

**FORD**

**PRICE LIST**

**OF PARTS FOR**

**MODELS**

**"N," "R" AND "S"**

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Also . . .

**1907**

Some Instructions for Adjustments,  
Replacements of Parts, and for Properly  
Driving and Caring for the Car.

# Ford Price List of Parts

for 1907 Models  
“N,” “R” and “S”

Showing  
numbered photograph  
of each part

*Prices subject to change without notice*

**The Ford Motor Company**  
Detroit, Michigan, U. S. A.

## Foreword

Human ingenuity has never been able to produce perpetual motion, to invent a machine that did not require adjustment, discover a metal that would not break or a bearing alloy that would not wear.

Science has enabled us to determine with wonderful accuracy the factor of safety required in different parts and experience has enabled us to reduce wear and probable breakages to a minimum.

Next to performing the impossible—making a perfect car—that manufacturer performs the most valuable service to his patrons who makes every part absolutely interchangeable—absolutely accurate—and who makes it possible for owners to procure replacements instantly and at a fair price. This is our aim in furnishing Ford owners with this parts price list in which every part of Models N, R and S is illustrated, numbered and priced.

The wise motorist is the one who understands that frequent inspection is essential to safety and that prompt replacements of worn parts is the truest economy.

We have endeavored herein to forecast the troubles which the novice may expect and to guard him against them.

Then we have revised our parts price list making it conform to the newer order of things and reducing prices to the lowest figure practicable—a figure made possible by our unrivalled facilities for quantity production.

Few persons appreciate how much money the manufacturer must keep tied up in parts, machinery, dies, jigs and tools for making them, if he would give his patrons prompt service. The Ford Company keeps on hand at all times every part of every model it has ever sold—and of those parts most likely to be called for, several hundred sets are always in stock. Many parts may never be called for—but they must be kept nevertheless. It is our boast that any Ford owner can get any part of any Ford car ever made at a moment's notice.

## **Introduction**

This is not a catalog. The average person into whose hands this book will come is already a Ford owner. We have your money and you have the car, and in a short-sighted sense we have no further concern in its performance or your welfare.

This does not, however, express the Ford attitude toward customers.

A Ford owner is a member of the big "Ford family," and his success or failure with his car, his pleasure and profit, or the reverse, are no less our concern than his. Our success depends upon the performance of Ford cars, and while in the natural course of events, in dealing with thousands of people we have never seen, and not being able to choose to whom we shall sell, we acquire a certain number of cranks—chronic grouches on whom just treatment is practically lost, and who cannot be satisfied, no matter to what lengths we go—these are exceptions to the rule and we have found the policy of "Ford courtesy" to be profitable—and good advertising.

If anything, unreasonable people receive less favors, although no less courtesy, at the hands of the Ford Company than do those customers who have the faculty of placing themselves in our position, and who, therefore, ask only for that to which they know they are justly entitled.

In our ambition to err on the side of liberality, we frequently meet with complex problems. There is the man who is always seeking an advantage and who tries to work one of the many old tricks on us, forgetting that our broad experience enables us to detect his plan almost in the first paragraph of his letter. This person is not always a customer. He is sometimes one of our own agents. Occasionally the plan works and he gets something at our expense to which he knows he is not entitled. In the case of an agent, repeated attempts to "work" us for replacements or allowances that are not justified by the circumstances are discovered sooner or later, and as a result he is summarily cut off.

We would like to feel that every customer was as honest in his intentions toward us as we are to treat all fairly and impartially, and if customers would practice this kind of honesty, they would promote liberality instead of discouraging it by their unreasonable demands.

Every designer has found that after he has tested in every possible way, and in the most severe manner possible, every part of his car, some weaknesses will develop in the first 500 that are placed in the hands of 500 customers, handled in 500 different ways and traversing as many different kinds of roads. He has, however, infallible means of ascertaining where a general cause for complaint exists as against an occasional break due to carelessness on the driver's part rather than an inherent defect in the machine.

If Ford owners will bear this in mind they will save much needless correspondence and many useless controversies which arise from customers asking that to which they know they are not entitled, in the hope that the company may be persuaded by a cleverly written letter or a strenuous "kick," to furnish gratis, parts for which, by all the rules of honesty and fair play, the customer should pay.

## **The Man Who Knows More than Ford**

The most pernicious agent for causing trouble is the repair man, the mechanic, electrician or the amateur person of mechanical bent with a propensity for disagreeing with designers who have proven their superior knowledge by their success. This class of people cause endless trouble and expense to owners, by their clumsy efforts to improve on the work of the maker of the car. We have coined a name for this type of meddler; we call him "The man who knows more than Ford."

Henry Ford has designed and built every type of gasoline motor known to the art and in his experimental work has undoubtedly gone further than any other investigator in this

line. He has proven many mechanical principles and disproven many theories.

Ford has manufactured and sold more automobiles than any other man in the world (over 16,000 in all) and he is in a position to watch, daily, the performance of these thousands of cars in the hands of his customers in all parts of the world. Every complaint that reaches the dignity of a general one is brought to Mr. Ford's personal attention and he is unceasing in his efforts to eliminate every cause of trouble that frets Ford owners.

It would seem, therefore, that any man of average intelligence would conclude that no detail had been left uninvestigated and no weaknesses allowed to enter in where Mr. Ford's experience could prevent it.

Notwithstanding this, we find in every city, town and village, one or more men who, in their criticisms and in their clumsy attempts to improve on Ford cars, show that they believe they "know more than Ford"—whose skill has made him world famous. For example: Half the repair men of the country will tell you "the fly-wheel on the Ford runabout is too light." Press them closely and you will find they "think" it is too light—they have no other basis of calculation—no scientific or practical means of demonstrating just what weight a fly-wheel should be for this particular engine, for all the different speeds of which engine and car are capable, and for all the different conditions it is designed to meet. Not having had the necessary scientific training or practical experience they do not realize that, before deciding on the weight of a fly-wheel the designer takes into consideration many factors of which they are wholly ignorant and brings to bear much experience which they have yet to acquire. He first determines by scientific calculation what it should be, and then by most exhaustive experiments and tests with fly-wheels of different weights just what it must be.

In the first few hundred cars that we turned out, two or three peculiar, unexplainable troubles developed. For a while

we were at a loss to account for them. Investigation finally disclosed the surprising fact that several men who "knew more than Ford" were putting heavy brass rings around the outside of each fly-wheel. Before we had discovered the cause, they had learned the fallacy of their theories, but meantime the motors had suffered greatly and in some cases were permanently injured.

Such persons are incurable—they still are experimenting with Ford cars much to the expense and annoyance of Ford owners who are foolish enough to permit them to "improve" on the work of the master.

We wish to warn all Ford owners that we are not responsible for Ford cars unless they are just as they left the factory as to mechanical equipment. If any change has been made and we can ascertain that fact, the customer will be entitled to no replacements or other concessions on that car.

The slightest change cancels the manufacturer's guarantee. We believe in the Ford car just as we make it. It will doubtless be improved from time to time, but the improvements will be incorporated only after they have had the most thorough test—not because some less experienced person "thinks" they would do better, or because they have "proven satisfactory" on some other car or motor the principles and efficiency of which differ materially from Fords.

We have stated before, this is not a catalog. Anything stated herein is said, not for the purpose of selling you a car, but to enable you to get the best possible service out of the one you have already purchased. Our assertion, therefore, that the most wonderful record of service ever achieved by any automobile is that of these Ford Runabouts, is made, not for advertising purposes, but to prove that in almost every case where an owner is getting other than the most satisfactory service out of his car it is due entirely to his lack of experience, his inability or disinclination to give his machine a reasonable amount of care, or to acquaint himself with proper methods of adjustment and operation. The other cases are where he

has listened to the advice of some man who "knows more than Ford" and has permitted the substitution of some device or to make some alteration, which seems harmless—perhaps beneficial in itself—but which eventually results in trouble and expense.

We will esteem it a favor if any customer will consult us before permitting outsiders—or even our own agents—to meddle with his car when such meddling calls for any change, however slight, from that of the original construction.

You know that your car will in any kind of service discount any other runabout made regardless of price. We ask you to take it for granted that every detail of design and construction has something to do with that performance. You cannot change the slightest feature without incurring the risk of destroying the efficiency in one way or another. If you want a better car than the Ford you have—get the next Ford Model; do not try to obtain it by changing the one you now have unless such changes are advised from the factory, out of the fullness of our experience with over 10,000 of these same cars, as against your experience with one or the garage man's casual acquaintance with ten.

**OVERCHARGES**—Complaints of overcharges on the part of agents are most difficult to adjust. We are inclined to believe that in most cases they are unfounded, although we sometimes find they are justified.

In a broad sense the agent's best interest is served by giving the customer the benefit of his best service and lowest charges. His men should know their trade and the car so well that no time will be wasted in hap-hazard guessing as to the cause of the trouble. Few customers object to paying a fair price for service performed—they do object, and with reason, to paying for guesswork or fruitless tinkering.

The habit some customers have of standing over the workmen while their car is being repaired is the cause of many complaints of overcharges, and it should be discouraged even at the risk of losing patronage. In no Ford branch is a

customer allowed in the repair shop. Experience has taught us that he spends a lot of his own time and that of the workmen, arguing and suggesting when it does no good but serves to confuse and delay the work. Of course he pays for the extra time. This, more often than any other is the cause of complaints of overcharging.

### Instructions for ordering parts — Owners.

It is more satisfactory all round for the owner to transact all business with the company through its accredited agent in his district. There are exceptions to this rule, of course, and in such cases the company will do its best to accommodate any Ford owner direct.

It is short-sighted on the part of the owner to get at odds with the local agent or to "go over his head" in the matter of purchasing parts, or complaints about his car. In all cases we refer the matter to the agent for his side of the case, before taking any action in the matter.

Every enterprising agent appreciates the value of the good will and support of his patrons, and experience teaches, that with few exceptions, the cause of dissension between customer and agent is due to the former asking concessions to which he is not entitled, or exacting service gratis for which he should, in all conscience pay, and the granting of which would work a hardship on the agent.

The average owner over-estimates the value of his recommendation of the car he drives, and on those grounds asks unreasonable things.

Put yourself in the agent's place, and remember that while you may be able to harm him by unjustly disparaging the car, on the other hand, there are many Ford cars talking against you, and Fords will sell regardless of your approval.

In cases where there is doubt in the mind of the customer as to whether his claim for replacement or other concession has been allowed by the factory while the agent insists on payment for it, the agent should always be willing to show the Company's letter in reply to the complaint or request. This is fair to all concerned—the customer is left no reason to doubt the word of the agent; he will know the grounds on which the claim was disallowed; and the Company will receive due credit for claims allowed and parts replaced.

The agent is entitled to no discount or payment for parts replaced gratis except transportation charge and his rightful compensation for the time consumed in installing the part in the car.

**TO FORD OWNERS**—To avoid unnecessary delays and useless correspondence, parts and repairs should, wherever possible, be procured through the dealer or agency or Branch from which the car was purchased or through the nearest FORD representative, who is generally in a position to know what is desired and how to order it. (If he is not, we should like to know it.)

With over 16,000 Ford cars in use it is obviously impossible for us to deal with all Ford owners direct. We cannot open accounts with or sell at a discount to any except regular agents with whom we make annual contracts. Where conditions are such as to, in our judgment, warrant it, we will fill orders for parts at prices listed in our parts catalog f. o. b. factory provided cash accompanies the order.

In all cases we must have motor number and model of machine and number of the part as per catalog of parts. If

these are not procurable, return the part properly tagged, charges prepaid, (or we cannot accept it) a special letter of explanation written, and return instructions given. Otherwise we cannot promise an intelligent fulfillment of the order.

Care in ordering to specify the exact part and to conform strictly to our rules in such matters will insure prompt service always.

Motor number is imprinted with die, in left side of aluminum crank case (don't mistake pattern number, 402, for motor number). Car number is stamped on name plate just below front of seats.

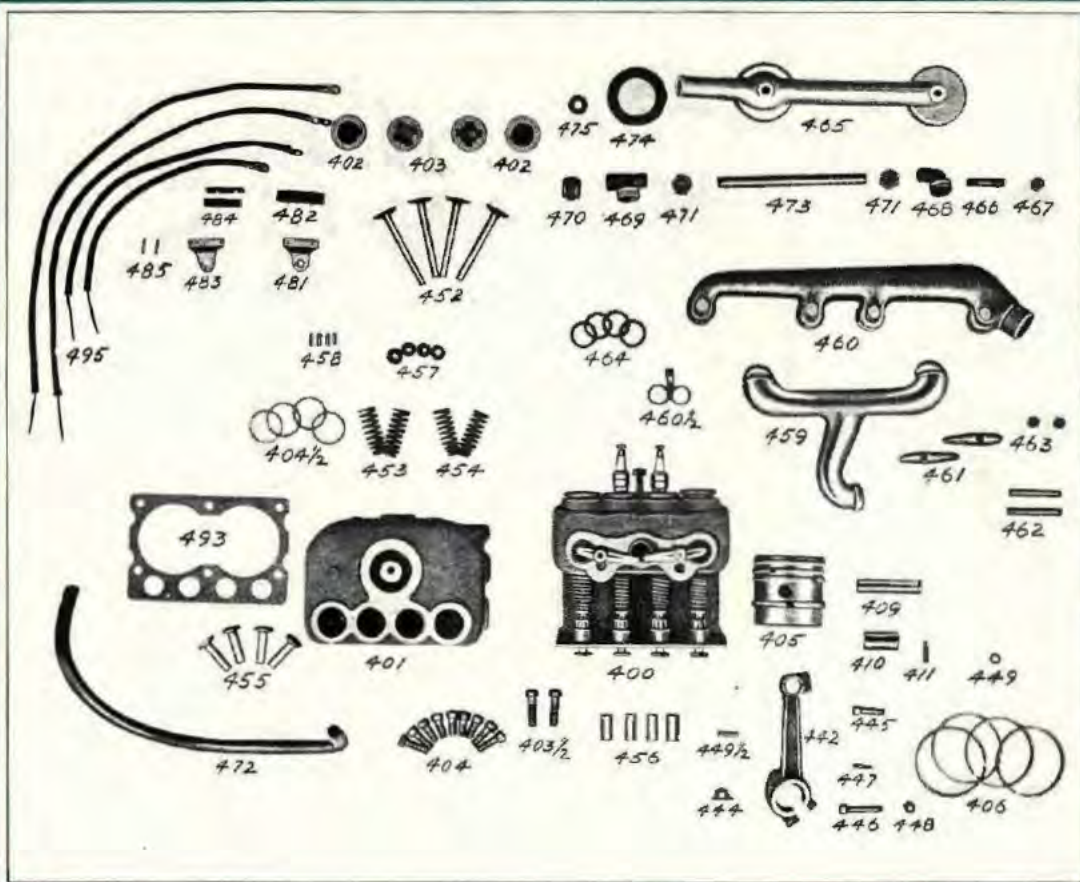
**TO FORD AGENTS AND DEALERS**—Broken parts must in all cases be sent to us transportation charges prepaid, for examination before any claim will be allowed. The new parts will be charged for and sent C. O. D.; and if any allowance is made credit will be given for old parts if returned within thirty days after defect is discovered.

The practice sometimes resorted to by agents of other concerns, of charging customers for parts which the factory has replaced gratis, is reprehensible and Ford dealers are warned against it.

Above instructions to owners relative to ordering parts must also be followed by dealers.

**Ford Motor Company,**  
**Detroit, Michigan, U. S. A.**

# Ford Motor Company, Detroit, Michigan, U. S. A.



## MOTOR

400	Two cylinder, with valves and springs	35.00
401	Cylinder, only	30.00
402	Head Plug (exhaust) } state	.15
403	" " (intake) } size	.15
403 1/2	Cylinder to crank case bolt (long)	.08
404	Cylinder to crank case bolt (short)	.08
404 1/2	Cylinder plug, copper gasket	.05
405	Piston, complete	5.00
406	" rings, (new style) each	.17
409	" Pin	.25
410	" Bushing	.20
411	" Pin Screw	.05
442	Connecting Rod, complete	2.60
444	" " fibre	.02
445	" " Adjusting Screws (piston end)	.05
446	" " Adjusting Screws (crank end)	.10
447	" " Bushing	.02
448	" " Screw Lock Nut	.10
449	" " Adjusting Screw Washer	.03
449 1/2	" " Cap Hinge Pin	.05
452	Exhaust and Intake Valve	.50
453	" Valve spring	.05
454	Intake " "	.05
455	Push Rod (valve lift)	.40
456	Bushing for Push Rod	.40
457	Valve Spring Seat	.05
458	" " Pin	.02
459	Inlet Pipe	3.30
460	Exhaust Pipe	2.00
460 1/2	" " Nipple	.05
460 B	Exhaust Pipe Pack Nut	.40
461	Inlet and Exhaust Pipe Clamp	.25
462	" " " " Stud	.10
463	" " " " " Nut	.05
465	Top Water Connection	2.25
464	Inlet and Exhaust Pipe Gasket	.05
466	Top Water Connection Stud	.10
467	" " " " Nut	.05
468	Side " " (rear cylinder) Elbow	.50
469	Side Water Connection (front cylinder)	.50

Always designate model of car and number of motor when ordering parts.

**MOTOR—Continued**

470	Water Connection Pack Nut (large)	.20
471	" " " " (small)	.15
472	" " " Tube (large)	1.00
473	" " " " (small)	.40
474	Top Water Connection Gasket (large)	.03
475	" " " " (small)	.03
481	Rear Wire Support	.10
482	" " " Fibre	.15
483	Front " " "	.10
484	" " " "	.15
485	Wire Support Screw	.05
487	Carburetor Bolt	.04
488	" " Nut	.04
493	Cylinder Gasket	.05
495	Wires from coil to cylinders Nos. 1-2 3-4 @ 50c each	2.00
405A	Piston complete (old style)	5.00
406B	" single ring (old style) width 3/8"	.25
406C	" double " " " " 3/8"	.25
406D	" bull " " " " 3/8"	.30

Always designate model of car and number of motor when ordering parts.

**Motor**

**TO REMOVE ENGINE FROM FRAME**—Remove radiator; remove fly wheel; loosen upper rear spring clips so axle can slide back a few inches; remove two bolts front engine bracket to frame; disconnect oil tube to ball joint. Disconnect gasoline tube at carburetor; disconnect exhaust pipe and spark-plug wires; remove bolts transmission frame to pressed steel frame. Slide engine and transmission back until front end can be raised above frame member; block up engine; remove bolts engine to transmission and lift engine out. It's unnecessary to remove dash or any other parts.

**TO REMOVE CRANK SHAFT**—Remove cylinders using special socket wrench No. 1,309. Remove side plates; disconnect connecting rods at crank shaft; remove steel half-time gear, using special gear puller No. 1,306 or similar device; remove front end plate; disconnect center bearing and draw shaft and center bearing forward. To replace, reverse operation.

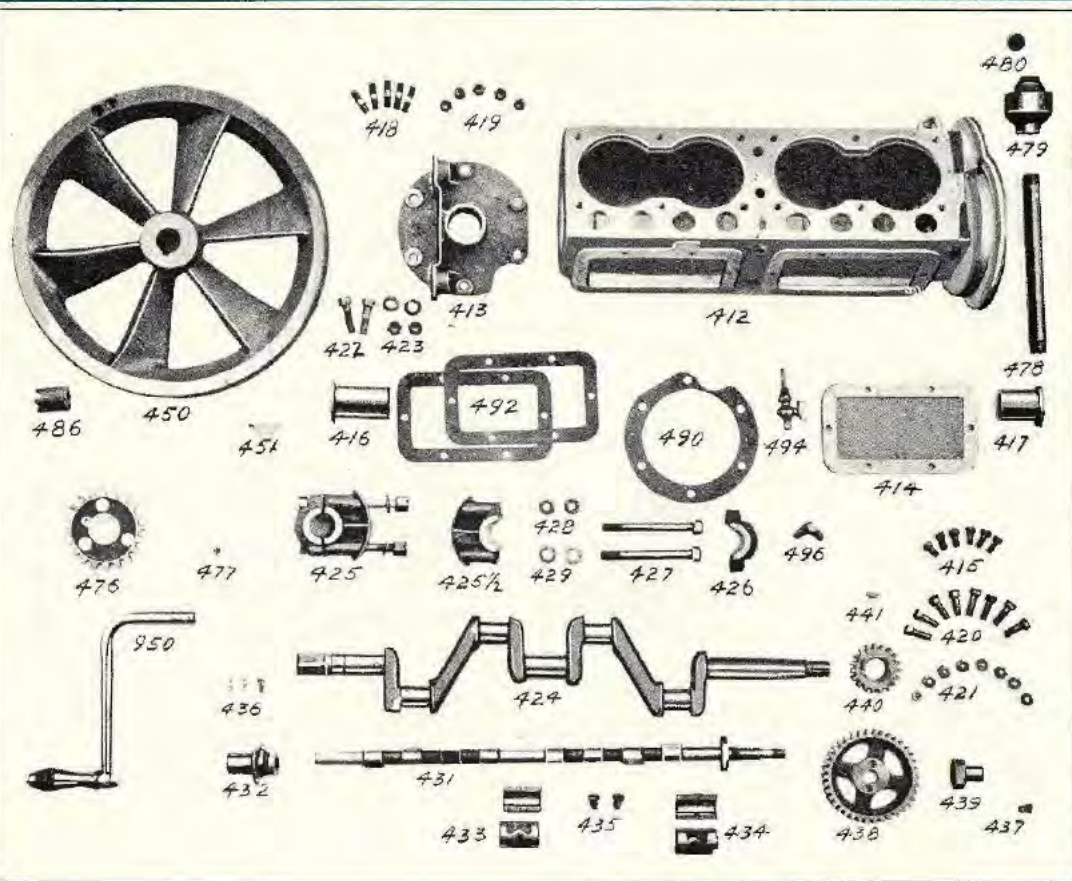
To adjust the central crank shaft bearing—Remove aluminum side plates and with special socket wrench No. 1,308 remove the nuts from the bolts which project up through the aluminum base between the two pairs of cylinders. This will allow the lower half of the bearing to drop down; remove the fiber shims and file down until the bearing is a close fit for the shaft. As, owing to the downward thrust of the power strokes the wear is usually on the lower half of the bearing, this adjustment will be sufficient in most cases.

You should ascertain whether there is any looseness between upper bearing section and the shaft when the bolts are loosened. In this event insert a thin paper shim between the upper half of bearing and the aluminum crank case.

Extreme care must be taken not to insert too thick a shim or to strain the shaft out of a perfectly straight line in adjusting the bearing. A deviation of even a few thousandths of an inch will produce a weave in the shaft when revolving, and this will soon set up crystallization with an ultimate result of a broken shaft.

The factor of safety in Ford crank shafts is so great we feel justified in stating that in every case broken shafts are due to crystallization, which in turn results from carelessness or unskilled adjustment of bearings. In order to ascertain whether your adjustment of the center bearing is straining the shaft, remove the front end plate and slip it off the studs. The shaft will then force the plate away from its position if the center bearing is not true.



**MOTOR—Continued**

412	Crank Case	30.00
413	" " Cover, front end with Bushing	3.00
414	" " Door	1.20
415	" " Screws	.05
416	Front End Babbitt Bushing	1.00
417	Rear End Babbitt Bushing	1.00
418	Front End Crank Case Cover Stud	.05
419	" " " " " " Nut	.05
420	Crank Case to transmission frame bolt	.05
421	" " " " " " frm. bolt nut	.08
422	" " " " " " Frame Bolt (specify size)	.08
423	" " " " " " " " nut	.05
424	" " Shaft	16.00
425	" " " " " " Main Bearing, complete	1.50
425 <sup>1/2</sup>	" " " " " " " " Body	1.00
426	" " " " " " " " Cap	.40
427	" " " " " " " " Bolt	.10
428	" " " " " " " " Nut	.10
429	" " " " " " " " Washer, steel	.02
431	Cam Shaft	6.00
432	" " " " " " Bearing, front end	1.00
433	" " " " " " " " center	1.25
434	" " " " " " " " rear end	1.25
435	" " " " " " " " Set Screw	.05
436	" " " " " " " " screw (front)	.03
437	Gear Dowel Pin	.05
438	Large Time Gear	3.00
439	" " " " " " " " Lock Nut	.30
440	Small " " " " " " " "	.75
441	" " " " " " " " Key	.10
450	Fly Wheel	5.00
451	" " " " " " " " Key	.20
476	Pump Driving Gear (bronze)	1.50
477	" " " " " " " " Dowel Pin	.03
478	Breather Pipe	.20
479	" " " " " " " " Hood	.40
480	" " " " " " " " Plug	.10
486	Starting Crank Ratchet	.60
490	Front End Crank Case Cover Gasket	.05
492	Crank Case Door Gasket	.05
494	" " " " " " " " Pet Cock	.35
496	Crank Case Oiler Check Ball	.25
486A	Crank Case Bushing Grease Cap—brass	.15
950	Starting Crank, complete	2.00

Always designate model of car and number of motor when ordering parts

**TO REMOVE END BEARINGS**—If a suitable press is available this is the best method of forcing out a bushing; otherwise it can be driven out. Every repair shop should have a bushing driver. This is simply and quickly made; take a piece of  $1\frac{1}{2}$  inch, round, steel or brass bar and turn one end down to slightly less than  $1\frac{1}{4}$  inch diameter for a distance of 2 inches. This leaves an  $\frac{1}{8}$  inch shoulder. Insert small end in the bushing and drive out.

As Ford bushings are machined accurately and reamed to one-thousandth of an inch of true, you should always use regular Ford bushings and thereby avoid any possible chance of getting the shaft out of alignment.

**TO REPLACE END BUSHINGS**—If a press is handy this is the best method of forcing them into place, but if no press is available they can be driven in, using a wood block, to avoid marring the bushing. (Always use a wooden block when it becomes necessary to drive a metal part. It would seem unnecessary to give this advice, but experience teaches that many people do not observe even this simple precaution when working with their machines.)

In order to avoid any possible chance of the bushing turning in the end plate it is made a very tight fit. In forcing it to place it may be compressed so the crank shaft will not enter. If it will enter at all—without driving—it will not be too tight, provided you are careful to watch the lubrication for the first few days. If entirely too tight, carefully ream (using  $1\frac{1}{4}$  inch ordinary hand reamer) or scrape the bushing until the shaft will go, exercising extreme care not to leave the slightest play.

Care must be exercised not to strain or spring the crank shaft. Not only that, but in handling, the utmost care should be exercised that it does not strike anything, and in laying it down be careful to lay it flat on the bench so it will not become warped. Ford crankshafts are ground to one-thousandth of an inch of true, and this degree of accuracy is neces-

sary in a shaft which is revolving so rapidly and sustaining so many alternating stresses.

In case of babbitt in the center crankshaft bearing burning out the better way is to order a new bearing complete, from the factory, paying for same and then return us the damaged bearing. After ascertaining the damage, we will charge you for rebabbiting and credit you with the difference.

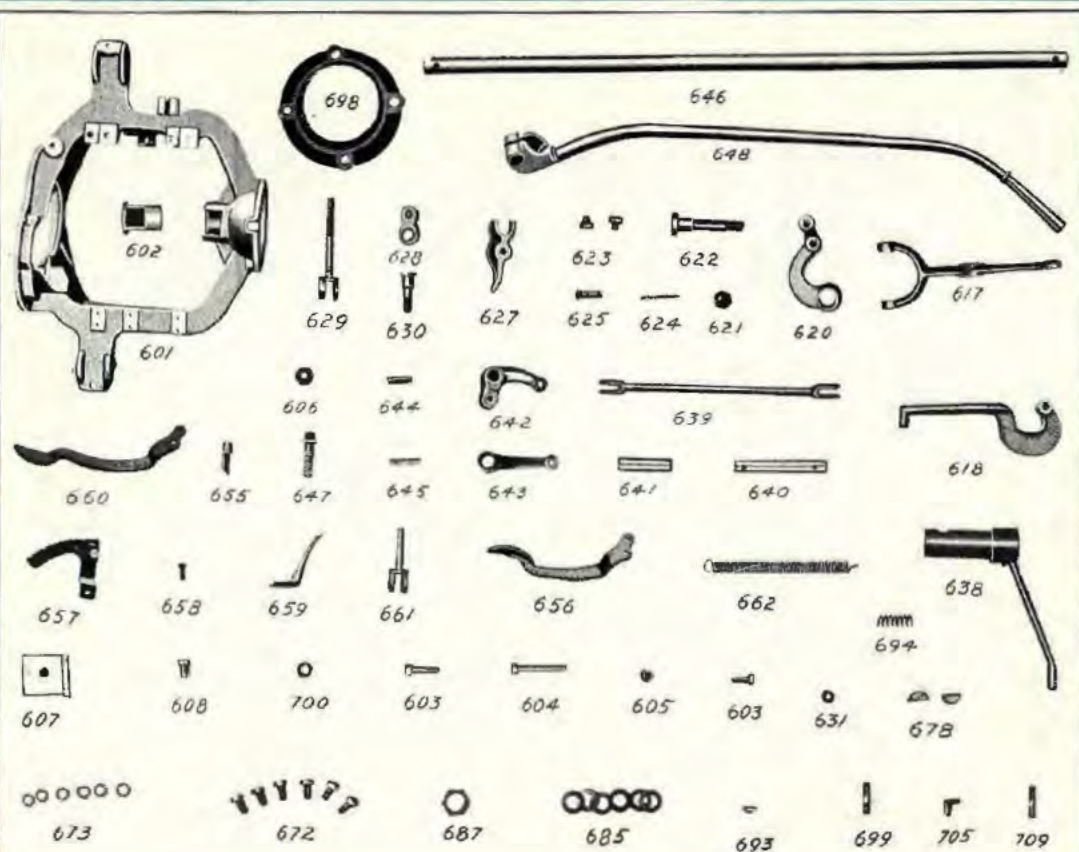
**SPRUNG CRANK SHAFT**—Owners occasionally send in crank shafts that have been damaged in collisions with trees, lamp posts, hydrants or other objects, expecting us to replace or to make some allowance on them. We wish to impress upon all such that a crank shaft, if sprung even the slightest, is utterly useless except as scrap metal. No method has ever been devised for straightening one to the degree of accuracy necessary. Barring collisions, Ford shafts should never break. However, we always like to inspect them, and if they show defect in work or material, will be replaced.

If the crank shaft has been cut by letting the bearings run dry and hot, you can, provided they are not cut deeply, create a new bearing surface by carefully filing the bearings straight and round. A very fine file must be used, as the slightest scratch will serve to cut the babbitt and it will soon run hot again. If possible get a piece of crocus cloth (never use emery), attach a piece of heavy twine or belt lacing to each end of the crocus cloth and carefully lap the bearing.

If the connecting rod bearing is found too large for the shaft in cases such as above, do not entirely remove the shim, as you will need this for future adjustment, but file sufficient off the thread end of the cap to make it fit the crank shaft. Connecting rod bearings should be tight fit and yet not have the slightest play—it should be sufficient to almost hold its own weight, just turning slowly on the shaft when released.

**TO ADJUST CONNECTING ROD BEARINGS**—Remove plates which cover the hand-holes at left side of engine base; there is a fibre shim between the jaws of the hinged bearing-

(Motor Continued on Page 10)



## TRANSMISSION

601	Transmission Frame, complete	25.00
602	" " Bushing	1.00
603	" " Bolt (small)	.04
604	" " " (large)	.08
605	" " Nut	.04
606	" " Washer	.04
607	" " Block	.04
608	" frame set screw	.05
617	" H. S. Cone Lever	.40
618	" H. S. pull rod	.50
620	" H. S. Bell Crank	.40
621	H. S. Cone Lever Bolt Nut	.05
622	H. S. " " "	.10
623	Transmission H. S. Cone Blocks	
	(two) each	.12
624	" H. S. Clevis Pin	.10
625	" H. S. Lever Pin	.10
626	" high and low speed	
	Lever Pins	.05
627	" S. S. Lever	.30
628	" S. S. Crank	.40
629	" S. S. Clamping Rod	.25
630	" S. S. Lever Pin	.10
631	" S. S. Lever Roller	.08
632	" S. S. Lever Roller Pin	.10
638	" Speed Lever on	
	Controller Shaft	.75
639	" Speed Lever	
	Connecting Rod	.25
640	" " Shaft	.20
641	" " Bushing	.40
642	" Control Shaft Brake	
	Lever (right)	.30
643	" Control Shaft Brake	
	Lever (left)	.30
644	" Control Brake Lever Pin	.04
645	" Control Lever Key	.04
646	" Controller Shaft	.60
647	" " Lever Clamp	
	Screw	.15
648	" " Lever	2.00
655	Pawl for Brake Lever Ratchet	.25
656	Transmission Brake Pedal	1.10

Always designate model of car and number of motor when ordering parts

**TRANSMISSION—Continued**

657	Brake Lever Ratchet	.08
958	" " " Rivets (short and long) each	.03
659	" " Band Ear	.40
660	Reverse Foot Pedal	1.10
661	" " and Transmission Brake Clevis	.30
662	Transmission Brake Pedal Spring	.10
672	Transmission Driving Plate Screw	.02
673	" " " Washer	.02
678	" " " Gear Key	.10
685	" " Triple Gear Thrust Washer	.04
687	" " Thrust Plate Lock Nut	.20
688	" " " " Key	.06
693	" " Friction Plate Key	.10
694	" " Band Spring	.04
698	" " Ball Cap	1.50
699	" " " Stud	.08
709	" " " Nut	.05
705	Transmission Ball Cap Oiler Ell	.25

**Transmission**

**TO REMOVE TRANSMISSION** without removing radiator or motor; remove drip pan; block up rear end of motor by putting a small horse, or box, or block under it so it will remain in position when transmission frame is disconnected.

Disconnect upper rear spring clips so axle can be slipped back (the axle can be sprung back sufficiently, but this is not good practice), remove bolts connecting transmission frame to motor. Disconnect front radius rods by removing cap which connects ball joint to transmission frame. Remove bolts holding transmission frame in chassis. Slip transmission frame back until shaft disconnects with engine crank shaft. Transmission and frame may then be lifted out. To remove transmission from frame remove three brake bands and lift out.

**TO DIS-ASSEMBLE TRANSMISSION**—First remove rear plate by taking out six screws. Then, holding front end of transmission shaft in a vise (or better still, slipping the squared hole over a  $\frac{7}{8}$  or  $1\frac{1}{16}$  inch square steel bar fixed in a vise), take a large wrench and turn lock-nut, which is just inside of rear plates, to the left until the pin is sheared off; remove nut. The part of the pin left in the nut may then be driven out. (It is unnecessary to drill out the other half of the pin which has been left in the plate because the nut, when replaced, will not screw up to the same point; so it will be necessary to then drill another hole in the plate to register with that in the nut when tightened.)

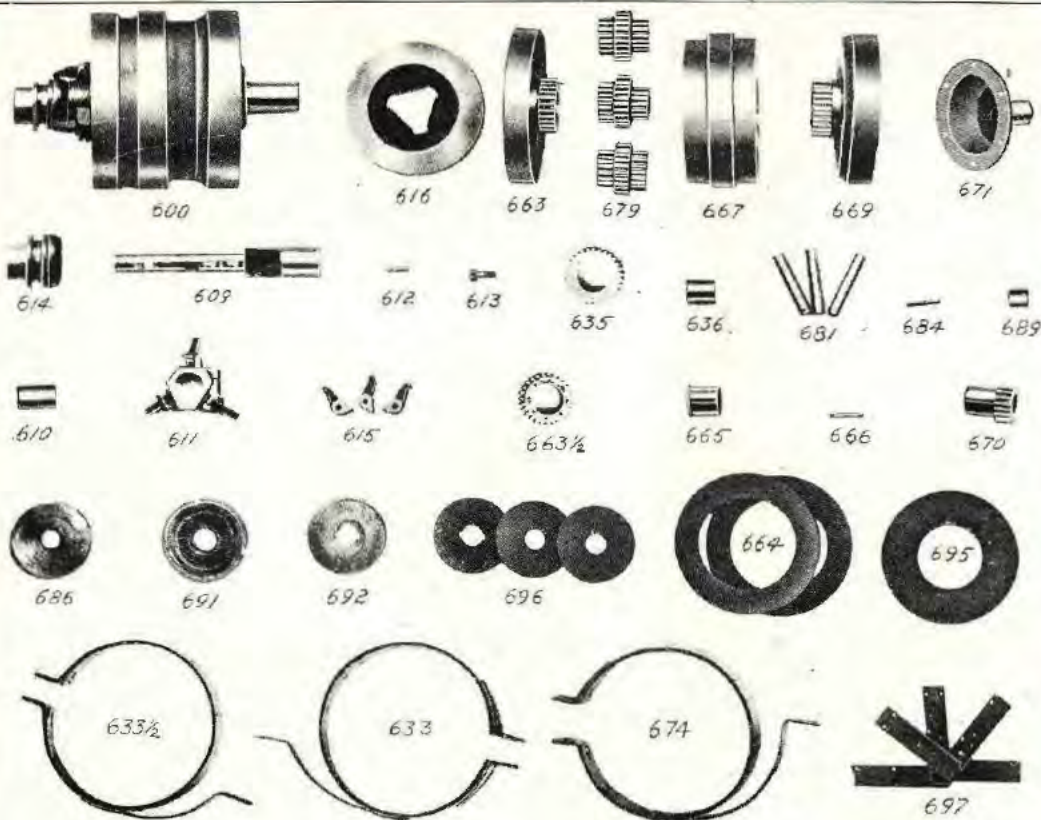
Remove thrust plate, first taking out Woodruff key which has been exposed; remove two small friction plate keys; take out friction plate. Other parts will then disassemble in rotation.

The slow speed gear is attached to the brake drum—the middle one of the three. To remove gear, drive out 8 rivets with  $\frac{3}{16}$  inch punch. Reverse gear is attached to reverse plate and may be removed by driving out rivets as above.

The gear which is keyed to the main shaft will generally slip off easily, but if not may be driven off by using a block of wood to prevent marring.

To remove triple gears, first drive out pins which secure the gear shafts in the drum, using a  $\frac{1}{8}$  inch punch. Pins can be driven from the outside; drive out shafts and gears can be easily removed. Note carefully the position of gears, as otherwise it will be somewhat of a puzzle to re-assemble them. The fibre thrust plates will wear almost

**Always designate model of car and number of motor when ordering parts**

**TRANSMISSION—Continued**

600	Transmission complete	45.00
609	" Shaft	3.50
610	" Bushing	.50
611	" H.S. Spider complete	4.00
612	" H.S. Pin	.02
613	" H.S. Screw	.10
614	" H.S. Cone	1.00
615	" H.S. Spider Levers (three) each	.30
616	" H.S. Friction Plate	1.50
633	" Brake Band	2.00
633½	" Reverse Band	2.00
636	" S.S. Gear	3.00
636	" S.S. Gear Bushing	.50
637	" S.S. Gear Pin	.02
663	Reverse Gear and Plate	6.00
663½	Reverse gear	2.50
664	" Plate and Gear case fibre	.30
665	" Bushing	.50
666	" Gear Pin	.02
667	Transmission Gear Case	5.00
669	" Brake Plate and Gear	6.50
670	" Driving Pinion	2.50
671	" Plate	5.00
674	" S. S. Band	2.00
675	" " Spring Bolt	.05
676	" " " Nut	.04
679	" Triple Gear	5.00
681	" Triple Gear Shaft	.20
682	" " Pin	.02
684	" " Pin	.04
686	" Thrust Plate (steel)	.50
689	" Driving Plate Bushing	.30
690	" " Lock Nut	.03
691	" Friction Plate (large) steel	.50
692	" Friction Plate (small) steel	.50
695	" Fibre between Brake Drum and Gear Case	.30
696	" Fibre between Friction and Thrust Plates	.10
697	" Fibre Bands (5 pcs.)	.25
697A	" Gear Case Dope Plug	.05

Always designate model of car and number of motor when ordering parts

indefinitely if kept lubricated, but may be replaced at any time at a small cost should they be allowed to run dry and cut.

Should the high speed clutch fingers become worn so that it is no longer possible to adjust the high speed clutch to hold properly, they should be replaced.

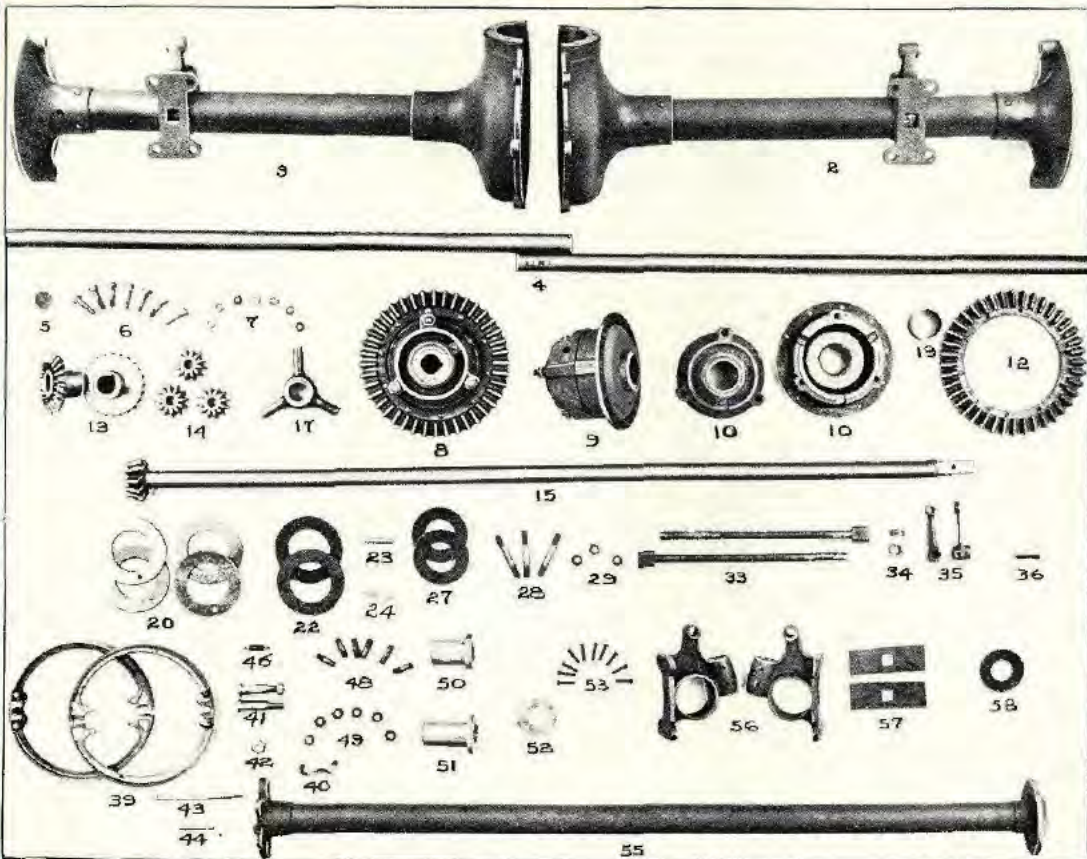
To remove fingers from spider—drive out rivets. In replacing fingers be careful to rivet them so they will remain free as otherwise they are liable to bind and hold the clutch in contact when it is supposed to be released. If oil is put on the cone and fingers occasionally they should wear a long time. It should not be necessary to replace the main shaft or spider during the life of the gear unless carelessness has been exercised when adjusting the high speed clutch not to tighten the set-screw sufficiently to hold. If the set screw slips it is liable to tear the threads off the shaft, in which case a new shaft will have to be put in.

If excessive looseness develops in the transmission it is well to take it apart and inspect the gears and bearings thoroughly to ascertain the cause. Should the bearings have been allowed to run dry the bushings may be badly worn or the shaft cut and the sooner this trouble is discovered the easier it will be to avoid a more serious repair account. Bronze bushings may be easily replaced, using a bushing driver, similar to that described elsewhere (under "special tools"). Remove the old bushing and press or drive a new one in place. The transmission case should be filled with Albany grease or other heavy oil about once every two weeks. Excessive slipping of the high speed clutch, due to imperfect adjustment, will tend to heat the transmission and draw the oil out of it. The Ford transmission design is such that the centrifugal force of the rapidly revolving drums throws the oil to the inner circumference of the drums from whence it cannot escape. When not revolving the oil in the upper side of the drum if hot and thin will leak out slowly. If the precaution is taken to throw in the high speed clutch when leaving the car for any length of time, a great saving of oil can be effected as there is then no chance

for it to work out. Great care should be taken, however, to always release the clutch before cranking the motor.

**TO ADJUST LOW, REVERSE AND BRAKE BANDS—**Use special socket wrench No. 1,303; loosen lock-nut couple of turns; then turn adjustment nut to point desired—to the right tightens band, to left loosens. Transmission brake and low are adjusted from above. Reverse is adjusted from below (holes in drip pan provide accessibility). The fibre gives ideal friction surface and holds best when oiled. If permitted to run dry will burn or cut. Can be replaced easily by ordering the fibre segments and riveting to place. Care should be taken to see that bands are a true circle, so that they do not drag when disengaged and that they take hold all around the drum when applied; high points cause noise when starting. To avoid unnecessary noise gradually apply the "low" with motor throttled down slow; let car get under way easily, then press on the "high" gently till the motor gets hold of its load, when the high may be pushed home. Then with throttle gradually increase speed of car to any degree desired, advancing spark if you desire to go at more than 8 or 10 miles an hour. Starting as above will add wonderfully to the life of the car, reduce or eliminate repair bills, and increase the pleasure of motoring.

**TO LUBRICATE TRANSMISSION GEAR—**In the transmission case between the low speed clutch band and the reverse, there is a threaded plug, another is located in the conical rear end section of the case. Remove these plugs and fill the case with Albany grease and replace the plugs, being careful to screw them up tight so that they will not work out. In the high speed clutch disc there is a hole drilled for oiling. The inner discs of the clutch are lubricated automatically from the inside of the case.

**REAR AXLE**

2	Rear Axle Housing (right half)	15.00
3	" " (left half)	15.00
4	" " Shafts (right and left) each	2.50
5	" " Thrust Washer (between ends of Axle Shafts)	.05
6	" " Housing Bolt	.08
7	" " Nut	.04
8	Differential, complete	30.00
9	Differential Case, complete	19.00
10	" " (right half)	5.00
11	" " (left half)	5.00
12	" " Drive Gear—40 teeth	10.00
13	Compensating Gears (two large) each	2.50
14	" " (three small) "	1.00
15	Drive Shaft and Pinion—11 teeth	6.00
17	Differential Spider and Bushing (Bushings only 60)	2.00
19	" " Pinion Housing Bushing	1.00
20	" " Thrust Plates (one hole, two hole) each	.20
22	" " Thrust Plates Washer (fibre)	.20
23	" " Gear Pin	.10
24	" " Key	.10
27	" " Thrust Washer (fibre)	.20
28	" " Case Stud	.12
29	" " Nut	.65
33	Hub Brake Cam Shaft	1.60
34	" " Collar	.10
35	" " Lever	.35
36	" " Pin	.04
39	" " Shoe (brass)	.200
40	" " Spring	.05
41	Brake Shoe Support Bolt	.20
42	" " Nut	.01
43	Rear Hub Key	.65
44	" " Pin	.02
46	Brake Shoe Spring (coil)	.05
47	Hub Brake Spring Rivets	.02
48	Driving Shaft and Rear Axle Housing Stud	.03
49	Driving Shaft and Rear Axle Housing Stud Nut	.05

**Always designate model of car and number of motor when ordering parts**

**REAR AXLE—Continued**

50	Drive Shaft Housing Bushing (front)	1.25
51	Rear Drive Shaft Housing Bushing	1.25
52	Drive Shaft Thrust Washer (rear) Steel	.10
53	Driving Gear Rivet	.02
54	Drive Shaft, only	2.00
55	Drive Shaft Tubing	7.50
56	Rear Spring Seat	2.50
57	" " Pad (leather)	.10
58	" " Hub Dust Ring (felt)	.05
58A	Drive Shaft Pinion—11 tooth specify bore	4.00
58½	Rear Axle Housing Brass Grease Cap	.10

**Rear Axle**

The keynote of Ford rear axle design is simplicity. To obtain the highest possible efficiency with the least frictional loss in transmission of power and with the fewest possible parts to wear, to get out of order and finally to be replaced was the Ford objective. With 10,000 runabouts and 1,000 six-cylinder touring cars on the road at the present time we can say we believe the Ford rear axle is more nearly perfect than any other. The unparalleled performance of Ford runabouts—defeating as they habitually do all other cars selling at less than \$1,500, in hill climbing and other contests—proves that there can be but very slight loss in the transmission of power through this axle—either that or the car is equipped with more surplus power than any of its competitors.

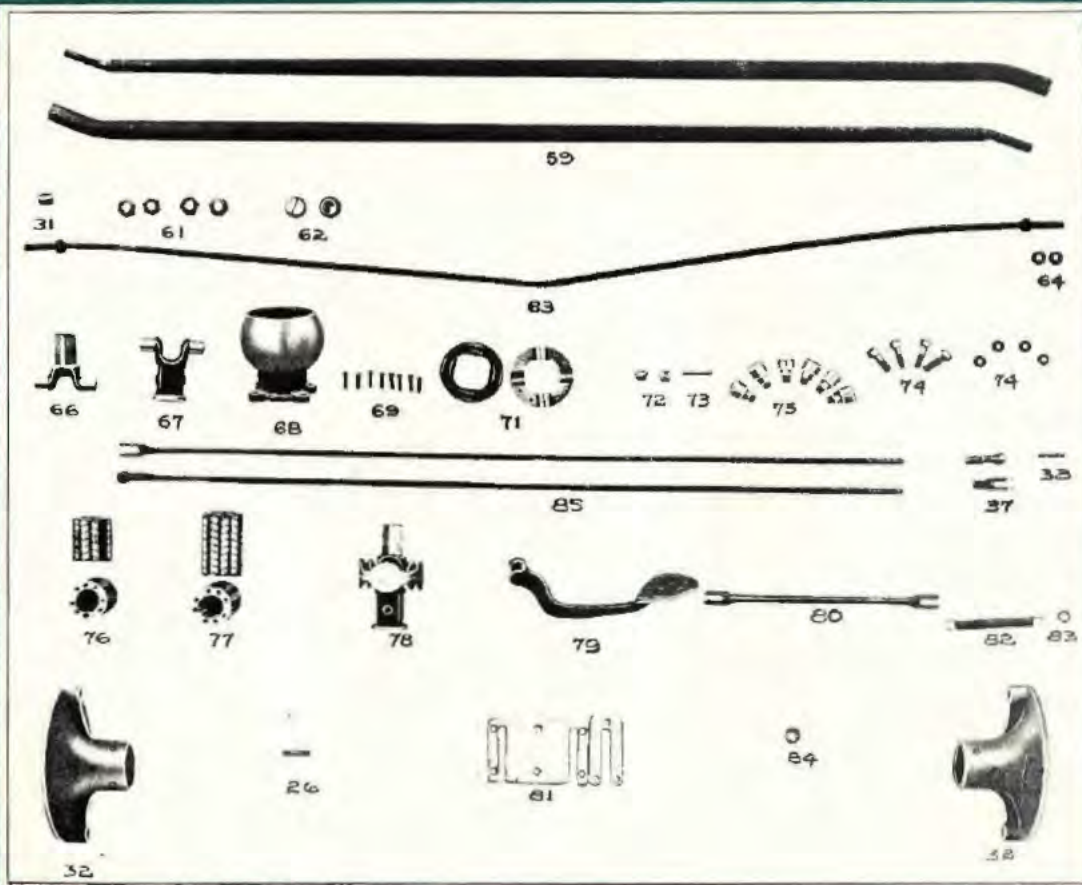
The "3-point drive" system is purely a Ford feature and is patented in every civilized country in the world. This construction necessitates the use of only a single universal joint and permits of the housing of the entire driving mechanism in a dust proof, oil tight case. If plenty of oil is supplied to these parts there should be no trouble during the natural life of the gears, made as they are of the best special alloy steel obtainable, carefully cut and case hardened. Of course like all other parts of a machine these will wear out in time and when the wear has become so noticeable that the gears do not mesh true or there is an excessive amount of play, the gears should be replaced. Occasionally the thrust bearing will wear sufficiently to let the gears out of true mesh; as these can be easily and cheaply replaced it is false economy to let them run an unreasonable length of time without inspection. Under ordinary circumstances an inspection once in six months should be sufficient and in this as in all other matters, a stitch in time saves many stitches.

Cheapness is not the primary consideration for using the fibre-between-steel washer construction to sustain the end thrust. In many standard machine shop tools such as drill-presses and other machines where the thrust is more severe than it is here, this construction is considered standard and we believe it is far superior to balls particularly inasmuch as it can be cheaply replaced and is less liable to cause trouble.

Under ordinary loads and with any reasonable kind of usage the Hyatt roller bearings should last almost indefinitely for, after several years' service in some of the earlier cars the wear is not noticeable.

**Always designate model of car and number of motor when ordering parts**



**REAR AXLE—Continued**

26	Differential Thrust Plate Pin	.04
31	" Housing Oil Cap	.25
32	Brake Band Support—right or left	3.00
37	Hub Brake Lever Clevis	.20
38	" " Clevis Pin	.06
59	Rear Radius Rod	3.00
61	" " " Nut	.05
62	" " " Cap	.25
63	" Axle Truss Rod	1.00
64	" " " Nut	.10
66	Universal Joint Knuckle (male)	1.00
67	" " " (female)	1.25
68	" " Housing	1.25
69	" " Ring Rivet	.02
71	" " " complete	1.50
72	" " Housing Plug	.08
73	" " Knuckle Pin	.04
74	" " Housing Cap Screw	.04
74	" " " " Nut	.03
75	Rear Axle Grease Cups	.20
76	Roller Bearing (inner) complete	1.40
77	" " (outer) "	1.60
78	Universal Joint complete	4.00
79	Brake Pedal (emergency)	.75
80	" " Connecting Rod	.25
81	" " Guide Plates (per set)	1.00
82	" " Spring	.05
83	" " Plate Spring Retainer	.10
84	" " Guide Plate Spring	.04
85	Hub Brake Pull Rod	.45

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## **In your worst moments you wouldn't trade your Ford for any other—now honest, would you?**

**DIFFERENTIAL**—The differential is of the most approved bevel gear type and will withstand the most severe usage. However, drivers, who are accustomed to apply the brakes so severely as to slide the wheels, whether in an emergency case or not, will now and then break a spider and for such usage no reasonable amount of metal in this part would be an adequate safeguard. Every owner should master the principles of the differential or compensating gear and thereby acquaint himself with the service it performs and more clearly understand what constitutes use, and what abuse, of this member.

Rear hub brakes are intended to perform the function of emergency brakes as their name implies and consequently they take hold severely. Used only in emergencies they should outlive the rest of the car. Many theories to the contrary notwithstanding, the transmission brake is not injurious to the driving gears if used judiciously, as every other part of the car should be used. And inasmuch as this brake equalizes the forces between the two rear wheels uniformly, is more easily lubricated, inspected and adjusted, it is better practice to use it for service than the hub brakes.

**TO DETACH THE REAR AXLE**—Jack up the frame, disconnect the springs from the spring blocks by removing nuts and spring clips. Remove the nuts which hold the two sections of the ball-socket together. This allows the ball to be drawn away from the transmission frame. Disconnect the brake connections and the axles may be removed from under the car.

**TO DIS-ASSEMBLE REAR AXLE**—Remove wheels by unscrewing hub cap, using special hub wrench furnished with car. Drive out pin and if key can be gotten hold of with pliers withdraw key first. Using wheel puller or similar device, pull wheels off. Disconnect drive shaft tube by removing nuts on front ends of the radius rods; remove nuts from studs which attach torsion tube to the differential housing. Draw away the tube. Remove bolts which hold two halves of differential housing together. The housing may then be drawn apart, exposing the differential.

Care should be taken to note the position of each part such as thrust washers, roller bearings, etc., so they may be accurately re-assembled.

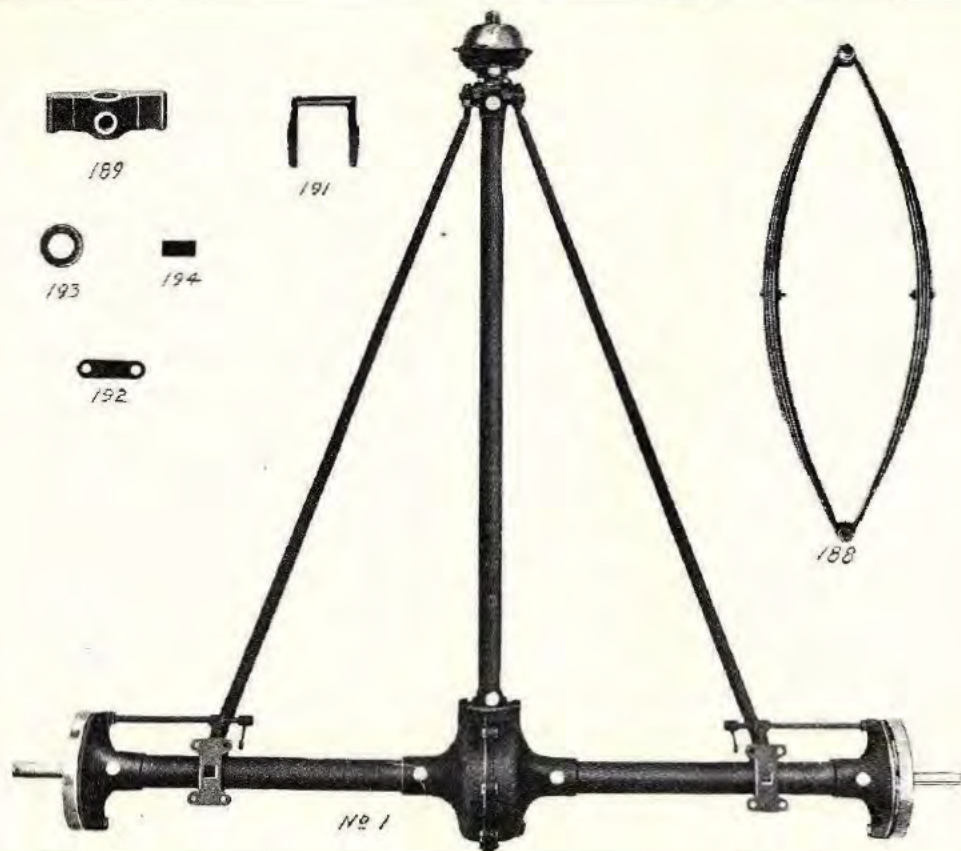
If necessary to dis-assemble differential gear any person with the slightest mechanical knowledge can readily see how it is done when it has been exposed to view. Great care should be taken to get every key and pin and bolt back in its exact position.

**TO REMOVE BEVEL DRIVING PINION**—In order to make a "fool proof" and absolutely reliable job the drive pinion is keyed onto the shaft and the end of the shaft riveted over. Inasmuch as the average machine shop will not have facilities for accurately replacing pinion and making sure that it is in perfect alignment, it is advisable to replace the entire shaft and pinion when the latter becomes too much worn for safe usage. This is best also because the shaft will likely have become worn at its bearings. If, however, it is desired to replace the pinion only, it may be removed from the shaft by cutting away the edges where riveted over and driving out the shaft.

In replacing, rivet over the end of the shaft as well as possible and be sure that the gear is on perfectly straight as otherwise it is sure to cause trouble and perhaps incur a larger bill for new gears than would pay for the complete shaft and gear in the first place.

Should you at any time find the driving pinion loose on the shaft, order a new key as the key has become worn and if allowed to go is liable to shear off and cause trouble.

Noise in the axle driving gears usually indicates wear either in the gears, in the thrust washers, or the bearings; inspection should be carefully made to ascertain the cause as soon as an unusual sound is heard. Another cause which may produce the same effect is a sagging of the rear axle due to continual jolting over the roads. This can be corrected by tightening up the truss rod. To do this remove the rear wheels; loosen the nut on the inner side of the brake flange and tighten up

**REAR AXLE—Continued**

1	Rear Axle, complete (state color)	80 00
188	" Springs each	4 00
189	" " Perch (upper) complete	50
191	" " Clip (lower)	20
192	" " " Guide	10
193	" " Upper Perch Collar	15
194	" " " " Felt	05
185	" Spg. Upper Perch Oil Plug	05

Always designate model of car and number of motor when ordering parts

the nut on the end of truss rod. As the truss rod will stretch more or less it is advisable to watch this carefully, tightening occasionally, at the same time being careful not to strain it so severely as to force the axle out of straight in the opposite direction.

**TO REMOVE MASTER BEVEL DRIVING GEAR**—Cut off rivets holding gear to flange on differential case with cold chisel, being careful not to rupture the flange. In the later cars the gears have holes  $1/32$  inch larger than those in the earlier ones and take a rivet that much larger. If you find the holes in differential case too small, ream out to the size of hole in the new gear. A good plan is to use the gear as a jig so that the holes will register.

The master gear will wear longer than the pinion, ordinarily, although there are exceptions to this rule. When the gear teeth begin to "pit" it is a good plan to renew the gear as the pitting shows that the case hardened shell has worn through exposing the soft metal.

In the event of a rupture of the differential housing or brake flange it is advisable to replace the entire half of axle housing for, unless you have experience and first-class facilities for doing this work you are liable to damage the casting and tube by trying to cut off the rivets and replace the cast section. This damage may not show up at the time but is liable to cause trouble later. In ordering be sure and specify which half is required, left or right—the right being that on the driver's side of the car.

**TO REMOVE BABBITT BUSHING** from drive shaft tube. If properly lubricated at all times these bearings should not require replacement more than once in two years. However, should the bearings run dry and cut sufficiently to allow of play, it would be economy to replace them. Take  $3/4$  inch or  $7/8$  inch round steel bar about 4 feet long—or a few inches longer than tube—insert from opposite end of tube and drive bushing out. A wooden mallet is better than a hammer for this purpose.

**TO INSERT NEW BUSHING**—Rest one end of the tube on a solid wood block, and drive the bushing in, using a wooden block also to cushion the blow so as not to mar the bushing. Of course if a press is available the bushing can be more easily forced into place.

The shaft will be a tight fit in the new bushing and it is proper that it should fit as tightly as it can be pushed in by hand.

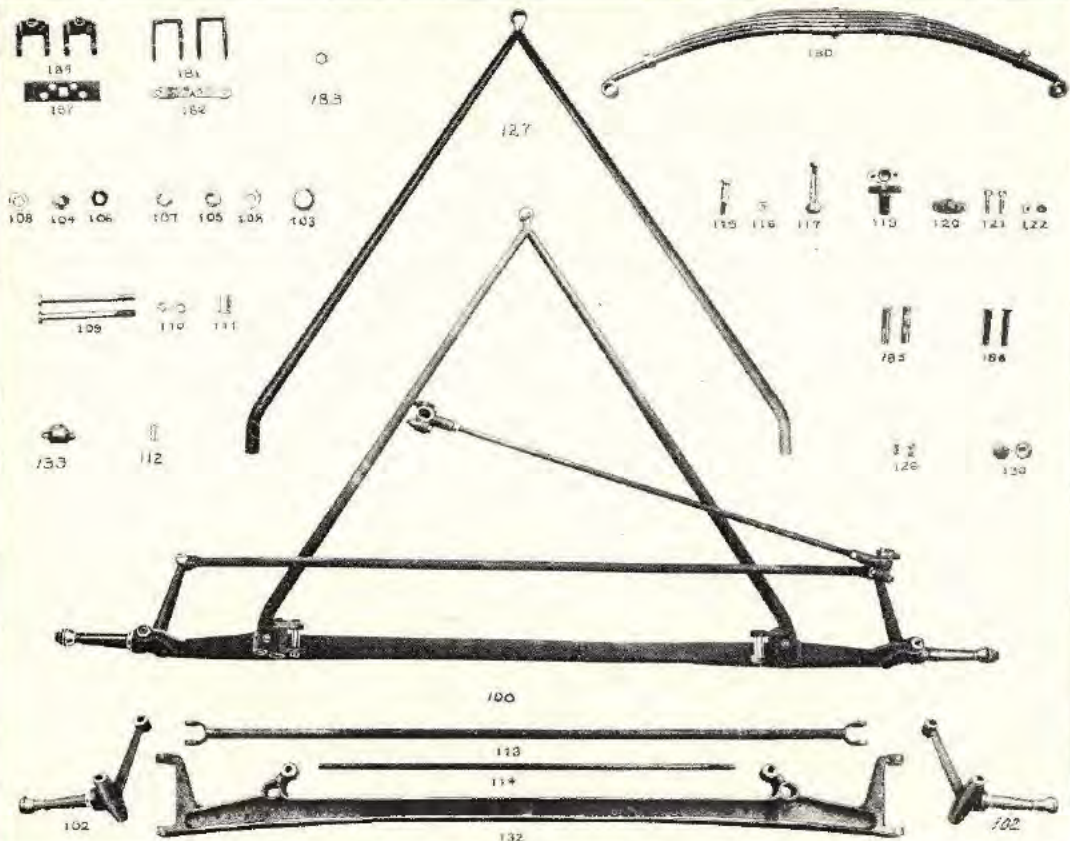
When in place it may be found that the shaft—unless also a new one—will have worn slightly at the bearing section and so it will be a loose fit even though the larger part of the shaft goes in tight. If excessively tight when in place, it will be liable to run hot. This tightness may be caused by a slight variation in the diameter of the tube causing the babbitt bushing when forced in to slightly compress. If necessary to relieve the bearing, scrape the babbitt bushing carefully, or better still, use a 1 inch hand reamer, being very careful not to make the hole so large as to allow the slightest play.

**TO DISCONNECT UNIVERSAL JOINT FROM DRIVE SHAFT**—Remove two plugs from top and bottom sides of ball casting. Revolve shaft until pin comes opposite hole; drive out pin and draw universal joint away.

Wear in the universal joint may be taken up by disconnecting the two halves, cutting off the rivets with a cold chisel and carefully filing or turning down the faces so as to allow them to come together. The hole will not then be perfectly round and should be carefully scraped or reamed to fit. Excessive wear in the steel parts calls for replacement of these parts.

If rear axle or wheel is sprung by skidding against a curb, or other accident, it is false economy to drive it. Tires, gears and all other parts will suffer and the bill for repairs will grow daily. If axle shaft is bent it is better to get a new one than try to straighten the old one.

Every Ford owner as well as every repair man should have a wheel puller similar to No. 1305. A tire can be removed



### FRONT AXLE

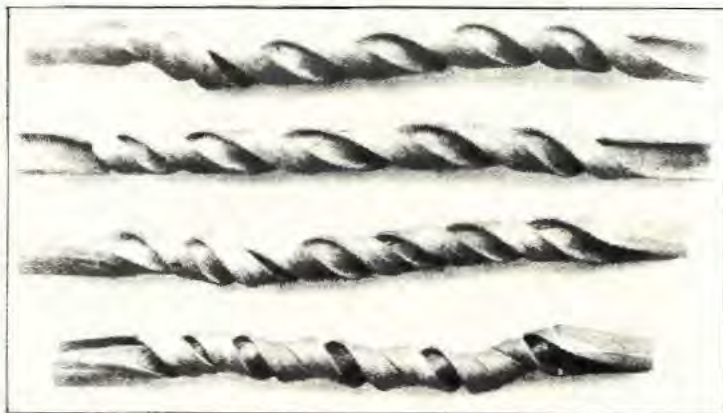
100	Front Axle, complete (state color)	25.00
102	Spindle (right) complete	4.00
102	" (left) "	4.00
103	Stationary Spindle Cones, each	.50
104	Adjusting Spindle Cones (left thread)	.40
105	" " (right thread)	.40
106	Spindle Nut (left thread)	.10
107	" " (right thread)	.10
108	" Washer	.05
109	" Bolt	.40
110	" Nut	.05
111	" Body Bushing (upper and lower)	.60
112	" Arm "	.25
113	Steering Spindle Connecting Rod and Yoke	2.95
114	" Gear Connecting Rod	.50
115	" Spindle Connecting Rod Bolt	.20
116	" " " " Nut	.04
117	" " " Round Head Bolt	.25
119	" " Ball Socket, complete	.50
119 1/2	" " " "	.15
120	" " " Cap	.10
121	" " " Bolt	.08
122	" " " Nut	.05
126	Front Axle Spindle Oiler	.20
127	" " Radius Rods, complete	5.00
130	" " " Rod Cap	.20
131	" " " Rivets	.02
132	" " only	14.00
133	" " Radius Rod Ball Cap	.75
180	" Spring (state color)	6.00
181	" " Clip	.20
182	" " " Cross Bar	.04
183	" " " Nut	.03
184	" " Hanger	.30
185	" " " Bolt	.16
186	" " " " to Axle	.16
187	" " " Pad	.05
187A	" " " Perch	1.00
187B	" " " Hanger Oil Plug	.05
709	" Radius Rod Ball Cap Stud	.10
710	" Spring Rod Ball Cap Stud Nut	.05

Always designate model of car and number of motor when ordering parts

easily and more carefully repaired and replaced by removing the wheel, and there are many occasions when it is necessary to remove the wheel. A good puller is cheap to buy or can be easily made. Some make a threaded cap to screw over hub cap threads. As the threads on Model N, R and S, are very fine this is not the best method as it sometimes strips the threads, spoiling the hub. A puller like No. 1305 grasps the enlarged end of the hub and will sustain more force without danger of injury to hub or thread.

### Front Axle

The factor of safety in the Ford front axle is so great that nothing but a serious accident or carelessly running into a curb when turning will serve to bend it and, to break it, is practically impossible.



Herewith is shown photographic reproduction of Ford front axle in torsional test, made in the laboratory of the State University at Ann Arbor, Michigan, showing them twisted three and one-half times, cold. In other words, this axle could be tied in a knot around a tree and then straightened cold without showing any serious effect of the ordeal.

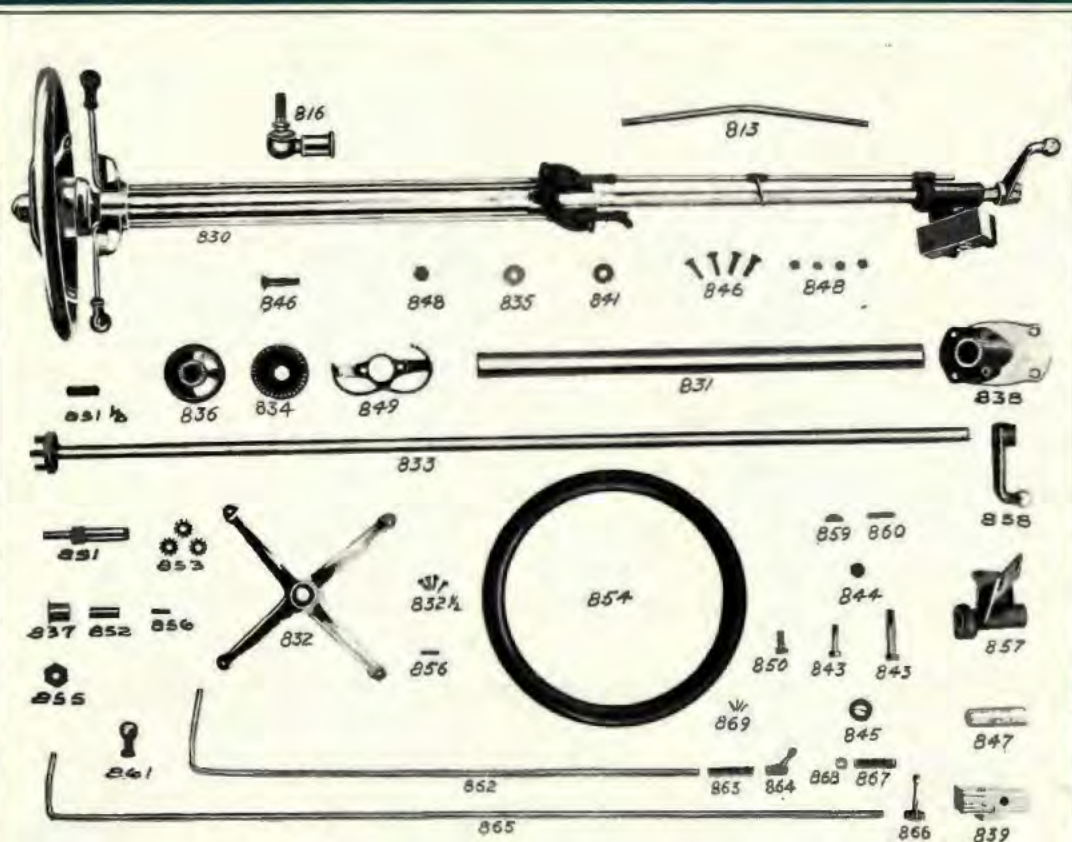
When by accident, an axle is slightly bent it is better to straighten it cold. In our own repair shops we have presses and accurate gauges for this work. If it is only a slight backward bend, any good blacksmith can straighten it. Do not under any circumstances heat any parts of these cars bent by accident, but straighten cold.

If a downward bend, better send to the factory or one of our branches where we have special gauges, tools and men who are expert in this work. Service will be prompt and price reasonable.

**BENT STEERING KNUCKLE**—Should a steering knuckle become bent it is necessary to have a gauge or jig to straighten it accurately. The eye is not sufficient to determine whether it is correct, and excessive wear of the front tire will be the result of inaccuracy in this place. In all cases it would be better to send to us for correction.

**TO CORRECT AN ERRONEOUS IMPRESSION**—The front wheels should set at an angle of about 3 degrees—that is to say, the distance, centre to centre, between the tops of the front wheels should be about 1½ inches greater than that between the bottoms. This is to give perfect steering qualities and to save wear on the tires when turning corners. The wheels should not, however, “toe in” at the front—lines drawn along the outsides of the wheels when the latter are in a straightforward position, should be parallel.

**TO REMOVE FRONT AXLE**—Disconnect spring shackles and ball cap which holds triangular radius rods to the trans-



## STEERING GEAR

813	Throttle or Lead Rods (small)	.15
816	" Rod Ball Joint	.30
830	Steering Gear complete	30.00
831	" " Post Tubing and Gear Case	8.00
832	" " Wheel Spider	3.00
832 1/2	" " Spider Screws	.05
833	" " Post and Pinion Spider	8.00
834	Steering Gear Internal Gear	3.00
836	Steering Gear Pinion Housing Cap	1.40
837	" " Cap Bushing	.50
838	" " Post Bracket on Dash	2.00
839	" " Gear " Block	.10
841	" " Post Bracket Screw Washer	.05
842	" " " " Nut	.05
843	" " " " Bolts, each	.08
844	" " " " Bolt Nut	.04
845	" " " " Washer	.04
846	" " " " Screw	.05
847	" " Post Bracket Bushing	.80
848	" " Bracket Screw Nuts (on dash)	.08
849	" " Gear Quadrant	2.00
850	" " Cap Screw	.05
851	" " Driving Gear	1.50
851 1/2	" " " " Pin	.05
852	" " " " Bushing	.40
853	" " Gear Pinions (three) each	.50
854	" " Wheel Rim	2.50
855	" " Wheel Nut	.20
856	" " Spider Key	.10
857	" " Gear Bracket on frame	1.00
858	Ball Steering Lever	1.00
859	" " " " Key	.05
860	Ball Arm and Thrust Collar Pin	.05
861	Lead and Throttle Handle	.28
862	" " Rod (long)	.20
863	" " " " Spring	.04
864	" " " " Lever	.10
865	Throttle Rod (long)	.40
866	" " " " Lever	.10
867	" " " " Spring	.04
868	" " " " Collar	.05
869	Lead and Throttle Rod Lever Pins	.02

Always designate model of car and number of motor when ordering parts

mission frame; disconnect spring clips, spring to front frame member.

To disconnect radius rods from axle, remove screw cap and draw out rivets. In replacing see that rivets go through both sides of tube and are tight.

Once every 30 days the axles should be carefully gone over to see that every moving part, such as bushings in spring connections, shackles, steering knuckles and hub bearings and every other moving part, however small or apparently unimportant are thoroughly lubricated, and that all nuts and connections are secure.

If this is done replacement of bearings should be unnecessary during the first year or two of the car's service. Wherever balls are used there is a liability of one splitting, so it is well to watch carefully the balls and races in the front wheels, and the slightest wear or defect in either should be followed by immediate replacement.

Ball bearings in front wheels should be adjusted so there is not the slightest play and yet so the wheel will turn freely. After tightening the lock nut, turn the wheel as the last operation may have tightened the cones too much.

The spring clips which attach the front spring to the frame should be inspected frequently to see that the nuts are not working loose, as this will permit the axle to shift sidewise interfering with the steering and may result in an accident when turning suddenly.

### **Steering Gear**

The Ford steering gear is a decided departure from any former device for this purpose, and after three years of service on various Ford models we can confidently claim more points of superiority for this gear than for any other. Like the Ford axle, it is now patented in all countries, so it is an exclusive Ford feature.

The gears which are arranged in the "sun and planet" form are located at the top of the post just below the hub of the

wheel. By loosening the set-screw and unscrewing the knurled brass cap—after having removed the wheel—they may readily be inspected and replenished with oil. Vaseline or Albany grease is best for this place and one filling will last six months at least.

**TO REMOVE STEERING WHEEL**—Unscrew the brass nut on top of the post, remove key and draw the wheel off.

**TO TAKE UP WEAR IN BALL JOINT**—Disconnect two halves of the ball socket and file off faces until they fit closely around the ball. If ball is badly worn it is safest to replace it with a new one.

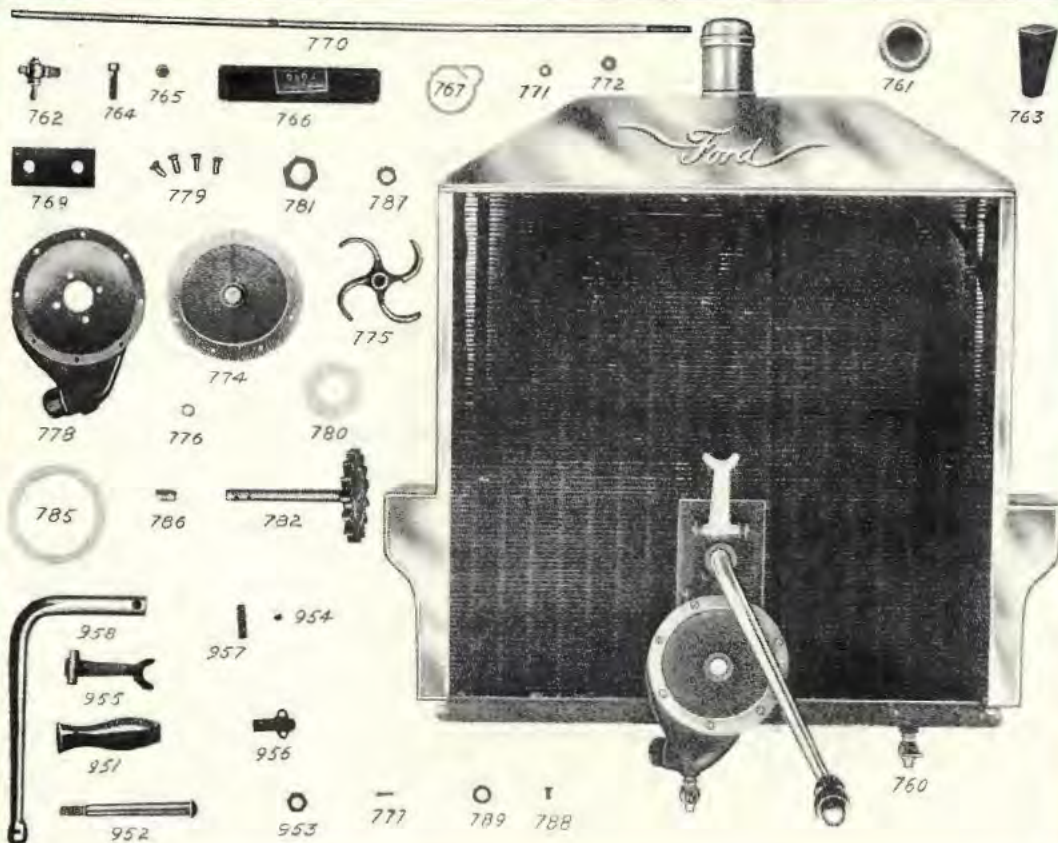
**TO REMOVE STEERING SHAFT**—Remove pin and disconnect steering arm from bottom of post. Unscrew knurled cap from gear housing, lift off wheel with center pinion; push shaft upward.

### **Radiator and Pump**

In order to be efficient, a radiator must necessarily be made of very light copper tubing and sheet copper sweated together. The more flexible and easy riding a car is, the more severe it will be on the radiator unless the driver exercises a reasonable amount of care. Driving at reckless speeds over dark and uneven roads at night frequently results in dropping into bad holes or washed out culverts and this is liable to open up leaks in the radiator. Extreme care should therefore be exercised in driving a car over bad and, especially, unfamiliar roads.

The use of clean, soft water, free from alkali and other salts will greatly lengthen the life of a radiator, and a frequent cleaning by running clear water through the radiator as well as the entire water system including cylinder jackets, will greatly increase the efficiency and retard decay by rust and other agencies. Disconnect hose and pipes between radiator and engine. Remove cover plate from pump; take the garden hose and let water run down through the radiator until it comes



**RADIATOR, PUMP AND CRANK**

760	Radiator, complete with Starting Crank and Pump (state thickness)	45.00
761	Radiator Cap (state diameter)	.50
762	" Drain Cock	.25
763	Strainer	.10
764	Radiator to Frame Bolt	.04
765	" " " Nut	.04
766	" Hose	.30
767	" " Clip	.08
769	" Leather Support	.05
770	" Stay Rod	.10
771	" " " Nut	.04
772	" " " Washer	.04
773	Pump complete	5.00
774	" Cover	1.00
775	" Fan	1.00
776	" " Collar	.08
777	" " Pin	.04
778	" Body (casing only)	2.50
779	" Cover Screw	.04
780	" Body Gasket	.04
781	" PackingNut (hexagon)	.25
782	" Shaft and Fibre Gear	.60
785	" Cover Gasket	.05
787	" Shaft Lock Nut	.25
788	" to support Screw	.10
786	" Cover Shaft Bushing	.10
486	Starting Crank ratchet (see picture page 8)	.60
950	" " complete (see picture page 8)	.05
950a	" " Ratchet Pin	.40
951	" " Handle	2.00
952	" " Bolt	.20
953	" " " Nut	.04
954	" " Set Screw	.03
955	" " Rest	.25
956	" " Spring	.10
957	" " Pin	.04
958	" " only	1.00

**Always designate model of car and number of motor when ordering parts**

out at pump and pet cock holes—pet cocks should be removed to allow freer flow. Then attaching garden hose to aluminum pipe on top of cylinders allow water to run through jackets and out through brass pipe until clean. This done once a month will repay you for the trouble.

**LEAKS IN RADIATOR** are usually caused by severely wrenching it in driving over rough roads or in hilly country. In turning from a level street at right angles up a stiff grade the radiator necessarily gets quite a severe wrench and persons driving in such places should exercise exceptional care. Few tinsmiths or others, unless they have had considerable experience in this particular kind of work, are equal to the task of repairing a bad leak in a radiator. The better way therefore is to send it to the factory or to some person who is known to be an expert in this work, rather than take a chance of more serious injury as a result of unskilled tampering with it.

**TO REMOVE RADIATOR** take off wooden hood blocks; disconnect water connections, top and bottom; disconnect from frame at either side, using special socket wrench No. 1309, holding heads of bolts with end of wrench No. 1314. Draw the radiator forward, being careful to note position of leather pads which hold radiator in proper position for accurately meshing pump gears.

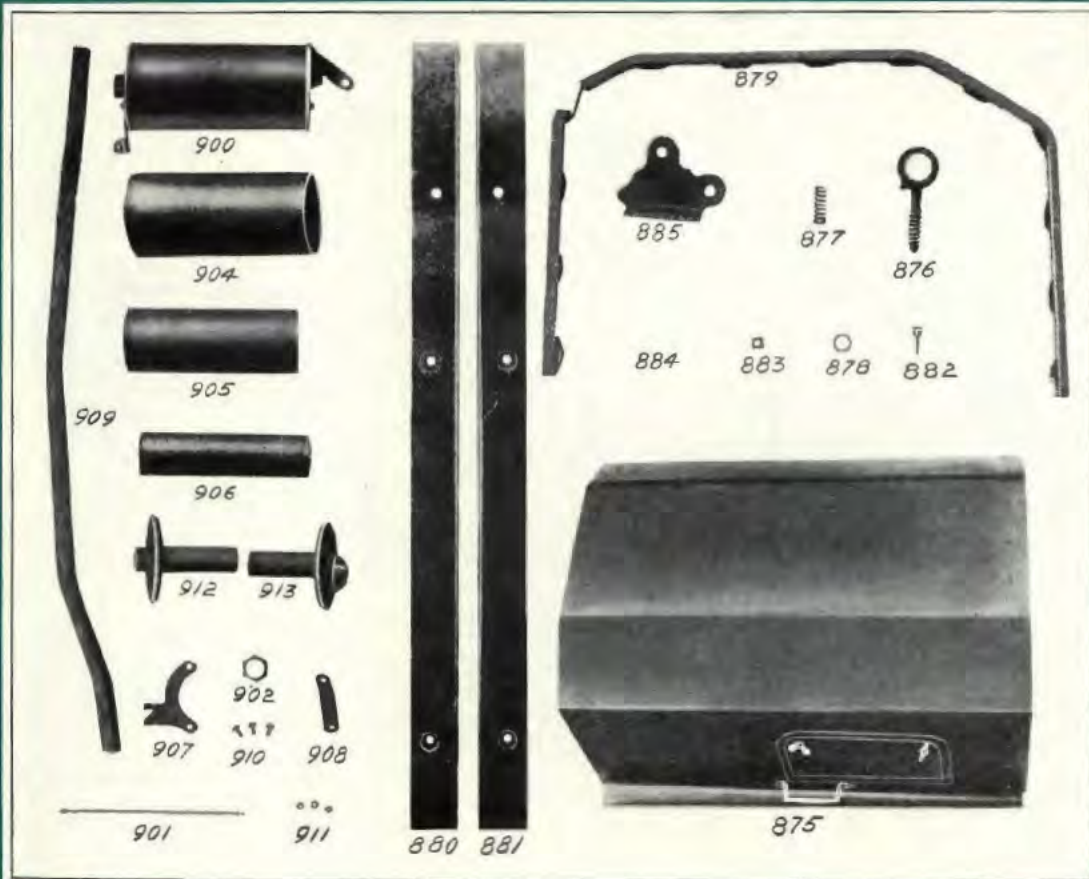
**PUMPS**—In designing and locating pump on the Ford run about Mr. Ford's chief idea was simplicity and accessibility. In order to obtain this latter he departed from all former rules and placed it on the front of radiator where it may be easily inspected. Not over two minutes' work is necessary to remove the eight short bolts which hold the cover plate in place. The driving gear is of fibre and meshes with a bronze gear on the crank shaft. Owing to the high speed at which these gears run it is essential that they be meshed accurately and for this reason great care should be exercised when removing the radiator to put it back in exactly the same position using the same leather pads. Care should be taken also to see that the

radiator stands perfectly plumb so that the fly-wheel cannot strike the pump gear. This can be adjusted by tightening or loosening the rod which connects the top of the radiator with the dash.

**SHEARING PUMP PIN**—In the event of any foreign substance getting into the pump serious damage might be done but for a simple expedient of putting a pin sufficiently strong to perform its natural functions and at the same time small enough to be more easily sheared off than it would be to break one of the vanes of the pump fan. Owing to this construction it will occasionally happen that the pump pin will shear off and in the case of overheating of the engine a brief inspection will readily disclose whether this is the case. The remedy is simple—replace the small pin with another or with a piece of wire or nail if the proper pin is not handy.

**IF PUMP LEAKS AT THE SHAFT**, the packing has probably become worn. To replace packing, disconnect radiator from chassis; remove pump cover-plate; disconnect pump fan; unscrew packing nut (gland) using special socket wrench No. 1310; seize gear and draw shaft out—if tight drive gently with wood block. To replace, take  $\frac{3}{8}$ x3/16 hemp packing 6 inches long. Insert pump shaft; wind packing round shaft and force packing down, using some blunt tool to force packing to place. Screw packing nut down tight, replace cover plate. Before replacing radiator on car, fill with water to see that packing does not leak.

**STARTING CRANK PIN**—Should the pin in the starting crank get sheared off by contact with the ratchet so that it becomes necessary to replace the pin, remove the radiator and lay it on a bench so that it rests on the starting crank; then with a cold chisel cut off both ends of the pin close. The crank can then be withdrawn from the radiator. The pin is held in place by a set-screw which in turn is soldered in place. Melt the solder and take out the set-screw; drive out the remaining portion of the pin. To replace, reverse the operation, being sure to screw the set-screw tight and solder it as before. This

**MUFFLER-HOOD**

900	Muffer complete with Brackets	2.50
901	" Rod	.08
902	" Pack Nut	.40
903	" Rod "	.04
904	" Shell (outer)	.40
905	" " (middle)	.25
906	" " (inner)	.25
907	" Bracket Intake End	.16
908	" " Exhaust "	.08
909	" Exhaust Pipe	1.10
910	" Bracket Bolt	.04
911	" " Nut	.02
912	" Head (front end)	.80
913	" " (exhaust end)	.80
875	Hood (State length and color)	7.00
876	" Clip	.20
877	" Spring	.04
878	" Washer	.02
879	" Support (on dash)	1.00
880	" Board on frame (right)(state color)	.40
881	" " (left) "	.40
882	" " Bolt to Frame	.04
883	" " Nut	.03
884	" " Screw	.05
885	" Support Bracket	.04
886	" Door	.50

Always designate model of car and number of motor when ordering parts

will avoid all chance of the pin coming out and possible loss of the crank. Extreme care should be exercised to not strain or fracture the radiator tubes when cutting off the pin.

If care is exercised to draw starting crank out with the left hand while the retaining dog is let down with the right there will be no danger of shearing off pins by a contact with the rapidly revolving ratchets.

### Muffler

**TO DISCONNECT THE MUFFLER** it is not necessary to disconnect the exhaust pipe from the motor although it is a good plan and a simple matter, necessitating only unscrewing the union; disconnect muffler from frame, unscrew union at forward end of pipe, drop down so it will clear the frame and slip back off the tube.

**TO CLEAN MUFFLER**—Remove nuts on ends of rods which hold muffler together and dis-assemble. To re-assemble muffler, reverse above operation, being careful not to get the holes in the different sections opposite each other.

### Carburetor

For both the Kingston and the Holly carburetors, there are four adjustments. (1) The needle valve which regulates the flow of gasoline through spraying nozzle; (2) Auxiliary air inlet by which the tension of the spring is tightened or loosened to admit more or less air to compensate for different engine speeds; (3) Throttle adjustment; (4) The constant height of gasoline in the float chamber may be regulated by bending up or down the fingers of the float valve lifter.

It is time well spent to disconnect your carburetor from the motor and take it apart piece by piece, to thoroughly familiarize yourself with its principles, its mechanism and the function of each part. In re-assembling be careful not to allow particles of dirt, waste or other foreign matter to get in, as these will

cause troubles that are hard to diagnose. The hands should always be clean when working with a disconnected carburetor.

**To adjust Kingston carburetor:** Set the auxiliary air valve so that about half the threads on the adjustment screw are exposed; loosen setscrew which locks needle valve adjustment and gently screw down needle until you feel it touch the seat, being careful not to put sufficient pressure on to destroy the seat or cut a groove in the needle valve. Unscrew three-fourths of turn, start motor with throttle half open; let run until motor warms up; open throttle wide (full). Leave spark in start position; turn adjusting needle for more or less gasoline, so as to get the greatest speed; close throttle carefully, screw in air adjusting valve until motor runs rich (black smoke, etc.); unscrew air **just** until motor runs even (steady). Fine thread on air valve allows of wide range of adjustment. If you unscrew air valve further, motor will continue to run but have no power on low speeds, and will start hard. To prove mixture, advance spark lever three or four notches, open throttle quickly. If you hear a popping in the carburetor as you open, a little more gasoline; if motor speeds up slow and uneven, less gasoline or a little more air. If when throttle lever is in the first notch the motor does not run slow enough to suit, adjust the throttle so it will close further, being careful not to permit it to close enough to stop the motor entirely.

**To adjust Holly carburetor:** Close (screw down) adjusting needle to seat; unscrew half turn; start motor; close throttle; turn needle until motor runs even; open throttle wide, let motor speed up; hold finger partly over intake if motor speeds up more by doing this; screw down air adjusting sleeve (screw) to cut off part of the air; if motor runs slower when shutting off air at intake valve, give more air.

When the car leaves the factory throttle adjustment is usually pretty well open as the motor and car are stiff and this is necessary to guard against stalling the motor when starting. When it has become limbered up, however, this should be changed.

**CARBURETORS**

(Holly)

1000	Carburetor, complete, '06 Type	8.00
1000A	" " " '07 "	8.00
1001	Float	.50
1002	" Chamber	2.00
1003	" Nut	.25
1004	Gasoline Intake Connection	.25
1004A	" Elbow	.25
1005	Spray Nozzle	.25
1008	Gasoline Intake Packing Nut	.20
1009	Float Valve	.50
1010	Mixing Chamber	2.50
1011	" " Cap, '06 Type	.50
1011A	" " " '07 "	.75
1011B	" " Screws	.05
1012	Throttle Gate	.25
1012A	" Screw	.05
1013	" Lever	.30
1014	" Adjusting Screw and Nut	.15
1015	Gasoline Needle Valve '06 Type	.50
1015A	" " " '07 "	.60
1016	" " Lock Nut	.10
1017	Air Adjustment Sleeve	.25
1018	" " Spring, '06 Type	.10
1018A	" " " '07 "	.10
1019	" " Lock Nut	.10
1020	Float Valve Guide	.25
1021	" Operating Lever	.25
1022	Auxiliary Air Valve	.25

(Kingston)

1100	Carburetor, complete	8.00
1101	Float	.80
1102	" Chamber	3.50
1103	" Valve	.50
1104	" Operating Lever	.25
1105	" Spring	.10
1106	" Guideplug	.25
1107	Mixing Chamber	4.50
1108	Auxiliary Air Valve	.40
1109	" Spring	.25
1110	" Adjusting Screw	.50

(Continued on page 30)

**Always designate model of car and number of motor when ordering parts**

If the throttle will not close far enough to suit when the lever is in the first notch, disconnect the ball joint from the lower end of rod and screw up the socket one or two turns. Connect it up again and, with the throttle adjustment screw you can obtain the desired result.

For racing or hill climbing a richer mixture is necessary than for ordinary driving and this can be determined only by practice.

Not one person in ten is able to acquire quickly the knack of adjusting a carburetor. Patience and keen observation are essential to success in this. Until your sense of smell has become sufficiently acute to detect the odor of a "too rich" mixture, and your ear so well attuned to the ordinary sounds of your motor that it will detect the slightest variation in the exhaust of one cylinder as compared with another, at high as well as at slow speeds, you cannot hope for ideal results.

The besetting sin of most motorists is to meddle unnecessarily with the carburetor, particularly with the auxiliary air adjustment. Ordinarily this should require no attention after once having been adjusted unless as occasionally occurs, the spring loses its tension, in which case it is necessary to remove the spring and pull out the large coils half an inch. If this will not suffice, the only cure is to get a new spring.

Excessive vibration of the engine when running slow and when there is no apparent miss, may be due to lack of compression in one cylinder. This cylinder gives a lighter impulse than the others thus destroying the balance of the engine.

One of the most aggravating troubles, and one difficult to locate, is a leak in the intake pipe. This may be caused by a small sand hole in the casting. Occasionally the gasket between the carburetor and intake pipe is eaten away by the oil so as to allow a leak. Either of these makes it almost impossible to get an accurate adjustment of the carburetor. In some of the early model N's the intake pipe may sometimes slip down so as to partially close the valve ports. In case of an irregular

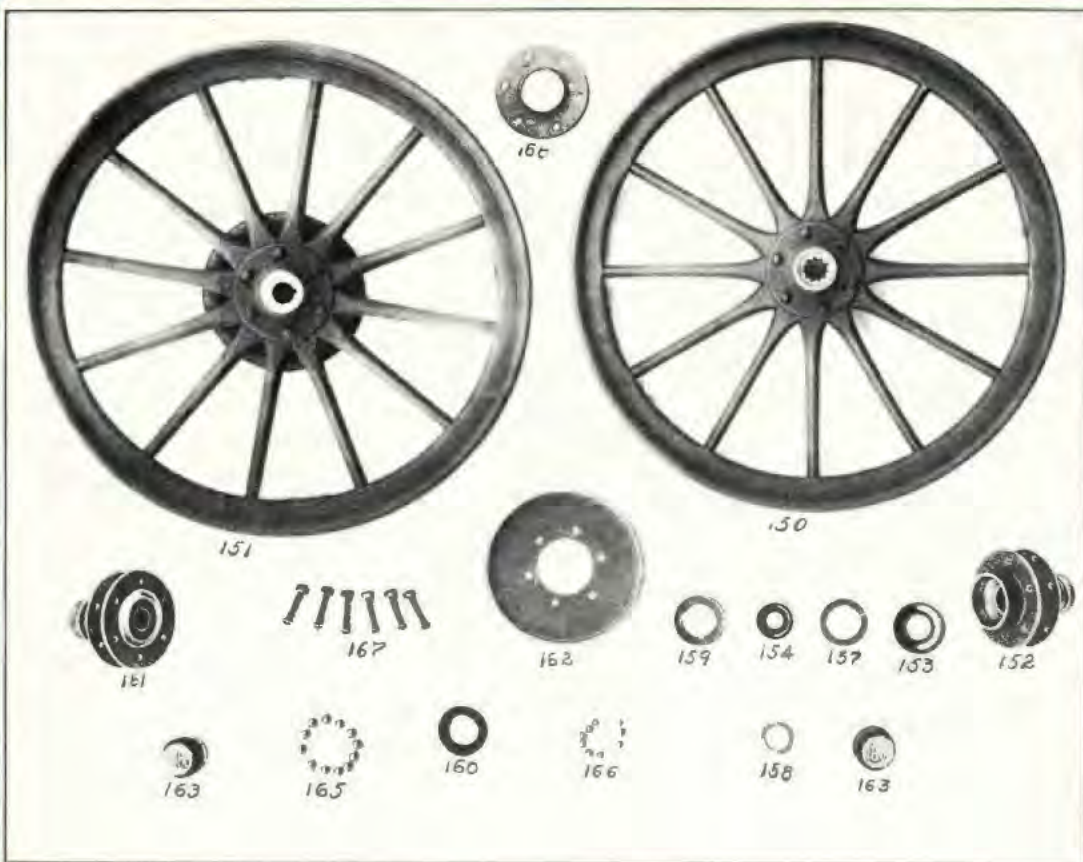
miss which you cannot locate in the carburetor, it may be well to remove both exhaust and intake pipes and carefully replace them.

When adjusting needle valve do not give it a quarter or half turn at a time, but change the adjustment by very slight degrees, waiting after each change until the motor has had time to get the new mixture.

When adjustment has been made care should be taken to tighten the setscrew which holds the needle valve and the thumb nut which holds the air adjustment so that neither of these can change their position on account of vibration of the motor. Sometimes the act of tightening the setscrew will change the adjustment slightly in which case, with a pair of pliers give it a very small fraction of a turn to the left, until you have obtained the desired results.

The average owner, thinks the carburetor should be adjusted before the car leaves the factory and forever after require no further attention. This is impossible for many reasons, one of which is that the new car being stiff in every bearing—if it was not it would soon become loose and noisy when the bearings had properly seated—makes it impractical to adjust the carburetor for very slow car speeds without making it so sensitive that the unskilled driver will frequently stall his motor when starting. Another reason is that the more economical a carburetor is, the more sensitive it will be to climatic changes. Variations of altitude and other climatic conditions—the difference between sea air and the lighter air of inland sections—make it necessary that each carburetor should be adjusted to meet its own peculiar climatic conditions.

Also as no two drivers handle a car exactly alike the same carburetor adjustment will never suit two individuals. Again; while theoretically possible to adjust a carburetor to give satisfactory results at both slow and extremely high speeds, no carburetor has ever been made in which it was possible to

**CARBURETORS—Continued**

1111	Auxiliary Air Thumb Lock Nut	.30
1112	" " Valve Seat	1.00
1113	Center Member	2.25
1114	Spraying Nozzle	.25
1115	Gasket	.05
1116	Priming Trap	.25
1116A	" " Screw	.05
1117	Gasoline Needle Valve	.50
1118	Needle Valve Set Screw	.05
1119	Throttle Gate and Screws	.25
1120	" " Lever	.65
1121	" " Adjusting Screw	.05
1122	" " Set Screw	.05
1123	Gasoline Intake Packing Nut	.10
1124	" " Elbow	.25
1125	Primer, complete	.40
489	Carburetor Flange Gasket	.05

**WHEELS**

150	Front wheel complete, including Hub Cap (specify color and rim)	12.00
151	Rear Wheel complete, including Hub Cap (specify color and rim)	12.00
152	Front Hubs complete with flanges, bearings and races	6.00
153	Large Races	1.40
154	Small "	.80
157	Large ball Retainers	.20
158	Small "	.20
159	Dust Rings, steel (front)	.40
160	Felt Washers (front)	.10
161	Rear Hub with flanges, each	6.00
162	" " Brake Drums	2.00
163	Hub Caps, each	.75
165	Large Balls, each	.05
166	Small "	.04
168	Hub Flanges	1.00
167	" Bolts and Nuts	.15

Always designate model of car and number of motor when ordering parts

obtain maximum efficiency under both conditions with the same adjustment.

In a case of irregular firing of the engine which is remedied by a very slight turn of the needle valve either way, and a frequent recurrence of this condition generally indicates that a small particle of foreign matter has become lodged in the needle valve, a slight turn of which will serve to dislodge it temporarily, unscrew the needle valve and take it out so as to allow the obstruction to escape with the overflow of gasoline when it is flooded. If this does not suffice, disconnect the gasoline pipe at the carburetor, draining out tank, pipe and carburetor. Occasionally it will be found necessary to take the carburetor apart and thoroughly clean it.

Weak batteries will call for frequent adjustment of the carburetor and give no satisfactory results on any adjustment. The remedy is obvious.

It is well to remember that there are several different points at which the correct relation between gasoline and air flow will give a good mixture—at one speed. There is only one, however, where a perfect mixture for all speeds can be obtained. To get this, patience is necessary. Once mastered, the problem becomes simple.

If motor starts hard when warm the level of gasoline in float chamber is probably too low. This may be caused by the cork float having become "waterlogged" (saturated with gasoline), so it floats lower; or, by too heavy pressure on the "primer" the float levers may have been strained downward. In the latter case shut off gasoline at tank; disconnect carburetor—lift out float; measure height of fingers and then bend them upward slightly, 1-32 to 1-16 of an inch. Replace. If carburetor floods, the float is too high; remove and bend fingers down slightly. The most frequent cause of carburetor flooding is dirt between needle and seat. Remove needle; wet needle point, dip into fine pumice stone and seating needle, give 3 or 4 half turns, will remedy the trouble. If float is "waterlogged," dry thoroughly and coat with shellac. Dry thoroughly before replacing.

Be careful not to screw needle valve down on the seat so hard as to destroy the seat or cut a groove around the tapered point of the needle; this done, it is almost impossible to obtain an accurate adjustment. If done, the cure is preferably a new needle; or with a fine file or emery cloth carefully file until the groove has disappeared and the point is a true taper.

A good mixture for running is not always best for starting the motor cold. Don't change the mixture, but lay a glove over the auxiliary air port, flood carburetor and crank. It should go on the third half-turn. Remove the glove; if motor is very cold it will require a minute or two to warm up. Slow spark, and leave throttle open a notch or two; hold your hand or a glove over the intake until it begins to run regularly, after which it will perform as on the previous day.

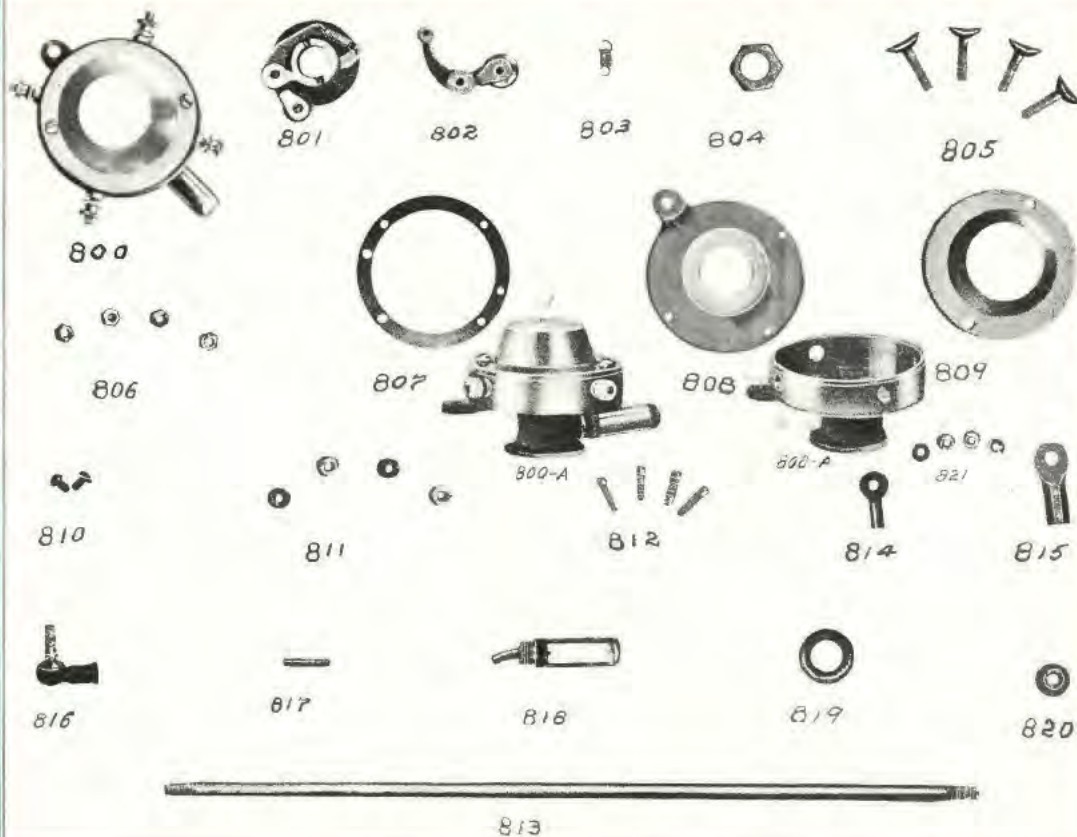
In very cold weather it may be necessary to give a slightly richer mixture—more gasoline, but this should be determined only after the motor has become warm.

It should be remembered that a carburetor adjustment made after the engine has been running so that the inlet pipe, carburetor and surroundings have become warm by the heat radiating from the motor, will not give perfect results when starting the cold engine in the morning. By laying a glove over the intake for a few seconds until the motor has gotten warmed up you will find that it will run all right although it will not run perfectly until the parts have attained the same temperature under which the adjustment was made. On the other hand if the adjustment is such as to make the engine start easier when cold it will require changing when the air under the hood and the surrounding metal has gotten warm.

Changes of gasoline will call for change of adjustment, provided the gasoline is of different specific gravity. Ordinary stove gasoline (68) if clean will give perfect results, so it is unnecessary to buy the higher priced article.

No driver should depend on another person to make his carburetor adjustments. He should go at it systematically and



**COMMUTATOR**

800	Commutator, complete	4.00
801	Brush, complete	1.00
802	Roller and Arm	.40
803	Spring	.02
804	Lock Nut	.05
805	Contact Points, each	.15
806	" Point Nuts	.05
807	Fibre with Contact Points and Nuts	1.20
808	Body	1.50
809	Cover	.25
810	Cover Screws	.02
811	Thumb Nuts	.02
812	Body Screw	.02
813	Lead Rod	.15
814	Small Wire Terminal	.04
815	Large "	.06
816	Lead Rod Ball Joint	.30
816A	Lead Rod Ball Joint Nut	.03
817	Pin (brush to Cam Shaft)	.05
818	Commutator Oiler	.20
819	Pin Collar	.05
820	Roller (state diameter)	.10
821	Contact Point Fibre Bushings per set	.10

**Always designate model of car and number of motor when ordering parts**

patiently study the problem until he has thoroughly mastered it, after which he will have no difficulty and run no risk of being stranded on the road because of carburetor trouble. There is a keen satisfaction in feeling that you can obtain any desired results by the simple adjustment of the carburetor, and once familiar with your machine this will no longer constitute a bugbear.

### **Commutator**

Many persons who "think they know," criticise the location of the commutator on the Ford runabout, forgetting that the designer has had a wider experience and a fuller appreciation of the functions as well as the troubles to which a commutator is liable, and has undoubtedly expended more thought on this problem than has any one of his critics. Simplicity and efficiency were the factors which dictated the location of the commutator—not cost considerations as some seem to imagine.

Many customers thinking "they know more than Ford" have gone to the expense of putting the commutator on a vertical shaft connected to the cam shaft by beveled gears. In every case these have, after a few weeks or months of use, gone back to the original construction, having incurred troubles of which they little dreamed. Absolute accuracy of timing—synchronous ignition—can be obtained only by the elimination of intermediary gears and other devices which may cause lost motion. The Ford engine develops more power than any other piece of mechanism of its size and weight and not a little of this efficiency is due to the location of the commutator.

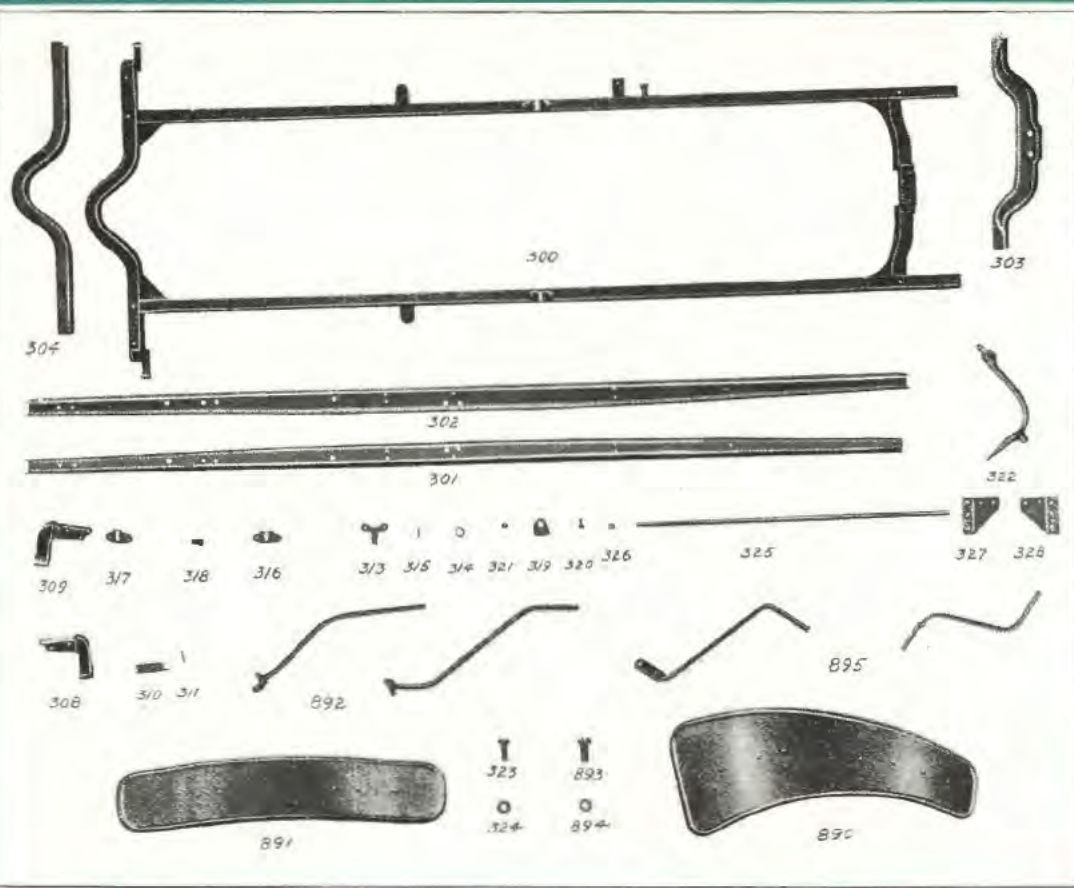
True, it is not in the most accessible place, but if kept well oiled with vaseline it should not require inspection or attention more than once a month and any motorist should be willing to undergo this trifling inconvenience in order to have greater efficiency all the time.

In making the weekly or monthly inspection of the car, clad in overalls and otherwise so equipped as to not mind a little

grease or dirt, examine the commutator to see that the fibre and the brass contact segments are not wearing unduly and that the brush roller is working freely; also that the latter is not worn on the pin so as to have excessive play. If not watched the roller is liable to become clogged with grease so that it cannot turn and it then wears a groove in the fibre and destroys the accuracy of timing. A little kerosene squirted on the operating parts will thoroughly clean them out and free them; then fresh vaseline should be inserted—no matter how much, it will not impair the contact—and the cover carefully replaced. Care should be taken that the grease cup which oils the main bearing is always supplied with oil, as otherwise this bearing will wear and allow the commutator to wobble on the shaft, destroying its accuracy and seriously decreasing the power of the engine. In no other place can a replacement be made so cheaply which will result in greater efficiency than in the commutator or its parts. As soon as serious wear is detected care should be taken to replace defective parts, thereby saving annoyance, roadside trouble and a heavier bill finally.

Two commutators of the same type but varying slightly in detail, have been used on the Models N, R and S. The one is composed of a fibre ring attached to a brass plate integral with the main bearing, and the other has a brass flange which completely encircles the fibre ring. The first is called herein "No. 800," and the second "No. 800A." As the different parts vary slightly it will be necessary in ordering to state whether your particular commutator is 800 or 800A.

We would strongly warn all Ford owners against the use of any other commutator than those supplied with the cars. Every type of commutator that has proven at all practical has been thoroughly tried and these have been adopted as representing the highest degree of perfection so far obtained in the matters of simplicity, efficiency and durability. There are many types of commutators which will work satisfactorily for a short time but this is the only type which we have found which will stand up for any length of time and give uniform service.



### FRAME AND "N" FENDERS

300	Frame, complete (state color)	25.00
301	Side Frame (right)	9.00
302	" " (left)	9.00
303	Front Cross Member with Spring Perch	5.00
304	Rear " "	4.00
308	" " Spring Support (right)	2.75
309	" " " (left)	2.75
310	" " " Pin	.50
311	Pin for Rear Spring Support Pin	.05
313	Brake Pedal Bracket	1.00
314	" " " Collar	.32
315	" " " Pin	.10
316	Controlling Shaft Bracket (right)	1.00
317	" " " (left)	1.00
318	" " " Felt	.05
319	Body Brackets, each	.10
320	" " Bolt	.04
321	" " " Nut	.02
322	Step	1.00
323	" Bolt	.05
324	" " Nut	.03
325	" Truss Rod	.40
326	" " " Nut	.05
327	Rear Gasket Plate (right)	.50
328	" " " (left)	.50
890	Front Guards, each	.50
891	Rear " "	.50
892	Front Fender Iron, right or left	.25
893	Fender Iron Bolt	.10
894	" " " Nut	.04
895	Rear Fender Irons (front or rear)	.25
896	Fender Clip, old style	.30

Always designate model of car and number of motor when ordering parts

The same is true of every other feature of the Ford car; but inasmuch as there are many enterprising persons engaged in trying to sell "better" commutators for Ford runabouts, (10,000 possible customers is an irresistible temptation), we feel it necessary to specially warn our patrons against this type of parts makers. (Next to the commutator vender, coil and carburetor salesmen are the most diligent and expensive pests who prey on Ford owners.)

If it becomes necessary to remove the commutator to replace it with another, the simplest way is to disconnect spring clips and loosen the bolts which hold the engine and transmission frame together, slipping transmission back an inch, or sufficiently to allow of taking the commutator off the shaft.

As all parts of commutator subject to wear, viz., fibre, contact points, brush, etc., can be removed from body and new parts substituted, it should not be necessary to take off commutator body at all.

An occasional inspection should be made to see that the commutator wires have not dropped down so as to come in contact with the moving parts of the transmission—high speed clutch spider—this will result in wearing the insulation off the wires causing an intermittent miss-fire, which is very difficult to locate as it may occur only when its spark-advance lever is in a certain position. The wires should be loose enough to permit the commutator to turn freely without unduly bending the wires at the terminals and yet not sufficiently loose to get in the way of moving parts.

See also that the wires do not come in contact with the exhaust pipe so the insulation will be burned off and an irregular "short" developed.

**TO DISCONNECT COMMUTATOR**—Remove the brass cap; unscrew lock-nut; withdraw the steel cap which is held in place by the lock nut; this exposes the retaining pin, drive out the pin and the commutator may be removed from the cam-shaft. To replace, reverse the operation, being careful to get

each part in its proper place. For information as to proper setting and wiring of commutator, see diagram herewith

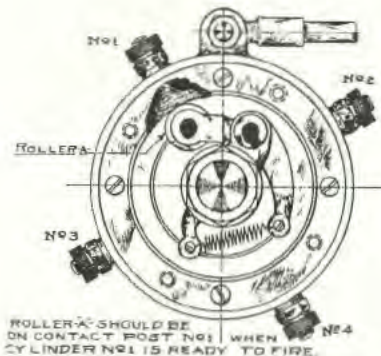
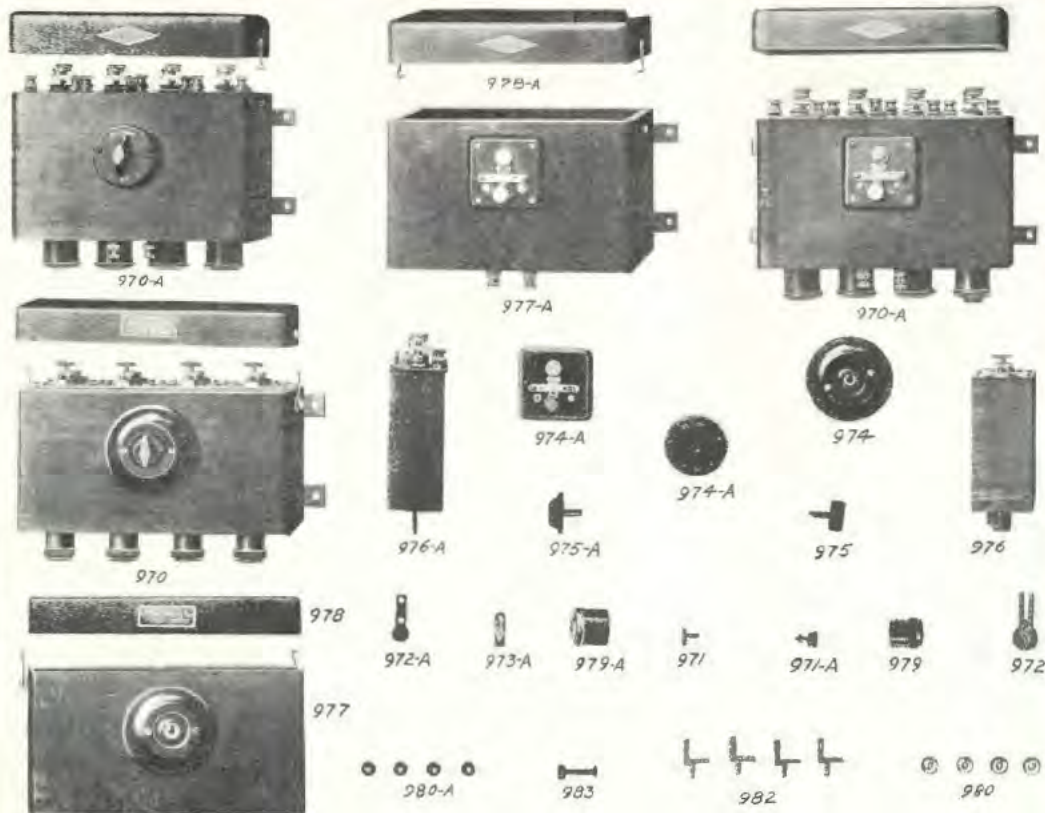


Diagram Showing Proper Method of Setting Commutator:

Sand and dirt, unless frequently washed away, will accumulate on the outside of the commutator, held there by the grease. This is bound to cause more or less trouble, and of the kind that is difficult to locate. Flush the outside of the commutator with gasoline once every week.



## COILS

970	Heinze Four Cylinder Spark Coil	25.00
971	" Adjusting Screw with platinum point	1.00
972	Vibrator with Platinum Point	1.50
974	" Switch	1.00
975	" Plug	.25
976	Units	5.00
977	Case	5.00
978	Cover	1.50
979	Rubber Sleeves	.25
980	Thumb Screws	.15
970A	Splitdorf Four Cylinder Spark Coil	25.00
971A	" Adjusting Screw with platinum points	1.00
972A	" Vibrator hammer	.25
973A	" Vibrator Spring with Platinum Point	1.00
974A	" Switch (state round or square)	1.00
975A	" Plug	.25
976A	Units	5.00
977A	Case (state kind of switch)	5.00
978A	Cover	1.50
979A	Rubber Sleeves	.25
980A	Thumb Screws	.25
982	Coil Dash Brackets	.25
983	Coil Dash Bracket Bolt and Nut	.10

Always designate model of car and number of motor when ordering parts.

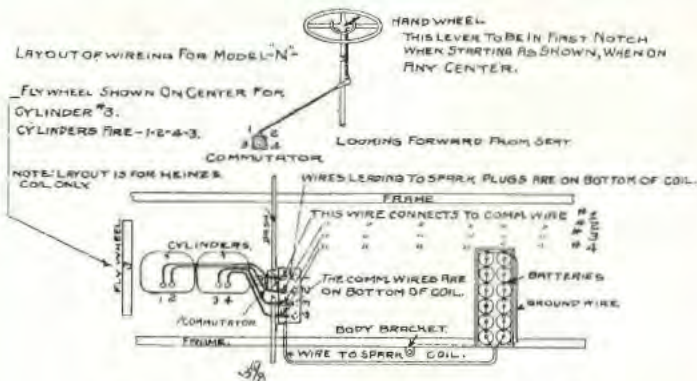


Diagram Showing Method of Wiring—Heinze Coil:

### Coils—Batteries

The most delicate part of an automobile is the coil; and yet, with proper care it should outlast the life of the car. Notwithstanding there are only one or two troubles which may occur in the coil which can be corrected by an ordinary driver or electrician, the average person has a hobby for monkeying with his coil, and a long and varied experience has taught us that about 99 per cent. of the coil troubles have risen through this inclination of the average user to go to the coil first and to some more likely place afterwards.

Too much battery current will sometimes "break down" the condenser of a coil and burn off the platinum points. Aside from this, ordinarily, all the coil troubles are due to inexperienced tampering. Not knowing what is inside, and having a curiosity to know, or in a vain hope that they may be able to

discover something, the average user will disconnect the vibrator supports and every other movable part on the coil. Trouble is certain to follow, and the only way it can be corrected is to send the coil to the maker.

A broken down condenser may be due to imperfect insulation, or the insulation may be burned out by an over strong current. In either case, you can do nothing with it, but send it to the maker for inspection and repair. Once you are convinced the condenser has broken down, the less you monkey with it the better, as you may more than double the expense.

### Coils

There are many fallacies about the "economy of battery current" in some coils as compared with others. It may be

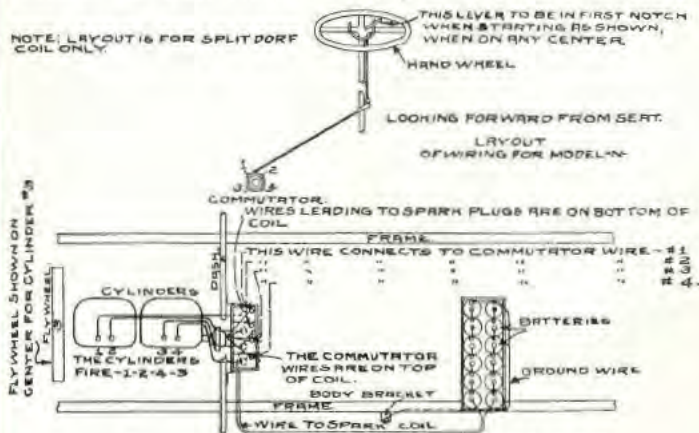
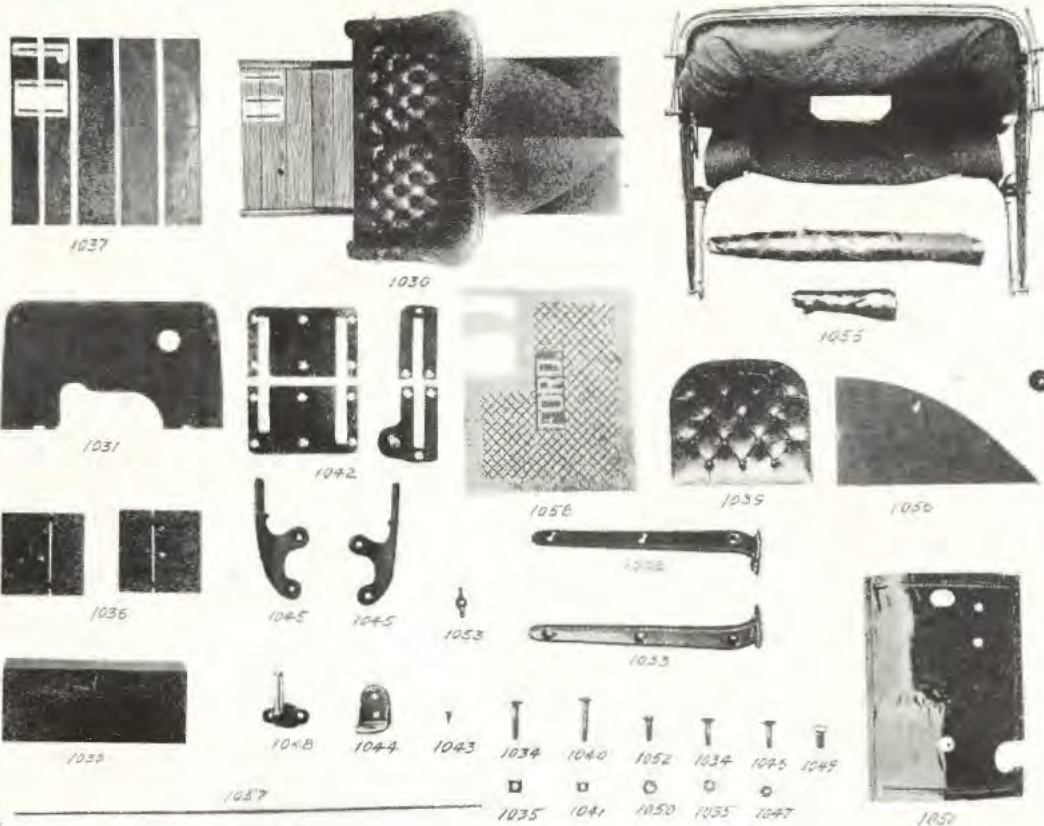


Diagram Showing Method of Wiring—Splitdorf Coil:



### BODY (N. & S.) AND PARTS (N. R. & S.)

1030	Body complete, finished and upholstered	75.00
1030A	Body only	35.00
1030B	Seat with Cushions	30.00
1031	Dash complete state color)	6.00
1032	" Bracket (right)	.25
1033	" " (left)	.25
1034	" " Bolt (state long or short)	.10
1035	" " " Nut	.05
1036	Seat Bottoms, each	.50
1037	Floor (five pieces) without guide plates	2.00
1038	Battery Box	.50
1039	Cushion, right or left, each	5.00
1040	Body Bracket Bolts, each	.05
1041	" " Bolt Nuts	.05
1042	Foot Pedal Floor Plates, per set	2.50
1043	" Plate Screw	.05
1044	Lamp Bracket (right or left)	.50
1046	" " Bolt	.10
1047	" " " Nut	.05
1048	Rear Lamp Bracket	.50
1049	" " " Bolt	.10
1050	" " " " Nut	.05
1051	Drip Pan	3.00
1052	" " Bolt	.10
1053	" " " Nut	.05
1055	For Tops write for Accessories Catalog	5.00
1056	Rear Deck Door	1.50
1057	Brass Moulding on Dash	1.50
1058	Rubber Mat (state size)	1.50
1059	Dash to Body Brackets	.15
1060	" " " " Bolt	.05
1061	" " " " " Nut	.02
1059A	Dash to Body angle Brackets	.15
1059B	" " " " " Bolt	.05
1059C	" " " " angle Bracket Nut	.03

Always designate model of car and number of motor when ordering parts

set down as a maxim that economy of current can only be secured by the sacrifice of other more desirable qualities.

The question resolves itself into the following simple terms: If you want a good spark in the cylinder, and certain ignition under varying atmospheric and other conditions, you must put the necessary current through the coil. You cannot get something for nothing. A coil having more winding than another will offer more resistance to the battery current, use less and deliver less to the cylinders. Technically, "E. M. F.=C.—R."—Electric Motive Force equals Current less Resistance. The less resistance in the coil, the more current through the plugs. When it is considered that the "economy" of some coils over others—each adjusted with equal care—will amount to perhaps one dollar a year, it will be seen that real economy consists in getting a spark and saving time in needless roadside adjustments of carburetor and other parts which are not at fault at all.

Current consumption may be regulated by adjustment of the trembler. For ordinary usage this should be adjusted loosely so the sound will be a dull buzz instead of a high note. Splitdorf coils, such as are used on Ford runabouts, should be adjusted so as to draw one-half to three-fourths amperes. Heinze coils, three-tenths to five-tenths amperes. In the case of racing cars we adjust the coils to draw three to three and one-half amperes. With that adjustment it delivers a very fat, hot spark but of course eats up the batteries very rapidly. Inasmuch as speed and certainty are the only requisites, battery current does not count under racing conditions.

**AMMETER**—Every owner should have an ampere meter and test the adjustment of his coil instead of doing it by guess work.

**COIL ADJUSTMENT**—Set vibrators as loose as possible by turning the adjustment screw until the contact points almost touch. Turn your engine over to position where the vibrator will buzz; turn adjusting screw to the left until vibrator will emit

an even, low buzzing sound without any blurring. A high note indicates too tight adjustment, and while this will give a hotter spark and more certain ignition it will consume an excessive amount of battery current.

To ascertain which, if any, of the four plugs are fouled with oil, short circuited with carbon, or inoperative from some other cause, open the throttle two or three notches to speed up the motor: now hold your two fingers on two outside vibrators so that they cannot buzz. The evenness of the exhaust will show that the other two are working correctly and that the trouble is not there; or, procontra, an uneven exhaust will indicate that it is between the two that are free. If the two cylinders fire evenly change the fingers to the two inside vibrators and again listen to the exhaust. Having ascertained in which pair the trouble is, hold down three fingers at a time until you find the one on which the motor does not fire. This will indicate in which plug the trouble is. Cylinder No. 1 is front cylinder, and they number in rotation 1-2-3-4. No. 1 coil unit is the one next steering post and they number 2-3-4 to the left.

Before deciding that your coil is the cause of the trouble inspect every other possible source of trouble. In ninety-nine cases out of one hundred you will locate it elsewhere. The first symptom of a broken down coil is a buzzing of the vibrator with no spark at the plug. A short circuit in a secondary wire will produce the same effect, so be sure it is not a short circuit before blaming it on the coil. A good way to test is to remove the wire from the cylinder in which the trouble occurs and connect a new wire from coil to plug, being sure there is no chance for a short circuit in the latter. Once certain that the trouble is in the coil and that it cannot be remedied by a simple adjustment of the vibrator, a better plan is to send coil to the maker.

An unusual case of trouble which looked like a broken down coil occurred recently. After driving through a heavy rain and through water puddles several inches deep, enough water had been thrown up on the bottom of the coil to thoroughly saturate the wood, inside as well as out. The current from the





981

985



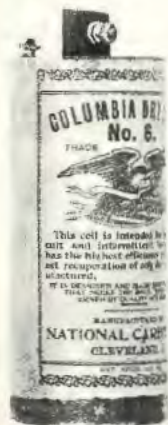
991



988



986



990



992



987

**BATTERIES, PLUGS, ETC.**

981	Cell Connections	.10
985	Secondary Wire Terminal	.10
986	Wire from Coil to Commutator (each)	.25
987	Battery to Coil Wire	.25
988	Ground Wire	.25
990	Batteries (dry cells)	.25
991	Spark Plugs	.75
992	Storage Batteries (40. amp-hour)	14.00

Always designate model of car and number of motor when ordering parts

secondary terminal followed the water back to the dash support, and of course, grounded.

Never meddle with the coil or its parts, except to make an inspection every week or two to see that all nuts are tight and everything in place, so that no mysterious short circuits will occur from this cause. In looking for a short circuit it should be remembered that the secondary current is a static, or alternating, current and will "creep" on any liquid—water, or oil mixed with dirt. The current creeping on the oil will form carbon on the outside of the insulation of the wires and will finally form a short circuit that will cause a lot of trouble and be difficult to locate. One of the chief causes of excessive battery consumption is the presence of water or oil on the primary wires. It is a good plan to renew all wiring every three or four months; the small expense of doing this will well reward you in immunity from ignition troubles.

**PLATINUM POINTS**—Excessive battery current or long usage will cause the platinum points to pit. As they do not wear away evenly this causes them to stick occasionally or to deliver a "drizzling" spark. The remedy is to file the surface off carefully, using a piece of fine emery cloth wrapped around a flat file, knife blade or other suitable article. Be sure to file the surface flat so as to give a good contact. If burned entirely away, replace with new one.

One symptom of a "leak" in the condenser is a very "fat" bluish spark at the vibrator points. To make sure that this is the cause of the trouble put a spark gap of about one thirty-second of an inch between the secondary wire and the plug. If the condenser leaks the spark will be irregular at the gap.

## **Storage Batteries, Dry Cells and Plugs**

It should be remembered that a new storage battery does not give nearly so good results as one that has been frequently

re-charged. With each re-charging its capacity increases and you will find it will become more satisfactory the longer you use it.

There are many theories and many fallacies about storage batteries. You will find the one you have is always the worst made—when a salesman for another comes around. Each claims certain points of superiority and each proves that the other is no good. The one that is backed by the best salesman sells for the highest price. Our tests of batteries, as of everything else, are more extensive than the average man can make and you will find that the only way you can improve on the regular battery will be to buy one of the same make but of larger capacity—more ampere hours.

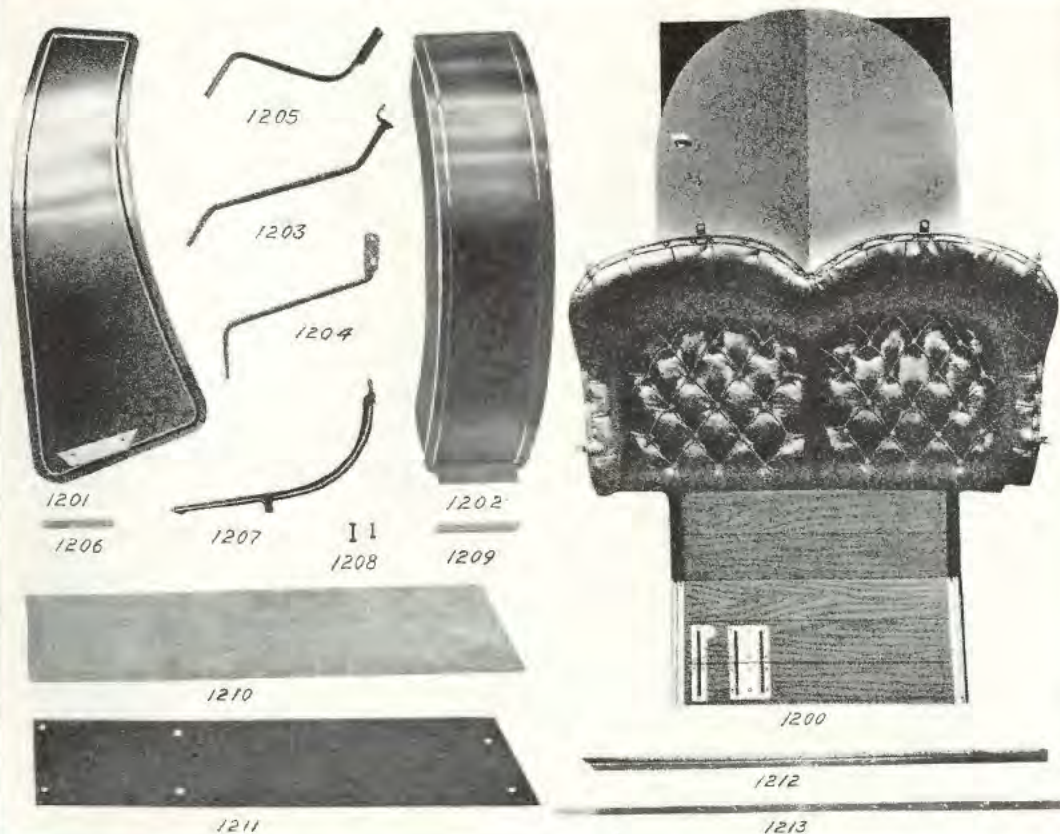
In connecting storage batteries always be sure that the positive pole—marked "P"—is connected to the coil, the negative pole—marked "N" to "ground."

A fruitful cause of trouble is the corrosion of the wires inside the storage battery terminals. The wires should be disconnected every two weeks at most, carefully scraped with a knife and "doped" with vaseline or other grease to prevent corrosion. A good plan is to solder a piece of pure lead wire onto the brass wire, using the lead to connect to battery terminal, as lead will not corrode. Batteries, either storage or dry cells, should be securely fastened in the box so they cannot shake around or jar out of place. Broken wires and loose terminal nuts are the result of this.

**EXHAUSTED BATTERIES**—Ninety per cent. of the "carburetor" troubles are in reality battery troubles. In driving a car of the speed capabilities of the Ford runabout, few people realize how many miles they cover in a day in city driving unless they have an odometer to keep them informed. They are, therefore, in the habit of expecting entirely too much of batteries.

A storage battery should be re-charged at least once every two weeks, and oftener if the car is driven constantly.

**STORAGE BATTERIES**—While, with proper care, the life of a storage battery is long, it can very easily be ruined or its



### "R" BODY AND "R" & "S" FENDERS

1200	Body	\$80.00
1201	Front Fender	2.00
1202	Rear Fender	3.00
1203	Rear Fender Iron (right or left rear)	.25
1204	Front " " ( " " " )	.25
1205	Rear " " ( " " " front)	.25
1206	Running Board Brass (rear)	.20
1207	" " Bracket	.75
1208	" " Bolt and Nut	.05
1209	" " Brass (front)	.20
1210	" " Rubber Mat	.75
1211	" " Complete	3.50
1212	" " Brass (outside)	1.00
1213	" " (inside)	.60
1214	Brass Screws doz.	.15
1215	Running Board Truss Rod	.40

Always designate model of car and number of motor when ordering parts

## A year hence they'll all be talking Vanadium steel—Ford taught them the meaning of the word

charge quickly exhausted by improper methods. For example: a favorite method among garage men for testing the power of a battery is to lay a file, screw driver or other steel instrument across the positive and negative poles. This not only discharges the battery very quickly, but seriously injures the plates by the violence of the discharge. If you have no volt meter and want to test the strength of the battery by "rule of thumb," take a piece of wire a few feet long, rest one end on one pole of the battery and then touch the other—not allowing the two ends to rest for more than a fraction of a second.

A storage battery should never be allowed to remain in the car after it has run down. It should be re-charged at once. Allowing it to stand sulphates the battery and causes considerable injury. A storage battery, when newly re-charged, should show about six and one-half volts on open circuit. When below six volts it requires re-charging.

One cause of deterioration of storage batteries is in the failure of owners to watch the liquid in the battery and see that it does not evaporate until the top plate is exposed. The liquid should cover the top at all times. The liquid is chemically pure sulphuric acid of a density of 1.75. It can be gotten at any garage or place where storage batteries are sold or used.

In connecting up storage batteries always be sure to connect the positive pole to coil and negative pole to ground. If this is done the platinum points on the vibrator will last much longer, as the deterioration will be confined almost entirely to platinum point in the end of adjusting screw, and as the latter is much cheaper and more easily replaced the above instructions should always be carefully observed.

**DRY CELLS**—Dry cells should show fifteen amperes when new, not less than twelve. With proper coil adjustment they will work down to about five amperes although it is unsafe to start on a trip of any length with them below six or seven. It should be remembered that one cell in the set registering less than five amperes will draw the entire six down to its level—in other words, if five cells each show ten amperes and

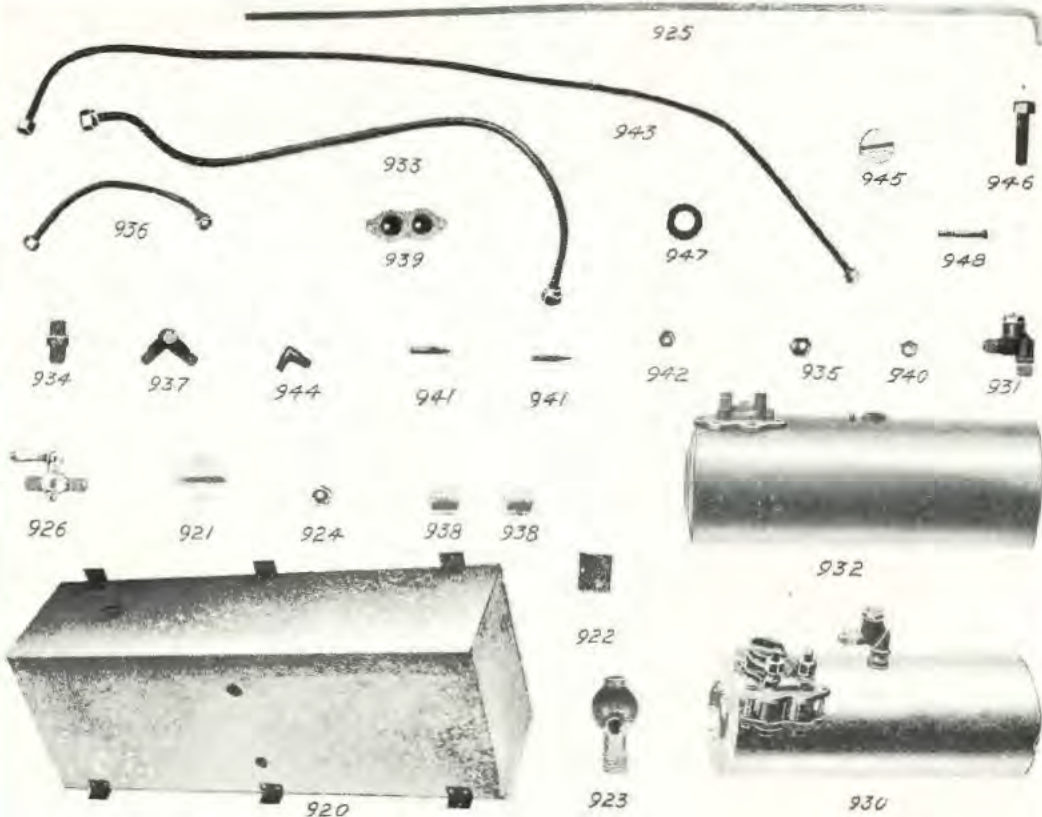
one shows four, four amperes is all you have to go on, and this is insufficient. Dry cells cannot be re-charged—they can only be renewed, and most people consider them not worth the trouble and expense.

In an emergency, however, as when caught on the road a few miles from home, with weak dry cells, the following expedient can be made to serve a good purpose. Drill a small hole through the sealing compound on top of each battery and fill them up with water—only a few spoonful will be required for each. Be very careful not to allow the water to run down the side so as to saturate the cardboard, as the cardboard is an insulation between the negative poles of the batteries. Your batteries will then carry about ten miles without further trouble.

Dry cells are uncertain at best and should not be depended on for long trips. A 6 volt, 40 to 60 ampere-hour storage battery re-charged regularly every two weeks will solve all your battery and nine-tenths of your ignition and "carburetor" troubles.

In no case should more than 6 volt storage battery be used nor more than 6 Columbia Dry Cells. More than this will deliver a spark hotter than necessary and will certainly burn off the platinum points very rapidly and perhaps result in breaking down the coil.

**PLUGS**—Sparking plugs are so well made now-a-days that they give very little trouble. Every motorist should carry half a dozen extra porcelains to fit his plugs and these can be readily replaced in case of the porcelain cracking from overheating. Some drivers have a great deal of plug trouble, while others using the same cars and the same plugs, claim they "never see a plug." It is unnecessary to tighten the thumb screw on top of the plug with pliers—in fact, this should never be done as you are liable to turn the core and thereby open or close the spark gap more than is desirable. Tighten the nut with the fingers just sufficiently so it will not come off and get lost.



### GASOLINE TANK - FORCE FEED OILER

920	Gasoline Tank	3.50
921	" " Filling Cap	.50
922	" " Brackets	.08
923	" " Sediment Bulb	.25
924	" " Feed Pipe Pack Nut	.04
925	" " " "	.65
926	" " Tank Stop Cock	.40
930	Oiler complete, including pipe and all connections	10.00
931	" " Check Elbows (on oiler)	.50
932	" " Reservoir	5.00
933	" " Pressure Pipe	.75
934	" " " " Connections to Exhaust Pipe (elbow)	.25
935	" " " " Pack Nuts	.05
936	" " Feed Pipe to Crank Case	.50
937	" " Check to Crank Case (elbow)	.25
938	" " Sight Feed Glasses, each	.10
939	" " " " lower half	.10
940	" " " " Pack Nuts	.05
941	" " " " Adj. Needles	.25
942	" " " " Pack Nuts	.05
943	" " Pipe to Drive Shaft	1.00
944	" " Connection to Drive Shaft (nipple)	.05
945	" " Reservoir Cap	.15
946	" " Connecting Bolts to Crank Case	.05
947	" " Sight Feed Glass Screws	.03
948	" " Gauge Glass Washer	.05
949A	Oiler Gauge Glass with Flange	.25
949	" " Sight Feed Glass Washers	.02

Always designate model of car and number of motor when ordering parts

In case of a foul plug on the road when you do not want to spend the time to clean or change it, a good expedient is to create a spark gap by disconnecting the wire and, with a string or shred of waste, tie it to the plug so the brass terminal will be about 1-16 or 1-32 inch from the plug core or nuts will generally suffice to remedy the trouble, temporarily at least. Speaking of spark gaps; they are undoubtedly efficacious in causing a sooty plug to perform, but they use up twice as much battery current as is necessary without them so should be adopted only as emergency expedients.

A "miss" in a motor just after starting cold, will usually disappear after a minute or two as the motor warms up. Sometimes only after high speed clutch has been engaged. Usually a "miss" can be remedied by "slowing" the spark—putting lever as far forward as it will go. This gives a long hot spark at the points and serves to burn away oil or other foreign matter lodged there. A drop of water—precipitated by quickly cooling a hot motor—between plug points, a drop of oil or particle of carbon can frequently be dislodged by disengaging the clutch and racing the engine a few seconds.

## **Lubrication**

Makers of high priced foreign cars still consider the simplest form of hand pump sufficient for all purposes, and so when an American buys a foreign made car, paying as many thousands as we ask hundreds for the same power, he is willing to use the hand pump and to replenish his oil supply whenever necessary. The American craze for automatic devices, however, demands that every function of the machine be performed without any attention on the part of the driver, and so we have a plethora of automatic oiling devices, mechanical and otherwise. There is a difference of opinion as to the accuracy and

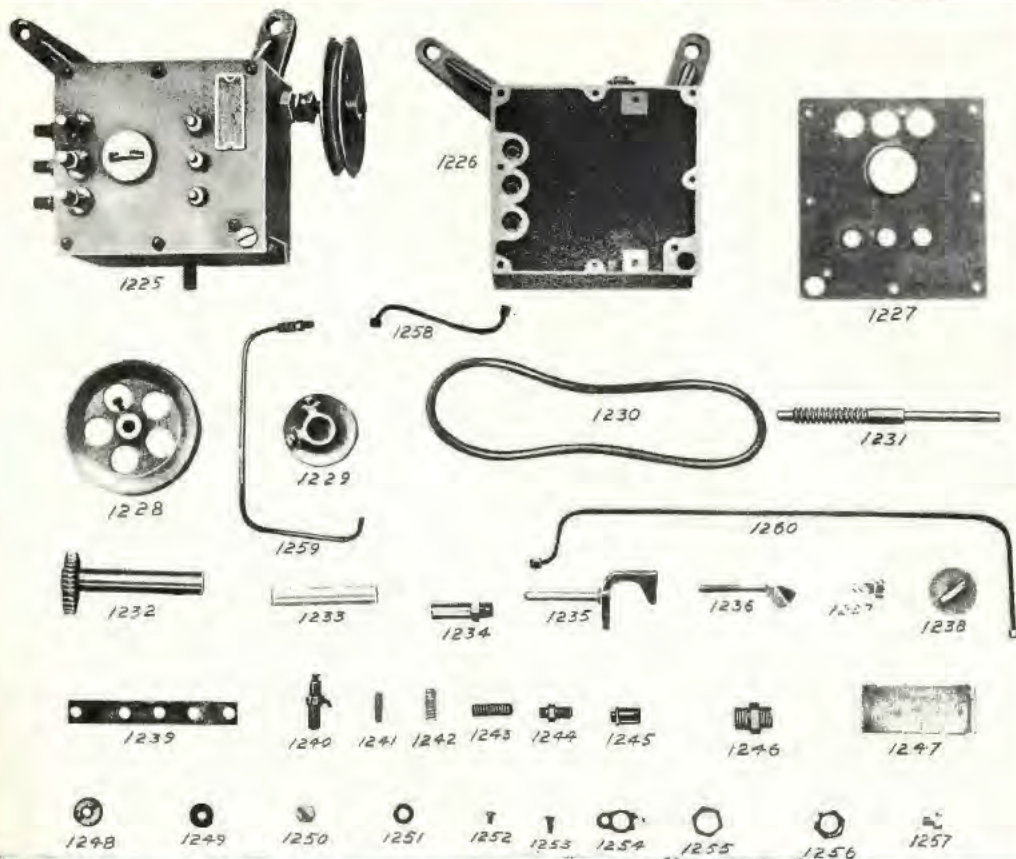
certainty of these devices. For the man who will take the trouble to thoroughly understand his oiler and to carefully adjust it to the engine's needs—and these needs are determined entirely by the peculiar methods of each individual driver—we believe no other oiler has ever been made that is more efficient, more certain and reliable than that which has long been used on Ford cars and which is fed by pressure from the exhaust. However, to meet popular demand we have equipped a number of the later Model R and Model S cars with a 3-feed mechanical oiler, which combines the qualities of efficiency and simplicity to a greater degree than any other we have so far been able to find or design.

The catalogue states that your oiler has a capacity sufficient for 150 miles. This is absolutely true, as has been proven by many owners, provided the car is driven at a moderate pace and the motor is never allowed to race when clutches are disengaged.

It is a crime to race a motor. It is little less a crime to drive a car at its highest speed for any considerable distance—especially when it has as much reserve power and speed possibilities as these Ford runabouts.

When the engine is driven to its limit, the oil is not consumed but is thrashed into a spray—a vapor—by the rapidly revolving cranks, and the excessive pressure set up in the base soon forces it out of the case. Most cases of worn engine bearings is due to this cause. While your car may be driven all day, covering a distance of say, 150 miles or over on one filling of your tank and with oil enough at the start to cover the bottom of the case three-eighths of an inch deep, it may all be threshed out in five minutes by driving full speed or by letting the engine race that long. A driver who understands and appreciates this will have no engine bearing troubles.

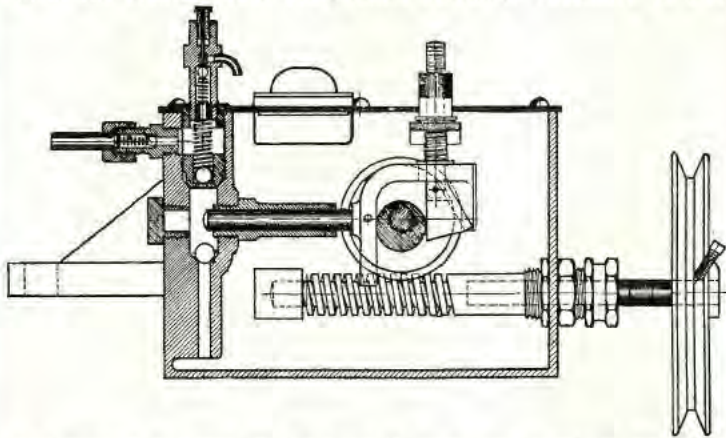
**TO ADJUST OILER**—Not knowing the individual characteristics of each driver it is impossible to say just how many drops of oil should feed to the engine base, but 30 or 40 drops per minute, when engine is running at moderate speed, is about

**McCORD OILER**

1225	McCord Oiler, complete	15.00
1226	Reservoir	4.00
1227	" Cover	.50
1228	Oiler Pulley on Oiler	.50
1229	" Drive Pulley on Cam Shaft	.30
1230	Driving Belt	.30
1231	Drive Shaft	.10
1232	Eccentric	1.70
1233	Gauge Glass	.20
1234	Stuffing Box	1.70
1235	Yoke	.60
1236	Plunger	.10
1237	Eccentric Screw	.05
1238	Filler Cap	.15
1239	Cross Bar	.25
1240	Bleeder Nozzle	.05
1241	" Spring	.05
1242	Plunger Spring	.05
1243	Stud	.10
1244	Oiler Pipe Nipple	.30
1245	Adjusting Button	.10
1246	Shaft Bushing and Collar	.10
1247	Strainer	.20
1248	Bleeder Bushing	.25
1249	Fibre Washers	.05
1250	Gauge Glass Plug	.15
1251	Plug Washer	.05
1252	Cover Screw	.05
1253	Cross Bar Screw	.05
1254	Adjusting Button Spring	.05
1255	Lock Nut	.15
1256	Packing Nut	.15
1257	Pump Plug	.05
1258	Oil Pipe to Crank Case	.50
1259	" " Front end Crank Case	.50
1260	" " Drive Shaft	1.00
1261	Oiler Bracket to Frame	.15
1261A	Cam Shaft Front end Bushing for McCord Oiler	1.00

**Always designate model of car and number of motor when ordering parts**

right. One or two a minute for front bearing and universal joint will be ample. It is best to remove the side plates frequently and examine the oil level until you have ascertained how much feed is necessary to maintain a uniform level in the crank case, and if the oiler is not sufficient to maintain this, put about a half pint in at the breather tube every other morning. Inasmuch as dirt



and carbon collects in the base in very fine particles and will eventually get into the bearings, the oil should be drained out of the engine every two or three weeks and a fresh supply put in. It is well to mop out the base by removing the side plates, using waste saturated with kerosene to cut the oil away.

One Ford owner, who claims he has driven 15,000 miles, and who asserts his engine is better today than when he first received it from the factory, makes it a practice to pour two gallons of kerosene through his engine every two weeks. He removes the plugs over the valves and, pouring a small quantity

in each cylinder, works it down past the pistons by cranking the engine over by hand. When told that it was not necessary to use so much he replied that two gallons of kerosene was cheaper than any other way he knew of to keep the engine in perfect condition, and while he might use a quart with satisfactory results, he felt safer in using plenty. A ride in his car, and the hill climbing demonstrations with it proved the correctness of his theory. The kerosene removes carbon from piston heads—unless it has been left long enough to become caked hard—cleans out the grooves, frees piston rings, cleans valves and finally rinses out the bearings in the crank case.

**DIRECTIONS FOR OPERATION AND REGULATION**  
**FORCE FEED LUBRICATOR**—It will be noticed that the entire mechanism of this lubricator is in the reservoir submerged in oil. One pump is used for each outlet, the stroke of each pump being regulated by the rising or lowering of the adjusting wedge which is accomplished by turning the adjusting button to the right or to the left.

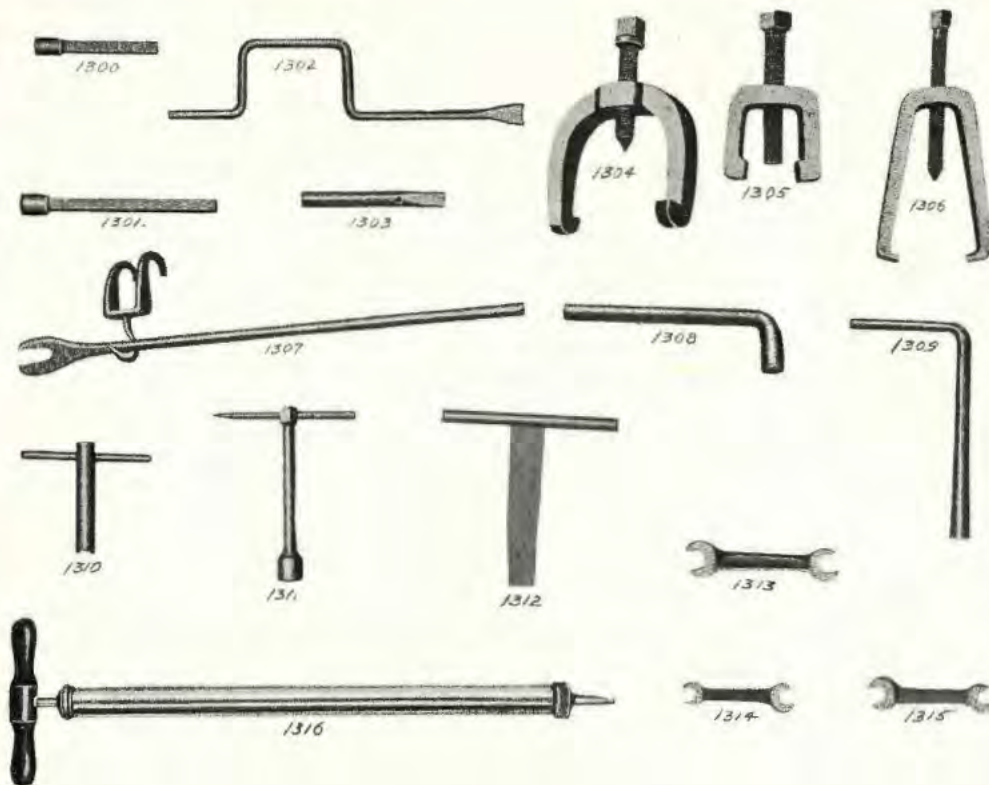
No. 1—Fill reservoir to within three-quarters of an inch of top.

No. 2.—Lubricators are shipped regulated to feed the maximum amount and when first started should be run at full capacity until oil shows at points of lubrication.

No. 3.—To regulate the flow of oil—Start the engine at normal speed and regulate the proper amount of oil for each point of lubrication by turning adjusting stem to the right for more oil and to the left for less. This operation should be repeated for each feed. The amount of oil being pumped from each outlet will be shown at bleeder test stem when push button is depressed. When being tested, the supply of oil is forced through the bleeder cock instead of the bearings. The push buttons should be released when test is completed.

**ENGINE CRANK SHAFT BEARINGS**—If engine is kept properly lubricated at all times (i. e. a constant level of about three-eighths inch in bottom of case), the old oil removed and



**SPECIAL TOOLS**

1300	Piston Pin Socket Wrench	.25
1301	High Speed Clutch Socket Wrench	.30
1302	Valve Grinder	1.00
1303	Transmission Band (low, reverse and brake) Socket Wrench	.25
1304	Fly Wheel Puller	2.50
1305	Wheel Puller	2.00
1306	Gear Puller	2.00
1307	Valve Spring Lifter	1.50
1308	Cylinder Bolt Socket Wrench	.30
1309	Radiator Wrench	.30
1310	Pump Packing Nut Wrench	.25
1311	Firestone Tire Wrench	.35
1312	Valve Plug Wrench	.25
1313	End Wrench No. 288	.25
1314	" " No. 289	.25
1315	" " No. 291	.25
1316	Dope Gun	2.00

**Always designate model of car and  
number of motor when ordering parts**

all sediment carefully washed away with kerosene about every two weeks and new oil substituted; crank shaft bearings should give no trouble in a year's use at least. In fact, there are several thousand of these cars on the road considerably over a year, none of which have given any trouble.

The universal joint which connects transmission shaft with driving shaft is lubricated from the pressure oiler. One drop a minute is sufficient for this, but care should be exercised to see that it is feeding at all times. The oil from the universal joint works down along the shaft into the differential case and finally out at the axle ends. If too much oil comes out, getting on the tires, cut down the feed. If this does not cure the trouble remove rear wheels and see if end of axle tube is covered with a thin brass cap. If not, order one and put on. This will effectually prevent a further recurrence of this trouble. The differential case should be refilled with heavy oil (Albany grease mixed with cylinder oil in proportion, four of Albany grease to one of oil—just thin enough to go through the dope gun) every thirty days,—oftener if car is driven constantly and hard. Go over every grease cup and refill; also with a small oil can, squirt a few drops into every moving part, as spring and steering connections, rear axle supports, and all other parts. This will prevent mysterious squeaks when driving, and prevent wear.

If oil does not feed freely through sight feed of pressure oiler, disconnect tube leading from exhaust pipe, at oiler. It may be clogged, in which case, plug muffler with a ball of waste, start motor and the exhaust pressure will blow out accumulations of carbon from the tube. Examine sight feed valves also and clean thoroughly. Run kerosene through feed tubes to clean them.

### Special Tools

We publish herewith photographic reproduction of special tools, which every repair shop, having Ford business, should

have. Also any owner who takes care of his own car should possess them.

It is not necessary that you buy these from us—most of them can be made by any good machinist. We will, however, supply any of them at the prices quoted, for convenience of customers and agents.

The end wrenches shown are standard, and under the numbers given, may be obtained from any hardware store.

The "dope gun" is one of several types which may be used with equal facility. There should be two nozzles—a large one for heavy grease and a small one for oil.

For a valve grinder, an ordinary carpenter's brace fitted with a "bit" having two projections to engage the holes in the valves makes a good combination. There are many ways of making a satisfactory valve lifter—the one shown is excellent when much of this work is done, as in a large repair shop.

For removing radiator (No. 1309): Cylinder bolts (No. 1308); pump gland (No. 1310) are very necessary, while special socket wrenches Nos. 1301 for adjusting high speed clutch and 1303 for transmission bands (low, reverse, and brake) should be always in the car.

For removing and replacing bushings, every repair shop should have a bushing driver to fit each size in the car. This is simply and cheaply made. Take a round steel bar six inches long and about 1-32 inch smaller diameter than the outside of the bushing. Turn one end down so it will slip into the bushing, leaving a square shoulder about one inch from the end.

A combination Volt Meter and Ampere Meter (watch pocket size) is a handy instrument for testing both storage and dry cells. Use ampere meter for testing dry cells, and volt meter for storage—never use ampere meter unless for storage as it will likely ruin the instrument.

Other handy tools are: one or two pairs of pliers—small and large—small machinist's hammer; eight inch monkey wrench and small bicycle wrench; small oil can; sheet of fine emery paper for cleaning spark plug points and coil trembler con-

tacts; good tire pump and repair kit; extra inner tube, and double handful of clean white waste. A cheap linen duster or pair of overalls is a grateful protection for good clothes when repairing a tire at the roadside.

### **Motor**—(Continued from page 9)

cap and main section of the connecting rod; remove this shim and file it down until, when the cap is drawn up tight by the connecting bolt, it is a close fit on the crank shaft.

To adjust piston pin bearing, remove the side plates as above, turn the crank shaft over until the piston is in the most accessible position and the connecting rod out of the way of the hand; with a socket wrench (No. 1,300) tighten up the set screw in the upper end of the connecting rod. The bearing section and bronze bushing are split, and by tightening this set screw the ends are pinched together. Be careful to get a close fit and yet not make the bearing bind.

If babbitt bushing has been burned out, permitting the bearing to run dry, it will be better and cheaper to send the connecting rod to the factory for re-babbitting. Our practice in this is to send you immediately a new connecting rod, charging you only for rebabbitting—\$1.00.

The object of using babbitt bearings instead of bronze is to guard against cutting the shaft in event of the bearing being allowed to run hot. If the trouble is detected before the babbitt has entirely melted out the shaft will not be cut seriously, but it is always well to inspect carefully and see whether it has suffered in this regard.

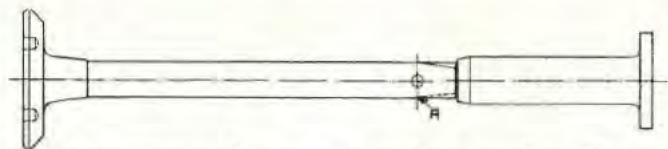
**TO REMOVE FLY-WHEEL**—Using a pipe wrench, unscrew the starting crank ratchet which acts as a retaining nut. The brass pump gear will then come off. As the shaft is tapered it is only necessary to start the fly-wheel when it will come off easily. Special fly-wheel puller No. 1,304 or a similar device should be used. If extreme care is exercised a few slight taps,

cushioned by a block of wood, on the end of the shaft will suffice, but as stated above, a crank shaft should never be subjected to such treatment. It is cheaper to buy or make a puller than incur the risk of springing the shaft. In replacing, be sure the fly-wheel goes on true, so it will not wobble when running.

**INSPECTION OF CAMS**—If the motor seems to produce less power than formerly—and you have ascertained that it is not due to carburetor adjustments, weak batteries, leaking or sticking valves, or carbon deposits in cylinders, it would be well to inspect the cams or pushers and see that they are not worn so as to reduce the lift of the valves. By raising the valves, using short pieces of steel or wood to hold them open, then tying the valve lifters up with a piece of string, it will be possible to remove the cam shaft without disconnecting the cylinder or removing crank shaft.

**TO REMOVE CYLINDERS**—Use special socket wrench No. 1,308. First disconnect ignition and water connections, exhaust and intake pipes, then remove bolts, which hold cylinders to crank case and lift off. In replacing cylinders take a piece of wire, 18 or 20 inches long (about 16-18 gauge steel or brass) and depress the upper piston ring so the cylinder will slip over; using the wire on each piston ring in turn will enable you to replace the cylinders with little trouble.

When valves or valve lifters become worn so as to leave unusual play between them, thus reducing the lift of the valves and diminishing the power of the motor, one of two things should be done; either replace the valve lifter with a new one or draw the valve stem out until there is a space about the thickness of a sheet of paper or 1-32 in. between them. In drawing out the valve stem extreme care must be exercised not to bend it, as this will cause the valve to stick or wear the seat and guide unevenly. The better plan is to draw out the end only below the hole—see cut—any blacksmith can do this. If too long, file off, being careful to leave a straight flat face.



WHEN NECESSARY TO LENGTHEN VALVE, DRAW FROM POINT 'A'; AS SHOWN BY DOTTED LINES.

**VALVES**—Valves should be ground at regular intervals—about every three months—whether they leak or not. The grinding of the seats will cause them to seat accurately and prevent uneven wear of the guides and consequent leaks past the valve stems—a condition which results in the most puzzling symptoms in the carburetor and unevenness in the running of the motor.

**TO GRIND A VALVE SEAT**—This operation requires care and skill. Place on the valve a small quantity of very fine ground glass, or, if this is not obtainable, very fine emery powder. Use sufficient oil to make a very thin paste, being careful not to allow the paste to run into the cylinder. The valve is then rotated back and forth, being firmly pressed down against its seat at the same time.

Occasionally lift the valve, change its position a part of a turn and drop down, then rotate as before. This prevents carrying a particle of emery or grit round and cutting a groove in the seat.

Noisy half-time gears are due either to worn teeth, or, more likely, to worn cam shaft and crank shaft bearings which permit the gears to get out of true mesh. Examine gears and if excessive wear is not apparent, try shafts for looseness and play. If the latter, replace bushings.

**TO REMOVE CAM-SHAFT**—First disconnect motor from transmission and lift out of chassis; remove commutator; loosen

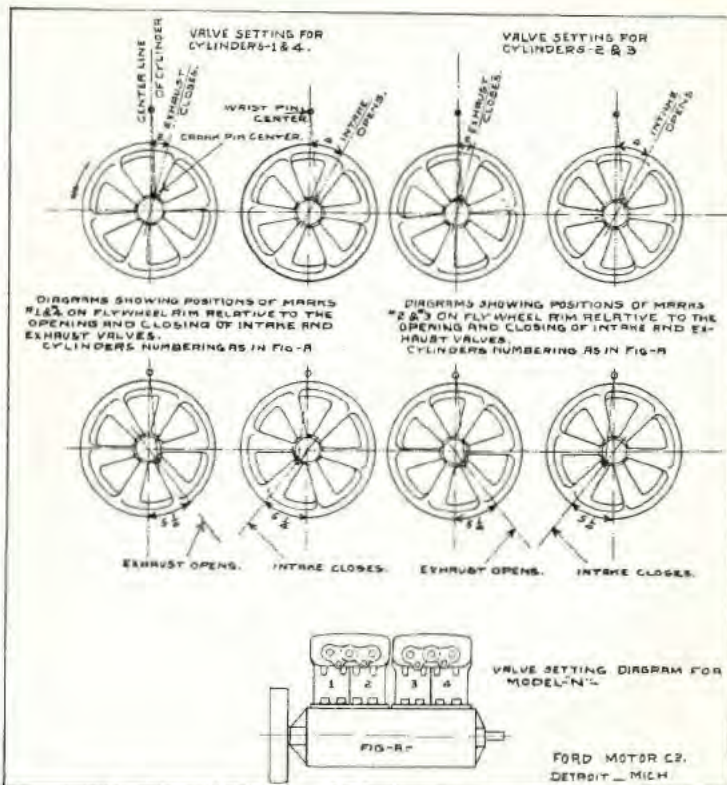


Diagram Showing Proper Method of Timing Valves:

set screws which hold cam-shaft bearings in place. Shaft and its bearings may then be withdrawn through end of engine case.

To replace, reverse operation being careful to mesh the gears as they were before—gears are marked, one punch mark being on a tooth and another between the two teeth which the first meshes.

The cam-shaft is a one-piece drop forging with all cams integral. It is impossible, therefore, for cams to become disarranged; only to replace on account of excessive wear should it become necessary to remove it.

**TO SET VALVES** see diagram page 51.

## General

Persons who have an imperfect understanding of the principles of the light weight, high powered gas engine, which alone is suitable for and capable of meeting the exacting service of motor car usage, frequently inquire why the maker does not "gear the car lower" and thus guard the driver against his own recklessness in the matter of speeding.

The aim of the designer is to make every part as light as possible so as to reduce the yearly tire bill—the most expensive item of motoring—and at the same time to equip the car with surplus power to meet the most severe road condition—sand, mud, soft clay, or hills—and to navigate such roads without having to change gears. If you have this surplus power available for the above conditions, there is no way to prevent you applying it under the most favorable conditions—and that gives you forty-five miles an hour. There is no law but common sense to prevent reckless driving any more than there is to prevent the use of fire arms or other necessary though dangerous agents by foolish persons.

It should be remembered, however, that driving a car at its limit of speed is most expensive. An athlete may run a hundred yards in eleven seconds, but the strain is so severe it will show

up in a prematurely aged man a few years later. Just because it is made of metal instead of flesh and bone and muscle, is no reason why extreme effort is not injurious to a motor or a chassis. As a matter of fact, racing machines, though built most carefully and of the best materials obtainable regardless of cost, are very short lived.

Every time you send your car to its limit you apply all the power the motor can develop and you strain every part severely. If you are willing to pay the price, it is your own affair, but one hour's driving at forty to forty-five miles an hour—and your car will do that if properly adjusted—will take more out of it than several months of reasonable driving.

**MAGNETOS**—The gullibility of some owners in allowing magnetos to be attached to their cars without first inquiring of us as to the probability of results and damages, has caused many coil troubles on Ford runabouts of late. As stated elsewhere, 10,000 possible customers is an irresistible temptation to makers and salesmen of automobile accessories—coils, batteries, carburetors, plugs, and magnetos. These, having in mind only the sale of their wares, and caring nothing for the customer or the future welfare of the other parts of the car, talk glibly of "more power," "economy," etc.—and get the money. Next thing we hear is that Ford coils are bad, the batteries useless or the carburetor little more than an excuse for a real carburetor. This, despite the fact that the other 9,000-odd cars are performing every day in the most satisfactory manner, not having been changed in any particular. The attachment of a magneto—unless one furnished or endorsed by us—will almost certainly result in injury to the coil and other parts. In such cases we decline to be held responsible or to make any concessions.

We have probably done more experimental work along this line than all the other manufacturers put together and we have not yet succeeded in getting a magneto that we thought was suitable for this car at a price that was reasonable. Magnetos which work through the coil undoubtedly give more power

and, at low speeds, may prove satisfactory, but at high engine speeds they are liable to burn out the insulation of the condenser, and are certain to burn off the platinum points very rapidly.

"Governors" that sometimes fail to perform are poor dependencies in these cases.

**ODOMETER**—Every car should be equipped with a small odometer so that an account of the exact mileage can be kept. This will prove a very profitable investment in more ways than one. First, you will be surprised at the mileage your car makes in a year, and you will be able to more accurately gauge your gasoline, oil and battery consumption and tire cost. We have known owners of Ford runabouts to claim they could not get 100 miles out of a set of 6 Columbia Dry Cells, and yet we have letters from other owners who have driven their cars over a year—some of the very earliest ones—and who claim they average 600 miles on a set.

**WEAK BATTERIES**—When your car develops an apparent looseness everywhere—so noisy and rattley it seems as if every part of the machine is hopelessly worn, try re-charging your storage battery or installing a fresh set of dry cells—you will find the trouble was due to irregular firing of the cylinders—lagging, so that the interval between impulses causes back lash in gears, excessive vibration and jerky running of the car. It's remarkable what a lot of ills a fresh battery will cure.

**TIRES**—Tires not in use should be kept in some dark place where the atmosphere is moist, preferably in a cellar. When the car is laid up for the winter the wheels should be raised off the floor and the air pressure in the tires reduced sufficiently to just keep the tires distended. It should be borne in mind that tires deteriorate less under moderate usage than when stored away. It should also be remembered that tires are one of the chief items of expense in the maintenance of a car and that proper care will more than double the life of a set of

them. Every owner should, therefore, study the peculiarities of rubber and learn how best to treat his tires to retain their resiliency.

**CARBON DEPOSIT**—This is one of the most fruitful sources of trouble in a gas engine. If the cylinders get too much oil a portion of it will work up past the pistons; the intense heat will consume or evaporate the oil, leaving a deposit of carbon; this may be augmented by too rich a mixture, which serves to deposit lamp black or carbon in a film on the inside and top of the compression chamber and on the heads of the pistons. The films thus formed will in time commence to scale and, the projections becoming fused by the heat of explosions, will serve to prematurely ignite the charge.

The symptoms are back-firing and knocking in the cylinders—as if the spark were too far advanced. An almost infallible symptom of excessive carbon deposit in the cylinders is: the motor showing plenty of power at high car speeds, but deficient in hill climbing on high gear. At slow engine speeds the incandescent carbon projections serve to pre-ignite the charge, thereby reducing the power of the motor. The cure is to take off the cylinders and scrape off the carbon deposit, being careful not to scratch the cylinder walls. The preventive is to so regulate your oil feed as to give the cylinders plenty, but not too much oil.

Carbon will also form on the porcelain portion of the spark plugs, thereby furnishing a circuit which the high tension current may travel over rather than jump between the sparking points of the plug. Usually only a part of the current will pass by way of the carbon film, still leaving a weak spark at the points. This causes intermittent firing. The symptoms are similar to a poor contact in the commutator.

This condition is difficult to detect, for the reason that when the plug is subjected to the usual test of removing from the cylinder and closing the electrical circuit, the spark is seen to jump free and "fat" between the points. This, because the

electrical energy which is sufficient to jump between two points  $\frac{1}{2}$  inch apart in the open air will jump less than 1-16 of an inch in the chamber under 60 pounds compression.

**OVERHEATING**—The cause of overheating in motors may be summed up as follows: Poor oil, insufficient oil, bad mixture, weak spark, slow spark, obstructed muffler, broken pump, flat or obstructed water pipe, low water, and valves out of time. The pump may be broken and still circulate the water. The radiator will get hot because slow circulating water does not cool as fast as fast circulating water. Occasionally the pin which holds the pump on shaft may shear off. Remove cover plate and replace pin.

### Common Sources of Trouble

There are a few common sources of trouble which may affect the operation of a gasoline-driven carriage and which we have mentioned in the order of their possible occurrence. Following these will be noted the remedy. In dealing with common sources of trouble the operator should remember that the difference between a comprehensive understanding of his automobile and the superficial knowledge possessed by many owners is the difference between success and failure. Familiarity with an automobile does not call for special mechanical ability; only a careful study of the directions and explanations contained in this book and a common-sense application of them to your car.

(1) **IMPERFECT VIBRATOR ACTION**—The vibrator can be seen by opening the top of the spark coil box; and this trouble can generally be corrected by changing the position of the adjusting screw on the top of the coil or by cleaning the platinum points. The indications of this trouble are uncertainty in starting, skipping of explosions and irregular action when running.

(2) **DIRTY SPARK PLUG**—This trouble can be corrected by removing the spark plug with an ordinary monkey wrench. The plug can then be cleaned, using brush or emery cloth together with some clean gasoline. If the spark plug points are badly burned, they may be cleaned with very fine emery paper or cloth, or fine sandpaper. The points on the spark plug should be 1-32 of an inch apart.

(3) **EXHAUSTED BATTERIES**—The remedy is obvious.

(4) **LOOSE OR BROKEN WIRES**—Troubles Nos. 4 and 5 must be discovered by inspection. In an engine well cared for and properly adjusted so as to turn easily, nearly all failures to start promptly and run regularly are electrical, easily found and quickly remedied. Do not waste time and patience in cranking an engine, for, if in proper condition, it will start as surely and run as regularly as a locomotive. One of the most annoying troubles to locate is a wire which is broken in the insulation. This can only be discovered by taking the cable in each hand between the forefingers and thumbs, and going over the wiring inch by inch.

(5) **A WEAK COMMUTATOR SPRING**—This will give all the symptoms of No. 1. That is, uncertainty in starting, skipping of explosions, and irregular action when running. It is the least liable to occur and the easiest to discover. If this trouble is suspected remove the cover on the commutator, when it can be easily located.

(6) **WORN COMMUTATOR**—The symptoms of this are similar to Nos. 1 and 5. It results from failure to keep a supply of lubricant in the commutator. The arc formed by the break in the current as the roller leaves the bronze segments, gradually burns the metal away, causing uncertainty of conduct and hence weak or uneven explosions. Take off the commutator, put in a lathe and turn about 1-64 inch or less off from the inside—being careful to turn it evenly.

(7) **WATER OR DIRT IN GASOLINE**—A globular trap is provided below the gasoline tank to catch sediment or water

and prevent it getting into the carburetor. This will arrest a limited amount of water or sediment, but it should be drained frequently. This should never happen if the gasoline is strained through a chamois skin. The remedy is to disconnect gasoline pipe from the carburetor and drain thoroughly. It may be well to completely drain the tank and refill with fresh clear gasoline.

**(8) FROZEN WATER IN CIRCULATING PIPES AND PUMPS**—This must never be permitted to occur as the operator should use an anti-freezing mixture in cold weather, or else drain the tanks and water system after the return from every run. No attempt should be made to run the engine when in a frozen condition as it is liable to break the pump and damage the engine beyond repair. The water cooling system must be thawed out by the use of warm water.

**(9) STICKY VALVE STEMS**—One of the most annoying troubles and sometimes one difficult for the amateur to locate is a sticky valve stem, causing the valve to stay off its seat and thus lose compression, or else seat itself so slowly that the engine will not run up to speed. This trouble can be remedied by removing the plug over the valve. The valve will then be exposed. Use plenty of gasoline or kerosene to wash the thick oil off the stem, turning the valve by hand. In most cases it can be cleaned sufficiently without dismounting it.

**(10) LEAKY VALVES**—These make themselves manifest by loss of compression, easily discoverable by cranking the engine. When this trouble occurs the valves should be ground to a good seat, using the process described elsewhere.

**(11) WEAK VALVE SPRINGS**—When the valves fail to seat themselves promptly the springs may be weak and should be looked after. A weak inlet valve spring makes itself evident by back-firing through the carburetor. A broken inlet valve key will give much the same indication. Substitution of new springs or parts is the obvious remedy.

## Pertinent Pointers

Know your car, but don't tinker unnecessarily. Give the manufacturer credit for knowing his business until the contrary has been demonstrated.

A full chauffeur and a full automobile can result in but one way—the chauffeur gets what is coming to him, but it is too bad about the car.

A mania for making adjustments indiscriminately is responsible for as many car troubles as is the habit other drivers have of neglecting needed repairs until the part gives out.

You have the right, inasmuch as it is your car, to experiment in the effort to show how much more you know about it than the original designer—but you do it “for better or for worse” and must accept the consequences.

No two drivers ever-agree as to the adjustment of a carburetor, the position of a spark or throttle lever, or the adjustment of clutches or brakes; therefore it is a bad habit to let others drive your car; you will find it out of adjustment invariably.

It is not possible to lose control of an automobile, though some drivers do “lose their heads.” You can stop quicker by applying the brakes gradually than by locking them so severely as to slide the wheels; the minute the car begins to slide it is just as liable to go sideways as forward.

Do not expect a set of springs designed to carry two and ride smoothly with that load, to transport four people and still retain their proper form and resiliency.

Skidding is frequently caused by a too severe application of the brakes. When your car skids, as it will sometimes do when turning corners at speed on wet pavements, release the brakes and clutch, throttle down the motor, keep your head and hold the car pointed in the direction you want to go.

Driving on very slippery pavements skidding can be entirely avoided by driving with spark and throttle only instead of using brakes to slow down; to slacken speed, put spark lever as far



forward as it will go, close throttle and run against motor. Use brakes only for full stop, and then "gingerly."

**DON'T HARBOR HOBBIES**—Persons who in their early driving days were harrassed by one certain kind of trouble are liable to blame every future trouble to the same cause—and usually they are wrong; also there are motorists who, like some other people, have a hobby for symptoms—they read the instruction book or listen to the tales of other motorists and begin to imagine they have the disease—the tinkering to find out frequently induces it.

### Inspection and Care of Car

No matter how carefully locked with spring washers, or cotter pins, every nut and bolt in an automobile will work loose from time to time. This is due to the vibration and the various strains to which a car is subjected. Every nut and bolt should be inspected at least once every two weeks to see that all are tight. Bolts which hold engine and transmission in the frame, spring clips and steering connections especially should be frequently inspected. It would seem that if the nuts were thoroughly tightened when the car was built, and fixed with cotter pins through castellated nuts, they should not require further attention unless purposely disturbed. This is erroneous. You can turn on a new nut until you twist the head off the bolt, but after running a few days the bolts will seat themselves and you will find the nut will require at least a part of a turn. This will occur frequently during the season. Intake and exhaust pipe clamps should be tightened occasionally. These will work loose even though the nut cannot turn on the thread.

**INSPECTION**—Immediately after coming in from a drive, and not just before starting on a pleasure trip, is the time to inspect every part of a car for loose nuts, spring clips, injury to tires or other parts, and then is the time to correct them.

It is well to remember that the only other person in your city who is vitally interested in the satisfactory performance of your car is—the Ford representative. Agents for competing cars are as vitally interested in its non-performance, and so serious a factor has this car become we have known of many cases of malicious tampering with the motor, coil and other parts to "put the car out of business."

Wherever possible, therefore, your car should be kept in the garage of the Ford agent—better still, at your own home—and it should be taken to him for all repairs and adjustments you cannot make yourself. So notorious is the tendency of competing garage men to tamper with Ford cars, some of our agents positively refuse to make the slightest adjustment, gratis, if they know the car has passed through the hands of other agents.

When an agent tells you he "threw up the Ford agency," take it with a grain of salt. More likely his treatment of customers or his methods of dealing did not meet with our strict ideas and rules in these matters. Anyway, it will be well to have all future repairs made by the man who is still interested in the good performance of your car—the present Ford agent or branch manager.

**LEARN YOUR CAR**—We have an agent in the West who has a number of Ford Runabouts in his city, and who has yet to make his first complaint, to ask for his first replacement, to renew a bearing or to kick about a carburetor or coil. We wondered why and went to see. Found he was a first class steam engineer; that he appreciated the need of adjustments—that it takes time to get a new machine into running order—and that it pays to nurse it the first few weeks. He has the happy faculty of imparting this knowledge to his customers—and he is energetic and honest enough to do so.

He says, "For some years my business was installing large steam power plants. They were made by the best concerns in the country. They were perfect when set up, but we—three or four of us—stayed with them every minute day and night for the first few months, waste in hand, wiping, oiling, inspec-

ing,—inspecting, oiling, wiping. Every few minutes we would feel the bearings to see that they were not running hot. Every day we would remove and carefully examine the oil cups to make sure they were feeding—that no dirt had gotten in and that the ducts had not become clogged. At first we would use a gallon of oil a day on one bearing of, say  $4\frac{1}{2}$  inches diameter. Gradually we would reduce this, watching unceasingly for trouble. At the end of six months she was running perfectly, without a sound or a jar and that same bearing was running on half a pint of oil every twenty-four hours."

If only automobile owners could have that training!

This same agent puts in half a day on every car he receives, adjusting the carburetor to meet his own climatic and road conditions—and teaching the new buyer how. Some agents when told this, say they cannot afford the time; he says he cannot afford the time they spend arguing with and pacifying disgruntled customers. That half day is all he ever will need to spend on that car—unless it collides with a railway train. It won't collide with a curb or hydrant—he is too careful to teach the owner the fine points of driving.

This man says it will take a month of careful adjustment from day to day, looking into the crank case frequently to see what is doing there, to adjust the oiler to the particular needs of each driver—and if another driver gets hold of the car it won't suit him, then.

He says his customers get 100 to 150 miles on a quart of oil—and his customers back him up in it.

He says he never received a Ford car that wasn't just as good as the best—that there are no "bad" carburetors on Fords, but that all need adjustment to suit the roads, weather, and the driver's own methods. In short, he says that the owner or agent who realizes what other kinds of machines require and gives a Ford car a fractional part of that attention, that man's name will never become known to the claims department.

**REPAINTING**—Once a year every car should have a thorough inspection and overhauling, replacing worn bushings and

other parts. This is a good time to enhance the outward appearance of your equipage by repainting. A properly painted car looks as good as new, and if properly used during the preceding months it actually is.

Avoid flashy colors and freakish combinations, especially if you wish to sell or exchange your car for a later model. Stick to standard colors as these will always command a higher price than any other. The same may be said with regard to changes of body, fenders or other details—the standard car just as turned out of the factory will always more readily appeal to the average taste and command a higher figure than any "improvement" you can make. Every Ford agent should be prepared to repaint your car for you and the cost should not exceed \$35.00. Time is the chief essential—time to let each coat dry thoroughly. Lack of time—the necessity for hurrying the output to satisfy impatient customers was the reason Ford cars were not more highly finished this season—you can correct that during the winter.

**WASHING THE CAR**—For the benefit of owners who care for their own cars we add a few hints on the proper method of washing. As the finish is apt to become ruined by improper care, these suggestions, if followed out, may possibly be the means of saving the owner considerable expense.

If city water pressure is handy the carriage should be thoroughly rinsed off with cold water by means of a hose, being careful not to get water on the ignition apparatus or wires. Until the mud has been thoroughly softened and rinsed off by the water, do not rub it, as the particles of sand and grit will scratch the varnish. After the dirt has been loosened and washed off, the carriage should be gone over with a coarse sponge (a large sponge is essential) and a fair quantity of good, soft automobile body soap. This removes the surplus oil and grease from the running gear and body, and adds a lustre to the finish. The soap should then be washed off with the sponge, together with the hose and cold water, after which the car should be rubbed perfectly dry with a soft, clean chamois.

**A CLEAN CAR**—The average driver considers his car clean when the body has been washed and brass polished. And the mechanism is clean if the bearings are free.

Few appreciate the value of thoroughly cleaning the outside of the motor, transmission and other exposed parts.

A New York man who owns Ford runabout No. 56,—one of the very first of the \$500 models and who boasts that he has never made a roadside repair or adjustment—never even hesitates on his way to anywhere—and whose car never takes the dust from any other car,—not even another Ford—attributes his “good luck” to the fact that twice a week, he goes over his engine—cylinders, crank case, valve springs, wires, transmission gear, and all other operating parts with a handful of waste well soaked with kerosene. If a “miss” occurs he can inspect with some chance of detecting anything that may be wrong or out of adjustment. And he won't ruin clean clothes, cuffs, or soil his hands doing it. Oil accumulations on a motor will result in dust and grit accumulation, and these will surely result in trouble and expense. That's why locomotive and stationary engineers are always wiping—everything is shining, nothing concealed by dirt.

Any change from standard construction or equipment of Ford cars, cancels the manufacturer's guarantee. While you may not appreciate the fact that the application of a carburetor not specially designed for the car, may result in rear axle trouble, this is nevertheless a fact. Irregular running of the engine acts most severely on crank shaft, transmission gears, rear axle gears, differential, and the tires. The Ford guarantee covers the Ford car as made by Ford—not as tampered with by someone who thinks he knows, but does not.

The man whose motoring bills are excessive, is the one who does not realize that bearings must wear, that moving parts must be regularly and sufficiently but not excessively lubricated, and that replacements of worn bearings should be made before absolutely necessary instead of waiting until the damage has been done to shafts, gears and other parts.

Half the pleasure of motoring is in the satisfaction one derives from mastering the problems, the principles and the functions of your motor and learning how to diagnose cases of trouble, to cure, and finally to prevent their recurrence.

There is a keen delight in knowing that the good behavior of a car is due to one's own intelligence and care, while any defect is a cause for chagrin.

Make it a practice to inspect all parts of the engine and transmission once a week, and to give the entire car a good look over, oiling, tightening nuts, and searching for evidence of wear.

Don overalls and jumper and go at it in earnest—you won't mind a little black grease—and you can grapple with problems of dirt—with wrenches—in a whole-hearted way.

Because one section of a fracture shows rust, indicating that the member has been partially broken for some time, some persons jump to the conclusion that the part must have been defective when it left the factory. This is not necessarily the case at all. Few breaks occur at the moment the part gives way. More often the fracture was made earlier and under a more severe shock than the one which finally severed the part. The original shock did the damage, but a small additional wrench was necessary to complete the job. While to the unpracticed eye the nature and cause of such a fracture is not easily determined, experience, aided by the microscope, enables us to tell with unerring accuracy, and our decision to allow or not to allow a claim for replacement is based on the most painstaking examination.

## Anti-Freezing Solutions

**ANTI-FREEZING SOLUTION**—A satisfactory anti-freezing mixture must offer protection against freezing down to reasonably low temperatures and must not injure any part of the mechanism nor cause any chemical action to take place,

neither should it leave any insoluble deposits on the internal parts.

There are several excellent formulae for anti-freezing mixtures and we will be pleased at any time on receipt of request to give the latest information available on this subject. Here is one we can recommend. Equal parts of glycerine, wood alcohol and water. (2) Calcium chloride is a cheaper solution but must be used with caution as too much will injure the radiator and other metal parts. Two and one-half pounds of chloride to 1 gallon of water is about the proper proportion. A little glycerine, about 1 pound, added, will tend to neutralize the injurious effects of the chloride.

### **Warning**

Owing to a large number of unscrupulous concerns who have already begun to prey upon Ford owners (tempted by the fact that there are now 10,000 possible purchasers for their wares) we feel it due to Ford owners to warn them against the wiles of gentlemen who, for their own good reasons, advocate the substitution of carburetors, magnetos, coils, commutators and other accessories, as well as tops, and even bodies, of their make in place of those that came with the car.

The habit of putting on extra seats is also quite prevalent in some sections, and while this is not so serious, inasmuch as the axles have ample strength to sustain the extra weight, it should not be done without changing the spring suspension; nor should extra holes be drilled in the frame for the application of other types of fenders or running boards without exercising extreme care as to where they are placed or what relation they bear to other holes. We have, so far, had no trouble with Model N. or S. frames on this score, but with former models, frames have been so weakened by careless drilling of holes as to be unsafe.

Another class of charlatans live by selling Ford owners cylinder oil, and some go so far as to put the Ford name on,

their only justification being that some unauthorized or irresponsible agent of the Ford Motor Company has given them a letter of commendation.\*

The only safe rules to follow in this matter is to positively refuse to substitute or to add any accessory to the Ford car without first obtaining the advice and sanction of the factory. The slightest change from the standard construction cancels the manufacturer's guarantee.

We are constantly improving details of Ford cars and these improvements are substituted for the original construction only after the most careful and exhaustive tests to determine their superiority. In buying such you have the backing of the maker, as well as the benefit of his greater experience.

The man who can sell you a “better top” for less than the Ford Company charges, or who tells you that his device has been tried by the Ford Company but the price was prohibitive, may be set down as a plain everyday falsifier. You will consult your own best interests by ignoring his advice and his wares.

The enormous quantities we buy enables us to get anything we want at prices well within our reach; and you can rest assured that you cannot buy a top or any other article of automobile equipment of equal quality at retail, as cheaply as we can

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\*Our experience with oils has been so extensive and our attitude now so well-known, salesmen no longer importune us to buy ordinary, or extraordinarily bad, lubricants under a fancy name. According to reports they reap a rich harvest from Ford owners, however.

We recommend to all Ford owners “Renown Engine” Oil. This may be bought at almost any village hardware store or from any agent of the Standard Oil Co. The price will vary slightly according to distance from refineries, but nowhere in the United States should you pay more than 35 cents per gallon in barrel lots, and 23 to 25 cents should be the price in most places. This oil possesses all the qualities essential for good lubrication, a sufficiently high fire test to meet all requirements and, if used in proper quantities, will leave less carbon deposit than any other oil we know of.

Any complaints about this oil, if sent direct to the Standard Oil Co., 1025 Scouten Ave., Detroit, Mich., will receive prompt attention from the manager.

sell it to you after making a good profit, because of our quantity purchases.

We would like to feel that every Ford agent has the best interests of the Ford Company and his customers at heart, but we feel it necessary to advise Ford owners even against some of these. Tempted by the profits to be gained by selling

carburetors, magnetos, coils and other accessories, we sometimes find agents so shortsighted as to recommend extras other than standard equipment of the car. In all such cases we would esteem it a favor if the customer will notify us before making the purchase.