of the engine, or with the throttle opening sufficient to run the engine from idle to approximately 12 M. P. H., the low speed jet alone is delivering fuel, and together with the air valve, controls the mixture proportions.

When properly adjusted, this gives you the idle mixture proportions of one pound of gasoline to eleven pounds of air, as stated on chart.

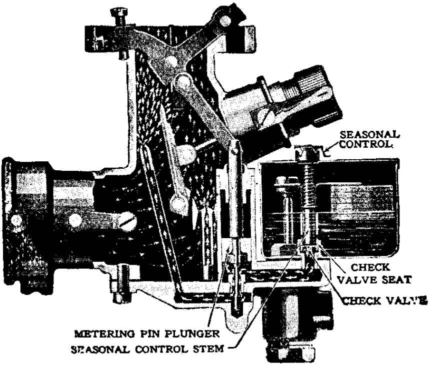

Figure 4

As the throttle is opened further, more air is allowed to enter the engine, which the venturi will not handle, and the air valve begins to open, and the increased air flow past the valve places a suction on the high speed jet, located just under tip of air valve, and it begins to deliver fuel.

On some cars with a high speed range, two high speed jets are used, one being placed directly under the tip of the air valve, and the other some distance below this point. The reason for using two high speed jets is that if the size of the one directly under the tip of the air valve were sufficiently large to take care of top speed, wide open, we would not be able to control the gas at low speeds, wide open. We therefore place one jet under the tip of the air valve, and the amount of gasoline which is delivered out of this jet, plus the amount coming out of the low speed jet, will run the car to approximately 35 M. P. H. on a level road. At this point, due to the in- creased air flow, the suction at the intermediate jet becomes such that fuel is then de- livered from this jet as well, and the amount of fuel from this jet is added to the amount coming out of the low speed and the high speed jets from there on to top speed. At wide open throttle, due to the much greater amount of air passing thru carbureter, these jets come into action at very much lower car speeds.

These three jets in conjunction with the air valve action control the amount of fuel used during the wide open throttle range of the engine, and gives you the power mixture of one pound of fuel to twelve pounds of air, as stated on chart. (See Fig. 4).

The economy mixture of one pound of fuel to fifteen and one-half pounds of air is very often misunderstood by the service man. Economy mixture proportions are known in the factory as part throttle mixture proportions, and are used during all

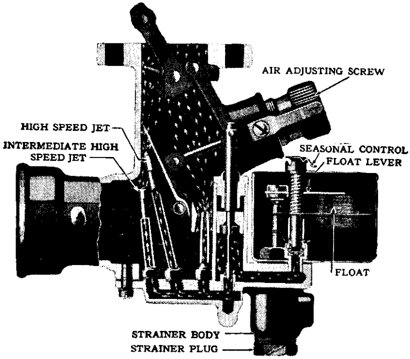

Figure 5

times when driving cars on part throttle up to near top speed, such as driving on a level road at speeds up to about fifty to sixty-five miles per hour, depending on the size of engine and chassis. For this part throttle driving we do not need full power fuel mixtures to secure the necessary power to drive the car at these speeds and loads, and we therefore reduce the amount of gasoline delivered by the high speed and intermediate high speed jets, as gasoline is our source of power.

This is accomplished by attaching to the throttle of the carbureter a metering pin which enters a jet known as the metering pin jet. This jet and pin are placed in the channel leading from the fuel bowl to the high speed and intermediate high speed jets, and as long as the metering pin is in the jet, the only fuel that can pass out of the high speed jets is that which passes between the walls of the metering pin jet and the pin. As soon as the metering pin is moved out of the jet as the throttle is opened sufficiently, we go from the economy mixture to the power mixture. As long as the pin remains in the jet we are operating on the economy, or part throttle mixture, and when everything is right, are using no more fuel than is required to drive the car at normal speeds. (See, Fig. 5).

This economy, or part throttle mixture is found in all such cases to be one pound of fuel to about fifteen and one-half pounds of air, as stated on chart.

You can readily see from the above that the amount of gasoline needed to operate a car depends very much on the throttle opening at which the car is operated, which will vary greatly with wind resistance, grade, road condition and speed.

All air entering the carbureter is controlled in the mixing chamber very accurately by the air valve spring, and this spring is very carefully worked out, so that with the correct jets installed the correct amount of gasoline will be delivered at all speeds and loads. Since the position of the air valve controls the suction on the jets, the air valve spring plays a very important part in the proper metering of gasoline. All springs are tested against a master spring so that they have the same deflection throughout the en- tire range of the spring, and even tho we have endeavored for years to show how important the proper spring action is, we have cases such as this: An owner of a particular car wrote in for a spring, which was sent to him. Several days later he returned the spring with a letter saying-" Am returning the spring you sent me, as it cannot possibly be the right one. The one in my carbureter is 3" long", which of course is two times as long as any of our standard springs.

We have so far not mentioned the sizes of the jets, but now let us discuss that question. The sizes of the jets used in the carbureter are determined by the fuel needs of the engine. Different sized jets are installed in the carbureter with the engine on the dynamometer until the combination of jets is found that will give the best performance. All jets are stamped and listed in parts list, **and jets of different number than standard should never be installed in any carbureter, unless you receive bulletin instruction from the factory.**

All of these jets are flow tested, and the amount of liquid which will pass thru a jet under a certain standard pressure is held, in our factory, to within two cubic centimeters plus or minus of the standard flows, which average from one hundred to three hundred cubic centimeters. And remember this, that if the right jet is used the flow of gasoline is absolutely controlled by the action of the air valve. Which says, automatically, that if the action of the air valve is not right the supply of gasoline cannot be right.

One request that comes in to the factory continually from service departments throughout the country is, "Please send me some smaller jets, this car is using too much gasoline." We have tried to show you from the above description of the actual working of a Marvel carbureter, that if the proper jets are used, and the air valve properly adjusted at idle, the only way that fuel consumption can be increased is thru a change in the amount of suction on the jets. This change in suction can only be made thru the change in position of the air valve. Change in position of the air valve in relation to the carbureter body can be caused by two things, namely: some trouble in the compression or ignition, requiring you to adjust the carbureter richer, because the engine will not properly burn the mixture with standard idle setting, or some trouble in the carbureter causing the air valve to not work freely, binding in its movement, due to dirt or to gum from the gasoline.

Quite often when an engine is brought into a shop to be overhauled, one of the first operations that is performed is to remove the manifold and carbureter assembly, and set it back on the bench very carefully so that the gasoline will not spill out of the carbureter. Then the cylinders ml1y be rebored, new pistons, rings, and pins installed, valves reseated and refaced, all gaskets installed new, new plugs new points, and the engine is timed right on the dot. Then the manifold with the old carbureter attached is bolted back on the engine. The engine is started, the air screw is screwed in and out and then in again, trying to get a good carbureter adjustment. Finding this impossible, the spark is first advanced and then retarded even tho it probably was set exactly right in the first place:

Finally the mechanic goes to the "boss" and tells him that the engine is stiff, and that it is impossible to get a good carbureter adjustment, but that the customer doesn't need to worry, as it will "wear in" in a short time. It is true that the engine is stiff, the same as cars coming off the line at the factory are stiff, and the idle will have to be set a little fast to keep the car from stalling until it gets broken in, **but there is no reason in the world why that carbureter shouldn't have been removed from the engine and completely overhauled, the same as the engine.** Then the power unit as a whole has been rebuilt and brought back to its original standard of operation.

There is another theory in the minds of many mechanics that we must change before we can expect to get good miles per gallon. The air screw is commonly known in the field as an "idle adjustment", but in reality it is more than that. It is an adjustment to be made at idle, and whether it is screwed in or out, it changes the air valve action and consequently the flow of gasoline thru the jets throughout the entire range of the engine speeds.

Nearly all of the service men in the field think that when they get an engine to idle down to where they can count the explosions, that they have the best adjustment that can be obtained. Most cars today are set at a normal idle of about six to nine M. P. H., depending on the type and size of engine. You say that you can't sell the customer on a fast idle, but it can be done, if you will tell him that this applies to not just the car you are working on, but to all other modern cars which have to idle fast, and then tell him why this is necessary. Compare any model of car built around 1918 with a car that is built today and has about the same cubic inch piston displacements. The modern cars have considerable more power and there- fore must have considerable more mixture to run on. This is supplied thru larger valves, larger manifolds and larger carbureters. A gasoline engine has a certain range of speed. If we have an engine built for a top speed of 50 to 65 miles per hour, then we can drop the idle down very low, but when we increase the size of the valves, manifolds, and carbureter, and change the valve timing to get a much higher top speed, we must of necessity set the idle speed a little faster in order to stay inside the operating range of the engine. We have given you from 15 to 20 M. P. H. more on top speed on the average car of today, and we are only asking for an increase of from three to five M. P. H. on idle, and if you set the idle speed lower than that specified by the factory, regardless of whether the customer wants it or not, you are going to make it impossible for him to get even a fair amount of "miles per gallon" from his car, which will be considerably below the standard set by the engineers for this car.

To give a synopsis of the points brought out in this talk, please consider the following:

1. A gasoline engine produces power by burning gasoline and air mixtures.

2. Anything affecting the ability of the engine to burn these mixtures affects its ability to produce power.

3. Three major items affect engine power, namely: Compression, Ignition, and Carburetion.

4. Don't "adjust carbureter", but "tune engine."

5. Engines are designed to give a maximum efficiency for a given amount of gasoline, which automatically gives the most miles per gallon.

6. "Carburetion" includes valves, manifolds, camshaft and carbureter.

7. It is easy to make an engine run on twice as much gasoline as it needs, but quite difficult to make it run on a mixture leaner than the economy proportions.

8. A car or carbureter can be made to operate as good or worse, but no better than it did when it came from the factory.

9. Low speed jet gives the idle mixture. Low and high speed jets give the power mixture, Metering pin and jet, by restricting the fuel flow to the high speed jets give the part throttle or economy mixture.

10. The air valve controls the amount of gasoline at all times going into the engine when the proper jets are used.

11. Factory specification jets must be used, if in doubt, see parts list.

12. The carbureter should always be over-hauled when major overhauls are made to

the engine, in order to get the maximum benefit from the service work done.

13. The air screw adjusts the mixture proportions throughout the full range of the engine, and not just at idle.

14. Carbureters must be adjusted at the idle speed specified by the factory.

15. When in doubt as to what is wrong with a car's performance, and you think it may be carbureter, put on a carbureter off a car of the same model that is working all right, and if you still have trouble it's not carbureter, if the trouble is gone it is carbureter.

16. Never use anything but standard factory parts secured from our Marvel stations.

17. Use the Authorized Marvel Service Station. They have been thoroughly instructed in engine tune-up and all carbureter service, arid are equipped with all special tools, gauges, etc., to efficiently overhaul any Marvel Carbureter.

How to Overhaul A Marvel Carbureter

We have tried in the first part of this booklet to give you a general idea of the problems of carburetion. We hope the following will give you a clear picture of how to overhaul a carbureter. Remember that the problem you are concerned with is to get the carbureter back to standard, just the same as it was when new, and we know that if you will follow the method outlined carefully you can very easily make a thorough overhaul of the Marvel Carbureter.

Before attempting any work on the carbureter, disassemble carbureter completely and clean all parts thoroughly.

In a great many Marvel Carbureter installations the throttle shaft and throttle fly are in the heat riser, above the carbureter proper. (Of course, in down draft this is reversed.) The riser, however, should always be removed and the throttle shaft examined for wear. All throttle shafts are given a clearance of approximately .0025" between the, size of the shaft and the size of the shaft hole in the casting. Throttle shafts vary in size on various carbureters, and are either 1/4", 5/16", 9/32", or 3/8". On all cast iron risers, wear will be found only in the t4rottle shaft itself, and re- placement of this shaft will cure the conditions of air leaks at this point. On die cast carbureter bodies, which carry the throttle, it may be necessary to rebush throttle shaft hole in the body, as well as replace the throttle shaft. Bushings are available thru the parts department, but after rebushing, be sure and ream the bushings to get proper amount of clearance and proper alignment between shaft and bushings. The throttle fly, when Installed, should be centered to accurately fit the bore of the carbureter body, and throttle fly screws then firmly tightened. Throttle lever also must be tight on, throttle shaft, and if not, replace with new assembly if wear exists at this point.

If riser carries heat control cam, see that the roller is not unduly worn, and is in proper alignment at right angles to the cain plate. If not, replace with new cam roller and lever. Also inspect cam plate for freedom of motion from dash control. If cam is "frozen" tight, inspect small damper assembly in heat tube connection of riser. If same cannot be freed up, disconnect from cam and remove this assembly and replace with new service assembly, after which again connect to cam. See that cam friction is then sufficient to hold cam in position when moved by dash control, and if insufficient friction exists, replace cam stud friction spring.

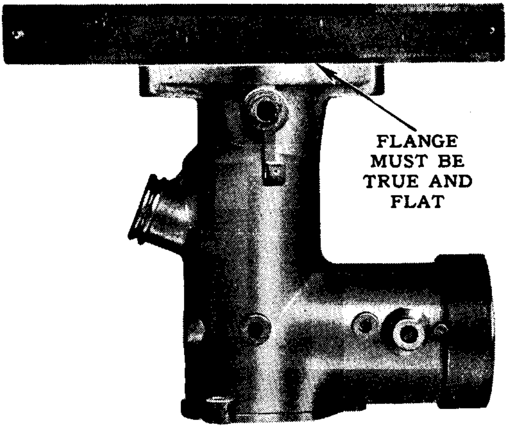

Figure 1

Always check the flange of carbureter body to see that it is flat and true. Gaskets cannot seal air leaks if flange is warped, and proper carbureter adjustment is impossible. (See

Figure 1) .If flange is not true, dress off with file and make true.

Never use anything but hard gaskets with die cast bodies. There are many gaskets which can cause flange warpage when flange is drawn up tight. Use genuine Marvel gaskets designed for this service.

Fig. 2. Clean and Polish

Inspect the spacer block with the low speed venturi.

Be sure and clean the venturi before reinstalling in carbureter body. It should have a smooth polished appearance. Metal polish is a good cleaner and polisher for this. (See Figure 2.)

CHECK FOR WEAR HERE

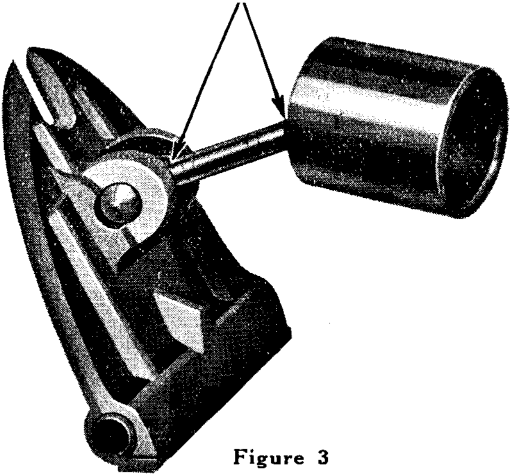

Figure 3

Figure 4

Clean the air valve and plunger assembly (Figure 3) and air valve shaft (Figure 4) using metal polish. If the plunger rod where it attaches to the plunger or to the air valve is worn excessively, replace with a new air

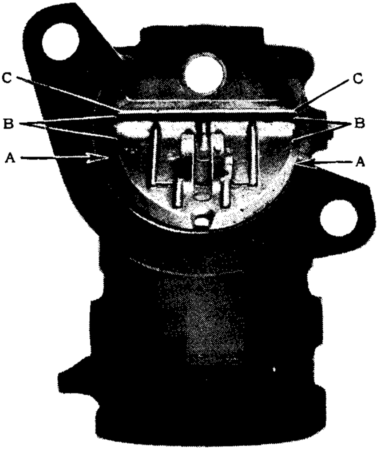

Figure 5

valve assembly (Figure 3) .When installing a new air valve it is necessary to check the fit of the air valve to the body of the carbureter. It must fit against body of carbureter from points A to A. There must be clearance of about .005" at B and B and tail clearance should be checked at C to C as shown in Figure 5. Marvel Calibration Chart gives tail clearance allowance for all models.

Fitting of the air valve to carbureter body should be done by filing. Care should be exercised in fitting not to file too much material away, as it usually only requires removal of a very small amount of material to get the proper fit. Use a fine file for this work and file lightly.

If the original air valve assembly is reinstalled, it is equally important to check fit of this air valve against body. If an air valve fits body, but tail clearance is below specification shown in Marvel Chart, inspection of air valve shaft will show wear and shaft should be replaced with new one.

Inspect the air valve spring. All springs are 1 1/2" in length except the Essex 1930, 1931, and 1932 and the Pontiac Six, 1930, 1931, and 1932, which are 1 1/16" long. In all cases where the carbureter has been in use for 15,000 to 20,000 miles, we recommend replacement of the air valve spring.

All springs are shipped in sealed boxes. with the correct part number on same. Consult the Marvel Calibration Chart for correct spring on each model of carbureter.

Clean the air screw and see that the inside is polished and smooth. There is a designed clearance allowed between dash pot plunger and air screw of .006" to .009". Reaming of air screws with reamers furnished by Marvel factory is only necessary when there is less than this clearance between dash pot plunger and air screw. Gum and corrosion caused by fuels is usually the cause of any binding action between the dash pot plunger and air screw, and if both are cleaned thoroughly, this will eliminate such condition. If a reamer is used on the air screw, be sure that air screw is reamed straight and smoothly.

Install the air valve spring and air screw in carbureter body. The ratchet spring must hold the air screw from moving, and should be installed so that the end of ratchet spring is even with the end of air screw, when the

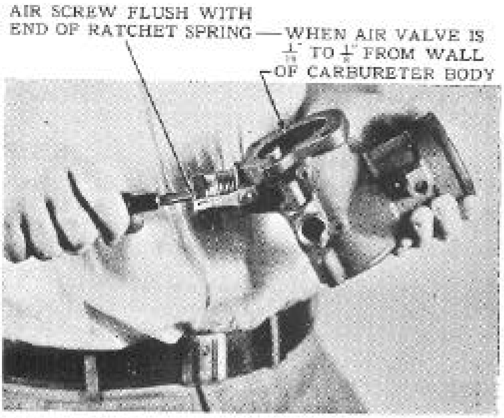

Figure 6

air valve is about 1/16” to 1/8” from wall ofcarbureter body, when held in position as shown in Figure 6.

Reinstall the choker mechanism, being sure that springs work freely. Be sure that choker fly is centered properly and fits bore of air intake perfectly when choke is in full closed position before tightening down on screws. Hard starting is bound to occur if choker fly does not fit air intake perfectly when closed.

Some Marvel Carbureter assemblies are equipped with a starting by-pass operated by the choker. Make sure that the spring holding by-pass valve into body has not been bent, and if it has, replace with new one as it is highly important that this valve is held tightly in the body to prevent air leaks at this point. Leak- age at this point would result in too fast an idle speed, and cause hard starting.

Many of these carbureters are also equipped with automatic choker mechanisms which allow free travel of choker valve during warm- up period, under control of the air flow through air intake of carbureter. Inspection should be made to see that choker fly has necessary freedom of motion, and that springs controlling choker fly are properly functioning.

You have now completed the repairs to the body part of the carbureter.

The bowl assembly is the next thing to work on. Be sure that it is cleaned thoroughly. Inspect all channels with a wire or with air pressure to insure that they are not restricted.

See that the high speed standpipes and low speed standpipes are clear. Examine the jets, and if the carbureter' has been in use for 20,000 miles or more, install new ones, as it is much cheaper to install new ones than to take a chance on them being of incorrect size, either through fuel action or tampering by uninformed mechanics. This includes the low speed nozzle, where a separate jet is not used. Where the old type bowl is used with a low speed adjusting needle, be sure and inspect same to see that no one has screwed this needle so tight against the nozzle as to enlarge the seat, if so, it is necessary to re-place both needle and nozzle. This condition exists when examination of needle shows a wide groove on seating face. Also, examine needle to see that the point is: not bent in any way, as this will change the fuel flow.

To get the right adjustment of the needle, turn it gently in against the seat, then out, until the notch in the disc head is even with the indicator pin extending from the bowl immediately above it, which should be just a little more or less than one turn from closed position. If any doubt remains as to correct needle setting, refer to the nearest Marvel Service Station, which has a fuel flowmeter for this purpose, and can definitely flow this low-speed needle to its correct position.

Always use a new felt packing around needle to avoid leaks, and packing should always be oil soaked before installing. Tighten packing nut firmly to hold needle in set position. Never attempt to lI1ove needle without first loosening packing nut

Never put different size jets or nozzles than those shown on Marvel Calibration Chart in any carbureter. The number of each jet and nozzle is plainly stamped on same and standard specifications should always be carefully followed.

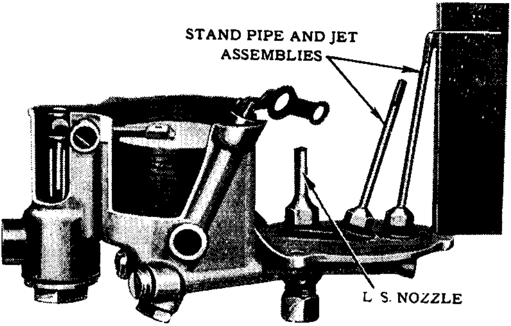

Figure 7

When installing nozzles, and standpipe and jet assemblies, be sure and use new gaskets. Install first the, low speed nozzle, then the intermediate high speed, and then the high speed standpipe and jet assemblies. Be sure and see that correct heights of these assemblies are maintained. They should be measured in manner shown in Figure 7, and should be in accordance with specifications on Marvel Calibration Chart.

The metering pin and jet should be carefully examined. Number of jet, metering pin, and link connecting pin to throttle lever are plainly marked on these three different parts. Metering pin and link should always be disconnected from throttle lever when disassembling, as this is considered part of the bowl assembly. Consult Marvel Calibration Chart for correct jets, pins, and links used in the different models. See that no one has bent the link attaching the metering pin to the throttle lever, as changing the length of this pin will change the time at which it comes out of the jet. If the link is shortened, it will bring the pin out of the jet too soon, and change to the power mixture ratio at too low a car speed, causing a waste of fuel. If the link is lengthened, it will bring the pin out of the jet too late and cause a lean action. Where a link has been bent, always replace with a new link. If in doubt as to whether it has been bent, compare it to a new link. On all old carbureters, always replace the metering pin jet.

The float and float valve mechanism, including the float valve seat, should be assembled in the bowl.

In a great many cases, floats are replaced by mechanics when not necessary. Fuels will not injure a cork float, but may discolor the varnish on same. Under no condition revarnish a float, as a special grade of insulating varnish is used in manufacture. Of course, if the float has been damaged by improper handling, resulting in breakage of the cork, then it should be replaced.

On the other hand, too many carbureters are overhauled in which a mechanic fails to replace the float valve and seat. When the float valve is worn badly, it should always be replaced, and at the same time a new seat should be installed with it. These parts are now only furnished in matched sets. A float valve is worn badly when it shows a groove on its seating face, and a seat will likewise show a wide tapered area where valve contacts. A good valve and seat should have but little more than a line contact.

Float level is also very important, and should be measured in the manner shown in Figure 8, measuring the distance from the top

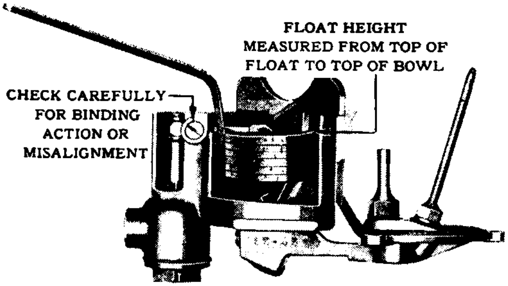

Figure 8

of bowl to top of float, when the float valve is in closed position. It is very import- ant to raise the float to the top position by lifting on lever in front of float lever shaft, as shown, which seats valve same as seated in service from buoyancy of float. Seating the valve by merely pressing down on float valve will not raise float completely and give the proper fuel level, as this does not take up the clearance between float valve and float lever.

See that no binding or mis-alignment of the float mechanism is present, as this is also a cause of carbureter leaks, and finally refer to Marvel Calibration Chart for proper level required on various model carbureters.

Now, test the float valve and seat to see that they hold. This can be done by turning the bowl upside down and sucking on the gas inlet to bowl. If you can maintain a vacuum. the valve is holding. Another method is to have a small tank of gasoline suspended at least 12 inches above the carbureter bowl, and attaching a line from this tank to the bowl, allow to stand for at least 30 minutes. If, with the pressure of this gasoline for this length of time, the fuel does not raise in the bowl, the valve and seat are satisfactory. After this test, install the bowl cover, using a new gasket.

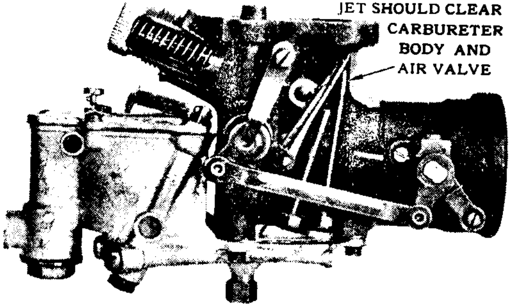

Figure 9

Now, assemble the bowl to the carbureter body, using a new gasket. See that the high and intermediate high speed jets are directly in the center of the air valve. Where a clearance is shown on specification chart between jet and wall, see that jet is ,away from wall of carbureter body the specified amount. In all carbureters, see that these jets do not touch either the wall of carbureter body or air valve. (Figure 9) .

Many Marvel bowl assemblies carry an accelerating pump in conjunction with the metering pin assembly, and operated by same. The check valve for these pumps will be found in the bowl at the end of fuel channel to accelerating pump and metering pin. Inspection should be made to see that check valve is in place and free to close against its seat.

With bowl assembled to body on Marvel installations using heat risers, next assemble riser to carbureter proper, using new gasket, find connect up metering pin link to throttle lever.

In order to assist in overhauling carbureters, we have recently made a package of gaskets which consists of a complete set for the carbureter. When overhauling a carbureter.

Always use a new set of gaskets. These packages are very convenient, and are each sold at a reduced price as an assembly.

The work done above, if carefully followed, will make any carbureter as good as new, and there is no reason why any mechanic, by properly following these directions, and measurements, as shown on the Marvel Calibration Chart, cannot make a satisfactory carbureter overhaul.

The carbureter is now ready for installing on the car. When choker and throttle controls are hooked up, see that throttle opens wide and properly returns to closed position. Likewise see that choker control is properly connected so that choker fly comes to full closed position when operated by dash control, and likewise returns to full open position when dash control is fully released.

On installations using heat control, inspect damper valve in exhaust manifold, which must move freely. Place heat control in full heat position and connect damper to carbureter. With throttle closed, damper valve should also be in closed position. If not in closed position, inspect connections between damper and carbureter throttle, which may have been bent or tampered with by some uninformed mechanic.

If you do not have the parts and necessary tools, send the carbureter to the nearest authorized Marvel Carbureter Service Station. They are fully equipped to do this work and will be glad to help you in all your problems.