Service Inspection Manual

for

Hudson Mechanics

HUDSON MOTOR CARS

HUDSON MOTOR CAR CO.
DETROIT, MICH.

SERVICE - must be judged by conditions under which it is rendered, and the circumstances which necessitate it.

¶ Co-operation is essential.

¶ If he who wants service will contribute towards it he will be better satisfied.

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Introduction

This book explains the numerous adjustments which are built into the Hudson car to make it economical of up-keep.

It is intended mainly for the benefit of our dealers' mechanics, or those upon whom the work of adjusting and inspecting Hudson cars devolves.

It is also issued to Hudson Owners so that they may be guided thereby should they be unable to take advantage of the assistance offered by our numerous dealers throughout the country and to enable them to direct and supervise repair work or adjustments which it may be necessary to have done in local repair shops where Hudson experts are not at hand.

Hudson cars are so widely distributed and are found in so many remote districts where service of any kind—hotel, railroad, telephone, etc., included—is almost entirely absent, that we recognize the obligation of thoroughly posting such owners as to the construction of their cars.

We believe that there can be no general definition of the word "Service," except that it obviously means the satisfactory elimination of any trouble which may be experienced, and the immediate fulfillment of an owner's requirements.

The troubles experienced by automobile owners are so varied and their requirements are so entirely governed by the human element, that it is impossible to issue a manual which would cover every situation in detail.

It must be borne in mind, however, that we all are dependent upon one another, not only for sustenance and protection, but in the discharge of obligations. No employee of a railroad, hotel, or any organization which performs labor for others, can give full satisfaction unless it is with the co-operation of patrons.

Automobile owners must co-operate with the dealers from whom they purchase their cars. And if they are reasonable in their demands, temperate in their judgment of employees, and conscientious in the discharge of their own duties, they are ninety-nine percent satisfied with their automobiles and with everything else they own.

To qualify these three necessary attributes, we will say first that it is reasonable to suppose that the foreman of a repair shop is better able to judge how long a job will take than a casual observer who is seldom in touch with the shop.

To demand that work be completed within a certain time, or to endeavor to extract rash promises of this nature from an employee, is unreasonable and results in dissatisfaction to the owner and jeopardizes the employee's good standing.

Hurrying repair work and inspection frequently results in important work being neglected or postponed and this, in turn, results in unexpected break-downs which might have been avoided had more time been allowed.

It must also be remembered that almost every man who owns an automobile has accumulated a little more than the average amount of wealth. It is equally reasonable to assume that he has done so by reason of his own ability. Therefore, he is very apt to possess ability beyond the average found in the working classes, from which ninety percent of our mechanics are drawn.

To expect all mechanics to display intelligence, judgment and foresight equal to that of the average Hudson owner is unreasonable. The owner must take this into consideration in judging the treatment he receives at the hands of employees in the dealer's Service Department.

The same applies to service of any kind—in a hotel, on the railroad, from the telephone company, or in a large department store. Obviously, the better the organization, the better trained will be its employees. This credit is due to the organization rather than to the employee.

The Aim of This Book

The Hudson Motor Car Company is endeavoring to place this booklet in the hands of every mechanic working on a Hudson car in order that he may not be required to work out problems for himself but rather that he may be able to adjust and repair a car along the lines detailed by experts in that work.

An automobile is a complicated piece of mechanism which comes in for more hard usage and abuse through lack of knowledge on the part of its operators, than any other piece of machinery we know of.

A locomotive represents quite an investment to a railroad company and is but little more complicated than an automobile. In comparison, an automobile does better work than a locomotive and the latter is invaribly operated by trained employees.

It travels on a smooth track but seldom makes more than a hundred miles at a stretch, and is sent to the round-house at least every 250 miles for a thorough inspection by expert mechanics. Every nut and bolt is gone over and tightened and all bearings and other lubricating devices are thoroughly inspected. This is done because the break down of a locomotive results in

the blocking of a line of traffic and the dissatisfaction of many hundreds, perhaps thousands, of people. It would not make for good service.

In the same way, lack of attention to an automobile sometimes results in break downs and delays, causing unnecessary expense which tends towards dissatisfaction.

For this reason, we say that owners must be conscientious in the discharge of their obligations as to the maintenance of their cars.

In the foregoing paragraphs, we have touched upon the necessity for inspection. Obviously, such inspection must be periodical according to the length of time the car has been in service or according to the actual mileage.

A new automobile, by reason of the fact that the owner is likely to be unfamiliar with its construction, and also due to the wearing in of the newly assembled parts, requires a little more careful attention during the first few months of its usage than it will thereafter. Therefore, all new Hudson cars should be inspected within the period of the first 500 to 600 miles of usage.

We do not expect that an owner who has been acquainted with his car such a short time should be required to make this inspection himself as long as he is able to take advantage of the more expert attention which our dealers are willing to give.

If he is located where he cannot take his car to the Hudson dealer's Service Station, it devolves upon him to make arrangements with that dealer for a mechanic to visit him. If this would involve too great a traveling expense on the owner's part, the car should be taken to a local repair shop and the work directed as outlined in this book.

A second inspection should be made after 1000 to 1500 miles of service, or within not more than two months' time, irrespective of mileage.

Thereafter, an inspection should be made at periods of one month, or approximately every 1500 miles of running.

Every owner of an automobile is interested in keeping down the operating expense of his car, especially those items of replacement of parts.

If the reader of this book is a Hudson owner, we have no hesitation in saying his car will cost little for up-keep if he will take advantage of the Hudson dealer's Service Department, if he will afford regular opportunities for inspecting his car, and if he will conscientiously discharge his own obligation in regard to the lubrication and operation of it.

Several years ago, it was the general belief that an automobile should run for about a year without attention; but that after that period, the car should be "thoroughly overhauled" before it could be considered in serviceable condition and ready for another year's work.

These overhaulings were naturally expected to be expensive operations and they generally resulted in the owner, who of necessity had to be a man of more than average wealth, disposing of his old car and purchasing a new one that he might obtain thereby another year's service at little expense. Obviously, the depreciation in disposing of such used cars was a considerable item.

The modern automobile is good for many years' service. Its only depreciation, from the standpoint of the owner, is in style, which, in these days of rapid improvement, changes almost as fast as the fashions in dress.

A good, modern automobile—and we emphasize especially, a Hudson automobile—is designed with built-in adjustments and facilities for lubrication which permit of its being maintained for many seasons in the pink of condition with no other attention than systematic, periodical inspection and adequate lubrication.

The Hudson Motor Car Company believes that all automobile owners appreciate these facts and that the greatest handicap in realizing such ideal conditions has been lack of competent mechanics and the absence of definite and detailed advice on the construction and up-keep of the car.

As far as the Hudson Motor Car Company is concerned, its service policy has been principally one of "Instruction." We have found by experience that the more information we issued in regard to our cars, the more promptly and satisfactorily are Hudson owners cared for by our dealers' mechanics.

No amount of good business methods or integrity of a manufacturer can do so much to satisfy the purchasers of a mechanical product as can competent help in time of trouble.

We have supplied such help to Hudson owners by means of our Reference Book, Lubricating Chart, and this booklet entitled "Hudson Service Inspection."

We have supplied it to our dealers by means of an elaborate system of technical Hand Books and by special information issued the moment necessity for it arises.

Ordering Repair Parts

When accidents occur, it invariably happens that repair parts are needed in a hurry.

It therefore has been our endeavor to have all Hudson dealers carry a stock of parts proportional to the number of cars in use in their territory.

In another part of this book is a map of the United States showing all the points where are to be found Hudson distributors or dealers who carry a large stock of parts.

If owners who are touring will consult this map and the list of dealers included herein, before ordering parts, they often may save considerable time and also transportation expense.

We therefore commend this to owners as another way to co-operate with our distributing organization so as to enjoy efficient service.

In this book you will find also twelve order blanks which should be used when ordering parts by mail, either from the factory or from the nearest dealer.

If owners will fill out all the information required on this blank, we will guarantee to fill the order correctly. If for any reason we fail to do so, it will be at no expense to an owner, either as to parts or transportation charges.

It must be noted, however, that it is required to fill in legibly name, address, car model, car number, car mileage to date, the approximate date of receipt, and the name of the dealer from whom the car was bought.

As an aid to the correct designation of the parts required, we refer you to the information contained in that portion of the book which deals with inspection.

If you will look up the items of inspection pertaining to that definite section of the car for which you require parts, you will be better qualified to specify such parts.

Should it be thought advisable to send parts back to the factory or to our dealers for duplication, please note that they must be sent **transportation prepaid,** and that the owner's **name and address** must be **legibly marked** upon the **outside of the package.**

Any correspondence pertaining to the part in question or inquiries for advice must **not be included with the goods** but must be mailed under separate cover.

It is advisable to notify the consignee (The Hudson Motor Car Company or the dealer) that parts are following by a certain express company and for a certain purpose. Include with the letter an order blank properly filled out.

This co-operation which we request involves but little time and trouble on the part of an owner. Yet on it depends largely the degree of satisfaction an owner will obtain from his car and the opinion he will form of the Hudson Motor Car Company and its selling organization.

ITEM No. 1

Lubrication Of All Points Shown On Chart

Perhaps no other feature of maintenance is so important to the life of an automobile as lubrication. Howard E. Coffin, the famous automobile pioneer, who has been so largely responsible for the design of Hudson cars, created the slogan, "THE BEST INSURANCE AGAINST TROUBLE IS LUBRICATING OIL." We are sure that all automobile owners appreciate this fact. But it is to be regretted that so few manufacturers have realized the necessity of furnishing the purchasers of their cars with information sufficient to insure their being familiar with the parts which require periodical attention and lubrication. Nothing will make a car last longer, barring accident and inconsiderate use, than high grade motor oil, suitable greases, and frequent inspection.

The Hudson Motor Car Company issue with their car a Reference Book, containing a Lubricating Chart. Included in the envelope which contains this Reference Book, is a large Chart of the same nature, printed on heavy paper and suitable for hanging in your garage. If you will conscientiously follow the instructions outlined on this chart, the necessity for replacing bushings and other wearing parts will be minimized to a degree almost beyond belief. It is not wise to discount our instructions that a certain part be lubricated once in so many miles. It is always possible to go a little farther than we specify but we have no hesitation in saying that if you will follow our instructions **to the letter,** you will realize the **ideal** condition under which a car can operate.

If this lubrication is objectionable to you, it devolves upon you to employ some one who will take care of the work. If you will take your car to our dealer for regular monthly inspection, he will go over it thoroughly and in accordance with our instructions. The oil and grease required for the work costs but little at the time but results in a considerable saving after a season's use of the car. Certain parts, such as the clutch throwout collar, water pump glands, oil reservoir, shackle bolts, etc., require more constant attention than a mere monthly inspection. These, therefore, must receive **your** attention daily, or according to the mileage specified on the chart.

It must be borne in mind that any guarantee given by the dealer as to the satisfactory operation of your car, is entirely conditional upon your fulfilling your obligations in respect to lubrication. For it would be unreasonable to assume that either the manufacturer or selling agent of an automobile could afford to place it in your hands and guarantee it unconditionally without

the assurance that it was going to be properly maintained. Such maintenance as we specify is absolutely essential to the satisfactory operation of your car.

See Hand Book Inserts, Nos. 123 and 128 and Hudson Owners' Bulletins as follows:

No. 9—Speed and Oil in Moderation.
No. 11—The Hudson Clutch.
No. 13—Lubricants in Cold Weather.
No. 15—Preparation of a Stored Car.
No. 16—Engine Oils.
No. 18—Springs.

ITEM No. 2

Clean Out Oil Reservoir—Refill With New Oil

Just as the human body depends upon good heart action, proper blood pressure, and the necessary qualities in the blood to nourish and sustain the nerves and tissues which govern our movements, so a motor needs sufficient circulation of good quality oil to eliminate friction and prevent wear to its moving parts. It must be borne in mind that the motor represents the entire source of energy for your car. It does an enormous amount of work and will stand a great deal of abuse before it wears out. Just how long it takes to wear out depends largely upon the grade of oil you use, the functioning of the oil pump, and the frequency with which you clean out the system and refill with new oil.

On the new Hudson, the oil reservoir is large and contains sufficient lubricant for many hundred miles. In order that you may waste as little as possible when draining the reservoir to refill, the oil level should be allowed to get lower as inspection day approaches. In the case of a new car, it is absolutely essential to drain off the reservoir after the first 500 miles and fill to the correct level with new, clean oil. There is a plug in the oil base for the purpose of draining and it is such a simple matter to perform this item of maintenance that there is really no excuse for an owner not doing it himself or having it done locally should he be unable to reach our dealer in time.

Pouring fresh oil into a reservoir containing a small quantity of dirty, used up oil, is not economy. The dirty oil, which contains sediment and carbon and is therefore black in color, mixes with the fresh oil and depreciates it in proportion to the amount of dirty oil mixed in. Thus, if you buy good quality oil at 50c to 80c a gallon, and pour in a gallon of it on top of a half-gallon of dirty oil, you are doing no better than filling

the motor with the cheapest grade of oil you can obtain and you have depreciated the value of the new oil at least fifty per cent. At least once a year, or after 6000 miles of running, the oil reservoir should be removed and thoroughly cleaned out. At least every 1000 miles, the reservoir should be emptied, flushed out with a quart or so of new oil to remove sediment and dirty oil remaining in troughs, and then refill with new oil.

We have issued a Bulletin on the importance of knowing the grade of oil used in your car and will be pleased to forward this upon request to any owner or interested party who requires further information.

Always bear in mind that putting new oil into a dirty reservoir is no better than using cheap or dirty oil to refill it; that the crank case should be drained and thoroughly flushed out every 1000 miles; that the cheapest kind of insurance against motor troubles and repair bills for overhauling is the cleaning out of the reservoir and refilling with new oil of good quality.

Reference—Hudson Owners' Bulletin No. 16—Engine Oils.

ITEM No. 3

Oil Pump Working—No Leaks

The reservoir having been cleaned and refilled, the oil pump should be inspected to see that the gauge is working properly and the regulating connection has not loosened or come out of adjustment. When idling, or running slowly, say up to ten miles an hour, the gauge should indicate approximately 1 to 1½ pressure. As the motor is accelerated through opening the throttle, the pressure should increase so that when racing the motor, or traveling at speeds above 35 miles an hour, the gauge should register 3 to 4 pressure. With the throttle wide open and with a car speed of approximately 60 miles an hour, the gauge should register full pressure.

Only in case the circumstances warrant it, should you drive your car without the oil pump working and then only when the oil reservoir has been filled so that the oil remains at a constant level in the troughs. We do not recommend this except in case of absolute necessity.

The construction of the oil pump and the method of regulation is fully covered in the Reference Book supplied with the car. As a precaution, this information is given again hereunder.

As speed and power increases, it imposes proportionately greater strains and stresses upon the moving parts of a motor; hence it has become necessary to develop an entirely new and improved oiling system. On the new Hudson motor, this is most suitably termed a circulating, constant level, splash system.

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The oil pump is mounted at the front of the motor, well above the frame line and in a position where it may be instantly inspected, removed, or tested without recourse to special tools or other appliances. Furthermore, it is of such simple and sturdy construction as to be easily comprehended by the layman.

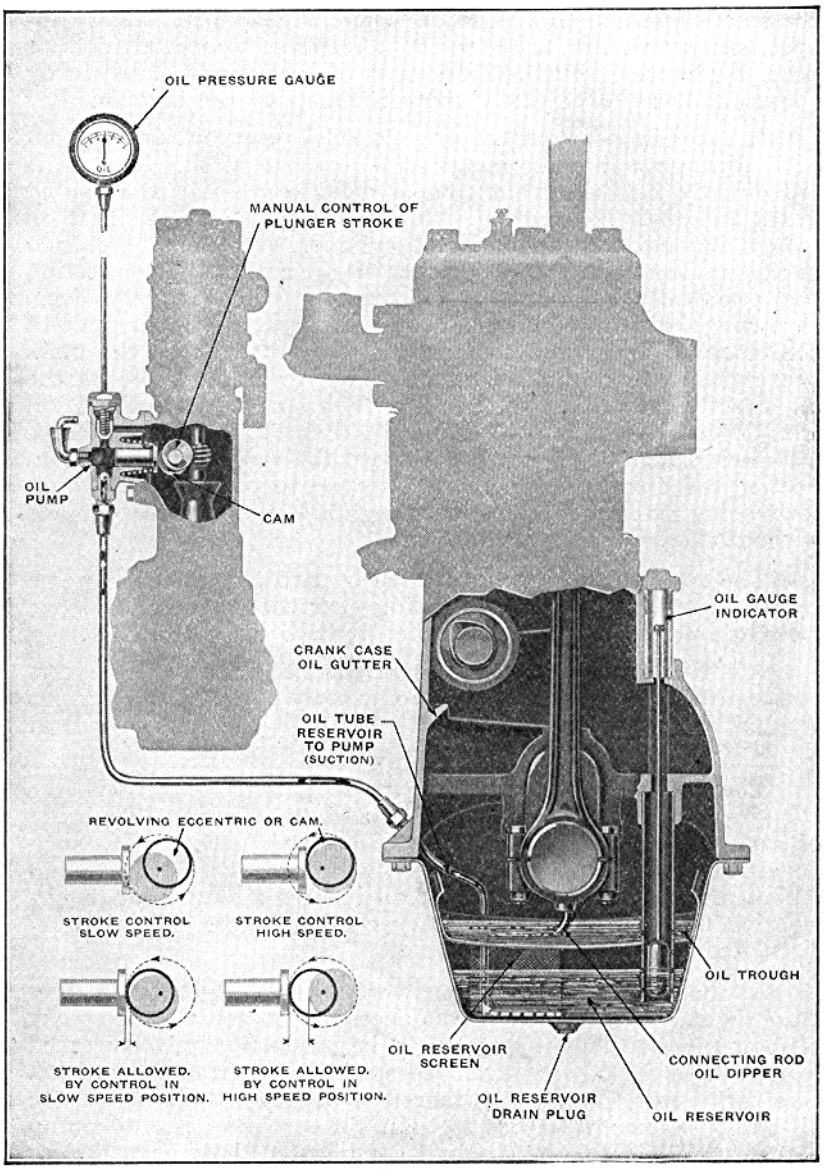
It takes its oil from the pressed steel reservoir, drawing all of it through a filter or metal screen of fine mesh. The oil is fed directly into the front compartment containing the timing gears and their bearings and flows from this into the first oil trough immediately under No. 1 cylinder. At each revolution of the crankshaft the large splasher on the end of the connecting rod practically empties this oil trough, which is very deep, throwing the oil into suitable channels or gutters on the side of the reservoir and crankcase. The upper gutters feed the main bearings in a continuous stream. The lower gutter feeds the oil directly into No. 2 oil trough. The splash from No. 2 oil trough feeds No. 3, and so on until No. 6 oil trough is reached, at which time the oil flows back into the reservoir. The connecting rod dipper is sufficiently effective to permit a very high level being maintained, thus insuring lubrication on steep grades without excessive oil consumption.

The two center bearings are fed by two troughs each. The front bearing is fed from the timing gear compartment and one trough, and the rear bearing is fed by two large troughs.

It is therefore immediately apparent that all oil which enters at the front end must circulate completely through the various troughs and bearings of the motor before it can find an exit at the rear end of No. 6 trough, there to re-enter the reservoir.

The reservoir contains over three gallons of oil (in the troughs and in the reservoir itself), and on account of its being of such large capacity and made of pressed steel, having such an exposed position under the motor affords excellent cooling facilities. The large quantity of oil insures a slow enough circulation to allow of the necessary cooling before the oil is recirculated through the system.

As the connecting rod dippers would splash proportionately more oil at higher speeds, it was necessary to control the stroke of the pump so that the flow might be proportionately increased to cope with the power developed as the motor was speeded up. The carburetor throttle has therefore been connected with the oil pump in such a way as to limit the stroke of the oil pump plunger. While this may sound complicated, it is nevertheless an extremely simple device, the action being obtained by means of an eccentric and a very large pump plunger. This eccentric holds the plunger away from the cam, which actuates it at low



Details of Oiling System

speeds, but allows it to come closer to the cam as the motor speed is increased. The pump therefore has a very short stroke when the motor is idling at the curb or running slowly, but the minute the throttle is opened wide, the pump plunger stroke is immediately increased in proportion so that before the motor has had time to pick up speed, the pump is delivering the necessary amount of oil to lubricate all moving parts under the increased pressure.

The reservoir is fitted with a float indicator which shows the level of the oil by means of a red button working in a glass tube on the left hand side of the motor.

For the benefit of mechanics working on our 1914, 1915 and 1916 models, it should be noted that the characteristics of the oil pump on these models are slightly different. The gauge should register approximately 1½ lbs. at all times and all speeds up to about 25 miles an hour unless the oil be cold, in which case the increased density causes it to record more pressure on the gauge, which is quite delicate and unaffected by temperature. At speeds over 25 miles an hour, the oil gauge will average 2½ lbs. pressure.

TESTING

If the gauge fails to register, the oil line connected to the top of the pump leading to the gauge should be removed and it can then be noted whether oil squirts out at the disconnected joint. If it does not, it is obvious that the pump is not working. The plunger which operates the gauge may not be operating or the ball check on the suction line may be clogged, or waste may have accumulated under the seat of this ball check so that the oil which is pumped from the reservoir may be forced back into it instead of being checked and forced into the bearings. The oil pump should then be removed and operated by hand in a bucket of oil, where its action can be easily observed. Before replacing the pump, it should be noted that the gasket between the pump and the crankcase is in good condition, and not indicating leakage.

On the 1914, 1915 and 1916 models, the pipes through which the oil is distributed are secured in the crankcase by compression type unions. Should there be leaks, it is obvious that the pump would suck air from the crank case instead of oil. These unions should be tightened by screwing up on the steel nut which will be observed in the hole through which the pipe projects. Putting packing around these unions is not a satisfactory way of eliminating air leaks on a suction line. It is absolutely necessary that the union be clamped up tightly so as to form a tight joint. Refer to pages 11 and 12 in our 1916 Reference Book for further

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information on oil pump construction and oiling system used on our 1914, 1915 and 1916 models.

Please bear in mind that **on all models,** the first thing to do when the oil gauge does not register is to disconnect the line leading from the pump to the gauge. This line, being sealed at the gauge end, contains no oil whatever. The gauge is therefore operated by the air pressure resulting from the oil distribution from the plunger in the pump. If the pipe connection at the gauge is loose, the oil will displace the air and, having an exit, will leak at that point. The line should then be drained of all oil and the union tightened up. This will restore the system to its original condition.

Never test the oil gauge with a tire pump or air pressure as this gauge is built to take only 5 lbs. pressure.

If the leakage is at the pipe connection on top of the pump, it will be immediately apparent and tightening it up will cause the oil gauge to work again. If the oil gauge connection be removed at the pump and no oil squirts out at that point, it is obvious that the pump is not working. On the new model there is a priming cock at the front of the pump and this should be primed and the pump tested for action before taking it down. If priming restores its action, it is reasonable to assume that the ball check is not holding back the oil in the pump and must be re-seated.

If these simple instructions are borne in mind, the repairing of the oiling systems on all models will be found extremely simple.

ITEM No. 4

Oil Reservoir Gasket

Our reason for calling for an inspection of the gasket is simply to insure against leakage. It is always possible that the oil reservoir may have become damaged through a large stone or some other road obstruction having hit it and this may have strained the reservoir to such an extent as to open a leak in the gasket.

It is also possible, though hardly probable, that some of the cap screws have become loose, causing a leak.

Such things all tend towards excessive oil consumption, unnecessary expense, and sometimes the danger of running out of oil and burning out the bearings in the motor. It is therefore highly important that the motor should be started and the gasket watched for leaks. Such leakage may be cared for by tightening the set screws, renewing the gasket or adding packing as the occasion may require.

ITEM No. 5

Examine For Carbon—Check Spark Plug Gaps

There are so many different types of spark plugs on the market, and the construction of the electrodes, porcelains, etc., is so widely at variance with the type of plug which we have found desirable, that we feel it essential to notify all our dealers and owners on the subject.

The Hudson motors are of the high compression, high speed type and the combustion chamber is comparatively small. On this account, it is absolutely essential that the electrodes be quite short and of the material or size necessary to prevent their becoming red-hot and causing pre-ignition. Plugs with a closed end, or shell, which extends down into the combustion chamber, will be sure to cause pre-ignition. The same is true of plugs which have several electrodes, or one central electrode of very thick section. On this latter type of plug, the porcelain is usually hollow and generally known as the "petticoat" type. On account of the great heat to which these porcelains are subjected, breakage is quite frequent, and the length of the electrode in such a plug is certain to cause pre-ignition.

Another disadvantage of the long electrodes is that they distort or warp under high temperatures and vary the spark gap from the correct setting.

The plugs which are fitted at the factory are of a type calculated to give the maximum amount of satisfaction and we are positive that they will not cause pre-ignition under any conditions.

We do not insist that the particular type of plug which we use be carried by our dealers or used by owners but we recommend that they consider our judgment in the selection of a plug before purchasing. Any type of plug which has a short, solid porcelain and small, short electrodes, will be satisfactory, provided the shell does not project down into the combustion chamber farther than the standard plug we supply. Such a plug must be gas-tight, and preferably without joints or packing.

The correct gap for the standard spark plug on the Hudson motor is from .025" to .028".

The symptoms of pre-ignition are: Back firing in the carburetor and missing under a heavy pull, especially on long hills where the constant load has a tendency to heat the motor above normal temperatures.

If the electrodes are being warped out of place by this heat, the missing will continue. After an experience of this kind, it will be necessary to remove the spark plugs and reset them. This will be only a temporary relief for they will develop the same trouble the next time they are subjected to a long pull or a slight overheating. The remedy is, use the correct type of plug.

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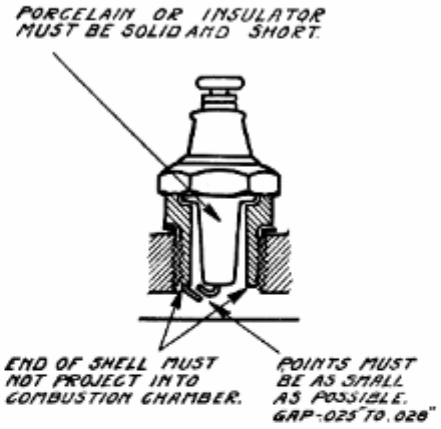
Owners will do much towards facilitating the work of mechanics if they will advise them of any symptoms of the above nature having evidenced themselves in driving their cars under the conditions outlined.



Plugs which have seen a season's service may become oxidized at the electrodes to such an extent as to cause the motor to miss when pulling hard. This can be eliminated by cleaning the electrodes with emery cloth.

The removal of a spark plug affords an excellent opportunity to inspect the cylinder for excessive carbon deposits. If excessive carbon is found to exist, the owner should be notified and his authority obtained for removing the carbon as it is obvious that a motor cannot be expected to operate satisfactorily if the cylinders are clogged in this manner.

The formation of carbon in the cylinders may be due to incomplete combustion of the gasoline, or the quality of the lubricating oil used, or both. Usually when such deposit is on account of a poor grade of lubricating oil, the difficulty may be eliminated by the use of a better grade, but when the formation is due to incomplete combustion of the fuel, the cause is usually of a mechanical nature and may be obviated. Leaky valves or pistons aggravate the conditions which cause carbon, because compression is thereby reduced and rate and completeness of combustion are impaired. Rapid and complete ignition is impossible at ordinary motor temperatures without proper and sufficient compression.

A weak spark may also give similar results although perhaps not to the same extent as poor compression.

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Incorrect carburetor adjustments, especially those which will increase the amount of gasoline drawn into the cylinders, are also responsible for carbon formation, and lastly, the timing of the ignition has an important bearing on the same subject.

Poor compression rarely exists on account of piston or piston ring trouble, but is more likely due to the carbon itself, which tends to accumulate on the exhaust valve seat, preventing tight closing of the valve and causing subsequent escape of the charge during the compression stroke. The weak compression not only results in lack of power but also in further deposit.

Grinding of the valves will therefore usually result in bettering conditions materially. We do not suggest to our owners the advisability of carrying out this operation themselves, although many who are mechanically inclined can obtain sufficient information from their mechanics to carry out the work successfully by observing the operations performed.

Weak ignition is usually due to depleted battery or poor contact of the generator brushes on the commutator, and may also be due to misadjustment, or accumulation of dirt on the distributor points, or improper setting of the spark plug gaps. Weak ignition can always be remedied and should not be tolerated.

Ordinarily it is unnecessary to make any change in carburetor adjustments especially when the Zenith or the Hudson carburetor is used. However, on 1914, 1915 and 1916 models on account of the poor grade of gasoline procurable at the present time, it is sometimes advisable to increase the size of either the high speed jet or the compensator during cold weather and to decrease them in warm weather, this being the only change necessary. In connection with these changes, the use of the strangler valve virtually amounts to a change in the carburetor setting, as the amount of gasoline drawn into the cylinders can be thereby increased and the judicious use of this accessory is recommended. Cold air should be used up to the point where missing or lack of power occurs, after which the hot air may be resorted to. Do not, however, attempt to operate your car in the strangled position, except perhaps for a very few moments on extremely cold mornings.

It is seldom necessary to change the timing of the ignition on Hudson cars. If for any reason, the small cam operating the breaker points should be shifted, it will be necessary to retime the ignition correctly, or of course obtain unsatisfactory results. Should this condition arise, we suggest that you study carefully the instructions in the Reference Book.

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We have gone to such length on this subject because we believe it advisable for all owners and mechanics to thoroughly appreciate the danger of allowing the motor to remain in a carbonized condition. Cleaning out the carbon is a matter of maintenance and to be expected periodically on any automobile. The average car, if maintained in accordance to our instructions and supplied with a high grade of oil, will run at least 3,000 miles before carbon deposits become in any way excessive. Where a good grade of gasoline is also used, it will be possible to run as much as 5,000 miles without any signs of carbon, provided the other conditions are correct. If you neglect to use good oil or to drain it out at specific periods, and if you do not conform to the instructions relative to the operation of the carburetor, etc., it is only reasonable to suppose that it will be necessary to remove the carbon more frequently.

The actual work required to perform this operation is not great since the removable cylinder head affords an excellent opportunity for doing a good job in a short space of time. It is to be borne in mind that in replacing the cylinder head, the holding down nuts should be tightened equally all over so as to avoid putting excessive pressure on any portion of the head at one time. This is only in accord with good practice and is generally understood by mechanics. The gasket between the cylinder head and the cylinder proper, need not be destroyed if due care is exercised. It is better to leave this gasket in place, taking the necessary precautions to prevent heavy tools falling upon it and denting it, rather than attempt to remove it and the cylinder proper. Should you remove it, be sure to replace it with the copper face up. No compounds or packing materials are necessary in order to make the gasket tight but it is necessary to have a clean surface between the cylinder head and the gasket. It is recommended that the water pipe on the cylinder head be removed to facilitate tightening the holding down nuts.

The hot air intake pipe which passes from the cylinder head will get out of place very easily and as no particular pains need be taken to insure tight joints at either the carburetor or manifold. it is an unimportant feature.

We do not recommend the carbon burning process because the skill of the operator is largely responsible for the job being satisfactory. On our 1915 models, however, it is unquestionably more economical to employ this method since the removal of the cylinders, when undertaken by incompetent hands, may prove a very expensive operation.

REFERENCES.

Hand Book Insert 118—Repairing oil floats.
Owners' Bulletin 16—General information on oils.

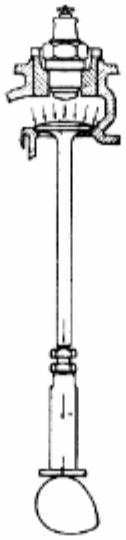
ITEM No. 6

Adjust Tappets and Check Clearance

As the demand for motor silence is becoming more and more pronounced and there is a tendency for mechanics to heed owners in their demands for this extreme silence, the question of proper adjustment of tappets becomes important. This does not refer to instances where any one particular tappet is noisy to an unusual extent, but to instances where the general tappet noise of a motor is greater, in the opinion of the new owner, than that in some other motors he may have noticed.

The lashing up of tappets with a minimum clearance on new cars results in cut push rods and cams. If it were possible to get all Hudson owners to drive their cars with a .005″ to .006″ tappet clearance for the first 500 miles, the wearing of tappets and cams would be practically unknown. If owners could be made to appreciate what this means to them in the ultimate life and economy in operating the car, they would certainly be glad to drive their cars with a little more noise until the parts were worn in and could be tightened with safety.

Showing condition which prevails when tappets are adjusted too closely and motor running under a load. Note valve slightly open due to expansion of valve stem, allowing full force of explosion to be transmitted through valve assembly to bottom of tappet. Cut push rods and burned valve seats are some of the results.



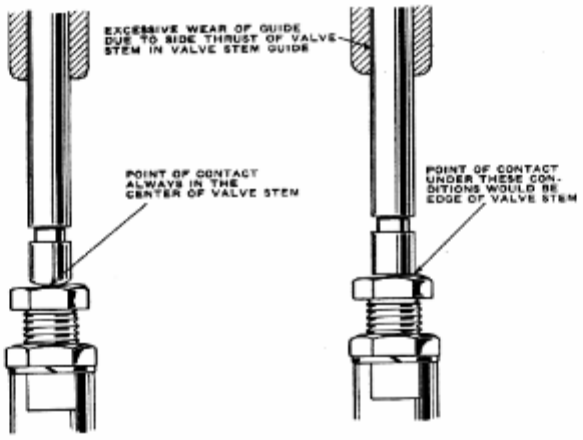
If proper clearance is allowed at these points, a film of oil will accumulate between cam and bottom of push rod at every revolution of cam shaft, preventing any chance of a cut tappet.

It is not right to take the quietest tappet of the twelve and lash up the others to equal it. Endeavor to average the noise as much as possible. The motor may be a little more noisy, but so long as there is a distinct evenness to the sound, it is far

ITEM No. 6

less objectionable than eleven quiet tappets and one noisy one. This method of adjustment offers a clearance of from .004" to .006" which will never result in cut push rods.

In the sketch we have endeavored to show what takes place when the tappets are lashed up too tightly. The tappet is riding the cam all the time. The ground surfaces of the cam and tappet, although perfectly smooth to the eye are actually not so. Any ground surface, fresh from the grinding wheel, is quite rough when viewed under the microscope, and if two such surfaces run together at high speed and with little or no oil, cutting is sure to result. The reason for this is that small particles of steel, which are removed by the cutting action, stay in the path of the cam and push rod and are not flushed out by the oil film, as would be the case if the tappet had sufficient clearance to leave the cam every revolution and allow a little oil to accumulate. We have made some tests on this phenomenon and find that a tappet which is run 500 miles with a .006" clearance polishes up to such an ideal surface that it is practically impossible to wear it thereafter even by abuse.



It is a physical impossibility to machine two surfaces so that they will always come together with a perfectly flat contact. Our sketch shows, in an exaggerated way, the condition of the adjusting cap screw which is not absolutely square with the bottom of the valve stem. In the case where the flat valve stem is used, the contact is made to one side and there is a direct thrust or tendency to push the valve stem away, which causes rapid wear

ITEM No. 6

of the valve stem guides. By pointing the end of the valve stem, it forms a small cup seat for itself, which is also in the center of the adjusting screw and the lift is therefore always direct and perfectly vertical.

As the quality and amount of oil contained in the motor has also a great deal to do with valve tappet noises, it is important that you do not unnecessarily adjust tappets without making due allowance for the condition of the oil and its effect on such tappet noises.

ITEM No. 7

Grind Valves If Necessary

It frequently happens that the inexperience of the operator results in incorrect manipulation of the carburetor strangler or improper lubrication. One of the troubles to be feared from such errors is an excessive carbon deposit on the valves and a tendency to destroy or corrode the valve seats. This is commonly known as "pitting." The reason why we specify an examination of the valves upon inspection day, is not so much because we wish to have these ground in periodically, but rather that the compression of the motor may be tested and the exhaust valves in particular be tuned up to see that they are seating properly.

If the valves are reground at the first sign of poor seating, subsequent regrinding may be totally unnecessary for a long period. However, if these things are allowed to go uncorrected, the result is bound to be a missing motor, jerky action of the car, and very probably a dissatisfied owner. We, therefore, consider it a part of the dealer's obligation to keep the motor properly tuned up in this respect during the first two months of the car's use. Obviously, the sooner these things are attended to, the less likely they are to cause trouble in the owner's hands at a later period.

A set of valves properly ground in after a car has run 500 miles or so will last for at least 4000 miles before they need touching up again, but if they are allowed to go until they are badly pitted before being ground in, as would be the case if they were not given proper attention upon the first inspection, the work necessary to put them in good shape would be considerably greater. Perhaps the valves would have to be turned down in order to re-seat them and the seats would have to be re-cut with a special tool before the valves could be ground in to them so as to hold compression properly.

This, therefore, becomes a matter of maintenance as mileage increases. If the compression is good on the first two or

three inspections, it is safe to assume that the valves are seating properly and the car is receiving considerate usage. If it becomes necessary to grind the valves in after the car has seen 3000 or 4000 miles of use, the owner should be notified that he may authorize the necessary work to be done at his expense. It is also well to note that at the time of inspection, these operations may be performed more quickly and at less expense to the owner.

ITEM No. 8

Valve Cover Plate Gasket Oil Tight

Quite a little oil is lost through leakage at the valve cover plates, especially after these have been removed by an incompetent workman for the purpose of adjusting or verifying the adjustment of the tappets. The cover plates are provided with gaskets and the gaskets are riveted on so that they will not be easily disturbed or damaged. Should such trouble occur, the leakage at the cover plates would be considerable, so much so that it may affect the oil consumption and bring forth complaint of this nature. The only remedy for a damaged gasket is replacement.

In cases where the gasket is not visibly damaged the remedy for leakage is proper alignment and a thorough tightening up.

In further explanation, it must be understood that a great deal of oil is pumped up into the valve tappet compartments. This is because the upper portion of the cover plates forms a venting point for that portion of the heated charge which leaks past the pistons and causes an expansion of the air in the crank case under high temperatures. The passage of air being mainly outward, it carries with it a considerable amount of oil vapor, which, striking the cool cover plate, condenses and trickles down into the pocket at the bottom of the compartment. This must drain back into the crank case in order to be saved. If the gasket leaks, it is obvious that the oil will be lost, making a dirty motor as well as an uneconomical one.

Plates which become damaged or bent through accident should be straightened and new gaskets fitted. The straightening operation is a simple one and only requires a surface plate and a little care. In fitting new covers, a Hydroil packing or some such material of a thick and closely woven nature should be used as oil has considerable penetration when hot and will easily run through gaskets of unsuitable material. Thin gaskets are practically useless as they are not sufficiently elastic to take up the slight inequalities on the machined surface of the cylinder bloc.

ITEM No. 9

Water Pump Glands Tight

The water pump glands should be inspected to see that there is no leakage at this point. If there is a leakage, the gland should be tested to see that it is screwed up tightly, and if such is found to be the case, it should be screwed back and packed in with candle wicking soaked in tallow, or a good grade of twine. Unfortunately, it is a fact that most mechanics use a wrench to tighten the gland far too often. Instead, they should put in new packing. The gland is of such construction that with the proper amount and proper quality of packing, it will prevent leakage with only a slight pressure from the packing nut. But, after the packing has once seated or been squeezed up by undue pressure from the nut, no amount of subsequent pressure will prevent it leaking, but will rather tend towards straining the bushing in the pump body, thereby loosening it up and causing a leakage which is very expensive to eliminate.

If mechanics will refrain from tightening these nuts with *a 12" wrench, but will pack them more often and handle them* more delicately, they will experience no trouble from loose bushings. These bushings are replaceable, of course, but it is an expensive operation and totally unnecessary for at least two seasons, provided the glands are properly packed and a good quality of water is used.

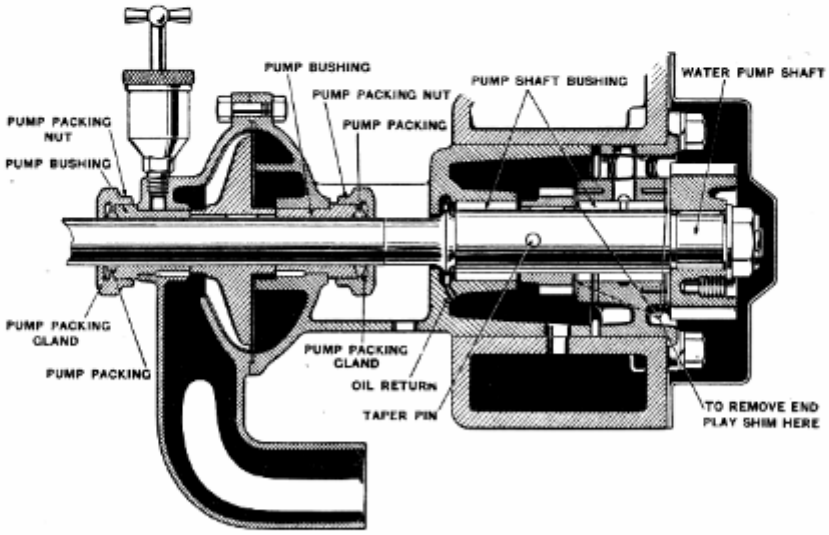
This applies to all models of Hudson cars, especially those having the die cast aluminum alloy pump bodies. In connection with the latter it should be noted that alkali water used in certain sections has a destructive effect on all metal, particularly on these alloys; and they cannot be expected to last so long as they would in sections where the water is of better quality. Incidentally, the same applies to radiator cores, which are made of a high grade, drawn brass. These cannot be expected to last indefinitely in territories where strong alkali water is used. The action of such water is to eat minute holes in the metal, which soon manifests itself upon the exterior surface of the radiator in little beads of water. These soon develop into serious leaks and must be promptly repaired in order to avoid frequent filling up of the radiator. When such water is the only kind obtainable, it is advisable to have a little soda at hand, a small quantity of which, when mixed with the water, will prevent corrosion as the soda precipitates the matter in the water. This necessitates a thorough cleaning occasionally

to remove the sediment. The amount of soda used should vary with the purity of the water. Up to one-half pound may be used and renewed when the water is changed every month or so.

ITEM No. 10

Pump Shaft and Coupling Secure

As the pump shaft is employed for driving the motor generator, it does considerable work. The necessary precautions have been taken to provide adequate bushings at the front end of the pump shaft and in the pump itself. There are also provisions for adjusting any end play which may develop due to the thrust from the spiral timing gears. The pump shaft should therefore be tested for end play by shucking it back and forth and noting the amount of movement. A certain amount of play is necessary but should this be excessive, more than .007", it may be necessary to remove the pump and add shims behind the washers which



Details of Water Pump

take the thrust from the timing gear and distributor drive. After removing the pump shaft, these washers should be lifted and a shim of suitable thickness placed behind them. This will eliminate end play and stop any objectionable rattle or noise emanating from such.

Excessive end play, if allowed to continue, results in a shucking back and forth of the pump impeller, or paddle, eventually wearing it or scoring the interior of the water pump. Provision has been made to allow for sufficient end play without possibility of damage but should the end play exceed 1/64", it is probable that damage will result.

The pump coupling should be inspected to make sure that the taper pin which secures the coupling is not loosening and that the key is in place. In instances where it has been necessary to remove this coupling, it may have been improperly reinstalled. Proper inspection will insure the coupling and pin being secure so that there will be no possibility of the pin dropping out or of the coupling loosening when the owner is out of range of assistance. Such an accident would tie up the car and probably necessitate being towed in, but if it is looked after periodically, this is never likely to happen.

ITEM No. 11

Motor Secure In Chassis—All Motor Bolts

Test all motor bolts. In order to preserve the alignment of the power plant with other units, especially the radiator and gear shifting mechanisms which project through or are attached to other portions of the car, it is essential that all motor bolts be in place. On the new model, the front motor bolts are cushioned underneath with a heavy spring so as to permit of a certain amount of weaving in the chassis without any tendency to strain the motor alignment in the wrong direction.

On the 1915 model cars, there is a semi-threepoint suspension which permits of rigid attachment. On this model, it is particularly necessary that all bolts be tested to see that they are tight as any looseness tends to destroy the alignment.

On the new model it is only necessary to test the tightness of the rear motor bolts. This is but the work of a few moments when suitable wrenches are used. It is highly important, however, and should not be allowed to escape the attention of the inspector.

Bolts which are left in a loosened condition permit of a great deal of hammering and pounding between the motor support and its bracket on the frame. This, in time, tends to crystallize the metal and breakage results.

ITEM No. 12

Adjust Fan Belt Tension and Inspect Fan Bearings

Most important in the functioning of the cooling fan is the fan belt tension. If this is allowed to become too slack, there is considerable slippage which results in insufficient air being drawn through the radiator and over-heating will occur. On the other hand, if the fan belt is too tight, as may be the case if a new belt has been fitted, the forced stretching of the belt causes a certain amount of destruction and tends to breakage, and the excessive pressure on the bearings in the fan hub will eventually ruin them.

The tension of the belt should be such that the fan can be easily revolved when taken by the rim and pulled around with two fingers. The belt itself should slip over the pulley on the crank shaft when grasped with the hand and pulled. If it is impossible to pull the belt in this manner, it should be loosened by lowering the bracket to which the fan is attached. This is done by merely revolving it around the stud on the cylinder block and bringing it closer to the crank shaft.

The fan bearings are of the cup and cone type and are secured by a lock nut. Any looseness of the bearings which may have been caused by a tight belt should be immediately adjusted, with instructions to the owner to watch the fan carefully and note if the bearings have been damaged. Upon the first signs of further loosening up, the bearings should be removed and examined. They should then be set up so that the fan will spin easily, having only enough play to permit it being felt when the fan is rocked by hand. If the bearings are set up too tightly, they will crush and cause destruction. This will cause a noisy fan which may later result in the owner attributing the noise to the motor itself, thereby incurring experimental expense in trying to diagnose the trouble through incompetent hands.

ITEM No. 13

Oil Hood Lacing—Hood Sockets Tight

There is a certain amount of weaving in an automobile from which necessitates the hood sliding upon the radiator and the dash. The actual amount of movement is small and will only be noticed on rough roads. To make this as frictionless and noiseless as possible, the hood lacing is used to support the ends of the hood. This lace should be kept soaked in oil so that there will be no squeaking or excessive friction at this point. If the lace is not oiled frequently and kept in good repair, the hood

works very stiffly and will tend to loosen the bracket in the body and at the top of the radiator. In addition, it may wear through the lacing and touch the metal shell of the radiator or cowl dash. This causes abrasion of the paint and may result in completely wearing through the metal. To repair such damage is expensive in the extreme, especially since it may be eliminated by a little attention once in a while.

The hood sockets, by which we mean the brackets which support the top hinge at the front and rear of the hood, should be securely bolted in place on the radiator and dash. If these are allowed to become loose, the working back and forth of the hood will be increased and the tendency to damage the cowl and radiator will be very much greater. Excessive looseness at this point usually results in wearing out the brackets on the side in which are fitted the holding down clips. All these troubles may be overcome by a monthly inspection and sufficient lubrication.

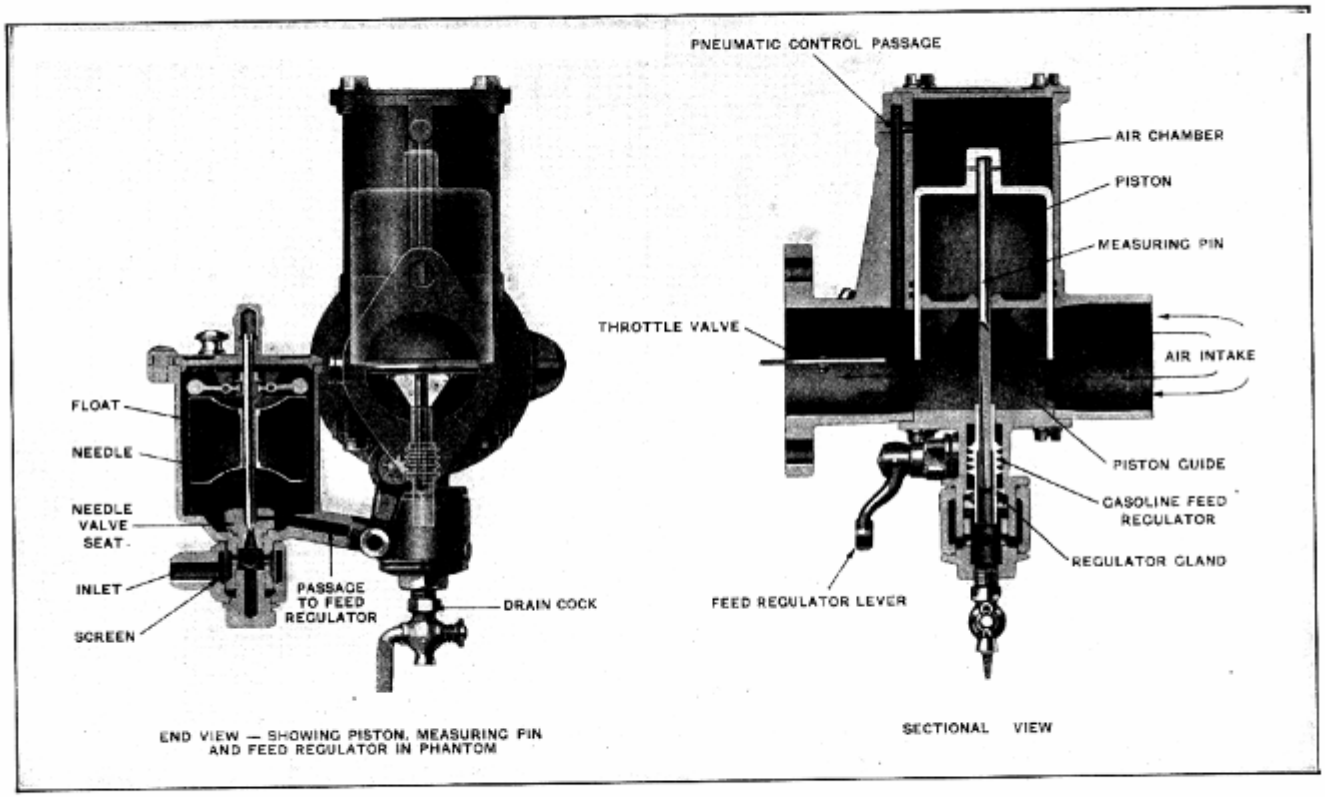
ITEM No. 14

Carburetor Throttle Adjustment

On the new model Hudson, the carburetor is of a special type adapted only to our particular design of motor. It is essentially a carburetor for high speed work, although it has a wide range. It is nevertheless necessary to see that the throttle is set so that the motor will idle steadily without completely shutting off the mixture when the hand throttle is closed. This adjustment is accomplished by means of a set screw in the butterfly lever, the manipulation of which is immediately apparent upon investigation. The action of the carburetor is explained in detail in the Reference Book and a summary of its numerous good features is given herewith.

It has been necessary to develop a special type of carburetor which can be depended upon to accurately proportion the mixture of gasoline and air at all speeds so that there will be no "starving" at the higher speeds and no tendency to "load" or flood the intake pipe at low speeds.

This special type carburetor may be said to be "pneumatically controlled" since no action of the driver can possibly alter the proportioning of gasoline and air. The butterfly valve, commonly called the throttle, is nothing more than a cock, or faucet, for delivering a certain amount of the mixture to the cylinders. The proportion of mixture delivered controls the speed of the motor or the power delivered, and therefore must be regulated by the driver.



The Hudson Carburetor

ITEM No. 14

The mixing chamber of the carburetor, wherein the gasoline and air are proportioned and vaporized, is of such design as to control itself by the amount of mixture passing through the throttle valve. In this way it will be seen that, upon opening the throttle suddenly at low motor speed, the requirements of the motor are comparatively small and the suction is comparatively weak. This suction controls the mixing of the gasoline and air pneumatically by lifting a piston measuring device in the mixing chamber, thus allowing only the correct amount of mixture to pass through. The necessary velocity or vacuum at the mixing device is controlled by the piston and gives perfect vaporization without having to use an excess of gasoline to obtain that result.

To sum up, the driver may stamp on the accelerator pedal and open the throttle valve with impunity; but the mixing device takes care of itself, proportioning the gasoline and air to the requirements of the motor with a precision which only a pneumatically controlled device can attain.

This improvement, which may rightfully be regarded as an improvement in the motor itself, is largely responsible for the great torque or pulling ability of the motor at low speeds.

The illustrations show very clearly the principles upon which this carburetor functions.

Aside from the periodical cleaning out of the screen at the base of the float chamber and draining off any water or sediment which may have accumulated below the regulator, there is absolutely no maintenance or intricate adjustment necessary.

The gasoline measured out by the measuring pin, may be varied by the gasoline feed regulator which is connected to the lever on the dash. In cold weather it is to be expected that a little richer mixture will be required. In warm weather, it may be set to a leaner mixture.

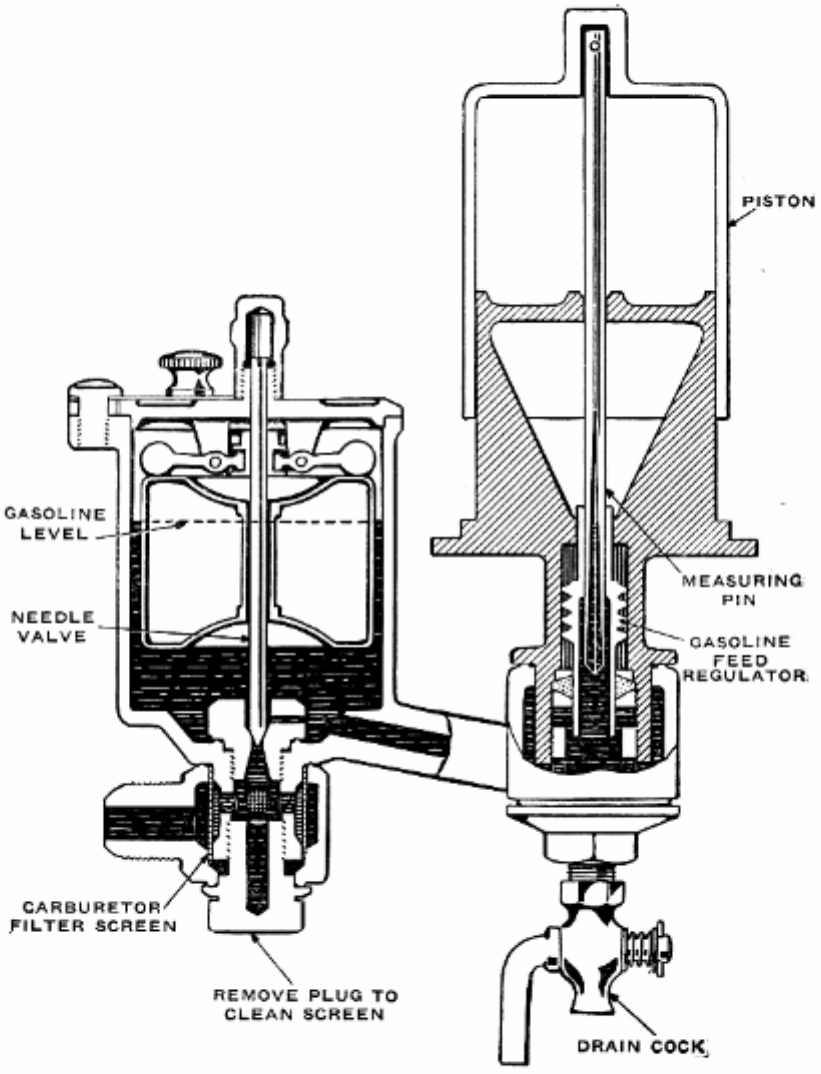
For high altitudes, where air is at a lower atmospheric pressure, proportionately less gasoline will be required. These adjustments are immediately accessible to the driver.

There are no nozzles to change, no matter what the conditions require.

The gasoline consumption of this carburetor depends entirely upon the performance of the car and the ability of the driver to regulate the feed to meet his requirements.

It is obvious that if the maximum performance is needed, more fuel will be required to obtain that performance.

For the average user, or for the man who is interested in obtaining great economy, the mixture may be set to run as lean as the driver desires.



Carburetor Float Chamber

ITEM No. 14

Bear in mind, however, that reducing the proportion of gasoline to air, gives a little less power and acceleration. Setting it in the right proportion, (which must be found by adjustment, according to climatic conditions) results in maximum power, and consequently a little higher fuel consumption than some owners wish to tolerate.

Setting it to give too rich a mixture results in carbonization, mis-firing, and increases the wear and tear on the moving parts of the motor.

INSPECTION

The only inspection necessary on this type of carburetor will be to see that the filter under the float chamber is not clogged up, thereby restricting the flow of gasoline, and that the needle valve is seating properly and does not allow the gasoline level to increase and flow over at the regulating sleeve. It is also advisable to note the action of the carburetor in order to make sure that the piston valve is acting smoothly and responds to the speed of the motor. It is possible that this piston valve may be stuck in the cylinder through an excessive accumulation of dust, which may be caused by driving on a much frequented road. Provided the owner uses the strangler for starting, it is very unlikely he will notice the valve having stuck, it being possible to operate this carburetor without any valve action at all. However, if the car is used by an experienced driver who counts upon quick acceleration and good hill climbing abilities, he will notice the difference. Especially will the difference be noticed if he is driving without the strangler; this particularly applies to cold weather.

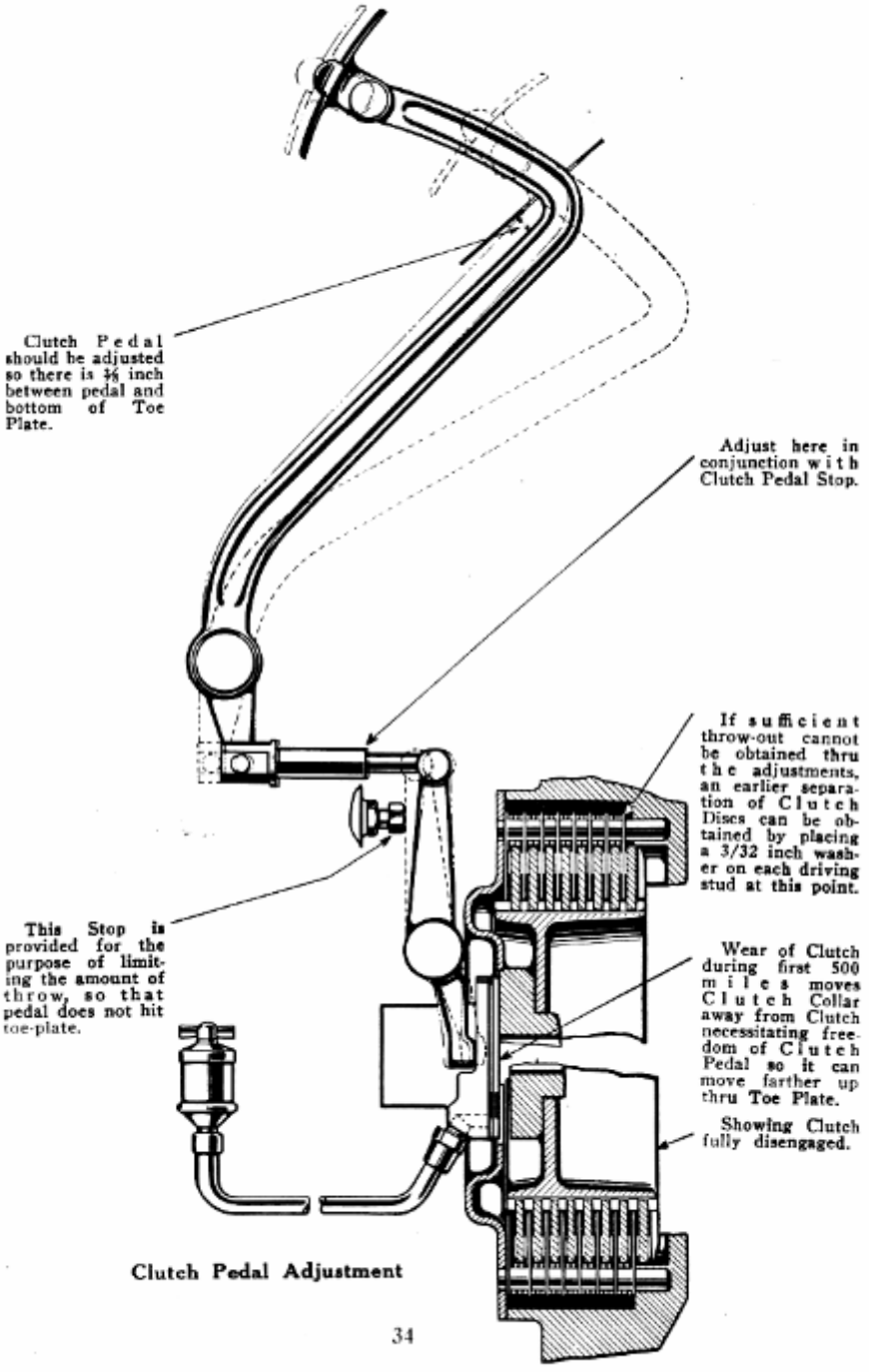
To free the valve, it is only necessary to remove the cover at the top of the cylinder, withdraw the valve from its place and clean it with a little gasoline. In putting it back, a few drops of kerosene on the top of the piston will help in flushing down any sediment or grit which the gasoline may have left.

On our 1915 models, which were equipped with the Zenith carburetor, the troubles that may be experienced and their elimination are fully outlined in Bulletin No. 10, also in our 1916 Reference Book, pages 24 to 28.

ITEM No. 15

Clutch Adjustment

In checking the adjustment of the foregoing items, the driver will have had occasion to start the motor. It is therefore a fitting time to check the adjustment and operation of the clutch. The first investigation on the part of the inspector should be to



Clutch Pedal Adjustment

note whether the clutch throwout collar has been properly lubricated by the owner, as any tendency to neglect this point results in a worn collar and excessive friction when the clutch is thrown out. This makes changing speed from first to second extremely difficult. It may also result in a completely burned out collar, making it practically impossible to change speed without noise. This in turn may cause the gears to be damaged through inconsiderate gear changing.

A complete description of the clutch and its adjustments, also the adjustments of the pedal and troubles resulting from these adjustments not being maintained, is given in our Reference Books, and a summary of it follows hereunder.

For the past five seasons' models, the Hudson Company has retained the same design of clutch, and it gives so little trouble that few have seen the inside of one.

The principle upon which it operates is the most simple one conceivable, based on the theory that there is a great deal of friction between cork and steel, but that the former element is extremely soft. In consequence the Hudson clutch is very smooth in action, but once engaged, it seldom slips.

The fact that the cork inserts become saturated with oil makes it difficult, compared with other types, to abuse the clutch. Except for an occasional cleaning out with gasoline, the only attention it requires is the maintaining of the lubricant, a mixture of one-half kerosene and one-half engine oil. Not more than a half pint of this mixture should be put in at a time.

In case of continued slippage, the addition of a small quantity of pure kerosene to the mixture already in the clutch will be of benefit, or adding a small quantity of motor oil will relieve the grabbing.

The Discs

The driving discs, which are secured in the fly wheel by four specially heat treated studs, are stampings, carefully flattened and machined so as to slide freely on the studs. The driven discs are also stampings but are thicker and have numerous holes in them; into these holes the cork inserts are pressed.

The corks are first soaked in water to make them pliable, then they are forced into the holes by a special machine. A considerable amount of cork is left projecting on either side of the disc and this is shaved off to leave about 1/32″ after the corks have thoroughly dried out, then the corks are ground flat on a surface grinder.

In making a replacement of corks in a repair shop not properly equipped, the surfacing of the corks is usually accomplished

by rubbing the disc on a piece of sand paper. The result is seldom satisfactory as the corks are not flat and even and do not give the full bearing surface which is necessary in order to have the friction to hold the power of the engine.

It is absolutely necessary that the corks be perfectly dry and show a full bearing surface. This latter point can only be ascertained by rubbing them flat on a surface that has been covered with Prussian blue or lamp black, using a very thin coating. The greater the bearing surface obtained, the longer the corks will wear and the less the spring tension necessary.

The spring tension can be varied to suit the necessity by putting shims, about the size of a fifty-cent piece, at the back of the spring. This compresses it more, making it shorter when the clutch is engaged.

The cork inserts drive the clutch drum on which they slide and this sliding, or separating motion is facilitated and equalized by small coil springs interposed between the driving discs.

Assembling the Clutch

In assembling the clutch great care must be exercised or these little springs will slip out of place and, becoming jammed between the moving parts of the clutch, will cause it to drag instead of releasing properly. Usually the noise made by the interference will indicate that something is wrong.

Another important feature is to see that the driven disc nearest the cover, at the back or transmission end of the clutch, does not slip out of the slots in the drum; this will cause a loud scraping sound when the clutch is released.

In assembling a clutch ready for inserting in the fly wheel, the following method is recommended.

1. Put the clutch drum on the bench and drop the disc on; a cork-insert disc first and then a plain disc. The discs should be selected so that they slide freely in the grooves of the drum and with the minimum amount of back lash.

2. After all the discs have been fitted in this manner, take the clutch cover and slip the studs through the holes in the driving discs, placing the separating springs one at a time.

3. This accomplished, and with the spring, the ball thrust bearing and the shims in place in the crank shaft, the clutch cover can be slipped into place.

4. By means of a lever looped into a wire on the motor foot and bearing against the driving jaws of the clutch, the whole clutch assembly can now be forced into place against the pressure of the spring very easily. When it has been entered sufficiently to allow of two cover bolts being started into place, the pressure of the lever may be released.

5. The cover should then be secured, care being taken to screw up the bolts evenly so that the tension on them will be the same all around. Unless this is carefully accomplished, the cover will be strained and the lubricant will leak out.

Making the Clutch Oil Tight

The gasket between the cover and the flywheel should be in good condition and shellacked on to the cover; it should be allowed to set for a while before using so that the shellac is "tacky" and will hold the gasket securely to the cover during the assembling operation. It is advisable to wind a little wicking around the heads of the bolts before screwing them down, to prevent leakage.

The assembling and rendering oil-tight of the clutch is greatly facilitated by the driving studs being riveted into the cover. In this way there are no packed joints in the flywheel except the cover and the screws which secure it.

Also, the cover and clutch can be assembled as a unit with no possibility of the discs slipping out of place by the simple expedient of clamping the jaws at the point where they project through the cover.

As a hint to the man who ever has to do this job, the bronze throwout sleeve may be utilized as a clamp temporarily, by wrapping some paper or thin shim metal around the jaws and then pressing the sleeve over it. There should be just enough shimming to make the sleeve a tight fit, but not so much that the sleeve will be distorted or otherwise damaged in removing it.

Conditions Governing the Clutch

The thrust of throwing out the clutch is taken on a bronze washer which fits into a recess in the face of the sleeve. It is highly important that this washer be sufficiently lubricated at all times or it will burn out. Other reasons for the shortened life of these washers are as follows:

1. The spring which keeps the pedal from coming back farther than is necessary may be adjusted to too great a tension, thus putting a constant thrust on the washer.

2. The driver may have a habit of driving with his foot resting quite heavily on the pedal. This is unnecessary.

3. The pedal may be improperly adjusted so that it is touching the toe plate. The result is the same except that in a case of this kind the clutch will probably slip so badly as to be noticeable.

4. The grease cup lubricating the pivot pin of the throwout fork may be empty and the fork seized up so that it will not move freely.

5. There is a stop provided for the purpose of limiting the amount of throw given. Since the corks wear slightly with use, and since too much throw is unnecessary, this adjustment should be inspected occasionally and always in the event of any repairs occasioning the dismantling of the transmission or pedals.

On the 1916 model, this stop is on the left, on the cap that carries the gear-shift rods. The adjustment is simple to determine. Whenever you find that the transmission gears stop and the gears can be engaged without the pedal being thrown all the way out, the adjustment needs attention and should be screwed out to meet the sleeve lever until it stops its travel at the correct moment. Too much throw means more effort to release the clutch and often makes the clutch noisy when disengaged.

The two most important instructions are: Don't slip your clutch more than is absolutely necessary, and then only when you **know** it has sufficient lubricant to stand it. Don't drive with your foot resting heavily on the pedal. If you **must** do so owing to congested traffic or natural nervousness, remember that the throwout sleeve will need more frequent attention.

Inspection Of The Clutch Pedal

The clutch pedal should be pulled back until it strikes the toe plate and the grease cup screwed down to make sure that grease is getting to the thrust washer. Provided this is in good condition at the time you make your inspection and there is sufficient grease in it, there is absolutely no reason why the owner cannot be prepared to take the responsibility for it until the time of next inspection. This grease cup positively must be screwed down once a day, and if there are any signs of negligence on the part of the owner to fulfill his obligations in this respect, you should not hesitate to call it to his attention.

The clutch pedal assembly should be adjusted so that when the clutch is engaged, the pedal clears the back of the toe plate. Note therefore that there must be a **clearance of 3/8 inch** between the underside of the toe plate and the clutch pedal. This is for the reason that after the clutch is run in, it settles and packs together more closely. Coincident with this wearing in of the clutch, the throwout collar moves **out**. This action, through the adjustment of the clutch throwout fork, moves the clutch pedal farther back through the hole in the toe plate. If there is not proper clearance to allow for this movement, the clutch throwout fork will have a constant pressure on the clutch

collar with the result that it soon burns it. It is then in practically the same condition as would prevail were you to keep a constant pressure on the clutch pedal with your foot.

Should you find the clutch pedal and clutch throwout fork in perfect adjustment and there is no indication that the clutch collar has been burned or worn to excess, but the clutch still continues to drag, it indicates that the adjustment of the clutch itself is such that the full throw does not allow a complete release of all the plates. This can be overcome by inserting a 3/32" washer on each driving stud at point "A" in illustration. This washer has the effect of more thoroughly releasing all the plates from one another by the fact that it affords an earlier releasing point when the clutch is thrown out.

These instructions apply to all models of Hudson cars inasmuch as the design of the clutch is practically the same throughout. Bear in mind at all times that most important to the satisfactory operation of the clutch are the following: The throwout collar must be properly lubricated. The clutch must contain a mixture of 50% oil and 50% kerosene. The clutch pedal must be in correct adjustment.

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Transmission Main Shaft End Play

This item deals with the details of adjustment in the 1915, 1916, and "Super-Six" Models. As this particular type of transmission has been in use for many seasons with only a few minor changes, the reasons for wear, and general principles, may be applied to all other models.

First in importance is the main shaft end thrust adjustment. On account of the thrust from the propeller shaft, due to the sliding motion of the forward joint, there is a varied pressure on the rear thrust bearing. When the car is tested at the factory, the end play at the forward joint is inspected and an allowance of .007" maximum and .004" minimum is made. A small amount of play is absolutely essential in order to insure a film of oil between the bronze and steel washers. Hence the minimum allowance of .004" end play. However, the surfaces of these thrust washers soon wear in with the result that the first five to seven hundred miles of running will develop more end play. The actual amount of wear will vary according to the accuracy with which these washers have been ground and seated.

It is absolutely essential that upon the first and second monthly inspections of the car, the forward joint should be

pried back and forth with a pinch bar, and if end play in excess of .007" prevails, one of the thin shims should be removed.

Removal of these shims is a simple matter, it being only necessary to back out the cap screws, slip the retainer back as far as it will go, and then, by means of a sharp chisel (as shown in the diagram), split the shim which is to be removed.

If there are no thin shims, the removal of one of the thicker ones will result in a permanent pressure on the thrust bearings through the tightening up of the cap screws on the rear bearing retainer. A thick shim must be removed and some thinner ones introduced to take its place. For instance, if the thinnest shim is .025" in thickness and it is required to take out at least .003", it will be necessary to remove the .025" shim and in place of it put seven .003" shims.

In no case should a thick shim be removed without replacing with a sufficient quantity of thin ones to insure correct amount of end play for lubrication. If thick shims are removed and the cap screws on the bearing retainer drawn up until the thrust washers bear against one another with no clearance, it will take only a short time for the bronze washer to overheat and burn out. This will develop end play in excess of that caused by normal wear and tear.

If end play in the main shaft is allowed to remain unadjusted, the back and forth movement of the main—or spline—shaft will work the faces of the gear teeth back and forth upon one another. This is especially true when the car is climbing grades in first and second speeds, particularly the latter. The pounding action increases the tendency to wear the thrust washers and in a few hundred miles the shucking back and forth of the main shaft will be appreciable to the driver.

As the main drive gear at the front end of the transmision is held in position endwise by the correct spacing of the thrust bearings, it is obvious that an excessive amount of play in the main shaft will permit the front main drive gear to move back and forth. The clutch pedal will chatter when climbing a grade on second speed, or when accelerating sharply, and the driver cannot help but notice it. This is a sure sign that the transmission rear thrust bearing is in immediate need of adjustment or is burned out through improper adjustment.

The excessive wear on the second speed gears soon changes the correct shape of the teeth and the second speed begins to fly out when climbing hills. This frequent slipping out of speed wears the gear teeth on an angle and sometimes damages the ball-stop or interlock plunger on the gear shifting rods. The only remedy is to replace the gears and properly adjust the end play of the main shaft. Strengthening the interlock spring will

do no good, as the gear teeth are worn on such an angle that the actual tendency of the power transmitted through the gears is to force them out of mesh.

The front thrust bearing of the main drive gear has no adjustment and it is seldom necessary to dismount it. It sometimes happens, however, that the oil return hole becomes clogged, this usually being due to the use of heavy greases or an unsuitable grade of liquid lubricant. The oil return hole is drilled through on an angle so that it enters the transmission case at the right hand lower side of the main drive gear, at a point where the gear teeth come out of mesh with the countershaft main drive gear. At this side, on account of the direction of rotation, there is a certain amount of suction which tends to draw the oil through the return drain. At the point where the drain passes under the outer Hyatt roller bearing shell, it is somewhat narrower in area, and obstructions are liable to occur at this point. Leakage of oil at the front bearing retainer will usually be found due to obstructions in the oil return and can only be eliminated by removing the obstructions so that there is a free passage for liquid lubricant to return to the case.

Oil leakage at the rear bearing is usually caused by a worn felt washer in the bearing retainers or by a worn bearing itself. When the bearing becomes worn, the shaft chatters and the hub of the universal joint upon which the felt washer bears, has a certain amount of eccentric motion imparted to it. This soon enlarges the hole in the felt washer and the oil leaks out. To remedy this, replace the rear bearing and felt washer, making sure that the hub of the universal joint is smooth and has not become roughened up or cut through contact with the retainer. In the latter case, the roughened hub would cut away the new felt washer and the leak would soon occur again.

The adjustments of the countershaft bearings are seldom necessary, as there is no tendency to back and forth motion except when running in second speed or in case of worn gears. A transmission which has seen a great deal of service may often be quieted by adjustment of the thrust bearings, thus eliminating the chatter without having recourse to the replacement of gears.

However, in many instances, the gears are replaced without properly adjusting the countershaft thrust bearings, with the result that very little good is done and the much-looked-for increase in silence is not gained.

In adjusting these bearings, it is absolutely essential that the adjustment be made at the front bearing, not the rear. In this way the shaft is adjusted towards the rear, the main drive

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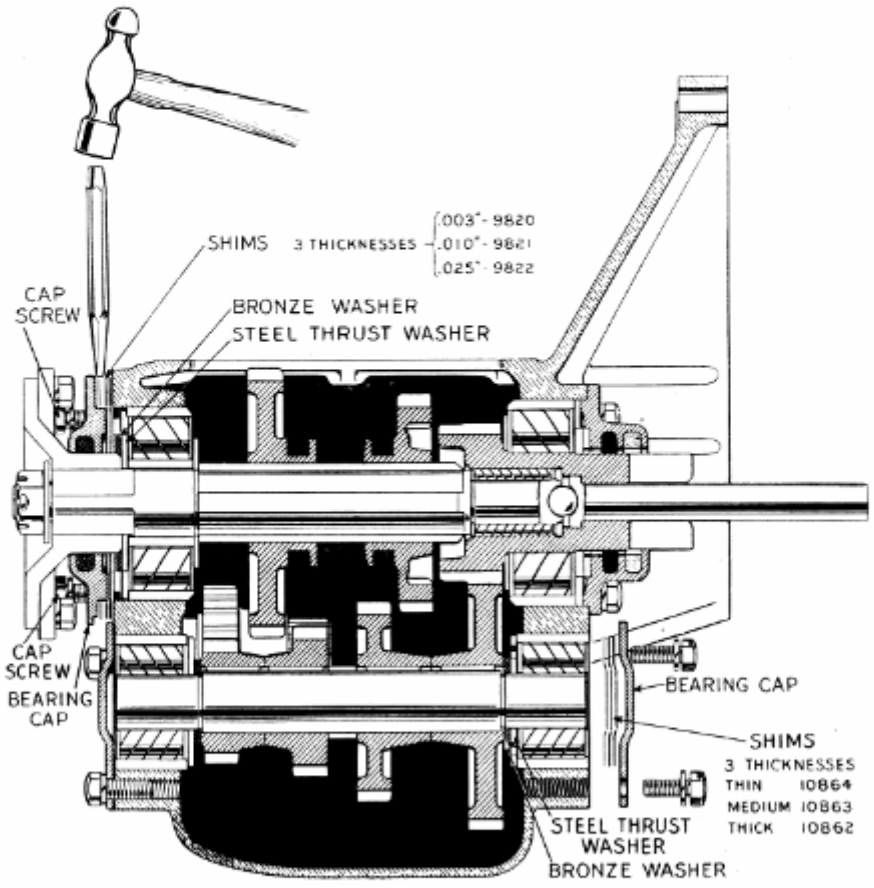
countershaft gear being brought away from possible contact with the bearing protector or washer which is pressed on to the main drive gear ahead of the bearing rollers. It is obvious that if the adjustment were made from the rear, the countershaft might be moved forward so as to cause an interference between the edges of the countershaft main drive gear and the bearing. This would make an objectionable noise and might result in considerable damage through chips, etc., getting into the lubricant and finding their way into the bearings.



Transmission Adjustments

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The method of adjustment is extremely simple, it only being necessary to introduce shims as shown in the diagram. These shims bear against the outer races of the Hyatt bearing and force it inward as soon as the bearing cap is tightened up. Since the steel thrust washers are supported by the outer races of the roller bearings, these, too, must move inward thereby taking up the end play. It is essential that there is end play of at least .004" to .007" in this shaft, but an end play of even .012" will do no harm whatever and will cause no appreciable rattle. As in the case of the main shaft, it is highly important that no permanent pressure be imposed upon the thrust bearings through tightening up the cap with too many shims in place. This would burn the bearing out and cause a great deal of end play in a short time.

In the illustration shown, the thickness of the shims and their symbol numbers are given. In order to get the full advantage of this adjustment on monthly inspections, the dealer should always have a good stock of such shims, as there is no knowing when their installation may be necessary. There is no reason why the split shims should be thrown away; they may be used again after flattening.

Another point to observe closely in connection with transmission adjustment and repair is the removal of the transmission from the motor. This should be as follows:

First, remove the bolts and cap screws on either side, leaving the extreme top bolt tightened up in position. This bolt now supports the entire weight of the transmission and allows no straining of the pilot shaft or main drive gear. As a last operation, remove the nut from the long bolt at the top, and when you have obtained sufficient help to insure your being able to withdraw the transmission in a perfectly straight line and with no bending or crimping whatever, pull it off slowly. **Leave the top bolt in place** to pilot the transmission shaft during removal.

If this method is not employed, a bent or strained pilot shaft will result; and when the transmission is put together again there will be an eccentric, growling noise from the main drive gear. This is because the main drive gear is not in line with the clutch and there will be no remedy except taking it out and straightening or re-fitting the pilot shaft.

On no account use heavy grease, cork compounds, or any lubricant other than of a liquid nature in the transmission case.

Heavy lubricant holds chips and dirt in suspension and circulates it through the bearings and between the teeth of the gears when in action. It blocks oil returns and totally fails to pass through the oil holes which circulate lubricants to the

thrust bearings. Use a light grade of oil, even ordinary motor oil if none other is obtainable. We strongly recommend that you follow the suggestions of our Lubricating Charts, using Whitmore No. 7, as this is undoubtedly the best type of lubricant for the transmission.

The transmission should be drained off periodically. With most common greases, it is advisable to throw the lubricant away. But if Whitmore Compound is used, it may be strained through cheese cloth and used again, as it does not deteriorate like ordinary oils. The main thing, however, is to remove all dirt and sediment, so that it may not be circulated through the bearings and between the gear teeth.

After having drained the transmission for cleaning purposes, it is a good plan to fill in about a quart of kerosene. This should be done with the motor running slowly and the drain plug out, so that the kerosene will flush its way through. This washes out a great deal of sediment which would ordinarily adhere to the walls of the transmission case, thereby rendering the straining of the lubricant and other precautionary measures less effective.

On those models which involve a Bower roller bearing instead of the Hyatt type, the adjustment is accomplished in exactly the same manner. Instead of plain thrust bearings, the flanges of the rollers take the thrust. If too many shims are removed so as to impose a permanent end thrust on these flanges, they will invariably crumble up and the chips and steel crumblings will ruin the bearings, necessitating replacement The same results will be found due to excessive end play which permits the propeller shaft to hammer or pound. The flanges of the rollers will not withstand this pounding action for any length of time without damage.

In the foregoing paragraphs, the reference to the slipping out of second speed and other transmission troubles are applicable to the earlier models without exception, as are also the instructions regarding the removal of the transmission. In case of transmissions which are attached by means of two side arms, it will be necessary to put a jack under the transmission or block it up in some way that will insure the mechanic not having to take the entire weight. Any system of blocking or jacking up which will insure the transmission being removed in a perfectly straight line backward from the motor, will be satisfactory.