Supervise Your Service Department

THE sale of every Ford car, truck or Fordson tractor carries with it a definite Service Responsibility. Whether this responsibility becomes an asset or a liability to the dealer, depends largely upon the supervision and direction given his Service Department.

Competent, courteous service men; service shops properly equipped and cleanly in appearance; high quality workmanship and the promptness with which repair work is taken care of, all have a tremendous bearing upon the opinions formed by car owners.

Ford dealers—these standards do not represent unattainable ideals. They can be reached in every dealership—and easily too—if you will but give your service department the attention it deserves.

The supervision of such an important branch of your business cannot be delegated in its entirety to an employee, no matter how competent he may be. Establishing the standards and holding your superintendent and his men to accountability in measuring up to them, is YOUR task and YOURS alone.

KEEP ITS STANDARDS HIGH
THE MAIN PART IN MAINTENANCE
RELIABILITY — ACCURACY — LOW COSTS

LEAVE YOUR *FORD* CAR to be repaired in the Maintenance Department of Hamlin W. Nerney Inc. and you give your car every advantage which expert skill and extensive, perfected mechanical equipment can provide.

ALL WORK GUARANTEED. And we mean just this—that our Firm guarantees that the workmanship is the best obtainable and the supervision is your safeguard against error. That nothing but genuine *Ford* parts will be used. If the work is not properly performed and the workmanship and material prove defective we will MAKE IT RIGHT.

NEPEN'S MONTHLY SPECIAL MONEY SAVERS.—Thousands of Ford owners in the great Southwest section of the city look forward to receiving our Monthly specials, which are designed to make friends for the firm and cut the cost of upkeep on Ford cars. If you are not receiving these announcements, a phone call or postal card will place you on our mailing list.

PHONE

VERMONT 0175

One of the Most Modern Equipped Maintenance Departments in Southern California

Fig. 129

Advertising Service

The folder illustrated in Fig. 129 is used by Hamlin W. Nerney in connection with a service follow-up system that keeps Ford owners in his vicinity constantly aware of the fact that an A1 Ford Service Station is interested in serving him at all times. Each month a post card is sent to every Ford owner on this dealer's record, calling attention to some detail in connection with his car which will enable the owner to reduce the operating expenses if taken care of immediately.

As a result of intensively advertising his service facilities, this dealer has built up a clientele which keeps his shop operating at maximum capacity. The owners of the cars which he services are satisfied, and the profits from his shop have been materially increased. These results certainly justify the effort.

We can now furnish, for service, gasket, Part No. T-45195, for opening in dash, through which sediment bulb flange projects. Gasket can be installed by merely loosening gas tank and pulling it back sufficiently to permit gasket being slipped over sediment bulb flange.

Tool for Assembling Hub Brake Spring

Notwithstanding the fact that this tool is a very essential piece of equipment for every Ford Service Station, very few dealers have taken steps to secure the bar for assembling hub brake spring, illustrated in Fig. 107, November Service Bulletin. To the dealer who handles a large volume of service work, the bar is almost indispensable and smaller dealers will find that it greatly facilitates a task which otherwise requires some time and effort.

The number of the bar is SZ-1157 and the list price is $.40. Dealers should place orders direct with the local branch.

Notice of Increase in Price of Front Fenders for the Present Ford Car

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Old Price</th>
<th>New Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-4800 D-40108</td>
<td>$5.00 list</td>
<td>$6.00 list</td>
</tr>
<tr>
<td>T-4801 D-40109</td>
<td>5.00 list</td>
<td>6.00 list</td>
</tr>
</tbody>
</table>

This change becomes effective January first, and is due to increased cost of manufacturing fenders of the improved design.
New Style Curtain Fastener Tools

Arrangements have been made for the manufacture of tools for installing the new type curtain fasteners used on the improved cars. These consist of a grommet punch, a grommet riveting tool, a rivet spreader and an anvil.

Fig. 130

The grommet punch (Fig. 130, No. 15) is to be used for punching the holes in the curtains in which the lift-the-dot fasteners are inserted. The grommet riveting tool (Fig. 130, No. 13) is for riveting the cinch fastener used on the bottom of the curtains as well as in the gypsy curtains. The rivet spreader (Fig. 130, No. 14) is intended for riveting the male fastener used on the curtains and the anvil (Fig. 130, No. 12) is designed for use with the two last mentioned tools for holding the fasteners while being installed in curtains.

The above mentioned tools are to be used in connection with the set of tools illustrated on page 40 of the May, 1924 Service Bulletin. The block in particular, Fig. No. 11, must be used for holding the anvil mentioned above and in future, a complete set of riveting tools will consist of the tools illustrated in the above mentioned Bulletin together with those listed below, the prices of which are as follows:

- Tool No. 12 Anvil ................... $0.40
- Tool No. 13 Grommet riveting tool .... .50
- Tool No. 14 Rivet spreader .............. .50
- Tool No. 15 Grommet punch ............. 1.75

These tools will enable dealers to handle replacement of all fasteners used on the improved car with the exception of T-41123 fastener (female). This is the fastener used in the open bodies and bow sockets. The only tool required to assemble this fastener in the body or bow socket is a small prick punch. After placing the fastener in the body or bow socket, insert the punch well into the fastener and strike it a light blow with a hammer. This will raise a projection on the outside of the fastener which will hold it in the body.

Dealers who have already purchased the set of tools shown in the May, 1924 Service Bulletin need only the tools mentioned above to complete their sets. Other dealers should specify for a complete set including tools for improved car fasteners. By specifying in this manner, the possibility of error in filling the order will be eliminated.

Orders for these tools should be placed with the branch under which you operate.

Crediting Owners for Replaced Parts

We find that considerable misunderstanding exists on the part of dealers as to the procedure to follow when it is necessary to replace parts in comparatively new cars which have been sold in some other territory.

In many instances the dealer making the repairs, instructs the owner to take the alleged defective parts to the dealer from whom he purchased the car, intimating that the latter will pass credit for the material. This method of handling is incorrect. The dealer making the repairs should allow credit for the alleged defective material replaced, forwarding that material in his regular freight shipments to the Branch under which he operates. In other words, he should handle the transaction just as if he had sold the car.

It will be possible to determine the age of the car by checking the motor number or by questioning the owner, who undoubtedly will have some identification such as license certificate, to indicate when the car was put in service.

If the question arises as to whether or not the parts are defective and the dealer is doubtful as to receiving adjustment, then he should in all cases get the correct name and address of the owner, explaining to him that it will be necessary for him to pay for all parts until inspection has been made by the Ford Motor Company, and that if adjustment is made by them, the owner can expect to receive credit for the material replaced at the price he paid for the parts.

Asking an owner to carry several broken or greasy parts several hundred miles, so as to get credit from another dealer, should be avoided particularly since our policies will not permit adjustment to be made except through the same channels that the replacement parts are purchased. Dealers should see that their service and parts men are thoroughly familiar with the proper manner of handling such cases.

The question of labor in connection with such repairs is, of course, optional with the dealer, unless he has authority from the dealer selling the car to make repairs at the latter's expense.
Locking Spare Tire on Carrier

It is evident that very few dealers are aware of the proper way to lock spare tires on the improved type of tire carrier. This carrier was designed to provide the maximum of protection against theft and when properly locked, it is as nearly theft proof as it is possible to make a tire carrier.

The proper way to lock the tire on with a padlock and chain is shown in Fig. 131. One end of the chain should be hooked on the padlock which is then inserted in one of the holes on the clamp nut. The other end of the chain should then be passed around the tire and rim and locked on the padlock.

Fig. 131

If the owner does not care to use a chain he can securely lock the rim on the tire carrier by merely placing a padlock in one of the holes of the clamp nut, thus preventing the nut from being removed.

For cars equipped with wire wheels, a lock nut has been designed which enables the owner to use a padlock. This nut, T-2852, has a hole bored through the end in which a padlock should be placed. With the padlock in place, the nut cannot be removed, as the padlock lodges against the hub of the wheel when the nut is given a slight turn. A locking nut is supplied with each set of wire wheels purchased.

In view of the fact that we have provided for a safe and neat way to lock spare tires, there is no excuse for chains being wrapped around the tire carrier in every conceivable manner. Dealers should see that owners are properly informed on this subject.

Genuine Ford Accessories

The purchaser of a Ford car can now secure a number of Ford accessories which not only enhance the good appearance of the car, but also possess the quality typical of Ford products.

We have made available to Ford owners, bumpers which are designed to give a maximum of protection at a very attractive price. They are double bar, both front and rear, full nickel and highly polished. Spring steel of a very high quality is used in their construction, resulting in a very rigid design. These bumpers are guaranteed by this company and also carry the underwriters endorsement. Dealers can therefore sell them with implicit confidence that they are giving their customers a genuine quality article.

The open car with lowered top is becoming increasingly popular and the top boots which we can now supply, should find ready favor with the more fastidious Ford owners. The top boots are made of a fawn colored, water proof sateen, are full tailored and enclose both top and bow sockets. Gypsy curtains of the same material are also available and the combination of top boot and gypsy curtains gives the car a very smart appearance.

The prices of the various items are as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bumpers, per pair</td>
<td>$15.00</td>
</tr>
<tr>
<td>Top boot (runabout)</td>
<td>5.00</td>
</tr>
<tr>
<td>Top boot (touring)</td>
<td>5.00</td>
</tr>
<tr>
<td>Gypsy curtains, each</td>
<td>1.50</td>
</tr>
</tbody>
</table>

Further particulars concerning the accessories mentioned above can be secured from our local branch. Ford owners will welcome the opportunity of securing quality accessories which are designed to properly fit the car, at characteristically low Ford prices. Consequently, there is an immense field open to Ford dealers and earnest effort toward the sale of these accessories will mean a proportionate increase in profits.

Weights of Improved Cars

The following is a list of the shipping weights of the various types improved Ford cars:

<table>
<thead>
<tr>
<th>Type</th>
<th>Starter</th>
<th>Starter</th>
<th>Dem.</th>
<th>Balloon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Touring</td>
<td>1728</td>
<td>1738</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roadster</td>
<td>1645</td>
<td>1655</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coupe</td>
<td>1831</td>
<td>1860</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tudor</td>
<td>1961</td>
<td>1972</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fordor</td>
<td>1994</td>
<td>2004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roadster with pickup body</td>
<td>1729</td>
<td>1736</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Service—? to Ford Owners

The following letter received from a Ford owner, indicates the result of a Dealer attempting to divide his efforts between the Ford business and other lines:

Ford Motor Co.
Detroit Mich.
Dear Sir:

Why should the Ford Service Station sell radio sets when he should be servicing Ford cars? Myself and several friends tried to get Ford Service and the boss was out selling radio. I do not call this service. If Mr. . . . . . . . . . . . . . . . . . . cannot make enough money selling Fords and give service, you better get a man that knows how to sell Fords and give service.

A Ford Friend.

Compared With

"I have your service follow-up letter dated November 21st and desire to compliment you on it. It is well written and a very good idea.

"After one experience with your service I came back to you for more and expect to again. You are entitled to know why. Every time I have gone to your place your boys give me the impression that they are really interested in doing business with me, and they not only wait on me quickly but have a very pleasant way about it.

"The work was done ON TIME and AS PROMISED. Not only that but the man in charge KNEW IT.

"They did not try to induce me to order a general overhaul of a certain part immediately but at my request were willing to try an alternative. Just a few days before another Ford man had told me a general overhaul was the only possible thing to do.

"I will not go into further details relative to other dealers but will give you a conclusion I believe supported by the facts. Many of the other dealers are making at least SOME money and because they are, they do not appreciate the business-making possibilities through better service. If you keep on doing good work and contrive to make it as snappy and pleasant as now, I think you will have a large measure of success."

The letter shown above was received by one of our dealers from a satisfied Ford owner. This comparison leaves no room for doubt as to the proper way to conduct a Service Station.

Measurements of New Type Gasoline Tank

The measurements of each gallon of gasoline in the new type tank are shown in Fig. 132. This sketch will enable dealers, who so desire, to make up gasoline measuring sticks which will accurately indicate the contents of the gasoline tank.

The following table gives the same information concerning the other type gasoline tanks used in Ford cars:

<table>
<thead>
<tr>
<th>OVAL TANK</th>
<th>SQUARE TANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Gallon 1 1/2&quot;</td>
<td>1 Gallon 3 2/3&quot;</td>
</tr>
<tr>
<td>2 Gallon 2 1/2&quot;</td>
<td>2 Gallon 3 1/2&quot;</td>
</tr>
<tr>
<td>3 Gallon 3 1/3&quot;</td>
<td>3 Gallon 3 1/2&quot;</td>
</tr>
<tr>
<td>4 Gallon 3 2/3&quot;</td>
<td>4 Gallon 3 1/2&quot;</td>
</tr>
<tr>
<td>5 Gallon 3 5/8&quot;</td>
<td>5 Gallon 3 1/2&quot;</td>
</tr>
<tr>
<td>6 Gallon 3 3/4&quot;</td>
<td>6 Gallon 3 1/2&quot;</td>
</tr>
<tr>
<td>7 Gallon 3 7/8&quot;</td>
<td>7 Gallon 3 1/2&quot;</td>
</tr>
<tr>
<td>8 Gallon 4 1/8&quot;</td>
<td>8 Gallon 3 1/2&quot;</td>
</tr>
<tr>
<td>9 Gallon 4 5/8&quot;</td>
<td>9 Gallon 3 1/2&quot;</td>
</tr>
</tbody>
</table>

Tips for Improving Service

The following are some suggestions which will not fail to improve your service and customers satisfaction:

Provide a definite place within your building into which incoming customers may drive.

Use neat signs to direct customers to service entrance.

Keep the approach to service entrance in good condition.

Have someone immediately show recognition of an incoming customer, either to take care of his wants at once, or to advise him he will be taken care of shortly.

Select an intelligent employe for the important function of greeting customers. He must not only be competent to diagnose mechanical difficulties, but show the tact and diplomacy of a salesman.
When installing the present type window regulators in doors on coupe or sedan bodies, it is essential that the instructions given in the sketch (Fig. 133) be followed. The tops of the three spacers should be filed or faced off $\frac{1}{16}$". The lug retaining the spring should be faced off $\frac{3}{16}$". The lug on the opposite side of the plate can either be faced off $\frac{1}{16}$" or cut off entirely.

The doors which we are now making have the pocket for the regulator drawn deeper and an additional $\frac{1}{32}$" clearance for the glass is incorporated in the inner panel. Until these doors are received, however, careful attention should be given this matter so as to eliminate the possibility of door glass breakage.

**Care of Tires**

Many owners fail to secure the proper amount of service from the tires on their cars because of lack of proper care. This is a matter of great importance to all Ford owners, particularly at this time when the price of rubber is very high, with resultant increases in the cost of tires. When the causes of excessive wear are understood, it is not difficult to obtain the maximum mileage built into the tires by the manufacturers.

The item of first importance is correct inflation. This matter is thoroughly covered in the May and November issues of the Bulletin.

Of next importance is the matter of alignment. Too rapid wear is quite frequently due to such things as bent axles, bent steering knuckles, a loose bearing, a bent spindle or other causes which tend to throw the wheels out of proper alignment. Excessive brake application, spinning of the wheels, or a rim unevenly placed on a wheel will have the same result.

In every case where there is evidence of premature wear, it is advisable to check the car very thoroughly for any irregularities such as those listed above. As a matter of precaution, it is good practice to have such an inspection made periodically.

Some types of anti-skid devices have a detrimental effect upon the treads of casings. Under some conditions, such devices may be necessary but to secure the maximum service from a casing, they should be used only when actually needed.

It is essential that chains be applied loosely. Tight chains tend to compress the casing at the point of contact with the ground. This results in the cross links cutting and gouging into the rubber cover and fabrics underneath. It is also important that the rounded sides of the links be against the rubber so that the roughly clinched ends of the cross links will come next to the road.
Setting of Front Wheels

The proper alignment of the front wheels on the improved car is shown in Figs. 134 and 135. There has been no change in the setting for toe-in but the pitch has been reduced considerably.

Due to the construction of the transmission, the four new parts must be put in together. The same ball bearings may be used however.

The S-343C gear is larger in diameter than the gear which it replaces and when installing this new gear in old tractors, sufficient clearance between the gear and housing must be maintained. Attention is directed to this, because of the fact that the space between the cores where they are put together leaves a slight ridge or fin, in the casting. The mechanic should make certain that this ridge is removed before installing the new gear.

Cowl Ventilator Weatherstrip

All cars now being produced are equipped with a cowl ventilator weatherstrip such as illustrated in Fig. 136. The weatherstrip is made of rubber and is fastened to the ventilator by a wire hook. It can easily be installed on all improved cars, except the Fordor, and is now available through service.

Special Ratio Gears for Fordson

It is sometimes the case that Fordson tractors are used for work which requires great pulling ability in intermediate speed. In such cases, a greater margin of power is highly desirable and we have accordingly arranged to supply four new transmission gears which increase the ratio in intermediate speed from 44.46 to 56.1. This gives 26% greater pulling ability in intermediate gear.

The gears are as follows:

S-338B Trans. shaft-upper (replaces F-1518).
S-343C Trans. gear (replaces F-1540C).
S-340B Trans. pinion-low (replaces F-1545).
S-342B Trans. gear-low (replaces F-1547).

Care of Shop Equipment

There seems to be a tendency on the part of shop men to overlook the importance and value of many pieces of equipment which they use. This applies particularly to electric drills.

Too many drills are "kicked under the bench" or thrown into a dusty dirty corner when not in use. An electric drill is a valuable part of the shop equipment and should be kept in a clean dry place, either on top of the tool bench or hanging on the wall. It is preferable to have a dust-proof cabinet in which to keep a drill when not in use.

It frequently happens that electric drills are heavily overloaded. Any good electric drill can be used occasionally to drill holes over its rated capacity without doing it any harm, but if continuously overloaded, serious damage will soon occur. Such troubles can be avoided by equipping yourself with a drill of sufficient capacity to handle your work.
Dimensions of Improved Commercial Chassis for Body Building

Fig. 137

Fig. 138
ONE of the most important factors to consider when purchasing accessories for an automobile is the manner in which they are fitted to the car. This is particularly true of bumpers. In designing the Ford bumper, careful attention has been given to this and as a result the bumpers can be attached very rigidly and securely to the frame. The frames of all improved cars have holes provided so that installation is a very simple matter as compared to any other type bumper.

One of the outstanding advantages of the Ford bumper is the fact that there is no possibility of the body being thrown out of alignment by its installation.

There are bumpers on the market which are installed by placing hangers between the body sills and the side or rear members of the frame. This results in the body sills being sprung, so that the doors bind, and not only causes the owner dissatisfaction but also impairs the reputation of our product.

To avoid such trouble, the center and front end of the body should be shimmed up an equal distance when bumpers of this type are installed. This, if extreme, will effect the fit of hoods and, of course, greatly increase the cost of installation.
The proper method of installing the Ford front bumper is as follows:

1. Remove fender bracket to frame bolt (either side).

2. Insert bumper bracket bolts in frame and install bracket (Fig. 140). Place lock washers on bolts and draw up nuts SECURELY.

3. Install bracket on other side in same manner.

4. Install bumper bracket to bar clamps (Fig. 141) in brackets. Do not draw up nuts.

5. Place bumper bars in clamps and after lining up bars, tighten one clamp only. Slide other clamp out toward end of bars approximately one inch, thus springing the bracket out. Tighten this clamp nut and then move other clamp out toward end of bars an equal distance. The tension thus placed on the brackets makes the bumper more rigid.

The installation of the rear bumper is accomplished in practically the same manner. First, line up bracket with holes in frame and insert bolts, (Fig. 142). Place lock washers on all bolts and tighten down nuts SECURELY. After both brackets have been installed as outlined above, the clamps should be placed in brackets as illustrated in Fig. 141. Placing the bars in the clamps is done in the same manner as the front bumper except that the brackets should be sprung in toward each other instead of out as in the case of the front bumper. Tighten one clamp after lining up the bars and move the other in approximately one inch before tightening clamp nut. The other clamp should then be moved in an equal distance and tightened.

After fastening the center clamp in place, the installation is completed.

A labor charge of $2.00 for installing a set of Ford bumpers is suggested, thus making the total cost to owner of a set of Ford bumpers installed on his car, $17.00.

Reducing Crankcase Dilution

Dilution of the oil in the crankcase can be greatly diminished by exercising a few simple precautions.

When starting a cold engine, it is necessary to greatly enrich the mixture and this has been taken care of by the combination choke and carburetor adjusting rod, with which all cars are now equipped. Many owners depend upon the choke, however, to keep the engine running until it is warmed up, instead of turning the carburetor adjusting rod, so as to enrich the mixture. This practice results in a charge of raw gas being drawn into the cylinders on each intake stroke. Some of this gasoline gets by the piston rings and eventually the oil becomes diluted to such an extent that it possesses very little lubricating value.

Running the engine with a rich mixture after it is warmed up, produces the same condition. It is, therefore, important that owners be instructed, not only to use the choke as little as possible, but also to see that the carburetor adjusting rod is turned back to the correct running position, after the engine is warmed up. These precautions will materially reduce the possibility of excessive crankcase dilution.
Work Benches

Fig. 143

To many mechanics, a work bench is merely a handy place to throw tools and old parts which are not required at the present moment. The space underneath the bench is often considered an ideal place to tuck away various things which are only occasionally used and, consequently, it soon becomes the trash collector of the shop. These unsatisfactory conditions can, to a great extent, be eliminated if a little thought is given to the type of bench used and its location.

A very satisfactory bench is illustrated in Fig. 143. This type bench is made of iron and does not require much attention to keep its neat appearance. By placing the bench away from the wall, both sides are made available for use and the number of benches required is reduced accordingly. Furthermore, there is not such a pronounced tendency to use the space under the bench for storing junk and the general appearance of the shop is, therefore, considerably improved. This good appearance can be retained indefinitely by painting the bench once a week with machine blue paint, made up of one gallon of tractor grey paint (M-210) and one quart of black paint, (M-213), mixed.

Efficient workmanship cannot be done with poor tools or equipment. The work bench is one of the most important pieces of equipment in your shop and should, therefore, be laid out so as to give the utmost efficiency. Careful thought along this line will produce remarkable results.

T-332A Front Springs

It has been brought to our attention that dealers are not carrying in stock a sufficient supply of T-332A front springs. This type spring is required for use on cars built previous to July, 1925, and it is, therefore, essential that dealers maintain a good stock of these springs.

If your stock of this item is depleted as a result of its having been omitted from the last issue of Dealers' Monthly Parts Order, arrange to secure a supply from the local branch at once.
Service Follow-up File

While there are many dealers who are maintaining a service follow-up file, we have found but few who are realizing the full benefits of the system. It is not enough to merely post the repair orders on the cards and periodically go through the file to ascertain which owners are bringing their cars in for service work. When handled in this manner, the file is a liability, since the results of its use are not proportionate to the labor expended upon it.

The sole purpose of maintaining a service follow-up file is to enable the dealer to keep himself informed as to what percentage of the potential business is coming into his shop. To do this, he must have some means of segregating the car owners who come in regularly from those who seldom or never bring their cars in for service work. It is this latter class of owners in whom the dealer is most interested, and in Fig. 144 we have shown a means of telling at a glance which owners are not using your service facilities. This is accomplished by using black and red flags to show when cars were last in and when they should return.

The part of the file which is circled in the cut is the barometer which indicates the measure of success your shop is having. These are the red flags and each one means that the owner, to whose card it is attached, has not been in your shop for thirty, sixty or ninety days.

In the right hand corner of each card is a space marked, "elapsed time since owners last call." This is divided into three sections as indicated by the lines in the cut. The first section is marked thirty days, the next, sixty days and the last section, ninety days. A space for each day of the month is also provided at the top of each card and, by placing a black flag on the date the car should be again inspected, a close check can be kept. After thirty days have elapsed since last call, a red flag should be placed on the card in the space provided for that purpose. Likewise, after sixty days and ninety days. In this manner, the file shows very plainly the number of owners who, for some reason, are not giving you their business.

If the file is carrying a number of red flags, it is evident that there is some condition worthy of investigation. It is up to the dealer to find out why these particular owners have not been in for such an extended period of time. Each red flag represents a certain amount of money which is evidently going to some outside garage. No Ford dealer wishes this condition to exist and when apprized of the fact in such an unmistakable manner will immediately take steps to eliminate the cause.

Black Chassis Paint

Our attention has been directed to the fact that a number of dealers hesitate to use M-165 Black Enamel for painting axles and other parts of the running gear, feeling that this paint is too expensive. This is an erroneous impression as M-165 is no more costly than many inferior grades of paint which are sometimes used. The ordinary black chassis paint can only be used on axles, etc., whereas, M-165, being a standard paint can be used on any part of the body or chassis. Considering the slight difference in price, if any, between a chassis paint and M-165, there is no advantage in using two kinds of paint, and the dealer who has a conscientious desire to turn out the best possible workmanship, will appreciate the advisability of using M-165.
Ford Snubbing Units

The snubbing unit which we are now supplying employs a steel cable instead of snubbing straps to fasten axles to units. This cable is of plow steel, stranded construction, processed to prevent rust under most severe conditions, and eliminates the necessity for further adjustment after units are once installed.

The installation of these units can be accomplished very easily in a short time without any change in construction of the car or drilling of holes. The proper procedure is as follows:

**INSTALL Rear Unit First**

Rear snubbing unit is to be bolted to left rear spring clip IN FRONT OF REAR CROSS MEMBER.

1. Remove two nuts from left rear spring clip.
2. Remove the rear spring clip bar, care being taken to avoid injuring the threads on spring clip.
3. Place snubbing unit with fitting "C" over spring clip, replacing clip bar so that the unit is in position in front of the rear axle as shown in Fig. 145.
4. Replace nuts on the spring clip and TIGHTEN SECURELY. Replace cotter pins.
5. Remove differential housing bolt "D" which is located just above the drive shaft. Bolt cable fitting securely to differential housing through hole from which bolt was just removed.

6. The rear snubbing unit is equipped with a special cable clip "E." Remove by pulling cable clip from cable with a pair of pliers. Lay it aside for use when installing front unit. Do not remove this clip until cable fitting is securely bolted to differential housing.
7. Make certain that cable does not rub on dust cover. If necessary, spring dust cover back with the aid of a screw driver or similar tool to insure cable clearance.

**Front Installation**

Before installing the front unit, clamp it in a vise and pull out cable as far as it will go. Then place clip "E", Fig. 145, on cable so as to hold the cable out.

1. Remove the two nuts from spring clip.
2. Remove front spring clip bar.
3. Place snubbing unit with front frame fitting "A" over front spring clip so that unit will be in position behind front spring as shown in Fig. 146. (Note snubbing unit will be to the right side of center of car.)
4. Snubbing unit front frame fitting replaces original spring clip bar.
5. Replace nuts on spring clip and TIGHTEN SECURELY. Replace cotter pins.
6. Clamp axle fitting "B" in proper position on lower axle flange to insure correct cable alignment. (Tighten clamp nut securely.)
7. Secure plunger on end of cable in axle fitting "B" and remove clamp "E."
8. Be sure cable does not rub on dust cover as outlined in instruction No. 7 under rear installation.
9. FORD Snubbing Units are self lubricating. Do not oil or grease.

All Ford snubbing units are correctly adjusted at the factory for average conditions. The car should, therefore, be tried after installation before changing adjustment.

Too much friction will check the rebound too abruptly, causing the car to ride rigidly while insufficient friction makes the snubbing
unit ineffective. If, after trying the car, it is decided that an adjustment of the tension is necessary, the desired friction can be obtained as illustrated in Fig. 147. Turn adjusting screw to the right to increase tension and to the left to decrease.

A set of snubbing units with special bracket for the touring car is furnished under part number T3209 and a set of snubbing units for all other types is carried under part number T3208. Each set consists of a pair of snubbing units with brackets and is put up in a carton complete with necessary bolts, etc., for installing.

The retail price is $9.00 per set and a charge of $1.00 for installation is suggested.

**Balloon Tire Chains and their Installation**

Ford size balloon tires are 29 x 4.40 and in no case should any tire chain except one made specially for this size balloon tire ever be used. Tire chains marked 30 x 3½ are not suitable because they do not fit. Balloon tires being larger in diameter and low pressure, present a much wider surface at the point where tire and ground meet. Therefore, unless a tire chain is made with long enough cross chains to cover this additional width, some part of the chain other than that made for the purpose will run between the tread and the ground. The parts forced under the tread are the cross chain connector hooks. All connector hooks of all tire chains are made of soft metal (not hardened as are the cross chains) because they must be bent around the side chain when assembled and also when a cross chain needs replacing. If cross chain connector hooks ride on the tread, the chain will quickly wear out, because they are not made for that service.

2. Ford Size Balloon Tire Chain Specifications

Exhaustive tests by tire chain manufacturers have definitely proved that tire chains (termed 29 x 4.40) to fit 29 x 4.40 balloon tire should have the following specifications:

**CROSS CHAINS:**
- Cross chains exclusive of connector hooks should not be shorter than 5½ inches.
- Diameter of cross chain wire should not be less than .192 inches.
- Hardened cross chains will give many times the wear of unhardened links.

**SIDE CHAINS:**
- Side chains should be made from wire not smaller than No. 10 (diameter .185 inches.)

**OVERALL LENGTH OF CHAINS:**
- Length of chains overall should not be less than 80½ inches.

3. To get the maximum wear, chains should fit the tire snugly. Loose tire chains slap the pavement with such terrific force at every revolution, that metal cannot stand up under it for any length of time. This also makes them very noisy. Putting the chains on tight and keeping them tight practically makes them a part of the tire and they are subjected only to smooth constant wear. This is unusually important and should be carefully watched, because all new side chains stretch from 1 to 2 inches after being run about 50 miles. Tire chains are made so that this stretching can be easily taken care of by engaging the fastener in the proper link for a tight job. A common practice for putting them on is to first jack up the car; then throw the chain over the tire with the smooth side of the side chain next the rubber and the fastener end forward. The two ends of the chain should be brought together with enough pressure to make the chain fit snugly on the tire with the smooth side of the side chain next the rubber and the fastener end forward. The two ends of the chain should be engaged with enough pressure to make the chain fit snugly on the tire with the smooth side of the side chain next the rubber and the fastener end forward. When thus applied, slack should be taken up after first few miles. Chains must fit snugly for maximum wear.
Because it is sometimes necessary to run a chassis before the body is mounted, we have made up an auxiliary gas tank to serve this purpose. We do not care to supply these assemblies but in order that dealers can have them made up locally, are showing a sketch of tank and fittings. (Fig. 148.)

The tank is a standard tractor gasoline tank, part number F3138, and can be requisitioned from the local branch. The piping and shut-off valves can be secured from any hardware shop.

Care of Rims

It frequently happens that many miles of tire service are lost as a result of owners failing to give the slightest attention to the tire rims. It is important that the rims be true and that tires fit perfectly and any variation in the rim contour eventually means tire trouble.

Such troubles will result from running on a flat tire, on a rim from which the tire has been removed or striking some object in the road. Consequently, the rim and tire should be examined closely at the first sign of any damage to the rim so as to avoid injury to the tire. When it is evident that a damaged rim is injuring a tire, it is advisable to purchase a new rim, since it is practically impossible to satisfactorily repair the damage. Furthermore, the price of a rim is inconsiderable as compared to the price of a tire.

The continued use of a rusty rim will inevitably result in trouble with the tire. Due to the fact that a flap is not used with clincher rims, the tube rests against the rim and the rust gradually cuts into the tube until a slow leak occurs. The rust on the rim also tends to cut into the casing around the bead, particularly in the case of damaged clincher rims. The flap used with straight side rims, protects the tube from being damaged by rust. In many cases, however, the rust causes the flap and casing to stick so tightly to the rim that the casing is damaged in the attempt to remove it from the rim.

All such troubles can be avoided by thoroughly cleaning the rims occasionally and giving them a coat of rim paint. This paint can be obtained from any local tire dealer.
Interesting Results of Starter Motor Test

The following letter was received from one of the U. S. Naval Air Stations:

"This station has completed a test of eight starter motors to ascertain which starter motor was the most powerful in hopes of finding one which had sufficient power to reel in an aerial target.

"Of all the truck and automobile starter motors tested, the Ford starter motor gave the best performance. The test was to determine whether or not a starter motor could develop 2 H. P., and if so, how long it could deliver that amount of power. The test showed that of all truck or automobile starter motors tested, the Ford starter motor was the only one to deliver 2 H. P. The following shows the result of the test:

<table>
<thead>
<tr>
<th>Time</th>
<th>R.P.M.</th>
<th>Volts</th>
<th>Amperes</th>
<th>H.P. Delivered</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 minutes</td>
<td>2500</td>
<td>5 3/4</td>
<td>135</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>2200</td>
<td>5 1/2</td>
<td>169</td>
<td>1 1/4</td>
</tr>
<tr>
<td>1 1/2</td>
<td>1750</td>
<td>5</td>
<td>203</td>
<td>1 1/2</td>
</tr>
<tr>
<td>2 1/2</td>
<td>1100</td>
<td>4 1/2</td>
<td>237</td>
<td>1 3/4</td>
</tr>
<tr>
<td>2 1/2</td>
<td>1100</td>
<td>4</td>
<td>271</td>
<td>2</td>
</tr>
</tbody>
</table>

"At the end of the twenty-one and one-half minutes, continuous running, the test was dis-

continued because the battery (a new 130 ampere hour 6 volt battery), had become so heated it was deemed advisable to do so to prevent destroying the battery.

"An examination of the starter motor showed that it was in perfect mechanical condition. It had not overheated, neither was the insulation impaired at all.

"Please accept our thanks for your courtesy and co-operation in lending us the motor for this test."

While we do not recommend the use of the Ford starter motor for any purpose other than that for which it was designed, the results of this test clearly indicate the quality and sturdiness of the unit.

Price of Grommet Punch Reduced

A reduction has been made in the price of the grommet punch illustrated in Fig. 130, of the January Service Bulletin. The price of this tool is now $1.25 instead of $1.75. This means a corresponding decrease in the price of the complete set of curtain fastener tools.

Dealers should place orders for these tools with the local branch, who will arrange for shipment direct from the manufacturer on the usual C.O.D. basis.

Genuine Ford Connecting Rod Trade Marks

Connecting rods of the light weight type, bearing the trade marks shown in Fig. 149, are to be accepted on the exchange basis. We are now making all our connecting rod forgings, and the rods supplied in future will bear the trade mark F in a triangle.

There are a number of genuine Ford connecting rods in service which bear trade marks other than those shown above. These trade marks are shown in previous issues of the Service Bulletin, however, and were, for the most part, used on heavy type rods, which are no longer subject to exchange.
Capitalize Courtesy

EVERY dealer's hope of successfully maintaining his business, depends to a great extent upon the attitude of car owners toward his organization. This attitude, for the most part, is formed by the treatment accorded owners on the service floor. Consequently, the employees who come in contact with owners should be chosen for their ability to create good will as well as for their mechanical knowledge.

The service man who meets the owners as they drive in, is the dealer's personal representative. In the eyes of the owner, his attitude represents that of the entire organization, and a disinterested manner of approach tends to create the impression that only indifferent treatment can be expected from the whole organization. On the other hand, prompt attention and a courteous word from a neat appearing service man makes the owner feel that the dealer has a personal interest in the satisfactory operation of his car. He has confidence in the work turned out by the dealer and has an open mind toward any suggestions offered in connection with his car. This feeling on the part of service customers means increased work in the service shop, increased sales of new cars and increased profits. It is the inevitable result of conscientious effort to render service.

Courteous treatment by every employee with whom owners come in contact, will go far toward building up this good will.

IT PAYS
Spring Clean-up

At this time of the year when car owners are beginning to think of tuning up their cars for the spring and summer trips, dealers have an opportunity to get in contact with many owners who do not ordinarily take advantage of the dealers' service facilities. A letter calling attention to a few simple operations which remedy the ill effects of cold weather operation will be given careful consideration and undoubtedly result in many owners bringing their cars in.

The spring clean-up should include a thorough flushing out of the cooling system. It is not enough to merely drain the radiator and refill it with clean water. The entire system should be thoroughly checked, hose connections carefully inspected and every effort made to remove all sediment and scale which might have accumulated. Hose connections which show the slightest sign of deterioration should be replaced.

The most satisfactory method of flushing out the cooling system is to open the bottom pet cock and let the water flow directly from the hose through the radiator and cylinder block. If there is evidence of a considerable amount of scale in the system, fill the radiator with a solution of water and a small amount of soda ash (approximately one and one-half teacupfuls) and run the engine for a short time. The entire system should then be thoroughly flushed out with clear water so as to remove all the soda solution.

In order to insure the removal of all particles of carbon or residue from the engine, it is good policy to remove the crankcase bottom cover and clean it thoroughly. The sediment bulb should be cleaned out and any deposits which might have accumulated in the gasoline feed line should be removed by blowing compressed air through it.

By taking these precautions now, owners can avoid the annoyance of improper operation. Most owners appreciate that these are attentions which every automobile requires and are, therefore, quick to respond to a suggestion from a dealer that they have the work taken care of.

Rear Axle Drain Plug

A number of cases were called to our attention where T-2532, rear axle housing oil plug, was screwed in so tightly that it could not be removed. There is no necessity for tightening the plug in this manner and in order to eliminate this possibility, we have redesigned the plug. Instead of having a hexagon head on which to place a wrench, the plug now has a square recess and is carried under the part number T-2532B.

This change also necessitated the redesigning of T-1387 wrench. A three-eighths inch square shoulder is now placed on the end of the handle, so that by inserting it into the recess, the plug can be turned in or out, but cannot be drawn up so tightly as to prevent removal.

Truck Cab Door Handles

All orders for part TT-12628 door handles are now being filled with the assembly consisting of TT-12628 and TT-12630 inside handle. This is due to the fact that the design of both these items has been changed and the redesigned parts cannot be used with the old style handles.

The present type assembly is illustrated in Fig. 150 and it will be noted that instead of having the locking screw in the end of the shaft, it is in the top of the inside handle. Furthermore, the inside handle is shorter than formerly and the whole assembly is a die casting instead of a malleable.

The greatest value of grease is its capacity to lubricate, eliminating friction—but, it also causes friction—when smeared on a customer's car inside or out.

Be certain that cars are clean before being delivered to customers.
Wire Wheels

This company is now manufacturing a limited supply of wire wheels and while we have not as yet reached a point where general distribution can be made throughout the country, it is essential that all dealers be acquainted with the proper method of changing tires.

The Ford wire wheel is constructed with a drop center rim which necessitates the use of a specially designed tire and tube. A number of tire manufacturers are now making tires and tubes which are adaptable to either drop center or flat base rims and these tires are identified by a red centering line directly above the bead. The tubes are marked “For either drop center or flat base rims.” Only tires or tubes which have these distinguishing marks should be installed on Ford wire wheels.

These interchangeable tires are supplied by the manufacturer with a flap. Do not use the flap when installing such tires on drop center rims, however, as the flap is furnished only for use on flat base rims. The construction of a drop center rim is such that a flap will cause innumerable troubles if used on this type rim. The cross section of drop center tire, tube and rim, Fig. 151, clearly illustrates why a flap would cause trouble.

One of the outstanding advantages of the drop center rim is the ease with which tires can be removed and installed. The work can be done more easily with the wheel on the tire carrier or axle. To install tires, the procedure outlined below should be followed:

1. Inflate tube until it is barely rounded out and place it in casing.

2. Place valve stem in hole of rim and press beads together until they are down in the drop center portion of the rim. Fig. 152. Continue forcing the beads into well, working both ways from valve, until top half is resting in rim well. The lower portion of the tire can then be pushed over rim flange very easily.

3. Raise tire up until it is perfectly centered on rim and beads are seated on ledges, Fig. 153. Then after applying not over two pounds air pressure in tube, work casing back and forth, thus insuring proper seating of beads, indicated by uniform position of red line outside of rim. This cannot be done if tire has more than two pounds air pressure.
4. Put valve nut on valve stem and then inflate tire. After inflating to proper pressure, tighten valve nut, attach valve cap and dust cap.

Too much emphasis cannot be placed upon the importance of properly seating the tire on a drop center rim. The red centering line should show an equal distance from the rim all around and on both sides, Fig. 154. Failure to follow these instructions will result in blowouts and other tire troubles.

The removal of tires from the rims can be accomplished with equal facility, the correct procedure being as follows:

With valve at top of wheel, remove valve inside, thus permitting all air to escape from the tube. Remove valve nut and push valve stem up into tire. Working both ways from valve stem, press beads together and down into rim well approximately one foot each way. Insert tire iron under both beads at point farthest from valve and pry tire over flange. The tire can then be removed from the wheel with the hands.

Adjusting Battery Horns

Our examination of the battery horns which are returned to us as defective clearly shows that in practically every case their failure is due to the adjustment of the points being tampered with. All horns are properly adjusted at the factory and only in very rare cases should it be necessary to change the position of the points. In such cases, the adjustment should be made with an ammeter in the circuit. When adjusted at the factory, the horns are set to draw a maximum of four and one-half amperes. This gives the most satisfactory tone and will not result in the points fusing together. If the amperage draw is increased, however, the silver points burn and eventually stick together. For this reason, the points should not be adjusted except with an ammeter in the circuit.

Ford Main Bearings

Requests have been received from a number of dealers for information as to the factory method of rebabbitting the main bearings. The practice followed at the factory has been duplicated by several manufacturers of rebabbitting equipment and in order that dealers may select equipment which follows our method, we are giving below an outline of the procedure followed in production.

The high pressure babbit metal is poured into the unheated block and is molded by the aid of a jig bar. It is held in place by lugs of babbit which fit into anchor holes in the casting. After the surplus babbit has been removed from the top of bearings, the caps are bolted to the cylinder block with a .012" shim between cap and block. This is the rough capping operation preparatory to boring the bearings to size. The blocks are then placed on large lathes and the bearings are bored with boring bars, the camshaft bearing holes being used as locating points. By holding the block in this manner during the boring, there is no possibility of any variation of the distance between the crank and camshaft bearings. This is important and we feel that all rebabbitting equipment for Ford blocks should utilize this method.

After the boring, the edges of the babbit are filleted to a radius corresponding to that on the crankshaft bearings. The bearing caps are then removed and the .012" shim taken out. Previous to removal the caps are marked so that when replaced they will be in the same position as when bored.

The oil holes in the upper half of bearing are now punched out and countersunk. The edges of the babbit in the block bearings are now filed with a flat rasp to an angle of 45 degrees with the lower face of the block. The groove thus formed when the cap is assembled, acts as an oil groove for the bearing and also as a clearance to take care of babbit pressed out during the subsequent running in of the bearings. The ends of the bearings are also filed smooth. A little oil is then placed on the bearings and the crankshaft is fitted in the block. The crankshaft end play is determined by the difference in the length of the rear bearing on the block and the length of the crankshaft bearing and should not be more than .004.
of an inch. The center and front bearings have from \( \frac{3}{16} \) to \( \frac{1}{8} \) end clearance which allows for expansion and lubrication. The oil grooves of the caps are now filed and the caps are placed over the shaft bearing, using the marks mentioned above to determine correct position. The cap is now rocked over the round shaft and two or more brass shims of .002" thickness are applied until the rock of the cap shows a .004" or .005" clearance between cap and block. The caps are then bolted down and the bearings are run in on a belting block at a speed of 700 R.P.M for the period of one minute. This process pressures the babbitt to conform to the shaft and a smooth, hard bearing results. After the belting operation, the rear bearing cap is removed and the bearing surface inspected. If this shows a full bearing surface, the cap is oiled, replaced and bolted down with same tension as previous to removing.

One of the most important items in reballing a cylinder block is having a clean, dry surface for the babbitt. If the bearing supports are covered with water or oil, even in the smallest quantity, there will be blow holes in the babbitt. Another important factor is having the babbitt heated to the proper temperature before pouring the bearings. Perfect bearings can be poured only when the temperature of the babbitt is between 800° and 840° F. If no pyrometer is available, the temperature can be estimated by the appearance of the metal. When the correct temperature is attained, the metal has the appearance of quick-silver and tarnishes slowly when the scum is scraped off, the coat of tarnish showing various colors. When cold, the metal acts sluggish and the tarnish assumes a dull appearance. The babbitt should be dipped from the bottom of the pot with a ladle which is approximately the same temperature as the metal. Otherwise, the metal will not be thoroughly mixed and will not have the proper wear resisting qualities.

Only new babbitt should be used, as the properties of the metal are changed by melting old babbitt in with the new metal.

**New Parts for Improved Cars**

Since the first of the improved cars were produced, several refinements have been added and it is our desire that these improvements be made on all present type cars including those in owners’ hands. The following is a list of the parts required to bring these cars up to date:

- T-50208X  Windshield weatherstrip, bottom.
- 40195X  Sediment bulb weather pad.
- 45591X  Pedal weather pad assembly.
- 45295X  Adjusting rod anti-rattler, on dash.

These parts are to be furnished free of charge and dealers should immediately take steps to secure from the local branch a sufficient number of the parts to take care of the cars in their respective territories.

**Redesigned Fan Bracket**

A change was recently made in the design of the fan bracket assembly as illustrated in Fig. 155. The fan eccentric now has a flange and lug on inside edge toward cylinder block. The cylinder head outlet connection has also been redesigned so that the adjusting screw is eliminated and the strength of the casting considerably increased.

To adjust the fan belt with this new type bracket, it is necessary to loosen the nut on the end of the fan shaft so that by using a wrench on the lug, the fan eccentric can be moved. The lug should be turned up to tighten the belt, and down to loosen. After the proper adjustment has been secured, tighten the nut on the

![Fan Belt](image)

fan shaft, thus drawing up on the fan eccentric plate which holds the fan eccentric in place. Fig. 156 shows the new parts in their relative assembling positions.

The following are the new parts used in the fan assembly:

- T-3988-638  Fan eccentric plate.
T-3004E-8719C Cylinder head outlet connection.

T-3987B-630 Fan eccentric.

The fan shaft, part T-606C, used with the above mentioned parts has also been changed slightly to adapt it to the new style eccentric. The diameter of the shoulder which fits in the eccentric is slightly smaller and the length is $1\frac{3}{4}$" instead of $1\frac{1}{4}$" as formerly.

The adoption of this new type bracket obsoletes all parts of the old fan bracket and dealers should return the following parts to their respective branches for credit as soon as a sufficient stock of the new parts is secured:

- T-3973C-647R Fan eccentric adjusting bolt.
- T-3973D-648R Fan eccentric adjusting bolt nut.
- T-3987-646AR Fan eccentric.
- T-3004C-8719BR Cylinder head outlet connection.

In every case where it is necessary to replace parts of the old style fan bracket assembly, dealers should install a complete assembly of the redesigned type. This does not include the fan and pulley assembly, which should be assembled to the new style fan bracket and retained in service.

Another Quality Accessory

In line with the policy of this company of making available to Ford owners, accessories of highest quality at reasonable prices, we are now supplying a combination stop and tail light assembly. Fig. 157. Careful consideration has been given to symmetry, appearance, durability and economy in designing this stop and tail lamp. The license bracket included in the assembly is constructed of heavier material than the standard license bracket, in order to carry the increased weight of the larger lamp.

Attention is directed particularly to the type of switch used in conjunction with this lamp. Fig. 158. It is very simply constructed and easily attached to the starter drive cover by tightening one screw. The switch is operated by a rod projecting from the switch and actuated by the lateral action of the brake pedal cam. This type of construction eliminates the necessity of using clamps, pull wires, etc., which are a constant source of annoyance and trouble when used.

The combination stop and tail lamp assembly is installed as follows:

1. Replace standard tail lamp and license
bracket with combination stop and tail lamp assembly.

2. Mount switch on end of starter drive cover with end of plunger just touching the end of brake pedal shaft at center. Tighten clamp screw, thus attaching switch firmly to starter drive cover. Fig. 160.

3. Connect closed terminal on short wire to terminal bolt on front of switch and run wire forward alongside of lighting cable to terminal block on dash, connecting to terminal at extreme right end of block. Fig. 159. This is the terminal to which yellow and black wire is connected. Tape this wire to lighting wire in two or three places with ordinary friction tape.

4. Attach terminal of long wire to rear side of switch and run wire back alongside of tail lamp wire to lamp, connecting end of wire to plug furnished with lamp. Stop lamp and tail lamp wires should be taped together in several places, to take up slack and prevent chafing on metal parts of car.

5. Cut off terminal at extreme end of tail lamp wire, strip insulation for about \( \frac{3}{4} \)" and insert this wire in second terminal of plug. Plug may be reversed in socket if necessary, to insure proper connection of bulbs to their respective switches. If connections have been properly made, depression of the brake pedal will cause movement of the ammeter needle, thus indicating that stop signal is lighted. See that all connections are tight.

The part number of the combination stop and tail light assembly is 3180SX. They are put up in individual cartons complete with switch and wiring and are plainly marked on the outside so that dealers can stock them conveniently. The stop light switch can be used with any type stop light and will be supplied separately under part number 3158SX at a list price of 40c.

At the price of $2.50, subject to usual dealers’ discount, this lamp presents another means of increasing the profits from your parts department. It is attractive, manufactured of high quality materials and of sturdy construction. Dealers can, therefore, wholeheartedly sell the lamp with confidence in its giving complete satisfaction.

Standard tail lamp and license brackets replaced by 3180SX, may be retained in dealers’ stock for sale through service or may be returned, freight prepaid to branches for credit on the usual basis of 30 per cent of list price, providing they are in salable condition.

**Oversize Valve for Tractor**

There has been a limited demand for a larger oversize tractor valve to be used in cases where valve seats are considerably worn in old tractors. It is our understanding that the practice heretofore has been to install valves designed for use in automobiles of other makes and we do not approve of this method of repairing Fordson tractors. Arrangements have accordingly been made to supply valves which have \( \frac{1}{8} \)" oversize heads and \( \frac{3}{16} \)" oversize stems. The dimensions of the valve are as follows:

- Diameter of head 1.805-1.820
- Diameter of stem .3425-.3435
- Diameter at valve seat line 1.745

It will not be necessary for dealers to carry any considerable number of these valves in stock since it is only in rare cases they can be used. Branches will carry a stock at all times and they can be ordered as required, under the part number S-242E—F-109ER.
Dimensions Truck Chassis for Body Designing

Minimum clearance between body and wheel to be - 4 3/8

View "A-A"

Location of Muffler Bracket Bolt Hole

Use Standard Ford Floor Boards

Ground Level

123" Wheel Base

"A-A"

Fig. 161
Better Service

An increasing number of Ford dealers realize that the stability of their business rests in so organizing their Service Departments that the repair of their customers' cars will return them a profit year after year. The dealer who has a large following of satisfied owners, has established a foundation that gives him a decided advantage in making car sales. It must be appreciated that every customer wields a certain amount of influence, and this invaluable sales aid can best be cultivated through properly servicing each and every owner.

The following essentials to good service deserve careful consideration by every dealer:

- Sufficient space for service work,
- Equipment and tools essential to good work,
- Competent superintendent and mechanics,
- Clean and inviting shop,
- Courteous floor men,
- Service follow-up system to keep in contact with owners,
- Daily supervision by the dealer.

The interest and enthusiasm that the dealer throws into the service end of his business cannot help but be reflected in a larger volume of car sales.

Let "Better Service" be the aim and slogan of all Ford dealers.
Fitting Spring Clips on Tudor and Fordor Sedans

As a result of the recent change in the frame rear cross member, it may be necessary, in some cases, for dealers to file the T-3833B-1737, rear spring clip, so as to make it fit properly. In Fig. 162 we are showing how this should be done in order to eliminate the possibility of too much stock being taken off the clip.

Clutch Push Ring Assembly

When making repairs to transmissions, some dealers have made a practice of replacing the pins in T-3336-770 clutch push ring assembly. This ring is a malleable and it is impossible to replace the pins without having them fit loosely. The pins being loose invariably results in the holes in part T-3321B wearing oval shaped, thus causing a loose fit and a noisy engine.

In order to eliminate the possibility of such trouble, we have discontinued supplying the pins for service and whenever excess wear on the pins is noted, a new T-3336-770 clutch push ring assembly should be installed. Any pins which you may have in stock are to be returned to the branch at once for credit.

Curtain Fasteners

The T-41129 curtain fasteners which we are now using do not have the word "Pull" stamped on the fasteners. This distinguishing mark formerly served the purpose of insuring the correct installation of the fasteners, but is unnecessary if the instructions given below are followed.

On runabout rear curtains, A (Fig. 163) must be toward rear of car.

On runabout door curtains, A must be toward outside of car.

On touring, rear and front curtains, same as runabout.

On touring, center curtains, A must be toward rear of car.
Windshield Wings

One of the most popular accessories for an open car is a set of windshield wings. The Ford windshield wing (Fig. 164) is the logical wing for Ford owners to purchase because it is Ford designed, and the clamps are specially constructed for Ford windshield standards.

![Fig. 164](image1)

They are not universal clamps which have but point contact. These clamps fit the stanchions firmly and rigidly. The shape of the glass is designed to enhance streamline appearance, and the glass used is of plate glass, best windshield quality, with square pencil bevel form edge. This type edge is used on Ford wings, so that there will be no blind spots to impair the vision when driving. Beveled edges distort the vision and also chip more easily.

![Fig. 165](image2)

The installation of Ford windshield wings is easily and quickly accomplished. As shown in Fig. 165, the four brackets are supplied in a carton and each bracket is tagged, so as to insure its being placed in the proper position on the windshield. Tighten fittings securely onto the windshield side arm, four and one-half inches above and four and one-half inches below wing nut on windshield side arm (Fig. 166). The wing nuts must be on top with the glass clamps facing toward rear. The glass should then be placed between the rubber pads of the glass clamps, in such a position that there is the same opening between top and body line of car. Adjust knurled screw at back of glass clamp so clamp will be flat on the surface of the glass. Tighten clamp, using screw driver, until glass is securely held.

The price of $6.50 for this high quality accessory is extremely reasonable, and dealers have a large field to work. Every owner of an open Ford car is a prospect for the sale of a set of these wings, and these owners should personally be apprised of the fact that you have them available. The installation of a set of these wings not only improves the appearance of a car, but also affords protection from wind and side drafts. The price is right, and by putting forth the proper effort dealers can realize a substantial profit from the sale of this accessory.

Ford Coil Unit Vibrator

Through error dealers have been given the impressions that we no longer supply 5008 vibrator. Our branches are able to supply this vibrator in any quantities, and dealers will find it advantageous to use this vibrator on old style units, rather than the 5008-B.
Rear Axle Grease Retainers

As an added precaution against rear axle grease leaks, we are now using a metal washer in conjunction with T-2511 leather grease retainer. This washer is designed so that the lugs exert a pressure on the leather collar, and thus hold it firmly against the axle shaft, as illustrated in Fig. 167.

The use of this washer, part T-2511B, greatly prolongs the life of the leather retainer and, notwithstanding the fact that satisfactory service is received from the retainer without the washer, we want this washer installed in every case where it is necessary to replace the retainers. Branches have been instructed to see that a sufficient quantity of T-2511B washers are shipped to dealers to balance the T-2511 leather retainers on hand. The price of the washer only is five cents, list, which makes the price of the complete grease retainer twenty-five cents, list. In filling orders for T-2511 retainers in the future, we will supply 2511C assembly, which consists of T-2511 with T-2511B, pressed on.

It is our intention to supply grease retainers in a carton, for sale through your parts department. This carton will contain two T-2511C retainer assemblies, and will sell for fifty cents, list. Dealers will be notified by their respective branches when these are available.

Credit for New Parts

It has been noted that a number of dealers have signs in their parts departments to the effect that no credit will be allowed for the return of new parts. In our opinion, this is a very poor policy to adopt, as it is bound to create ill feeling on the part of your patrons. Practically all other merchandise is sold with the understanding that it may be returned in the event that it is unsatisfactory or not required, and we can see no reason why this should not apply to Ford parts. In many cases where owners do their own repair work, they purchase parts which they believe may possibly require replacement and, after getting into the job, find that some of the parts are not needed. In such cases, an arbitrary stand does the dealer no good, in fact, it may mean the loss of future business.

Our new discount policy was established with a view to increasing the volume of parts sales to small garages, by providing an incentive for them to order parts in larger quantities. Dealers cannot expect to receive the hearty cooperation of garages if they adopt rules which may work a hardship upon this class of trade. Cooperative service is one of the essentials for the successful operation of a Ford dealership, and refusing to permit the return of new parts purchased over your counter is not in line with this policy. It does not necessarily follow that the cash should be refunded in every case, as it is frequently possible to exchange the parts for others which can be used.

Labor Charges

Shipments recently went forward to branches of the revised issue of the Suggested Schedule of Repair Operations, Form 3554. The labor operations in this schedule have been revised and brought up to date to cover the improved car as well as the old style car, also, prices for installing accessories are included.

The charges suggested in our schedule are to be considered maximum labor rates, in fact, where conditions permit, dealers will find it to their advantage to make reductions in many cases. Automobile owners are rapidly becoming educated to the flat rate basis of repair charges, and any increase over the suggested charge has a tendency to create a feeling of suspicion in the owner's mind. The thought naturally presents itself that the dealer is either too inefficient to keep within the schedule or is deliberately attempting to make an exorbitant profit on each job brought in. No Ford dealership can exist long under either of these unsatisfactory conditions.

The profitable conduct of a service shop depends largely upon volume of work, efficient shop layout, close supervision, equipment and competent mechanics. Without these vital elements, the dealer's overhead is bound to be excessive. Raising labor rates will not take care of excessive overhead, in fact, there is a reasonable doubt as to whether labor rates can be made high enough to offset losses sustained on account of unsatisfactory operating conditions.

In any event, the service customer should not be penalized because of the dealer's inefficiency. This practice will inevitably result
in many owners taking their cars to outside garages for repair work, with the result that the dealer loses the profit on the new parts and, possibly, the sale of a new car at a later date.

The prime thought behind the recent revision in the discount policy was to improve the general character of service stations and to divert a larger volume of the Ford owners' repair work to the Ford dealer. This means increased revenue through a greater volume of parts sold at retail and less at wholesale. Dealers should not lose an opportunity of increased profits, made possible through this policy, because of excessive labor charges.

It will be noted that the charge for overhauling an engine includes rebabbitting bearings. Also that no additional charge is to be made when it is necessary to rebore cylinders.

Investigation shows that some dealers, in order to reduce labor costs, are neglecting to rebabbit engine bearings. This practice should be discontinued, as it is one that is bound to cause customer dissatisfaction. An owner drives a car for several thousand miles with entirely satisfactory results and then brings it to the dealer for overhauling, with the expectation that after the repairs have been made, he will obtain practically as much service out of the rebuilt engine as was obtained before it was rebuilt. Unless the bearings and the crankshaft are properly fitted this cannot be accomplished. The result is that the dealer either has to perform guarantee work, or the customer becomes dissatisfied with the work and takes his car to some other place.

No dealer can afford to take a chance on losing any of his service customers, since it is volume of work which means profits, and steps should be taken to see that this very important operation is not neglected.

**Rear Axle Nut Wrenches**

A comparatively small number of dealers and service dealers have secured S2248 and S2591 rear axle nut wrenches. The rear axle nut cannot be properly tightened without a wrench of this type and every dealer and garage should have one of each. The low list prices of $1.25 for the S2248 and $1.50 for the S2591, subject to regular discount, make it possible for all service stations to secure them and an order for at least one of each should be placed with your next parts order.

**Oversize Cylinder Assemblies**

Branches can now supply T-2991 cylinder assembly—oversize, at a price of $45.00, subject to regular discount.

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**Ford Paints and Polishes**

The Spring season, with its paint-up and clean-up campaigns in all parts of the country, affords Dealers an excellent opportunity to increase sales of Ford paints and polishes.

Many Ford owners, who have more or less neglected their cars during the winter season are now cleaning them up, and these owners will appreciate your calling their attention to such items as Ford Touch-up, Ford Body Polish, Ford Nickel Polish, etc.

Every Ford owner is a prospect for material of this kind and an attractive window or counter display at this season, when the owner is particularly interested in improving the appearance of his car, will aid in the sale of these Ford products.

Sell your customers on the idea that the purchase of this material is not an expense but an economy, as the proper use of these paints and polishes will not only improve the appearance of the car, but will also lengthen the life of the body, fenders, etc.

This is an opportune time to sell Ford Paints and Polishes—take advantage of it.
Data on Fordson Tractor

The data given below in connection with the Fordson tractor should assist dealers considerably in selling prospective buyers on the merits of the Fordson.

Motor—
Bore and Stroke, 4” x 5”—4 Cylinder, Firing order, 1-2-4-3.
21.4 B. H. P. at 1000 R. P. M. with 55 lb. compression kerosene head.
24.6 B. H. P. at 1000 R. P. M. with 72 lb. compression gasoline cylinder head.
Three main bearings 2” Dia. by 3” long. Connecting Rod Bearings 2” x 2”—All bearings burned in.
Piston Displacement 251.3 cu. in. Piston Clearance, .003”.
Wrist Pin 1.375” Dia. by 3.5” long. Weight of Flywheel 120 lbs.
Weight of Iron Piston with rings and pin 4.42 lbs. Weight of old style Connecting Rod 3 lbs., 3 ozs.
Weight of Steel Piston 1 lb., 12 ozs. (Piston 5 1/2” long.) Weight of Light weight Connecting Rod 2 lbs., 12 ozs. Weight of Steel Piston with Rings and Pin 2 lbs., 5 1/2 ozs.


Ignition—Ford Magneto with four spark coils and commutator. Maximum Spark Advance 60°.

Lubrication—Constant level splash—Flywheel circulated. Capacity 2 1/4 Gal.

Air Washer—Float type. Capacity 7 qts. water.

Valves—1 3/4” Lift—both inlet and exhaust cam profiles the same. Inlet opens 10° past upper dead center with piston 4 5/8” above top of cylinder. Inlet closes 40° past lower center with piston 4 1/2” to 4 3/8” below top of cylinder. Exhaust opens 30° ahead of lower center with piston 4 1/4” to 4 3/8” below top of cylinder. Exhaust closes on upper center with piston 3/16” to 3/8” above top of cylinder. Tappet clearance .020”.

Valves—Silicon Chromium Alloy Steel. (Timing dimensions are for iron pistons. Steel pistons domed 3/16” higher than iron.)

Transmission—
Clutch—Multiple disc. 17 hardened Discs running in oil (900 lb. Spring Pressure or 54 lbs. per sq. in. on plates).

Change Gear—Constant Mesh (Internal Gear Clutches) Ball Bearings throughout. 5-7 pitch Gears. Transmission Brake of Multiple Disc Type.

Worm—Reduction 51 to 3. 15°, 8’ 32” lead angle. Lead 2.444 Linear Pitch .8147” Triple Thread Worm.

Rear Axle—Semi-floating. Four pinion differential running on ball bearings.

Ratios and Speeds With Standard Gears at Motor Speed of 1000 R.P.M.

<table>
<thead>
<tr>
<th>Gear</th>
<th>Final Ratio</th>
<th>Worm Speed *</th>
<th>Axle Speed *</th>
<th>Tractor Speed with Standard 42” Steel Wheels</th>
<th>Tractor Speed with 40” Tires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>81.87 to 1</td>
<td>207.7 R.P.M.</td>
<td>12.23 R.P.M.</td>
<td>134 Ft. P. Min., 1.53 M.P.H.</td>
<td>128 Ft. P. Min., 1.46 M.P.H.</td>
</tr>
<tr>
<td>Int.</td>
<td>44.26 to 1</td>
<td>382.3 R.P.M.</td>
<td>22.49 R.P.M.</td>
<td>247 Ft. P. Min., 2.18 M.P.H.</td>
<td>256 Ft. P. Min., 2.68 M.P.H.</td>
</tr>
<tr>
<td>High</td>
<td>17.74 to 1</td>
<td>953.3 R.P.M.</td>
<td>56.36 R.P.M.</td>
<td>620 Ft. P. Min., 7.05 M.P.H.</td>
<td>610 Ft. P. Min., 6.75 M.P.H.</td>
</tr>
<tr>
<td>Rev.</td>
<td>46.39 to 1</td>
<td>366.4 R.P.M.</td>
<td>21.56 R.P.M.</td>
<td>237 Ft. P. Min., 2.69 M.P.H.</td>
<td>226 Ft. P. Min., 2.56 M.P.H.</td>
</tr>
</tbody>
</table>

Ratios and Speeds with “Special Plowing” Gears at Motor Speeds of 1000 R.P.M.

<table>
<thead>
<tr>
<th>Gear</th>
<th>Final Ratio</th>
<th>Worm Speed</th>
<th>Axle Speed</th>
<th>Tractor Speed with Standard 42” Steel Wheels</th>
<th>Tractor Speed with 40” Rubber Tires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>79.15 to 1</td>
<td>215.0 R.P.M.</td>
<td>12.64 R.P.M.</td>
<td>139 Ft. P. Min., 1.58 M.P.H.</td>
<td>132 Ft. P. Min., 1.50 M.P.H.</td>
</tr>
<tr>
<td>Int.</td>
<td>56.1 to 1</td>
<td>303.0 R.P.M.</td>
<td>17.83 R.P.M.</td>
<td>196 Ft. P. Min., 2.24 M.P.H.</td>
<td>187 Ft. P. Min., 2.14 M.P.H.</td>
</tr>
<tr>
<td>High</td>
<td>17.7 to 1</td>
<td>958.3 R.P.M.</td>
<td>56.36 R.P.M.</td>
<td>620 Ft. P. Min., 7.05 M.P.H.</td>
<td>590 Ft. P. Min., 6.71 M.P.H.</td>
</tr>
<tr>
<td>Rev.</td>
<td>58.5 to 1</td>
<td>290.0 R.P.M.</td>
<td>17.10 R.P.M.</td>
<td>188 Ft. P. Min., 2.14 M.P.H.</td>
<td>179 Ft. P. Min., 2.04 M.P.H.</td>
</tr>
</tbody>
</table>
Lubrication—Transmission. Capacity 3 Gals.

Pulley Attachment—
- Drive Gear Spiral Bevel 4-5 pitch (Mitre) 5½" P. D. Spiral 27° Angle.
- Pulley 9½" Dia. 6½" Wide. Speed 1000 R. P. M. Belt Speed 2480 feet per minute.

Weights—
- Weight (less driver, water, oil, lugs) 2425 lbs. Engine with Vaporizer and Coils, 661 lbs.
- Total weight of tractor including all liquid supplies and 150 lb. driver, 2920 lbs.
- Distribution of above weight—front wheels 1063 lbs.; rear wheels 1857 lbs. (Shipping weight—with oil but without fuel and water, 2543 lbs.)
- With driver and oil but without fuel or water, 2693 lbs. Front 889 lbs; rear 1804 lbs.

Dimensions—
- Wheelbase 63". Turning circle 21 ft. Dia.
- Distance between front rims 40½". Distance between rear rims 37½". Width of front rims 5". Dia. of front rim 28". Width of rear rim 12". (Extension rims 7" wide for light soil). Dia. of rear rim 42". (3" Cleats rivetted on rim.) Overall length 102". Overall width 61½". Overall height 54½". Clearance 11½".
- Height of draw bar from ground 12" lateral. Adjustment 7".

Glass Breakage
The breakage of window glasses in closed cars is sometimes due to misalignment of channels or some part of the window regulator. The replacement of a glass without correcting this condition, is only a temporary remedy, as the glass will again be broken when subjected to a slight jar.

In cases where glass breakage cannot be attributed to ordinary accidents, the following items should be checked as the possible cause of the breakage.
- There should be at least ½" clearance between glass and regulators.
- Channels must be straight.
- Clearance between the door and both pillars.
- Sash rest on the bottom carrying rubber bumper, should be closed to hold rubber from sliding out, also, the rest should be positioned so the glass rests fairly on same.
- Glass should not be too loose in slides.
- On older type regulators, see that regulator arms are not forced off the slide track. Tracks should be bent up to prevent arm from running off.

Tractor High Compression Head
For some time past, we have been furnishing as optional equipment on new tractors, a cylinder head having a shallower combustion chamber. This cylinder head was designed primarily for use at high altitudes where the rarified atmosphere necessitated an increase in the power of the tractor. The head has given such generally satisfactory results under all conditions, however, that we have no hesitancy in advocating its use by any owners who feel that more power from their tractors would be advantageous.

The new head raises the compression from 55 pounds to 72 pounds, thus increasing the horse-power at the rated speed of 1000 R. P. M. from 21.4 to 24.6, as shown by the power curve illustrated in Fig. 169. This increase of 3.2 brake horse-power is accomplished without any change in fuel consumption.

When used under ordinary atmospheric conditions gasoline as fuel will give greater efficiency than kerosene; but for high altitude work, either kerosene or gasoline may be used with equally satisfactory results.

The price of the high compression head is the same as the standard, viz, $12.00. All high compression heads are marked, "FORD—HIGH COMPRESSION," in depressed letters ½" high between second and third cylinders.

Many owners follow the practice of having the charging rate of the generator on their cars increased during the winter months. This should be readjusted to ten to twelve amperes now that warmer weather means more frequent use of the cars for long trips.
Ordering Window Regulators

SOME difficulty is oftentimes experienced by dealers in ordering the correct type of window regulators. The following is a list showing the part numbers of the regulators used in the various closed body doors:

**Coupe—1924-26**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Type of Regulators</th>
</tr>
</thead>
<tbody>
<tr>
<td>18034A1X</td>
<td>Door complete—R.—Wood Frame</td>
<td>*17200-C &amp; D</td>
</tr>
<tr>
<td>18033A2X</td>
<td>Door complete—R.—Steel—1925</td>
<td>17200-E, F, G &amp; H</td>
</tr>
<tr>
<td>18034A1X</td>
<td>Door complete—L.—Wood Frame</td>
<td>*17200-D &amp; 17201-C</td>
</tr>
<tr>
<td>18034A2X</td>
<td>Door complete—L.—Steel—1925</td>
<td>17200-E, F, G &amp; H</td>
</tr>
<tr>
<td>50345X</td>
<td>Door complete—R.—Steel—1926</td>
<td>50400</td>
</tr>
<tr>
<td>50346X</td>
<td>Door complete—L.—Steel—1926</td>
<td>50401</td>
</tr>
</tbody>
</table>

**Tudor—1924-26**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Type of Regulators</th>
</tr>
</thead>
<tbody>
<tr>
<td>18538A1X</td>
<td>Door complete—R.—Wood Frame</td>
<td>†17200-B</td>
</tr>
<tr>
<td>18538A2X</td>
<td>Door complete—R.—Steel</td>
<td>**17200-E &amp; I</td>
</tr>
<tr>
<td>18539A1X</td>
<td>Door complete—L.—Wood Frame</td>
<td>††17201-B</td>
</tr>
<tr>
<td>18539A2X</td>
<td>Door complete—L.—Steel</td>
<td>***17201 E &amp; I</td>
</tr>
<tr>
<td>50345X</td>
<td>Door complete—R.</td>
<td>**50400</td>
</tr>
<tr>
<td>50346X</td>
<td>Door complete—L.</td>
<td>***50401</td>
</tr>
</tbody>
</table>

**Fordor—1923-26**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Type of Regulators</th>
</tr>
</thead>
<tbody>
<tr>
<td>18036X</td>
<td>Door complete—Frt. L.—Wood Frame—brown uph.</td>
<td>*17201-A &amp; B</td>
</tr>
<tr>
<td>18037X</td>
<td>Door complete—Rear R.—Wood Frame—brown uph.</td>
<td>*17201-A &amp; B</td>
</tr>
<tr>
<td>18038X</td>
<td>Door complete—Rear L.—Wood Frame—brown uph.</td>
<td>*17200-A &amp; B</td>
</tr>
<tr>
<td>18375A2X</td>
<td>Door complete—Rear R.—Wood Frame—blue uph.</td>
<td>*17201-A &amp; B</td>
</tr>
<tr>
<td>18376A2X</td>
<td>Door complete—Rear L.—Wood Frame—blue uph.</td>
<td>*17200-A &amp; B</td>
</tr>
<tr>
<td>18373A3X</td>
<td>Door complete—Frt. R.—Steel—blue uph.</td>
<td>17200-E, F, G &amp; H</td>
</tr>
<tr>
<td>18374A3X</td>
<td>Door complete—Frt. L.—Steel—blue uph.</td>
<td>17201-E, F, G &amp; H</td>
</tr>
<tr>
<td>18375A3X</td>
<td>Door complete—Rear R.—Steel—blue uph.</td>
<td>17201-E, F, G &amp; H</td>
</tr>
<tr>
<td>18376A3X</td>
<td>Door complete—Rear L.—Steel—blue uph.</td>
<td>17200-E, F, G &amp; H</td>
</tr>
<tr>
<td>54271X</td>
<td>Door complete—Frt. R.—brown uph.</td>
<td>17200-E, F, G &amp; H</td>
</tr>
<tr>
<td>54272X</td>
<td>Door complete—Frt. L.—brown uph.</td>
<td>17201-E, F, G &amp; H</td>
</tr>
<tr>
<td>54273X</td>
<td>Door complete—Rear R.—brown uph.</td>
<td>17201-E, F, G &amp; H</td>
</tr>
<tr>
<td>54274X</td>
<td>Door complete—Rear L.—brown uph.</td>
<td>17200-E, F, G &amp; H</td>
</tr>
</tbody>
</table>

*17200-A, 17201-A, 17200-C and 17201-C are obsolete and replaced by 17200-D. When using the "D" type regulator to replace the "A" or "C" type, also replace the lock board.
†Also used for Tudor quarter window—left.
††Also used for Tudor quarter window—right.

**Note**—Wood frame doors are no longer supplied—It is accordingly necessary to use steel doors when replacement doors are required.
Gaining Confidence of New Car Purchasers

The profitable conduct of the Ford Dealer's service department depends largely upon his success in establishing close contact with the Ford car owners in his locality.

It is particularly important that special effort be made from the moment a new car is delivered to foster the thought in the owner's mind that the dealer's service department has a personal interest in his car.

The John S. Walker Company have always made it a practice to introduce buyers of new cars to their Service Manager at the time the new car is delivered. The purpose of this is to make the purchaser feel that the company's interest extends beyond the sale and to establish the first step in the contact between their service department and the customer.

The Walker Company also use the card illustrated in Fig. 170 to further this contact.

This card is mailed to each car purchaser seven days after delivery of the car. Service letter accompanying card is reproduced in Fig. 171.

The real value of the card is in the psychological effect it has on the owner. While every dealer is perfectly willing to give one or more service inspections if the owner voluntarily drives his car in, there is a tendency for owners to neglect this: possibly, due to the fact that they are not aware of the dealer's willingness to render such service. For this reason, a card from the dealer, emphatically requesting that the car be brought in, cannot fail to give owners a favorable impression of the dealers organization.

Ford Service is Better Service. Any effort put forth by dealers to make car owners realize this fact more fully will be reflected in the profits from the service shop.
Mr. W. A. Brown,
1258 Woodward Ave.,
Detroit, Mich.

Dear Sir:

I have just been advised by our Sales Department that you have purchased a new Ford car, and inasmuch as it is my duty to see that you get the maximum pleasure from your car, also the best Ford service possible, I am taking the liberty of writing you and enclosing an inspection card.

This card you will notice, bears the date of delivery and also the date that you are to bring your car in for a general inspection. Inasmuch as the guarantee on labor expires at the end of thirty days, it is absolutely necessary that you have the car thoroughly looked over at this time.

It is generally necessary to make certain adjustments after a car has been driven thirty days, and it is for your benefit that we are asking you to have this inspection made, thereby saving yourself time and money, also keeping you satisfied with the treatment you receive from this service station.

I trust that we will have the pleasure of serving you on the date mentioned on your inspection card. Be sure and bring same with you.

Thanking you kindly for your attention to this matter, I am

Very truly yours,

THE JOHN S. WALKER CO.

Per

Service-Mgr.
Repairing Tractor Dash

It sometimes happens that on old tractors, which have seen considerable service, the hole in the dash for the steering shaft becomes worn. To eliminate the play which results from this condition, it is suggested that a front wheel spindle bushing, part S-60, be pressed in the steering shaft hole and reamed with a one-inch reamer. The sketch, Fig. 172, shows the correct dimensions to which the hole should be drilled.

Body and Nickel Polishes

For some time past we have been supplying separate body and nickel polishes for both Ford and Lincoln cars. These have been supplied under symbol numbers M-230-F and M-230-L for the Ford and Lincoln body polishes, and M-216-F and M-216-L for Ford and Lincoln nickel polishes.

In view of the fact that the Lincoln body and nickel polish can be used with equally satisfactory results on either Ford or Lincoln cars, it has been decided to furnish only the Lincoln polishes when present stocks of Ford polishes are exhausted.

The body polish, which can be used on either varnish or lacquer finishes, will be supplied in pint bottles under the symbol number M-230 and the list price is $.75. The symbol number of the nickel polish is M-216 and the list price is $.50 per can.

Cowl Carpets

The first of the improved Tudor Sedan and Coupe bodies were equipped with T-50546 and T-50547 carpets underneath the cowl. The use of these carpets have since been discontinued and we are now using in their place a cowl cardboard assembly.

When an order is received for one of the carpet assemblies, it will be necessary to furnish T-50527B and T-50536B cowl cardboard assembly right and left, since we can no longer supply the carpet assembly. The low price of 25 cents each on these cardboard assemblies, makes the replacement of both sides considerable cheaper than that of one cowl carpet.

Rear Wheel Pullers

There has been some demand for a heavier puller for wood wheels as well as a puller for wire wheel hubs. We have accordingly arranged to supply the wheel pullers illustrated in Fig. 173 under the symbol numbers 5-Z-1170 for the wood wheel puller and 5-Z-1172 for the wire wheel puller.

The plunger in the screws of these pullers is of considerable assistance in starting wheels which stick. THIS FEATURE SHOULD NOT BE ABUSED. It is not necessary to strike the plunger a very hard blow if the puller is correctly used. Ordinarily, the tightening of the screw with a wrench is sufficient to remove a wheel or hub, but in the event that it sticks to the shaft, continue to exert pressure on the wrench, at the same time, tapping the plunger lightly with a hammer.

These pullers may be ordered direct from the local Branch and will be supplied at the list prices of $2.25 for the 5-Z-1170 wood wheel puller and $1.90 for the 5-Z-1172 wire wheel puller.

A puller of the same type as the 5-Z-1170 is also available for the TT truck. The part number of the truck wheel puller is 5-Z-1171 and the list price is $2.40.
Power of Suggestion

In practically every case where a car is brought into a service station for repairs, an observing service man can find something in connection with the car which most owners will appreciate having brought to their attention. The average owner has no idea as to the condition of his car, and is invariably inclined to give consideration to suggestions.

The service man should not be content with writing up a repair order for only those items which the owner believes need attention, but should suggest that while the car is down for some particular item, that he be given authority to make any necessary repairs to other items which require replacement.

For the convenience of the service salesmen on the dealer's service floor, we have prepared the chart of correlated parts illustrated in Fig. 174.

This chart should also prove beneficial to the parts salesman. A number of owners, who repair their own cars, have not had sufficient experience along this line to know exactly what parts should be replaced when doing a certain job. It frequently happens that such owners make two or three trips to a dealer's place for parts and this can, to a great extent, be avoided, by an alert stockman. The parts ordered invariably indicate the nature of the work being performed, and the stockman cannot only assist the owner, but also increase his parts sales by suggesting the possibility of other related parts being required in order to make an A-1 job.

Repairing Tudor and Coupe Doors

Instead of upholstering the sides and top of Tudor and Coupe doors, we are now using a metal finish strip, T-50280B and 50281B. This new type finish strip is made in one piece and slides down over retainer strips on each side pillar. Before attempting to remove the finish strip, the door check strap should be unfastened from the door so that the door may be swung completely open. The door garnish strip should then be removed and after running out the three screws at the top, the finish strip can be taken off by sliding it up over the retainer strip, if necessary starting it with a piece of fibre and rubber hammer as shown in Fig. 175.

The upholstery is fastened to the door by glove fasteners which are assembled to equally spaced holes in the door. To remove the upholstery, insert a screwdriver between the glove fasteners and the door. This will force the fasteners out of the holes and the upholstery together with the glove fasteners can then be removed. If upholstery is not held snug when replaced, remove old fastener by lifting up one or two prongs with sharp tool and replace with new fastener.

In the event that a broken glass is being replaced, the finish strip retainers should be removed by running out the screws which hold them to the door and the side wall of cloth covered rubber channels spread sufficiently to remove and replace glass.

Advertising Service Brings Results

The Ford dealership is the logical place for Ford owners to have their cars serviced. From the standpoint of equipment, interest in the car, quality of workmanship and economy, no outside garage can compare with the Ford dealership in the servicing of Ford cars and this fact should constantly be kept before the public. Effective newspaper advertising will help to accomplish this.

That the Southern Motor Co., our dealer at Columbia, South Carolina, is appreciative of the value of advertising is evidenced by Fig. 176. Advertising of this kind connects the dealer's name inseparably with the name Ford, so that the thought of one immediately brings the thought of the other.
Southern Motor Company's Complete Ford Service

To complete the satisfaction of the FORD OWNER and make it a lasting pleasure, Southern Motor Co., Inc., maintains a splendidly equipped Service Station where every facility and convenience are readily available.

SOUTHERN MOTOR CO., INC.
"In the Heart of Business Columbia"
1518-1520 Sumter St.

Complete Ford Service

For the convenience of our customers we have established a

Modern Battery Dept.
Using Only Genuine Ford Batteries

Upholstery and Top Replacements
Can be done right here in our place by competent men, good materials, fair prices.

Day and Night Service
Serve, any time night or day, by experienced Ford mechanics—using genuine Ford parts.

Southern Motor Company, Inc.
"In the Heart of Business Columbia"
1518-1520 Sumter Street. Phones 4611-7606

Southern Motor Co.
NIGHT SERVICE MAKES BIG HIT
LET US SERVICE YOUR FORD CAR

Our 24 Hour Guaranteed Service Is the talk of the town

Our Parts Department Is Open Day and Night

Southern Motor Company
1518 Sumter Street. "In the Heart of Business Columbia." Phones 4611-7606

Fig. 176
Aligning Headlights

We are now using a redesigned headlight bracket assembly in full production. The two brackets are fastened to the fenders and are rigidly supported by a connecting tie rod which also serves as a holder for the license bracket. This new design makes it possible to adjust and focus headlights without the use of a bending bar. The headlights are mounted on a swivel and by loosening the nut on the bottom of the bracket, they may be moved so as to secure the correct adjustment.

Headlight assemblies of the type first used on the improved cars have been carried under part numbers T 6501-AR and 6501-CR right, and T 6502-AR and 6502-CR left. This practice is being discontinued, since it is only necessary to change the position of the door to adapt a right hand lamp to the left side and vice versa.

All headlights of the old type will hereafter be shipped as right hand lamps under part numbers T 6501-AR and 6501-CR. In cases where they are installed on the left hand side, it is suggested that the door be removed until installation on the fender is completed. It is then merely necessary to replace the door on the lamp so that the word FORD on the lens is at the top.

Due to the fact that the position of the headlights on the fenders was slightly changed, it is necessary to make a change in the shop layout for focusing and adjusting headlights. The correct dimensions for the new layout are shown in Fig. 177. It will be noted that both the old and new layouts are shown in the diagram and it is suggested that this change be made in the shop layout at once. The old layout is indicated by the horizontal 28-inch line and vertical lines 14 inches from center line of car, while the new layout is shown by the horizontal line 30 inches above level of surface on which car stands and vertical lines 16 inches from center line of car.

In order to avoid confusion, the new layout can be painted with red paint and the old one with black. Every Ford dealer should have a place in his shop marked off as indicated in the diagram since, in our opinion, this is as necessary as any other equipment in the shop.

To secure the correct adjustment on the headlights, it is particularly important that the lens be absolutely perpendicular, with the word "Ford" at the top. Otherwise, the lights cannot be properly focused.

At this time of the year many owners are using their cars for long trips, in many cases traveling through a number of different states. The lack of uniformity in state laws covering lighting equipment oftentimes causes embarrassment to motorists and this is particularly likely to happen if no attention is given to the focusing and alignment of headlights. Ford headlights, when correctly adjusted and aligned, not only comply with every state law, but also give an exceptionally good driving light. The full benefits of this equipment are lost, however, if the lights are not kept in adjustment and in our opinion it is the dealer's responsibility as well as the owners, to see that this is taken care of. Glaring headlights reflect upon the car and any reflection on the car has an adverse effect upon the dealer's sales possibilities. Consequently, it is to the dealer's advantage to see that cars which are serviced in his shop do not go out with improperly focused headlights. The time required to do the work is inconsiderable and the effect upon the owner, when informed that the headlights on his car have been adjusted, more than repays the dealer for the time expended. It is another step toward making Ford Service recognized as Better Service.
Common Tire Injuries

There are certain fundamentals which must be observed to secure the maximum service and mileage from automobile tires. One of these is correct air pressure. Air pressure in the tire is the cushion between the road surface and the rim, and if this pressure is not kept up to the point recommended by the tire manufacturer, it is inevitable that trouble will be experienced.

In order that dealers may familiarize themselves with some of the most common tire injuries, we are illustrating below results of running tires without the required air pressure.

Air gradually or causing sudden blow-out, even on smooth road or standing still.

The same condition in a balloon tire is illustrated in Fig. 179. Such breaks can occur at any point in carcass from bead to bead, depending upon angle at which tire hits object. These breaks may run with or against cords.

Another example of damage to a balloon tire, resulting from low air pressure, is shown in Fig. 180. The rim bruise just above the bead resulted from the tire hitting some object at an angle, driving the sidewall down over the edge of the rim flange and crushing the fabric at the point of contact. If the object is sharp or jagged, marks may show on the outside of the tire, but if the object is smooth, the tough and elastic rubber on outside will show no evidence of the blow.

Injuries such as these can be eliminated by constantly carrying the recommended air pressure. The life of a tire depends upon this factor and regular attention to inflation of tires is economical insurance against annoyance and tire expense.

The balloon tires, now being used as standard equipment on front wheels of ton trucks, should be inflated to forty pounds pressure. Dealers should see that purchasers of trucks so equipped are advised accordingly.

Other recommended balloon tire pressures are shown in the following table:

<table>
<thead>
<tr>
<th>Car</th>
<th>Front</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roadster</td>
<td>27 lbs</td>
<td>27 lbs</td>
</tr>
<tr>
<td>Coupe</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>Sedan</td>
<td>27</td>
<td>30</td>
</tr>
<tr>
<td>Touring</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>Roadster with pick-up body</td>
<td>27</td>
<td>30</td>
</tr>
</tbody>
</table>
Ford Pyroxylin Finishing

The application of Pyroxylin finish to automobile bodies has many advantages over the use of paint and enamels. Pyroxylin unlike paints and enamels is a gun cotton product and is not affected by the extremes of heat and cold, light and darkness, moisture and dryness, that tend to break down, and in a comparatively short time destroy even the most costly varnished surfaces. Neither is a Pyroxylin surface easily affected by oil, grease, etc., and since it is not readily scratched it can be dusted off without harming the finish. In fact rubbing and polishing tend to improve the original lustre.

These qualities have created a popular demand for Pyroxylin finish, particularly since it can be applied in a few hours, at a comparatively low cost.

In addition, Pyroxylin finish affords the Ford owner an opportunity to maintain the satisfactory appearance of his car at very little expense.

Dealers generally will find it advantageous to install the equipment necessary to handle this class of work in their own shops. The finishing of customers' cars as well as the reconditioning of used cars by this quick process opens a very profitable field to our dealers.

The following pages contain detailed instructions on the application of Pyroxylin finish to Ford cars.
Section A
GENERAL
Finishing Rooms

Satisfactory Pyroxylin finishing, like any kind of painting, can only be performed under cleanly conditions. For this reason, it is advisable to provide a finishing room. This may be a space, preferably at the extreme end of the Service Station, separated from the rest of the building by sheet metal partitions.

Every precaution should be taken to eliminate dust and lint in the finishing room. To accomplish this, the floor should be kept sprinkled with water, or preferably, oiled. The temperature of the room should be maintained at 80° Fahr. Also, it should be very well ventilated in order to eliminate toxic vapor of a very low flash point.

An ideal and inexpensive method of ventilation for a small finishing room is to have an exhaust fan at the rear end of the room, with the motor located outside the finishing room. Thus fire hazard, due to sparking motor brushes, short circuits, etc., is eliminated. See Fig. 181.

In the event that the fan is belt driven, the belt should be grounded so as to eliminate the possibility of static electricity causing trouble. See Fig. 182.

Lighting Finishing Room

Because of the character of the work performed, it is particularly desirable that the finishing room be well lighted. Artificial lighting should be restricted to electricity. Gas lighting, etc., is
dangerous and must never be used under any circumstances. The shades enclosing the bulbs should be provided with glass fronts. This will protect the bulbs from accidental breakage with its accompanying spark, which might cause serious fire.

Section B

EQUIPMENT

The following equipment is necessary for the work of spraying Pyroxylin:

1. Air brush with a quart feed cup (45 lb. pressure gun)
2. Rubber hose for above
3. Air transformer (water and oil separator)
4. Touchup air brush
5. Rubber hose for above

One of the principal components of the spray equipment has not been mentioned in the above list, i.e. the air compressor. Practically all Ford Service Stations are equipped with a tank air compressor. The air transformer mentioned can be attached to the air line in use at the Service Stations and utilized to advantage without the necessity of purchasing a special compressor for the purpose. However, Service Stations not equipped with compressors, should secure a complete spraying equipment which includes motor, compressor, air brush, tank, separator, etc.

To secure satisfactory results, a compressor should be capable of delivering at least 6 cubic feet of air per minute. The following chart gives the capacities of the various sizes of compressors at different speeds:
The finishing room should also be supplied with the following equipment:

1. Water tool brush
2. Set of rubber gloves
3. Half-inch camel's hair brush
4. Two glazing knives—4 inches
5. One 1½-inch putty knife
6. Two small striping brushes
7. One L. L. hydrometer
8. One H. L. hydrometer
9. Steel wool
10. Rubber skiver

(See Fig. 183)
Section C
MATERIAL REQUIREMENTS
The finishing room should be supplied with the necessary amount of the following:
(a) 1. Sandpaper Nos. 00 A1 Oxide, 280, 320, and 400
2. Adhesive tape (F.O.S.) one roll. (Special tape for Pyroxylin work)
3. Cheesecloth
4. Respirator
(b) 1. Paint remover
2. Alcohol (for making M-107)
3. Drake green (satin finish), Pyroxylin (M-123)
4. Moleskin (satin finish), Pyroxylin (M-125)
5. Pyroxylin primer (M-701)
6. Pyroxylin glaze (M-702)
7. Pyroxylin surfer (M-703)
8. Pyroxylin stripe, emerald green (M-109)
9. Pyroxylin stripe, champagne (M-118)
10. Black Pyroxylin (M-127)
11. Pyroxylin thinner (M-145)
12. Tack rag varnish (M-401)
13. Straw enamel (M-134)
14. Casino red enamel (M-136)
15. Emerald green enamel (M-140)
16. Top dressing (M-255-F)
17. Spar varnish (M-430)

Section D
PYROXYLIN FINISHING
Operation No. 1
Washing Body.
Before a car can be refinished, it must be thoroughly washed with soap and warm water. Where the equipment is available, it is preferable to steam the car thoroughly so as to remove all grease, sand and dust from the chassis, underneath the fenders, etc.
Operation No. 2
Removing Old Paint (Optional).
Unless the old paint is badly checked or marred, it is not necessary to remove it unless the car owner desires it.
NOTE—Goggles and rubber gloves should be worn while performing this operation.
Spread paper on the finishing room floor and place the car in the center of the floor. Fill a quart cup with paint remover, and apply with a water tool brush, beginning with the upper back (see Fig. 184). The paint remover loosens the paint from the body (see Fig. 185) and it may be easily scraped off with a glazing knife (see Fig. 186). Clean up, using steel wool (see Fig. 187). It is advisable to work from top down.

Operation No. 3

Sanding Bare Metal. Use No. 00 L. W. A1 Oxide Cloth.

After all the paint has been removed, the body should be dry sanded with No. 00 L. W. A1 oxide cloth, to a good smooth surface (see Fig. 189). Use compressed air to blow out all foreign matter dislodged by the sandpaper (see Fig. 190). Sand the fenders (see Fig. 191), running boards, radiator shell, hood, lamps, etc., making sure to remove all rust, grease, etc., as Pyroxylin will not adhere to a greasy surface.

Operation No. 4

Preliminary Washing.

Starting with upper back, wash the upper part of the body, a small area at a time, with a sponge or towel, soaked in gasoline or benzol (see Fig. 192). Next wash the lower part (Touring car and Roadster to be treated same as lower part of a closed body), particularly in

Fig. 187

Fig. 188
and around the door hinges, under the belt mouldings, T-mouldings, side-sills, door jambs and heel boards. Use a water tool brush in the inaccessible places. Utmost care must be exercised in removing the last vestiges of grease, oil, etc. Dry the body with clean towels.

**Operation No. 5**

**Final Body Wash, M-107, (necessary only when paint has been removed, Operation No. 2).**

Wear rubber gloves.

Wash the entire car body with M-107 in the same manner as Operation No. 4. Wipe dry as before and tack rag the entire body. (See Fig. 194.)

**Operation No. 6**

**Protecting Windows, Windshield glass, etc.**

When the body has been sanded down, the windows should be closed and covered with paper. For this purpose adhesive tape (F. O. S.) may be used. One may accomplish good results by applying a thin coat of grease with a small brush in place of covering the glass with paper. Cover the engine with papers. Grease the hub caps, headlight and tail light lenses, license plates, etc. (See Fig. 193.)

**Operation No. 7**

**Prime, Using M-701 Pyroxylin Primer.**

(A) If the old paint has not been removed from the car, and Pyroxylin is sprayed over it, the Pyroxylin may act as a paint remover. Consequently the old paint must be sealed. Furthermore, Pyroxylin will not adhere to bare metal spots, therefore, it is imperative to prime with M-701 Pyroxylin Primer.

(B) In cases where the old paint has been removed because of a checked surface, the bare metal should be primed. Therefore, the body should be sprayed with M-701 Pyroxylin Primer. (See Fig. 195.)

**Always Use Respirator During Spray Operations**

Fill the cup attached to the air brush with the desired Pyroxylin Primer, thinned with its own volume M-145. Attach the air hose from the air and water separator connected with the air
compressor to the air brush and spray the entire surface of the body with a good solid coat, beginning from the top down.

The amount of air used in different air brushes depends upon the make and type of brush, and the operator is referred to the instructions enclosed with the air brush in use.

The air brush must be held 7 inches to 10 inches away from the surface being sprayed, and the nozzle should be adjusted in such a way as to have air holes in the same plane in which the air brush is being used. This means that the fan spray emitted from the air brush must be at right angles to the plane at which the material is being sprayed. When the car has been sprayed with Pyroxylin Primer (M-701), check the surface for skips, etc., and if necessary, spray again.

(C) Fenders, running boards, radiator shell, hood, headlights, etc., should also be carefully primed around edges over bare metal spots, etc.

Clean Air Brush with M-145 immediately after use

(Figure 196 shows a primed body and hood.)

Operation No. 8

Air Dry.

Pyroxylin Primer should be air dried at room temperature for 15 minutes.

While the following operations are not necessary, the quality and appearance of the finished job can be greatly improved by performing them before proceeding to operation No. 9.

(a) Sand, using No. 280 Al Oxide Sandpaper.

1. Lightly dry sand prime coat with No. 280 Al oxide sandpaper, to a good smooth surface.
2. Tack rag the entire body.

(b) Spot-glaze, using M-702 Pyroxylin Glaze.

1. Spot glaze the body where necessary. The glaze is applied with a 1⅛-inch glazing knife, in a
semi-paste form, used at glazing consistency.
2. Air dry spot glaze 10 minutes at room temperature.
3. Feather cut edges of spot glaze,
4. Tack rag entire surface.
(c) Spray M-703 Pyroxylin surfacer.
1. Spray a solid coat of M-703 Pyroxylin surfacer, thinned with M-145 Pyroxylin thinner to a gravity of 32 H. L. Be. at room temperature. (Heavy Liquid Beaume.)
2. Air dry same for 20 minutes at room temperature.
3. Water sand surfacer coat with No. 320 Al oxide sandpaper.
4. Wash with water and wipe dry with clean cloth. Let air dry 30 minutes.
5. Tack rag the entire surface of car body.

Operation No. 9
Spray M-127 Black Pyroxylin
1. Spray a coat of M-127 thinned with its own volume of M-145 Pyroxylin thinner, over fenders, running boards, radiator shell, headlights, chassis, etc. (See Fig. 197.) Repeat immediately with a second coat of the same.
2. Jack up the rear end. Revolve each wheel with hand and spray a good solid coat of M-127 Black Pyroxylin on both sides.

3. Jack up the front end and spray the two front wheels with M-127 Black Pyroxylin in the same manner. (See Fig. 198.)

Air dry M-127 Black Pyroxylin about 10 minutes at room temperature. (Figure 199 shows a primed car body with fenders, etc., sprayed in Black Pyroxylin. The car is ready for papering.)

Operation No. 10

Papering fenders, running boards, dust shields, etc.

It is necessary to cover the running boards, fenders, dust shields, etc., with paper in order to protect their surface from fogging when the car body is sprayed in colors. (Figure 200 shows these parts covered with paper preparatory to spraying body in colors.)

Operation No. 11

Pyroxylin First Double Header.

The term "double header" implies two single coats, one sprayed horizontally, the other sprayed vertically.

Spray this coat on primed car body. But if an exceptionally good job is de-
sired and body has a coat of M-703 Pyroxylin Surfacer that has been sanded, fill air brush cup with Pyroxylin of desired color, thinned as suggested below. Proceed to spray horizontally the entire exterior surface of body above and below the belt moulding, including the door jambs, edges of Coupe and Roadster deck lid and side sills with the **first single header** of the Pyroxylin of specified color.

Repeat immediately with **first double header** of the same materials sprayed vertically. (See Figs. 201 and 202.)

Unless otherwise specified the Pyroxylin should be cut as follows:

- Pyroxylin (any color) 1 part by volume.
- Pyroxylin thinner (M-145) 2 parts by volume.

**Operation No. 12**

**Air Dry.**

Air dry Pyroxylin for 5 minutes in the finish room.

**Operation No. 13**

**Pyroxylin Second Double Header.**

Fill the air brush cup with Pyroxylin of same color as sprayed before and proceed to spray horizontally the entire surface of body above and below belt moulding with the **second single header**.

Repeat immediately with the **second double header** of the same material sprayed vertically.

Spray a coat of the Pyroxylin on roof rail, as well. As usual cut Pyroxylin with M-145, as recommended above.

**Operation No. 14**

**Air Drying.**

Let body air dry at room temperature for 10 minutes.

**Operation No. 15**

**Spraying Hood.**

The primed hood shown in Fig. 196 may be sprayed at this stage with two double coats of Pyroxylin to match the Pyroxylined body while the body air dries. (See Fig. 203.)

**Operation No. 16**

**Inspect and Repair.**

Inspect the body with spot light for
bare spots, sags, off color spots, etc. These must be repaired. (See Fig. 204.)

Spot glaze scratches with M-702 Pyroxylin Glaze with 1\(\frac{1}{2}\)-inch putty knife, being careful to use just enough to cover bare metal, as it should not be sanded unless necessary. If necessary, feather out edges with No. 320 A1 oxide sandpaper. Tack off and apply Pyroxylin of desired color with air brush.

Sags may be allowed to dry, when they can be cut with a razor blade and sanded to a smooth surface with No. 320 A1 oxide sandpaper. Such sanded spots should be tacked off and given a solid coat of Pyroxylin to match. Air dry at room temperature for 10 minutes.

NOTE—The body thus finished has a matt surface which may be made glossy as follows:

(a) Water Sand Pyroxylin with No. 400 A1 oxide sandpaper.

If the finishing room is to be used for bringing up some other bodies in Pyroxylin, the body may be taken to the wash rack for the water sanding operation. Immerse a sponge in a trough of clear, running water and wet a small area at a time.

Dip a quarter sheet of No. 400 A1 oxide sandpaper in water, and water sand lightly to a smooth surface. Use edge of a rubber skiver 2 x 3 inches on the wet, sanded surface to see whether or not all orange-peel effect, dirt, sags, etc., have been eliminated. If nice,
smooth surface has been obtained all over, wash body with clean water and wipe dry with a piece of washed cheese cloth.

(b) Spray M-145. Spray the entire surface of the car body with a wet coat of M-145 at about half the air pressure used for Pyroxylin spraying. The thinner has a tendency to level out the Pyroxylin surface, leaving same smooth and glossy.

(c) Air dry body at room temperature for 10 minutes.

Operation No. 17
Striping, Touchup of Roof Rail, and Top Dressing.

(a) Striping colors for:
Drake Green body,
Use M-109 (Emerald Green)
Moleskin body,
Use M-118 (Champagne)
Thin stripe material with M-145 Pyroxylin thinner on a glass plate, using a Sword striping brush. Hold brush between thumb and index finger, using the other three fingers along the lower edge of the moulding to serve as a guide.
The stripe must be solid in color and not less than \( \frac{3}{16} \)-inch and not more than \( \frac{3}{8} \)-inch below the lower edge of belt moulding.
It must not be less than \( \frac{1}{16} \)-inch or more than \( \frac{3}{8} \)-inch wide and must be placed around the entire body, across side of "Coupe pillars" in line with body stripe, down side of pillars \( \frac{3}{8} \)-inch from the edge, across bottom of the pillar \( \frac{3}{8} \)-inch up. Stripe should come up sharp to, not over, beading or T moulding. Stripe must also be carried across the cowl. Air dry 10 minutes.

(b) Brush a coat of M-255F on the top and sun visor. Air dry 10 minutes. This dressing may also be used on cushions and other trimmings of the open car bodies. (See Fig. 206.)

Operation No. 18
Cleaning Windows, Windshield, Hub Caps, Tires, etc.
Remove all paper from windows, windshield, etc., and wipe off the grease with a towel. Wash the glass clean with a rag dipped in benzol or gasoline.
Remove grease from headlamp lenses with putty knife and wash same with a rag dipped in gasoline or benzol. License plates and radiator cap may also be cleaned similarly. Tires may be cleaned with a towel soaked in M-145.
NOTE—Do not let towel soaked in M-145 come in contact with Pyroxylin
finished surface, as it will destroy the finish at point of contact.
(Figure 207 shows a used car re-finished in Pyroxylin.)

Section E
REPAIRING PYROXYLIN
A service station will frequently be called upon to touch-up accidental scratches, bump out and repair panels, etc., either on new cars or cars not in use long enough to show any wear of the Pyroxylin. The information that follows will enable an operator to do all repair work successfully.

If the body needs bumping out, it should be taken care of by the dealer. Use Ford standard bump out tools.

(a) PATCHING—It is usually possible to patch Pyroxylin. As a general rule any area smaller than the size of an open hand should be patched. In cases where much patching has to be done on the same panel, it is advisable to refinish the whole panel. To accomplish this, proceed as follows:

1. Water sand the spot to be touched up with No. 320 Al oxide sandpaper. If necessary, sand the entire panel lightly.
2. Wash same with water; wipe dry and tack rag.
3. Spray a coat of Pyroxylin primer over the bare spot, merging same with the surrounding Pyroxylin.
with a touchup air brush. Air dry 5 minutes.

(4) Spray Pyroxylin to match over the spot primed, using a touchup air brush. Air dry 5 minutes.

(5) Spray the entire panel with the same Pyroxylin; this would help eliminate the mismatching of color in patching. Air dry 10 minutes.

NOTE—If desired, water sand the whole panel very lightly. Spray M-145 as recommended in section D. If necessary, stripe the panel.

(b) TOUCHUP—Small scratches, bare metal and off color spots may be touched up as follows:

(1) Sand the spot lightly, making sure to remove all rust, etc.

(2) Wash same and wipe dry.

(3) If necessary, spot glaze, applying same with 1-inch putty knife. Care should be taken to use just enough of it to cover the bare spot.

(4) If necessary, dry sand putty to feather out edges, using No. 400 A1 oxide sandpaper.

(5) Tack off. Spray Pyroxylin to match, using touchup air brush. Air dry 10 minutes.

(6) Spray M-145 on the spot if so desired.

NOTE—Bare spots that are not very prominently located may be lightly sanded and touched up with Pyroxylin, using a striping brush.

Section F

REFINISHING FENDERS

Fenders, dust shields, hoods, radiator shell, and apron, should be examined and should their condition warrant refinishing, they may be sprayed with M-127 as recommended before. However, if the customer so desires, a new set of enameled fenders may be installed on the car.

When sheet metal parts are desired in Pyroxylin to match body, water sand the entire surface, being careful to remove all rust, grease, etc. Wash with benzol or gasoline. Spray a coat of M-701 Pyroxylin Primer and air dry in finish room for 10 minutes. Spray two double coats of desired Pyroxylin. Air dry 10 minutes.

Section G

MISCELLANEOUS

1. Refinishing wheels.

(a) Wooden wheels should be washed
clean, sanded with No. 280 A1 oxide sandpaper and sprayed with two coats of M-127 Black Pyroxylin. Air dry each coat 15 minutes.

(b) Wire wheels should be washed, cleaned, sanded with No. 00 A1 oxide cloth and given two coats of any of the following three enamels with an air brush. Dry each coat 12 hours.

Straw .................................. M-134

Casino Red .......................... M-136
Emerald Green ....................... M-140

Finish with a coat of M-430 spar varnish, using an air brush. Dry spar varnish coat 24 hours.

2. Making a tack rag.

Dip 1½ yards of cheese cloth into tack rag varnish (M-401), same should be wrung out and spread out to dry till it gets sticky (tacky). Fold it up and keep in a damp cloth ready for use.


Mix one gallon of 28% ammonia hydrate (Tech.) with 26 gallons of denatured alcohol, and add 25 gallons of clear water. This wash will neutralize any acid remaining on the car body from soldering, etc. This wash evaporates completely, leaving no trace of solids on the car body. Due to its containing almost half its volume of water, the Service Stations should make their own final body wash.

CLEANING PYROXYLIN

Should the body or other Pyroxylin finished parts of the car become spat-tered with tar or other substances used on roads, the spots can be easily removed with benzol or gasoline. If full strength gasoline or benzol is used, there is a possibility of softening the finish. It is accordingly suggested that the benzol or gasoline be mixed with one-third its own volume of motor oil.

Dip a soft cloth into the mixture and, using only one finger, rub the spot gently until it has been removed. The rubbed spot should then be washed off with clear water.

Pyroxylin materials will be furnished by the Ford Motor Co., in suitable containers and at reasonable prices.
Service Equipment

SATISFACTORY repair work depends upon the intelligent use of correctly designed service equipment.

Such equipment not only saves time in performing the various repair operations, but it improves the accuracy of the work. New tools and measuring devices, which are now available, permit the repair man to work to limits which practically equal manufacturing standards.

The dealer who fails to recognize the importance of using up-to-date repair methods and efficient service equipment, is in reality paying many times its cost in the daily loss of time and the good will of his customers through inability to perform satisfactory repair work.

In this issue of the Service Bulletin, we are describing for the instruction of both dealers and service mechanics, how some of the motor repair operations are performed with the K. R. Wilson combination machine.
Rebabbitting Cylinder Block and Fitting Crankshaft

To insure a satisfactory job when overhauling a motor, it is always advisable to rebabbit the main bearings in the cylinder block. Attempting to recondition the old bearings by hand scraping is an extremely slow process and is not nearly as satisfactory as when new bearings are installed and properly fitted.

To rebabbit the cylinder block, the first operation is to remove the old babbitt bearings. This is done by cutting out a strip of babbitt about ¼" wide from the bottom of each bearing, the strip extending the full length of the bearing. A hammer and chisel are used for this purpose. After cutting out the strip, lightly tap each side of the babbitt, as shown in Fig. 208; the two halves together with the anchor lugs can usually be lifted out. Should a lug break off and remain in one of the anchor holes in the block, it can be drilled out with a ¼" drill.

After removing the old bearings, transfer the cylinder block to a wash tank filled with hot water and with which plenty of good metal cleaner has been mixed, and thoroughly wash the block. The block is then removed from the tank and the bearing guides carefully wiped with a dry cloth, also wrap a piece of dry cloth around the end of a small screw driver or the tang of a file and thoroughly clean out the anchor and oil holes in the bearing guides. The cleaning operation is very important, as the success of pouring depends largely on providing a clean dry surface for the babbitt. If water or oil are present, even in the smallest quantity, there will be blow holes in the babbitt. Do not attempt to dry the bearing guides with the use of a blow torch or other heating apparatus as this tends to draw out oil from the porous cast iron, which forms an oxidized surface and prevents the pouring of a good bearing.

Next place several pounds of Ford babbitt in the melting pot and light the torch. To obtain the best results with K. R. Wilson equipment, the babbitt should be heated until it just commences to show a dull red.
After cleaning the bearing guides, fill the oil holes in the bottom of the guides with asbestos wicking; the wicking should be packed down tightly until it is flush with the surface of the guide. This is done to prevent any babbitt entering the oil holes (see Fig. 209). The cylinder block should now be positioned, either on the floor or on a small bench, preparatory to pouring the bearings, placing a clean pan underneath the cylinder block to catch any excess babbitt which may be spilt while the bearings are being poured.

Next place the rebabbitting fixture in the bearing guides in the cylinder block and slide the adjustable collars up against the ends of the guides, the screws in the collars (see “A” Fig. 210) are then tightened and the pouring blocks (see “A” Fig. 211) placed against each side of No. 3 bearing. Before commencing to pour the babbitt, it is a good plan to slip on a pair of
asbestos gloves to prevent any possibility of burning the hands while pouring the hot metal.

By this time, the babbitt should be hot enough to pour. As stated above, when the babbitt reaches the correct temperature it will just commence to show a dull red. When it has reached this point, turn the flame down slightly so that the babbitt does not get too hot and stir it thoroughly before pouring, also skim off the dross which forms on top of the metal; this should not be skimmed off, however, until just before the babbitt is to be poured as the dross is composed of tin oxide and will form nearly as fast as it is skimmed off.

With the pouring blocks placed against each side of No. 3 bearing, take one ladle in each hand and fill them with sufficient babbitt to more than pour the bearing. Place the ladles on each side of the bearing, slightly off-setting them, as shown in Fig. 212, and pour the liquid into the bearing rapidly. After pouring the bearing, quickly replace the babbitt ladles in the metal pot and remove the babbitt pouring blocks before the babbitt gets a chance to set. Unless the pouring blocks are removed immediately after the bearing has been poured, the overrun or excess babbitt will harden on the pouring blocks and it will require several minutes' labor to chip it off with a hammer and chisel in order to remove them. After pouring No. 3 bearing, transfer the pouring blocks to the center bearing and pour that bearing in the same manner, then repeat the operation on No. 1 bearing.

When all of the bearings have been poured, adjust the flame low on the melting torch and remove the rebabbitting fixture. To remove the fixture, loosen the screws in the adjustable collars (see “A” Fig. 210) and slide the collars back, then with a copper hammer or rawhide mallet tap upward on the front end of the rebabbitting fixture, at the same time lifting up the rear end with the left hand.

The bearings should now be carefully examined. If one of the bearings did not pour properly, it should be removed and poured again without disturbing the other two bearings, and before cutting off the sprues or lugs on the good bearings. When all of the bearings are O. K. turn out the flame underneath the babbitt melting pot.

The next operation is to cut off the lugs or sprues from each side of the bearings. This is done by placing a sharp cold chisel approximately 1" wide on the ledge which has been cast on each side of the bearing by the babbitting mandrel and with a hammer lightly tap the chisel across the entire length of the bearing (see Fig. 213). Do this operation carefully to
avoid twisting the babbitt or breaking off the opposite corners of the bearing. Next level off the top of the bearings with a special babbitt file and slightly bevel both upper edges. The oil holes are then drilled in the bearings and the asbestos wicking which was used to fill the oil holes is removed.

**Peining the Bearings**

The bearings are now ready to be peined. Before peining the babbitt, place the peining tool in a vertical position in the bearing and rock the tool back and forth to see that the slots in the peining tool do not come in contact with any burrs which may have been left on the edges of the bearing. This is very important for one stroke of the hammer may loosen a bearing so that it cannot be tightened. To pein the bearings, hold the peining tool in a vertical position and with a hammer strike the end of the tool a sharp blow, then hold the tool at a slight angle and pein each side of the bearings in the same manner (see Figs. 214 and 215). The bearings should then be tested for tightness by lightly tapping them with a hammer; if tight, the bearings will sound solid, if there is a hollow or rattling sound, the bearings are loose and should be repined. If this fails to tighten them it will be necessary to pour new bearings. Loose bearings are usually caused by incorrect peining or by carelessness on the part of the operator when cutting off the babbitt lugs or sprues.

After peining the bearings, drive out the camshaft rear bushing with a hammer and driver, also remove all traces of old gaskets and burrs from the finished surface on the bottom of the cylinder block.

**Installing the Boring Fixture**

The cylinder block is next transferred to the combination machine and is held in position by means of two cap screws in the machine, which are inserted into corresponding bolt holes in the flange of the block (see “A” Fig. 216). A square is then placed against the table of the machine and the bottom of the cylinder block, as shown in Fig. 217, and the block raised or lowered by means of the adjusting screw (see “A” Fig. 218) until the block is absolutely square with the table of the machine. The adjustment is then locked by running down screw “B”
into the water outlet connection hole in the cylinder block. The screw is tightened with a wrench, after which the block should again be checked with the square, as sometimes slight variations will cause the block to be forced out of position when this screw is tightened and a second adjustment might be necessary.

The table of the machine, together with the cylinder block, is next tipped back in a vertical position and the false camshaft inserted into the camshaft bearing guides. See Fig. 219. The purpose of the false camshaft is to correctly locate the babbitt boring fixture on the cylinder block so as to insure correct gear centers.

The boring fixture is now placed in position on the block, with the guide lugs on the fixture
resting against the false camshaft. Line up the bolt holes in the fixture with corresponding bolt holes in the cylinder block, then turn the adjusting screw, (see Fig. 220) until the two guides on the boring fixture rest squarely but lightly against the false camshaft.

Under no circumstances should the adjusting screw be tightened any more than is actually necessary to hold the guides on the fixture against the false camshaft. If the screw is tightened too much it will raise the rear side of the boring fixture from the cylinder block and change the centers of the timing gears.

The fixture should now be checked to make sure that it lies absolutely level on the block. This is done by placing a finger on each corner of the fixture, as shown in Fig. 221, and attempting to rock it. (All four corners should be checked in this manner.) If there is any movement,
it indicates that the surfaces of the block and fixture are not absolutely parallel and the
corner which is low should be built up to the correct height by inserting sufficient shims be-
tween the fixture and the cylinder block to insure these parts being absolutely level.

The fixture is then bolted to the cylinder block by means of the four combination bolt and
speed wrenches. See Fig. 222. Only three of the bolts are installed at this time, the fourth bolt
(the one which is inserted through the inner left hand corner of the fixture) is not installed
until after the bearing caps have been bolted in place, which will be described later.

Checking the Crankshaft

The next operation is to examine the crankshaft for scores, cracks, wear and alignment.
If the shaft is cracked or badly scored, a new shaft should be installed. Light scores can be
removed from the crankshaft bearings by oiling a strip of fine sand paper and wrapping it
around the bearing and rotating the sand paper back and forth with a narrow strap.

Next stand the shaft in an upright position, and measure each bearing with micrometers
for being out of round; the measurements should be taken at several different points around
the shaft. (See Fig. 223.) If any of the bearings are worn out of round more than .0015" the
old shaft should be replaced with a new one.

If the bearings are O.K., shaft is the then checked for alignment. This is done by positioning
the shaft on "V"-ways, inserting a piece of brake band lining between the shaft and the "V"-
ways to protect the bearings. An indicator is then placed under the center main bearing and
the shaft slowly revolved. The indicator is graduated in one thousandths of an inch, the
amount the shaft runs out being indicated by the movement of the hand on the dial. If the
shaft is sprung .015" or less, it can be straightened on a press, as shown in Fig. 224. To protect
the bearing while straightening the shaft, insert a piece of brake band lining between the ram
of the press and the bearing.

Next check the flange on the end of the shaft. This is done by first placing the shaft on
"V"-ways, and positioning any heavy object against the end of the shaft to prevent it sliding
forward while the flange is being checked. An indicator is then placed against the flange, as
shown in Fig. 225, and the shaft slowly revolved. If the flange runs out more than .0015" a
new shaft should be installed.
Installing Shims

After inspecting the shaft, measure all three main bearings with a micrometer to determine the exact amount of wear on each bearing. If the bearings all measure up to standard size, that is, 1.248", place three standard Ford shims on each side of the three main bearings, preparatory to installing the bearing caps (see Fig. 226). If, however, the crankshaft main bearings are worn undersize, the wear must be taken up by building up the bearings on the block with additional shims to an amount equivalent to that which the shaft bearings have worn undersize in addition to the usual three shims which are carried between each side of the bearing halves during the rough boring and line reaming operations.
For example, suppose the front main bearing on the shaft is worn .001" undersize, the center bearing .002" and the rear bearing .0015". Then with the boring fixture bolted to the block as shown in Fig. 226, and the usual three shims placed on each side of the bearings, we would, in the case of No. 1 bearing, place an additional Ford shim on one side of the bearing. (A standard Ford shim is .0025" thick.) By placing the shim on only one side, it would raise the bearing cap half of the thickness of the shim, which would be .00125" at the center of the bearing, which amount practically corresponds to the amount of undersize of that bearing. The center bearing would require two extra shims, one on each side; this would raise the cap .0025" or .0005" too high, this difference, while not important, can, however, be taken care of by only tightening the bearing bolts sufficiently during the boring and reaming operations to prevent the cap from shifting. The same process is then used on the No. 3 bearing. In using this method, it is an easy matter to arrange any combination of shims to obtain the correct adjustment on a bearing which has worn slightly undersize.

These additional shims which are installed for adjustment purposes, are used only during the line boring and line reaming operations; they are then removed when fitting the crankshaft, thus insuring each bearing cap being drawn down to exactly the same amount that the individual crankshaft bearings are worn undersize, which insures a uniform clearance in all three bearings, with only a slight amount of hand scraping.

Boring the Bearings

With the boring fixture positioned on the cylinder block and the correct amount of shims placed on each side of the bearings, install the bearing caps, using rough babbitted main bearing caps, parts No. 3031-B, 3032-B, 3033-B, instead of finished caps. Rough bearing caps insure the bearings being bored absolutely round and in exact alignment. When replacing the caps throughout the different operations, always replace them in exactly the same position. The script word “Ford” which is cast in each cap can be used as a guide for this purpose.

Much time will be saved in removing and installing the bearing caps throughout the different operations if quick detachable bolts are used (See Fig. 227.) Before installing the bolts, make sure that the bolt holes in the shims are in exact alignment with the holes in the bear-
ings, in order to avoid damaging the shims when inserting the bolts through the caps. Only a slight pressure should be applied in tightening the bearing bolts.

The cylinder block, together with the table of the machine, is next tipped into a horizontal position until the table rests squarely on the bed of the machine. The two tapered locating pins (see "A" Fig. 228) are then inserted through the table into the machine. The pins are used to bring the table into exact alignment with the head of the combination machine. It is not necessary to fasten the table down during this or the align reaming operations as the direction of rotation will prevent it moving.

The fourth combination bolt and speed wrench is now inserted through the cylinder block and boring fixture and the nut "B" drawn down tightly on the end of the wrench. Next connect the boring bar to the head of the combination machine by means of the universal joint (see "C" Fig. 228), then throw the feed lever forward and start the motor. The boring operation requires about 3 1/2 minutes. While the bearings are being bored, take an oil can and flow a little oil into each bearing. This will prevent the babbitt chips from scoring the bearings.

When the boring operation is completed, pull the feed lever back and stop the motor, then remove the boring fixture. This is done by first removing the combination bolt and speed wrench which was last installed (see "B" Fig. 228). The two tapered locating pins (see "A" Fig. 228) are then withdrawn and the cylinder block and table of the machine tipped forward into a vertical position. The bearing caps and shims, are then removed. When removing the bearing caps care should be exercised not to misplace any of the shims, as it is extremely important that the exact number of shims be replaced between the bearing halves during the line reaming operation. The three remaining combination bolt and speed wrenches are then withdrawn and the boring fixture lifted off of the cylinder block. Next take a dry cloth and carefully wipe out any metal chips, oil, etc. from each bearing.

Align Reaming the Bearings

The bearings are now ready to be line reamed. The first operation is to place the line reamer in the bearings with the pilots of the reamer resting in the bearings, as shown in Fig. 229. Place the shims on each side of the bearings, replacing the exact number of shims which were re-
moved when the boring operation was completed. The bearing caps are then installed on each bearing, making sure to replace each cap in its original position. The caps are bolted in place with the quick detachable bolts (see Fig. 230) after which the cylinder block and table of the machine are tipped forward into a horizontal position. Next install the two tapered locating pins (see “A” Fig. 231) and connect the reamer to the head of the machine by means of the universal joint “B.” The feed lever is then thrown forward and the motor started. With an oil can, a little oil onto the reamer during the line reaming operation. About 3½ minutes is required to ream the bearings.
After the bearings have been reamed, pull the feed lever back and stop the motor, then remove the tapered locating pins and turn the cylinder block and table into a vertical position. The bearing caps and reamer are then removed and a shim withdrawn from each side of the three bearings. If any extra shims were used for adjustment purposes during the boring and reaming operations they are also removed. This will leave two shims in place on each side of the three bearings for making future adjustments between the bearing halves. With the two shims in place on each side of the three bearings, replace the bearing caps, bolting them down with the quick detachable bolts.
Facing and Filleting the Bearings

The rear bearing cap is now ready to be faced off and a \( \frac{1}{8} \)" radius or fillet formed on both ends of the rear and center bearings and on the rear end of the front bearing. Inasmuch as the rear main bearing is the thrust bearing and takes up all end play of the crankshaft, it is important that this bearing be faced off to the correct length and absolutely square with the crankshaft, that is, so there will be .003" to .004" clearance or end play between the end of the bearing cap and the flange of the crankshaft. To determine the correct amount to face off, first measure the length of the crankshaft rear main bearing with inside micrometers; these are furnished with the equipment (see Fig. 232); then deduct .003" from this measurement to provide for the necessary clearance, and adjust the regular 4" micrometer to correspond (see Fig. 233). The bearing cap is then faced off a little at a time, an equal amount of metal being faced off each end until the length of the bearing cap corresponds with the reading on the micrometer.

For example, suppose the inside micrometer showed the length of the crankshaft rear main bearing to be 3.125", by deducting .003" from this measurement we get 3.122", which is the dimension to which the 4" micrometers should be set and which represents the length to which the bearings should be faced off. To face off the bearings, place the main bearing facer in position, as shown in Fig. 234, and face off a little metal from the end of the bearing cap, then reverse the facer, inserting it into the opposite end of the bearing (see Fig. 235) and remove an equal amount of metal from that side, repeating the operation until the length of the rear bearing cap corresponds with the reading on the 4" micrometer. (See Fig. 236). When the rear bearing is O. K., a radius or fillet is then formed on both ends of the center bearing and on the rear end of the front bearing. To allow for expansion of the crankshaft caused by heat generated in the engine, the center and front bearings are fitted with an end clearance of \( \frac{1}{8} \)" to \( \frac{1}{16} \), which makes it unnecessary to measure these bearings with the micrometer after cutting the fillets.

Fitting the Crankshaft

After the filleting operation has been completed, remove the bearing caps and shims and take a dry cloth and carefully wipe out any oil, chips, etc. from each bearing, also see that the
crankshaft is thoroughly clean. Next place a very light coating of Prussian Blue on each of the crankshaft main bearings (see Fig. 237) and position the shaft in the cylinder block; the shaft is then turned back and forth several times, after which it is removed and the bearings carefully examined. The points which show blue on the babbitt surface are the high spots; these will usually be found at the fillets, and can be removed by lightly scraping them with a bearing scraper. (See Fig. 238.)

After fitting the bearings in the cylinder block, the shaft is again positioned in the block and the bearing caps fitted. The caps are fitted one at a time. This is done by placing two shims on each side of the bearing and bolting the cap down with the quick detachable bolts;
the shaft is then turned back and forth several times, after which, the cap is removed and the high spots scraped down with a bearing scraper. The remaining two bearings caps are then fitted in the same manner. Next place a little oil on the caps and bolt them all down in place on the cylinder block. If the caps are properly fitted, it should be possible to turn the shaft back and forth with the hands, as shown in Fig. 239. If the shaft is tight, loosen the bearings one at a time until the tight one is found, then remove the cap and lightly scrape down the high points as previously described.

If the cylinders require reboring, the crankshaft should now be removed and the cylinders rebored as described under the heading of reboring. If the cylinders are O.K., remove the quick detachable bolts and bolt the bearing caps in place with the standard Ford crankshaft bolts. The cylinder block is then transferred to an engine stand and the push rods, camshaft, valves, etc., installed in the usual manner.

Reboring the Cylinders

For the reboring operation the cylinder block remains attached to the table by means of the same two cap screws which were used during the rough boring and finish reaming operations (see Fig. 216). From this position the table and cylinder block are then turned until they are at right angles with the head of the machine. In order to turn the table it is first necessary to withdraw the four table hinge pins (see "A" Fig. 240). The table is then positioned on the bed of the combination machine so that No. 2 cylinder is in exact alignment with the boring head (see Fig. 241).

The two tapered locating pins "A" are next inserted through the locating holes in the table into corresponding holes in the bed of the machine. The pins are used to correctly align the table so that the cylinder block will be held at exactly right angles to the combination machine. The table is then bolted down by means of the cap screw shown at "B."

The next operation is to measure the exact amount of taper or wear in each of the cylinders in order to determine to what size they should be rebored. The measurement is taken by placing a cylinder gauge graduated in one-thousandths of an inch into the cylinder and moving the gauge up and down the cylinder at different points around the bore (see Fig. 242).
The amount the cylinder is out of round, tapered, or worn is indicated by the movement of the hand on the dial. Scores can be noted by visual inspection.

For example, suppose that we find it is necessary to remove .027" in order to properly clean up the cylinder. On referring to the Ford parts price list, we find that the piston which would more nearly correspond to this measurement would be .031" oversize, which would in this case be the correct size to install.

The pistons should next be checked for roundness as they occasionally become out of round due to rough handling in shipping. The pistons are checked with 3" to 4" micrometers the measurements being taken at different points around the skirt of the piston (see Fig. 243),
If the piston is out of round, it can be trued up by lightly tapping it with a rawhide mallet on the side of the skirt which shows the greatest diameter. Inasmuch as there is sometimes a slight variation in the diameter of the pistons, they should be carefully measured. If the variation exceeds .001 of an inch, the cylinders should be bored to fit their respective pistons.

Adjusting the Boring Bar Cutter

The cutter in the boring bar is adjusted so that it will bore the cylinder .003" larger than the actual diameter of the piston to be installed. The additional .003" is to allow for clearance. Do not make a mistake and bore the cylinders .003" or .004" larger than the oversize marked on the piston, as the actual diameter of the piston is approximately .002" less than it is marked so as to insure ample running clearance. For example, a .031" oversize piston would measure 3.778". To this measurement we would then add .003" which gives us 3.781" and which would be the correct size to bore the cylinder.

The next operation is to set the boring bar cutter to cut the correct size. In the example we used we found that the diameter of the .031" oversize piston was 3.778", to this we added .003" for clearance which gave us 3.781" or .031" oversize. The special micrometer furnished with the equipment is then adjusted to show a reading of only half of this amount or .0155" and the boring cutter set to correspond with this reading. The reason for adjusting the cutter to cut only half of the amount that the cylinder is to be bored oversize, is due to the fact that as only one cutter is used, it is measured from an imaginary center of the shaft to its point, but as it cuts all the way around the circle it actually doubles this measurement, so that by setting the cutter to .0155" it actually cuts .031".

The cutter can be easily adjusted by slightly loosening the two set screws in the cutter head with a special set screw wrench and turning the adjusting screw with a screw driver until the setting of the cutter corresponds with the reading on the special micrometer (see Figs. 244 and 245). The set screws are then tightened and the cutter again checked to make sure the adjustment was not altered when the set screws were tightened.
Installing the Boring Bar

After correctly adjusting the cutter, the boring bar is installed in the cylinder. The bar is located in the cylinder by means of two split tapered locating plugs. It is important therefore that the bottom and top of the cylinders be perfectly clean, as even a small particle of dirt may throw the bar out of line with the cylinder bore. Also pass a fine file over the top of the cylinder block to remove any burred threads or carbon which might prevent the permanent guide from resting squarely against the cylinder block.

To install the boring bar, place one of the two-piece tapered plugs on the bar just in front
of the cutter head (see Fig. 246). The assembly is then positioned in No. 2 cylinder as shown in Fig. 247, making sure that two of the supports on the locating plug rest on the bottom of the cylinder (see Fig. 248). Next hold the bar in this position with the left hand and with the right hand, place the second two-piece tapered plug over the front end of the boring bar (see Fig. 249) and force it into the top of the cylinder with the hand. It is important that the plugs fit tightly in the cylinder in order to correctly align the boring bar. This can be done by firmly holding the front plug in position in the cylinder with one hand while forcing the boring bar in with the other.
Next place the rear permanent guide over the end of the boring bar (see Fig. 250) and slide it forward until it rests squarely against the bottom of the cylinder block. The two special combination bolt and speed wrenches are then inserted through the flange on the cylinder block and the permanent guide and nuts run down loosely on the end of the bolts (see “A” Fig. 251). Next tighten the clamp screw “B” then tighten the two nuts on the ends of the special bolts. (It is important that the clamp screw “B” be tightened before drawing down the two nuts “A” on the end of the special bolts.)

The front permanent guide is installed in the same manner, i.e., by inserting it over the
front end of the boring bar (see Fig. 252) and sliding it forward until it rests squarely against the face of the block. The guide is then bolted to the face of the block with either two or three \( \frac{1}{4} \) x 1" cap screws (see "A" Fig. 253) which are not tightened until after the clamp screw "B" has been drawn down.

After making sure that the front and rear permanent guides are securely fastened, remove the two temporary locating plugs. To remove the locating plugs, it is first necessary to loosen the two permanent guide clamp screws approximately one-half turn. The plugs can then be pushed out of the cylinder by means of a small steel rod provided for this purpose (see Fig. 254).

The boring bar is next slipped forward until the boring cutter is about 7.4" away from the bottom of the cylinder. When sliding the bar forward, care must be exercised not to damage the cutter by allowing it to strike against the bottom of the cylinder. This can be avoided if the operator will grasp the boring bar near the bearing with his left hand and use it as a brake while sliding the bar forward with his right hand (see Fig. 255).

The split bearings in both the front and rear permanent guides are next adjusted. This is done by slightly tightening the two permanent guide clamp screws which were previously loosened half a turn to permit the removal of the temporary locating plugs. (See "B" Figs. 251 and 253). To adjust the rear split bearing, place a cylinder head speed wrench on the rear permanent guide clamp screw and an 8" or 10" wrench on the square end of the boring bar (see Fig. 256), then while turning the bar gradually tighten the clamp screw until the bearing just commences to tighten, this can be determined by a slight drag which will be felt on the wrench while the bar is being turned. When the bearing in the rear permanent guide has been adjusted, tighten the bearing in the front permanent guide in the same manner.

After tightening the guide bearings, connect the boring bar to the feed screw by means of the universal joint (see "A" Fig. 257). Place plenty of oil on the boring bar just ahead of the bearing, also in the oil cups, in the combination machine, then throw the feed lever forward and start the motor.
Removing the Boring Bar

The boring operation will require about 8½ minutes, during which time the operator can devote to other work. As soon as the boring is completed, the cutter automatically stops and the boring bar may be removed. To remove the boring bar, first loosen the two guide bearing clamp screws, then remove the cap screws which hold the front permanent guide to the top of the cylinder block and withdraw the guide from the boring bar. The boring bar can then be withdrawn through the top of the cylinder (see Fig. 258) after which the lower permanent guide is removed. Next take a dry cloth and carefully wipe out the cylinder, then measure the
cylinder bore with an inside micrometer (see Fig. 259) or an indicating dial gauge to make sure that the cylinder has been bored to the correct size. If the cylinder is O. K. set up for No. 1 cylinder before moving the block and table of the machine; if the table and cylinder block are moved first and then fastened down it will be impossible to place the rear permanent guide in position on account of it coming in contact with the screw which holds down the table. This applies only to No. 1 cylinder, as No. 2, 3 and 4 can be set up after the table and block have been correctly located.

After boring No. 2 and No. 1 cylinders and checking them for accuracy with the inside micrometers, repeat the operation on No. 3 and No. 4 cylinders.

Dealers interested in the purchase of this equipment can obtain full information regarding prices, etc., from the nearest Ford Branch

IMPORTANT

Retain this Bulletin for Future Reference
Battery Service Equipment

COMPLETE battery service includes both the recharging and repairing of batteries.

The principal equipment item is the battery charger—its selection and proper installation require special attention.

When selecting a battery charger, the following points should be carefully considered:

(a) Efficiency and operating cost.
(b) Capacity and recharging time.
(c) Adaptability for all classes of recharging.
(d) Price.

To secure satisfactory performance, the charger must be properly installed—wires must be sufficiently heavy—proper type fuses used—and cable or pipe connections made in accordance with requirements.

Detailed instructions covering the installation and operation of the K. R. Wilson one-day battery charger are contained in this issue of the Service Bulletin.

NOTE: The battery charger is also equipped with a device for recharging the magneto magnets in the car. Instructions covering its use will be published in the October 15th issue.
The Battery Charger

The K. R. W. Battery Charger is a bulb type rectifier which changes the incoming alternating current to direct current of the proper amperage and voltage for battery charging.

It has a capacity of from 1 to 15 batteries and an adjustable charging rate of from 2 to 12 Amps. It will charge the average battery in from 10 to 15 hours, thus making it possible to charge approximately 25 batteries every 24 hours with this type of charger.

This design of charger should not be confused with the regular bulb type rectifier which requires 24 to 36 hours for recharging a battery, nor with the motor generator type of charger which charges batteries in from 6 to 8 hours. Rather in design and principle of operation, it strikes an average between these two extremes. As a result it furnishes 10 to 15 hours recharging service on the average battery, or it can charge equally as well at the long slow rate required by new or rebuilt batteries. Furthermore, both rates can be combined at the same time.

The charging current is distributed between the two rectifier bulbs in such a manner that wear on the bulbs is reduced to a minimum. Specially balanced and equalized units in the charger assist in prolonging the life of the bulb, while fuses protect both the bulb and transformer against accidental overload. A bulb life of 800 hours is guaranteed by the manufacturers of the charger, although this is generally exceeded.

The two bulbs rectify both halves of the incoming alternating current, thus giving a full wave pulsating direct current. It is because the charging current is not a pure direct current, but consists of pulsations at the rate of 7200 per minute, that makes fast recharging possible with this type of charger without danger of over-heating or damaging the battery.

Installation Instructions

Due to the wide variance in local ordinances covering the installation of electrical equipment, it is difficult to furnish specific installation instructions which will apply in all cases. If, however, the following instructions are observed when installing the K. R. W. Battery Charger, and the work is performed by an electrician familiar with local requirements, the installation can be quickly and easily made.

The full load consumption of the Charger is approximately 1850 Watts, or slightly more than 2 H. P. The current draw is 18 Amps. on the 110 volt machine and 9 Amps. on the 220 volt type. It is therefore necessary to have your local power company install a meter large enough to handle this load. If you have a meter it is advisable to have it checked to see that it is the proper size. It is also important to have the line which supplies the charger sufficiently heavy to carry the load. Usually local regulations govern the size of the wire to be used. However, in the absence of such regulations we suggest the following: If the charger is located more than 150' from the meter use No. 8-BX cable. If less than 150' use No. 10-BX cable. This means that the specified size cable should run from the meter direct to the charger or from a heavy distributing line, so that the lines supplying the charger have sufficient carrying capacity to carry the load. If they are too small, they will cut down the capacity and efficiency of the charger.
Regulations Covering Installation

In most localities electrical regulations require a safety switch and fuse box being installed before the incoming A. C. line is connected to the charger (see "A," Fig. 261). This switch is used only for disconnecting the line while working on the charger and should never be used to shut off the charger while it is operating—the snap switch on the charger being used for this purpose.

For the 110 volt type charger, a 125 volt, 30 Amp. box fused for 30 Amps. should be used. For the 220 volt charger, use a 250 volt, 30 Amp. box fused for 30 Amps. This box is not furnished with the charger as it is a part of the electrical installation.

In order to comply with the requirements of the National Board of Fire Underwriters, all connections to the charger must be of BX armored cable or pipe and standard threaded openings are provided for that purpose in the base of the charger.

Mounting the Charger

To keep the charger away from the acid fumes which arise from the batteries when they are being charged, it is advisable to mount the charger on the wall at least six feet away from the charging line. If this cannot be conveniently done, the charger can be mounted on the end of a special charging bench. Specifications of this bench are shown in Fig. 260. When mounting the charger on a bench, always try to provide sufficient ventilation so that an excessive amount of fumes will not reach the charger and cause corrosion.
If the charger is mounted on the wall, be sure that it is securely fastened. Possibly the best plan is to fasten a heavy wooden cross piece to the wall and then bolt the charger to this cross piece, making use of the bar which acts as a brace from the outer edge of the cast iron base to the wall below the charger. 3/8-inch lag screws are supplied for mounting.

The proper method of connecting up the charger is shown in Figs. 261 and 262. "A," Fig. 261, is the safety switch and fuse box. "B" is the BX cable or pipe which is screwed directly into the base of the charger as shown. "C" are the wires from "B." They are pulled through the opening and cleaned ready to be soldered to the leads from the charger. The leads on the charger are marked either 110 or 220 volts, with brass markers. These wires are now twisted together, soldered and taped as shown at "D" and "E," Fig. 261. They are then pushed up into the opening and the cover plate installed as shown in Fig. 262.

The D. C. charging leads are marked with brass markers "POS" and "NEG." If the charger is mounted on a bench within a few feet of the batteries, the porcelain insulator can be placed in the opening with the D. C. charging leads brought out through the two holes in the insulator as shown at "A," Fig. 262. Rubber covered leads of at least No. 12 wire with clips on the end should be used for connecting the charger to the battery line. The ends of these leads are soldered to the charging leads and taped as shown at "B."

When the battery line is located some distance from the charger (six feet or more) it is advisable to run No. 10 BX cable or pipe as a distributing line to the battery bench. (See Fig. 263.)

In this case, attach the BX cable or pipe to the threaded hole in the base of the charger and
use a standard metal cover plate over the opening after the connections are made. Flexible covered charging leads should then be attached to the ends of the two leads which extend through the porcelain and the connections soldered and taped.

The K. R. W. charger has been approved by the National Board of Fire Underwriters and if care is used in setting it up, particularly in the use of wire of large enough carrying capacity, and all connections carefully made, satisfactory results are assured.
Correct Type Bulbs to Use

Only bulbs of the following catalogue numbers should be used in the K. R. W. Charger:

Tungar No. 189049
Rectigon No. 289416-B

Be careful to check the number of the bulb which is stamped on the base, for if the wrong bulb is used, its life is likely to be very short and its efficiency poor.

The bulbs which are furnished are put through a special testing process by the manufacturer of the charger. This test practically eliminates any possibility of securing weak or defective bulbs, and for this reason it is advisable for K.R.W. charger users to purchase replacement bulbs direct from the charger manufacturer, The Heyer Products Company, 208 Sylvan Ave., Newark, N. J. This will assure users receiving carefully tested bulbs of the correct catalogue number and will also facilitate adjustment should a bulb not equal its guaranteed minimum life of 800 hours.

Installing the Bulbs

To install the bulbs, remove the charger cover by running out the two screws which hold it to the case and screw the bulbs firmly into their sockets. To avoid any possibility of breakage when installing, turn the metal base of the bulb rather than the glass. Next attach the flexible clip leads to the projecting end of the bulbs, being careful to connect the left clip lead to the left (No. 1) bulb and the right lead to the right (No. 2) bulb. (See Fig. 264.)
Operation of New Bulbs

New bulbs are "green" and must be broken in slowly to give the best bulb life. New bulbs should, therefore, be operated for the first three or four hours on 4 batteries or less at about a 5 Amp. rate per bulb. Do not put bulbs on a heavier load until first operated in this manner. Note: It is advisable not to use a new bulb for magneto charging until it has had several days battery charging service. This will insure the new bulb being thoroughly broken in.

Connections for Recharging Batteries at High Rates

The batteries are connected in series so that the positive post of one connects to the negative post of the next. The positive post can usually be indentified by the "plus" mark on it and if this is worn off it can be identified by its size as it is the larger of the two terminal posts. Be sure to watch this point carefully when connecting the batteries, for if a battery is connected in the line reversed, it may blow the charger fuses. If it does not blow the fuses, the battery will be discharged instead of charged, and if left on long enough will be charged in the reverse direction.

An efficient type of battery connector is the drive-in type shown in Fig. 265. A light tap of a hammer drives the acid resisting steel point well below any corrosion and into the clean metal where it makes a good contact. To remove the connectors it is only necessary to give them a slight twist and they will come out easily and without danger of breaking the steel point.

Fifteen of these connectors are supplied with each charger. Should any additional ones be required they can be purchased locally at any wholesale automotive supply house.

Batteries to be charged should be arranged in line with the positive terminal of each battery facing out. The connections are made by connecting the positive of one battery to the negative of the next. The positive charging lead is connected to the positive end of the battery line and
the negative charging lead to the negative end of the battery line. As these batteries are all connected in series they will each receive the same charging current. The charging rate can be adjusted from 2 to 12 Amps.

Connections for Recharging Batteries at Low Rates

New or repaired batteries must be charged at a lower rate than batteries which have been in service. This can be accomplished without slowing down the entire line by connecting the batteries requiring slow charging parallel to each other or to another battery in the line. For example: suppose we have four batteries on the line which are being charged at 12 Amps. and we desire to place four more batteries on the line to be charged at the rate of 6 Amps. This can be done without slowing down the line, by first shutting off the charger and then connecting the four batteries in parallel to each other or grouping them as shown at "A," "B," "C," and "D," Fig. 266. When connecting them be careful to see that the connections between the terminals of these batteries and those in the line are positive to positive and negative to negative. By connecting the four batteries in this manner the charging rate of 10 to 12 Amps., is divided between batteries "A," and "B," and "C," and "D," so that each battery receives but 5 or 6 Amps. If a still lower rate is desired another battery, (see "E") can be connected to "B" in the same manner as "B" is connected to "A." Thus the three batteries ("A," "B" and "E") will get only one third of the total charging current.

New batteries or rebuilt batteries in which the negative plates have become dry should be given an initial charge of four Amps. for a period of 96 hours. Old batteries which have been in service can, of course, be given the maximum charging rate of 12 Amps.

When charging batteries they should be checked to see that they do not overheat. This should be done with a good thermometer. In no case (except in the Tropics) should the temperature of the solution exceed 110° F. (In the Tropics the temperature should not exceed 125°.)
Operating Charger for 10 to 15 Hour Recharging

To recharge batteries in 10 to 15 hours, both rectifier bulbs are used, each bulb rectifying one-half of the A.C. wave and each one handling up to 6 Amps., its capacity.

Both bulbs should be used whenever charging 4 to 15 batteries. The charging rate with two bulbs can be varied from 2 to 12 Amps. When charging less than four batteries, only the left bulb should be used and the charging rate not increased beyond 6 Amps.

All batteries can be safely charged at a rate of from 10 to 12 Amps. with the exception of new, or rebuilt batteries in which the negative plates have become dry. These, as well as batteries receiving the initial charge, must be charged at a lower rate.

To operate the charger on both bulbs proceed as follows:

(a) Be sure that switch “C-3,” Fig. 267 is in the “Charge Batteries” position.

(b) See that both control switches, “B” and “B-1,” are turned all the way to the left.
(c) Turn on both snap switches, "C-1" and "C-2," and see that both bulbs light.
(d) Adjust charging rate by turning switch control knobs, "B" and "B-1," as follows:
(e) Turn "B," one notch to right (clockwise) to its first position. Then turn "B-1" to the right until the desired charging rate is shown on the meter.
(f) If "B-1" goes all the way around and the rate does not come up, turn it all the way back to the left, then turn knob "B" another notch to the right and repeat with "B-1."
(g) When adjusting charger with both bulbs operating be sure to look at the charge indicator. (See Fig. 270) to see that both the bulbs are charging before increasing the rate to more than 6 Amps. (Read instructions under heading "The Charge Indicator Meter").
(h) When changing batteries on the line or shutting the charger down always turn both switches "B" and "B-1," Fig. 267 all the way to the left, to the "Off" position. For changing batteries it is not necessary to turn off the snap switches, "C-1," and "C-2," but when shutting down the charger these should be turned off after switches "B" and "B-1" have been turned off.
(i) If No. 2 bulb is cut off while the machine is operating at 12 Amps., the charging rate to No. 1 bulb will drop to less than one-half, and switches "B" and "B-1" must be turned up to bring the rate up to 6 Amps.
(j) Never turn on No. 2 bulb while No. 1 bulb is operating at 6 Amps.—start the machine over again.

Charging Rate Tapers Off

The charger is designed to furnish a tapering charging rate so that as the batteries become charged the charging rate automatically tapers off from twelve Amps. to eight or nine Amps. If it is desired to continue charging at the high rate, readjust control switches, "B" and "B-1" (see Fig. 267).

When charging overnight, leave the charging rate at not more than ten Amps. By morning the rate will have tapered off to about six Amps.

Never leave the charger operating overnight until the final line has been operating at least one-half hour. This will enable the operator to discover if the plates in any of the batteries on the line are shorted which might cause an excessive current during the night and blow the fuses.

Operating Charger at Low Rate—Three Batteries or Less

When charging three batteries or less, at rates less than six Amps, only one bulb should be used. One bulb can be used satisfactorily up to 6 Amps. but it is advisable to use both bulbs whenever more than 3 batteries are being charged, as the charger is more efficient. For charging rates greater than 6 Amps. both bulbs must always be used as No. 1 bulb alone cannot be used at more than 6 Amps. without overloading and shortening its life.

Charging rates of 4 Amps. are generally used on initial charging of batteries, or for charging over the week-end where no one will be near the charger for a day or so. The low charging rate on one bulb is seldom used as in most cases the batteries are needed as soon as they can be re-charged.
To operate charger on No. 1 bulb only, proceed as follows:

(a) Be sure that switch “C-3” is in the “Charge Batteries” position as shown in Fig. 267.
(b) See that snap switch “C-2” for No. 2 bulb is turned off.
(c) See that both control switches “B” and “B-1” are turned all the way to the left.
(d) Turn on snap switch “C-1” controlling No. 1 bulb—the bulb should light.
(e) Adjust charging rate by turning switch control knobs “B” and “B-1” as follows:
   (f) Turn “B” one notch to right (clockwise) to its first position.
   (g) Then turn “B-1” to the right until the desired charging rate is shown on the meter.
   (h) If “B-1” goes all the way around and the rate does not come up, turn it back to zero, then turn up “B” another notch and repeat with “B-1.”
   (i) To stop the charger, turn switches “B” and “B-1” back to zero. Always do this when changing batteries on the line or shutting down the charger.

NOTE: When charging on No. 1 bulb do not turn on No. 2 bulb as this might damage the bulb or blow a fuse. Shut off the charger completely and start on both bulbs as covered in instructions.

**Use of Low Voltage Plugs**

Due to the heavy load (2 k.w.) taken by the charger, when both bulbs are operating, the line voltage will sometimes drop 5% or 8%. To compensate for this condition, which naturally cuts down the capacity of the machine, a plug is supplied directly below the fuses. When charging 12 batteries or less this plug must remain in the left-hand position. (See Fig. 269.) When charging more than 12 batteries, it is placed in the right hand position. (See Fig. 268.)

To make this change always shut off the charger by turning the control handles “B” and “B-1,” and snap switch “C-1” (shown in Fig. 267), to the “off” position. **This is important.**
The Charge Indicator Meter

When both bulbs are operating, the total charging current is indicated on the ammeter, but this does not show that each bulb is rectifying and taking its share of the load.

If for any reason one of the bulbs is lighted but is not charging, then the entire current is carried by the other bulb, which will shorten its life and if it is operated at more than 6 Amps., will blow the fuses.

The purpose of the Charge Indicator is to show that both bulbs are operating, and if only one bulb is charging, which one it is.

After adjusting the charger with both bulbs turned on (and both lighted) see that the “Charge Indicator Pointer” is approximately in the center of that section of the scale marked “safe.” (See Fig. 270.)

If one bulb is not charging, then the pointer will swing over and indicate the bulb that is charging. Never adjust the charging rate beyond 6 Amps. when the charge indicator shows that only one bulb is operating, but examine the bulb and fuses to locate the trouble.

When operating the charger on the left bulb only, (the right bulb being turned off), the indicator will point to the left of the scale, (see insert “A,” Fig. 270). When operating in this manner be sure that the charging rate of 6 or $6\frac{1}{2}$ amperes is not exceeded.

The right bulb cannot be operated alone, as in order to turn it on, the left bulb must first be turned on. Sometimes the left hand fuse, which protects the left bulb, will blow out and the
right bulb only will be charging. In this case the pointer of the charge indicator will swing to the right as shown in insert “B,” Fig. 270 which shows that only the right bulb is charging.

Whenever the charge indicator hand goes well into the red part of the scale marked “danger” it indicates that the bulb on that side is being overloaded and bulb and fuses should immediately be checked.

The charge indicator has been added to the charger as an additional protection to both the bulbs and charger, and removes all possibility of improper operation if it is carefully watched whenever adjustments are made.

**Proper Fuses to Use**

Figure 271 shows the arrangement of the cartridge fuses which are installed in the compartment behind the small hinged door in the center of the front panel. These fuses as previously explained are used whenever the charger is used for battery charging. Fuses “A” and “B” are the D. C. fuses, they protect the rectifier bulbs and should never be more than 15 Amps. Fuse “C” is the incoming A.C. line and should be 15 Amps. on 220 volts and 30 Amps. on a 110 volt line.

These cartridge fuses can be renewed when blown out, by inserting a new link into the fuse. A supply of extra fuse links is furnished with each charger and new ones can be obtained locally, or direct from the manufacturers of the battery charger.

When replacing a link be sure to install one of the correct size. The size is stamped on the end of the link. Care should be exercised to watch this point carefully as several sizes of links are furnished.
Should a fuse blow out, shut the charger down completely before removing the fuse from the clip. The old link can be removed by screwing out the two threaded ends of the fuse with a screwdriver. See Fig. 272. After removing these ends, the burnt out link, together with the small slotted washers which hold it, can be withdrawn from the cartridge. The new link is installed by bending the link about \( \frac{3}{4} \) inch from the end at right angles and inserting it into the slot in the washer as shown in Fig. 273. The link and washer are then placed in the cartridge and the end of the plug screwed into place. Next place the remaining slotted washer over the end of the link which projects from the opposite end of the fuse and bend the link over. Replace the end of the plug and slightly tighten both ends with a screwdriver.

**Tracing Trouble**

The following information will assist in locating blown fuses, poor connections on battery line, bulb trouble, and other difficulties which occasionally occur:

*If bulb does not light:*

(a) Examine A.C. fuse.
(b) Check current supplied to charger.
(c) Try a new bulb or try the same bulb in another charger.
(d) See that center contact of bulb socket is clean.

*If bulb lights but does not charge:*

(a) Examine battery line connection.
(b) Examine fuses (left and right hand) protecting bulbs.
(c) Examine clip connection to bulb tip.
(d) Try another bulb. It is always advisable to have a spare bulb on hand.

If none of the above tests indicate the trouble, it is probably due to a defective battery on the line or the charger is not operating. To check the charger, disconnect the charging line where
it connects to the charger and connect the leads from the charger together. Start up the machine on one bulb. If the meter indicates a charging rate, it is proof that the charger is operating and that the trouble is in the battery line. To locate a troublesome battery, check each battery individually. This is done by connecting the charger to a single battery and adjusting the ammeter reading with one bulb operating at about 5 Amps. If the meter shows a reading, the charger is working and that battery is O.K. Keep adding batteries and increasing the charging controls until the troublesome battery is located.

**If D.C. fuses blow out:**

If the D. C. fuses (see “A” and “B,” Fig. 271) in the charger blow out: Note—Occasionally new bulbs even after “breaking in” according to instructions will blow the D. C. fuses several times during the first week or so of operation after which they will continue operating without further difficulty with the fuses. Other causes for fuse trouble are:

(a) Charging rate is too high.

(b) One bulb is charging at the high rate. Watch the charge indicator.

(c) Batteries are reversed on the line.

(d) A.C. line has a loose connection and is causing the machine to start up and shut off under full load.

(e) One or both of the bulbs are defective. Watch the bulb as you adjust the machine to full load—if one burns brightly and the fuse blows, it is evident that it is defective. Be careful to start off charger with new bulbs as explained, not exceeding 5 Amps. This helps to preserve the bulbs.

(f) An external A.C. fuse is too light, causing one or both of the D.C. fuses to blow out when the external fuse fails.

(g) The line voltage is fluctuating. This may be due to the lines which supply the current to the charger and other equipment being too light. If the ammeter pointer moves up and down on the scale when the charging rate has been set, it indicates that the incoming A.C. voltage is not steady. This may cause the fuses in the charger to blow out and the only remedy is to consult your local electric company and have the proper lines installed. Under no condition put in heavier fuses than is called for as this will throw the strain on the bulbs and may damage them.

**If the A.C. fuse blow out:**

If the A. C. fuse (see “C,” Fig. 271) blows out:

(a) The fuse may be defective.

(b) It may not be of the proper capacity.

(c) Trouble may be in the line fuses outside of the charger—these fuses should all be checked.

**Charger does not reach capacity:**

If the charger does not reach capacity:

(a) Power lines may be too small—note installation instructions and have the electric company check voltages while charger is operating at full load.

(b) D.C. charging leads may be too small.
(c) There may be a defective battery on the line. A badly sulphated battery, a cell without electrolyte, or a poorly burned lead connection may be the cause of the trouble. The proper remedy is to subject each battery to a complete test. This can be done with a battery tester.

(d) If most of the batteries on the line are nearly charged, the rate naturally tapers off.

(e) Poor battery connections—use the drive-in type of battery connector so as to get below the corrosion on the lead post and into the clean metal.

(f) A worn out or defective rectifier bulb may be the cause. Try a new bulb.

(g) The ammeter may be reading low. Check the charging rate at the batteries with another meter. (Moving coil type must be used for this purpose.)

**Batteries fail to charge sufficiently:**

If the charger is working satisfactorily, as shown by test given above, the only cause of the batteries failing to come up as they should is due to the condition of the batteries themselves.

Hydrometer readings are not reliable as in many cases the electrolyte is either too weak or too strong and is therefore not a true indication of the condition of the charge of the battery. The only reliable rule to follow regarding the use of a hydrometer when charging batteries is as follows: When the hydrometer reading stops showing an increase, charge about two hours longer and then remove the battery, for it has taken its maximum charge. If one or more cells are low they should be adjusted.

**Give Full Details When Ordering**

The following information must be given when ordering a battery charger:

(a) Voltage of line on which the charger is to be used.

(b) Cycles (frequency of line).

(c) State whether charger is to be shipped by freight or express.

(d) Specify whether or not an extra bulb is desired. (Extra bulbs are furnished at $7.20 each, net.)

Dealers interested in the purchase of this equipment can obtain full information regarding prices, etc., from the nearest Ford Branch

**IMPORTANT**

Retain this Bulletin for Future Reference
Recharging Magnets

In addition to charging batteries, the K. R. W. battery charger (described in the October 1st issue of the Service Bulletin) is equipped with a magneto recharging device which permits recharging magnets in either the car or tractor without removing the magnets from the flywheel.

By means of this recharging device, magnets which are weak can be brought up to their full strength within a few seconds time. This is done by passing a heavy direct current consisting of 3600 pulsations per minute through the magneto coil.

Special switches and fuses are provided with the battery charger so that it can be quickly adjusted for either battery or magneto recharging.

Detailed instructions covering the use of this device are contained in this issue of the Service Bulletin.
Recharging Magnets in the Car

Before recharging magnets in the car, it is a good plan to first check the magneto to determine whether or not the trouble is actually due to weak magnets. Occasionally all that is required is to clean the magneto terminal post and contact point on the coil assembly. If this fails to remedy the trouble then the magneto should be carefully checked.

The K. R. W. magneto tester provides a quick and accurate method of testing the magneto. The tester consists of an A. C. ammeter with a special scale arrangement for accurately registering the condition of the magnets. (See Fig. 274.) Two leads are attached to the tester; when checking the magneto one of these leads is clipped to either the engine or the frame of the car, (see “B,” Fig. 275), the other lead being clipped to the magneto terminal post “A.” It is unnecessary to disconnect the magneto terminal wire when making the test as battery ignition only is used and the terminal wire will not interfere with the reading. To protect the meter it should be held in the hand while making the test.

Testing the Magneto

To test the magneto first check its strength at starting speed. To do this, turn the engine over with the starter leaving the ignition switch off. The indicator pointer should indicate between the two scale divisions enclosed in the bracket on the left side of the dial. (See “A,” Fig.
274.) If a reading of at least 3½ Amps. is not obtained, it indicates that the magneto is weak at cranking speed.

After making the test at cranking speed, start the engine on battery and speed it up sufficiently to get the highest reading on the test meter. The markings on the scale under the word "Running" will show the condition of the magneto. A magneto which is up to standard will read 100% or more. A magneto which tests "Good" while a trifle below standard, would not require recharging. A magneto which tests "Fair" will usually operate satisfactorily when the car is travelling above 20 miles an hour, but will be found to be weak at cranking speed, and should therefore be recharged. Magnetos which test "Poor" should of course be recharged.

Cars equipped with magneto ignition only must be tested in a different manner, as the test meter when attached to the contact post cuts out the magneto ignition. To test the strength of the magnets on cars not equipped with a battery, fasten one of the lead clips to the frame of the car and then start the engine on the regular magneto ignition. Speed up the engine and while it is running, fasten the other lead clip to the magneto contact post. This will cut off the ignition and the engine will gradually stop, but the reading can be obtained while the engine continues to rotate, providing the test is made quickly.

As excessive end play in the crankshaft affects the strength of the magneto and is often confused with weak magnets, it is a good plan to check the shaft before recharging the magnets. If there is more than .015 end play, the trouble is undoubtedly caused by excessive end play in the shaft rather than weak magnets.

If the end play in the crankshaft is not excessive, that is, less than .015, then the trouble is due either to the magneto coils being grounded or shorted, or to weak magnets.

If the magneto coils are not badly shorted or grounded, the current from the charger will clear the obstruction when the magnets are being recharged. If, however, the coils are so badly shorted or grounded that the charger cannot burn them clear, then it will be necessary to either repair or replace the coil assembly before the magnets can be properly recharged.
Recharging the Magnets

The magnet recharger is included as standard equipment with the K. R. W. Battery Charger. The battery charger can be purchased less this device if desired. However, we recommend that the complete unit be obtained as the magnet charger is both a time and labor saver and has proved unusually efficient.

The magnets are recharged in the car with the same transformer and bulbs as are used in the battery charger. The change over is easily made by turning a switch and installing a heavy fuse. The 2-k. w. transformer in the charger, which is already connected with the heavy lines of the power service, makes it possible to pass a powerful charging current through the magneto coil and bring the magnets up to their original strength. Grounds and shorts will usually be cleared by this charging current. In cases where the coils are so badly grounded or shorted that the charging current cannot burn them clear, it will be necessary to either replace or repair the coil assembly.

How the Magnets are Recharged

The magnets are charged in the car by passing a heavy pulsating current from the rectifier through the magneto coil. This current consists of 3600 pulsations per minute, each pulsation for a fraction of a second, reaching approximately 80 Amps. The effect of this current is to cause an intense attraction of the magnet clamps against the coil faces. This attraction, together with the strong recharging current, builds up the magnetism in the magnets within a few seconds time.

Best results will be obtained if the magnets are charged in their original polarity. The polarity can be determined with a polarity indicator and contactor. The indicator and 25 feet of charging lead is furnished as standard equipment with the combination battery and magneto recharger. In Fig. 276 is shown a transmission which has been cut away to show clearly how the indicator operates.
Adjusting the Battery Charger for Magneto Recharging

To adjust the battery charger for magneto recharging:

(a) First turn all battery charger switches completely off.

(b) Remove all charger fuses from the compartment behind the small door in the front panel.

(c) Place the special red fuse found in the steel box on the left side of the charger (see "A," Fig. 277) in the center fuse clip (see "A," Fig. 278) in place of the regular A.C. fuse. (For magneto charging, a heavier fuse is required than in battery charging. For example, the 110-volt charger will require a 60 Amp. fuse (2-30 Amp. links) while the 220-volt charger will require 30 Amps. (1-30 Amp. link). It will also be necessary to see that equally heavy fuses are used in the line supplying the charger.)

(d) Turn the knob handle (see "C-3," Fig. 279) to the right, until it is in the "Charge Ford Mag" position.

(e) Turn both snap switches "C-1" and "C-2" to the "on" position, and see that both bulbs light.

The charger is now ready to operate, so be careful that the prod which is attached to the charging lead does not come in contact with any metal part of the car, as this may blow out the magneto charger fuses. Figure 279 shows the correct setting of the switches when recharging the magnets.

Instructions for Recharging the Magnets

After adjusting the charger for magneto recharging, remove the magneto contact plug and insert the magnet polarity indicator with the charging lead attached, into the opening (see...
Fig. 280. Press the indicator down firmly, so that it will make a good contact with the coil and then have some one turn the engine over very slowly with the starting crank. While the engine is being slowly turned the hand on the dial of the indicator will now move back and forth as first
the north and then the south pole of a magnet passes underneath the indicator. Watch the hand on the indicator dial until it points to the side of the scale marked "Reversed" (see "A," Fig. 281). Then, while the engine is being turned very slowly, the hand on the dial will move to the opposite side of the scale marked "Correct" (see "B," Fig. 281). Continue turning the engine very slowly and stop when the indicator hand comes back to the center of the scale at the point marked "Charging position" (see "C," Fig. 281). When this position is reached the magnets are opposite the coil faces and are in the correct polarity for recharging. Next take the red
charging prod and hold it against the engine or frame of the car and count five (see Fig. 282) repeating the operation two or three times. A heavy vibration indicates that the charging current is flowing. Watch the charge indicator meter on the battery charger to see that both bulbs are operating (pointer should indicate "Safe").

After charging in one position, the engine should be turned one quarter of a turn and the magnets again charged, repeating the operation until the magnets have been charged four times, once at each quarter turn.

To get exactly one quarter turn, rotate the engine very slowly after charging in one position, and get the following readings: reversed, correct, reversed, correct, and apply the current at the next charging position. This is one quarter turn, or four magnets from the first position (there are 16 magnets in all).

Charging in one position will give the magneto about 90% full strength but the magnets are charged unevenly. A more lasting charge will therefore be given if the magnets are charged on each quarter.

Should the fuses in the magnet recharger fuse box blow out (see "B," Fig. 277) it shows that the magneto coil assembly has a ground or short that is too heavy to be overcome by burning, and it will therefore be necessary to replace the assembly or find and remove the ground. These two fuses ("B," Fig. 277) are placed in the charging line to protect the charger and bulbs against overloading, or short-circuiting. They are fused to 50 Amps. Two 25 Amp. links should be placed in each cartridge if replacement becomes necessary.

After the magnets have been recharged, shut off the charger, then turn the upper left knob, "C-3" shown in Fig. 279, to the battery charging position; replace the proper fuses and the charger is again ready for battery work.

The spare fuse used in the center fuse clip for magneto charging is placed in the box on the left side of the charger, as shown at "A," Fig. 277. The polarity indicator is placed in the fuse clip which holds it securely in the box. The charging cables are kept in place by coiling them around the box as shown in Fig. 277.

Dealers interested in the purchase of this equipment can obtain full information regarding prices, etc., from the nearest Ford Branch

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IMPORTANT

Retain this Bulletin for Future Reference
Valve Timing

FEW repair operations affect motor performance more noticeably than accurately timed valves.

When valves are properly timed, a full charge of vaporized fuel is drawn into the cylinders. This insures a uniform power impulse in each cylinder which is absolutely essential in developing maximum power and a smooth running motor.

When valves are not properly timed, loss of power and overheating usually occur. For example, if an intake valve closes too soon, it prevents a full charge of gas being drawn into the cylinder. If it closes too late, the piston on its upward stroke may force part of the charge into the carburetor, the result in both instances being a weak power stroke.

Should an exhaust valve open too early, part of the expanding gases on the power stroke will escape through the exhaust. If it opens too late, hot burned gases are held too long in the cylinder, causing the motor to overheat and preventing the admission of a full charge of fresh gas.

Detailed instructions for accurately timing valves are contained in this issue of the Service Bulletin.
Timing Valves by Piston Travel

After grinding or refacing valves, or after the valve seats in the cylinder block have been reseated, the valves should always be retimed.

Grinding the valves or reseating the valve seats causes the valves to seat further down in the cylinder block and as a result the timing is changed.

Attempting to time an engine, which has been in service for some time by checking the air gap between the valves and push rods, is impractical, as the wear on certain parts such as valves, push rods, camshaft, and time gears, renders such a method inaccurate.

The accurate method of valve timing is to time the valves by piston travel. This method of timing insures maximum power and smoothness, as the valves open and close at exactly the right time to admit the maximum amount of vaporized fuel as well as to expel all of the burned or exhaust gases from the cylinder.
In timing valves by piston travel, the closing of the intake and the opening of the exhaust valves are the points which should be observed.

The intake valve in the Model T motor should just seat when the top of the piston is $3\frac{3}{8}$ to $3\frac{3}{2}$ inches below the face of the cylinder block as the piston comes up on the compression stroke (see Fig. 283). The compression stroke can be easily recognized by the fact that both the intake and exhaust valves are closed when the piston comes up on this stroke, the compression stroke being the only stroke on which both of these valves are closed when the piston is on an up stroke.

The exhaust valve should just start to open when the top of the piston is from $3\frac{1}{2}$ to $3\frac{3}{16}$ inches below the face of the cylinder block, as the piston travels downward on the power stroke (see Fig. 284). The power stroke can be easily identified by the fact that both the intake and exhaust valves close when the piston is moving down on that stroke, the power stroke being the only stroke on which the exhaust and intake valves are both closed when the piston is on a down stroke.

**A Gauge for Timing Valves**

A valve timing gauge made by K. R. Wilson provides a quick and accurate method of timing the valves. The gauge is provided with an adjustable lever for checking both the intake and exhaust valves. The lever is riveted in place so that it is slightly offset with the center line of the gauge. This results in the lever presenting both a short and a long side when it is swung from one side of the gauge to the other. When the gauge is used for checking the exhaust valves, the lever is turned so that the long side points downward the distance from the end of the lever to the edge of the gauge measuring $3\frac{3}{16}$ inches (see Fig. 285). When checking the intake valve the lever is turned so that the short side points downward, the distance from the end of the lever to the edge of the gauge measuring $3\frac{1}{8}$ inches (see Fig. 286).

By referring to Figs. 283 and 284, it will be noted that a low limit of $3\frac{3}{8}$ inches and a high limit of $3\frac{3}{2}$ inches is given as the distance from the face of the cylinder block to the head of the piston when the intake valve closes and the piston is coming up on compression stroke. Also that a limit of $3\frac{1}{16}$ to $3\frac{3}{16}$ inches is given for the opening of the exhaust valve as the piston goes down on the power stroke. The Wilson valve gauge is designed to time the intake and exhaust
valves so they will close and open approximately midway between these limits. That is, the intake valve is timed so it will close when the head of the piston is $3\frac{1}{8}$ inches below the face of the cylinder block as the piston comes up on the compression stroke and the exhaust valve so it will open when the head of the piston is $3\frac{3}{8}$ inches below the face of the block as the piston moves down on the power stroke.
Timing the Opening of the Exhaust Valves

When timing the valves with the gauge, possibly the simplest method is to first time the four exhaust valves and then time the intakes. (The four exhaust valves are shown in Fig. 288.) To prevent having to unnecessarily turn the crankshaft when timing, time the valves in the firing order of the cylinders, namely, 1, 2, 4, and 3.

To accurately time the opening of the exhaust valves, turn the lever on the valve timing gauge so that the long side points downward (see Fig. 285), then with the starting crank, turn the engine over until the piston in No. 1 cylinder starts to move downward, on the power stroke. Place the valve timing gauge in the cylinder so that the end of the lever rests on the head of the piston. As the piston travels downward, the gauge will gradually move into the correct position. Next, while turning the engine very slowly, place the thumb and forefinger on the head of the exhaust valve and apply a downward pressure, at the same time turning the head of the valve back and forth as shown in Fig. 287. As long as the valve is seated, a slight resistance or "drag" will be felt in turning the valve. The instant, however, it starts to open, the head of the valve can be turned freely with the fingers. At this point the end of the lever on the gauge should just touch the head of the piston (see Fig. 289). If the valve opens before the piston has traveled down the cylinder the full length of the gauge (see Fig. 290), the valve stem is too long, and it will be necessary to remove a small amount of stock from the end of the stem so that the valve will just open when the head of the piston touches the end of the lever on the gauge as shown in Fig. 289. The quickest and most accurate method of doing this is to grind the end of the valve stem in a valve refacing machine until it is the correct length. When grinding, the valve must be held in a "V" block as shown in Fig. 292, as it is absolutely necessary that the end of the stem be evenly ground.

To prevent any possibility of getting the valve too short, only a small amount of stock should be ground off at a time.

If the valve opens after the head of the piston is below the end of the gauge (see Fig. 291), the valve is too short. If it is only a trifle too short it can be refaced (see Fig. 293). This allows
the valve to seat a little lower in the cylinder block and has the same effect as lengthening the valve stem.

When refacing a valve, never grind off so much of the metal that a sharp edge is formed between the beveled face and the head of the valve as shown at "B," Fig. 295. There should
be at least a little stock left at this point (see "A," Fig. 294). After a valve has been refaced, it should always be "ground in" to insure a perfect seat.

If a valve is so short that it requires the removal of an excessive amount of stock from the face of the valve, a new valve should be installed.

After timing the exhaust valve in No. 1 cylinder, repeat the operation in Nos. 2, 4, and 3 cylinders.

**Valves Timed With or Without Valve Springs Installed**

The experienced mechanic usually times the valves before the valve springs are installed. The exact moment of closing being determined by the slight resistance or "drag" felt on the head of the valve when it is turned back and forth as shown in Fig. 287. Likewise the instant the valve can be freely turned, determines the point of opening.

For the mechanic who has had only limited experience in timing valves by piston travel, possibly the best plan is to time the valves after the springs have been installed. This, of course, requires a little extra time in the event it is necessary to remove a valve on account of it being too long or too short for accurate timing. However, the possibility of making an error in determining the exact moment of opening or closing of a valve is practically eliminated; this being due to the tension of the valve springs. For example, when timing the closing of the intake valves, the exact moment of closing can be easily determined, as the instant the valve closes it can no longer be turned back and forth with the fingers as shown in Fig. 287.

Likewise, when timing the opening of the exhaust valves, the exact moment of opening can be easily determined as the instant the valve can be turned with the fingers, it has started to open.

**Timing the Closing of the Intake Valves**

To accurately time the closing of the intake valves, turn the lever on the valve timing gauge so that the short side points downward (see Fig. 286). Then with the starting crank, turn the
engine over until the piston in No. 1 cylinder just starts to come up on the compression stroke. Next place the valve timing gauge in the cylinder and slowly turn the engine with the starting crank at the same time applying a downward pressure and turning the head of the valve back and forth with the thumb and forefinger as shown in Fig. 287. The instant a slight "drag" or resistance is felt, the valve has seated. Or if the valve springs have been installed, the instant the head of the valve can no longer be turned with the fingers, it has seated. At this point the head of the piston should just come in contact with the lever on the gauge (see Fig. 289).

If the intake valve closes before the piston reaches the end of the lever on the gauge (see Fig. 291), the valve is too short and it should either be refaced or replaced as previously described.

If when the valve seats, the head of the piston has pushed the gauge up in the cylinder (see Fig. 290) the valve stem is too long and a small amount of stock should be ground off the end of the stem (see Fig. 292), so that the valve will just seat when the head of the piston comes in contact with the end of the lever on the gauge.

After timing the intake valve in No. 1 cylinder, repeat the operation in Nos. 2, 4, and 3 cylinders.

Timing Valves in the Fordson

With the exception of the difference in the distance between the face of the cylinder block and the top of the piston when the exhaust and intake valves open and close, the same method of timing valves in the Model T motor applies to the Fordson.

In the Fordson motor, the intake valve should just close when the top of the piston is 3 1/2 to 4 1/2 inches below the face of the cylinder block as the piston comes up on the compression stroke, while the exhaust valve should just open when the piston is 4 1/16 to 4 3/4 inches below the face of the cylinder block as the piston goes down on the power stroke.

A gauge similar in design to the one shown in Fig. 285 can be obtained for timing the valves in the Fordson.

Dealers interested in the purchase of this equipment can obtain full information regarding prices, etc., from the nearest Ford Branch

IMPORTANT

Retain this Bulletin for Future Reference
Cleanliness in the Shop

WITH few exceptions, dealers' repair shops - whether it is the big shop in the city or the little shop in the smaller center - show that not enough attention is paid to cleanliness.

Cleanliness cannot be stressed too much. No one cares to patronize a shop where floors are coated with grease and dirt and a general “don't care” appearance is presented. You would not again visit a restaurant where the floors were dirty, the table linen soiled and a lack of ordinary cleanliness prevailed.

Realizing that these conditions are offensive to a large class of car owners, Ford dealers who are really interested in building up a profitable service business, will make a systematic effort to remedy them. Right now if you walk into the shop it's a ten to one shot some of the following conditions will be found:

Floors and windows dirty - There is no excuse for a dirty floor. If it is a concrete floor and is saturated with grease and oil—scrub it. A good grade of cleaning compound and a bucket full of hot water will accomplish wonders. The same material used more sparingly will make an excellent window washing and paint cleaning compound.

Accumulation of junk under benches and in corners - The greatest crime against cleanliness is an accumulation of junk underneath wall benches and in corners. Frequently, too, the tops of benches are littered with tools and worn parts which increases the disorderly appearance. Judging by appearances, if some dealers had a bench a half a mile long, they would eventually find scraps enough to fill every foot of space. This is poor business, as regardless of the size of the shop, the sooner it is learned that it pays to keep it free of junk, the quicker more money will be made and a greater pride taken in the shop.

Tools scattered promiscuously about - Every tool should be kept in a designated place and the mechanic required upon completion of a job to return the tools he has used to their appointed places. This saves time when the tools are again required and insures proper care being taken of them. It also increases the life of the tools and cuts down the overhead.

Torn and soiled posters - Frequently gaudy posters of some accessory article are displayed on the walls of dealers' shops. Oftentimes these posters have been up for considerably more than a year with the result that they have become dirty and torn. No dealer can afford to clutter up his place of business with “circus” posters which detract from his principal business of selling and servicing Ford products.

More paint desirable - Many shops which were painted when the building was built have not since known the feel of paint or brush. An application of good paint will work wonders in brightening up a shop and giving it a cleanly and inviting appearance. In painting the shop, possibly the best results are obtained by painting the walls white to within six feet of the floor and from there on to the floor using a dark grey. Fordson tractor paint (M-210) has proved unusually serviceable for this purpose and inasmuch as dealers can purchase it at net price the cost is quite reasonable.

Commencing at once start a real organized campaign to clean up the shop and keep it clean. Experience has proved that it is the clean shop which attracts trade — the unclean shop drives it away.
A K. R. Wilson magneto gap gauge (see Fig. 296) provides a quick and accurate method of checking the height and alignment of the magnet clamps as well as saving considerable time in obtaining the correct gap between the magnet clamps and coil cores when assembling the transmission to the engine.

To check the alignment of the magnet clamps with the gauge, first make sure that the flange of the transmission shaft is free from dirt and burrs, also see that the contact surface of the gauge is absolutely clean as the presence of even a small particle of dirt will throw the
gauge out of alignment. Next turn the stem of the gauge in a horizontal position as shown in Fig. 297. The stem can be turned by pulling forward on the front end of the gauge until the pin (see "A," Fig. 296) is disengaged from the slot. The gauge is then bolted to the shaft. After the gauge is bolted in position turn the stem so that the short end points downward as shown in Fig. 298. Turning the stem in a horizontal position prevents any possibility of damaging the gauge. For example, if the gauge was installed with the stem in a vertical position and the end of the stem rested on a magnet clamp which was a trifle high there would be a possibility of breaking or springing the gauge when the bolts which hold it to the flange of the transmission shaft were tightened.

After the gauge is installed, revolve the gauge until the lowest magnet clamps are found, then adjust the stem until it touches one of these clamps. To adjust the stem, loosen the lock screw (see "A," Fig. 298) and turn the adjusting screw "B" until the stem just comes in contact with the magnet clamp. The adjustment is then locked by tightening screw "A."

After adjusting the stem, slowly revolve the gauge. This will detect any variation in the height of the magnets. Magnets which are high can be set to the correct height by lightly tapping the magnet clamps with a copper or lead hammer (see Fig. 299) and tightening the screws. Care must be exercised in performing this operation to prevent damaging the magnet supports. When the magnets have been adjusted to a uniform height, see that the magnet clamp screws are all drawn down tightly and the ends of the screws are securely peined. The clamps should also be inspected, as it is absolutely essential that they be drawn down tightly against the magnets.

**Checking the Gap Between Magnet Clamps and Coil Cores**

The magneto coil support is assembled to the cylinder block so there will be a clearance (gap) of not less than .025 or more than .040" between the magnet clamps and coil cores after the transmission is installed. To obtain this adjustment quickly, first carefully clean the
contact surfaces of the magneto coil and cylinder block, then assemble the coil support to the cylinder block by running in the screws which hold it in place, replacing the same number of shims between the coil and cylinder block as were withdrawn when the coil was removed.

Clean off any dirt or burrs from the flange of the crankshaft and see that the contact surface of the gauge is absolutely clean. Next turn the stem of the gauge in a horizontal position and bolt the gauge to the crankshaft flange. After the bolts have been drawn down, turn the stem of the gauge so that the long end points downward as shown at “A,” Fig. 300.

When installing the gauge do not alter the original setting of the stem which was made when adjusting the magnets, as this setting must be used to obtain the correct adjustment of the coil.

With the gauge bolted to the flange of the crankshaft, the coil support is now adjusted so that the stem of the gauge will lightly touch the faces of all of the coil cores on the upper half of the coil support, leaving a gap of from .006 to .010” between the end of the stem and the faces of the coil cores on the lower half of the support when the gauge is slowly revolved. The coil support is adjusted by removing or replacing shims between the support and the cylinder block. Shims of different thicknesses are provided so that extremely close adjustment can be obtained. To install the “U” shaped paper shims, part No. 3275, it is unnecessary to remove the coil support as the shims can be placed in position by loosening the four magneto coil cap screws and moving the support slightly forward. When performing this operation always turn the gauge stem in a horizontal position (see Fig. 297).

When the correct adjustment is obtained, wire the four magneto coil cap screws together and assemble the transmission to the engine. After installing the transmission, the gap should be checked with thickness gauges (feelers) to make sure that the coil support has been properly adjusted so that there is a gap of from .025 to .040” between the magnet clamps and coil cores.

A magneto gap gauge, similar in design to the one shown in Fig. 296, is also furnished for the Fordson tractor.
Transmission and Brake Band Riveting Machine

This new riveting machine (Fig. 301) relines transmission and brake bands in less than half the time required by the hand method and in addition eliminates the possibility of springing the band out of shape as often occurs when the hammering method is used.

Old rivets are quickly sheared off by means of the hardened and ground cutter which is provided with the machine while the rivet holder and special die, which are used for installing the new rivets, spreads the ends of the rivets so that they curve back and are forced well below the surface of the lining.

To chop off the old rivets in a worn lining, insert the rivet cutter between the lining and the band (see Fig. 302) and press down on the foot pedal at the base of the machine.

New linings are riveted to the bands by inserting a rivet into the rivet holder of the machine and holding the band in the position shown in Fig. 303. The rivet is then forced into place by pressing down on the foot pedal.
Sometimes a main bearing knock or excessive motor vibration can be traced directly to a bent or sprung crankcase.

A crankcase which is sprung invariably throws the transmission shaft out of alignment and as the transmission shaft is firmly bolted to the flange of the crankshaft it is in reality an extension of that shaft, consequently any misalignment is bound to affect the operation of the motor.
Before installing a crankcase always check it for alignment. The operation requires but a few moments and is excellent insurance against one cause of motor vibration and main bearing knocks.

A crankcase aligning jig (see Fig. 304) provides a quick and accurate method of checking the crankcase. (Before checking the case it should be thoroughly cleaned, making sure to remove any traces of old gaskets, etc., which may be sticking to the flanges.) The crankcase is checked by placing it on the alignment jig, inserting the ten locating studs in the jig through corresponding bolt holes in the flange of the case. The locating plugs are next inserted through each end of the crankcase into the jig (see Figs. 305 and 306) and the locating pins inserted through both crankcase arms (see Fig. 307). If the alignment of the crankcase is O.K., it will rest evenly on the jig at all points and the locating plugs can be freely inserted into the fixture. If the case does not seat squarely on the jig or if difficulty is experienced in installing the locating plugs, the crankcase is sprung and it will be necessary to straighten it. This is done by striking the high points with a hammer (see Fig. 307) until the crankcase rests squarely on the jig and the locating plugs can be freely inserted into the fixture.

Occasionally a crankcase has been sprung so that it has a tendency to bow either in or out, and as a result difficulty is experienced in attempting to straighten it on the jig. This is due to the fact that when a crankcase is sprung in this manner, it is first necessary to bend it in the opposite direction to which it is sprung and then bring it back to normal from that side in order to prevent it springing out of line again. This, of course, cannot be done on the aligning jig, as the level surface of the fixture prevents bending it below that point.

In an instance of this kind, possibly the simplest method is to straighten the case on an arbor press. This can be done by positioning the crankcase on the press and pressing out
the bowed or raised point, a little at a time, until the crankcase is drawn into line and checks accurately when tested on the aligning jig.

Once in a while a crankcase has been sprung so that the sides of the case where the crankcase arms are attached have slightly spread. This condition can be remedied by placing the case in an arbor press and pressing the sides together a little at a time until the case checks accurately on the aligning jig.

Dealers interested in the purchase of this equipment can obtain full information regarding prices, etc., from the nearest Ford Branch.

Fleet Owner Parts Discount Not Restricted By Volume Purchased

Although our policy in respect to discount applying to Fleet Owners on parts purchases has been clearly defined, complaints are occasionally received to the effect that certain dealers withhold discount providing the purchase does not exceed $1.00. While the amount involved is small, it nevertheless is an element of dissatisfaction to the Fleet Owner.

So let it be definitely understood that the Fleet Owner's discount applies regardless as to whether the purchase amounts to 10 cents or $10.00, the same principle applying on dealers' purchases from this Company.

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