

SERIES AA
INFORMATION BOOK

Mod. 1928

Stutz Motor Car Company of America
INDIANAPOLIS, IND., U. S. A.



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INFORMATION BOOK

Issued February, 1926

Price 50 Cents

Issued by
THE SERVICE TECHNICAL DIVISION
STUTZ MOTOR CAR COMPANY OF AMERICA, INC.
Indianapolis, Indiana, U. S. A.

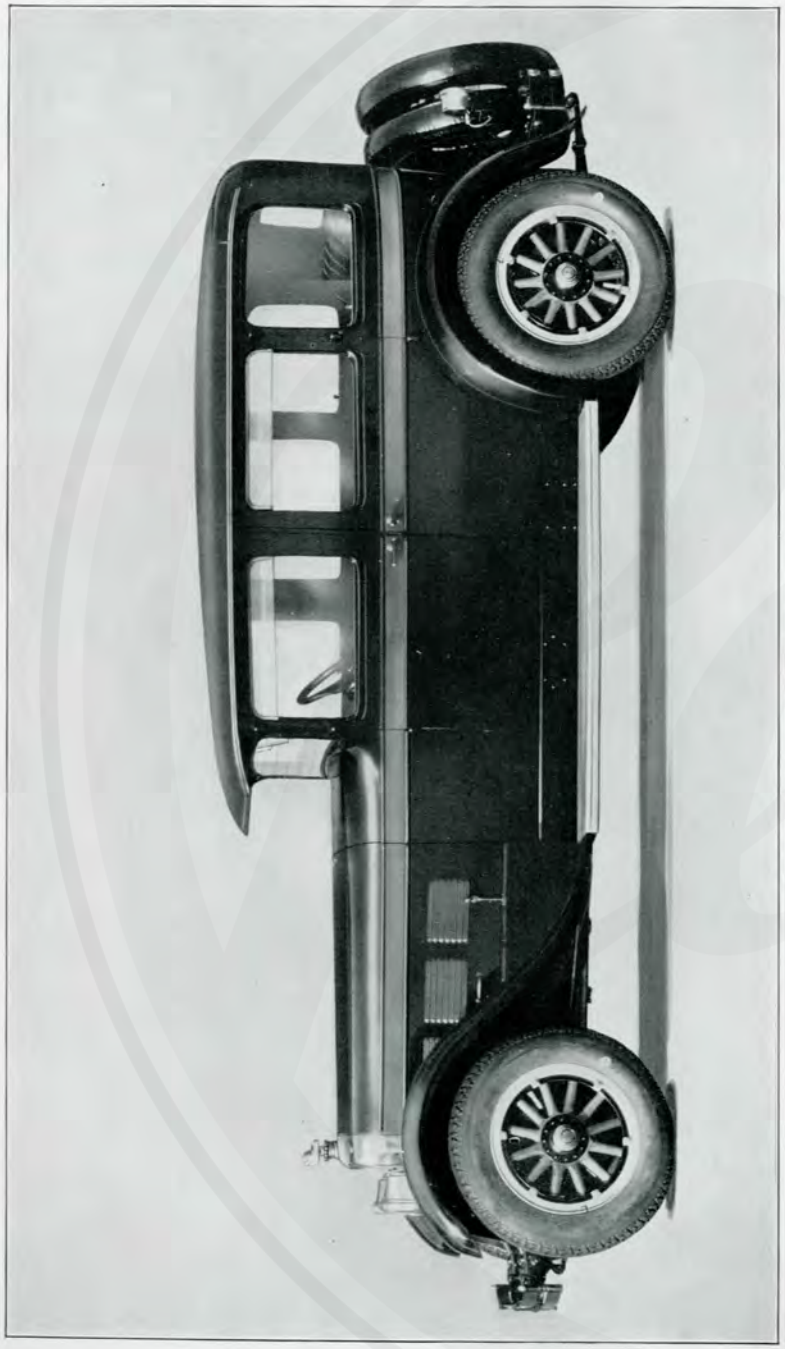


Figure 1—New Stutz Vertical 8 Series A A Sedan

foreword

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The New Stutz is a marked departure from conventional construction. The claims of originality and marked advances in the design of the new car lie in the fact that various thoroughly tried mechanical plans from the best engineering practice of both United States and Europe have been coordinated into one unified design.

The entire car is of such clean design as to make it quite possible for any owner to thoroughly understand the principles of the various parts. The operation, construction and the various adjustments on the car are thoroughly described in this book in an effort to help the owner obtain the detailed knowledge of his car which will bring him the full pleasure of ownership.

No mechanism will operate continually and satisfactorily entirely without attention. The New Stutz does not require any considerable amount of attention and care and an excessive amount of tinkering and unnecessary adjustment should be avoided. Periodic and Systematic inspections combined with proper lubrication are essential to obtain the maximum performance and the freedom from repairs which are built into every New Stutz. For these reasons your attention is called to the lubrication and inspection schedules.

Maximum performance of the car can only be assured provided the car receives proper treatment when first put into use. The engine of a new car should under no circumstances be raced, or pulled hard, or the car driven fast during the first 750 miles of its use.

SERVICE POLICIES

STUTZ MOTOR CAR COMPANY'S POLICY—Satisfactory relationship between the Stutz Motor Car Company and the Distributor or Dealer is contingent upon mutual good faith. The Stutz Motor Car Company desires to make good all its obligations expressed or implied which will assure every New Stutz owner the maximum of service at the minimum of consistent cost.

DISTRIBUTORS' AND DEALERS' RESPONSIBILITY

The Distributors' and Dealers' Service obligations are:

(a) To carry out the Stutz Motor Car Company's policy with the owner.

(b) To maintain adequate parts stock and proper facilities for making repairs, adjustments and do general overhauling in a prompt and competent manner at reasonable charges.

(c) To thoroughly instruct every New Stutz owner in the proper care and operation of his car. To provide maintenance instructions or inspections for a reasonable period without charge. Very few Distributors or Dealers realize the importance of getting over the Stutz maintenance story during the first few hours of ownership.

OWNER'S RESPONSIBILITY

True, but seldom realized, is the great responsibility for satisfactory Stutz service which rests on the shoulders of the owner. The responsibility for proper operation and care is quite beyond the possibility of the Stutz Motor Car Company's supervision. Upon the owner consistently and intelligently carrying out the Distributor's instructions on care and operation, depends the success of each individual New Stutz.

STUTZ MOTOR CAR COMPANY'S RESPONSIBILITY

(a) Within ninety days after delivery of a New Stutz car to owner, we will furnish, free of charge, at the Stutz Motor Car Company of America, Inc., Indianapolis, Indiana, duplicate parts to replace any parts that are returned, with shipping charges prepaid, and which are determined by us to have been faulty in material or workmanship, or we will put such parts in condition as good as new without charge.

(b) Discounts to independent repair shops will be subject to agreement between Distributor and Dealer and the repair shop.

(c) The Stutz Motor Car Company will refuse to consider claims for, or accept for adjustment, any parts not supplied by us.

(d) For service and replacements on electrical equipment, carburetor, tires, rims or other trade accessories that are not made by us, request should be made direct to the nearest service station maintained by the maker of such accessory. While we, the Stutz Motor Car Company, do not assume any direct responsibility for accessories, we will do all possible to assure the owner a square deal from the maker of these parts or accessories.

(e) We will provide Stutz Distributors and Dealers with a list of manufacturers of accessories used on the New Stutz car as well as a list of their service stations.

STUTZ VERTICAL 8
SERIES AA DATA

Number of Cylinders—8.
Cylinder Bore—3 3/16 inches.
Stroke—4½ inches.
Piston displacement—287.27 cubic inches.
Horsepower—(N. A. C. C.) 32.52.
Horsepower—(Brake) 92 at 3,200 revolutions per minute.
Wheel base 131 inches.

Car number stamped on name plate fastened to forward side of dash under the right side of the hood and also stamped on right end of frame cross member just back of radiator. Engine number stamped on crankcase at base of distributor and also stamped on the engine plate on left hand side of cylinder head cover. The following weights are for complete cars with all standard equipment but without any special equipment.

Type	Description	Weights
No. 2.	Two-passenger Speedster	4,175
No. 4.	Four-passenger Speedster	4,175
No. 5.	Five-passenger Sedan	4,416
No. 6.	Brougham	4,390
No. 9.	Victoria Coupe	4,273
No. 10.	Two-passenger Coupe	4,200
	Chassis	3,212

STANDARD EQUIPMENT

In addition to the usual equipment the list price of the New Stutz includes the following standard equipment:

Shock Absorbers—Watson Stabilators.

Bumpers—Two-bar in front, two-bar bumperettes in rear, bumpers attached direct to frame.

Rims—Five Firestone 29x4½ nominal size rims to carry 6.20x20 tires are included, but list price does not include spare tire.

Top boot, standard equipment on types 2 and 4.

Tonneau cover standard on type 4.

Windshield wings standard on types 2 and 4.

WEIGHTS

20 Gallon Gas	131 pounds
7 Gallon Water	58½ pounds
Passenger (average)	150 pounds

PARTS ORDERS

Replacements or repair parts should be secured through Stutz Distributors and Dealers where possible.

If necessary, parts may be obtained direct from the factory. The owner should in every case insist on genuine Stutz parts. Parts from the Stutz Motor Car Co. are of standard material, machined in the standard way and carefully inspected to insure the same high standard of quality as required in the complete car. Each part is priced as low as possible consistent with the cost of producing parts of high quality.

When it is necessary to order parts direct from the factory the order should be made after consulting a parts book and the car number should be given with each parts order. The car number is stamped on the name plate located on the forward side of the dash under the right side of the hood and also stamped on the right hand end of the frame cross member, just back of the radiator.

RETURNED PARTS

Stutz Distributors and Dealers are supplied with special forms and tags for use when parts are returned to the factory for inspection and credit consideration. These parts are inspected and referred to the Service Claim Division for a decision as to whether or not credit shall be allowed in accordance with the Stutz Service Policy. Owners must return parts through a Stutz Distributor or Dealer, as failure to fill out the proper blanks and tags may result in the loss of the parts.

SERVICE DEPARTMENT TECHNICAL DIVISION

It is one function of this branch of the Service Department to supply detailed technical information to Stutz owners concerning anything pertaining to the service of their Stutz cars. To secure this service, address Service Department Technical Division, and give car number, state clearly what information is required and give all available information to facilitate an answer.

PART I

PREPARING THE CAR FOR SERVICE

The phenomenal service and long life of some individual cars in the hands of owners is to a great extent due to the care which the cars receive when first unloaded and put into service. Listed below are several items which are of considerable importance in promoting the long and dependable service of the New Stutz car.

Certain changes must be made at the beginning and end of freezing weather. Cars are shipped from the factory with such adjustments as will meet the average climatic conditions of the Central United States. For localities having climatic conditions differing from those of the Central United States, the paragraphs on "Seasonal Changes" should be followed.

UNLOADING FROM FREIGHT CAR. New cars shipped from the factory will in most instances be unloaded and prepared for service by a Stutz Distributor or Dealer. However, if this service is not available the following instructions will be of value to the owner receiving the car.

CHECK CONTENTS OF SHIPMENT. Before signing for the shipment a careful check of the car and all of its equipment should be made.

1. Inspect the box car seal to see that it is intact.
2. Remove the car covers carefully to prevent the covers from scraping over the car. The covers should be removed at once from the box car. (Covers are not used on all shipments.)
3. See that all the accessories and equipment specified on the car order are actually with the car. Bumpers and special equipment are sometimes detached to facilitate loading and unloading, but the entire standard and special equipment which appears on the bill of lading should be with the car.
4. See that the side curtain rods are in the door pockets of open cars. Each open car is shipped with a Top Boot and Top Rests as Standard equipment and each type 4 car is shipped with a Tonneau Cover as Standard Equipment.
5. The tool equipment is packed in a sealed box and if it does not appear to have been tampered with, it will not be necessary to open and check item for item. A packing list is pasted to the box.
6. Inspect the general appearance of the car to see that it has not been damaged in shipment.

In every case the carrier receipts for the car and equipment in good condition, and is responsible for any loss or damage to the car or car equipment in transit. The carrier or his agent

should be notified at once before the car is unloaded if there are any claims for damage or shortage, and the box car seals should be returned to "Traffic Department, Stutz Motor Car Company of America, Inc., Indianapolis, Indiana," with a detailed report of the damage or shortage.

If everything has been found in good order, the car may be removed from the freight car. When unloading from a side door, skids under the rear wheels and careful maneuvering should eliminate possible damage to the fenders and running boards.

CYLINDER LUBRICATION. When the car is shipped from the factory, the cylinders are flushed with oil. If the car is shipped to a locality remote from the factory, or delayed considerably in transit, oil should again be introduced to the cylinders through the spark plug holes before attempting to start the engine. There should be a perceptible amount of smoke from the exhaust when the engine is first started. Provided the spark plugs are removed they must be handled carefully to insure the proper spark plug gap after reassembly.

Additional cylinder lubrication is assured during the first 750 miles the car is driven by the addition of oil to the gasoline as described under "Gasoline."

ENGINE LUBRICATION. The lubrication system of the New Stutz engine holds approximately 12 quarts of oil. Cars are shipped from the factory with the engine filled with 12 quarts of a lubricating oil which we believe is best suited to meet the average weather conditions at the season of shipment. If, due to unusual climatic conditions, the oil in the engine is too thick to flow readily, or too thin to have a satisfactory "body," it should be changed at once for a more appropriate oil. The selection of lubricating oil is discussed in the chapter on "Lubrication."

CAR KEYS. At the time each car is shipped two keys are attached to the steering wheel in a conspicuous place. Both of these keys should be delivered to the car owner. The two keys are exactly alike and each key will operate all the locks on the car.

RADIATOR. The radiator drain cock which fits in the radiator outlet pipe is opened at the factory and the cooling system drained. A second drain cock is provided at the right rear of the cylinder block for draining the block in freezing weather. This cock should be inspected in every case to be sure that it is not left open. The cooling system should be filled with seven gallons of water or in freezing weather with a non-freezing solution as discussed under "Seasonal Changes".

GASOLINE. The gasoline tank is at the rear of the car and has a capacity of approximately 20 gallons.

DURING THE FIRST 750 MILES THE CAR IS OPERATED, PUT ONE QUART OF THE BEST MEDIUM GRADE ENGINE OIL IN THE GASOLINE TANK WITH EACH 10 GALLONS OF GASOLINE.

VACUUM TANK. Gasoline is lifted from the gasoline tank and supplied to the carburetor by the vacuum tank. The vacuum tank is located on the dash at the left side of the engine. If the fuel system has been completely drained, the vacuum tank must be primed before the engine will start. The vacuum tank should ordinarily be primed by pouring approximately one quart of gasoline into the filler plug on top of the vacuum tank. A small funnel or a hose should be used to avoid the fire hazard of spilled gasoline.

With gasoline in the rear tank, it is possible to fill the vacuum tank as follows: See that the ignition switch is "off" and the hand throttle lever closed. The starter pedal should then be depressed and held down not to exceed 20 seconds. The engine should then be allowed to stand idle for 30 seconds and the starter pedal depressed again and held down for 20 seconds. After depressing the starter pedal two or three times in this way, enough gasoline will usually be lifted to the vacuum tank, to start the engine as described under "Starting the Engine", after which the vacuum tank will again function by itself. THE THROTTLE MUST NOT BE HELD OPEN WHILE FILLING THE VACUUM TANK IN THIS WAY SINCE OPENING THE THROTTLE DECREASES THE VACUUM IN THE INTAKE MANIFOLD AND CAUSES THE VACUUM TANK TO FUNCTION MUCH MORE SLOWLY. The battery should never be completely discharged in an effort to prime the vacuum tank.

GASOLINE GAUGE. The gasoline gauge may stick when the tank is first filled. The gauge or gauge-operating mechanism should not be tampered with as a few miles of rough road will start it operating and no further trouble should be experienced.

REAR AXLE LUBRICATION. The worm drive rear axle is capable of extremely long and efficient service if properly lubricated. The differential is filled to the level plug with approximately one quart pure castor oil.

TRANSMISSION LUBRICATION. The transmission is filled at the factory with three pints of lubricant. Changes in lubricant necessary through climatic changes or conditions are discussed under "Lubrication Specifications."

RIM SQUEAKS. Occasionally when a car is first put into service, a rim squeak will develop which cannot be stopped by tightening the rim lugs.

These squeaks usually come from either the lock ring or the area of contact between the rim and felloe band.

To stop a persistent rim squeak, first deflate the tire, loosen the dust cap on the valve stem, and remove the lock ring, leaving the casing in place on the rim, and the rim in place on the wheel. Paint or brush a pasty mixture of powdered graphite and oil all the way around the channel or groove in the rim where the lock ring fits. Replace the lock ring, inflate the tire and try the car on the road. If the squeaking persists, remove the tire and rim without deflating the casing and paint or brush the graphite paste all the way around the felloe where the inside of the rim rests.

The graphite mixture used should be pasty or thick enough to prevent it from running or throwing off. The mixture can best be applied with a brush.

TIRES. The pressure of each tire of a new car should be checked before the car is put into service and checked each week thereafter with a balloon tire gauge. A schedule of recommended tire pressures is given below and it is only through observing these recommendations that the maximum performance, safety and comfort of the New Stutz may be obtained.

Type.	Description	Tire Pressure Front	Rear
No. 2.	Two-passenger Speedster	40 to 45	36 to 41 pounds
No. 4.	Four-passenger Speedster	40 to 45	36 to 41 pounds
No. 5.	Five-passenger Sedan	40 to 45	36 to 41 pounds
No. 6.	Brougham	40 to 45	36 to 41 pounds
No. 9.	Victoria Coupe	40 to 45	36 to 41 pounds
No. 10.	Two-passenger Coupe	40 to 45	36 to 41 pounds

The care of the tires is discussed under "Tires," page 25.

BATTERY. The battery terminals are not usually disconnected when the car is shipped from the factory. The terminals should be wiped clean, a fresh coat of vaseline applied and the terminals tightened regardless of whether the terminals are connected or not when the car is received. Connecting the battery terminals the wrong way will cause the ammeter to register "charge" when the light switch is turned on with the engine shut off. The battery charge should be checked at once and distilled water added if necessary. Due to unusual driving conditions some owners may require a change in the charging rate. This change is discussed in the chapter on "Electrical Equipment."

PART II

SEASONAL CHANGES

It is essential that certain changes and adjustments be made before and after freezing weather. When shipped from the factory, cars are adjusted and lubricated for operation in the prevailing climate in the Central United States. Cars shipped to localities having climatic conditions greatly different from those of the Central United States, should have the necessary seasonal changes made at once before the cars are put into service.

LUBRICATION. The correct amount of lubricant is placed in the engine, rear axle, transmission, steering gear and other chassis parts when the car leaves the factory. The necessary seasonal changes in lubricant are described under "Lubrication", Part V.

RADIATOR AND COOLING SYSTEM. The radiator and cooling system should be completely drained and thoroughly flushed as described on page 62.

A large number of preparations are used to prevent freezing of water in the cooling system. Only two solutions have proven satisfactory at the factory and it is strongly recommended that no solution but these two described, be used, since some preparations have been sold which are harmful to the Radiator or cooling system in general.

GLYCERINE. Not all preparations of Glycerine are satisfactory for use in the cooling system. However, a special preparation is marketed by the Proctor and Gamble Company of Cincinnati, Ohio, which has some very desirable qualities. This preparation is sold under the trade name of "Ivo Distilled Radiator Glycerine". The advantages of this preparation are that it does not lower the boiling point of the solution in the Radiator and does not evaporate readily. The preparation is also odorless and does not dissolve the lacquer finish of the car, if spilled. Ivo mixes readily with water and the proper proportions are indicated below.

Glycerine	Water	Freezing Temperature
10½ Quarts	10½ Quarts	10° Fahrenheit above zero
14 Quarts	7 Quarts	0° Fahrenheit
16 Quarts	5 Quarts	10° Fahrenheit below zero
17½ Quarts	3½ Quarts	20° Fahrenheit below zero
19 Quarts	2 Quarts	30° Fahrenheit below zero

ALCOHOL. Solutions of alcohol and water are the most generally used to prevent freezing in cold weather. At the beginning of freezing weather the cooling system should be completely drained and flushed out. The proper solution of alcohol and water should be mixed together and this solution poured

into the radiator using a funnel. This precaution is necessary since alcohol will dissolve the lacquer finish on the car. If alcohol is spilled on lacquer the finish should be washed immediately with water. Any of the alcohol solution which is lost through evaporation should be replaced by adding a solution of half alcohol and half water. It is advisable to have the radiator solution tested occasionally with a hydrometer. The proper proportions are indicated below.

Alcohol	Water	Freezing Temperature
5 Quarts	16 Quarts	10° Fahrenheit above zero
6 Quarts	15 Quarts	0° Fahrenheit
7 Quarts	14 Quarts	10° Fahrenheit below zero
8½ Quarts	12½ Quarts	20° Fahrenheit below zero
10 Quarts	11 Quarts	30° Fahrenheit below zero

HOSE CONNECTIONS. The four hose connections, at the top and bottom of the radiator and each side of the water pump, should be inspected at the beginning and at the end of freezing weather. It is usually advisable to replace these connections since the deterioration of the inside of the hose cannot always be readily detected. Failure to replace deteriorated hose may result in plugging the inside of the hose and the radiator passages. Many non-freezing solutions shorten the life of rubber hose connections.

INTAKE HEATER. The intake manifold has a "Hot Throat" just above the carburetor flange. This throat is heated by exhaust gases which surge through two separate branches of the intake manifold. A valve is provided in each of these branches for controlling the amount of heat to the manifold. The valves are of the "Butterfly" type and a slot in the external face of each valve is parallel to the valve plate. Consequently when the external slot is parallel to the exhaust passage the valve is open and when the slot is turned at a right angle to the exhaust passage the heat is completely shut off. It will not be necessary to shut the heat entirely off except in extremely warm weather. The heat should be turned on full in extremely cold weather. For moderately cold weather, the two valves should be turned at an angle of approximately 45° to the car wheelbase. In each case the valves should be turned the same amount, but in opposite directions. The low end of each slot should be toward the center of the engine. The valve is locked in place by a nut on the inside of the manifold. To alter the valve adjustment, loosen this nut and tap the inner end of the valve stem lightly to loosen the valve.

CARBURETOR. The Duplex Zenith Carburetor used on the New Stutz together with the intake manifold design makes

changes in carburetor adjustments unnecessary throughout the life of the car. The carburetor and the two low speed adjustments are described in the pages on the "Carburetor."

RADIATOR SHUTTERS. The use of radiator shutters in freezing weather is very advantageous. The engine cannot operate to its maximum efficiency and performance unless it is kept at the proper temperature. The shutters should be inspected frequently and the thermometer in the instrument panel noted occasionally to be sure that the engine is not over heated. Stutz Distributors and Dealers can give complete information concerning radiator shutters.

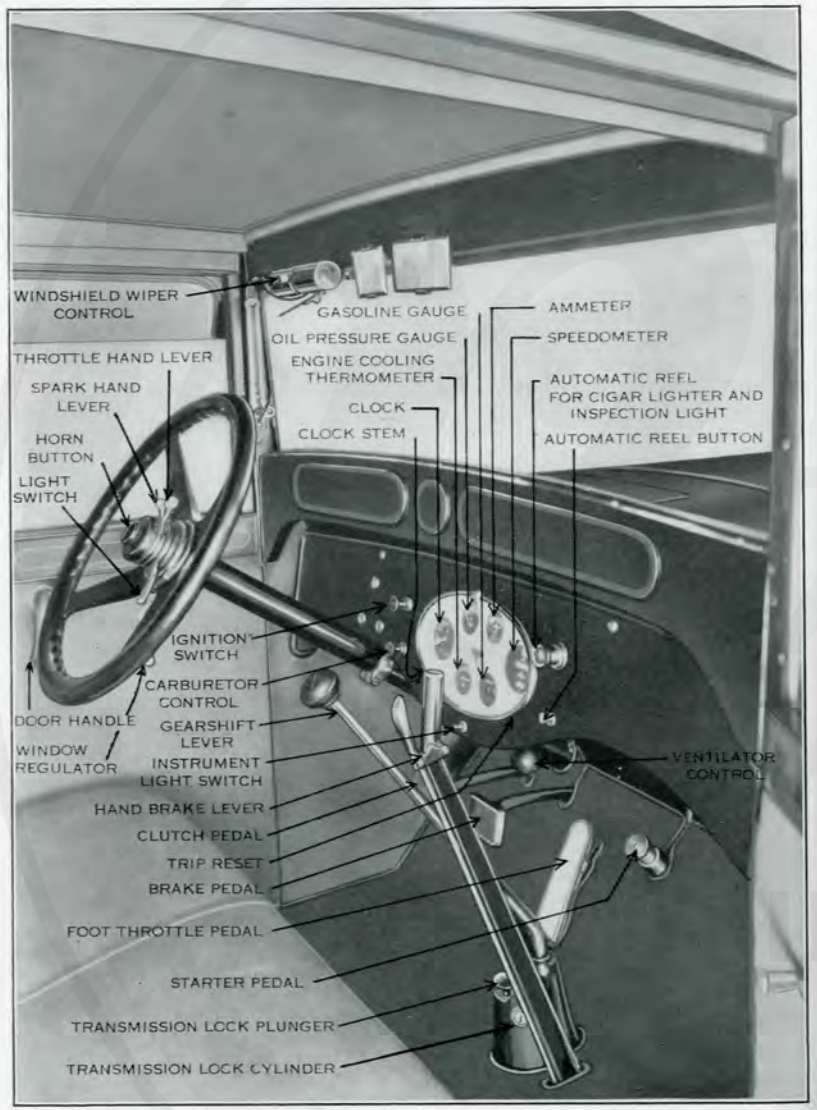


Figure 2—Controls

PART III

OPERATION

It is of utmost importance that the car be given the proper attention and the proper adjustments made before the car is actually put into operation. For this reason it is necessary that Part I, on "Preparing the Car for Service," be carried out thoroughly before actually operating the car.

CONTROLS

FOOT BRAKES. The right hand pedal controls the New Stutz Hydrostatic brakes. These brakes are thoroughly described in Part IX. Excessive use of brakes and the sudden harsh application of the brakes is a common fault of inexperienced drivers. The right foot will normally rest on the foot throttle. The brake pedal is linked to the stop light switch so that the stop light operates whenever the brake pedal is depressed.

HAND BRAKE. The hand brake is located within easy reach from the steering wheel, considerably higher and nearer to the driver than conventional. The driver need not lean forward in an effort to reach this brake. The hand brake operates a contracting band on a drum located at the rear of the transmission as described under "Brakes." There is no connection between the hand brake and the stop light, as the hand brake is frequently left in the locked position when the car is parked.

SWITCH-IGNITION. A Delco pull switch is located on the instrument board to the left of the instrument panel. The switch is a unit by itself and no lock is provided. The advantage of this construction is that the conventional ignition switch lock is not effective since it is easy to wire around the switch. Consequently owners have a false feeling of security when locking the switch. The omission of the lock from the ignition switch directs the owner's attention to the transmission lock which is a far more effective lock. The ignition switch is "off" when the button is pushed to its forward position and "on" when it is pulled toward the driver. In the "on" position, the battery current flows intermittently through the ignition system. The intermittent flow of current may be observed through the moving of the ammeter hand when the engine is running slowly. The engine cannot be started or run without first turning on the ignition switch and the switch must be turned off when the engine is not running. The storage battery will be discharged if the switch is left "on" when the engine is stopped.

SWITCH-LIGHTING. The lighting switch is controlled by a lever on the steering wheel just under the throttle lever. It is in easy reach and the driver may operate the lights without removing his hands from the steering wheel. The switch

lever controls the special double filament bulbs in the headlights which are described under "Lights." There are four positions of the light switch. The switch is "off" in its lowest position.

The four positions are arranged as follows:

4. Head lights—high beam—and tail light.
3. Head lights—low beam—and tail light.
2. Dim light (in head light) and tail light.
1. Tail light, only.

Bottom—Off.

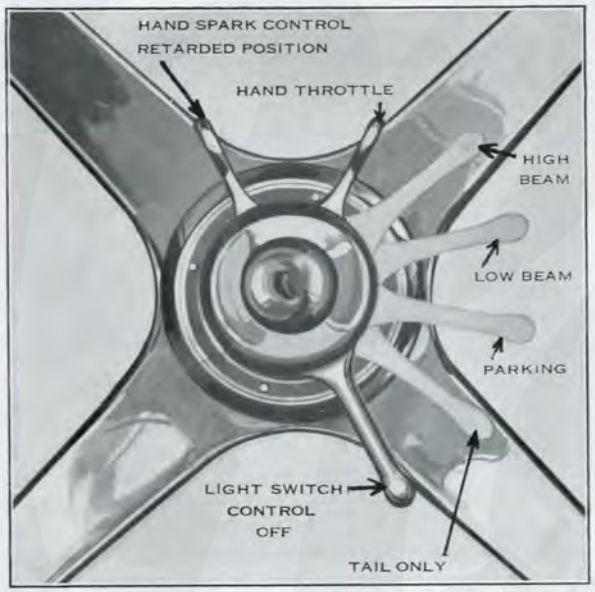


Figure 3—Light Switch Positions

CARBURETOR DASH CONTROL. The carburetor dash control is located directly below the ignition button on the instrument board at the left of the instrument panel. The control should normally be left in its forward position or pushed forward against the instrument board. When starting the engine the control may be pulled out temporarily to secure a rich mixture, but it should be returned to its normal position as soon as possible. Using the carburetor control too much will result in an excessive amount of raw gasoline entering the cylinders. This increases engine wear and prevents the proper functioning of the engine. The carburetor and carburetor control are described fully under "CARBURETOR."

HAND SPARK CONTROL. The ignition timing is controlled automatically, supplemented by the hand control lever

located at the left on the steering wheel. The ignition timing is retarded when the hand lever is in its highest position and advanced when the lever is in its lowest position. When starting the engine the hand lever should be placed at about mid position of its travel. When the engine commences to run, the hand lever should be advanced or pulled down a varying amount depending upon driving conditions.

It is not possible for the automatic spark advance to meet all driving conditions. The proper manipulation of the hand spark control is easily learned and will add to the performance of the car. At all times while the engine is running, the hand spark control should be advanced as far as possible without causing the engine to pound or labor. At speeds above 50 miles per hour it is usually possible to make use of the entire spark advance. Retarding the spark too far will cause the engine to heat and use an excessive amount of gasoline.

THROTTLE. The foot throttle, or accelerator pedal, is located to the right of the clutch pedal. The foot throttle is interconnected with the hand throttle lever at the right of the steering wheel. The hand throttle is closed in its upper position. Most drivers prefer to use the foot throttle but the hand throttle will be found convenient on long drives or in starting the car in motion upon an incline. The hand throttle should be opened a very little while starting the engine. It is injurious to permit the engine to race by leaving the hand throttle open after the engine starts.

STARTER PEDAL. The starter pedal is located at approximately the center of the upper toe board. The starting motor is manually engaged by depressing the starter pedal as far as it will go. The starter pedal must be pressed all the way down in order to engage the starter pinion in the flywheel gear and close the starting motor circuit. There is an over-running clutch on the starter pinion. This clutch protects the motor armature. It is very important, however, that the starter pedal be released at once when the engine commences to run. The starter is described under "Starting Motor".

CLUTCH PEDAL. The left hand pedal is the clutch. The left foot should normally rest on the toe board or the floor and not on the clutch pedal. Inexperienced operators sometimes rest the left foot on the clutch pedal while driving. This practice should be avoided as it causes an unnecessary amount of wear on clutch parts. The clutch parts are so light as to make a clutch brake unnecessary. Consequently the clutch pedal may be depressed all the way down in shifting gears without causing the gears to clash. In the normal position of the clutch pedal the engine drives the clutch mechanism and through the clutch mechanism turns the transmission drive gear. When the clutch is depressed, the clutch mechanism comes to rest even though

the engine is running. The proper way to shift gears is described under "Shifting Gears."

GEAR SHIFTING LEVER. The gear shift lever is unusually long and extends up near to the steering wheel, within easy reach of the driver. The transmission is of the conventional selective three speed ahead type.

CHASSIS LUBRICATOR PLUNGER. The Myers Self-Lubricator system for the automatic lubrication of the chassis is refilled from the engine lubrication system by a by-pass plunger valve on the forward side of the dash under the right hand side of the hood. The proper manipulation of this plunger is described in Part V, on "Lubrication."

INSTRUMENT PANEL. The instruments are grouped under a detachable glass panel on the instrument board. This panel covers the clock, speedometer, ammeter, oil gauge, gasoline gauge and the engine cooling thermometer.

Each of the instruments may be removed from the back of the panel without disturbing the remaining instruments. The instrument panel light is held in place by a spring clip and may be pulled out from the rear for replacement.

STARTING THE ENGINE

The engine of a new car should, under no circumstances, be raced or pulled hard or the car driven fast during the first 750 miles of its use. REGARDLESS OF THE NUMBER OF MILES AN ENGINE HAS BEEN DRIVEN, IT SHOULD NOT BE ABUSED BY RACING OR HARD PULLING WHEN FIRST STARTED AS IT TAKES A FEW MINUTES FOR THE LUBRICATING OIL TO REACH ALL THE WEARING SURFACES. THIS IS PARTICULARLY TRUE IN COLD WEATHER.

The engine should be started as follows:

1. Be positive that gear shift lever is in the neutral position.
2. Place the hand spark lever half way between the "advanced" and the "retarded" position.
3. Open the hand throttle slightly.
4. Pull out the ignition switch.
5. Depress the starter pedal all the way down.
6. While the starter is turning the engine over, pull the carburetor dash control out momentarily to secure a richer mixture. In cold weather it will be necessary to pull the control all the way out.

As soon as the engine fires, remove the foot from the starter pedal and gradually push forward on the carburetor control returning it to its normal position as soon as possible without causing irregular operation of the engine.

It is important to release the starter pedal as soon as the engine fires.

STOPPING THE ENGINE

The engine is stopped by first closing the hand throttle and then pushing the ignition switch in to its "off" position.

SHIFTING GEARS

The inexperienced driver should first try all the controls before starting the engine. The driver should become accustomed to the feel of the clutch, the brake pedal and the gear shift lever. The position of the gear shift lever in the three speeds ahead, in neutral and in reverse is illustrated in Figure 4.

The New Stutz clutch and transmission are designed to facilitate shifting gears. A little intelligent practice is sufficient to enable any driver to shift gears quietly. Any gear noise or tendency of the car to jerk is an indication that the driver is not operating the controls properly. The operator should practice with the controls until the mistake is discovered.

After starting the engine as described above, depress the clutch pedal and pull the gear shift lever into low or first speed position. Many drivers prefer to shift directly into second speed, except when starting the car on hills. No damage is done by this practice provided the driver is careful not to jerk the car and also not to slip the clutch too much in picking up speed.

With the car standing, the engine running, the clutch released and the gear shift lever in either first or second speed the hand or foot throttle should be opened slightly to increase the engine speed and the pressure on the clutch pedal should be decreased gradually permitting the car to start smoothly. The throttle should then be opened a little further to increase the car

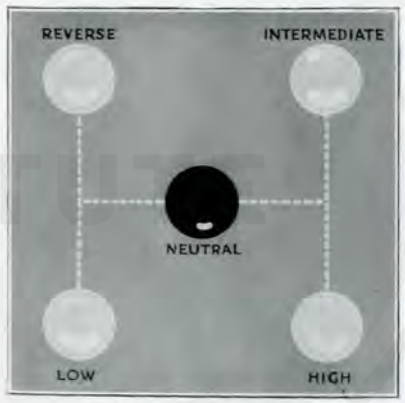


Figure 4—Gear Shift Positions

speed slightly before the next shift is made. The driver will find the foot throttle convenient for this.

PROVIDED THE HAND BRAKE HAS BEEN SET TO HOLD THE CAR ON A HILL THE BRAKE MUST BE

RELEASED AS THE CAR IS STARTED. IT IS A COMMON MISTAKE OF INEXPERIENCED DRIVERS TO DRIVE WITH THE HAND BRAKE SET. THIS PRACTICE IS VERY INJURIOUS TO THE BRAKE LINING.

After the car is in motion, in order to shift to the next higher speed, close the hand throttle if it is open and permit the foot throttle to close, depress the clutch pedal and move the gear shift lever to "neutral," doing all these things at the same time. The gear shift lever should be moved from neutral into the next higher speed after a slight pause. The foot can then be removed from the clutch somewhat faster than when first starting the car in motion. The foot throttle should be opened slightly as the engine slows down.

The engine should never be pulled so slow or so hard as to cause it to labor and pound in either second or high gear. The driver should never hesitate to use the lower gears when climbing steep grades and pulling through soft roads.

There are two methods of shifting from high or intermediate gear to the next lower gear. The easier way is to wait until the engine is pulled down slow and then, with the throttle part way open, depress the clutch pedal part way and shift quickly to the next lower gear. Engage the clutch quickly and without jerking the car. This shift must be made at low car speed and completed in a very short length of time.

A second method of shifting to a lower gear is called "Double Clutching." This is done as follows: Depress the clutch, return the gear shift lever to "neutral," accelerate the engine and at the same time engage the clutch for an instant when the gear shift is in neutral, then depress the clutch again and instantly shift into the next lower gear. The entire change must be made very quickly. This method of shifting, or "Double Clutching," can be accomplished more quietly at higher car speeds than is possible with the first method.

IMPORTANT. Never attempt to force the gears to enmesh if the shift has been started improperly and the gears clash, because serious damage to the gears may follow. Stop the car and start over again.

THE ENGINE AS A BRAKE

The engine may be used as a brake when descending long hills by closing the throttle and allowing the car to turn the engine. On steep hills the car should first be brought to a stop and then shifted into intermediate, or low gear. The throttle should be closed and the car allowed to drive the engine.

THE IGNITION SHOULD NOT BE SHUT OFF OR THE SPARK LEVER RETARDED WHILE COASTING WITH THE CAR DRIVING THE ENGINE AS THIS PRACTICE IS HARMFUL.

PART IV

INSPECTION AND CARE

Periodic and systematic inspection of the car is essential to obtain the long life, freedom from repairs, and maximum performance built into every New Stutz.

Adjustments should not be made until necessary although it is very important that thorough inspections be made at regular intervals to prevent excessive wear or loss of power due to causes which may not be readily detected in ordinary running.

INSPECTION SCHEDULE

DAILY

(for Lubrication see Chart page 28)

Gasoline	Check Supply
Water	Check level in Radiator
Lights	Inspect

WEEKLY

Battery	Add distilled water
Tires	Check pressure and inspect for cuts and imbedded glass or nails

MONTHLY OR EACH 750 MILES

Engine	Thoroughly clean the engine
Compression	Check cylinder compression
Valves	Adjust valve lash
Wheels	Align front wheels
Steering	Adjust ball and socket joints on steering cross rod Inspect springs in ends of steering reach rod to eliminate play
Steering Gear	Inspect for lost motion or oil leaks
Brakes	Adjust if necessary
Clutch	Inspect for ½ inch free travel of pedal
Axle—Rear	Inspect packing gland on worm shaft
Battery	Take hydrometer reading of each cell
Body Bolts	Tighten
Door Bumpers	Inspect
Gasoline Strainer	Remove and clean bottom and screen
Water Pump	Inspect packing gland
Spring Bolts	Inspect and tighten if necessary
Generator	Inspect coupling, commutator and brushes, clean if necessary

EVERY THREE MONTHS OR EACH 2,250 MILES

Distributor	Wipe distributor head clean, inspect timing contacts
Timing	Check ignition timing
Spark Plugs	Clean and adjust
Wheels	Inspect and adjust front wheel bearings
Battery	Remove terminals, clean, grease and tighten

EACH 4,500 MILES

Axle—Rear	Inspect and adjust (if necessary) axle shaft bearings worm shaft bearings and differential bearings

EACH 9,000 MILES

Stabilators	Inspect and adjust

CARE OF LACQUER FINISH

Lacquer finish has been adopted for the New Stutz because of its well known qualities of beauty together with resistance to weather and wear. No finish is entirely impervious to weather, wear or abuse and the following suggestions will lengthen the life of the New Stutz finish.

Alcohol dissolves lacquer. In freezing weather it is advisable to mix alcohol with at least an equal amount of water before pouring it into the radiator. A funnel should always be used in pouring alcohol into the radiator. The proper proportion of alcohol in freezing weather is described under "Seasonal Changes." Alcohol, when spilled on lacquer, should be washed off at once with water.

WASHING. New cars when unloaded should be washed at once to remove the abrasive cinders and coal dust which usually collect on finished surfaces during railroad transportation.

Washing should be done with clear water, and no soap or gasoline should be used. The surface should first be thoroughly flushed with a low pressure stream of water. Then with a soft clean sponge and more water remove dust and dirt. The car should be dried with a soft, clean chamois. Rubbing with sponge or chamois should be done in straight lines rather than circles.

POLISHING. After the car is washed it may be polished either by rubbing with clean, dry cheesecloth or by using a suitable polish. All polishes are not suitable for this purpose, and a polish must be selected which will not collect dust on the surface and which will work satisfactorily on the lacquered body and also on the fenders, which are finished in baked enamel. Stutz Distributors and Dealers will be able to supply a polish suitable for Stutz cars.

THE STRIPING ON STUTZ BODIES SHOULD NEVER BE RUBBED EITHER DRY OR WITH WATER OR ANY SORT OF POLISH, since striping is not so durable as the rest of the finish and can be rubbed off.

WHEELS. The wheels are finished with varnish and not lacquer. It has been our experience that wheels should be cleaned with clear, cold water only and no polish used. If it is necessary to use soap to remove oil from the wheels, the soap should be thoroughly rinsed off with clean, cold water.

TOPS ON OPEN CARS

The New Stutz tops are covered with high grade black top material. The inside of the top should be cleaned occasionally with a vacuum cleaner or a stiff brush or whisk broom. The celluloid curtain lights should not be brushed, but should be cleaned with a damp chamois. The outside of the top should

be cleaned with water and a sponge, or, if necessary, with a sponge and soap suds from high grade pure linseed oil soap. All soap should be rinsed off thoroughly. The finish on the body should be wet when the top is washed. Dry the top with a clean damp chamois. Most top dressings and cleaners are injurious to the top.

LOWERING THE TOP. Never fold the top while it is damp or dusty and dirty. The top depreciates rapidly when lowered due to the creasing of the top material and there is the possibility of chafing even when carefully folded.

Each open car is shipped with a Top Boot and Top Rests as standard equipment. Each type 4 car is shipped with a Tonneau Cover as standard equipment.

Top Rests—Top rests are packed with the tools when open cars are shipped. The top rests are threaded so that they may be screwed into threaded holes which are concealed under the quarter curtains. The car must not be operated with the top folded unless a top boot is used. Before folding the top it is important that the quarter or gypsy curtains at the rear quarters of the top be unsnapped. Also replace and tighten the acorn nuts which hold the top of the windshield.

The top deck material must be pulled from between the bows at the back and wrapped up under the upper bow from the rear. Fold the material smoothly between the bows. The straps must hold the bows down securely to prevent damage from chafing. The top dust boot is made to fit smoothly when the top is properly folded and if the top is not carefully folded the dust boot may be damaged in an effort to get it on. The boot must be drawn on both sides evenly, and this operation is facilitated by a person standing at each side and pulling it into place. There should be no wrinkles in the top boot after it is put on properly. Small wrinkles may be smoothed out by sponging with water.

CARE OF UPHOLSTERY

The upholstery and interior trimming of closed cars should be cleaned with a vacuum cleaner, a whisk broom or stiff brush.

Open cars are upholstered in hand buffed leather. Leather upholstery should be cleaned by brushing or by washing with castile soap and water. Once each year the leather should first be washed and then should receive an application of dressing made of three parts of boiled linseed oil and one part vinegar. The dressing should be applied with a cloth and rubbed well between the pipes or sections. Allow the dressing to remain on the leather about an hour and then wipe the surface clean to prevent damage to garments.

MOUNTING SPARE TIRES

The spare tire carrier is designed to carry either one or two spare tires as desired. A single spare tire and rim is mounted as follows: Turn the tire so that the groove in the rim is away from the body or toward the rear, lift the tire and hook the rim groove in the rear notches in the two upper shoes. Swing the tire into position and tighten the clamp shoe against the groove at the bottom.

Two spare tires and rims are mounted as follows: Turn the clamp shoe at the bottom of the carrier at right angles to the car wheel base and screw the clamp shoe handle in an upward direction as far as it will go. The first tire to be mounted should be turned so that the rim groove is away from the body or toward the rear. Lift the tire and hook it between the bottom of the tire carrier and the rear frame cross member. Lift the tire as high as possible and swing the top into position so that the rim groove rests in the notches nearest to the body in the two upper carrier shoes. The second of the two tires can be mounted by turning the rim groove forward or toward the body. Hook the rim groove on the rear notches of the upper carrier shoes. Hold the bottoms of the two tires in place and turn the clamp shoe parallel with the wheel base before screwing it down tightly.

The clamp shoe handle may be locked only when in a position directly across the back of the car. The lock should turn easily and if it resists locking or unlocking a slight change in handle position should free it. When the handle is unlocked the cylinder springs out a short distance. In order to lock the handle the cylinder should be pushed in as the key is turned. The threads of the tire clamp and the lock cylinder should be lubricated with engine oil or oil and powdered graphite several times a year.

TIRE COVERS

The New Stutz tire covers are best applied in the following manner:

Deflate the tire.

Place the valve stem through the hole in the cover.

Wrap and stretch the cover first around the side of the tire farthest from the detachable rim. Then stretch the cover around the other half of the tire. The strip of the cover which coincides with the tread of the tire should be squarely over the tread.

The cover should be smoothed and stretched in place. A flat tool, with blunt edges, similar to a tire tool is convenient if carefully used in stretching the cover smooth.

The tire should then be inflated and the cover sponged and smoothed until all wrinkles disappear.

When the tire is mounted, the opening in the cover should be toward the body.

When two spare tires are carried, the second to be mounted should have the side of the tire cover nearest to the detachable rim stretched on first. This brings the opening on the second tire cover toward the body also.

TIRE SKID CHAINS

Chains should never be used excepting when necessary and should be removed when the necessity is passed. As a result of the New Stutz Hydrostatic brakes, tire chains will be unnecessary excepting under severe conditions. The wheels, brake drums and brake mechanism are of exceptionally clean design and make special instructions for the use of tire chains on the New Stutz unnecessary.

Standard size tire chains of 6.20 x 32 size should be used. In each case the side chains should be pulled tight on each wheel and surplus links removed.

TIRES

If a tire becomes deflated for any reason, as in case of puncture, the car should be stopped at once, as driving a few hundred feet on a deflated tire may completely ruin it. Tires must be kept inflated to the pressures recommended in the table given below in order to get long life, easy riding and ease of steering.

TIRE PRESSURE. Tires should be tested each week with a balloon tire gauge, since high pressure tire gauges are not sufficiently accurate. A few pounds variation represents a greater percentage of the total pressure in a balloon tire than in the case of a high pressure tire.

Types	Description	Front Tires	Rear Tires
No. 2	Two-passenger Speedster	40 to 45 lbs.	36 to 41 lbs.
No. 4	Four-passenger Speedster	40 to 45 lbs.	36 to 41 lbs.
No. 5	Five-passenger Sedan	40 to 45 lbs.	36 to 41 lbs.
No. 6	Brougham	40 to 45 lbs.	36 to 41 lbs.
No. 9	Victoria Coupe	40 to 45 lbs.	36 to 41 lbs.
No. 10	Two-passenger Coupe	40 to 45 lbs.	36 to 41 lbs.

Note: Under inflation is injurious to tires.

ALIGNMENT OF WHEELS. An unusual jolt or strain from hitting a curb or projection on the road surface may throw the wheels out of alignment. This condition will cause excessive tire wear and also interfere with steering ease. The proper alignment of front wheels is described on page 77.

TIRE WEAR CAUSED BY BRAKES AND CLUTCH. The harsh, sudden application of the brakes, or the sudden

engagement of the clutch, throws unnecessary strains on the chassis and causes excessive tire wear.

SCRAPED SIDE WALLS. The rubber on the side walls of a tire may be scraped and worn off by driving in ruts or by driving the car against the side of the curb. The cords of the tire are then exposed to the rotting action of dirt and moisture.

GARAGE FLOORS. The garage floor should be kept clean and free from oil, as oil attacks and rots rubber.

STORING TIRES. Tires deteriorate with age, but this deterioration may be lessened by storing them in a cool, dark place. Where the car is to be stored for several months, jack up all the wheels and leave the tires inflated only enough to hold their shape. All oil should be removed and the tires should be protected from light or a protective tire paint should be used.

SPARE TUBES. Spare tubes should be carried in a small waterproof bag to prevent chafing in the tool compartment. French Talcum should be dusted on the side of the casing before the tube is put in.

CUTS. Cuts or openings in the rubber tread or side walls of tires should be repaired at once to stop further damage. Small cuts can be repaired with cement and tire putty. Large cuts should be vulcanized at once.

PART V

LUBRICATION

Adequate lubrication prolongs the life of any piece of mechanism.

Lubrication of the New Stutz safety chassis has been given unusual care, in an effort to provide the very best lubrication at a minimum of delay or effort to the owner. Two particularly interesting features of the New Stutz lubrication are the Myers Self Lubricator for the automatic lubrication of the chassis and the Oil Rectifier through which engine oil passes. These features are described in detail on the following pages.

There are a few operations which must be gone through with, and some specifications which must be observed in order to assure correct lubrication. Stutz Distributors and Dealers should be consulted concerning lubricants, as they are in a position to supply lubricants which meet with the requirements of the New Stutz.

LUBRICATION SPECIFICATIONS

ENGINE OIL. It is not possible to use the same grade of engine oil throughout the year excepting in extremely mild climates.

A "heavy" grade of oil should be selected in exceptionally hot weather.

Throughout the mild weather, a "medium heavy" oil should be used.

When the temperature drops to near freezing, a "medium" grade of oil should be selected.

For extremely cold weather, a "medium light" oil should be used.

Specifications are not an accurate index to the lubricating value of an oil, and the only safe method is to select an oil of nationally recognized worth, approximating the required specifications. The specifications of two grades of very satisfactory oil are as follows:

	Warm Weather	Cold Weather
Viscosity at 100° F.	515 Saybolt	375 Saybolt
Viscosity at 210° F.	63 Saybolt	57 Saybolt
Flash	420° F. Minimum	420° F.
Chill test	45° F.	25° to 30° F.

*The chill test requirements will depend upon the severity of the cold weather.

The engine Lubrication System is described on page 32.

TRANSMISSION. Use a high grade fluid mineral gear oil. A heavier lubricant is required in warm weather than in cold weather. Two grades of the same brand of lubricant should be used and the transmission drained and refilled at the beginning and at the end of freezing weather. In cold weather, the transmission lubricant must be thin enough to flow readily or the gears will shift with difficulty and the bearings will not receive proper lubrication.

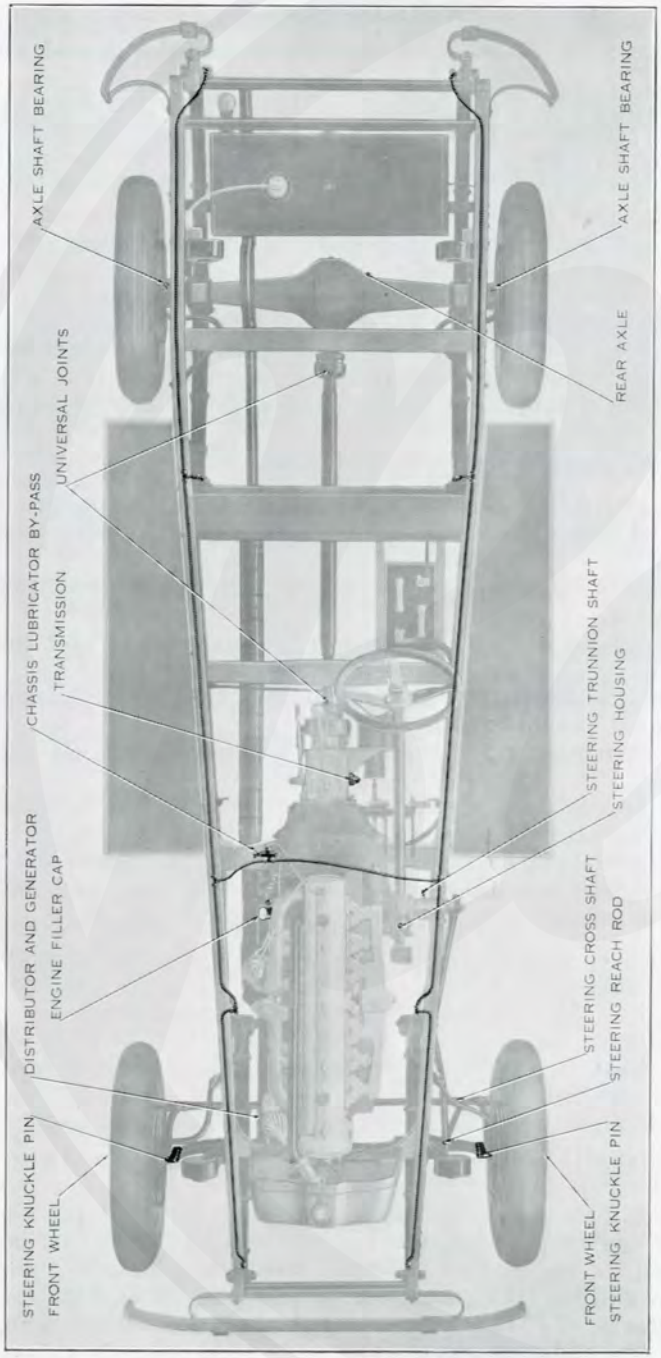


Figure 5—Lubrication Chart

LUBRICATION SCHEDULE

(For inspection schedule see page 21.)

EVERY 750 MILES OR EACH MONTH

Horn	Six drops light gun oil
Brake Pedal linkage	Five drops engine oil on each joint
Hand Brake linkage	Five drops engine oil on each joint
Throttle linkage	Three drops engine oil on each joint
Spark linkage	Three drops engine oil on each joint
Generator	Ten drops engine oil in each of two oil cups
Distributor	Ten drops light engine oil in oil cup
Water Pump	Fill grease cup and empty into pump
Steering Gear Housing	Keep housing full of lubricant

EACH 1,500 MILES

Steering knuckle pin reservoirs	Fill with engine oil
Universal joints	Fill with transmission oil
Universal joint splines	Smear with cup grease
Engine	Drain and refill with 12 qts. of engine oil NOTE*—Engine should never be operated on less than eight quarts at any time.
Chassis Lubricator By-Pass	Before changing engine oil, depress plunger 3 to 5 minutes to fill chassis reservoirs
Steering Gear Trunnion Shaft	Fill reservoir with engine oil
Steering cross shaft	Fill with engine oil
Steering reach rod	Fill with engine oil
Front Wheel bearings	Clean and pack with cup grease
Rear Axle shaft bearings	Clean and pack with cup grease
Transmission	Fill to level plug with transmission lubricant (capacity 3 pints)
Rear Axle (Differential)	Fill to level plug with pure castor oil.

EACH 4,500 MILES OR TWICE A YEAR

Spring Leaves	Spread on old engine oil with brush
Speedometer cable	Remove from casing and apply cup grease.
Rectifier	Before changing oil, clean inside of Rectifier and renew strainer or wash in gasoline

STEERING GEAR. The steering gear should be kept filled with Sunoco Special Steering Gear Lubricant, or some other good similar oil.

UNIVERSAL JOINTS. The two universal joints on the propeller shaft should be lubricated with the same oil used in the transmission.

HORN. The horn must be lubricated with a light non-corrosive gun oil, or fine oil.

GASOLINE GAUGE. The gasoline gauge Transmission Wire should be lubricated with Grolan Oil, which may be obtained through Stutz Distributors and Dealers.

CUP GREASE. Use a high grade medium body cup grease at the points indicated on the "Lubrication Schedule."

REAR AXLE. A high grade pure castor oil must be used in the worm drive rear axle. The oil must be chemically pure and we recommend that this oil be obtained through Stutz Distributors or Dealers. Failure to lubricate the worm and worm wheel properly will void the guarantee of these parts as outlined under "Axle Rear". There are four plugs on each axle housing. The top plug has a hexagon head. This plug is an air vent to maintain atmospheric pressure in the axle regardless of temperature changes. A ½" pipe plug located near the top of the left side of the axle center is the oil filler plug. A ½" pipe plug located in the right side of the worm wheel carrier is the level plug. Before filling the axle, the old oil should be drained through the ⅜" drain plug under the worm. The level plug should then be removed and fresh castor oil poured in the filler plug until oil starts to flow out of the level plug. Approximately one quart of oil is required to fill the axle to the level plug. Permit excess oil to drain from the level plug for a few minutes before replacing the level plug and the filler plug.

CHASSIS LUBRICATION

MYERS SELF LUBRICATOR. Twelve spring bolts on the Safety Chassis are lubricated by the Stutz engineers' adaptation of the Myers Magazine system. The system is comprised of magazines or oil reservoirs located adjacent to the wearing surfaces. Oil is fed from these reservoirs by capillary attraction through felt wicks directly to the wearing surfaces.

The advantages of this system of Chassis Lubrication are that oil is continually fed directly to the wearing surfaces by wicks. Through the well known principle of capillary attraction, these wicks supply oil at the rate at which it is used. The wearing surfaces are constantly kept bathed in oil due to the use of wicks and there is never a surplus of oil. Clean oil only is carried through the wicks, since dirt and solid particles will not travel through the wicks.

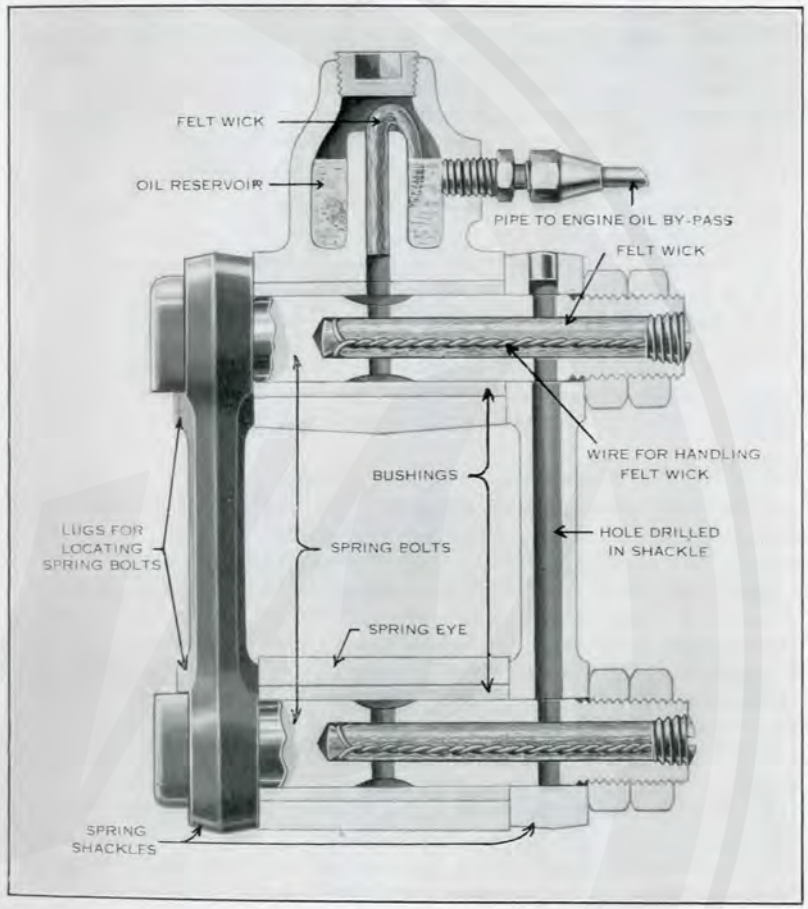


Figure 6—Myers Self Lubricator

Oil in the reservoirs is periodically replenished by a system of pipes connected to a plunger valve which should be depressed each time engine oil is changed, by passing oil from the engine lubrication system to the reservoirs. The plunger valve should be depressed while the engine is running, causing engine oil to be distributed through the system to each of the reservoirs. This operation should be done before the engine oil is changed, using the old oil, and should be done when the engine is hot if possible. The plunger should be held down long enough to flush out all the reservoirs as indicated by a tendency of the spring bolts to drip oil. The distribution pipes from the engine refill the reservoirs on each of the six front spring bolts and the six rear spring bolts.

STEERING KNUCKLES. Each of the steering knuckles is lubricated by a separate Myers magazine or reservoir which is not supplied by oil from the distribution system. Each of these magazines should be filled every 1,500 miles. These two magazines are not connected to the chassis lubrication pipe system as a means of precluding any possibility of excessive lubrication and consequently lowered efficiency of the brakes.

STEERING CROSS ROD AND DRAG LINK. The steering cross rod and the steering drag link are each hollow. These hollow tubes should be filled with engine oil through pipe plugs each 1,500 miles. The oil is fed out each end through wicks which keep the ball joints thoroughly lubricated.

MISCELLANEOUS CHASSIS PARTS. The other various parts of the chassis which require periodic lubrication are indicated in the lubrication schedule and chart on pages 28 and 29.

ENGINE LUBRICATION

The engine construction is described in Part VI on "Engine." The lubrication of the New Stutz engine is of the force feed type with oil circulated through the engine under pressure by a gear oil pump. From the oil base the lubricating oil passes through a tubular oil screen which is detachable for cleaning. and is drawn through an external suction line to the oil pump. The pump is located at the right front of the engine somewhat above the oil base to prevent any possibility of freezing. The pump discharges oil into an external pipe which carries oil to a passage in the crankcase. This passage is drilled the entire length of the engine at the right side of the crankcase. This hole constitutes a manifold for the distribution of oil through drilled passages to each of the nine main bearings. An oil regulator provides a by-pass from this long oil hole. The regulator adjustment is accessibly located at the right side of the crankcase. The proper regulator setting will provide for minimum oil pressure of 10 pounds or more when the engine is idling and a maximum of 50 pounds or less when the engine is running at high speed; both of these readings being taken with the engine hot. Oil which is by-passed by the regulator valve passes directly back to the oil base.

From each of the nine main bearings, except the rear and front bearings, oil flows to the connecting rod bearings through holes drilled in the crankshaft. The crankshaft is not hollow except for these drilled oil passages. From the connecting rod bearings oil is thrown off and lubricates the cylinder walls and the floating piston pins.

A pipe at the front of the engine diverts some of the oil from the long distribution passage in the crankcase. This pipe delivers oil to the forward accessory drive shaft bearing, and to a vertical passage through the cylinder block and cylinder head

to the overhead camshaft and valve mechanism. From the forward accessory shaft bearing, oil flows through a hole drilled diagonally in the shaft to the rear accessory bearing. Passages also deliver oil to the two automatic chain idler sprockets and the transfer sprocket. From the automatic idlers oil is thrown out on the silent chains.

From the front camshaft bracket oil enters the hollow camshaft. Each cam has a radial hole on the cam heel. These holes contain small metering pins. The oil pressure forces the pins out so that one end of each pin protrudes from the cam and wipes on the valve adjusting cap, directing a small flow of oil over each valve cap and piston. Oil also flows from the camshaft through radial holes to each of the remaining camshaft bearings.

From the rear camshaft bearing oil flows out a radial hole to a pipe leading from the rear camshaft bracket to the chassis lubricator by-pass and to the oil rectifier.

Oil from the camshaft and valve mechanism drains down to a horizontal passage in the top of the cylinder head. This passage runs the whole length of the cylinder head and drains at the rear through vertical holes to the crankcase and at the front through a horizontal hole, which drains the oil on the timing chains.

The oil metering pins in the camshaft keep the wearing surfaces of the valve adjusting cap and the valve piston constantly flooded with oil. This is done without causing an excessive amount of oil mist or finely broken up oil in the cylinder head cover and results in extremely quiet and long lived valve mechanism. An excessive amount of oil cannot reach the valve stems since the valve piston guides are bolted directly over the oil drain channel in the cylinder head and the lower valve guides extend up inside the valve piston guides in such a way as to prevent any excessive lubrication.

OIL RECTIFIER

The New Stutz Oil Rectifier is designed to maintain the viscosity or "body" of the engine oil by a process of distillation using exhaust heat, and to remove solid particles from the oil by filtration or straining through a strainer of special construction.

Without the Rectifier the fresh oil put into the engine becomes contaminated in a few miles, and this contamination increases until the oil is again changed, by which time the oil has usually lost most of its lubricating value. This process of contamination is cumulative and continuous in every engine whether new or old. The contamination consists of solid particles and liquid dilution from the fuel, and also water, which is a product of combustion.

The Rectifier is mounted on the rear exhaust manifold at the right side of the engine and works continuously while

the engine is running. Surplus oil delivered to the hollow camshaft flows out at the rear camshaft bracket and through an external pipe to the rectifier under approximately 10 pounds pressure.

The oil enters the bottom of the rectifier and passes through a filtering member which removes the solid particles. From the lower chamber oil passes to an upper chamber. The upper chamber is surrounded by a jacket through which exhaust gases are circulated. As the water and fuel dilution is boiled off by

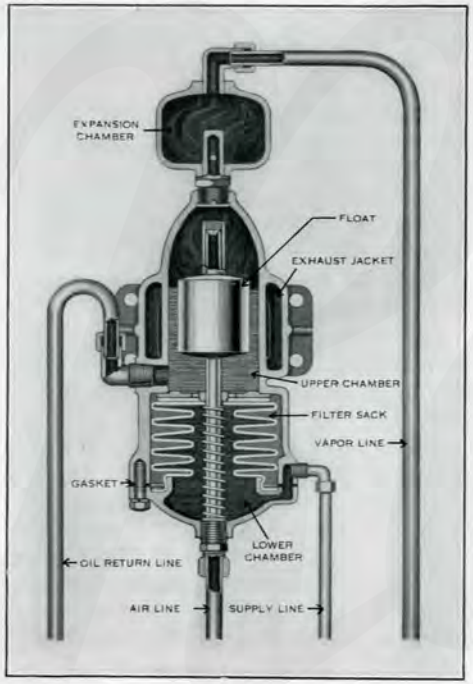


Figure 7—Oil Rectifier

exhaust heat, these gases are carried to the carburetor through a pipe which, due to carburetor suction, maintains a partial vacuum in the upper chamber.

A breather pipe, which resembles a stand pipe, runs up nearly to the top of the upper chamber. This breather pipe is in the center of the rectifier and around the outside of the breather pipe is a circular float. This float carries a valve which fits in the top of the breather pipe and partially closes off the breather opening when the float is down.

The top of the standpipe is above the upper oil level. The oil is forced through the strainer in the lower chamber and,

at a predetermined level, the oil causes the float to open the breather valve. Before this level is reached the oil rises up over the top of the bend in a goose neck or syphon pipe leading back to the crankcase. The slight vacuum created by the carburetor connection retards the syphoning action until the breather valve is opened by the float, restoring atmospheric pressure. The syphon action is rapid and as the upper chamber drains the cycle is repeated. The oil remains in the upper chamber in contact with the exhaust jacketed walls long enough to boil off the liquid diluent, the fumes from which are carried to the carburetor and mixed with the incoming charge to the cylinders.

CHANGE ENGINE OIL. As the result of extensive experimental work it is recommended that the engine oil be changed at the end of the first 500 miles and each 1,500 miles thereafter, and that the rectifier filter be renewed or cleaned each 4,500 miles.

Oil which will be drained from the engine each 1,500 miles will have a higher lubricating value than oil drained at half this mileage from engines not equipped with the Stutz Rectifier. Experimental work has indicated, however, that the life of the engine is prolonged by changing oil each 1,500 miles. This is particularly important in cold weather, and where the car is used for short runs with frequent stops.

REPLACING RECTIFIER STRAINER. The Rectifier strainer may be removed by taking out the cap screws at the bottom of the rectifier, disconnecting the breather pipe and withdrawing the lower cap of the rectifier with the strainer. The strainer member is fastened to the cap by a brass wire ring. This ring can be released and the strainer removed and replaced or cleaned with gasoline. The strainer should be fastened in place again with the brass wire ring.

CLEAN INSIDE OF RECTIFIER. Each time the strainer is removed the plate between the upper and lower chambers should be removed together with the float. The removal of this plate makes the upper chamber accessible for cleaning. Clean the inside of the rectifier, the float and the float valve and also the small hole at the center of the float valve before reassembling.

CHECK RECTIFIER OPERATION. After reassembling the Rectifier and tightening the connections, to check the operation of the rectifier disconnect the bottom end of the syphon tube and enter the tube in a glass or can. With the engine running at average road speed oil should flow from the syphon pipe in a very short time.

CLEAN SCREEN. Each time the oil is changed the screen in the oil base should be removed and cleaned.

NEVER FLUSH A STUTZ ENGINE WITH KEROSENE

A New Stutz engine should never be flushed with kerosene. It will not ordinarily be necessary to flush the engine at all, provided the oil screen is removed from the oil base each time the engine oil is changed. The oil screen should be washed clean and the oil pan should be inspected through the screen opening to determine if any sludge has been formed. If any sludge appears in the bottom of the oil base, it should be scraped out with a clean wire brush, or if necessary after an inspection the oil base may be dropped in order to remove the sludge.

PART VI

ENGINE

THE ENGINE OF A NEW CAR SHOULD UNDER NO CIRCUMSTANCES BE RACED OR PULLED HARD OR THE CAR DRIVEN FAST DURING THE FIRST 750 MILES OF ITS USE.

The New Stutz engine is unconventional in its excellence of performance and also its long life and freedom from service troubles. The principles of engine construction are all thoroughly tried out and proven and represent a co-ordination of the best European and United States practices.

GENERAL SPECIFICATIONS. The engine is of the Vertical 8 cylinder type with valves in the head and overhead camshaft. The engine displacement is 287.27 cubic inches, with bore of 3 3/16 inches and 4½ inch stroke. The cylinders are cast integral with the crank case and form an extremely rigid unit.

An effort is made in the succeeding paragraphs to thoroughly describe the construction and the service operations on the New Stutz engine in order that the owner may better appreciate the excellence of the New Stutz design and construction and better understand the service operations on these cars.

ENGINE SERVICE

The New Stutz engine is designed to develop unusual performance and to do this without the necessity of frequent repairs and adjustments. The most frequent service operations required on the modern automobile engine are those operations required by the valve mechanism. This condition emphasizes the advantage of the New Stutz construction in that this construction makes possible the removal of the cylinder head and the entire valve mechanism, including the camshaft, camshaft bearings and all the valve mechanism as one unit. This unit may be carried to the bench or to a special stand for further operations, including adjustment of valve lash.

VALVE MECHANISM. The valve mechanism is direct acting with a minimum of moving parts or moving weights. There are no tappets, push rods, rockers or levers in the valve mechanism, as the overhead camshaft acts directly against caps threaded on the ends of the valve stems. One entire valve mechanism, including half the weight of the valve spring, weighs approximately 12 ounces. This construction, together with the valve spring design, makes it possible to use comparatively light valve spring pressure and still prevent the valves from leaving the cam and "Floating."

VALVE LASH AND VALVE NOISE. The New Stutz valve mechanism is designed for .032-inch lash or clearance for

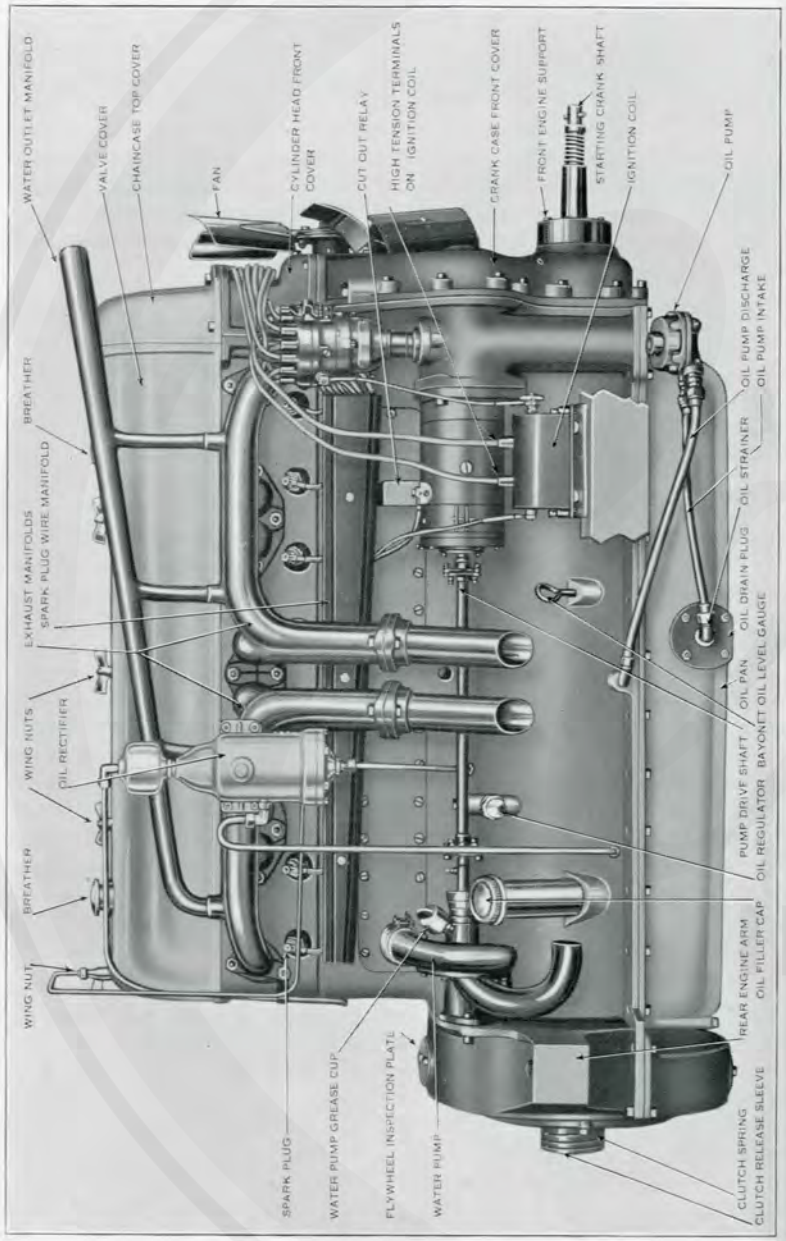


Figure 8—Engine—Right Side

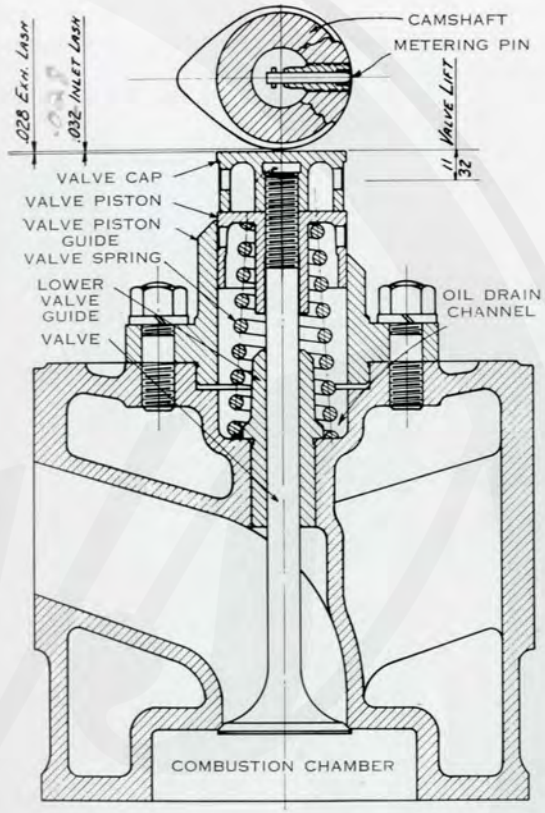


Figure 9—Cross Section Through Valve

the intake valves and .028-inch lash for the exhaust valves. The procedure for setting valve lash is discussed under "Adjusting Valve Lash." This adjustment is essential to the proper functioning of the engine. The valve mechanism is so simple and rigid as to make valve adjustments unusually permanent. The thought is sometimes expressed by the uninitiated that a large amount of valve lash necessarily results in a large amount of noise. This impression is entirely false. There must be some noise in every poppet valve mechanism, but this depends upon cam design and upon the design and complications of the valve mechanism. When any two parts of the valve actuating mechanism have lash or clearance it makes no difference whether that clearance is a few thousandths of an inch or several inches.

Two factors which largely determine how much noise will be made by valve mechanism are, first, how fast the valve mechanism is moving when the end of the valve stem is struck as the valve is first set into motion; and, second, the number of parts

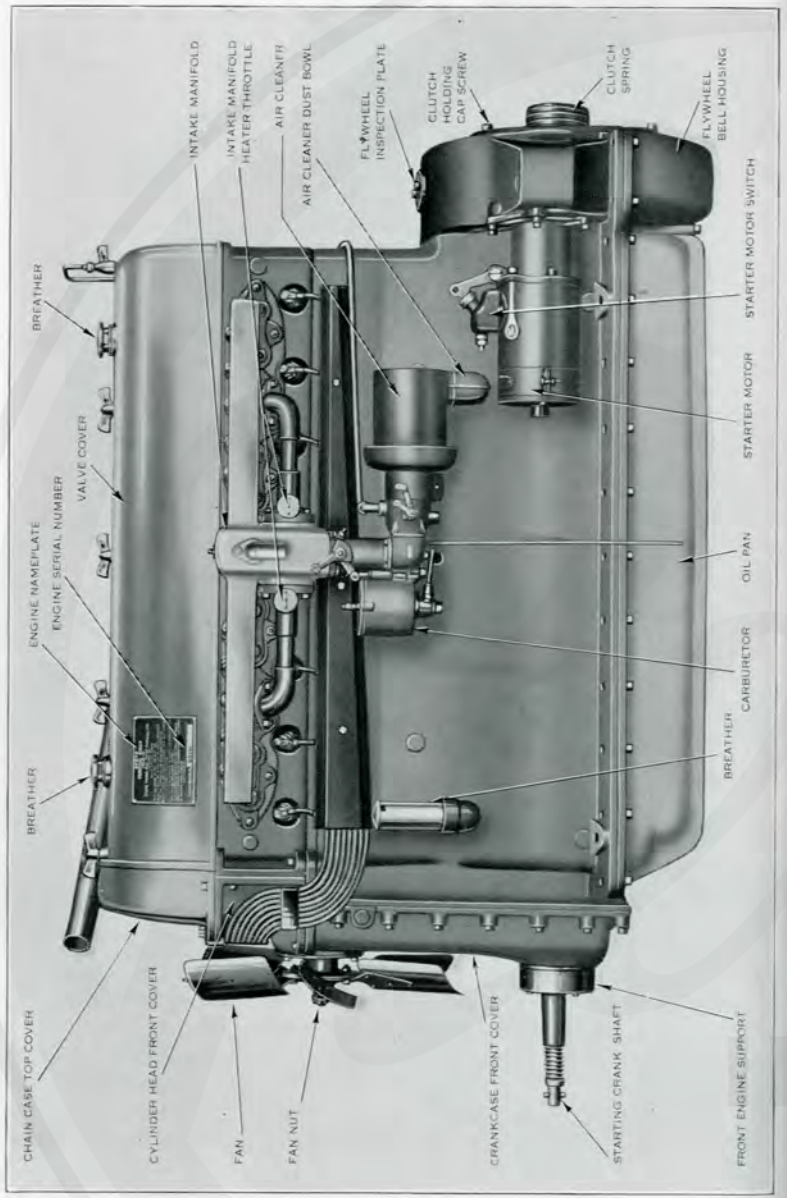


Figure 10—Engine—Left Side

in the valve mechanism where there may be some clearance or play, since each of these joints will add to the noise of the valve mechanism each time a valve is opened. The New Stutz camshaft is designed to decrease the valve lash very slowly just before the valve starts to open. As a result of this construction the valve is struck a very soft blow when it is first put into motion.

The New Stutz valve mechanism also has the unusual advantage of having only one point in the mechanism where clearance and consequent contact blows are possible. The cams wipe directly on the valve caps screwed on the ends of the valve stems. The cams are ¾ inch wide and the slight shock or blow between the cam and the valve cap is still further softened by the oil film deposited on top of the valve cap by the camshaft metering pin as described under "Lubrication"—page 33.

The conventional valve mechanism would be extremely noisy with the valve lash recommended for the New Stutz because the conventional camshaft is not designed for this large amount of lash.

A further advantage of the New Stutz valve construction is the unusual cooling of the exhaust valve which results from screwing the valve piston and valve cap on the valve stem.

ADJUSTING VALVE LASH. The valve pistons and valve caps screwed on the end of the valve stem each have eight ¼-inch radial holes around their circumference. The valve piston guides are cut away at the left so that short bars may be entered in the holes in the valve piston and the valve cap to make the necessary adjustments. The procedure for adjusting valves is to turn the camshaft with the heel of the cam, at one side of the metering pin, directly over the valve cap. The clearance should then be set with .032 inch feeler or shim for intake valves and with a .028 inch feeler for exhaust valves. The camshaft is so designed that the setting of both intake and exhaust valves may be varied somewhat and an optional setting of .029 inch for intake valves and .025 inch for exhaust valves may be preferred by some owners. In each case the normal valve lash of .032 inch for exhaust valves must be used for timing the camshaft. There should be .004 inch difference between the intake lash and the exhaust lash, and uniform lash must be used on any one engine. Intake and exhaust valves can be distinguished readily because each exhaust is located directly adjacent to a camshaft bearing.

IN ORDER TO LOOSEN OR TIGHTEN THE VALVE CAP THE BAR WHICH IS PLACED THROUGH THE VALVE PISTON HOLE SHOULD BE SWUNG OVER AGAINST ONE END OF THE CUTOUT IN THE VALVE PISTON GUIDE AND THE WORKMAN SHOULD PULL ON THE BAR INSERTED IN THE VALVE CAP. THIS

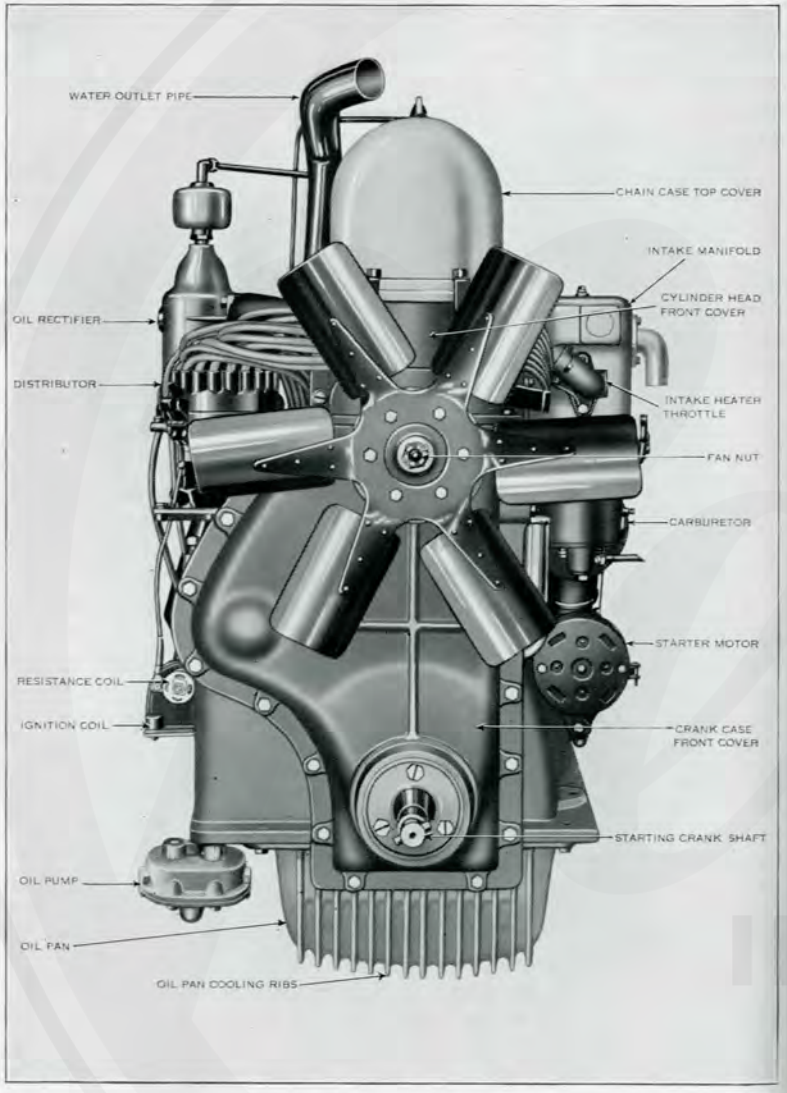


Figure 11—Engine Front

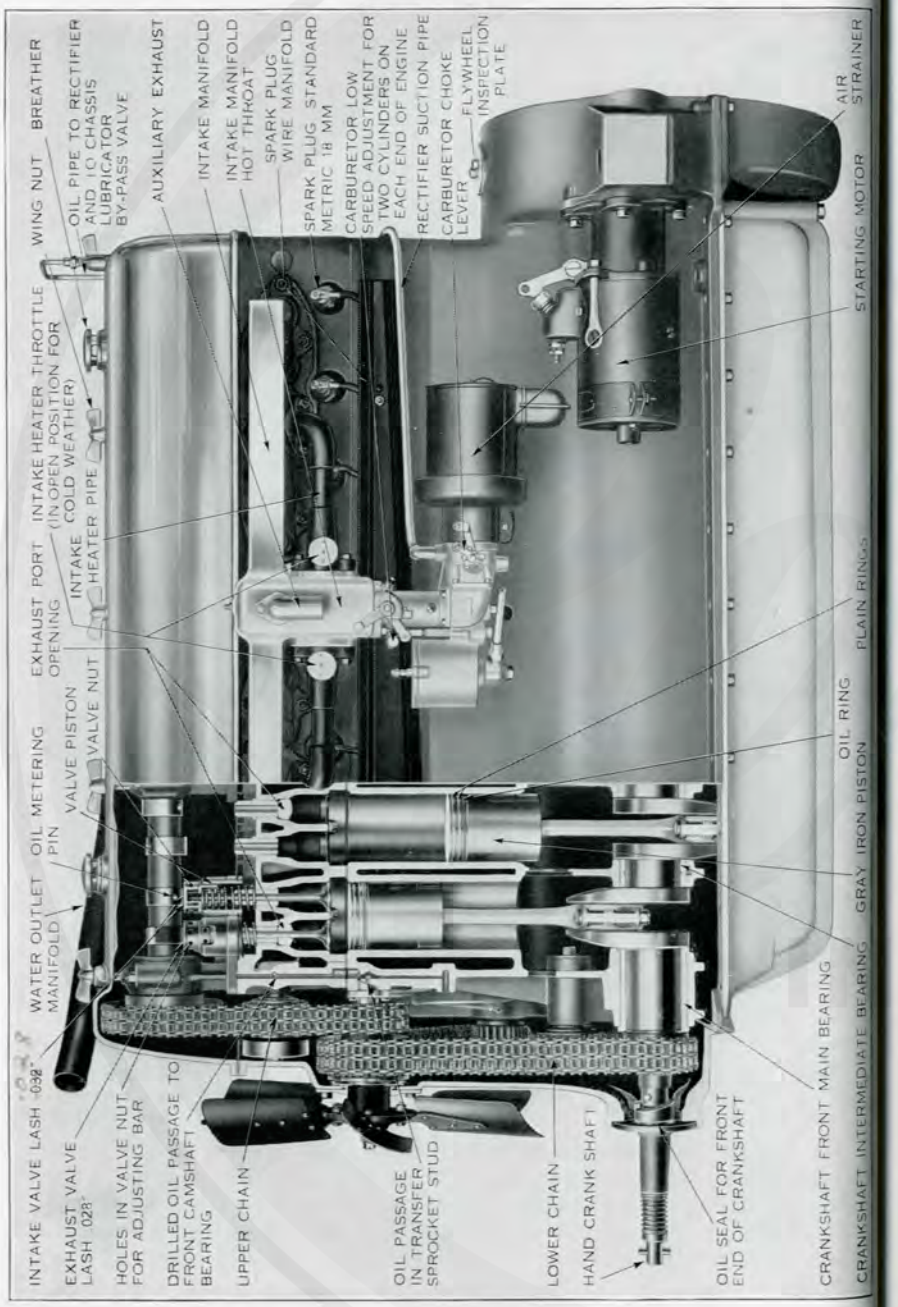
PROCEDURE IS NECESSARY TO MINIMIZE THE POSSIBILITY OF RAISING A BURR ON THE VALVE PISTON AROUND THE HOLE IN WHICH THE ADJUSTING BAR IS INSERTED. PROVIDED SUCH A BURR IS RAISED IT MAY RESULT IN A VALVE STICKING, DUE TO THE BURR ON THE PISTON BINDING IN THE PISTON GUIDE.

VALVES. The valves are made of Chromium-Silicon alloy, which is extremely tough and resists distortion or pitting when hot. Each valve weighs approximately 4.5 ounces. The valves are of the "Modified Tulip" shape. The valve stems are 3/8 inch in diameter and each stem is threaded at the end with a 3/8-24 S. A. E. thread to receive the valve piston and valve cap. The outside diameter of the valve head is 1 9/16 inch with a 45 degree seat. The valve lift is 11/32 inch for both intake and exhaust valves.

VALVE PISTON. The valve piston is of light construction made from mild steel, which is turned and ground accurately to 1½ inch diameter. The inner bore of the piston is threaded with a 3/8-24 S. A. E. thread at the top to engage threads on the valve stem and bored out accurately to 3/8 inch at the lower part of the piston to fit snugly over the unthreaded part of the valve stem. The pistons are 7/8 inch long and weigh approximately 3.5 ounces each. The valve pistons are drilled with eight 1/4-inch radial holes as a means of adjustment.

VALVE CAP. Valve caps are screwed on the tops of the valve stems. The top surface of the valve cap is ground and carefully lapped. This surface is 1 17/32 inches in diameter. The valve cap has eight 1/4 inch holes drilled radially to provide means of valve adjustment.

VALVE GUIDES. Each valve has two guides. The inner guide is of a conventional type pressed into the cylinder head. The outer guide or valve piston guide is a gray iron casting bored and ground out accurately to 1½ inches inside diameter. The outer valve piston guide is held to the cylinder head by two 3/8 inch studs and nuts. The steel valve piston on the valve stem slides up and down in the bore of the valve piston guide. The valve piston is flooded with oil from the camshaft. Excess oil is wiped from the piston by a knife edge around the top of the piston guide. Oil which passes the valve piston drains down into a gutter or channel which is milled the length of the cylinder head. The piston guides are bolted over this channel, the channel drains into the crank case through two vertical passages at the rear of the cylinder head and cylinder block and through one horizontal passage at the front of the cylinder head. This horizontal hole directs the oil over the timing chains. Extreme length of life of the valve mechanism is obtained through the large area of valve guides which assure the valves remaining



tight and in proper alignment. The inner valve guide acts as a gas seal, but takes very little side thrust since the valve piston keeps the valve properly aligned. Excess oil is prevented from penetrating to the valve stems since the valve piston guides drain the excess oil out and into the gutter or channel in which the level is considerably below the top of the inner guide.

VALVE SPRINGS. One spring only is used on each valve. These springs are made of Holcomb Chrome Vanadium electric furnace spring steel. The valve spring is of a slightly conical shape and variable pitch. The conical shape and variable pitch of the spring assures a different natural period of free vibration for each coil of the spring and results in damping out any tendency of the spring to take up and emphasize the periodic motion of the valve at any speed. This construction removes the most frequent source of valve spring breakage and, in connection with the high grade material used and the comparatively low stresses in the spring, practically eliminates the possibility of valve spring breakage. The loaded resistance of the valve spring should be approximately 40 pounds at 2 15/32 inches, which corresponds to the valve spring length when the valve is closed and approximately 90 pounds at 2⅛ inches, which corresponds with the valve spring length when the valve is opened. The recommended method of checking valve springs is to place the spring on a surface plate and measure the overall free length which is between 2 11/16 and 2 13/16 inches.

CYLINDER HEAD COVER

The cylinder head cover is an aluminum casting held in place by five wing nuts. The rear hold down stud is drilled with a hole which communicates with a circumferential oil groove in the rear camshaft bearing. Excess oil pumped to the camshaft flows out through this hole and the hollow wing nut on top of the cylinder head cover to the pipe line which carries the oil to the oil rectifier mounted on the rear exhaust manifold. A by-pass on this oil line may be depressed to supply engine oil to the chassis lubrication system as described under "Chassis Lubrication. Two breathers are provided in the cylinder head cover. Each time the cover is removed it should be cleaned inside.

The proper procedure for removing the cylinder head cover is to take it off from the left side. The rear end of the cover should be lifted first to break the seal between the cylinder head cover and the upper chain cover.

CHAIN COVERS

CHAIN CASE TOP COVER. The upper chain cover is an aluminum casting which covers the camshaft sprocket. The bottom flange of this cover is on a level with the bottom of the cylinder head cover. The upper chain cover is held to the center

chain cover by four screws. The upper and center chain covers are removed together as one unit for valve grinding and similar service operations.

CYLINDER HEAD FRONT COVER. The center chain cover is an aluminum casting, the top of which is approximately level with the top of the cylinder head casting and the bottom of which is approximately level with the bottom of the cylinder head casting. The center housing is held in place by four machine screws threaded into the cylinder head, two threaded into the forward end of the crankcase and two threaded in the lower chain cover.

CRANKCASE FRONT COVER. The lower cover encloses the chain from the top of the cylinder block down. This cover is held in place by thirteen 3/8 inch cap screws in the cylinder block and three 3/8 inch cap screws in the oil base. The cover is a gray iron casting. The oil seal at the front end of the crankshaft is provided by a cone on the hand crank stud. The spring which holds the crank stud out of engagement with the crankshaft, also holds the cone against a seat in the chain cover, effectively sealing the front end of the crankcase from oil leakage.

To remove the lower chain cover, remove the radiator as described under "Radiator." Block up the front end of the engine. Loosen the two nuts which hold the U-shape strap which forms the front engine support. It is unnecessary to loosen these nuts more than 1/8 inch. Remove the 6 bolts in each end of the frame cross member and remove cross member by sliding it to the front of the car. Remove the thirteen 3/8-16 cap screws which hold the lower cover to the crankcase and the three 3/8-16 cap screws which go through the cover into the oil base. The cover is also held in place by two dowel pins. The cover may now be removed.

There are two large bosses on the lower chain cover, one at each side of the cover near the top. These bosses are drilled and tapped with 5/8-11 U. S. S. thread. These holes are provided to facilitate the removal of the engine from the frame. Authorized Stutz Service Stations will have special hooks and screws for these holes, and a special bar for fastening the chain hoist on to the hooks. Cars are shipped from the factory with special plugs for covering these two holes.

CAMSHAFT

The camshaft it carried on the cylinder head in five bearings. These bearings are machined directly in the gear bronze camshaft brackets which are bolted to top of cylinder head. The camshaft is made of McQuade-Ehn S. A. E. No. 1015 special tested forging steel, case carburized and hardened. The camshaft is of unusually stiff construction with a minimum diameter

of 1½ inches, and weighs approximately 18½ pounds. The stiffness of the shaft is accentuated by the fact that in each case the exhaust cams are located directly adjacent to the camshaft bearings. This construction is advantageous because a greater effort is required to open an exhaust valve than an intake valve since the exhaust valve opens against the pressure which remains in the cylinder toward the end of the power stroke.

The contour of the cams has been calculated and laid out with extreme care and skill to give hammerless opening and closing of the valves together with rapid opening and closing characteristics. End play is taken by the front camshaft bearing. The camshaft should have .004 to .006 inches end play and each

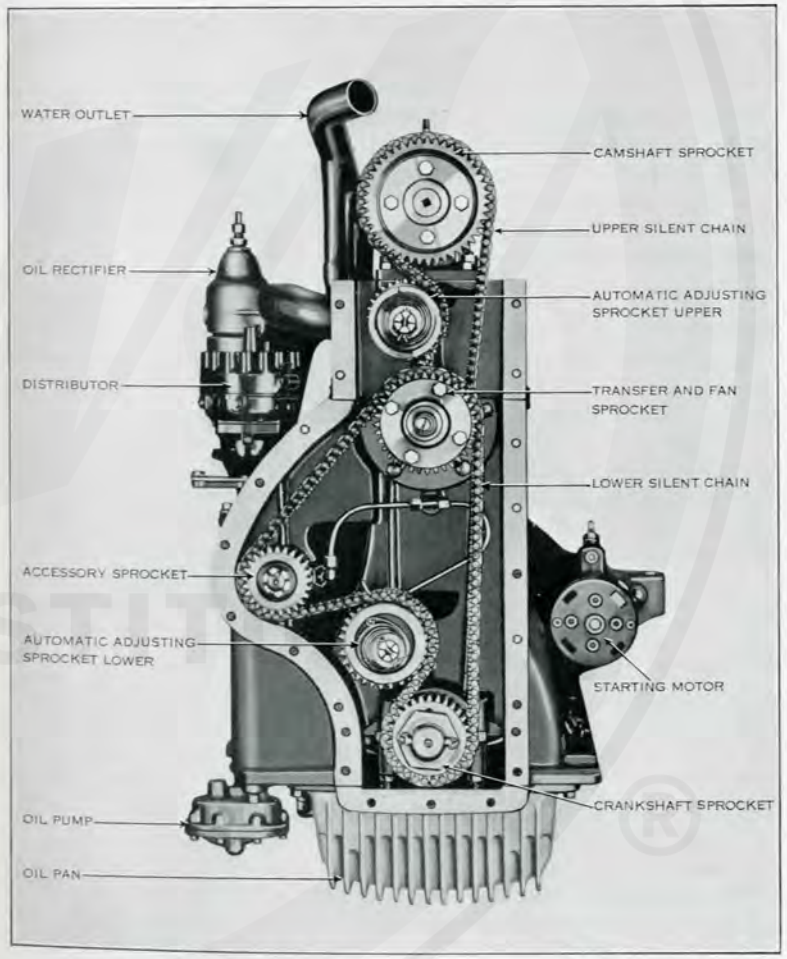


Figure 13—Engine Front with Silent Chains Exposed

camshaft bearing should have .003 to .005 inches diametrical clearance. The camshaft brackets are accurately located on the cylinder head by dowel pins which make line reaming unnecessary.

CAMSHAFT DRIVE

The overhead camshaft is driven by two Link Belt silent chains. The chains are each ⅜ inch pitch. The lower chain is 1½ inches wide and approximately 48 inches long, when extended, while the upper chain is 1¼ inches wide and approximately 33¾ inches long when extended. The lower chain drives the accessory shaft at 1.2 times the crankshaft speed and the transfer sprocket at 5/6 times the crankshaft speed. The accessory shaft and transfer sprocket and the camshaft rotate in the same direction as that of the crankshaft.

Four studs are provided on the 45 tooth camshaft sprocket to hold it in place on the camshaft. This construction makes possible 180 different positions of the camshaft and consequently makes it possible to set the camshaft with a maximum error of 1 degree rotation of the camshaft, or 2 degrees on the flywheel. The procedure in setting the camshaft timing is described under "Timing the Valves".

AUTOMATIC IDLERS. Both of the chains are adjusted automatically by patented idler sprockets which are carried on eccentric mountings containing coil springs which maintain a constant tension throughout the long life of each chain. In order to disassemble either of the drive chains, it is first necessary to disassemble the automatic idler sprocket. This may be done by pulling the cotter pin from the end of the stud on which the sprocket is mounted. The large eccentric hub may then be pulled out away from the sprocket. The coil spring will be released before the hub slides from the stud. The coil spring unwinds as soon as it is released and removes the tension from the chain. After the eccentric hub is removed, there will be enough slack in the chain to permit removal of the sprocket or chain wheel.

To reassemble the automatic idler, after the camshaft is properly timed and the camshaft sprocket turned counter-clockwise with sufficient pressure to tighten the right side of the chain, viewed from the front, engage the sprocket or chain wheel in the chain and start the eccentric hub onto the stud. Engage the end of the hub in the sprocket.

A special tool is then engaged on the inside tongue of the coil spring and the spring wound up 1¼ to 1½ turns. The inside spring tongue may then be dropped into the nearest slot in the stud. The large plain washer and cotter pin which holds the sprocket in place may then be replaced.

TIMING THE VALVES

The valves are properly set when the engine leaves the factory. No change will be necessary except that each time the valves are ground or the cylinder head disassembled for similar operations it is advisable to check the valve timing as a means of eliminating minor changes in valve timing due to stretching of the timing chains.

Crank the engine over until the mark "Top C 1 & 8" on the flywheel is visible at the center of the upper inspection plate opening, and the distributor rotor is in position to send a spark to the two distributor head terminals marked "8R" and "8L."

With the crankshaft in the position indicated above, set the camshaft with cams No. 1 and No. 2, counting from the front pointing up as illustrated in Figure 15D, page 53. With the camshaft in this position adjust valve No. 2 with .032" lash or clearance. Turn the camshaft clockwise, viewed from the front, until No. 2 valve is about to open. Place a .004" feeler between No. 2 valve cap and the cam. Set the camshaft so that the .004" feeler can be passed between the cam and the valve cap with a little resistance. The pressure on the shim must not be sufficient to lift the valve off its seat. The camshaft must remain in this position until the drive chain and sprocket are assembled.

Mesh the camshaft sprocket in the chain and place the camshaft sprocket on the camshaft flange without assembling the bolts. Rotate the camshaft sprocket counter clockwise, viewed from the front, thereby tightening the chain on the intake manifold side of the engine. The camshaft sprocket holes may be lined up with the camshaft flange holes by slipping the chain on the transfer sprocket one tooth at a time. Provided a closer adjustment is necessary to line up the holes it will be found that each quarter turn of the camshaft sprocket changes the position of the sprocket holes by one-quarter tooth. The chain should not be disengaged from the upper sprocket but should be slipped on the transfer sprocket in this operation. The position of the sprocket holes should be checked with the drive chain tight on the intake manifold side of the engine. The camshaft and flywheel must not be turned during this operation.

When the camshaft sprocket holes line up with the holes in the camshaft flange, install the four cap screws which hold the sprocket to the camshaft. New lock washers should be used and the cap screws should be wired after the setting is checked.

THE AUTOMATIC IDLER SPROCKETS SHOULD BE ASSEMBLED IN ACCORDANCE WITH THE INSTRUCTIONS UNDER THE HEADING "AUTOMATIC IDLERS" ON PAGE 48 EXCEPT THE SPRING SHOULD BE WOUND 1½ to 1¾ TURNS.

BOTH EXHAUST AND INTAKE VALVES SHOULD BE ADJUSTED WITH A LASH OR CLEARANCE OF .028". THIS SUPERCEDES ANY OTHER INFORMATION CONCERNING CLEARANCE.

Do not fail to check valve timing. This may be accomplished by adjusting No. 2 valve, which is the intake valve for cylinder No. 1, with .032" valve lash as described above. The engine should be cranked over two or three times and No. 2 valve should start to open when the flywheel mark "IN OPEN" is in the center of the upper inspection plate opening. In every case a line through the center of the upper inspection plate opening must fall between the marks "IN OPEN" and "Top C 1 & 8" on the flywheel, and not more than ½" from the mark "IN OPEN." The engine should be turned ahead, or clockwise from the front, in making this check as reversing the rotation of the engine introduces an error due to back lash in the driving mechanism.

tion plate hole. The crankshaft should be turned ahead or clockwise viewed from the front, to bring it to the desired position. Turning the crankshaft backward might introduce an error in timing due to back lash in the lower chain. Place the cylinder head in place on the block.

With the crankshaft in the position indicated above, set the camshaft with cams No. 1 and No. 2 counting from the front, pointing up. A line through two of the tapped holes in the camshaft flange should then be exactly vertical. A line through the other two holes in the camshaft flange will be horizontal. The joint in the front camshaft bearing may be observed at the exact center of the two holes placed horizontally.

Engage the camshaft sprocket in the teeth of the upper chain. Slip the recess in the camshaft sprocket over the corresponding shoulder of the camshaft flange. Rotate the camshaft sprocket counter clockwise viewed from the front of the engine as far as it will go but do not turn the camshaft or crankshaft. If the holes in the camshaft sprocket line up with the holes in the camshaft, the setting is correct and the cap screws may be put in place. Providing the camshaft sprocket holes do not line up with the camshaft holes the sprocket should first be set to the nearest tooth. Then disengage the camshaft sprocket from the chain and rotate one-quarter turn at a time in either direction until the best possible alignment between the holes is obtained. Because of the 45 teeth on the camshaft sprocket and the four holes in the sprocket, the maximum possible error in the camshaft setting should be 1 degree of the camshaft or 2 degrees of the crankshaft. When the proper setting is obtained, draw down the cap screws which hold the camshaft sprocket in place, and assemble the automatic idler sprocket as described under "Automatic Idlers." The camshaft setting should then be checked before locking the cap screws which hold the camshaft sprocket in place. With the flywheel marking IN OPEN directly under the center of the inspection hole, a line through two of the camshaft sprocket cap screws should be exactly vertical.

VALVE GRINDING. Grinding valves is an unusually simple operation on the New Stutz. The proper sequence of operations in grinding the valves is as follows:

1. Put on fender, cowl, headlamp, door and seat covers.
2. Drain water from radiator.
3. Remove six 5/16" bolts holding hood in place and remove hood.
4. Remove six 5/16" oval head cap screws from radiator splasher and pull splasher forward. These cap screws are threaded in the frame.
5. Remove four ½" nuts from two studs at bottom of radiator.

6. Remove two radiator hose connections and radiator tie rod.
7. Remove radiator by tipping back the top toward the cowl and pulling the bottom forward to clear the starting crankshaft.
8. Remove cotter pin and one ½" nut holding fan in place and six ¼" cap screws holding fan drive cover in place. Remove fan and cover.
9. Remove top and center camshaft drive chain covers as one unit by removing the eight fillister head cap screws in lower cover. After removing covers place a sheet metal plate or cover over top of the lower chain cover to keep anything from falling into the engine. Authorized Stutz Service Stations have special covers for this purpose.
10. Remove automatic idler assembly and camshaft sprocket.

    Note.—This operation is described under "Automatic Idlers".

    Note.—The chain may be removed from the camshaft sprocket after the automatic idler assembly is removed and the camshaft sprocket may then be left in place on the camshaft throughout the camshaft grinding operation. This procedure is not usually advisable since the valves will not require grinding excepting at lengthy intervals. It is usually advisable to reset the camshaft sprocket to eliminate any change in timing due to the stretching of timing chains.
11. Disconnect oil line from rear cylinder head cover nut and remove the five wing nuts holding cylinder head cover in place. Remove the cylinder head cover.
12. Remove eighteen 7/16" cylinder head hold down nuts and washers and two 7/16" fillister head cap screws in front of head.
13. Close shut off valve on bottom of vacuum tank and disconnect gasoline line on bottom of carburetor, vacuum line on intake manifold, rectifier line on carburetor, and disconnect the choke and carburetor controls.
14. Remove four 7/16" bolts from exhaust manifold connections to exhaust pipes.
15. Disconnect one ¼ inch, two ⅜ inch and one ½ inch oil line on rectifier and put on blind caps or plugs to keep the oil from leaking from rectifier.
16. Remove cylinder head and place on stand.

    Note.—Most Stutz Authorized Service Stations will have special stands for holding the cylinder head assembly while performing service operations. This work may be done on a bench but this makes the removal of the rectifier and the intake manifold advantageous.
17. Remove ten ⅜" nuts holding the five camshaft bearing caps in place, remove the caps and the camshaft.



Figure 15-A

Before removing the camshaft or the cylinder head, the upper automatic adjusting sprocket must be disassembled in order to loosen the upper silent chain, preparatory to disassembly. The sprocket is held in place by a cotter pin and a plain washer. The first operation is to pull the cotter pin and remove the plain washer.



Figure 15-B

The second operation is to withdraw the eccentric hub from the sprocket. After the hub is withdrawn a short distance the coil spring will unwind, releasing the tension on the silent chain.



Figure 15-C

The sprocket may now be removed, leaving the silent chain sufficiently slack to permit removing the chain from the camshaft sprocket if desired. It is advisable to remove the camshaft sprocket from the camshaft and retime the camshaft upon reassembly, as this operation is very easily accomplished and will eliminate the possibility of any slight stretch in the chain effecting the valve timing.

A special cover plate may be obtained to cover the opening down into the crankcase front cover.



Figure 15-D

FOR VALVE TIMING SEE PAGE REVISED

To time the camshaft upon reassembly, first turn the crankshaft until the mark "IN OPEN" on the flywheel is visible at the center of the upper inspection plate opening, and the distributor rotor is in position to send a spark to the two distributor head terminals marked "1R" and "1L". Then turn the camshaft so that cams No. 1 and No. 2 each stand approximately 45° from vertical, as illustrated.

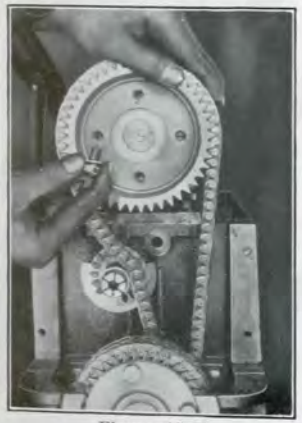


Figure 15-E

With the crankshaft and the camshaft in position, engage the camshaft sprocket in the chain, place the sprocket on the camshaft flange and rotate the sprocket counter-clockwise, viewed from the front, drawing the chain tight on the carburetor side of the engine. Two of the holes in the camshaft flange will be in a vertical line and the other two holes in a horizontal line. Provided the sprocket holes do not stand in the proper position, disengage the sprocket from the chain, then each quarter turn of the sprocket will change the relative position of the sprocket holes by one quarter of a tooth.

The split in the front camshaft bearing should be visible at the center of each of the horizontally placed holes. When the sprocket holes line up with the holes in the camshaft flange, assemble the sprocket to the camshaft with the four cap screws.

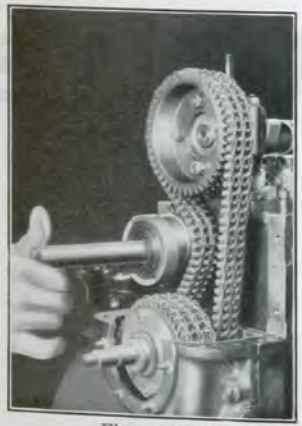


Figure 15-F

With the camshaft properly timed and the sprocket assembled in place, reassemble the automatic adjusting sprocket. The spiral spring should be wound up 1¼ to 1½ turns after the eccentric hub is turned clockwise to remove all slack from the chain. Enter the spring tongue into the nearest of the slots in the stationary stud. The plain washer and cotter pin may then be assembled in place.

18. Loosen the valve piston caps as described under "Adjusting Valve Lash." Remove the valve caps.
19. Remove the sixteen spark plugs.
20. Remove carbon from combustion chambers in head and from piston tops.

    Note.—A wire brush mounted in a small portable drill motor is effective for removing carbon.
21. Remove valves by locking valve piston with adjusting bar and unscrewing valve with screw driver bit in brace.
22. Clean valves.
23. Grind or reseat valves and valve seats.

    Note.—Well equipped shops will have special equipment for reseating valves and valve seats which is highly satisfactory and much quicker than grinding them by hand.

    Note.—the valve seat in the cylinder head should be 1/16″ to 3/32″ wide.
24. Thoroughly clean and blow out all carbon, dirt or grinding compound from the combustion chambers, valve guides and valve passages.

    Note.—The mechanic must be careful to remove all traces of dirt and grinding compound from the intake passages in particular. Failure to do this may permit abrasive entering the valve mechanism and cylinder after the engine is reassembled.
25. Clean valves and reassemble, lock valve pistons and screw valves with screwdriver brace until the pistons stand with their top surfaces approximately 1/16″ above the top edge of the valve piston guides. Screw valve caps down lightly on top of valve pistons.
26. Install camshaft and camshaft bearing caps. Place a few drops of oil on each journal before assembling the caps.
27. Adjust valve lash, set intake valves at .032 inch and exhaust valves at .028 inch clearance at heel of cam at either side of oil metering pin. Note: See "Adjusting Valve Lash".
28. Wipe out cylinders which were cleaned in operation 20, clean top of cylinder block, clean and inspect gasket and renew same if damaged. Put gasket in place on cylinder head. Note: The cylinder head gaskets should be renewed approximately every second time the head is removed.
29. Remove cylinder head assembly from stand or bench and place on cylinder block. Replace washers and hold down nuts and two fillister head cap screws at front of block.

    Note.—Tighten cylinder head nuts down evenly a little at a time.

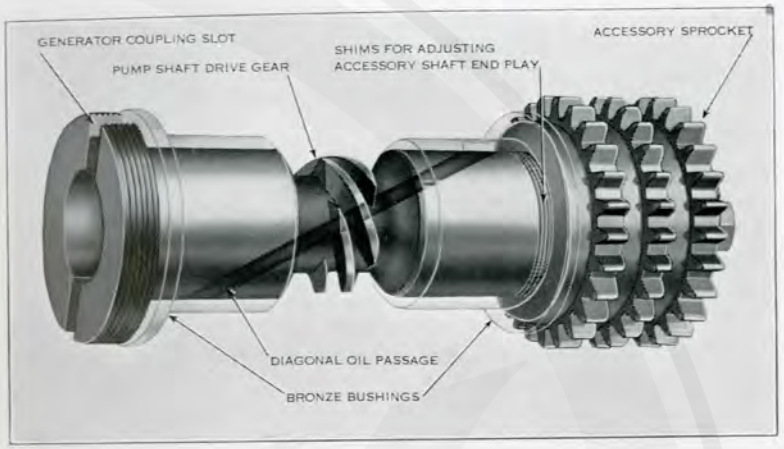


Figure 16—Accessory Shaft

30. Connect gasoline and oil rectifier lines, vacuum line, carburetor control, and choke control. Open shut off valve at bottom of vacuum tank.
31. Connect exhaust pipes to manifolds, replacing gaskets if necessary.
32. Clean, adjust and reinstall spark plugs.

    Note.—Spark plug gaps should be .025 of an inch.
33. Time engine, reassemble chain and automatic idler sprocket.

    Note.—This operation is described under "Timing the Valves," page 48.
34. Assemble drive chain covers, fan drive cover and fan.
35. Put on radiator, tighten hose connections and fill with seven gallons of water, or glycerine or alcohol solution. Replace radiator tie rod.

    Note.—Radiator hose connections should be replaced frequently particularly if there are any indications of deterioration of the inside of the hose. It is good practice to change the radiator and pump hose twice each year.
36. Replace radiator splasher plate and be sure that hand crank cap is in place.
37. Check ignition timing and distributor points as outlined under "Ignition."

ACCESSORY SHAFT

The accessory shaft is located at the right front of the engine and driven by the lower camshaft drive chain. The accessory

sprocket has 25 teeth and the crankshaft sprocket has 30 teeth. The drive is consequently 1.2 times the crankshaft speed. The direction of rotation is the same as that of the crankshaft. The accessory sprocket is keyed to the shaft and held in place by a hexagon nut and cotter pin.

The accessory shaft is made of steel which is carburized, hardened and ground. There are two bearings on the accessory shaft. The bearings have No. 10 S. A. E. white metal face and No. 66 bronze back. These bearings are pressed into a hole bored in the crankcase. The bearing journals are each 1½ inches in diameter and 1½ inches long.

The accessory shaft end thrust is taken by flanges on the bearings. An adjustment is provided through shims between the sprocket and a shoulder on the shaft.

The accessory shaft is lubricated by an oil pipe which carries oil from a long horizontal passage in the crankcase, delivering it to the front accessory bearing. From this point, oil is carried to the rear accessory bearing by a diagonal hole drilled through the accessory shaft. The rear end of the accessory shaft is flanged and grooved to receive the Oldham coupling drive of the generator. A spiral gear is machined in the accessory shaft between the two bearing journals. This gear drives the vertical pump shaft and drives the distributor through a tongue and groove joint at the upper end.

OIL PUMP

The conventional gear type oil pump is used. This pump is located at the lower right front corner of the crankcase, slightly above the oil level in the oil base. The pump is easily accessible and is located sufficiently high to prevent freezing in case any condensed water penetrates to the engine oil. The pump is held in place with two studs and nuts. The pump is driven by a long vertical shaft which extends up to the distributor. A spiral gear is keyed and pinned to the shaft so that it engages a spiral gear machined on the accessory shaft.

FAN.

The fan has six wrought aluminum blades riveted to a steel spider. The fan is 16½ inches in diameter. The fan spider is bolted to the fan hub by six ¼ inch bolts. The hub is keyed to the fan drive stud and held in place by a ½ inch hexagon nut and lock washer. The drive stud is held to the transfer sprocket by four ⅜ inch cap screws. The transfer sprocket drives the fan at 5/6 times the crankshaft speed and the direction of rotation is that of the crankshaft. As a result of this construction, there is no fan bearing other than the transfer sprocket bearing. The transfer sprocket is carried on a stationary stud lubricated by pressure from a vertical oil passage to the valve mechanism.

CYLINDER BLOCK AND CRANKCASE

The cylinders are cast in an extremely rigid gray iron block with the crankcase. The cylinder bores are finished by grinding accurately to size. A large chamfer is machined at the bottom of each cylinder bore to facilitate entering the piston with the rings in place. The piston and connecting rod assembly cannot be withdrawn from the top of the block due to the large diameter of the connecting rod main bearings. The water jacket extends the full length of each of the cylinder barrels and two large, detachable plates at the lower right side of the jacket serve as inspection plates. The rear inspection plate carries the pipe connection through which the cooling water enters the block from the water pump. Baffle plates are provided on the detachable plates for directing the flow of water in such a way as to maintain uniform temperature throughout the cylinder block.

Seven heavy lateral webs or walls in the crankcase each carry one of the main bearings. These webs are flanged at their lower edges for increased strength. In addition to these seven webs, each of the end walls carries one main bearing.

The crankcase extends 2¼ inches below the center of the crankshaft. This construction makes it possible to machine the top surface of the oil base flat, as described under "Oil Base" and also adds to the rigidity of the crankcase. The crankcase is finished inside with crankcase sealer and the entire block is finished outside with gray engine enamel.

OIL BASE

The oil base is an aluminum casting with fourteen cooling ribs on the bottom. Vertical splash plates are cast into the oil. base to prevent surging of the oil. The top of the oil base is machined flat, due to the crankcase extending 2¼ inches below the center line of the crankshaft. The oil base does not contain any felt packings or oil rings to prevent oil leaking from either end of the crankshaft. The front end of the crankshaft is sealed by a conical seat on the hand crank stud. This seat is held sealed by a spring which holds the hand crank stud out of engagement. The rear end of the crankshaft is sealed by the rear main bearing. The entire reservoir is covered by a flat plate, held in place by machine screws. In case any sludge forms in the crankcase, the oil base should be dropped and cleaned after the cover plate is removed.

PISTON

Light cast iron pistons are used. The piston skirt is smooth and presents an unbroken wearing surface of large area. Internal ribs and uniform unbroken walls insure freedom from distortion. This material and design also assures long life, small change in clearance with changes in engine temperature, and offers assurance that the skirt will not collapse when hot as

sometimes occurs with aluminum pistons, slightly, if any, lighter than the New Stutz piston. The piston weighs approximately 1 pound 5½ ounces without rings or pin.

PISTON RINGS. Three piston rings are provided, all above the piston pin. The two top rings are plain, while the lower ring is an oil regulator. The width of each of the rings is ⅛ inch.

PISTON PIN. The piston pin is located at the center of the effective area of the piston skirt and not at the center of the piston measured from top to bottom. This location increases piston life and decreases the possibility of piston slap. The distance from the center of the piston pin to the top of the piston head is 2 7/16 inches. The piston pin is of the floating type made of mild steel which is carbonized, hardened, ground and lapped. A Tobin bronze button is pressed into each end of the pin. No locking device is used; the end travel of the pin is limited by the bronze buttons touching the cylinder wall. The pin should have .006 to .008 inch end clearance in the cylinder bore. The pin is ⅞ inch in diameter. The connecting rod carries a bronze piston pin bushing 1⅜ inches long and the total length of bearing of the piston pin in the piston is 1⅜ inches. The fact that these two areas are equal insures the pin floating equally in the connecting rod and in the piston. The advantage of this construction is that the life of the piston pin is extremely long, since wear is spread over nearly the entire pin.

CONNECTING RODS

Connecting rods are made of forged aluminum alloy heat treated. The connecting rods are extremely light, weighing 1 pound 14½ ounces complete with bearing cap bolts, bearings and piston pin bushing. This light weight is a great advantage in reducing vibration and reducing bearing loads. The light weight is in no sense gained at the expense of rigidity and strength in the connecting rod.

The connecting rod main bearings are poured directly in the connection rods, and pure tin is used for bonding the bearing metal into the connection rod. The bearings are cast centrifugally to insure close grain and freedom from bubbles. S. A. E. No. 10 white bearing metal is used for the connecting rod bearings. There are two 7/16 inch bearing cap bolts on each connecting rod bearing. The bolts are made of crome nickel steel.

CRANKSHAFT AND MAIN BEARINGS

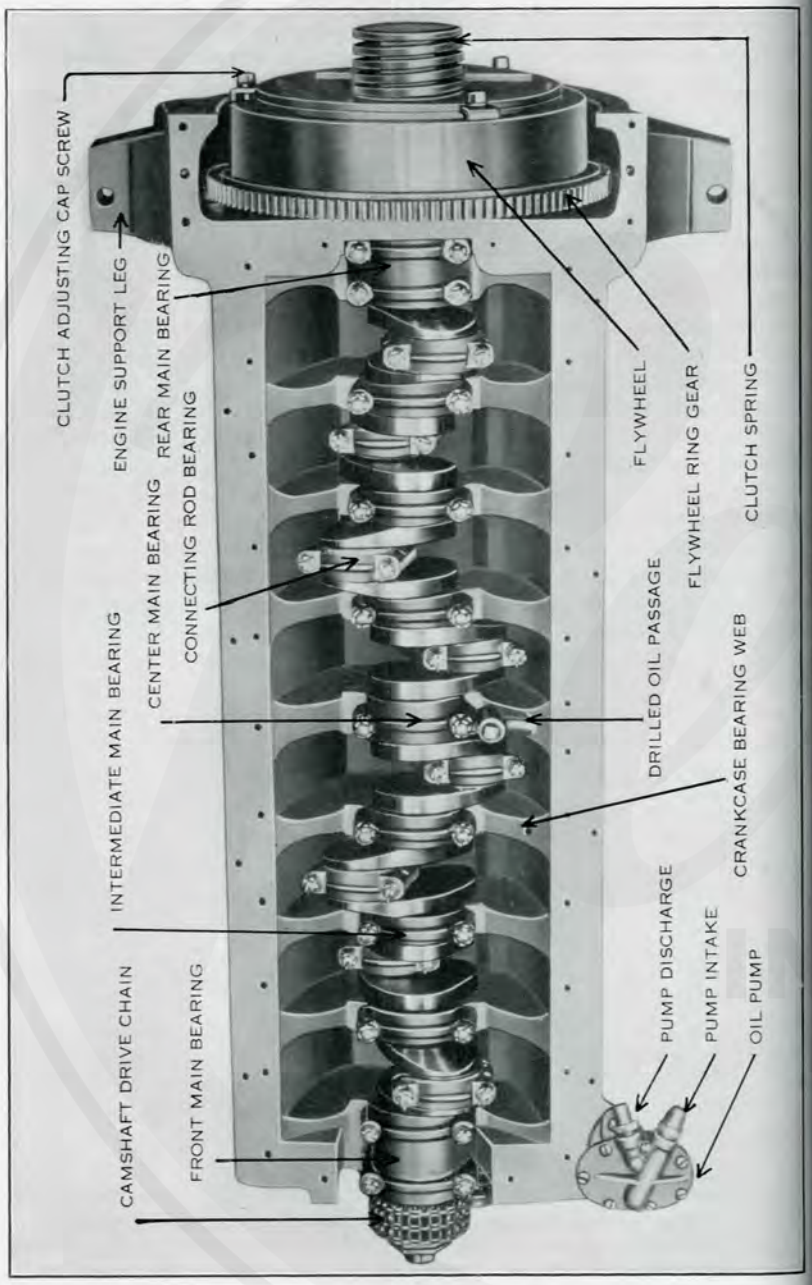
The crankshaft is made of S. A. E. No. 1045 steel, forged, heat treated and ground to an extremely smooth accurate finish. Nine main bearings are provided. The main bearings are 2½ inches in diameter. The location of the crank throws is of the 2-4-2 design with two throws on each end located at 90 degrees to the four center throws. This type of crankshaft makes possible an inherent balance of the engine which avoids vibration set up in some types of vertical eight-cylinder engines.

The nine main bearings have a total length of 14.97 inches. The large bearing area and heavy construction of the crankshaft, which is machined all over and weighs 85 pounds, assure extremely rigid construction and exceptionally long life. The main bearings are made of S. A. E. No. 10 Alloy white bearing metal face and S. A. E. No. 66 bronze back. This corresponds to aviation specifications. The crankcase and crankcase bearings caps are rough bored, finished bored, and reamed to accurate limits. No hand scraping or hand operations are necessary on the white metal bearings as these bearings fit in the crankcase without selection and the bearings are held to such close limits that no selective fit to the crankshaft is necessary. The crankshaft is balanced statically and dynamically to very close limits.

The crankshaft end thrust is taken by the front main bearing. The crankshaft sprocket is keyed to the crankshaft and held in place by a large hexagon nut, which is slotted and locked with two machine screws. Excessive crankshaft end play may be corrected by loosening the locks on the large hexagon nut and drawing this nut down since the crankshaft is purposely designed so that the crankshaft sprocket will not be pulled all the way down against a shoulder. The crankshaft sprocket may be removed with a gear puller. To replace the crankshaft sprocket, coat the end of the crankshaft with white lead, plunge the sprocket into boiling water for a minute and slip it on the shaft while hot.

INTAKE MANIFOLD. The intake manifold is an aluminum casting of patented design. This manifold represents Stutz application of the Swan type manifold. The crankshaft is of the 2-4-2 type, described under "Crankshaft". In this type of engine, the firing of the center four cylinders is evenly spaced and the firing of the remaining four cylinders, that is, two cylinders on each end, is evenly spaced. In order to provide perfect manifolding for this type of engine, the Stutz engineers have developed a manifold which is, in reality, two manifolds, the inner manifold supplying the four center cylinders, and the outer manifold supplying the two cylinders on each end of the engine. The vertical passages of the two manifolds are surrounded by a jacket through which exhaust gases are circulated. This circulation is provided by two brass pipes bolted to the manifold. These pipes communicate with auxiliary exhaust ports in the cylinder head. Exhaust gases flow through these passages and out an auxiliary exhaust outlet, keeping the vertical riser on the manifold hot.

A valve is provided in each of the branches for controlling the amount of heat to the manifold. The valves are of the "Butterfly" type and a slot in the external face of each valve is



parallel to the valve plate. Consequently, when the external slot is parallel to the exhaust passage, the valve is open and when the slot is turned at a right angle to the exhaust passage, the heat is completely shut off. It will not be necessary to shut the heat entirely off except in extremely warm weather. The heat should be turned on full in extremely cold weather. For moderately cold weather, the two valves should be turned at an angle of approximately 45° to the car wheelbase. In each case the valves should be turned the same amount, but in opposite directions. The low end of each slot should be toward the center of the engine. The valve is locked in place by a nut on the inside of the manifold. To alter the valve adjustment, loosen this nut and tap the inner end of the valve stem lightly to loosen the valve.

In order to avoid difficulties introduced at extremely low speeds, by minute variations in throttle seating and carburetor action, a small slot is machined in the carburetor flange connecting the two vertical passages of the manifold.

In order to take full advantage of the New Stutz intake manifold, the Zenith Duplex type of carburetor, which is virtually two carburetors operating from a single float chamber is used. Carburation is discussed under "Carburetor and Fuel System."

FLY WHEEL

The flywheel is 12 11/16 inches in diameter, machined all over and weighs approximately 47 pounds. The flywheel ring gear for the starter motor is a separate hardened steel ring, shrunk in place on the flywheel. There are 118 teeth on this ring gear. The teeth are of special form to gain silent operation. The flywheel is held in place by six bolts, one of which is oddly spaced, to insure returning the flywheel to its original position.

ENGINE COOLING SYSTEM

RADIATOR. The radiator is constructed with an alloy bronze core of the Fedders cellular type held inside a heavy pressed steel shell which is first copper plated and then given several successive coats of nickel plating.

The radiator may be removed from the car after removing the hood and radiator tie rod by loosening up the four nuts on two studs which extend from the bottom of the radiator and hold the radiator in position on two feet or brackets extending forward from the frame cross-member under the radiator. The radiator should be inspected each time the gasoline tank is filled to be sure it is full of water. The radiator must be given a certain amount of attention, particularly in localities where there is a large amount of mineral substance in solution in the water. Some water leaves a deposit of scale in the entire cooling system and this scale gradually stops up the radiator passage. One further effect of scale is the lessening of the efficiency of the

radiator, since the heat from the water must travel through this scale, which is a heat insulator. For these reasons clean rain water should be used for the cooling system wherever possible, and the radiator flushed and cleaned out occasionally.

FLUSHING THE RADIATOR. The radiator may be cleaned as follows: Drain the cooling system and fill it again with 6½ gallons of clean soft water. Add one pint of glycerine or three teacupsful of baking soda. Cover the radiator and start the engine, permitting it to run until the water has boiled for a few minutes. Drain the radiator again and remove the hose connections. Enter a garden hose in the bottom water connection in the radiator and tape or plug the opening so that water can be circulated from the bottom of the radiator toward the top. A quantity of water should be run through the radiator in this way. While the water is circulating through the radiator, the core may be tapped gently by placing a flat board on the front of the core near the top, and striking this board with a mallet. The blows should not be heavy enough to distort any part of the core, as the tapping is intended only to loosen particles which may be lodged in the core passages.

HOSE CONNECTIONS. The hose connections should be inspected and renewed twice each year, as indicated under "Seasonal Changes."

WATER PUMP. The water pump is located at the right rear of the cylinder block and driven from the rear of the generator by a long shaft and two metallic universal joints. The pump is of the centrifugal type, blind on one end. The single packing gland is easily accessible. The graphite packing is 13/16 inch long on the shaft. The 11/16-inch pump shaft is made of Ludlum Delhi Stainless Steel. This material is non-corrosive.

The pump impeller is a red brass casting, of the enclosed rotor type. The pump housing is gray iron casting. The pump is flanged at one end and held to the crankcase by two cap-screws. A pilot shoulder is machined on the flange. In order to replace the hose connection from the pump to the cylinder block, it is only necessary to loosen the hose connections and to loosen the cap screws which hold the pump to the crankcase, and, without moving the pump shaft out of line, rotate the pump housing in the direction opposite to crankshaft rotation.

The single pump packing gland is easily accessible at the front of the pump. This packing may be replaced without removing the pump. The packing should be tightened occasionally. To tighten the packing, turn the nut by hand in the direction of rotation of the crankshaft. Too much force on the packing shortens the life of the pump shaft and packing. A grease cup is provided for lubricating the pump bearing and packing.

PART VII

CLUTCH AND TRANSMISSION

CLUTCH

The clutch is a single plate "dry disc" type. All parts of the clutch, excepting the driven disc, are locked to the flywheel and rotate with it. The light weight of clutch driven parts permits the clutch to come to a rest very quickly when the clutch pedal is depressed. This feature of design makes a clutch brake unnecessary and consequently provides for extremely easy gear shifting since the clutch brake is a source of difficulty, particularly to women drivers.

CLUTCH FACING. The clutch driven disc is faced with two ⅛-inch friction facings of unusually large diameter, with a total friction area of 57 square inches. The facings are ground parallel and held within very close limits.

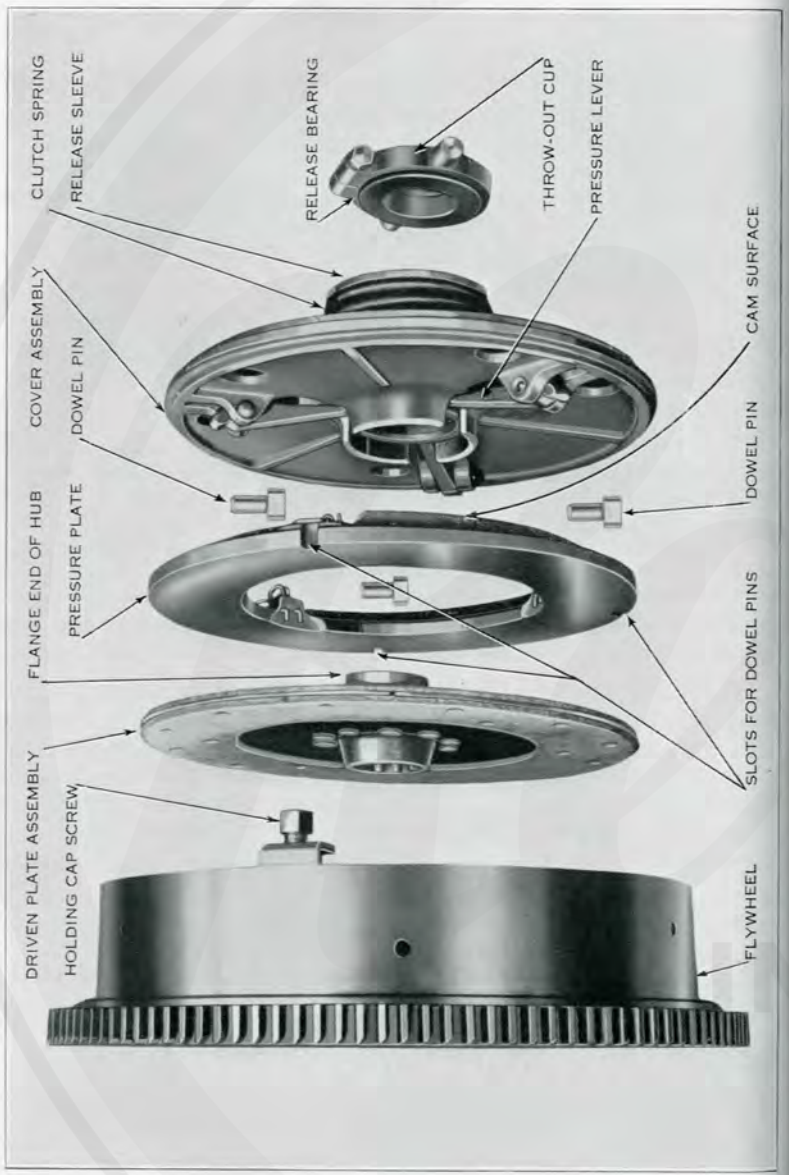
CLUTCH SPRING. A single clutch spring is used. This spring is held to a loaded resistance of 295 to 300 pounds at 2⅜ inches length.

CLUTCH RELEASE SLEEVE. The release sleeve is supported on the hub of the clutch cover and does not run on the shaft. The sleeve is prevented from turning on the cover by a key. The rear face of the release sleeve is made wide and ground smooth to provide contact for the clutch release bearing.

CLUTCH RELEASE BEARING. The release bearing is made of a special graphite composition carried in a throw-out cup mounted on the pedal shaft throw-out yoke. When the clutch pedal is depressed to release the clutch, the release bearing is moved forward against the flat, smooth surface of the release sleeve. Moving the release sleeve forward disengages the clutch.

CLUTCH PRESSURE LEVERS. Three pressure levers are mounted directly on the clutch cover with their outer ends bearing against three cam surfaces on the pressure plate, and their inner ends engaged in the release sleeve. As the clutch facings wear, the pressure plate moves closer to the flywheel face, permitting the release sleeve to move toward the transmission. This motion decreases the spring pressure and also decreases the clearance between the release sleeve and the release bearing. This decreased clearance can be felt by the driver in the decreased amount of free travel of the clutch pedal before the resistance of the clutch spring is felt. A clutch adjustment is provided to compensate for this condition.

CLUTCH ADJUSTMENT. Wear of the friction surfaces may be compensated by loosening the three 7/16-inch U. S. S. Cap Screws which hold the clutch cover in place on the flywheel. The cap screws are spaced 120 degrees apart. It is only necessary to loosen the cap screws ⅛ inch before the clutch cover



may be turned with relation to the flywheel. The three pressure levers are mounted directly on the clutch cover and their ends rest on three wedge-shaped cam surfaces on the pressure plate. As the clutch cover is turned to the right in the flywheel, the outer ends of the pressure levers move to thicker sections of the pressure plate cams, throwing the pressure plate forward and tightening the clutch.

Turning the clutch cover to the right compensates for wear in the friction surfaces and brings the clutch pedal back to the proper adjustment. It is not ordinarily necessary to move the clutch cover more than ½ inch clockwise while looking toward the front of the car in order to compensate for clutch wear. After turning the clutch cover to its new position, tighten the three cap screws and try the clutch pedal. With the proper adjustment, the distance from the rear facing of the release sleeve to the clutch cover should be 2⅜ inches. If this dimension is more than 2⅜ inches, loosen the three holding cap screws again and tighten the cover still further by turning it toward the right; if the dimension is less than 2⅜ inches loosen the clutch slightly. In each case the dimensions should be checked when the three cap screws are tight.

CLUTCH PEDAL ADJUSTMENT. The clutch pedal is set properly when the car leaves the factory and should require no further adjustment. When properly set, the clutch pedal should have ½ inch of free travel before the resistance of the clutch spring is encountered. It should be possible to press the clutch pedal all the way down without encountering any solid obstruction before the pedal pad strikes the toe board. The normal throw of the clutch pedal should push the clutch release sleeve forward approximately ⅜ inch, as this amount of throw-out is required for a clean release.

REMOVING THE CLUTCH. In order to disassemble the clutch from the flywheel it is necessary first to remove the transmission as described under "Transmission." After the transmission is removed, to remove the clutch, proceed as follows: Remove the three holding cap screws and clamps which hold the clutch cover in position on the flywheel. It will then be possible to remove the clutch cover, together with the release sleeve and clutch spring and the three pressure levers as one unit. The pressure plate may next be lifted out. Remove the three dowel pins with pliers and lift out the driven plate assembly.

CAUTION: Do not under any circumstances let the transmission hang in the clutch assembly, as this may spring the clutch parts.

REASSEMBLING CLUTCH. The driven disc assembly should be placed in the flywheel with the flanged end on the hub toward the rear of the car. A small amount of hard oil should be placed on the splines in the hub. Too much grease

should not be used at this point, as an excessive amount of grease may throw out on the friction surfaces. Next, put in place the three dowel pins which drive the pressure plate. The dowel pins must be turned to the proper position to line up with the pressure plate. This may be done by squaring the dowel pins up with the rear face of the flywheel. Do not file the pins or the slots in the pressure plate, as the pins must be a close fit in the slots.

Put the clutch cover in place and rotate it to approximately the right adjustment. The cover may be turned through a total angle of approximately 100 degrees from the extremely loose to the extremely tight position. Tighten the cover in place and try the adjustment. Line up the pilot bearing and driven plate with the stub shaft before tightening clutch cover holding bolts. Tighten holding bolts before pulling out the shaft.

NOTE—Each time the clutch is completely disassembled, the self lubricated ball bearing which carries the forward end of the clutch shaft should be removed, cleaned and packed in cup grease. The bearing is carried in a recess in the flywheel.

TRANSMISSION

The transmission is the selective three-speed forward type mounted in a unit with the engine. The transmission is of conventional design except that the gear shift mechanism is so designed as to make the top of the transmission unusually low in order to clear the floor boards. All transmission gears are made from Uma steel hardened in an electric furnace and finished by roll burnishing. The transmission drive shaft and the main shaft are mounted in ball bearings. The pilot bearing is a Hyatt roller bearing. The countershaft runs on two Hyatt Roller bearings mounted on a stationary shaft.

LUBRICATION. The transmission should be drained and thoroughly washed out with kerosene twice each year or at the beginning and end of freezing weather. The transmission should then be filled up to the level plug with the proper lubricant, as outlined under Lubrication Specifications. Two quarts of lubricant are required to bring the oil up to the level plug.

CONSTRUCTION. The transmission drive gear is an integral part of the transmission drive shaft which extends forward from the transmission and serves as a clutch shaft. The forward end of this shaft is splined to carry the clutch driven plate assembly. The front end of the shaft is turned to a smaller diameter to fit in a ball bearing mounted in the flywheel. This shaft is also carried on one ball bearing at its rear end in the transmission. The transmission drive gear is constantly in mesh with the countershaft drive gear. The countershaft cluster gear runs on two Hyatt roller bearings which, in turn, bear on the stationary countershaft. The four countershaft gears are driven

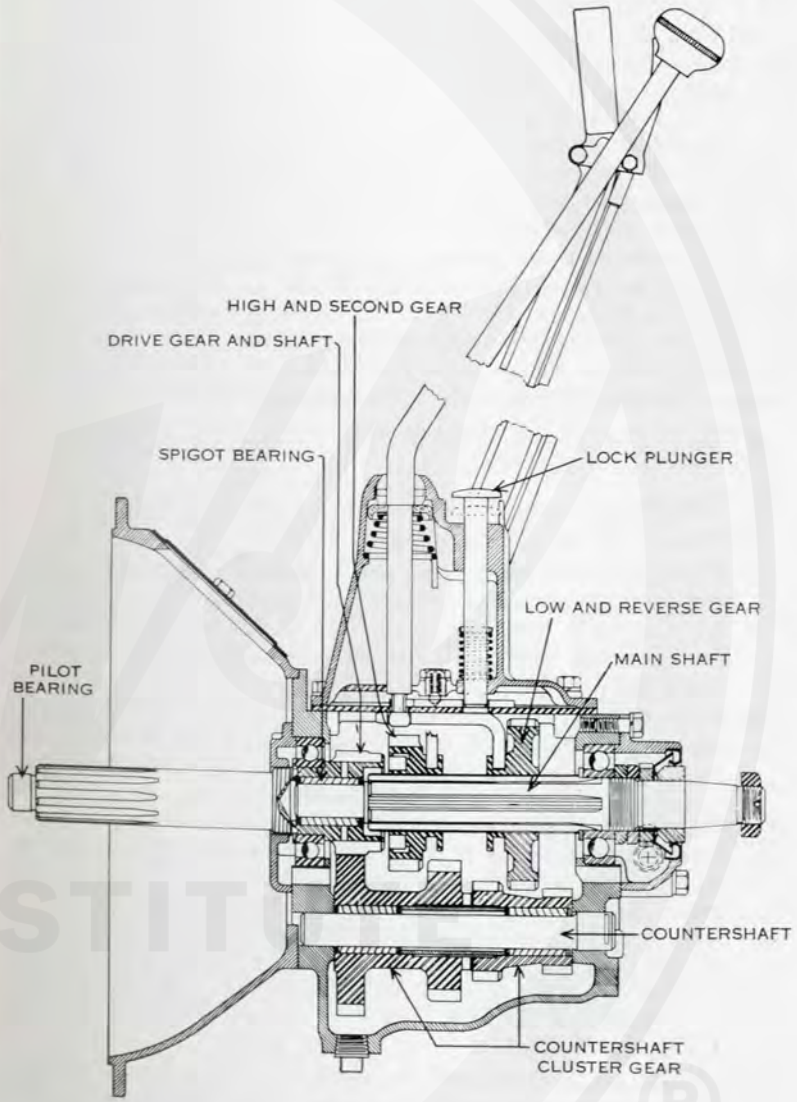


Figure 19—Transmission

by the transmission drive gear whenever the clutch is turned. The four gears turn freely and carry no load when the transmission is in neutral or in high gear.

In first and second speed, the drive is transmitted from the transmission drive gear to the countershaft gears and by them back to either the low or second speed sliding gear. When the car is driven in reverse the drive is transmitted from the transmission drive gear to the countershaft gears and from the countershaft reverse gear to the reverse idler gear, and from the reverse idler gear to the low and reverse sliding gear on the transmission main shaft.

The transmission main shaft is carried on one ball bearing at the rear of the transmission and a Hyatt roller bearing in the transmission drive gear. The main shaft is tapered at its rear end and carries the forward Universal Companion Flange and the Transmission Brake drum. There are two sliding gears mounted on the splined part of the transmission main shaft.

REMOVING THE TRANSMISSION. The transmission can be removed as follows:

1. Run the car upon a ramp or over a pit.
2. Detach the speedometer drive shaft.
3. Remove the six bolts from the forward Universal Companion Flange; push the forward Universal and the propeller shaft toward the rear of the car as far as the splines in the propeller shaft will permit and drop the front end of the propeller shaft.
4. Remove the 1-inch hexagon nut which holds the Universal Companion flange on the tapered end of the transmission main shaft and pull the companion flange from the transmission main shaft. A bar should then be placed across the floor board opening and a sling put around the brake diaphragm housing to hold it in place after the transmission is dropped. Remove the cap screws which hold the brake diaphragm housing to the transmission case.
   NOTE: DO NOT DISCONNECT ANY OF THE HYDROSTATIC BRAKE PIPE CONNECTIONS OR IN ANY WAY BREAK THE SEAL IN THE SYSTEM, AS THIS IS UNNECESSARY IN REMOVING THE TRANSMISSION.
5. Block up the transmission and remove the cap screws which hold the transmission case to the engine bell housing.
   DO NOT PERMIT THE TRANSMISSION TO HANG IN THE CLUTCH ASSEMBLY, AS THIS MAY SPRING THE CLUTCH PARTS.
6. Slide the transmission to the rear, supporting it at all times, then let it down and take it out from beneath the car.

SPEEDOMETER GEARS

The Speedometer is driven by a flexible drive shaft which is coupled to the Speedometer Driven Gear and Shaft. The gear and shaft assembly is carried in a small housing which is screwed to the right rear side of the transmission. The speedometer drive gear is carried on the transmission main shaft. In case any change is made in the drive ratio of the rear axle, which necessitates a change of speedometer drive ratio, it is necessary to change both the speedometer drive gear and the speedometer driven gear. This change is made as follows:

Disconnect the Speedometer Drive Shaft. Unscrew the small housing which carries the driven gear. Disconnect the forward Universal joint at the companion flange. Pull the companion flange from the tapered transmission main shaft. Remove the rear bearing retainer from the transmission. The transmission drive gear will then be accessible and can be removed.

PART VIII

PROPELLER SHAFT AND AXLES

PROPELLER SHAFT

The drive shaft is of the exposed tubular type and no torque arm is used, as the torque reaction is taken through the rear springs and the Hotchkiss type of drive. The drive shaft has an outside diameter of 2½ inches and is 53 inches in length between the universal trunnions in normal running position. The propeller shaft is statically and dynamically balanced.

UNIVERSAL JOINTS

Two metallic type universal joints are used, one at each end of the shaft. The joints are self-contained and oil tight. There are two oil plugs provided for each joint. To fill the joint with oil, turn the drive shaft so that one plug is down and one is up. Remove both plugs and insert an oil gun in the lower hole. Fill the joint until the oil runs out the upper hole. The same lubricant used in the transmission is also used in the universal joints.

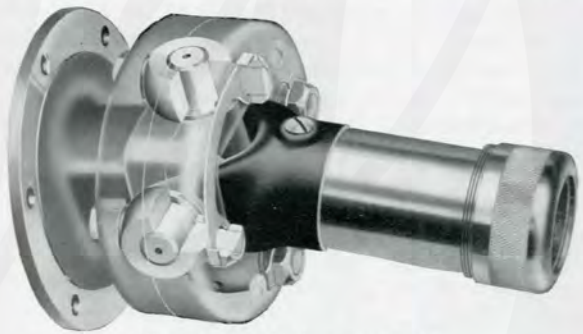


Figure 20—Universal Joint

DISASSEMBLING THE UNIVERSAL. The universal joints may be disassembled after removing the eight nuts, four on each side, which hold the two oil retaining housings together. After all the nuts have been removed, tap the studs lightly to separate the housings. Care must be taken not to damage the ground surfaces of the housing joint. In reassembling the joint, care must be taken to see that the four cork packing washers are in place and that they have not been damaged by handling. The ground surfaces of the housing should be painted with a thin coating of shellac before they are assembled, to form an oil seal. The eight nuts on each joint should each be turned down a little at a time to prevent any distortion of the housing.

Provided the universals are slid off the propeller shaft spline, the position of each universal on the shaft should first be marked to make certain that the joint will not be turned to a new position in reassembling. The trunnions of the yoke on the rear

end of the shaft must be parallel with the trunnion of the yoke on the forward end of the shaft to assure smooth action of the propeller shaft in driving the car.

AXLE, REAR

The New Stutz rear axle is worm drive. The advantages of this construction are, lowered center of mass of the axle and the entire car, extreme length of life, quietness, accessibility and freedom from service troubles.

The introduction of worm drive is a distinct innovation in this country, although worm drive rear axles have been used on some of the finest European cars for many years.

The "F. J." type of worm drive has been selected for the New Stutz axle, because no other type of worm drive offers the same advantages of high efficiency, long life and silence. The advantage of the "F. J." type of the worm gear can be explained largely upon the basis of the rolling and sliding action of the worm on the wheel and the low rubbing velocity and low pressure per unit of tooth area. After any reasonable period of wear the worm continues to generate the theoretically correct form on the worm wheel. In this way, there is no cumulative error between the teeth as is common with bevel or spiral drive gears.

Extreme length of life and freedom from service troubles have been demonstrated by the many high speed buses and trucks which have given phenomenal service with worm drive axles. Service in excess of 300,000 miles practically without replacement or adjustment is not unusual. This makes it possible for the Stutz Motor Car Co. to guarantee the worm and worm wheel of the New Stutz rear axle for two years from the date the new car is purchased, provided the axle is properly lubricated as described in Part V, and properly adjusted.

The worm drive, due to an entirely different principle, requires a worm wheel considerably smaller in diameter than the ring gear on a gear driven axle with the same gear reduction. The worm drive axle housing is consequently smaller in diameter. A further important advantage lies in the fact that the worm on the New Stutz axle is carried below the worm wheel. The propeller shaft is so low, together with the small maximum diameter of the axle housing, as to permit lowering the entire car approximately five inches as compared with cars with gear drive rear axles.

Unusual quietness is an inherent feature of worm gearing. This quietness is maintained throughout the working life of the worm and worm wheel, because such wear as occurs in the worm wheel does not alter the true theoretical shape of the teeth, as outlined above.

The accessibility of the New Stutz worm drive axle leaves nothing to be desired, since it is only necessary to withdraw each of the axle shafts a short distance, loosen up the nuts which

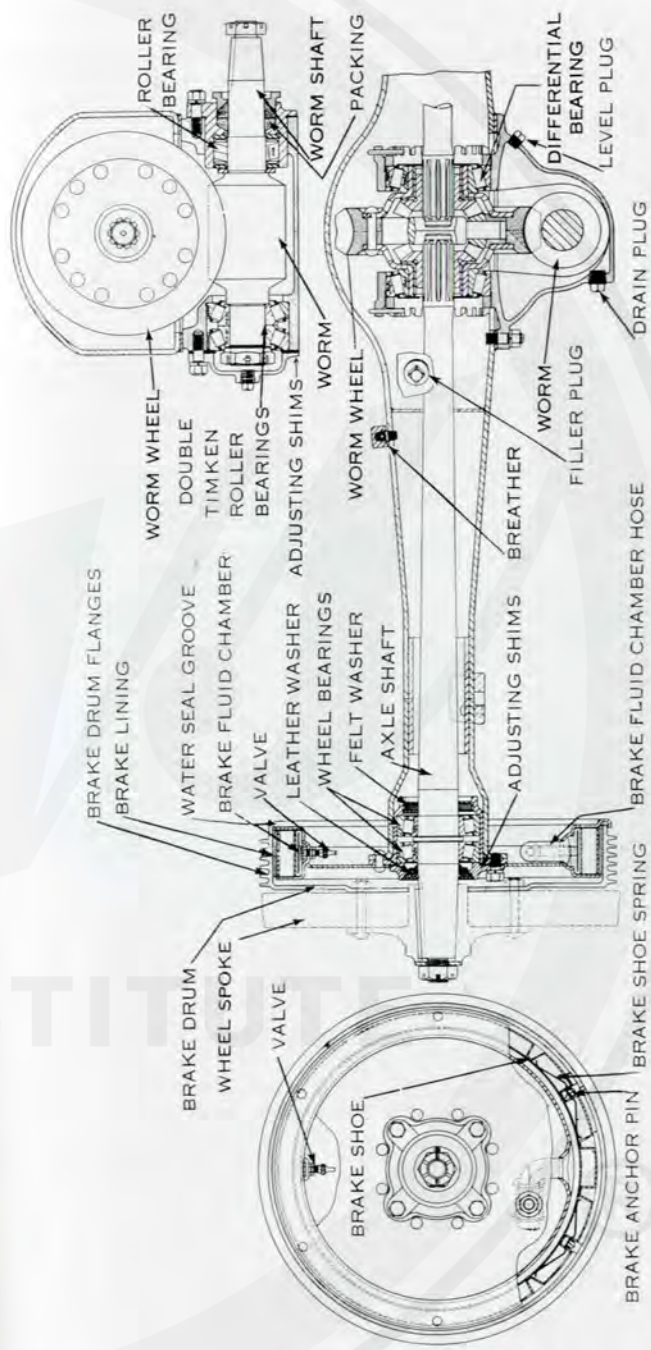


Figure 21—Axle—Rear

hold the worm and worm wheel carrier in place, and drop this member to the ground. The entire unit may then be taken to the bench and every necessary operation, including adjustment, may be done on the bench before the assembly is put back into the axle housing.

WORM SHAFT. The worm is integral with the worm shaft. The worm is hardened and ground accurately to the correct shape. The worm and worm shaft bearings are in a continual bath of lubricating oil. The worm shaft is carried in one Hyatt roller bearing at its forward end and in two Timken roller bearings at its rear end. The worm is of a straight type and does not require adjustment forward and aft in the car with reference to the worm wheel. Adjustment of the two Timken bearings at the rear end of the worm is provided through the shims under the cap at the rear of the worm wheel carrier. This cap holds the bearing outer race in place.

The proper adjustment of the end play of the worm shaft is essential to the long life of a worm drive axle. The worm shaft should have .005 inch end play.

Provided the worm shaft is to be disassembled, the lock nut on the rear end of the worm shaft should be loosened before the axle is disassembled.

A packing gland is provided at the forward end of the main shaft. This gland is held in place by two nuts. During the first thousand miles the car is driven, the packing gland should be tightened down several times. Only a small amount of force is required to draw down this packing. Tightening the packing too much will result in heating the worm shaft unnecessarily, and may possibly give rise to leakage later. After the first thousand miles of use, it should only be necessary to inspect the packing gland each three thousand miles and tighten the packing slightly if any leakage is evident.

DIFFERENTIAL BEARINGS AND ADJUSTMENTS. The differential is carried in two large Timken roller bearings, one at each side. The bearings are lubricated by the oil in the differential housing and ordinarily require no attention except proper lubrication. In adjusting the differential bearings, two factors must be considered. First, all excessive end play must be taken out of the bearings; and second, the worm wheel must be adjusted to the right or left to align with the worm. The differential bearings are set properly at the factory and do not ordinarily require realigning the worm wheel with the worm. Consequently, the only ordinary adjustment will be to take out the end play in the differential assembly. This should be done by tightening the bearing which is at the left-hand side of the differential, while looking toward the front of the car. The right-hand bearing should be disturbed only when necessary to take down the entire differential assembly. The correct worm wheel end play adjustment may be obtained by tightening the left-

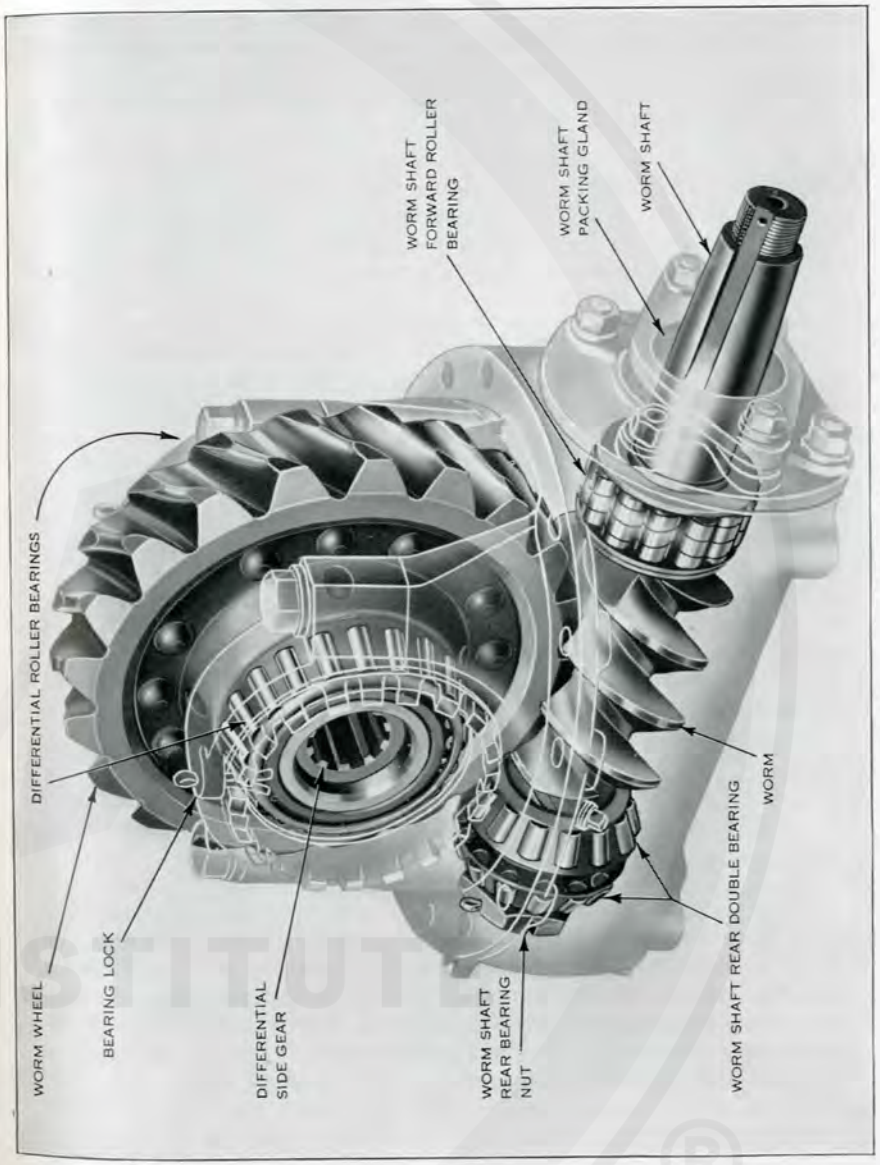


Figure 22—Worm and Worm Wheel Assembly

hand adjustment until the bearings are tight and then unscrewing this same adjustment one notch. Before adjusting either of the differential bearings, it is necessary to remove the differential carrier from the axle housing; this may be done by pulling out each of the axle shafts a short distance and removing the nuts which hold the carrier to the axle housing.

In order to check the alignment of the worm and worm wheel, paint the teeth of the wheel with a thin coating of Prussian Blue and turn the worm by means of a wrench or temporary crank on the forward end of the worm shaft. The worm should be turned in its forward direction of rotation or clockwise when looking toward the rear of the car. As the worm and worm wheel revolve, the blue will be wiped off the wheel, showing the area of contact between the worm and the worm wheel teeth. The contact area when the worm is driving the wheel in forward direction is on the left-hand part of the front face of each tooth when looking toward the front of the car. This mark will be visible at the top of the assembly when viewed toward what would normally be the front of the car. This area should extend from the "leaving side" across the face of the wheel to one-half or three-quarter of the width of the wheel. When driving ahead the worm thread enters the "entering side" of the worm wheel first and leaves the "leaving side." By offsetting the worm wheel to this extent while at rest, the lateral movement of the wheel when power is applied will bring the worm and worm wheel into direct alignment under load. No attention should be paid to the coast contact, as this is controlled by the cutting of the worm wheel.

AXLE SHAFT. The rear axle shafts are made of nickel chromium steel. The shafts are tapered from 1¾ inch diameter at the rear wheel bearings to 1 3/16 inches diameter at the differential. The axle shafts are driven from ten splines in the differential side gears.

WHEEL BEARINGS. Double Timken roller bearings are used at each end of the rear axle housing for wheel bearings. To remove an axle shaft, first remove the hub cap and wheel nut, pull the wheel from the tapered end of the axle and then remove the ring of cap screws which hold the bearings in place. Any necessary adjustment in the bearings may be made by changes in the shims under this cap. After the retaining cap is removed, the axle shaft with the two roller bearings may be pulled out of the axle housing.

The wheel bearings should be cleaned and adjusted each 4,500 miles. The bearings should be cleaned with a stiff brush and gasoline or kerosene. To thoroughly remove all old grease the bearings should occasionally be placed in a solution of washing soda and water and brought to a boil.

Before the bearings are reassembled they should be dried and covered well with clean cup grease, free from acid or dirt or any other solid matter. The end of the axle housing should also be packed with grease.

The proper adjustment of the wheel bearings will provide for approximately .005 inch end play. To make this adjustment, remove shims, if necessary, and screw up the bearing cap screws until the shims are tight and there is no end play in the shaft. The bearings should still be sufficiently free to permit the axle shaft to turn freely when revolved with a wrench placed on the nut on the shaft end. When this condition is attained, add one of the thinnest shims, which should give approximately .005 inch end play to the shaft.

AXLE, FRONT

The front axle is a heat treated alloy steel forging. The center of the axle is of I-Beam section, while the ends of the axle are reinforced to carry stresses from the front wheel brakes. The steering knuckles are of the reverse Elliot type. The king pins are of hardened steel ground accurately to size. There are two bronze bearings and one ball thrust bearing in each steering knuckle. The ball thrust bearing is adjustable for preventing excess vertical motion of the steering knuckles relative to the axle. Shims are provided for this adjustment.

STEERING CROSS ROD. The steering cross rod has a ball joint at each end. Shims in these ball joints provide a means of adjusting the "toe in" of the wheels. A spring in each joint prevents rattle. The cross rod is hollow and engine oil contained in this reservoir lubricates the ball joints through felt wicks. The cross rod should be filled periodically with engine oil through a plug in one end provided for this purpose.

ALIGNING FRONT WHEELS AND AXLE. The proper alignment of the front wheels is essential to the long life of the front tires, and to the ease of control and proper functioning of steering mechanism. The front wheels should toe in 5/16 inch when measured with the wheels turned straight ahead. The measurement should be taken at the height of the centers of the hub caps and between the two front wheel rims at two points, one in front of the axle and one behind the axle. The difference between these two measurements should be 5/16 inch. The car should be rolled to several different positions and the toe in rechecked as a means of eliminating errors due to the rims not running exactly true.

When viewed from the front of the car, the wheels should lean out at the top at an angle of 2½ degrees from the vertical, as this is the correct amount of camber.

The front wheels are carried on two Timken roller bearings. In ordinary service these bearings should be removed, cleaned greased and readjusted twice each year. If the

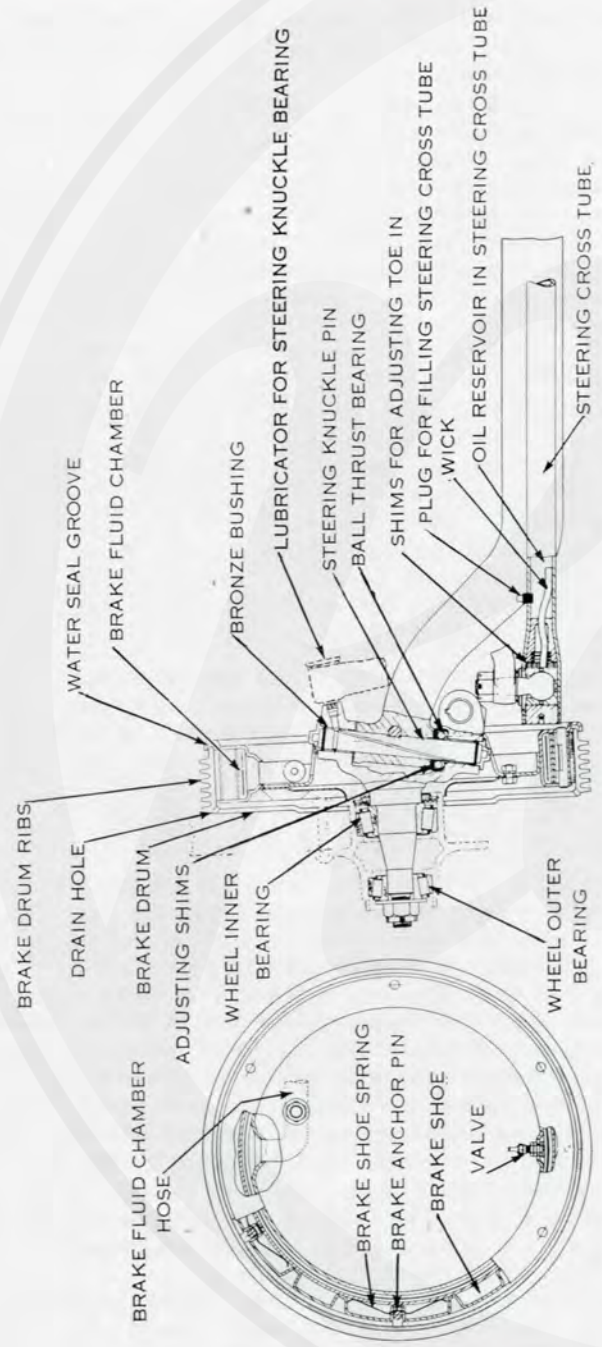


Figure 23—Axle—Front

service is unusually severe, the front wheel bearings should be inspected every three months. The bearings are held in place by a castellated nut, which is locked with a cotter pin. To remove the bearings, remove the castellated nut from the end of the spindle and pull the wheel out a short distance until the outer roller bearing may be removed. The wheel should then be removed. Do not permit the outer bearing to fall from the wheel, as this may bend or damage the cage. The bearings, spindles and insides of the hubs should be cleaned with a stiff brush and gasoline or kerosene. Occasionally the bearings should be placed in a solution of washing soda and water and brought to a boil to clean off any old grease from behind the rollers. After thoroughly drying the bearings they should be repacked with clean grease free from acid, grit or solid matter of any sort. The inside of the hub between the two bearing cups should also be packed with grease.

To reassemble the wheel, with the inner bearing in place on the spindle, slide the wheel into place then press the outer bearing in place, slide the keyed lock washer on the spindle and tighten the adjusting nut until the bearings bind slightly without actually locking the wheel. From this position back the nut off one or two notches or just enough to allow the wheel to rotate freely, but without noticeable end play. Lock the nut in this position with the cotter pin. When the adjustment is correct cover the end of the spindle with grease and replace the hub cap.

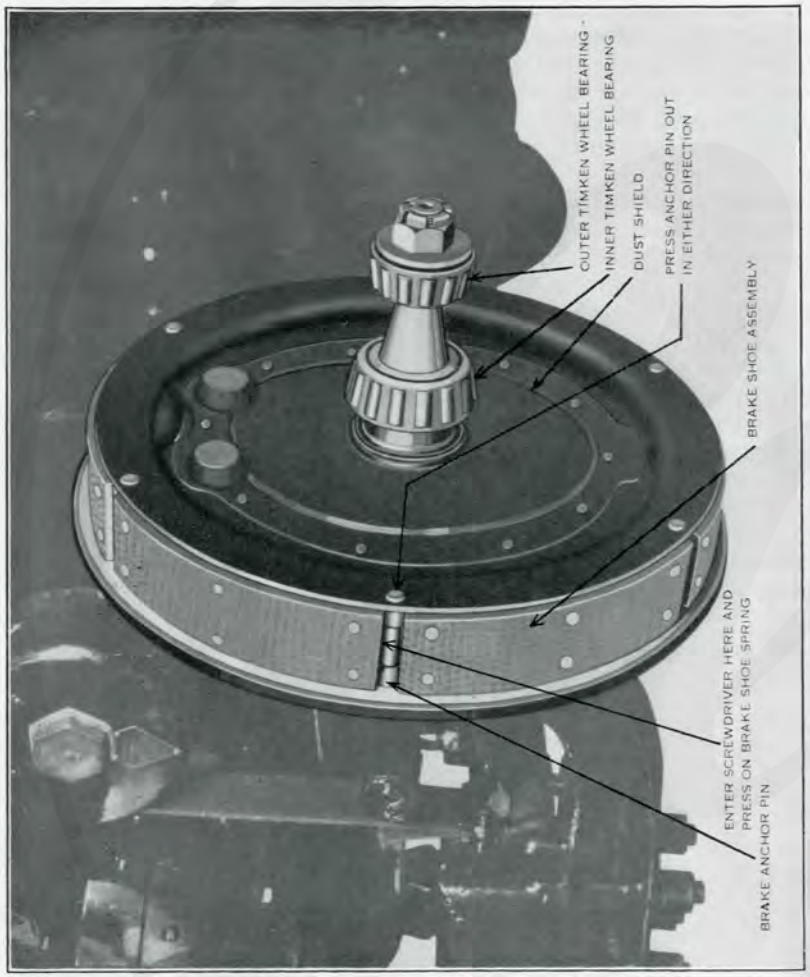


Figure 24—Brake Unit—Assembled

PART IX

BRAKES

The New Stutz is equipped with Hydrostatic Brakes on all four wheels, controlled by the foot brake pedal. The hydrostatic brakes are an entirely new development of the hydraulic principle. The actuating fluid is a solution of half alcohol and half water. This solution is placed in all cars shipped from the factory, regardless of destination or season of the year. No other solution should be used at any time. The system is hermetically sealed and leakage is practically impossible. Pressure is developed in the system by a plunger, connected directly to the brake pedal, which compresses a bellows contained in a metal housing bolted to the left side of the transmission. The plunger is approximately 3 inches in diameter. No liquid is in contact with the plunger, but depressing the pedal causes the plunger to distort the rubber bellows, forcing the liquid out into the system.

In each wheel is a Brake Fluid Chamber, somewhat similar to a small flat inner tube. This tube is rigidly encased on three sides, the open side corresponding to the tread on a flattened inner tube. Six shoes or segments rest around the circumference of the open side of the tube. Six springs and six anchor pins hold the shoes down against the rubber tube, preventing the shoes from dragging and preventing brake rattle.

When the brake pedal is depressed the fluid displaced flows through sealed pipes and establishes an equal pressure throughout the system, expanding the tubes in the four wheels and pressing the six shoes in each wheel out against the brake drum. The shoes or segments are each restrained from rotating in either the forward or the reverse direction by the anchor pins or stops. The entire set of twenty-four shoes or segments in the brake system is perfectly equalized by the fluid pressure.

The pins, which restrain the shoes from rotating, are locked in place by flat springs, which hold the shoes against the rubber tube. Each pin is turned to a smaller diameter at its center section and the flat spring fits into the smaller section locking the pin in place.

The brake shoes or segments may be removed after removing the pins referred to above. There is enough clearance beside each pin to enter a thin screwdriver blade and rest its end against the flat spring. Pressing on the screwdriver will flatten the spring and release the pin so that it may slide out. The brake shoes may then be replaced by a relined set without waiting to reline the old shoes. There is no wear on the steel shoes, and all shoes are interchangeable.

There are several important advantages of the New Stutz Hydrostatic brakes.

Perfect equalization of the load on each square inch of lining on the twenty-four brake segments is gained through equal-

ization of fluid pressure. This equalization is absolute, since the same pressure must exist at every point in the liquid. Such equalization is not possible through mechanical methods and is also not possible in conventional hinged shoes or band brakes. This is particularly true of band brakes which almost invariably start with point contact which is sometimes spread to a larger area, but never actually equalized over the friction area.

The result of perfect equalization of the load over the braking area is extreme smoothness of brake action, either forward backward, turning or under any other condition, and added safety through eliminating any tendency toward partial seizure of brakes, such as frequently occurs with band brakes on slippery roads. Extreme length of life of brake lining is a further result of perfect equalization since no one part of the friction surface receives more wear than any other part. Since the lining is never overloaded, it wears away very slowly. A further advantage of the New Stutz Hydrostatic brakes is the entire freedom of the brake system from any effect of chassis spring action. There also are no parts which can rattle.

WET WEATHER BRAKING. The operation of the brakes is not affected by wet weather because: First, the brake action is so smooth, together with the entire absence of any wrapping action to cause the brakes to partially seize, that there is very little danger of sliding the wheels on slippery roads unless the operator purposely causes them to slide. Second, the inner edge of each brake drum fits into a groove which is machined in the brake housing. The construction is such that it is practically impossible for water to penetrate to the braking surfaces. Any water which might penetrate is thrown out or drains immediately. There are holes drilled radially in the brake drum to facilitate draining water which might penetrate to the inside of the brake drum. Third, the brakes in the four wheels are so perfectly equalized as to cause each wheel to exert an equal retarding effect.

FOOT BRAKE ADJUSTMENT

The brakes are properly adjusted when the car leaves the factory and should require very little attention and very infrequent adjustment, since wear on the braking surface is extremely gradual. The car should not be driven hard or fast during the first 750 miles of its use. After this mileage any minute irregularities in the braking surface will have disappeared. The brakes are adjusted by means of the adjustable yoke and rod which link the brake diaphragm plunger to the brake pedal. The brake action is unusually smooth and the mechanic should not be led by this smoothness to tighten the brakes to the point where they will drag.

Provided the brakes show a tendency to drag when new, it is usually an indication that there are some small protrusions

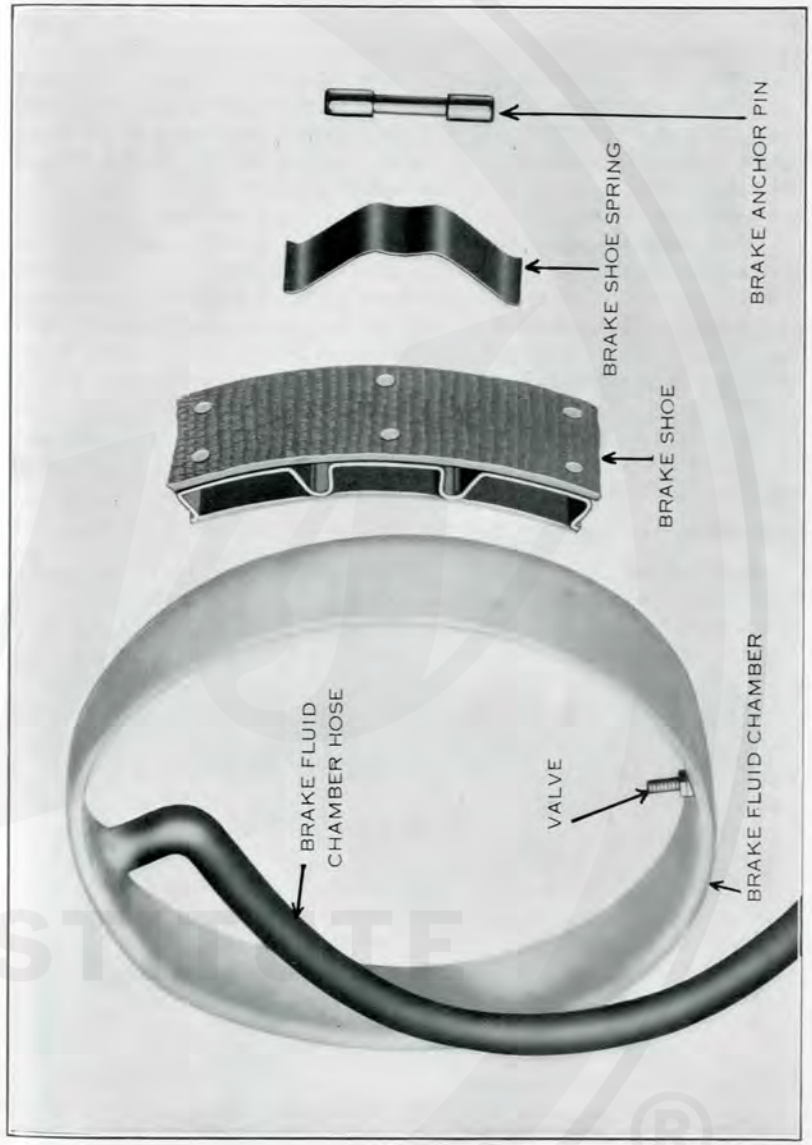


Figure 25—Wheel Brake Unit—Disassembled

on the brake surface. Rather than to permit the brakes to heat, it is advisable to loosen them slightly by changing the adjustment at the pedal. Provided this adjustment has been let out to its limit of travel, the brake can be loosened still further by bleeding off a little liquid from one of the wheels, as described

The brakes are tightened, to compensate for wear, "Refilling the Brakes" by lengthening the linkage which connects the brake pedal and the diaphragm plunger. There are sufficient threads on the rod to take up the maximum amount of wear which is possible before relined brake shoes must be installed.

The braking system is hermetically sealed and it should not be necessary to break this seal throughout the life of the car. Provided the seal is broken for any reason, the system should be refilled in such a way as to insure that all air will be excluded. The brakes will not function with any air in the brake system. The presence of air in the system is indicated by the brakes dragging when released and by a soft action of the brake pedal which permits depressing the pedal all the way to the floor boards without any considerable braking effect. This condition may be corrected by refilling the brakes.

REFILLING THE BRAKES

Authorized Stutz Service Stations will have special pressure tanks or pumps for filling the Hydrostatic brake system. The procedure as outlined below will apply to service stations with special equipment, but the operation may be done in any garage with slight modifications. The tank or pump should be cleaned at regular intervals and it is advisable to permit the solution of half water and half alcohol to stand at least over night before it is used, since this will insure freedom from minute air bubbles.

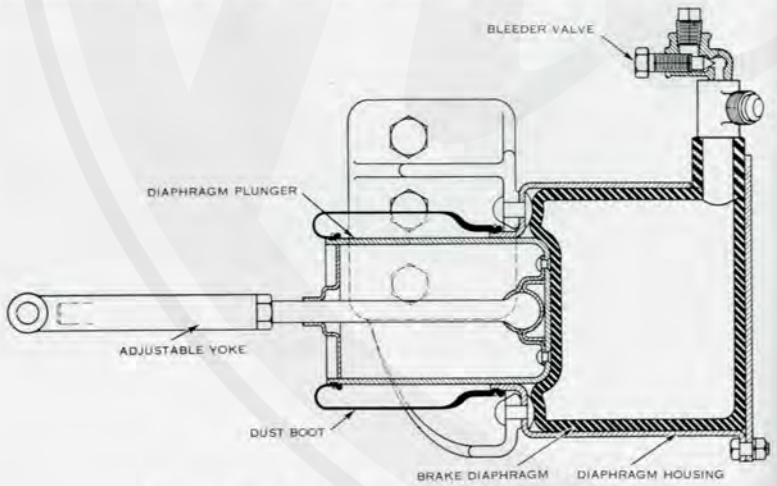


Figure 26—Brake Diaphragm—Pedal Unit

Before attempting to refill the system, shorten the adjustable yoke between the brake diaphragm plunger and the brake pedal to the limit of the adjustment.

Unscrew the fitting at the top of the diaphragm housing. The fitting contains a valve and a pipe plug. The two-way connection to the pipe lines should not be disturbed. Place a small funnel in the opening from which the fitting was removed and fill the diaphragm with the alcohol and water solution. After the diaphragm is filled, a goose neck pipe which extends up underneath the steering wheel may be installed where the fitting was removed. This goose neck should have a shut-off valve and a bend at the top of the pipe should direct the overflow into a pan beneath the car.

Each of the rubber tubes in the four wheels is provided with a valve similar to the valves used on inner tire tubes. These valves are located 180 degrees around the tube from the point of attachment of the rubber hose through which the braking fluid flows into the tube. The hose enters the front wheel tubes at the top and the rear wheel tubes at the bottom.

There should be two hose connections from the supply tank and each of these hoses should carry a connection of the type used for tire pressure lines. Attach the two supply tank connections to the valves at the bottoms of the two front wheel brake tubes, without removing the valve centers. Turn on both supply tank lines. The supply tank pressure should be from 60 to 80 pounds per square inch.

Any air in the tank line should, of course, be blown out before the line is connected to the front wheels. Bleed the fluid out at the goose neck attached to the diaphragm until no more air bubbles come through. With the pressure still on the system, shut off the goose neck valve for a minute and then open this valve suddenly. Do this several times as a means of blowing out all air bubbles. When no more air bubbles appear, restrict the opening from the goose neck so that a small stream only flows from this point and screw one of the bleeding hoses, which are part of the tool equipment, on the valve in each of the rear wheels. These bleeding hoses have small projections at their centers, which hold down the valve centers, permitting fluid to flow out when they are screwed in place. Permit the fluid to bleed from the two rear wheel units until no more air bubbles appear. During this time the goose neck valve should be very slightly open to permit a small flow of fluid from this point.

The advantage in bleeding the brakes this way, is that it eliminates any possibility of air from any one branch of the distribution pipes backing up into another branch which has already been bled, thus creating an air pocket.

If found necessary to add to the brake fluid in other than an authorized Stutz Service Station, it may be accomplished by the use of tire pump barrel; by first, removing the plunger; second,

filling the pump barrel with half alcohol and half water; third, replacing the plunger in the pump; fourth, connecting the pump hose to the brake bleeder tubes (these bleeder tubes are the small tire valves found on the lower side of the front wheel brakes and the upper side of the rear wheel brakes); fifth, force that quantity of liquid as is contained in the pump barrel into the brake system.

It may be found necessary to repeat this operation, all of which depends on the amount of brake action required.

The system will now be completely filled and free from air. There will be an excess amount of fluid in the system. Connect the pedal linkage, leaving the adjustment ¼ inch longer than the shortest possible adjustment. This should establish a pressure in the system and should cause the brakes to drag. A small amount of fluid may then be bled from any one of the brake tubes in the wheels until the brakes no longer drag. Too tight an adjustment will result in the brakes dragging and heating, while too loose an adjustment will make it possible to depress the brake pedal all the way to the toe board without sufficient increase in brake pedal resistance, and consequently without obtaining maximum brake action.

HAND BRAKE

The hand brake lever operates a band brake which contracts on a brake drum located at the rear of the transmission.

The brake drum is cast iron, machined all over and 6½ inches in diameter. The drum is bolted to the forward universal companion flange which, in turn, is keyed to the tapered end of the transmission mainshaft.

The camshaft which operates the hand brake is located on the lower side of the band. This camshaft also anchors the brake band in position, although there is a supplementary anchor which holds the top of the band.

The hand brake band is 2½ inches wide and lined with 3/16 inch brake lining approximately 18½ inches long.

There are two adjustments on the hand brake. An adjustable yoke connects the hand brake lever with the brake camshaft. It is adjusted by means of a nut between the two branches of the yoke. This adjustment is usually sufficient to compensate for wear. A second adjustment is provided by a nut on the left side of brake camshaft. This nut changes the relative position of the left cam and provides a means of equalizing the right and left sides of the brake band.

PART X

CHASSIS GENERAL

MAIN FRAME

The main frame weighs approximately 350 pounds and is of extremely rigid construction. Seven cross members are used, five of which are tubular. The frame is 27 inches wide at the front and 47 inches wide at the rear. The side members are 7¾ inches deep and 2 inches wide, made of 5/32 inch hot rolled steel.

RUNNING BOARDS. The running boards are of steel construction, bolted directly to the frame side rails. The construction of these running boards is an added safety factor, in that the running boards are in effect "side bumpers" which protect the sides of the car and the occupants in case of collision from the side.

CHASSIS SPRINGS

The New Stutz is equipped with four Watson Stabilators. The spring suspension of the New Stutz is designed to coordinate balloon tires and soft springs with stabilators, which embody the finest development to date in restraining spring rebound.

FRONT SPRINGS. The front chassis springs are semi-elliptic, shackled at the front and held rigidly at the rear. The front spring horn forms a pad against which the front bumper is bolted. The rear ends of the front springs lie entirely inside the tapered frame side rails. The front springs are nearly flat and unusually soft. The increase in load per inch of deflection is approximately 350 pounds. The springs are made of Chrome-Vanadium steel. The front springs are 38 inches long and 2¼ inches wide and the center of the point of attachment of the axle is 18 inches from the center of the front spring bolt.

REAR SPRINGS. The rear springs are underslung as the axle is mounted on top of them. The springs take the torque reaction and drive from the axle, as no torque tube is used. The entire length of the rear springs lies inside the frame side rails. The springs are held rigidly at their front ends and shackled at their rear ends. The total length of the rear springs is 62 inches and the axle is mounted 30 inches from the center of the forward spring bolt. The rear springs on all body types are 2¼ inches wide, although the increase in load per inch of deflection varies from 160 lbs. to 200 lbs. depending on body type.

SPRING LUBRICATION. The spring leaves are lubricated by a thin film of oil which seeps out of the spring bolts. No other lubrication will ordinarily be required. Provided a spring squeak develops, engine oil should be applied to the sides of the spring leaves with a stiff brush. If the squeak persists, the spring

should be disassembled, the leaves cleaned and graphite grease smeared between the leaves before reassembling.

SPRING BOLTS. The spring bolts are automatically lubricated by the Stutz chassis lubrication system, described in Part V, on Lubrication. The spring bolts are all ¾ inch in diameter excepting the rear spring forward bolt, which is ⅞ inch in diameter. The spring bolts are all held in place by nuts threaded on the ends of the bolts excepting the rear spring forward bolt which has no thread and no head, and is locked in place with a pinch bolt. In order to remove this bolt, the pinch bolt should be removed and the spring bolt driven out by entering a punch in the small hole in the frame side member drilled centrally with the spring bolt.

STABILATORS

Spring rebound makes itself felt in two ways in particular. When the wheel of the car strikes a bump in the road, the chassis spring is compressed. The spring tends to return to its normal position with a considerable amount of force and this force will not expend itself until the entire car is given a toss or a pitch. Another effect of spring recoil may be observed in a tendency of the chassis springs to take up and emphasize a period of bouncing due to the peculiar spacing of a series of bumps on the road.

The Watson Stabilators permit the springs to be compressed without restraint when the wheels strike a bump, but restrain the recoil force of the springs and damp out the tendency of the car to toss or bounce by absorbing some of the rebound energy through friction in the stabilators.



Figure 27—Stabilator, with Adjusting Wrench in Position

The stabilators exert a varying amount of restraint upon spring recoil. The force exerted varies from a maximum force at the point where the spring is compressed to a minimum when the spring stands in its normal position. The advantage of this construction is that the restraining action of the stabilator is actually proportionate to the spring requirements under all conditions of speed and road surface.

STABILATOR CONSTRUCTION. The stabilator is constructed with a stationary brake drum, half of which is carried on the base which is attached to the frame, and the other half of which is carried on the stabilator cover, which is fastened to the base by 6 screws. There is a gap of ⅜ inch between the two halves of the brake drum when the stabilator is assembled. A brake shoe operates on the outside of the brake drum. A coil spring is assembled inside the brake drum. A hook from the coil spring extends through the opening between the two brake drum halves and hooks into the brake shoe assembly. The inner end of the coil spring is engaged in a central mandrel. A large hexagonal nut on the outside of the stabilator cover is a part of the mandrel and by turning this nut in the direction of the arrow stamped on the nut, the spring is wound.

When the car spring is compressed, the motion of the stabilator strap permits the spring to rotate the brake shoe around the brake drum. The stabilator strap is held tight by the stabilator spring and the deflection of the spring is not restrained. The rapid recoil of the car spring is checked by the stabilator strap pulling the stabilator brake shoe into contact with the brake drum. Some of the recoil energy is absorbed by the friction of the brake shoe on the stationary brake drum. The magnitude of the stabilator braking action depends upon the amount of the brake shoe which is brought into contact with the brake drum and this, in turn, depends on the amplitude of car spring action. Only that portion of the brake shoe is effective which is drawn in between the strap and the drum.

STABILATOR ADJUSTMENT. Stabilators are sent out from the factory with adjustments which should not ordinarily be changed except to check the adjustment each year or each 9,000 miles. Two adjustments only are possible on the stabilator. These adjustments are described in the following paragraph.

SPRING TENSION ADJUSTMENT. The coil spring in the stabilator may be adjusted as follows: Remove the small screw which holds the hexagonal cap over the adjusting nut. Take off the rubber gasket under the cap and lay the cap and gasket aside where they will not be injured. A special stabilator wrench illustrated in Figure 27 is supplied in the tool kit. This wrench is made to fit into the slotted hexagon adjusting nut.

The slots prevent the wrench from slipping off while the adjustment is being made.

IT IS DANGEROUS TO THE WORKMAN TO PERMIT THE WRENCH TO SLIP OFF WHILE THE SPRING ADJUSTMENT IS BEING MADE. PERMITTING THE WRENCH TO SLIP MAY ALSO DAMAGE THE STABILATOR.

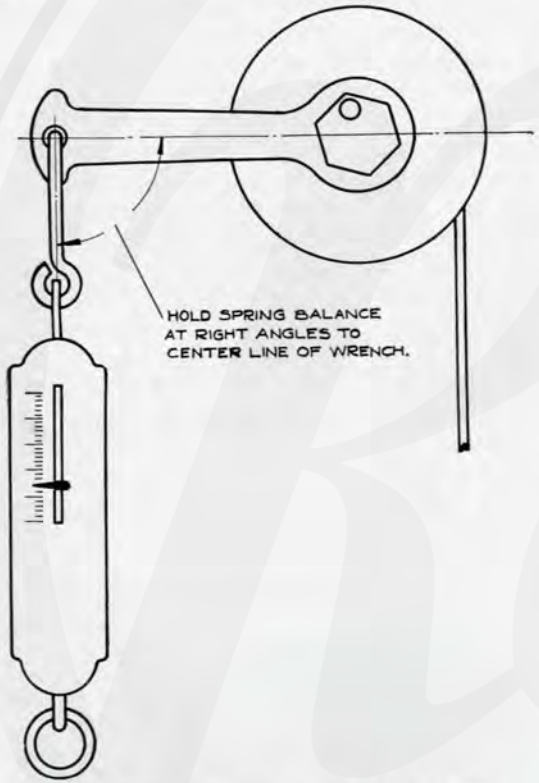


Figure 28—Stabilator Spring Adjustment

Place the wrench in the slot around the adjusting nut. A 1/4 inch hole is drilled in the end of the stabilator wrench handle. A spring balance should be hooked in this hole and held at right angle to the center line of the wrench to check the stabilator spring setting. There is a certain amount of free motion in the locking pin and the spring setting may be checked without removing the locking pin by pulling on the spring balance until a free spot in the nut position is reached. The spring balance should be pulled in such a way as to turn the adjusting nut slightly in the direction of the arrow stamped on the adjusting nut. Provided the locking pin is not completely removed from

the hole, care should be used to be sure that the spring balance is pulled only far enough to release the locking pin. The correct setting of stabilator springs is very important and these settings are as follows:

Front stabilator spring.....34 lbs.
Rear stabilator spring.....28 lbs.

No deviation from the above settings should be made.

Provided the spring is to be completely unwound, the screw which holds the cap in place over the adjusting nut may be screwed into the locking pin to form a handle as illustrated in Figure 28. The locking pin should not be removed entirely, but should be left with one end sticking into the hole in the nut. The adjusting nut should be permitted to unwind under spring pressure 1/6 turn at a time. The spring will turn the nut in the direction opposite to the arrow stamped on the nut. Do not turn the nut backward beyond the point where it comes to rest, as this may break the spring. After unwinding the spring, the cover may be removed by removing the six screws which hold the cover to the base.



Figure 29—Watson Stabilator Disassembled

STRAP ADJUSTMENT. The strap extends out from the stabilator window or opening, and down to the axle where it is clamped in place. There is one eyelet in this strap. The position of this eyelet is governed entirely by the way the strap is attached to the axle. Spring adjustment has nothing to do with strap adjustment. With the car on a level floor, with full equipment, but no passengers or extra load, the strap eyelet should be approximately 1/2 inch below the top of the window opening as shown in Figure 28. In this position, the eyelet will be on a horizontal line through the center of the stabilator. If the eyelet is above this position, the stabilator will exert too great a restraining force and cause stiff riding. If the eyelet is below this position, the stabilator will offer too little restraint to spring rebound.

To change the strap adjustment, unwind the stabilator springs as described under "Spring Adjustment". With the spring completely unwound, correct the eyelet position by unclamping the strap at the axle and reclamping so that the strap eyelet is 1/2 inch below the top of the stabilator opening when

the strap is taut. To see if the eyelet is in the correct position, put a little tension on the strap by winding the spring 1/3 turn with the wrench before tightening the clamp. When the correct adjustment is obtained, the strap clamp should be tightened as close to the axle bracket as possible.

Cars are sent from the factory with the straps adjusted so that the strap eyelet stands more than ½ inch from the top of the stabilator window. This adjustment is necessary since the straps stretch slightly during the first few hundred miles the car is driven. Therefore, the factory adjustment should not be changed unless, after the first 1,000 miles, the strap eyelet does not come to the proper position.

STABILATOR SERVICE. The stabilator will not ordinarily require any service operations throughout the life of the car. Only two major service operations other than adjustment will ever be necessary.

BROKEN STABILATOR STRAP. In case the stabilator strap is broken or damaged, a new strap may be installed without disassembling the stabilator. After unwinding the stabilator spring, provided it is not already unwound due to a complete breakage of the strap, pull the piece of old strap out through the stabilator window and unhook it, hooking the new strap in place. Proceed to adjust the strap and then the stabilator spring as described under "Strap Adjustment" and "Spring Tension Adjustment."

There is a difference between the front and rear straps and between stabilator straps on the New Stutz and those used on many other cars. Consequently, the new stabilator strap should be checked with the old strap, to be sure that the eyelet is the same distance from the hook on the upper end of the strap.

Breakage of the stabilator strap is a definite indication that the stabilator is out of adjustment and that some unusual condition exists. In most cases it will be advisable to check the car spring, the axle alignment and any other possible source of exterior irregularity before replacing the strap.

BROKEN STABILATOR SPRING. Stabilator springs should ordinarily give no trouble throughout the life of the car. However, if the stabilator spring is broken, it may be replaced by removing the stabilator cover which is held in place by six screws. The screws are unevenly spaced so that it is not possible to return the cover to the wrong position. The cover, together with the brake shoe, may then be taken to the bench. Turn the brake shoe in the cover until the end of the strap which is attached to the brake shoe is opposite the cover window. Hold the cover with the open side down, and shake or tap gently on the bench until the shoe and spring slide out together.

To remove the spring assembly from the shoe assembly, hold the shoe in one hand, grasp the spring in the other hand, and pull the spring out through the gap in the brake shoe, at the same time turning the spring assembly so as to unhook it from the shoe assembly.

CAUTION: NO PART OF THE STABILATOR SHOULD UNDER ANY CIRCUMSTANCES, BE LUBRICATED IN ANY WAY. THE STABILATOR IS SO CONSTRUCTED THAT NO LUBRICATION IS NECESSARY AND THE USE OF OIL OR GREASE WILL DEFINITELY PREVENT THE STABILATOR FROM FUNCTIONING PROPERLY AND MAY PERMANENTLY RUIN THE BRAKE SHOE.

STABILATOR NOISE. There should be no noise whatsoever from the stabilator when the car strikes an obstruction. Before tracing noise to the stabilators, other sources of noise should be checked by detaching the stabilators. To do this the stabilator spring should be unwound and the strap disconnected. The car should then be driven on the road. Provided the noise continues, it will be found that it is not in the stabilator.

There are two kinds of noise which may possibly be traced to the stabilator. A slapping noise may sometimes be made by the instrument if the brake shoe drags on the brake drum preventing the stabilator coil spring from keeping the strap tight at all times. A groaning noise may also be made by the stabilator brake shoe under certain conditions. In either case, the stabilator should be disassembled as described under "Broken Stabilator Spring." The brake shoe should be inspected and replaced if there is any tendency toward softness or deterioration. Remove the inserts in the brake shoe and clean the shoe thoroughly with Number Two sand paper until the surface is clean and smooth. Do not use emery cloth for this operation. Brush the shoe off thoroughly and wash it with gasoline. Put in new Watson inserts. The removal of the inserts will be facilitated by pulling the brake shoe to one side, away from the steel back. Do not bend the steel back.

STEERING GEAR

A Ross Cam and Lever steering gear is standard equipment on the New Stutz. Two unique features of this steering gear are the variable pitch of the thread or cam and the unusual length of the lever arm which follows the cam contour. The pitch or thread of this cam is much more gradual at the center than at the ends of the cam. As a result of this, the gear reduction through the steering gear mechanism is considerably greater while the car is going straight ahead than when the front wheels are turned to the extreme position at the right or left. With this construction, the steering gear is practically irreversible and extremely easy to handle through the range of wheel positions which are used most frequently. At the two

extremes, used in turning, the steeper pitch makes the steering gear more nearly reversible and permits the front wheels to right themselves when the steering wheel is released after turning a corner.

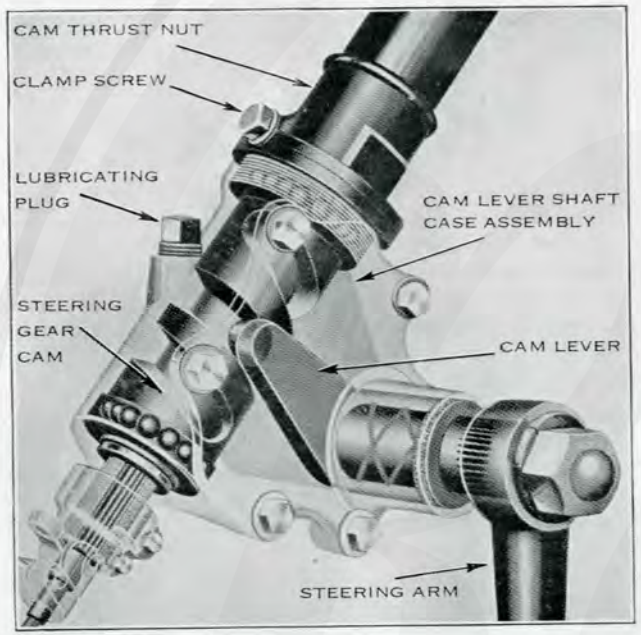


Figure 30—Steering Gear

The long life and continued service from the steering gear are assured by two adjustments. The round stud on the cam lever, which makes contact with the cam, is conical in shape. Any wear between this conical stud and the cam is corrected by setting the stud deeper in the cam. This is done by removing shims from under the Cam Lever Shaft Case Assembly. This adjustment should never be so tight as to bind.

It is also possible to adjust the cam for end play. The end thrust of the cam is taken by two ball thrust bearings, one at either end of the cam. As a means of adjusting end play shims are provided between the steering gear housing and the cam thrust nut on the lower end of the steering column. In order to tighten this adjustment, it is only necessary to loosen the clamping screw on the adjusting nut and unscrew the adjusting nut until the shims are exposed. Remove one shim by cutting with snips and screw the nut back into position to test the gear. After making this adjustment, tighten the clamping screw, being sure that the split in the lock washer is against the main steering gear housing. This adjustment should never be so tight as to bind the ball thrust bearings.

To attach the steering arm to the cam lever shaft after disassembly, turn the steering wheel to a position midway between its maximum movement to the right and to the left. The front wheels should then be placed straight ahead. In this position the length of the drag link should permit the steering arm to hang in a vertical position when it is placed on the cam lever shaft splines.

Do not drive the steering arm on with a hammer as it is possible to injure the internal parts by so doing. Put the arm on and draw the nut tight with a long wrench. The steering arm must be inspected occasionally and kept tight.

LUBRICATION. In order to assure the proper performance of the steering gear, lubricant should be added each 750 miles. The housing should be kept filled with Sunoco Special Steering Gear Lubricant or a similar fibrous grease. There are only a very few greases that will measure up to the proper standard which requires that the lubricant flow freely yet be retained in the gear without unusual care; that it cling to the contact surfaces so as to prevent metal to metal contact and that extremes of temperature must not greatly alter its property of flowing and, also, of clinging to the surfaces in contact. It is recommended that an Alemite or a similar connection be inserted in place of the pipe plug and the housing filled completely by this means.

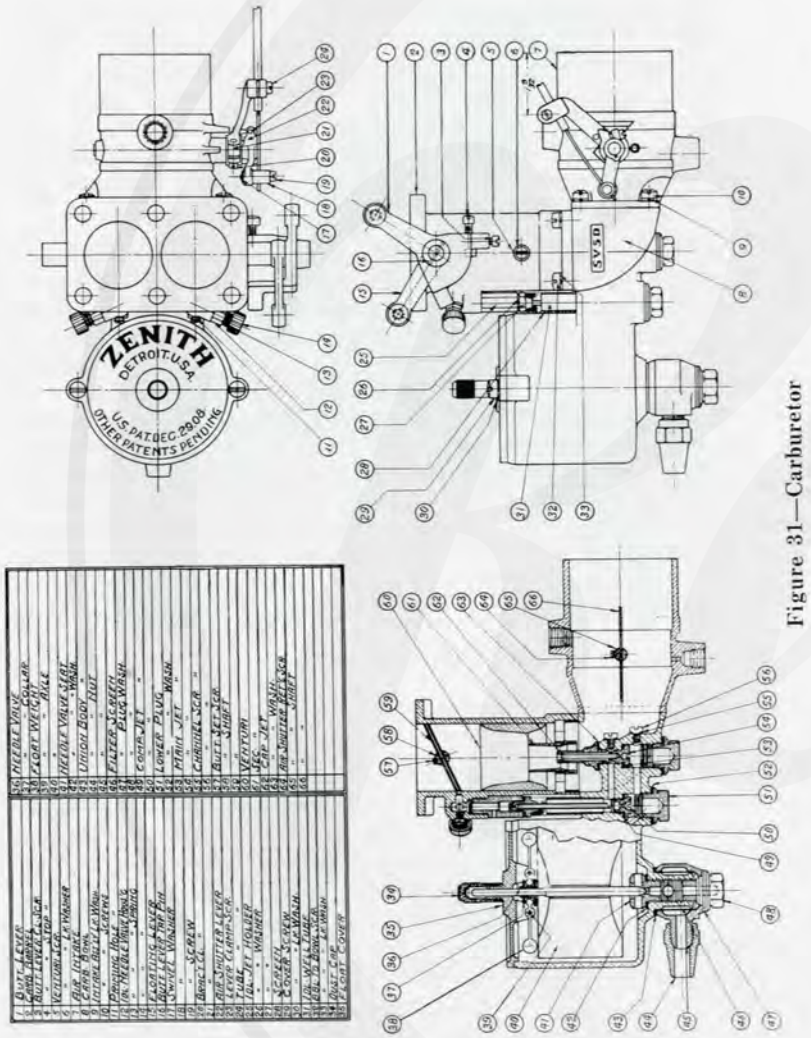


Figure 31—Carburetor

PART XI

CARBURETOR AND FUEL SYSTEM

The Stutz-Zenith Model SV5D carburetor is duplex instrument comprising two 1¼-inch carburetors fed by one fuel chamber, similar in construction to the carburetors used almost universally in aviation. The inside barrel supplies the middle four-cylinders while the outside barrel feeds the two cylinders on either end. Exact carburation through the entire range of engine speed and performance is obtained by the use of this special carburetor, together with the intake manifold described in Part VI on "Engine".

ADJUSTMENT. The carburetor is of the plain tube type adjusted accurately at the factory. No further adjustment is required throughout the life of the carburetor excepting that a low speed or idle adjustment is provided on each of the two carburetor barrels.

IDLE ADJUSTMENT. No attempt should be made to change the idle adjustment until after the ignition timing has been checked, the distributor contact points cleaned and adjusted and the spark plugs cleaned and adjusted. The compression pressure on each cylinder should also be checked and any possibility of excessive leaking through the valves eliminated. The valve lash should be checked. The engine should then be thoroughly warm before proceeding to the idle adjustment.

Adjust the Butterfly Lever Stop Screw so that the engine idles as smoothly and slowly as possible. Then turn in or out on the two idle Needle Valves, manipulating one needle at a time, until the engine runs evenly. Backing the needle out too far will cause the motor to stop due to leanness, while turning the needle in to the right too much will have the same effect, due to richness. It is a matter of finding the mean between these two limits, at which point the motor will hit smoothly. This will be with the needle on the inside barrel backed out approximately one turn and the needle on the outer barrel backed out approximately ¾ turn from its seat. When the motor is hitting evenly, it will be possible to adjust the Butterfly Lever Stop Screw for the desired idling speed, after which it should be securely locked in place with the Butterfly Lever Clamp Screw.

MOVING PARTS. The only moving parts in this carburetor are the throttles, the float mechanism, and the air shutter or choke. The throttles must open fully and close evenly at idling speed to develop the full motor range. This is assured through pinning the throttle lever and securely fastening both the throttles to the single shaft. The float mechanism is a simple device, having the needle collar soldered in the correct position.

FLOAT LEVEL. A line is scribed on the outside of the float chamber indicating the proper gasoline level inside the float chamber. The float level should not be above this line and should not fall more than 3/32 inch below this line. Leaking from the carburetor will, in practically every case, be due to dirt under the float needle.

CARBURETOR CHOKE. The air shutter or choke should be adjusted to close and to open wide when manipulated from the dash. The choke should be used momentarily when starting the engine, but the choke should in every case be returned to the normal running position as soon as possible without causing the engine to miss. Slow starting and low gasoline mileage can usually be traced to improper manipulation of the choke. The carburetor dash control button is in its normal running position when pushed forward as far as it will go.

CARE OF CARBURETOR. Since there are no other moving parts in the carburetor, the only care required is an occasional cleaning of the filter screen by removing the Filter Plug. The Lower Plugs also contain traps for collecting dirt and water, so these plugs should be removed periodically. Sometimes it is possible to run for years without cleaning the carburetor when a gasoline strainer is provided, as described under "Gasoline Strainer", but we recommend cleaning the carburetor two or three times each year to make certain of uninterrupted service. An accumulation of dirt and water may cause leaking, through particles lodging under the Needle Valve. Spitting and lack of speed may be caused by the Main Jets becoming clogged with dirt. Spitting and loss of acceleration may be caused by clogged Compensators. Faulty idling, due to plugged Idle Jets, may also result from dirt. All jets may be removed and cleaned without affecting carburetor adjustment. However, a wire or other hard material should never be forced through the calibrations, as this would enlarge these fuel openings.

CARBURETOR SERVICE. This carburetor is manufactured by the Zenith-Detroit Corporation, Detroit, Michigan, who maintain for your benefit over 1,200 stations in this country in addition to representatives in foreign centers. The Zenith-Detroit Corporation will advise you of the nearest station and will be glad to assist you on any question pertaining to carburation.

GASOLINE STRAINER

The gasoline strainer is part of the standard equipment on the New Stutz. The strainer is located directly below the vacuum tank on the line leading from the bottom of the vacuum tank to the carburetor. The strainer bowl is held in position with a wire bail. Each month the strainer should be cleaned as follows: Shut off the gasoline valve below the vacuum tank, spring the bail to one side and away from the strainer bowl, remove the bowl and the strainer. Wash both in gasoline. Reassemble the strainer and the bowl, taking care to get the strainer up into position without crushing it. The strainer is made with a Monel metal screen, as this material resists corrosion.

AIR CLEANER. The New Stutz is equipped with an AC Air Cleaner.

A considerable amount of the wear which occurs in the various parts of an automobile engine is due to abrasive particles of dust which find their way into the engine through the carburetor air intake.

The AC air cleaner separates the solid particles of dust from the air drawn into the carburetor. There are no moving parts in the air cleaner. The carburetor suction draws air into the air cleaner, through directing veins which give the air a rapid rotating motion. The particles of dust are all so much heavier than corresponding volumes of air, that the dust particles resist changes in direction, move spirally around the air cleaner wall until they strike the end of the air cleaner and are deposited in a removable container at the bottom of the cleaner. The clean air moves spirally through the center portion of the cleaner and strikes a directing plate, and leaves the cleaner in a straight line and enters the carburetor.

The container at the bottom of the air cleaner traps the dirt separated from the air. Each three months, twice each year this container should be removed and cleaned out. The gasket between the container and the cleaner body must not be damaged, as a tight fit is essential to the proper functioning of the cleaner.

VACUUM TANK

The vacuum tank consists of a small upper chamber mounted inside of a large chamber. When full, the vacuum tank holds approximately a gallon. The upper chamber has one connection to the gasoline tank and one connection to the intake manifold. A partial vacuum exists all the time in the intake manifold while the engine is running. The vacuum tank uses this partial vacuum to lift gasoline from the gasoline tank to the vacuum tank, from which the gasoline flows by gravity to the carburetor. There is a float in the upper chamber which controls valves in the lines from the gasoline tank and from the intake manifold and also controls a valve to the air vent.

When the upper tank is nearly empty the float is down, and in this position the valve in the line from the intake manifold will be open, and the valve in the line from the gasoline tank will be open, while the valve to the air vent will be closed. The result will be that air will be sucked out of the vacuum tank through the intake manifold connection. This suction will lift gasoline from the gasoline tank in the rear to the vacuum tank and cause the upper chamber to partially fill with gasoline.

After the float rises to a certain level, the float mechanism

closes the valve in the line to the gasoline tank and opens the air vent, permitting the gasoline to run down out of the upper chamber into the lower chamber. From the lower chamber the gasoline flows to the carburetor and as soon as the float in the upper chamber falls the process is repeated.

Very little attention will be required by the vacuum tank with the exception of occasionally cleaning the screen in the connection to the gasoline tank. This connection is at the top of the vacuum tank and can be removed and cleaned very easily. Occasionally the sediment and dirt in the bottom of the vacuum tank should be drained off by opening the drain plug at the bottom of the tank.

It is necessary for the proper functioning of the vacuum tank that the connections between the vacuum tank and the intake manifold and also the connections from the vacuum tank to the gasoline tank at the rear of the car be kept tight. Any considerable amount of leakage in either of these lines will prevent the vacuum tank from functioning.

In case the vacuum tank is completely drained either by running out of fuel or intentionally, it is customary to refill it through the pipe plug at the top of the tank as well as refilling the gasoline tank. It is quite possible, however, to avoid filling the vacuum tank by hand without damaging the storage battery as follows:

After filling the gasoline tank, close the hand throttle lever and the foot throttle, and with the ignition switch "off" depress the starter pedal and hold it down for not to exceed 20 seconds. The engine should be allowed to stand idle for 30 seconds and then the starter pedal should be depressed again and held down for 20 seconds. After depressing the starter pedal two or three times in this way, enough gasoline will usually be lifted to the vacuum tank to start the engine as described under "Starting the Engine", after which the vacuum tank will again function by itself. THE THROTTLE MUST NOT BE HELD OPEN WHILE PRIMING THE VACUUM TANK IN THIS WAY, SINCE OPENING THE THROTTLE DECREASES THE VACUUM IN THE INTAKE MANIFOLD AND CAUSES THE VACUUM TANK TO FUNCTION MUCH MORE SLOWLY.

The storage battery should never be completely discharged in an effort to prime the vacuum tank.

GASOLINE GAUGE

A Grolan gasoline gauge is standard equipment on the New Stutz. The indicating unit of the gauge is mounted in the instrument panel.

The gauge may not operate satisfactorily during the first few miles when a new car is unloaded and the gasoline tank filled. A few miles on a rough road should start the gauge to functioning properly and there should be no further difficulty with this in-

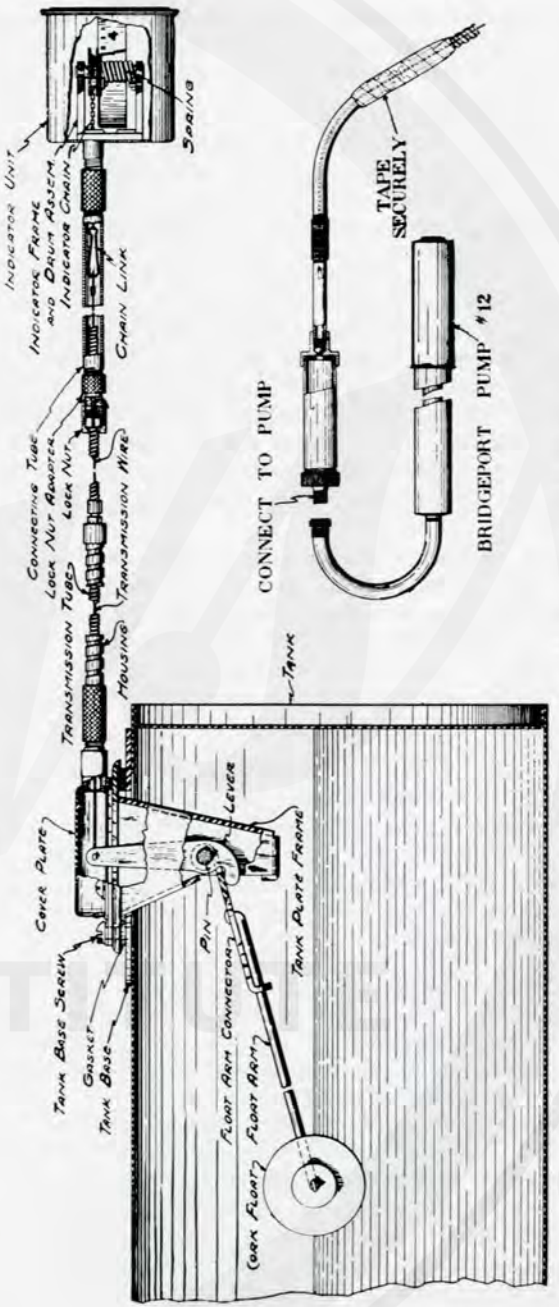


Figure 32—Grolan Gauge Mechanism and Lubricator

strument. Provided the gauge does not operate satisfactorily when first put into service or throughout the life of the car, the difficulty can almost always be corrected by lubricating the transmission wire.

GAUGE LUBRICATION. To lubricate the transmission wire, drain the gasoline tank, loosen the adjusting lock nut, unscrew the connecting tube from the indicator and slide the connecting tube back on the transmission tube as far as possible. Disconnect the transmission wire from the chain link on the indicator.

Tape the opening between the housing and the connecting tube securely to prevent the loss of oil. Remove the cap from the lubricator and fill the lubricator barrel with Grolan lubricating oil or with a good non-corrosive light gun oil. Replace the cap and connect the hand air pump. Pump twenty strokes slowly on the hand pump to force the oil through the whole length of the transmission tube. Reassemble the transmission wire to the chain link and screw the connecting tube to the indicator.

To adjust the indicator, empty the tank, loosen the adjusting lock nut, pull the transmission tube out from the indicator to move the indicator toward "empty" and push the tube in toward the indicator to move the indicator toward "full". When the proper adjustment is obtained the adjusting lock nut should be tightened with the fingers only, as it is not necessary to use pliers.

INDICATOR UNIT. The indicator unit of the gasoline gauge is fastened to the instrument panel by two nuts. This unit keeps a light tension on the transmission wire and when the control wire is loosened from the indicator chain link the indicator spring should pull the indicator around to "full". Pulling on the indicator chain should turn the indicator back to "empty" against the spring pressure.

TANK UNIT. The tank unit is held on the top of the gasoline tank by screws. There is a cork float in the gasoline tank connected to a long float arm. This float arm is fastened to a lever which, in turn, rests against a link fastened to the control wire. The float mechanism does not push on the control wire when the gasoline tank is being filled, but as the float rises the indicating unit in the instrument panel is permitted to pull the control wire farther and farther toward the front of the car.

To remove the tank unit, drain the gasoline tank, disconnect the gasoline line, disconnect the forward end of the transmission wire from the indicator as described under "Gauge Lubrication". Slide the connecting tube out over the end of the transmission wire and lock it to protect the end of the wire. Remove all the clips which hold the Transmission Housing in place between the

Instrument Board and the gasoline tank. Drop the gasoline tank and remove the screws which hold the tank unit to the top of the tank.

THE GASOLINE GAUGE TRANSMISSION HOUSING SHOULD NOT BE BENT EXCEPTING IN A SMOOTH CURVE OF LARGE RADIUS.

GASOLINE TANK

The Gasoline tank at the rear of the chassis has a capacity of approximately twenty gallons. The tank is suspended in three points with a spring at the rear for the third point. There is a safety baffle inside each suspension hanger. Each baffle is air tight and forms an additional seal to prevent any possibility of leakage from the suspension points on the tank. A small breather or vent is provided at the center of the top of the tank.

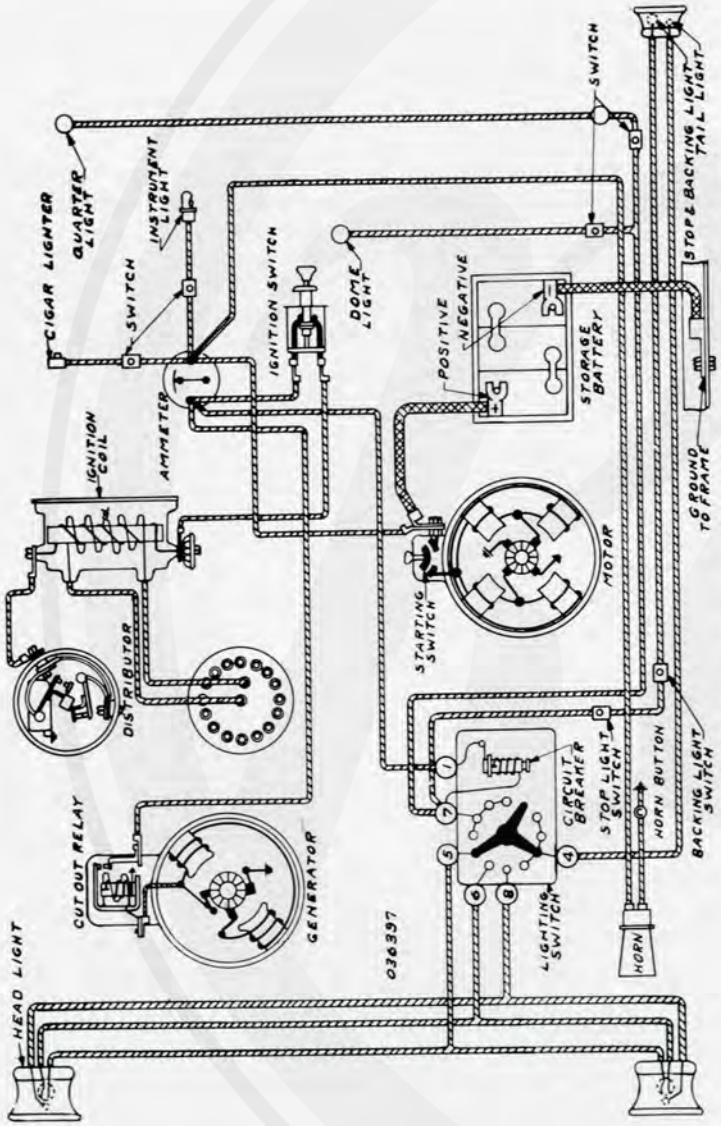


Figure 33—Wiring Diagram

PART XII

ELECTRICAL SYSTEM

The Delco numbers for the equipment used on the New Stutz, are as follows:

Starting Motor	No. 334
Generator	No. 333
Distributor	No. 5296
Ignition Coil	No. 2191
Lighting Switch	No. 1283
Ignition Switch	No. 1293

The entire system is of the single wire or grounded type, the engine and frame of the car forming the negative side of the electrical circuit.

Before attempting to remove or repair any of the electrical equipment, one of the battery terminals should be removed. The engine should never be run with the storage battery removed or disconnected or with any break in the charging circuit.

IGNITION

The New Stutz is provided with two spark plugs for each cylinder or a total of 16 spark plugs. Two sparks occur in each cylinder at the same time. These two sparks are positively synchronized as described in following paragraphs.

The two spark plugs together with the Stutz valve-in-head construction result in an extremely short distance from any part of the combustion chamber to the nearest spark plug. This improves combustion conditions to a marked degree which, in turn, improves the flexibility, acceleration and economy of the New Stutz engine and decreases engine wear by decreasing the amount of unburned fuel which washes down past the pistons, destroying the oil film and diluting the crankcase oil. Another result of improved combustion is the decrease in service operations on the valves due to the decrease in the amount of carbon formed during the unusually complete and rapid burning of the compressed charge in each cylinder. The two spark plugs and the two sparks in each cylinder also decrease to a minimum the possibility of delay due to ignition trouble.

DISTRIBUTOR. The distributor is mounted at the right front corner of the engine and is driven in a clockwise direction at one-half the crankshaft speed by an eccentric slot on the upper end of the spiral gear that drives the oil pump. The distributor is of the new Stutz-Delco design, and comprises two Breaker Arms or two sets of timing contacts spaced so that the fiber blocks on the two arms bear against the cam at points 135 degrees apart. The contacts are electrically connected in parallel. The two pairs of contacts are operated alternately by a four lobe cam. Since the timing contact arms are connected in

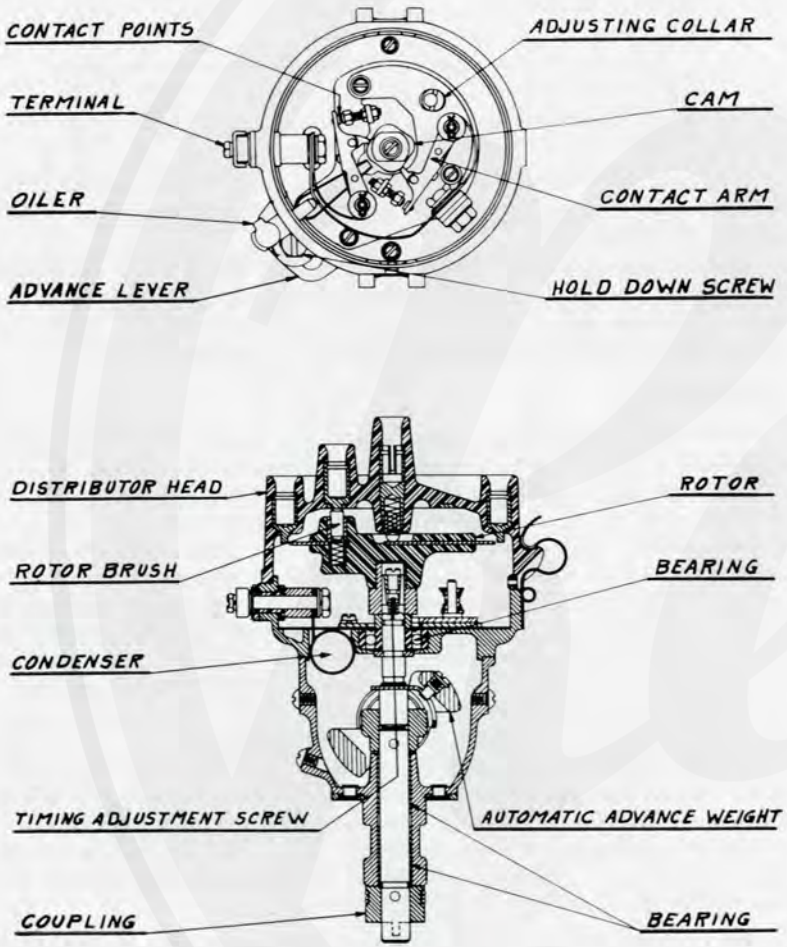


Figure 34—Ignition Distributor Unit

parallel and operated alternately by a four lobe cam, the primary current from the breaker arms is interrupted each 45 degrees of rotor travel, or each 90 degrees of flywheel travel. The 8-cylinder engine requires a spark each 90 degrees of flywheel travel.

The two sets of timing contacts in connection with the four lobe cam are used as a means of increasing the time the contacts are closed, allowing the ignition coil to become completely saturated, which, in turn, improves the high speed performance of the engine by producing a hotter spark than normal at high engine speed. The use of two sets of timing contacts is in no way responsible for two sparks being sent each cylinder. The two sparks are a result of ignition coil construction which is described under "Ignition Coil."

SPARK ADVANCE. Spark advance is necessary to compensate for the time required, after the timing contacts open, until the sparks finally jump the gaps in the two spark plugs. Ignition advance also compensates for the time required for the flame to spread from the two spark plugs through the compressed charge in the cylinder. At high engine speed the engine turns through a considerable angle after the timing contacts open before the maximum combustion pressure is developed in the cylinder. Automatic spark advance mechanism is provided in the distributor and this mechanism is supplemented by a hand spark advance on the steering wheel.

The hand spark advance range is 38 degrees of crankshaft travel. The hand spark advance is accomplished through the rotation of the distributor head in relation to the distributor cam. When the distributor head is turned counter-clockwise it manually advances the spark, while turning clockwise retards the spark.

The automatic spark advance range is 28 to 32 degrees of crankshaft tread. The automatic spark advance mechanism is a ring type governor mounted around the distributor shaft and linked to the distributor cam. The distributor shaft is made in two pieces, the upper part revolving in the annular ball bearing and the lower section revolving in two bronze bearings. The four lobe cam and the rotor are carried on the upper end of the shaft while the automatic advance weight is carried by the lower end.

TIMING CONTACTS. The timing contacts should be inspected and adjusted after the first 750 miles the car is used, and thereafter, each 2,250 miles. The first adjustment is necessary as the two contact arm rubbing blocks, which bear on the cam, wear to a seat during the first few hundred miles. Thereafter, inspections should be made each 2,250 miles to be sure that the contact points do not become pitted or blackened. The two pairs of contact points should present a "frosted" appearance with no projection or black discoloration. The larger service stations have special equipment for dressing contact points, but the oper-

ation can be done by holding a thin oil stone firmly between the points and moving it back and forth. It is not necessary to remove the pits or holes in the points provided there are no projections and provided the points have a reasonable area of clean contact surface. Adjustment of each pair of contacts should be such that when they are fully open, the distance between them will be the thickness of the gauge on the Delco distributor wrench, marked "Distributor", which is .025 to .027 inches. The two sets of timing contacts should be adjusted with as nearly the same gap as possible. After cleaning and adjusting the contact points, check the ignition timing as described under "Timing the Ignition."

A second adjustment is provided, whereby the angle of the contact arms may be changed. It is essential that the two contact arm rubbing blocks bear on the cam at points exactly 135 degrees apart. The arms are set properly at the factory, and no change should ordinarily be necessary, since the two pairs of contacts will continue to interrupt the ignition current each 90 degrees of flywheel travel, provided the contact points have the proper gap when wide open. However, to facilitate adjustment when the contact arms are replaced, one of the arms is mounted on an adjustable plate. The spacing or angle of the contact arms may be adjusted as follows:

Remove the distributor head and rotor. Considerable time can be saved in retiming the engine if the rotor position is marked in some way before it is removed. In making the mark, the rotor should be turned counter-clockwise with a light pressure so as to take out all back lash. When retiming, the rotor should be turned counter-clockwise again to obtain the

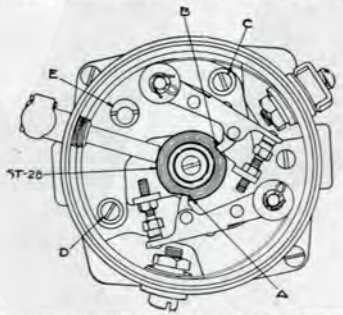


Figure 35—Delco Breaker Gauge

same setting. Loosen the screw in the center of the cam and remove the cam. Substitute Delco Breaker Gauge No. ST-28 which may be obtained from any United Motors Service Station or from the Dayton Engineering Laboratories Company of Dayton, Ohio. Do not tighten the screw as the gauge should be free to turn on the shaft. Rotate the gauge until the breaker arm blocks drop into the notches on its surface. Then, holding the

shoulder of the one notch firmly against the heel of the block at "A", loosen the screws "C", and "D", and turn the eccentric "E" until the heel of the other block is in contact with the shoulder of the other notch at "B". With the arms in this position, tighten the screws "C" and "D".

The adjustment can be checked by holding the gauge solidly against the rubbing blocks and lifting each breaker arm in turn. If they are properly set, a slight friction should be felt as the arms are raised from the gauge.

When the arms are correctly located, place the cam in position and adjust the contact separation. The motor should then be timed as described under "Timing the Ignition."

TIMING THE IGNITION

When the car leaves the factory, the ignition is properly timed and should not require further attention except to check the setting each 2,250 miles. After adjusting the timing contact points, the timing may be checked as follows:

1. Remove the crankcap from the radiator and crank the engine very slowly by hand, until the cross pin through the end of the crankstud stands vertically or in an up and down direction.
2. Remove the inspection plate from the top of the flywheel housing. The mark "TOP C 1 & 8" should be visible at the center of the opening, indicating that the engine is on upper dead center for cylinders one and eight. If the mark TOP C 1 & 8 is not visible, crank the engine one-half turn and it will be.
3. Retard the hand spark lever and pull out the ignition switch.

   NOTE: The hand spark lever is retarded in its highest position.
4. Advance the hand spark lever. As the hand lever reaches a point between the "nine" and "eight o'clock" position, the ammeter should drop to zero, or if the lights are on the ammeter should drop about two amperes. Provided the ammeter hand does not drop to zero, loosen the timing adjustment screw in the center of the distributor cam and advance the cam setting slightly by turning the cam clockwise. Provided the ammeter drops to zero before the hand lever reaches a point between "eight" and "nine o'clock", retard the cam setting slightly by turning the cam counter clockwise. In each case, before checking the adjustment, turn the cam counter clockwise with a light pressure to take up any lash in the drive. After securing the proper adjustment of the cam, press the cam down as far as it will go and lock it in place.

NOTE: The various positions of the hand spark lever may be compared with the position of the hour hand of a clock.

The spark is retarded when the lever is in its highest position. This corresponds to the position of the hour hand at eleven o'clock. When the spark is fully advanced the position of the lever corresponds with the hour hand at seven o'clock. The nearer to the full retard position the hand lever is when the ammeter drops to zero with the engine on one and eight center, the greater the advance on ignition setting. If maximum efficient advance range is desired, set at nine o'clock position.

NOTE: Provided the ignition has to be retimed, the rotor should first be removed and the timing contact points adjusted. The lock screw at the center of the cam should be loosened and the cam turned with a wrench to a point which will place the rotor in position to send a spark to two terminals in the distributor marked 1R and 1L. The cam should then be turned slightly to bring it to the position where the contact points are just opening.

CAUTION

To eliminate an error through back lash in the distributor drive, the engine should be turned only in its normal direction of rotation while timing the ignition.

DISTRIBUTOR HEAD. The distributor head has eighteen high tension terminals. The two central terminals are connected to the ignition coil. The sixteen remaining terminals, spaced 22½ degrees apart around the head, are connected to the sixteen spark plug wires. The terminals of the left and right-hand plugs are placed alternately. The terminals in the head are marked, the one directly above the forward hold-down clip being No. 1 R, and the terminals counted in a clockwise direction from this point are as follows: 1-R, 8-L, 6-R, 3-L, 2-R, 7-L, 5-R, 4-L, 8-R, 1-L, 3-R, 6-L, 7-R, 2-L, 4-R, 5-L. The firing order is 1-6-2-5-8-3-7-4. The cylinder nearest the radiator is number one.

ROTOR. The rotor is carried on the upper end of the distributor shaft and is for the purpose of distributing the two high tension sparks from the single ignition coil to the two spark plugs in the cylinder which is on firing center. The sparks from the coil are delivered respectively through the two terminals at the center of the distributor head. From these terminals, the current flows respectively through the metal button and the carbon brush to the two metal plates imbedded in the rotor. These metal plates do not rub against the sixteen distributing pins which lead to spark plug wires, but come near enough to these pins to permit the spark to jump from each of the metal plates to the pins. The rotor plates are spaced 157½ degrees apart as each plate must deliver a spark every 45 degrees travel to alternately spaced terminals or pins in the distributor head.

CARE OF THE DISTRIBUTOR. Lubrication of the distributor bearings is accomplished through an oiler located on the side of the distributor housing. Eight to ten drops of light engine oil should be placed in this oiler every 750 miles.

The cam against which the breaker arm fiber rubbing blocks bear, should be lubricated occasionally by wiping on a very thin film of vaseline. This is particularly necessary during the first few hundred miles that the car is used, as it is during this time that the rubbing blocks take on a glazed surface. Too much lubrication at this point must be avoided, as only a very thin film of lubricant is required.

The center plunger in the distributor head should always make contact with the rotor, and the small rotor brush should always make good contact with the brass track in the distributor head. The brush is made of carbon and care must be used in removing the distributor head and handling the rotor, as the brush is easily broken.

CONDENSER. A single condenser is mounted inside of the distributor housing beneath the breaker plate assembly. The condenser consists of two long strips of tinfoil insulated from each other by strips of parafin paper, one strip being connected to the frame or ground and the other to the two insulated timing contacts. The condenser decreases the amount of sparking at the timing contacts and increases the voltage of the current induced in the secondary windings of the ignition coil. The condenser is mounted in a moisture-proof metal case.

SPARK PLUGS

The New Stutz engine has 16 spark plugs, two in each cylinder. These plugs are arranged 8 on the right-hand side of the engine and 8 on the left-hand side of the engine. The ignition sparks from the ignition coil are distributed by the distributor to the proper spark plugs and the sparks jump across the gaps between the electrodes of the plugs. After a long period of time, the sparks will burn away the electrodes, widening the gap so that the plugs must be readjusted. The 16 spark plugs should be removed periodically, cleaned and adjusted with .027 to .032 inches gap. One of the blades on the Delco distributor wrench is marked "Spark Plug" and this blade is .027 to .032 inches in thickness and should be used for setting spark plugs.

The spark plugs are standard metric thread. This thread is 18 MM in diameter, which is the metric standard for spark plugs. Spark plugs should be obtained from the Stutz Motor Car Company, although practically all automobile supply houses carry standard metric spark plugs which are interchangeable with those used in the New Stutz.

IGNITION COIL

The purpose of the ignition coil is to transform the low voltage current from the storage battery or generator, to a current of high voltage capable of jumping the gaps in the spark plug

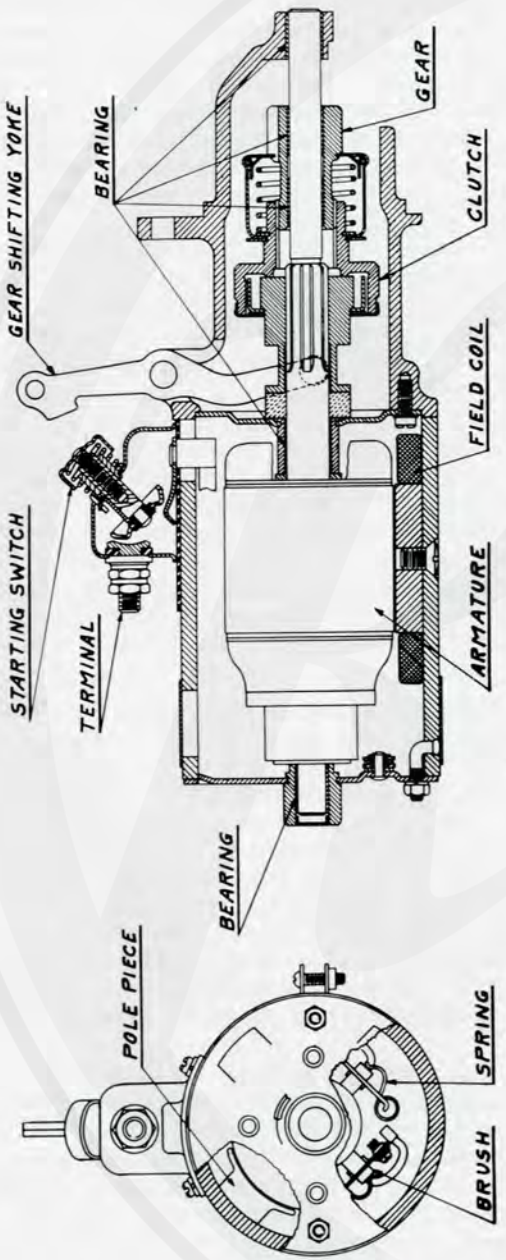


Figure 36—Starting Motor

in the engine. The ignition coil consists of a soft iron core around which the primary wire is wound. The primary winding consists of a small number of turns of comparatively large wire and it is through this winding that the intermittent battery current from the two contact arms flows. The ends of the primary winding are connected to two small terminals at the ends of the coil case. A double secondary coil is wound around the outside of the primary coil. The two ends from this double secondary coil are attached to the two large high tension terminals located in the center of the coil case. The secondary winding consists of a large number of turns of fine wire. Each turn of both coils is insulated.

When the timing contacts in the distributor close, the battery current flows through the primary winding of the ignition coil. The instant the primary circuit is broken by the opening of the contacts, a very high voltage is induced in the double secondary winding. The high voltage current flows from the two terminals at the center of the coil and is distributed to the proper spark plug wires by the distributor rotor.

RESISTANCE UNIT

A Resistance Unit is mounted on one end of the ignition coil. The unit is in the primary ignition circuit and prevents excessive discharge from the storage battery when the ignition switch is pulled out and the engine is not operating. The resistance winding will burn out if the ignition switch is left on for a considerable time with the engine standing. If the resistance is burned out the ammeter hand will not move when the engine is cranked with the switch on. The unit may easily be replaced.

STARTING MOTOR

The starting motor is of the four-pole series wound type. All the cables and connections in the starting motor circuit must be tight and in good condition to supply the starting motor with the full battery current. The starting motor is engaged mechanically when the starter pedal is depressed. The linkage from the starter pedal moves the small pinion on the starting motor shaft into engagement with the teeth on the flywheel. After the gears are engaged, the starter switch on top of the starter motor is closed and current flows from the storage battery, causing the starter to turn the engine over. The proper adjustment of the electrical contacts will not close the battery circuit until the gear teeth on the small pinion are fully engaged in the flywheel teeth. When the driver releases the starting pedal, a spring returns the pedal, breaking the battery circuit, and withdrawing the starter pinion from the flywheel gear teeth.

Provided the teeth on the starter pinion gear and the teeth on the flywheel gear strike in such a way as to prevent the pinion

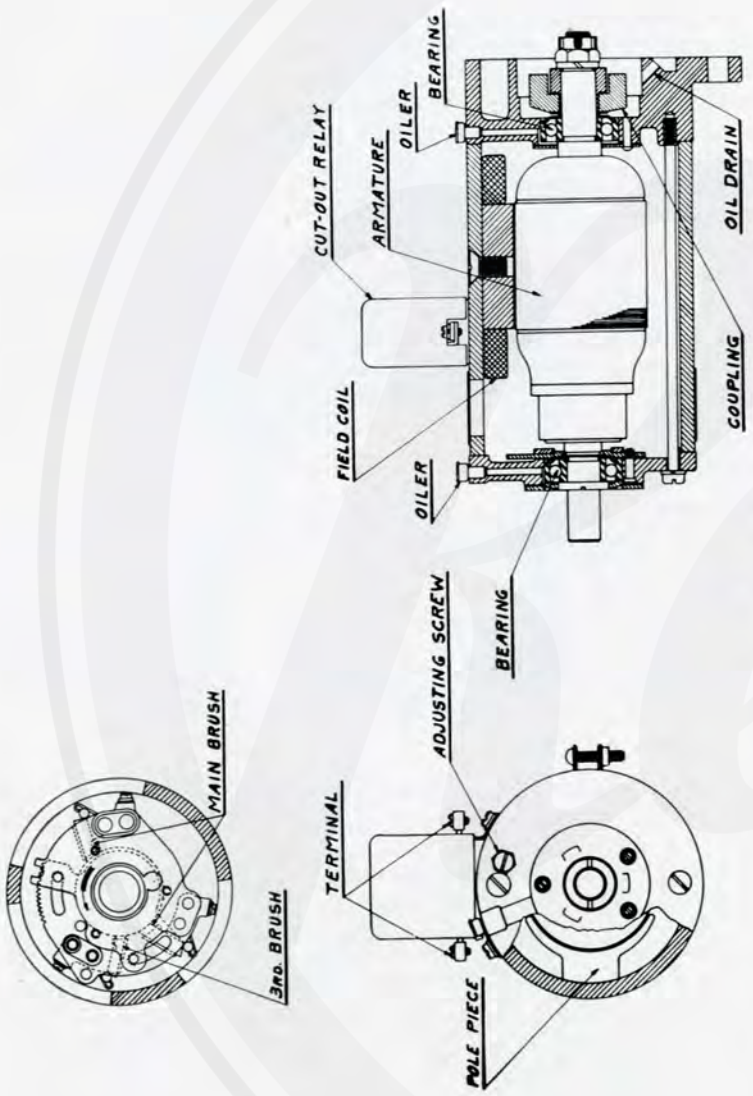


Figure 37—Generator

from meshing properly when the starter pedal is depressed, a stiff spring permits the starter pedal to be depressed all the way down, closing the battery circuit. This stiff spring snaps the pinion into mesh very quickly when the battery circuit is closed and the starter begins to turn.

A starting motor over-running clutch is provided to protect the starting motor armature from serious damage in case the starter pedal is not released immediately when the engine starts to run. The over-running clutch permits the starter pinion to turn faster than the starter armature, but this practice shortens the life of the starting motor and of the over-running clutch and the driver should release the starter pedal immediately when the engine starts.

STARTING MOTOR LUBRICATION. The starting motor has no oilers, as the three bearings on the motor shaft are made of a special grade of bearing bronze inlaid with graphite. The graphite contained in this bearing material provides ample lubrication and the bearings must not be oiled.

The over-running clutch is packed in lubricant when built, and no further attention is required.

If the starter commutator becomes black and dirty, it should be cleaned with a cloth.

GENERATOR

The generator is driven by the accessory drive shaft at the right front corner of the engine. The drive is through a metallic Oldham type coupling. The generator turns clockwise when viewed from the front of the car. The drive ratio is 1.2 times the crankshaft speed.

The generator furnishes current to the lights and ignition and also recharges the storage battery. The battery in turn, provides a source of current for the starting motor, for lights, ignition and other electrical accessories when the generator is not turned fast enough to supply this current or when the engine is not running. The generator is a two-pole shunt-wound unit having third brush regulation. The third brush is connected to one of the field leads and restricts the maximum output of the generator. One of the characteristics of this type of regulation is that the generator output will decrease slightly at high speed. The third brush affords a convenient means of adjusting the charging rate of the generator as described under "Charging Rate".

GENERATOR LUBRICATION. The generator armature is mounted on two ball bearings which should be lubricated with 10 drops of engine oil every 750 miles through each of the two oilers on top of the generator.

GENERATOR BRUSHES. The spring tension on the generator brush arms is 1¼ lbs. It is important that this tension

be obtained as the operation of the generator depends upon the contact of the brushes on the commutator. A small spring scale may be used to check the brush spring tension. This scale should be attached to the roller at the end of the brush spring and the reading taken just as the roller leaves the brush.

CHARGING RATE. The generator charging rate is adjusted at the factory to meet average driving conditions. Due to unusual driving conditions, some owners may require a higher or lower charging rate. The charging rate should be sufficiently high to keep the battery nearly fully charged. Too high a charging rate results in overcharging the battery and shortens its life, while too low a charging rate will also shorten the life of the battery. The generator is not designed to charge at a rate higher than 16 amperes with the generator warm and it is not advisable to charge at this high rate unless absolutely necessary.

The third brush is the means of automatically regulating the output and also the means of adjusting the maximum output. The third brush is connected to the field windings and is mounted on a movable plate which permits rotating the third brush around the axis of the generator shaft. The plate on which the third brush is mounted may be rotated by means of an adjusting screw on the generator end frame. Changes in the charging rate should be made while the generator is warm. An accurate ammeter should be connected in the charging circuit to determine the generator output. It is not advisable to use the dash ammeter for determining the generator output, as a dash ammeter will usually show a somewhat smaller current than is actually generated. After adjusting the charging rate, it is sometimes necessary to reseat the third brush. This may be done by wrapping a strip of "oo" grade sandpaper part way around the commutator with the rough side out. Set the third brush on the sandpaper and rotate the commutator and the sandpaper back and forth, seating the brush. The sandpaper should be wider than the brush. Emery cloth should never be used as emery will become imbedded in the brush and commutator and continue to cut and wear. Emery is also an electrical conductor. Wipe the commutator and brushes clean before replacing the cover band.

CUT-OUT RELAY

A cut-out relay mounted on top of the generator automatically opens and closes the circuit between the storage battery and the generator, permitting the generator to charge the battery while the engine is running at medium and high speeds, and preventing the battery from discharging through the generator windings when the engine is idling or stopped. The cut-out is magnetically operated; the contacts close when the generator voltage rises above that of the battery, and open when the generator voltage drops below that of the battery.

The cut-out is properly adjusted at the factory and should require no attention other than to see that the contact points are kept clean. The adjustments should not be tampered with.

SWITCH—IGNITION

The ignition switch is controlled by a push and pull button located on the instrument board to the left of the instrument panel. No lock is provided on the ignition switch. The advantage of this construction is that it is very simple to wire around any ignition switch. Owners, therefore, place too much confidence upon ignition locks. The omission of this lock directs the owner's attention to the transmission lock, which is a much more effective means of preventing theft.

The ignition switch is "off" when pushed forward toward the front of the car and "on" when pulled toward the rear of the car. In the "on" position, the battery current flows intermittently through the ignition system. The intermittent flow of current may be observed in the vibrations or movements of the ammeter hand when the engine is running slowly. The engine cannot be started or run without first pulling out the ignition switch, and the ignition switch must be pushed forward when the engine is not running, as the storage battery will be discharged if the switch is left "on" with the engine stopped.

SWITCH—LIGHTING

The lighting switch is controlled by a lever conveniently located on the steering wheel. The switch lever controls the special double filament bulbs in the head lights as well as all the other lights. There are four positions of the Light Switch, which are arranged as follows:

4. Head lights—high beam—and tail light.
3. Head lights—low beam—and tail light.
2. Dim light (in head lights) and tail light.
1. Tail light only.

Bottom—Off.

The steering wheel lever controls the mechanisms in the lighting switch which is located in a square box-shape container mounted at the bottom of the steering column. The switch mechanism is entirely protected from dirt, oil and water.

CIRCUIT BREAKER

The circuit breaker, a protective device which takes the place of fuses, is completely enclosed in the light switch at the lower end of the steering column. The normal amount of current flowing to the horn, light and ignition circuits does not affect the circuit breaker, but an abnormally heavy current, such as would be caused by a ground or short circuit, causes the contacts of the circuit breaker to operate and intermittently cut

off the flow of current. This causes a clicking sound, which gives a distinctive warning. This clicking sound will continue until the ground or short is removed, or the switch is operated to cut off the circuit on which the ground or short circuit exists. The driver should investigate the source of the short circuit at once as the circuit breaker draws enough current to discharge the battery very quickly. In this manner the circuit breaker protects the wiring, switch and storage battery. As soon as the ground or short circuit is removed, the circuit breaker restores the circuit and there is nothing to replace as would be the case if fuses were used.

AMMETER

The ammeter is used in connection with the electrical equipment to permit the driver to keep a check on the performance of the electrical system. The instrument is for the purpose of indicating the net amount of current that flows to the storage battery from the generator or to the electrical system from the battery.

At all car speeds faster than approximately 8 miles an hour, with the lights "off", the ammeter should indicate "Charge". With the lights "on", a slight discharge will be indicated at slow speeds. The lamp load will also reduce the charging rate at high speeds, as this load reduces the amount of current passing through the storage battery.

Should the ammeter indicate "Discharge" with the engine running at normal driving speed without lights, it should be taken as an indication of trouble, and the electrical equipment and wiring should be checked over by an authorized Stutz Service Station.

CAUTION

Do not attempt to operate the system with the storage battery disconnected or removed from the car. Very serious damage to the apparatus may result from such action.

Before attempting to remove or repair the starting motor, or before disconnecting any wires from the ignition and lighting switches, be sure to first disconnect one of the terminals of the storage battery to prevent short circuits.

STORAGE BATTERY

The six volt 170 ampere hour storage battery is carried in a battery box under the left side of the front seat. The negative terminal of the battery is grounded on the frame, as the entire electrical system is of the single wire grounded type.

Upon delivery of a new car, the car should be taken at once to the nearest of the battery manufacturer's service stations, and registered in order to take advantage of the service facilities offered.

The battery terminals of a new car should be wiped clean and a fresh coating of vaseline applied before the car is put into service. At the end of each six months of service, the terminals should be disconnected from the battery and the battery posts and the insides of the terminals scraped. The battery posts and the terminals should be given a thin coating of vaseline and the terminals tightened down on the battery posts. The ground cable should be disconnected where it fastens to the frame cross member and this connection should be scraped clean and coated with vaseline before it is reassembled.

The most common source of battery trouble is the failure to keep the liquid in the battery at the proper level. The caps should be removed from each of the three battery cells once each week and distilled water added if necessary to keep the level of the liquid approximately one-half inch above the top of the plates. Filling the battery too full will result in the acid flowing out of the battery caps and partially short circuiting the top of the battery. Allowing the level of the liquid to fall too low will result in permanent injury to those parts of the plates which are exposed above the liquid level. Distilled water only should be added to the battery. It is never necessary to add acid. The amount of water required by the battery is one means of guarding against an unforeseen failure of the battery. Provided one cell of a battery repeatedly requires more water than the other two cells, the battery should be examined by a competent man, as there may be a crack in the battery jar.

The charging rate of the generator should be such as to keep the battery almost fully charged most of the time. Too high a charging rate will heat the battery and will also prevent the occasional discharge of the battery. The life of the battery plates is prolonged by permitting the battery to be partially discharged at a reasonably slow rate occasionally. If the battery is permitted to stand or to operate continually with a very low charge or nearly discharged, the life of the battery will be shortened. If the battery ever becomes completely discharged it should be removed at once from the car and taken to a competent battery station for recharging.

When placing a car in storage, it is advisable to remove the battery and leave it with a battery charging station, where it can receive the proper attention. Provided the battery is to be stored in the car, it should be charged approximately each six weeks.

Each of the three battery cells should be tested with a hydrometer once each month. With the battery fully charged, a reading of approximately 1.280 specific gravity will be obtained in each cell. The battery is approximately half charged when the hydrometer reading is 1.250, while a reading of 1.150 indicates that the battery is completely discharged. The readings from

each of the three battery cells should be approximately the same and any wide variation between the readings should be investigated by a battery man.

A fully charged battery will not freeze at any temperature ordinarily encountered in any country. A half charged battery will freeze at approximately 38 degrees below zero Fahrenheit. A fully discharged battery will freeze at approximately 15 degrees above zero Fahrenheit.

When the car is taken on long tours where there is little night driving, it is sometimes advisable to either reduce the generator charging rate or to burn the headlights to prevent the battery from being over-charged.

HORN

A Klaxon horn, type 12-C, is standard equipment on the New Stutz. The horn contains a small motor which drives a serrated disc in contact with a button on the horn diaphragm. The tone of the horn is dependent upon the speed at which the small horn armature revolves. The proper adjustment may be obtained by turning the slotted screw marked "Adjust" on the back of the horn, to the left until no sound is heard except the motor humming, when the battery current flows through the horn. Then turn the screw back to the right until the desired tone is obtained.

HORN LUBRICATION. The horn does not require any lubrication excepting that whenever the horn is removed from the car, it is advisable to remove the horn motor cover and place a few drops of high grade non-corrosive gun oil on the two felt washers, one at each end of the armature shaft. These felt washers are saturated with oil when the horn leaves the factory and this oil keeps the horn bearings lubricated. Service operations on the horn should be performed by United Motors Service Stations. Stutz Distributors and Dealers are in a position to advise concerning the nearest of these service stations.

LIGHTS

All lights on the car should be inspected periodically. A repeated tendency of lights to burn out will usually indicate that there is a loose connection or a partial open circuit somewhere in the generator circuit. The generator is capable of impressing a very high voltage on the circuit if the normal resistance of the battery is increased. The resistance in the circuit is increased by loose connections or open circuits, and consequently, repeated light trouble can usually be corrected by cleaning the battery terminals as described under "Storage Battery" and by checking the entire circuit for loose connections.

The standard light equipment on the Stutz car is as follows:

Location	Candle-power	Base	Voltage
Head—High beam	21) Double	Special	6
Low beam	21) Filament		
Head parking	4	SC	6
Dash	2	SC	6
Quarter lights	21	DC	6
Tail	2	SC	6
Backing and stop	21	SC	6
Inspection spotlight	21	SC	6
Instrument panel	2	SC	6

NOTE—DC indicates double contact base, SC indicates single contact base.

Two light bulbs are used in the headlight. The small parking light bulb has a Single Contact base, while the other bulb is of special construction with double filament and Double Contact base. The current for one filament flows in one base contact and out through the body of the bulb, while the current to the other filament flows into the other base contact and out through the body of the bulb.

HEADLIGHTS

The Twin Beam Monogram headlight lenses are 9½ inches in diameter. The double filament bulb is so located that one filament throws a high beam for driving in the country while the other filament throws a low beam for city driving. Both beams are 21 candle-power. This eliminates the hazard of dimming lights to pass on-coming cars, since the low beam is so low that it cannot possibly cause an objectionable glare.

Two adjustments are provided on the headlights. An adjusting screw at the center of the back of the light controls the focus. This adjustment should be set to provide a straight, round beam of light when the lens is removed.

A second adjusting screw in the back of the lamp, just below the focusing screw, tips the bulb in such a way as to raise or lower the beam. The proper adjustment will provide a straight round beam of light, 37 inches high at 25 feet in front of the car when the lens is removed.

The headlights are held in place by adjustable sockets. After the two adjusting screws at the backs of the headlights are properly set with the lenses removed, set the headlights to project their beams so that 25 feet ahead of the car the two beams are 30½ inches apart.

All headlight adjustments should be made with the "high beam."

IN ALL CASES FOLLOW THE INSTRUCTIONS OF LOCAL OR STATE AUTOMOBILE LAMP REGULATIONS FOR THE ADJUSTMENT AND OPERATION OF THIS TYPE OF LAMP, WHEN THEY DIFFER FROM INSTRUCTIONS HEREIN CONTAINED.

INSTRUMENT LIGHT

The instrument panel is illuminated by a concealed light in the center of the panel. This light is held in place by a spring clip and may be pulled out from the rear of the panel.

CIGAR LIGHTER AND INSPECTION LIGHT

An automatic reel is provided on the instrument board at the right side of the instrument panel. The current is automatically turned on when the wire is pulled out from the reel, and off when the wire is returned to place. The button just beneath the reel controls the automatic return of the wire.

Two tips are provided. One is a cigar lighter and this tip will normally be left in place. An inspection light is also provided. The light fits in a bracket on the forward side of the right-hand end of the instrument board.

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Standard Warranty

Our warranty is that required of all automobile manufacturers by the National Automobile Chamber of Commerce, and is as follows:

WE WARRANT each new motor vehicle manufactured by us to be free from defects in material and workmanship under normal use and service, our obligation under this warranty being limited to making good at our factory any part or parts thereof which shall, within ninety (90) days after delivery of such vehicle to the original purchaser, be returned to us with transportation charges prepaid, and which our examination shall disclose to our satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties, expressed or implied, and of all other obligations or liabilities on our part, and we neither assume nor authorize any other person to assume for us any other liability in connection with the sale of our vehicles.

This warranty shall not apply to any vehicle which shall have been repaired or altered outside of our factory in any way so as, in our judgment, to affect its stability or reliability, nor which has been subject to misuse, negligence or accident, nor to any commercial vehicle made by us which shall have been operated at a speed exceeding the factory rated speed, or loaded beyond the factory rated load capacity.

We make no warranty whatever in respect to tires, rims, ignition apparatus, horns or other signaling devices, starting devices, generators, batteries, speedometers, or other trade accessories, inasmuch as they are usually warranted separately by their respective manufacturers.