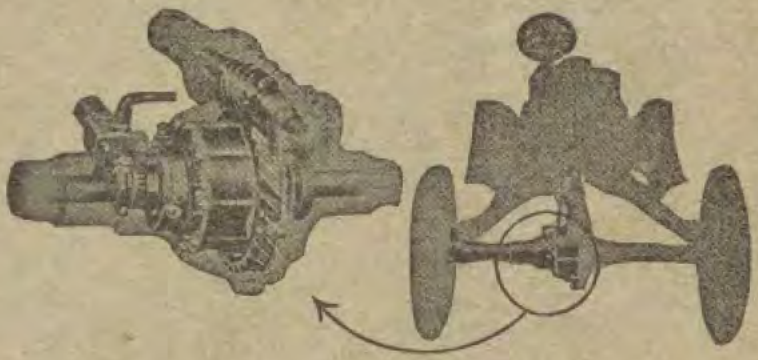
LUBRICATION ADJUSTMENT AND CARE *of the*

RUCKSTELL AXLE

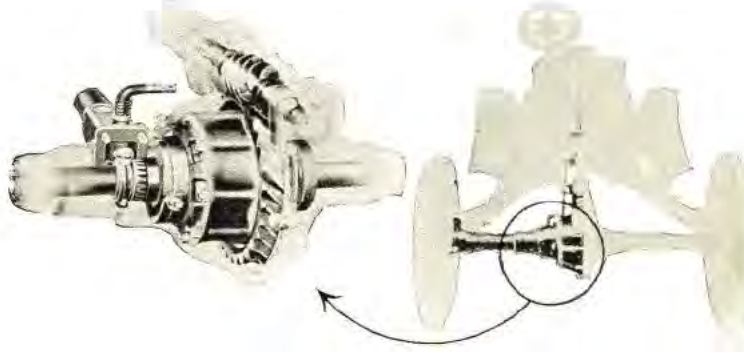


RUCKSTELL SALES & MFG. CO.

LUBRICATION ADJUSTMENT AND CARE

of the

RUCKSTELL AXLE



RUCKSTELL SALES & MFG. CO.

Printed in U. S. A.
May—1926

Foreword

The founders of the Ruckstell Sales and Manufacturing Company early conceived the need for a two speed axle for automobiles. They were pioneers in this field.

Fig. 1. Showing the position of the Ruckstell Axle shift

In view of the fact that the Ford car employs the planetary type of transmission, with two forward speeds and one reverse, the RUCKSTELL AXLE is indeed an invaluable addition, since its installation provides the Ford cars with four speeds forward and two on reverse.

As manufacturers of specialized automotive equipment, the Ruckstell Sales and Manufacturing Company has sought to incorporate in this product those features of design and qualities of material and workmanship which make for strength, endurance, freedom from minor adjustments and annoyances, coupled with minimum weight.

In motor vehicle operation it is important that the engine requirements be given close attention, such as fuel,

lubrication, cooling and ignition—that all of us recognize. But it is equally important that the same care and attention be given the units which transmit the engine power to the rear wheels, such as the clutch, transmission and rear axle.

Things unseen are matters often forgotten; hence the need for this booklet which deals with the proper care, adjustment and lubrication of one of the most important units of this combination—the Ruckstell two speed rear axle.

The rear axle of a motor vehicle is called upon to transmit the power to the rear wheels, to bear the severe strains and stresses of stopping and starting, and to carry from 60% to 80% of the total weight of the vehicle and its load. All these things it is designed and built to do—and do well. But neglect its lubrication and it is seriously handicapped in performing these duties.

The importance of correct lubrication cannot be over-emphasized. Injury to the gear teeth and bearings will result immediately and without warning if lubrication be interrupted for a few minutes only. The cost of repairs or replacements may not be large in itself, but the delay from loss of service—especially in the case of commercial vehicles—may prove expensive.

To secure correct lubrication, it is not only necessary that the oil be of high quality, but it must also be of the correct body and character. Lack of proper attention to lubrication may be a source of greatly increased repair bills, besides subjecting the owner to the additional annoyance and expense due to the "lay-up" of the vehicle in the repair shop.

The cautions and recommendations contained in this booklet can be easily followed by anyone interested in efficient and economical operation. The suggestions

which are offered are simple and will require but little time to carry out. Their adoption will pay large dividends in service and satisfaction.

GENERAL DESCRIPTION

All internal combustion engines deliver their maximum power at high speeds. Hence when heavy roads or steep grades are encountered—conditions that demand the maximum power of the engine—a means must be provided that will permit the engine to speed up and meet the increased demands made upon it.

This is accomplished through the medium of gears—a series or train of such gears of varying size, incorporated in a transmission—enabling the operator to change the rotative relationship between the engine and driving wheels. A final gear reduction is also provided in the rear axle.

In the ordinary axle no provision is made to change this ratio. In the Ruckstell Axle, however, two ratios are provided. With this increased variety of ratios a better and more satisfactory engine performance is possible.

The Ruckstell Axle, therefore, makes possible in the same unit, a car of power and speed.

The Ruckstell Axle comprises a supplementary planetary reduction gear assembled in the rear axle housing, introducing a slow moving reduction gearing between the large driving ring gear and the differential case. This unit is locked and does not function in any way when the Ruckstell Axle shifting lever is in "high" or forward position,—the unit revolving with the differential ring gear,—the engine drive being direct through the drive shaft pinion and differential ring gear to the axle shafts. When the supplementary reduction is in engagement (lever in

back position) it entails but three additional moving parts, namely, that of three small spur gears. These three spur gears are in constant mesh with an internal gear, the latter a unit part of the large ring gear. The three spur gears

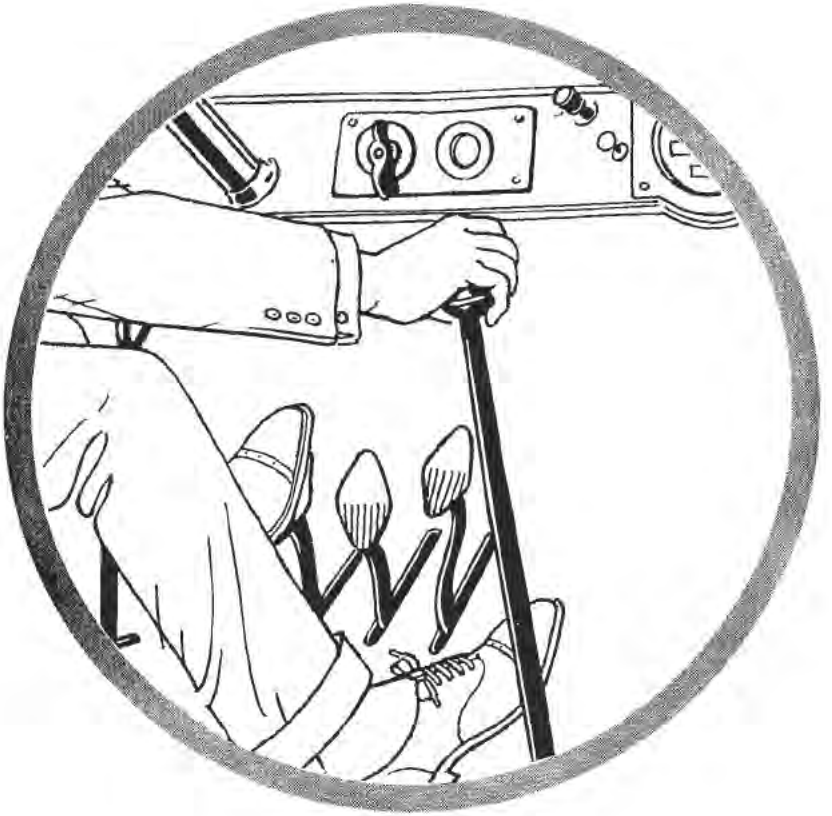


Fig. 2. You Merely Shift this Lever. Change speeds as you desire, noiselessly, no matter how fast you are traveling. When the lever is FORWARD your car is always in Ford speeds; when the lever is BACK your car is always in Ruckstell speeds. The lever is installed conveniently for the right hand, as illustrated.

are also in constant mesh with a centrally positioned spur gear surrounding the axle shaft. The engagement of the supplementary reduction transmits the engine power from the large ring gear, through the Ruckstell planetary reduction, to the rear axle shafts through the medium of the standard Ford differential.

The differential housing has a combined filling and level testing hole located at the rear of housing and fitted with a hexagon head screw plug. See Fig. No. 16 and 17.

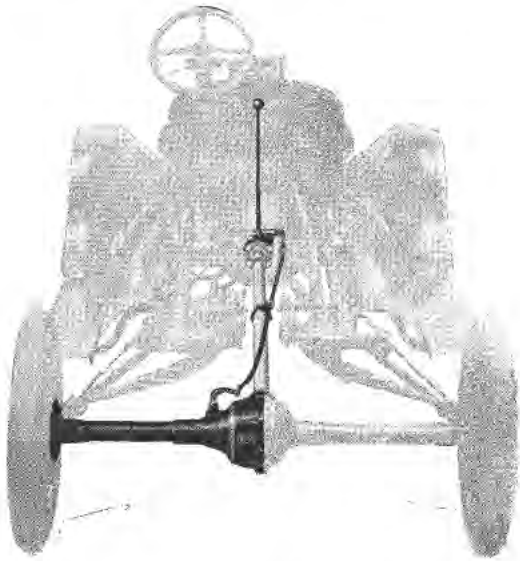


Fig. 16. This picture was made especially to show where the RUCKSTELL AXLE is installed and how it becomes an integral part of the Ford car. The regular left housing is replaced by the Ruckstell housing containing the Ruckstell reduction or power gearing. You thus have a car with TWO-PURPOSE PERFORMANCE, combining POWER and SPEED.

DETERMINING THE CORRECT LUBRICANT

The selection of a lubricant of the body and character for rear axle lubrication is a problem requiring careful study by competent engineers familiar with the design and construction of these models as well as the performance of lubricants under the various conditions of service to be encountered.

Each working part of an axle assembly must be protected by a film of lubricant adequate to withstand the severe pressures developed in order to prevent rapid wear. The supply of lubricant must be continuous and free from foreign matter of any kind which might scratch or cut the gear teeth and highly polished bearing surfaces.

Fig. 17. This picture shows the RUCKSTELL AXLE installed on the Ford truck. Unlike so-called reduction devices or auxiliary transmissions sometimes installed *in front* of the worm gear, the RUCKSTELL AXLE *replaces* the regular left housing with one large enough to contain the additional planetary gearing. No brazing, no cutting, no welding. There is no added friction on the worm gear. No weight is added on the drive shaft. Does not cause a twist, in the drive shaft tube, of either car or truck, and therefore does not loosen or shear the bolts that attach the drive shaft tube to the rear axle housing.

The enclosure of the gears and bearings in the differential housing permits them to run in a bath of lubricant which flows to all working parts by the action of the gears. To withstand the heavy pressures and maintain an unbroken protective film a heavy-bodied fluid lubricant of special character is required. Such an oil must be adapted to coat, follow and cushion the gear teeth at all times and must lend itself to perfect distribution to all bearings and surfaces requiring lubrication.

CAUTION

The use of grease or lubricants containing insoluble matter in rear axle assemblies should be guarded against. Lubricants of this nature do not lend themselves to ready distribution and exhibit a tendency to channel and separate; also to clog up the oil ducts in the carrier. Under certain conditions such lubricants may undergo a change in structure resulting in gumming or corrosion.

hours for the truck without alteration to the former axle parts. Ruckstell Axle parts replace certain Ford Axle parts, the latter being removed and dispensed with.

The Ruckstell Axle unit complete in every detail, including cotter pins, is packed in plainly labelled individual cases.

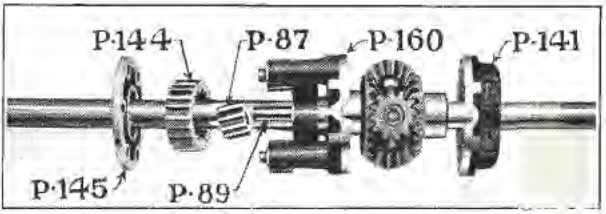


Fig. 6. Showing first passenger axle assembly position

PASSENGER CAR MODEL

The passenger car model Ruckstell Axle is packed with the center unit parts correctly assembled. Note their location and relation, one to the other, when unpacking. All necessary small parts for complete installation are in cloth bags.

Grind off the ends of the FORD DIFFERENTIAL SPIDER, using the Ruckstell right-hand differential case as a gauge or secure special spider from dealer.

In making a Ruckstell installation in a used car, it is recommended that all Ford parts showing wear be replaced with new parts. Full efficiency is thus assured.

Assemble the Ford differential in the Ruckstell differential cases as shown in Figs. No. 6 and 7. Be sure the nuts on the differential case bolts are tight. Lock them with the cotter pins from the larger of the cloth bags.

IN ASSEMBLING THE RESPECTIVE PARTS, ONE WITH THE OTHER, APPLY FREELY A HEAVY MOTOR OIL SUCH AS GARGOYLE MOBILOIL "B", TO ALL GEARS, SHAFTS AND BEARING SURFACES. THIS CANNOT BE ACCOMPLISHED AFTER THE AXLE HOUSING

HALVES HAVE BEEN BOLTED TOGETHER. THIS ASSURES IMMEDIATE LUBRICATION DURING INITIAL OPERATION.

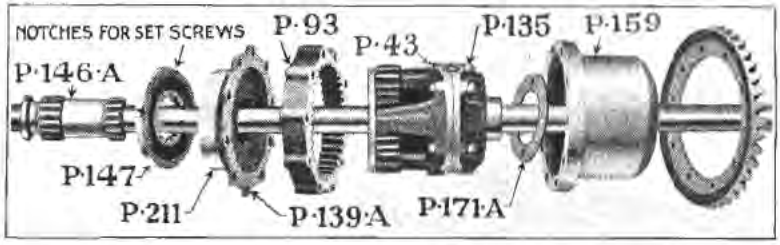


Fig. 7. Showing the second position of passenger axle assembly

Arrange the center unit parts and assemble them on the Ford master gear as shown in Fig. No. 8. Place the fibre differential thrust washer in the right hand master support. The washer will retain its position if smeared with a little high grade cup grease such as Mobilubricant. Do not use Ford steel washer No. 2529 instead of the fibre washer.

Washers are provided and should be placed under the heads of the master gear cap screws. Set all the screws down with a 70-pound pull (this is a hard pull for the average man), using an eight-inch socket wrench. After they have been pulled tight, tap them firmly on their heads with a hammer and then pull each down evenly again. Lock them with No. 18 iron lock wire. THERE IS NO NEED FOR FEAR OF BREAKING THESE CAP SCREWS, as they are made of a special alloy steel, heat treated, and will withstand a great strain. The use of cap screws other than those furnished with the axle will result in breakage or other trouble. We cannot be responsible for damage or service claims if the instructions herein are not rigidly followed.

The Ford thrust washers should be placed over the pins on the outside of the master gear support and Ford axle housing. Mesh the sliding clutch gear with the center gear and press it in toward the center of the axle

unit as far as it will go. This cannot be done after the axle housings are in place, and in the absence of the proper setting the shift lock assembly cannot be attached.

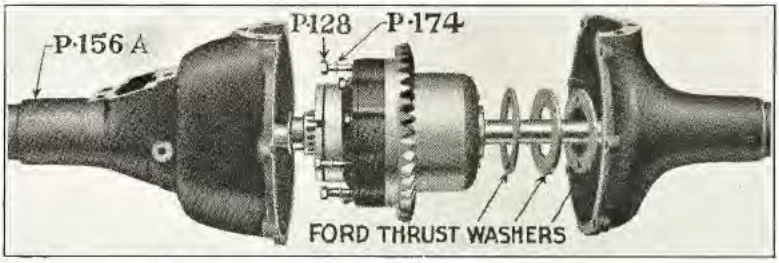


Fig. 8. Final assembly of passenger axle unit in housing

Slip on the axle housings, lining up the notches in the gear clutch plate with the holes for the set screws in the axle housing. The set screws should enter both notches.

Attach the shift lock assembly as shown in Fig. No. 9 using the cap screws and lock washers from the larger

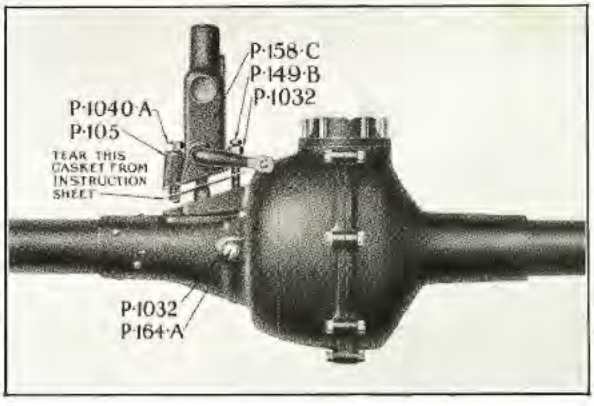


Fig. 9. Showing the installation of shift lock (passenger axle)

cloth bag. Insert the gear clutch plate set screws. With the axle housings securely bolted together, tighten the set screws and lock them with the 7/16" S. A. E. nuts. Lubricate the shift lock thoroughly with a high quality heavy motor oil such as Gargoyle Mobiloil "B" before attaching.

Assemble the shift tube halves with the shift tube coupling by means of the headless rivets furnished. Attach the shift tube assembly using the clevis pins and cotter pins.

Assemble the shift tube as shown so that it will clear the battery box and the gas tank drain. The shift tube support assembly should be installed about midway so it will shift freely without binding. See Fig. No. 16, page 17.

HOW TO INSTALL THE SHIFT LEVER

The shift lever assembly should be mounted as shown in Fig. No. 10 with the shift lever on the LEFT side of shift lever bracket.

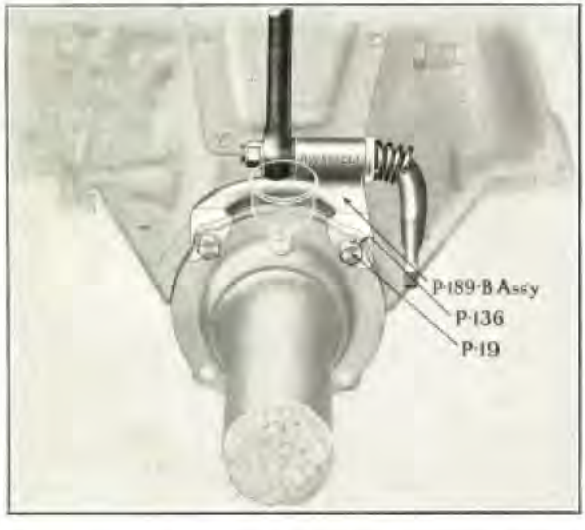


Fig. 10. Shift lever bracket installation (passenger axle)

The necessary parts for attaching the shift lever are furnished.

Oil freely with a hand oil can the felt oil retaining rings at each end of bracket shifter bearing.

TRUCK MODEL

The truck model Ruckstell Axle is packed with the center unit parts correctly assembled. Note their location and relation, one to the other, when unpacking. All necessary small parts for complete installation are in cloth bags.

Assemble the Ford differential in the Ruckstell differential cases. (See Fig. 11). Be sure the nuts on the differential case bolts are tight. Lock them with cotter pins.

IN ASSEMBLING THE RESPECTIVE PARTS, APPLY FREELY A HEAVY MOTOR OIL SUCH AS GARGOYLE MOBILOIL "B" TO ALL GEARS, SHAFTS AND BEARING SURFACES. THIS CANNOT BE ACCOMPLISHED AFTER THE AXLE HOUSING HALVES HAVE BEEN BOLTED TOGETHER. THIS ASSURES IMMEDIATE LUBRICATION DURING INITIAL OPERATION.

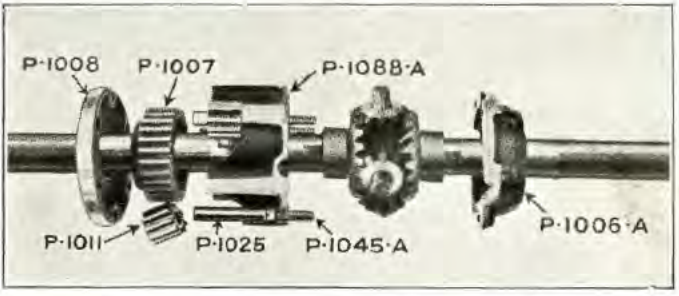


Fig. 11. First position of truck axle assembly

Arrange the center unit parts and assemble them on the Ford worm gear, as shown in Fig. No. 12. The side of the internal ring gear in which the holes are counterbored should face toward the worm gear. This counterbore fits over the larger diameter of the worm gear bolts.

In assembling the center unit as shown in Fig. No. 12 the 8 steel washers should be placed under the nuts of the worm gear bolts. Pull the nuts up TIGHT and lock them with cotter pins. Line up the set screw notches in the gear clutch plate with the set screw holes in the axle housing. Mesh the sliding clutch gear with the center gear and press it in toward the center of the axle unit as far as it will go. This cannot be done after the axle

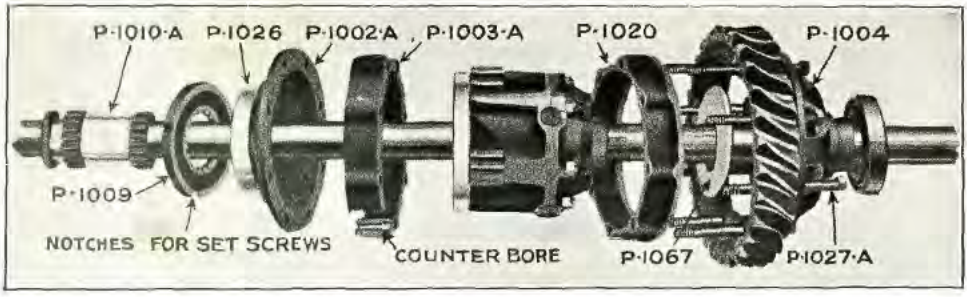


Fig. 12. Truck axle assembly in second position

housings are bolted together, and in the absence of the proper setting the shift lock assembly cannot be attached. The thrust faces of the inner races of the ball bearings should face toward the worm gear, as shown in the phantom view in Fig. No. 13.

Attach the shift lock assembly, as shown in Fig. No. 14, using 4 cap screws and lock washers. Insert the gear clutch plate set screws, care being taken to engage both notches. With the axle housings securely bolted together, tighten the set screws and lock them with the 7/16" S. A. E. nuts. Lubricate the shift lock thoroughly with a high quality heavy motor oil such as Gargoyle Mobiloil "B", before attaching.

Assemble the shift tube halves with the shift tube coupling by means of the headless rivets furnished. Attach the shift tube assembly with the clevis pins and cotter pins.

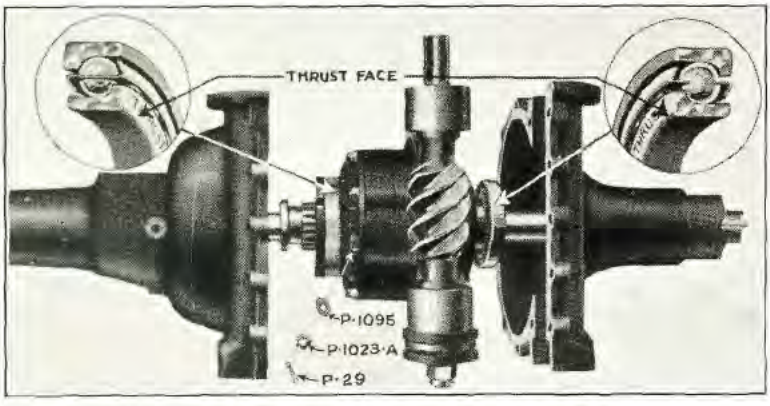


Fig. 13. Assembling the housing halves over the truck axle unit

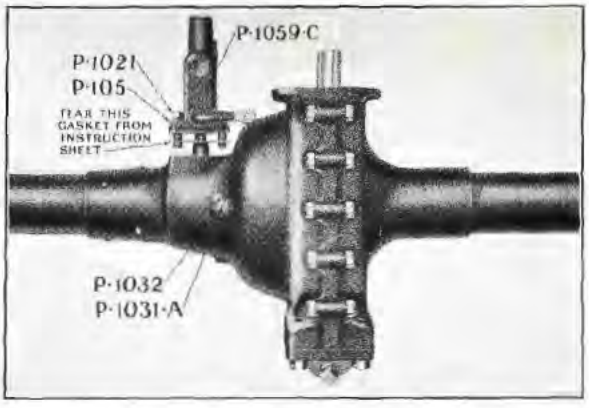


Fig. 14. Mounting the shift lock (truck axle)

HOW TO INSTALL THE SHIFT LEVER

The shift lever assembly should be mounted as shown in Fig. No. 15, with the shift lever on the RIGHT side of shift lever bracket.

The necessary parts for attaching the shift lever are furnished.

Fig. 15. Installation of the shift lever bracket (truck axle)

Oil freely with a hand oil can the felt oil retaining rings at each end of bracket shifter bearing.

BOTH MODELS

Make a rigid inspection of the Ford rear wheel axle bearings to make sure they are in a serviceable condition. If these bearings become worn they will permit a wabbling of rear wheels and eventually cause damage to the rear axle driving gears. Inspect carefully the oil retaining washers positioned in the axle tubes just inside rear wheel bearings. If these become worn they will permit a leakage of oil out past the bearings to the rear wheel brake drums.

Thoroughly clean the rear wheel axle bearings and pack with a high quality grease, such as Mobilubricant.

READ CAREFULLY THAT SECTION OF THIS BOOKLET UNDER THE CAPTION OF "*DETAILED LUBRICATION INSTRUCTIONS*" BEFORE ATTEMPTING TO OPERATE A VEHICLE NEWLY EQUIPPED WITH THE RUCKSTELL AXLE.

LUBRICATION PROVISIONS

The Ruckstell Axle is designed to ensure the proper lubrication of all gears and bearings provided a lubricant of high quality, correct body and character is used and the proper level maintained.

The entire axle with the exception of the brake shaft and wheel bearings is lubricated from the lubricant in the differential housing.

FIRST
or
Ruckstell Emergency Low
(Ruckstell lever back; Ford foot pedal pressed down)

SECOND
or the usual
FORD LOW
(Ruckstell lever forward; Ford foot pedal pressed down)

THIRD
or
Ruckstell Intermediate High
(Ruckstell lever back; Ford foot pedal released)

FOURTH
or the usual
FORD HIGH
(Ruckstell lever forward; Ford foot pedal released)

Fig. 3. How to change speeds

The use of a supplementary planetary reduction between the ring gear and the differential case is an exclusive feature of the Ruckstell axle. It eliminates all possible increased strain and stress on the Ford chassis and its component parts, which would otherwise exist due to the gear reduction being mounted between the transmission and the drive shaft driving pinion. The Ruckstell Axle unit is shock-proof and fool-proof, and adds but a few pounds to the weight of the car. This additional weight is embodied in the rear axle housing where it can be properly supported and carried, eliminating any increased or rapid wear of other chassis units. It is noiseless in operation and its engagement by means of the sliding sleeve is easily and noiselessly accomplished by shifting the operating lever. It is the new way and the right way of furnishing ADDITIONAL POWER PROPERLY APPLIED, creating a vehicle of "Two Purpose Performance", that of Power and Speed. By retaining the standard 3.63 to 1 Ford axle reduction gears the installation increases the pulling power by 55%.

The Ruckstell Axle installation permits the employment of 3 to 1 rear axle reduction gears. This combination provides a 3 to 1 high gear, a 4.73 to 1, a 8.45 to 1 and a 13.01 to 1 reduction which satisfies every desire in car performance, at the same time providing a 20% greater car speed and 30% more pulling power. (See Fig. 18).

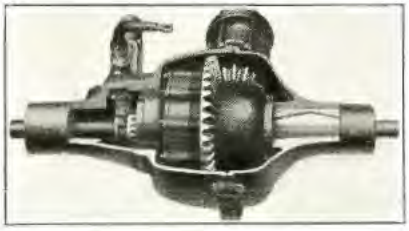


Fig. 4. Cutaway view of Passenger Model

Fig. 5. Phantom view of Truck Model

The standard Ford truck as produced is fitted with either a low speed worm of 7.25 to 1 or a high speed worm of 5.16 to 1. This optional reduction is to meet the particular nature of work the truck is intended to perform. With the installation of the Ruckstell Axle the high speed worm may be employed entirely giving the vehicle all the advantage of high speed as secured with the high speed worm but with a pulling power greater than the standard low speed worm. Where the Ruckstell Axle is employed in conjunction with the low speed worm of 7.25 to 1, it increases the pulling power by 60%.

The installation of the Ruckstell Axle includes the mounting of a shifting lever conveniently placed for easy operation by the right hand. Merely push the lever forward or back, at any car speed, up hill, down hill, or on the level. It engages silently, but positively.

ASSEMBLY INSTRUCTIONS

The RUCKSTELL AXLE is not an added accessory but a "Built-In" unit requiring the dismantling of the Ford rear axle housing and its embodiment therein. The installation however is made quite rapidly requiring about three (3) hours for the passenger car and about four (4)

LUBRICATION RECOMMENDATIONS

For Correct Lubrication of Ruckstell Axles the use of a pure petroleum product of such body and character as will fulfill the conditions outlined above, is necessary.

Our engineers have determined that best results are obtained through the proper use of a heavy-bodied straight mineral gear oil such as Gargoyle Mobiloil "C", or a high-grade gear oil of similar body and character. Such an oil should be used in accordance with instructions set forth below under heading of Detailed Lubrication Instructions to attain best results.

Gargoyle Mobiloil is carried in stock by more than 60,000 dealers and dispensing stations in the United States and Canada. It is also available throughout the civilized world, and in every one of the many Nations where Ruckstell Axles are in service.

DETAILED LUBRICATION INSTRUCTIONS

Special Note:—

Upon completion of the assembly and installation of a new Ruckstell Axle in the vehicle and before removing the jacks holding the rear wheels off the floor, remove the combination filling and level testing plug shown in Figures No. 16 and 17 and pour into the differential housing ONE PINT of heavy motor oil such as Gargoyle Mobiloil "B". Then revolve the rear wheels by hand for several minutes. This procedure is a measure of further precaution and ensures immediate distribution and the establishment of an oil film between all metal working surfaces; a practice we have found advisable when the units are first installed.

The preceding paragraphs apply to both the passenger car and truck installations.

Before putting the vehicle into service the lubricant level should be brought up to the level of the filling and level testing plug. See Figs. No. 16 and 17.

The passenger car axle has a *total* capacity of one quart of differential lubricant. On first filling this requires one pint of a high quality heavy motor oil such as Gargoyle Mobiloil "B" and one pint of Gargoyle Mobiloil "C". On subsequent complete fillings it requires one quart of Gargoyle Mobiloil "C" or equal.

The truck axle on the first filling requires one pint of a high quality heavy motor oil such as Gargoyle Mobiloil "B" and three pints of Gargoyle Mobiloil "C". Subsequent complete fillings require two quarts of Gargoyle Mobiloil "C" or a high grade oil of similar body and character.

LEAKAGE

The presence of rear axle lubricant on the rear wheel brakes is not only most unsightly but renders the braking mechanism useless until the lubricant at the brakes has been entirely removed and the brakes thoroughly cleaned. This unsatisfactory condition is invariably due to one or both of two things, namely, unserviceable oil retaining washers at wheel bearings or overfilling of the rear axle housing.

In the event of leakage inspect carefully the Ford oil retaining washers positioned in the axle tubes just inside the rear wheel bearings. If unserviceable replace with new Ford washers. In replacing, cleanse thoroughly the Ford rear axle bearings and pack with a high quality grease of similar body and character to that of Mobilubricant. Rear axle oil retaining washers will not remain in good condition if rear axle bearings are worn. Wheel bearings and oil retaining washers must be in good condition to prevent the leakage of lubricant.

CAUTION: Do not overfill the rear axle housing. A combined filling and level plug is located at the proper point to discourage the tendency to overfill. Overfilling causes leakage at the wheels, dirt accumulation and slipping brakes.

If the lubricant is not kept up to the proper level the gear teeth may become dry; excessive wear and excessive noise are the usual result of this condition. Furthermore, if the level is too low excessive pinion shaft bearing wear will ensue.

The lubricant level should be inspected every 2000 miles by the removal of the oil level plug, and brought up to the proper level by the addition of fresh oil, if found to be low.

FLUSHING:—At least once a year the differential housing should be drained, flushed out and refilled with fresh Gargoyle Mobiloil "C" or equal, to the proper level. Fill through the filling hole until the lubricant just runs over the edge of the oil level hole.

REAR WHEEL BEARINGS

Every three hundred (300) miles refill and screw down grease cups furnishing lubricant to the rear wheel bearings. Every five thousand (5000) miles, remove rear wheel bearings, cleanse thoroughly and repack with high quality grease such as Mobilubricant.

SHIFT LEVER BEARING

Every two thousand (2000) miles apply freely, engine oil with hand oil can to the felt oil retaining rings at each end of the shifter bracket bearing.

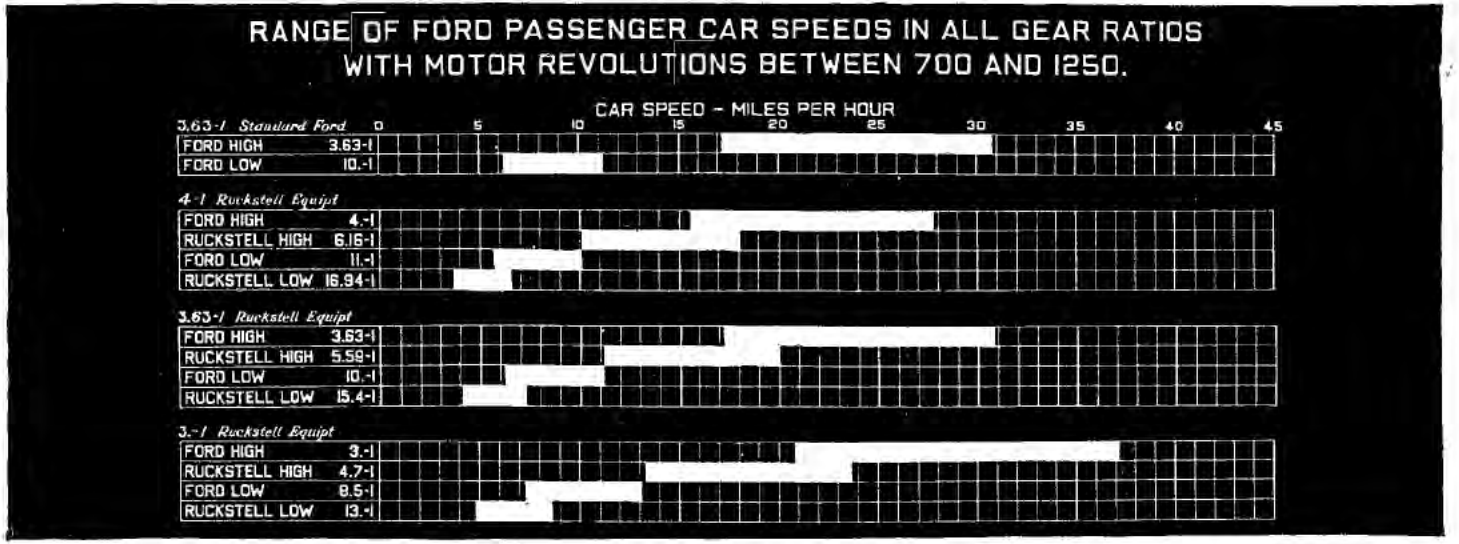

RANGE OF FORD PASSENGER CAR SPEEDS IN ALL GEAR RATIOS
WITH MOTOR REVOLUTIONS BETWEEN 700 AND 1250.
CAR SPEED - MILES PER HOUR
0
5
10
15
20
25
30
35
40
45
3.63-1 Standard Ford
FORD HIGH 3.63-1
FORD LOW 10.-1
4-1 Ruckstell Equipt
FORD HIGH 4.-1
RUCKSTELL HIGH 6.16-1
FORD LOW 11.-1
RUCKSTELL LOW 16.94-1
3.63-1 Ruckstell Equipt
FORD HIGH 3.63-1
RUCKSTELL HIGH 5.59-1
FORD LOW 10.-1
RUCKSTELL LOW 15.4-1
3.-1 Ruckstell Equipt
FORD HIGH 3.-1
RUCKSTELL HIGH 4.7-1
FORD LOW 8.5-1
RUCKSTELL LOW 13.-1

Fig. 18

OTTO HESSE, PRESIDENT — WALTER C. KERN, SECRETARY — H. B. WHITAKER, TREASURER

The Hesse Motor Car Company

DEALERS AND JOBBERS IN

Automobiles, Supplies and Accessories

AUTOMOBILES
REPAIRING
REPAINTING
RETRIMMING

FORD CARS
FORDSON TRACTORS

TIRE REPAIRING
TRUCK BODIES
TOPS
GARAGE

Leavenworth, Kansas.

July 18, 1925.

Universal Equipment Co,
1201 Winchester Ave,
Kansas City, Mo.

Attention, Mr C.V. Ruble.

Gentlemen;

We want to state emphatically that we have had a most profitable experience with the Ruckstell Axle, in the passenger and truck type. There isn't a question in our mind that the Ruckstell Axle, particularly in the truck field, has been a potent factor in the sale of truck equipment. We have sold upward of fifty Ruckstell Axle equipment within the last twelve to fifteen months, and would certainly dislike to know that no further supply of this equipment could be had.

The Axle, without a question of a doubt, assists very materially in meeting competition in both the passenger and truck field.

Yours truly,

THE HESSE MOTOR CAR CO

WCK:JS

H C Kern Sec'y

Prepared by

VACUUM OIL COMPANY, NEW YORK, N. Y., U. S. A.

In collaboration with the

RUCKSTELL SALES AND MANUFACTURING COMPANY

New York City Oakland, Calif.