MARMON 34

A Scientifically Constructed Light Weight Car

NOTICE

Marmon was once a famous name in passenger cars, and one of the easiest riding, finest cars manufactured in the United States. It was built by the Nordyke and Marmon Company (established in 1851), which at one time built fine milling and flour-making machinery.

This folder is a reprint of an original catalog of the famous Marmon "34," and has been made available for collectors and those who desire to preserve the memories of a once fine motor car.

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MARMON 34

A Scientifically Constructed Light Weight Car

IN this "brief" of the mechanical construction of the new Marmon 34 we believe we have pictured a car that will appeal to any experienced motorist as representing a distinct advance along sound, conservative engineering principles. The fact that men who for years had driven good cars and who already maintained in their private garages as many as three and four other cars of the higher-priced types signified their intention of purchasing a Marmon 34 to add to their string before they had even seen an illustration of it, simply making the decision on the strength of the car's specifications, forecasted the prestige which the Marmon 34 has since gained for itself.

And yet, impressive as these specifications and these facts are they do not do the new Marmon justice, for it is only in the remarkable performance of the car on the road that the true excellence of the car is made apparent.

There is a sort of nimble, sure-footed fleetness about the new Marmon and it is this that astonishes and delights those who drive it for the first time; and the greater number of cars these first-triers have driven previously, the more striking is the sensation.

Experienced drivers who have never before driven an automobile faster than thirty-five miles an hour because of a natural timidity, have driven the new Marmon sixty-two miles an hour on an ordinary, good country road with perfect tranquillity.

The reason for the lack of fear in this case is the *"tranquillity of the Marmon 34"* at that speed—the lack of noise, the lack of vibration or apparent stress in any part of the car, and the utter lack of any skidding or "throwing" tendency in following the slight swervings of the road, or any "leaping" tendency in passing over the ordinary hummocks and rises that were encountered.

Yet this car of 136-inch wheelbase and seven-passenger capacity, fully equipped with oil, gasoline, water, all tools, top, windshield, extra wheel and tire, weighs only 3540 lbs.

How does it hold the road at sixty-two miles an hour? There are *several* reasons for this peculiar "ability."

One reason is the scientific proportioning of the sprung and unsprung

weight and the even distribution of the sprung weight which produces perfect balance throughout the car.

Another reason is the Marmon Compound Cantilever Rear Spring which absolutely prevents the body from swaying from side to side over the rear wheels and thus eliminates the "whip-lash" motion in the rear to which is due most of the skidding tendency of ordinary cars.

Still another is the notable unification of Marmon design, which makes the body and the chassis practically a unit. The body, which is of aluminum, is made in three pieces—cowl, front seats, and rear seats—which are bolted directly to the frame. This construction makes the body practically *part of the frame*, obviates the necessity of sills, and permits an extremely *low-hung* body, the floor boards being but 24½ inches from the ground. Thus the passengers sit low in the car, at comfortable seat height, and the center of gravity is low.

Few men and fewer women when they first contemplate a car have in mind as one of the requirements *"comfort at sixty miles an hour."*

The Marmon was not *designed* with "comfort at sixty miles an hour" as the main idea in the designer's mind. But in designing it to be comfortable and to hold the road well at from *twenty* to *thirty* miles the details were so carefully and precisely worked out that the nimble, surefooted, graceful, symphonic action of this extraordinary car is undisturbed at sixty miles or even at the *greatest* speed of which it is capable.

Whether you will ever use the maximum of the Marmon's seventy-four (brake test) horsepower for the *speed* it will develop, is beside the question. You may some day wish to use it for a short rush ahead at a crossing or a quick pick-up at a side street, for great reserve power in these emergencies is often *more* necessary to safety than good brakes.

Because of its unusually sensitive and powerful brakes, the Marmon is one of the easiest controlled cars in the world. The smallest woman can bring the Marmon to a short stop with perfect ease. This feeling of security makes the car a real pleasure to drive.

The era of the big, high-powered, flexible, easily controlled, light-weight car, in which aluminum must play an important role, is ushered in with the new Marmon 34.

The following details of construction will indicate the care exercised in building this car, the quality of the materials used, and the soundness of the principles upon which the design of the Marmon 34 is based.

Nordyke & Marmon Company
Established 1851
Indianapolis, Ind.

The Marmon 34

THE Marmon 34 may be truly called "A Scientifically Constructed Light-Weight Car." It is a comfortable, high-powered, high-quality car, having a wheelbase of 136 inches in the following models:

7-passenger touring car	Price	$2,750
5-passenger touring car	"	2,700
4-passenger "Club" roadster	"	2,700
3-passenger "Club" roadster	"	2,700

Prices F. O. B. Indianapolis

Weight

The shipping weight of the seven-passenger touring car is 3,295 pounds; ready for the road, all gasoline, oil, and water compartments filled, with spare wire wheel and tire — full standard equipment — 3,540 pounds. The shipping weight of the five-passenger is 3,215 pounds; fully equipped, ready for the road, as above, is 3,450 pounds. Compare these weights with other cars of the same class.

Performance

The Marmon 34 touring car in standard touring form readily attains a speed of 65 miles an hour; it will accelerate from 10 to 50 miles an hour in less than 18 seconds; it may be toured-in with comfort and with feeling of complete safety and security at speeds of 50 to 55 miles an hour. The wonderful flexibility of the motor makes it fully the equal of any multi-cylinder motor yet produced, and its operation a marvel of smoothness. The balance is so perfected that the car can be used on long touring trips without fatigue.

Features

The striking features of the new car are the extensive use of aluminum, the deep Z-section frame, the three-piece body, the compound cantilever cross-suspension type of rear springs, transmission held in suspension on front end of torque tube, etc.

The largest structural portion of the motor — including the cylinder barrels, water jackets, bearing supports and the upper half of the crankcase — is molded from aluminum in one piece; hard iron sleeves are inserted to form the cylinder walls and a cast-iron header carrying the overhead valves is bolted securely to the top.

The body, the fenders, the hood, the radiator shell, part of the rear axle and transmission case are further examples of the extensive use of aluminum.

The frame is of 25-point carbon steel 10 inches deep, the lower flange turning out and forming the running board and fender supports.

The compound cantilever cross-suspension rear springs give a new comfort in riding; especially is the effect noticeable at high speed in the absence of side sway.

All these new features of the Marmon 34 mark a long step forward in American motor-car building.

Specifications

The Marmon 34 is furnished with the following body types: Seven-passenger touring, five-passenger touring, four-passenger "Club" roadster, three-passenger "Club" roadster.

Wheelbase

The wheelbase is 136 inches. Short turning radius.

Weight

The weight of the seven-passenger touring car, ready for shipment, is 3295 pounds. The actual weight of this car, in full touring trim—extra wheel and tire and all gasoline, oil, and water compartments filled—is 3450 pounds for five-passenger car, 3540 pounds for seven-passenger car.

Aluminum

Aluminum is used more extensively than in any other car. The main structural member of the motor, the body, fenders, hood, radiator shell, and many small castings—usually of iron or bronze—are of aluminum.

Motor

The motor is six-cylinder, bore 3¾ inches, stroke 5⅛ inches, with quiet, efficient overhead valve construction. The en-bloc cylinder casting, water jackets, bearing supports, and crank case are combined in a single aluminum casting. Hard-iron cylinder barrels fit in the aluminum casting with a cast-iron firing head.

Lubrication

Motor lubrication is by the famous Marmon hollow crank shaft force-feed system, supplemented by a hollow rocker arm pivot so that all valve parts are lubricated by pressure feed. Cams are integral with cam shaft, cut from a single steel forging.

Frame

The frame is of extraordinary depth—ten inches—the steel running boards, hot riveted to the side members, form a part of the frame.

Body

The body bolts direct to the frame without sills or subframe. It is made in three sections: First—Cowl, containing gasoline tank, wind shield supports, and instrument board; second—front seats with compartment for folding chairs; third—tonneau seats. The floor boards are 24½ inches from the ground.

Upholstery

The upholstery is removable, the extra seats fold out of the way when not in use, and passengers sit deep in the car at comfortable height with plenty of leg room.

Springs

The rear springs are of the compound cantilever type mounted across to the rear of the frame and axle, eliminating side sway and giving perfect spring action and balance. All springs are self-lubricating.

Front Axle

The front axle is an I-section drop forging with marine-type thrust-bearing steering spindle, operating in self-contained oil bath.

Clutch

The famous Marmon cone clutch, transmission suspended on front end of torque tube, tubular propeller shaft, and perfectly aligned helical gear—give a silent drive and a saving of power.

Oiling

Only four grease cups are used, and these are on the steering connections. The front axle spindles, clutch release collar, transmission, and rear axle run in medium weight oil—sufficient for 15,000 miles.

Wheels

Five wire wheels are standard equipment. Tires, Silvertown cord 34 x 4½ inches, front and rear.

Equipment

Bosch magneto, generator, and starting motor. Every convenience that may be desired for general use is furnished.

Prices

$2700 for three, four, and five-passenger models; $2750 for seven-passenger model. All prices are f. o. b. Indianapolis.

Wire Wheels on the Marmon 34

How it Affects Comfort and Handling

as there is not sufficient weight above the springs for the springs to react against, and as a result, the wheels will continue to rise in the air until stopped by gravity, and of course, carry the body with them.

However, if the body is heavy in comparison with the axles, the springs will be compressed as the bump is gone over, and the body being considerably in excess of the weight of the axle, will quickly return the axle to the ground with a comparatively small movement of the body. Keeping the wheels in contact with the ground, by keeping the ratio of the unsprung and the sprung weight as high as possible, not only results in very easy riding, but very much more accurate and safe steering, as the wheels can do a very much better job of guiding the car when in contact with the road than when in the air.

Decreasing Unsprung Weight

The front axle of the Marmon 34, complete with the wire wheels and tires, weighs 205 pounds. Under the same conditions, with wood wheels and demountable rims, this weight is 265 pounds, an increase of about 30 percent, this 30 percent increase in the unsprung weight makes such a difference in the handling of the car that it has to be tried to be realized.

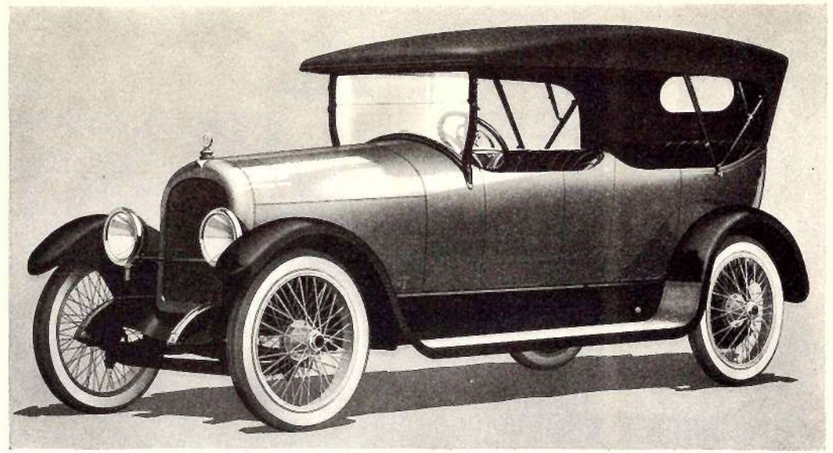
Wire Wheel Stronger

The wire wheel is very much stronger than the wood wheel, and is very much more difficult to dish when the car skids against some object. The resiliency of the wire wheel and its better action in cooling the tire, results in longer tire life. When tire replacements are necessary, it is vastly easier to change the entire wheel than to change the demountable rims. In weight, strength, accuracy, ability to perform its functions properly, and with the ease with which the tire changes may be made, and its immunity from shrinkage and cracking from weather conditions and climatic changes, the wire wheel is superior to the wood wheel.

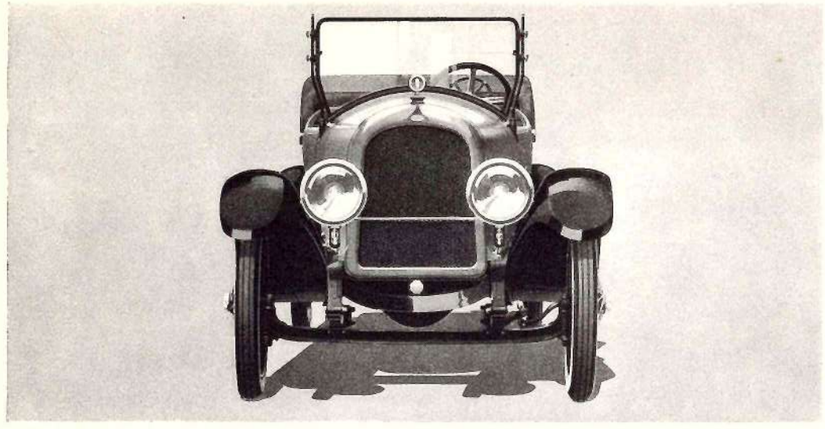
The only point in which the wood wheel is superior to the wire one lies in the fact that the wood wheel is somewhat easier to clean.

Steel will Eventually Supplant Wood

Point by point, wood has been eliminated from automobile construction. Steel has replaced it for frame members, and metals have entirely replaced it in body construction except for tacking strips and floor boards. Cheapness has been the main reason for maintaining it in the construction of wheels, one of the most vital points about the car where the safety of the passengers is concerned. It is inevitable that, for this purpose the safer and more desirable material — steel — will eventually entirely supplant wood as a constructive material.



Five or Seven Passenger Touring Car



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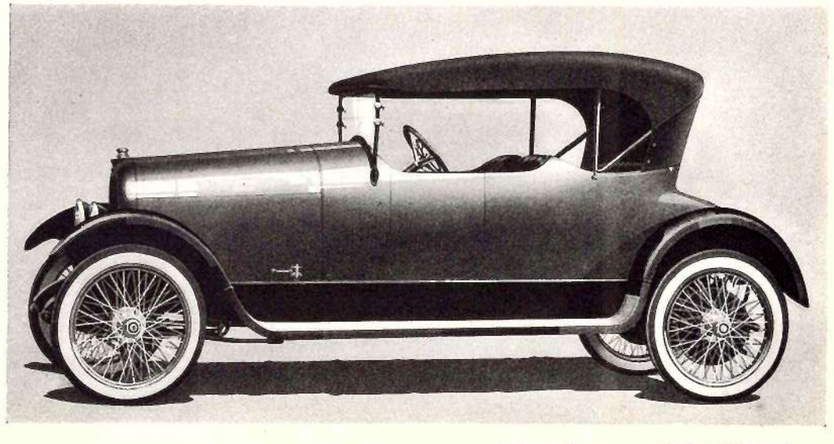
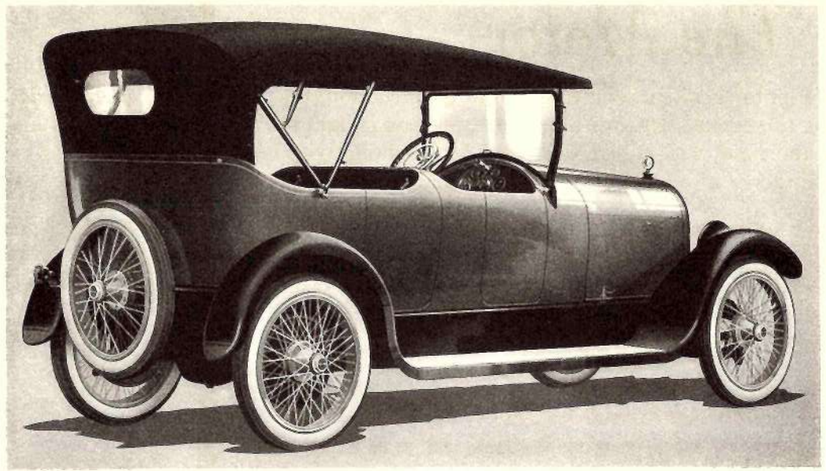
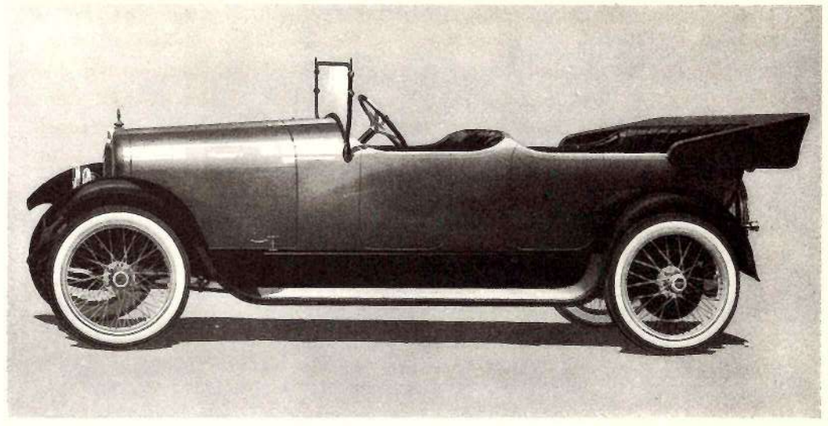


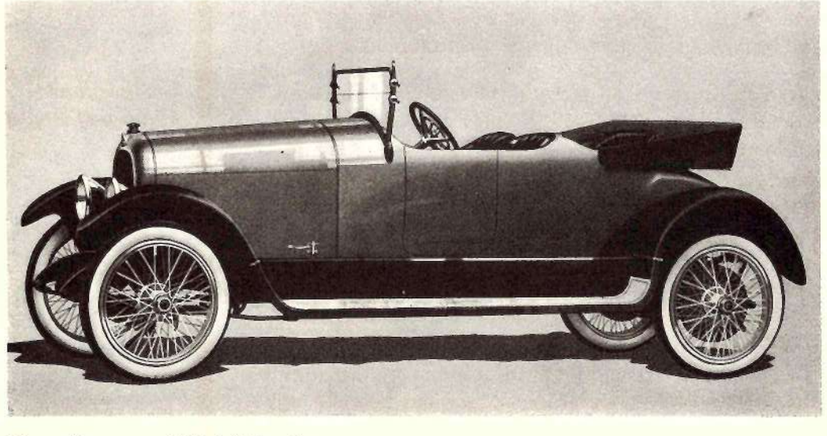
Four-Passenger "Club" Roadster



Five or Seven Passenger Touring Car



Five or Seven Passenger Touring Car



Three-Passenger "Club" Roadster

Wire Wheels on the Marmon 34

Wire Wheels Standard Equipment

Two points were considerably emphasized in the executive committee directions to the engineering department for the design of the Marmon 34. These were: First—car weight, ready for the road, should be kept as low as safety permitted; Second—at speed the car should handle with ease and certainty. Inasmuch as an extremely low list was not insisted upon, these two requirements inevitably led to the selection of wire wheels for standard equipment instead of wood wheels.

Weight Saving—105 Pounds

The net saving in weight of the Marmon 34, equipped ready for the road with five wire wheels, as against the same car with wood wheels and a spare rim is 95 pounds. The extra tire carrier for the demountable rim weighs about 10 pounds more than the carrier for the spare wheel, so the actual difference on the cars, as turned out, is 105 pounds. So much for the weight saving.

Rim Weight Reduced

At 60 M. P. H. the road wheels are revolving at the rate of 600 turns per minute. The wood wheel with its demountable rim and felloe band concentrates the major part of the weight at the outer diameter of the wheel, which, of course, is moving at a speed nearly as great as the car. With the wire wheel, this rim weight is reduced more than half.

Gyroscopic Action

You are familiar with the gyroscope, and know how, even in the little toy ones only a few inches in diameter, when once they are set spinning, it is very difficult to move them so as to change the plane of their rotation. Of course, an automobile wheel when rotating is a gyroscope, and as they bounce over the road, or are moved with the steering apparatus, their plane of rotation is changed, to which changes the gyroscopic action offers a very considerable resistance.

Why Wire Wheels are Best

It would be possible to build a wheel so heavy at the rim that it could easily break the axle ends off from this gyroscopic action at high speeds. To make the car safer and easier to handle, this gyroscopic action should be kept as low as possible, which means that the rim weight should be kept to the lowest possible point. This inevitably leads to the selection of wire wheels, as you have noticed that all modern racing cars that develop any speed invariably use, it being practically impossible to handle the cars at the speeds attained with the heavier wood wheel equipment with demountable rims.

The Relation Between Sprung and Unsprung Weight

In designing the springs of a car, the ease with which the car will ride, and the accuracy with which it will steer, will depend not upon the total weight of the car, but upon the ratio between the weight below the springs, commonly called unsprung weight, and the weight above the springs. To make this plain, imagine the body and chassis to weigh only as much as the axles, and the axles to weigh as much as body and chassis. In going over a bump in the road, the wheels as they reach the top of the bump will not be compelled to fall down on the far side,

Equipment

Tank in Cowl

Gasoline Tank

In the Marmon 34 the gasoline tank is in the cowl, a practice which is employed largely by European builders. The cowl gasoline tank construction is not the cheapest method, contrary to popular belief. It is one of the most expensive methods, but undoubtedly the best. It is a simple matter to remove the tank and very easy to clean or repair if necessary.

In Logical Position

It is directly over the rear of the motor in a most natural position. By this method of location, the tank can be reached very easily for filling, all vacuum or pressure devices are eliminated and the necessity of long gasoline-carrying pipes, which are subject to clogging and breaking. The pipe used from tank to carburetor is less than 2 feet long. The gasoline tank is bolted within the aluminum cowl, yet it does not interfere in the least with front seat passengers or bother the driver in the operation of brake or clutch pedals.

Plenty of Room

In placing the gasoline tank in the cowl better balance of the car is secured. If all the weight of the car were concentrated in the center, the balance would be perfect. Placing the gas tank in the rear adds so much weight behind the rear wheels, increases the tendency to skid, makes the car harder to drive and disturbs the balance and adds to tire wear. Fifteen years of automobile manufacturing experience has taught us that balance is a most essential point in motor-car construction.

Gasoline Gauge on Dash

The tank is of 15 gallons capacity. The filler cap is to the right of the center and is under the hood. A gauge on the cowl allows the driver to know at all times the extent of his gasoline supply.

Equipment

Equipment

Bosch electric starting and lighting system, separate units, with storage battery easy of access; large electric head lamps with small "finder" lights for city driving, dash, tonneau, and tail lamps. License plate holder in combination with tail light. Lamps black enamel with nickel finish. Switch for lights conveniently mounted on dash. One-man pantasote top, front end supported by windshield, with dust boot and "Jiffy" curtains; divided rain vision, ventilating watertight windshield, very substantially supported on cowl dash. Speedometer and clock mounted flush on dash with speedometer drive from gear on driving shaft underneath the car. Electric inspection lamp with long extension cord. Electric horn mounted under hood on top of motor with push button in center of steering wheel. Power tire pump mounted on motor. Shock absorbers front and rear and rebound straps mounted on rear axle. One extra wheel mounted on carrier on rear. Coat rail, adjustable foot rest, assortment of tools, jack, etc. Two spare wheels at an extra charge. Motometer at an extra charge.

The Motor

Motor

Use of Aluminum

The Marmon 34 motor is of our own design and construction, the striking feature being the extensive use of aluminum, making it light in weight, very strong and rigid, with a high degree of heat conductivity, allowing perfect cooling.

Instead of using cast-iron cylinders bolted to a crankcase, the cylinders are integral with the crankcase and are made of a single aluminum casting, which extends to the center line of the crankshaft. This large aluminum casting is the main structural member of the motor, carrying the supports by which it is fastened to the frame.

Rigid Motor

In this connection it is interesting to note the advantage gained in forming the cylinders and crankcase in one casting. The design of this member, which supports the main crankshaft bearings, is of extreme importance in eliminating vibration and wear.

The Marmon 34 single-piece crankcase and cylinder casting is of extraordinary depth, as compared with conventional design, and results in a motor of exceptionally sturdy construction.

Type and Size

The motor is six-cylinder, vertical, bore 3¾ inches, stroke 5⅛ inches, valve-in-head type. Total displacement of the six cylinders, 339.63 inches. Standard horsepower rating, 33.75. On the test block the dynamometer shows that 74 horsepower is obtained at 2,450 r. p. m.

Cylinders Aluminum with White Iron Inserts

The upper half of the crankcase and the cylinder barrels and water jackets are cast in one piece of aluminum. The cylinders are machined accurately and hard white cast-iron sleeves dropped into the aluminum cylinder bores. This can easily be done, as steam is turned into the aluminum water jacket while the iron sleeves are being inserted. Collars at the tops of the sleeves hold them up while the cylinder head holds them down firmly in the aluminum water jacket.

Inserts will not Loosen—can be removed easily

These inserts always fit tight, because the cast-iron, being exposed to the flame of combustion, expands more rapidly than the aluminum, which is thoroughly water cooled.

Should a cylinder insert be scored or otherwise damaged, it can be easily removed and replaced by expanding the aluminum casting.

Crankshaft and Bearings of large size

The crankshaft is 2.25 inches in diameter. It runs on four main bearings, the front bearing being 2.75 inches long by 2.125 inches diameter, the center bearings each 2.25 inches long by 2.25 inches diameter, and the rear bearing 3.75 inches long by 2.25 inches diameter. The crankshaft is put in standing and running balance, the flywheel is put in standing and running balance, and with the flywheel bolted to the crankshaft, the two together are then put in running balance. Each crankshaft bearing is of nickel babbitt with phosphor bronze back, the upper half fitting into the aluminum case, the lower half fitting into a cap that is bolted to the casting — a construction method which readily allows a perfect alignment and adjustment of bearings. It is not necessary to remove the motor from the chassis to take up the connecting-rod bearings.

The Motor

Camshaft and Push Rods

The camshaft is placed conventionally and runs on four bearings. The camshaft and cams are integral—a one-piece forging.

The push rod guides and tappets are inserted from the bottom of the case and have roller type cam followers. These operate submerged in oil. The push rods are of aluminum to reduce weight, for the same reason that aluminum pistons are employed. The ends of the rods are protected by case-hardened steel ball-shaped tips. The rocker arms have long bearings and are mounted upon a hollow shaft which is connected with the overflow from the governor of the lubricating system, thus providing a circulation of oil for these parts.

Cam Design

The cams are of the hollow ground type, which gives a quicker opening than the conventional design, allows the valves to remain open longer and a very rapid closing. In designing, the uniform acceleration principle has been followed to secure gentle opening and closing, thus avoiding unnecessary shocks, wear, and noise. The lifting surface of the cam is concave rather than flat, as in conventional design.

Cast-iron Firing Head

A cast-iron firing head is bolted to the top of the aluminum cylinder casting. This firing head holds the valves, valve mechanism, and spark plugs, and acts as a clamp on the cylinder inserts. This firing head also carries the intake and exhaust ports, and there are continuous passages from front to rear through which the cooling water circulates.

Valves in the Head

The valves are located side by side in the cast-iron cylinder head. They are all the same size, measuring $1\frac{15}{16}$ inches in diameter and are very light, having $\frac{3}{8}$-inch stems only 5 inches long. Two valve springs are used, one $1\frac{3}{4}$ inches in diameter and the other 1 inch, one within the other. The use of the two springs prevents synchronism of spring and actuating mechanism at certain speeds and so prevents tossing of the valves at the higher speeds. If a single spring were used it would have to be nearly twice as stiff as the two smaller springs combined.

The valves have water-cooled seats and the cover on the top of the motor protects the valve mechanism from dust and dirt.

The removable firing head makes valve grinding a very simple operation. To get access to the valve seats, remove the head.

Inlet and Exhaust

The water-jacketed inlet manifold is quite short, facilitating carburetion and allowing for a high mounting of the carburetor. It has three connections to the cylinder casting, each connection supplying two cylinders, the distribution of gas being uniform. The exhaust manifold, made of steel tubing, has four ports and points to the front of the motor rather than the rear, as in ordinary practice. The primary value of this placement lies in the cooling of the exhaust gases, due to the close proximity of the exhaust pipe to the fan. Lowering the temperature in the exhaust pipe, close to its connection to the cylinders allows a freer passage of burned gases. Another fundamental advantage is in having a relatively cool exhaust pipe under the car and far away from the floor boards. This advantage will readily be realized by the front seat passengers in summer driving. The muffler is placed amidship of the car under the right side.

Wheels*

Wire Wheels Most Satisfactory

Houk demountable wire wheels are furnished as standard equipment. Wood wheels can be supplied, where wanted, at an extra cost. One extra wire wheel is supplied and an entire wheel can be easily removed and replaced with a new one should it be necessary.

Wire wheels were adopted as standard equipment only after a most thorough test, extending over a period of three years. Strength, lightness, resiliency, and effect on tires were carefully noted, and it was found that the wire wheels were superior in all of these points and effected a considerable reduction in weight.

*See special article on wire wheels, pages 23-24

Tires

Silvertown Cord Tires

The tires are 34 x $4\frac{1}{2}$, front and rear — Goodrich Silvertown Cord.

Speedometer Drive

Speedometer Drive

Speedometer drive is through a flexible shaft from a pair of spiral gears running in oil, mounted on the main drive shaft to the rear of the transmission under the front seat. This method of driving the speedometer will be appreciated by those who have had experience with the old method of mounting on the front wheel, which often results in the breaking of the flexible shaft, noise and other annoyances, due to the exposed position of the speedometer driving gears.

Finish

Dark Blue Standard

The standard finish for the bodies is rich dark blue with fine robin egg blue striping, black frame and chassis and fenders. The standard color for the wheels is ivory.

Other Colors

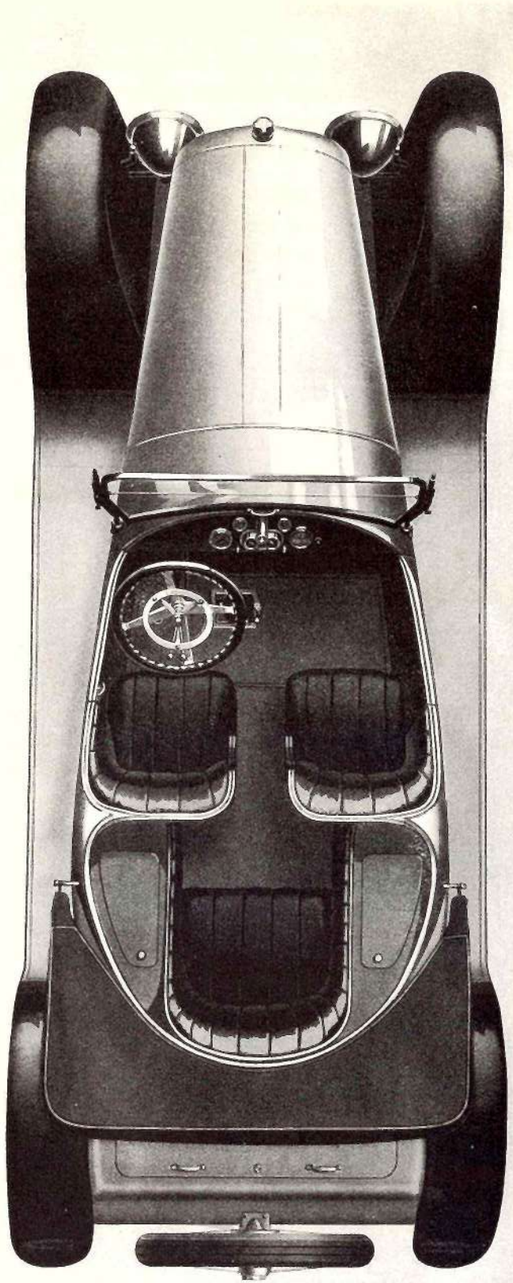
We give two color options at an extra charge of $25 net. These are: Gray with Napier green striping, or maroon with red striping.

Any other colors different from standard or two options given above will be charged for at the rate of $50 net per car, excepting white and delicate colors, for which an extra charge of $75 net will be made.

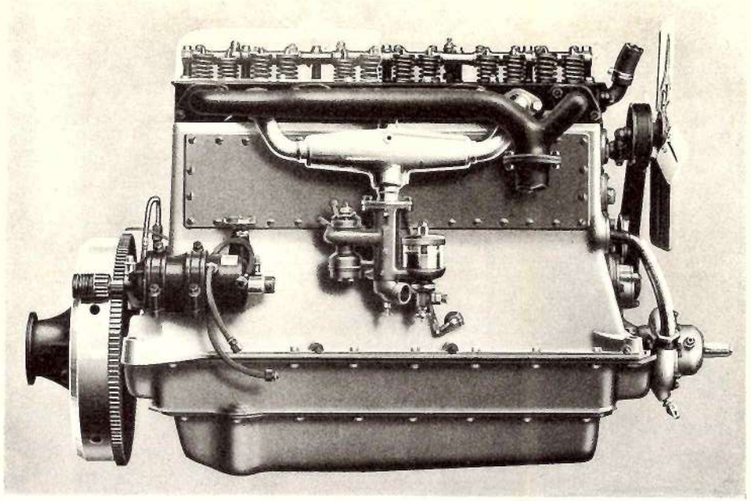
Carrying Space

Front Door Pockets Carry Tools

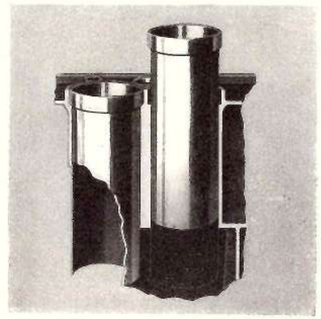
Carrying space for jack, chains, heavy tools, etc., and spare tube is provided under the front seat. All doors have pockets and one front door carries an assortment of small tools neatly arranged.



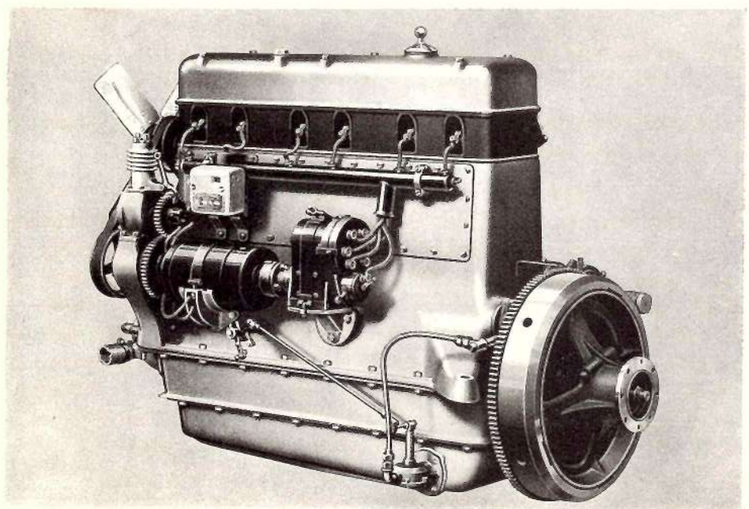
The three-passenger "Club" Roadster allows a sociable, roomy arrangement for the passengers—riding in perfect comfort



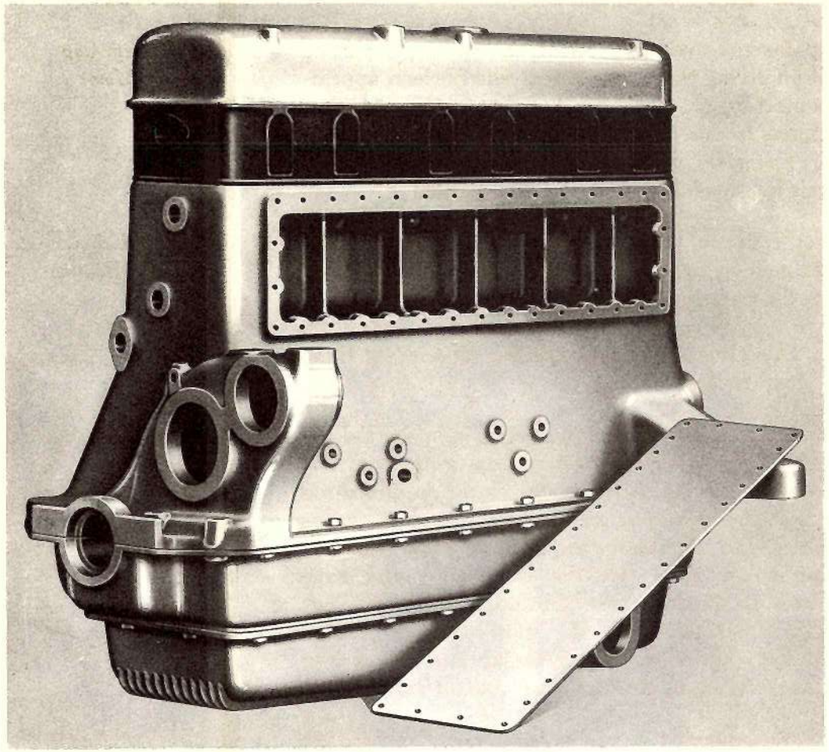
The motor is clean and compact with working parts enclosed



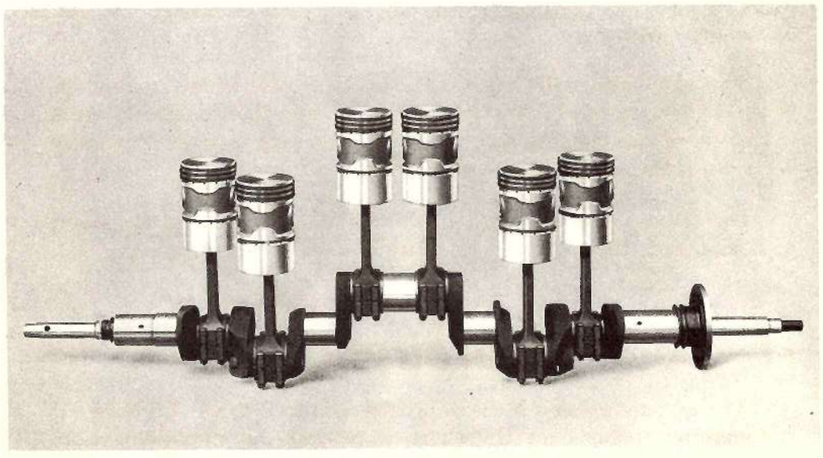
The hard iron inserts fit tightly in the aluminum cylinder casting



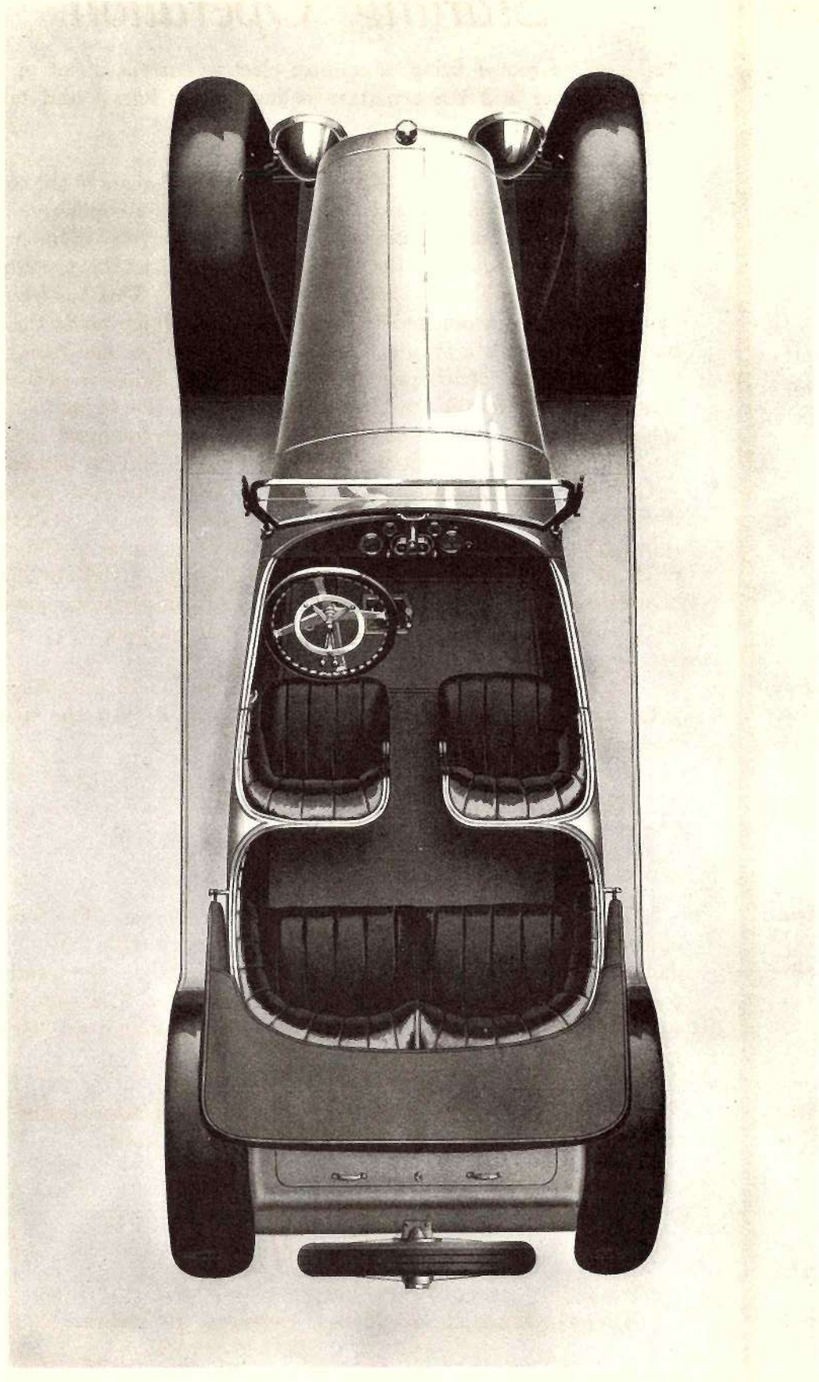
Motor accessories are conveniently arranged—accessibility was a foremost consideration of the designer



The Marmon 34 motor—showing the extensive use of aluminum



The crankshaft and aluminum alloy pistons of the Marmon 34 motor



The four-passenger "Club" Roadster presents an ideal body for the owner who needs carrying capacity with comfort in a roadster

Starting Operation

the gasoline motor firing, a counter electric current is set up in the starter motor and the armature is instantly released and takes its normal position.

Clashing of Gears Avoided by Novel Device

A very unique method of avoiding clashing of gears in the engaging of the starter has been worked out by the Marmon engineers. It was found that sometimes the pinion teeth would be directly in line with the gear teeth; consequently the engagement could not be accomplished without considerable noise and clashing of gears. This has been overcome by putting a pin into the projecting nut which holds the pinion on the shaft, with a spring behind it. This pin enters into a spiral slot in the hub of the starter pinion. The spring is between the head of the nut and the head of the spiral, its function being to keep the spiral in forward position at all times. This is so mounted that when the switch is closed and the teeth of the flywheel and the pinion strike against each other instead of engaging, the additional amount of draw-in pull of the starter shaft revolves the pinion by means of this spiral groove and pin. The amount of motion is equal to the circular pitch of the gear, consequently there is always enough to give one complete tooth turn. It is obvious to see that, under these conditions, the pinion will always engage without noise or clashing.

Weighs 30 Pounds Turns Motor 135 to 145 R. P. M.

The starter motor is very small and compact, weighing 30 pounds, yet, owing to its extremely high efficiency, will turn the motor at from 135 to 145 r. p. m.

Brakes

Large Braking Area

There are two sets of brakes on the rear wheels. The foot pedal operates the external contracting set, 2 inches wide by 17 inches diameter, braking area 106.5 square inches each shoe, the internal expanding set is $16\frac{11}{16}$ inches diameter, braking area 71.8 square inches each shoe, operated by the hand lever. Total braking area, 360 square inches.

Asbestos Against Steel

The braking surfaces are asbestos fabric against pressed steel drums, which are securely fastened to the wheel hubs.

Wheelbase

136-inch Wheelbase

The wheelbase is 136 inches, clearance 10 inches.

Short Turning Radius

Even though the wheelbase is long, the turning radius is quite short since the front end of the frame has been brought in to accomplish this. It will be noted that the body sets well between the axles — no rear overhang and front axle ahead of the radiator.

The Motor

Aluminum Cap Covers Motor

An aluminum cap fastens over the top of the motor, enclosing the valve mechanism and giving the motor an extremely clean appearance. This cap gives a most logical means for disposing of the crankcase gases and smoke which rise from every motor, and which are disagreeable to the passengers. The gases and smoke are drawn from the cover through a pipe to the air intake of the carburetor and burned.

Timing Gears Inside of Front Bearing

The helical timing gears, of wide face, are entirely within the motor casting, the main gear on the crankshaft being inside of the front main bearing, driving the camshaft and the magneto and generator drive gears. Thus all drives are cared for with one train of three gears within the crankcase. This gives stiffer and sturdier support for these gears and minimizes gear noises.

Aluminum Pistons

The pistons, are of cast aluminum alloy, being light in weight. The pistons, being light, very materially reduce the stresses on the bearings. At high motor speeds the stresses due to the reciprocating parts may be greater than the explosion pressures unless great care is taken to keep these parts light. Probably the most valuable property of the aluminum piston is due to the fact that its great conductivity for heat keeps it so cool at all times that the lubricating oil is not burned, hence no deposit of carbon is formed. Four rings are used on each piston, three packing rings above the piston pin and one oil ring below. The packing rings are $\frac{3}{16}$-inch wide, while the oil ring is only $\frac{1}{8}$-inch wide.

Connecting Rods

The connecting rods are steel forgings, heat treated, perfectly balanced with the bearing caps held by four bolts. The shaft ends have bronze back nickel babbitt bearings solidly mounted and accurately finished. The piston pin bushings are of bronze.

Removable Water Jacket

A noteworthy feature of the motor is the removable water jacket plate. If it is ever desired to clean the water jacket spaces, they can be readily reached.

Uniform Cylinder Walls

The aluminum walls around the cylinder inserts are uniform in thickness because of the care that can be taken in the moulding process by reason of the opening on each side. Perfectly machined cylinder bores are obtained in this construction.

Due to superior conductivity of heat in aluminum, as compared with cast iron, the motor cooling facilities are wonderfully increased.

Carburetor

Carburetor

The carburetor used is the improved float-feed type. Carburetion is facilitated because of the short water-jacketed intake manifold designed so that condensation is eliminated. The carburetor can be adjusted at all times from the instrument board on the cowl. The carburetor is hot water jacketed and has a hot air intake.

Motor Oiling System

Marmon Force Feed the most Perfect Type of Engine Oiling System

The Marmon system of automatic force feed lubrication of the motor is continued. This system, whereby oil is fed to the bearings under pressure through a hollow crankshaft, was used in the first Marmon car built in 1902. It has been improved and developed until it is now the most perfect type of gasoline engine oiling system. This system of oiling is used on the leading foreign makes and is coming into very extensive use among high-priced American cars, following the introduction and development of the Marmon design.

Main Bearing Oiling

A helical-geared pump forces oil from the reservoir in the bottom of the motor through leads to each main bearing. In each bearing there is an inlet, which registers with a hole in the bearing through which the oil is forced. The crankshaft is hollow and is kept full of oil by the pressure. There is an outlet in each connecting rod bearing through which these bearings are lubricated.

Piston Pin Lubrication

The piston pin bushings receive ample lubrication by providing holes in the top to catch the oil spray thrown from the fast-revolving crankshaft.

Valve Mechanism Lubrication

The overhead-valve rocker arms receive their lubrication through a hollow shaft on which they are mounted. The oil is forced through a lead into the hollow shaft, from which holes lead the oil into the individual rocker arm bearings. At this point the oil overflows through a tube into the valve tappet chamber, down into oil wells immediately over the valve tappet guides. The oil is kept at a level well above the tappet guide bearings, so that the rollers, pins, bottom end of push rods and guides are submerged in oil. The upper ends of the push rods also receive thorough lubrication.

Camshaft Lubrication

The camshaft bearings are lubricated through leads from the oil wells above the tappet guides. There is a pocket above each camshaft bearing which provides a head of oil against each bearing at all times.

Cylinder Wall Lubrication

The cylinder walls are amply lubricated by oil thrown off by the movement of the cranks. Excess oil is scraped from the cylinder walls by a special ring for this purpose. Below this ring, and below the lower main ring, there is a circular space with holes leading to the interior of the piston through which excess oil runs to the crank case, and this oil also helps to lubricate the piston pin bushing.

Gear Lubrication

The gears driving the camshaft and magneto shaft are running in oil at all times, supplied from the overflow of the tappet oil wells.

Oil Pressure

The pressure of the oil up to the limit of the safety valve is automatically regulated in direct ratio to the power produced. A safety valve allows the pressure to be set as desired so that the range of pressure is between one and sixty pounds, according to the speed of the motor, oil temperature, etc.

Starting and Lighting

Bosch Equipment Separate Units

The starting and lighting units are furnished by the Bosch Magneto Company. For the past two seasons Marmon cars have been equipped with Bosch starting and lighting systems and the operation of this equipment has been so satisfactory that it is continued.

The generator and starting motor are separate units — the generator is located on the left side of the motor, driven through the timing gears; the starting motor is located on the opposite side and operates by direct engagement to a ring gear on the flywheel.

Wiring

Extreme care is taken in the wiring. All wires run in loom, except the direct connections to the headlights and tail light which are housed in flexible metal conduit. There is not a joint in any wire—the wires are of different colors and all connections to junction blocks are numbered, with a corresponding number on the connector. There is one set of wires for the lighting system and one for the starter. The wiring system is assembled in our electrical department and furnished in complete made-up form to the car assembler.

Generator Control

The Bosch generator is of a shunt wound, high-efficiency type. It is very light, weighing only 28 pounds, and operated at magneto speeds, that is, 1½ to 1 engine speed. The electrical controls for the electrical apparatus are very simply arranged on the generator. The switch and ammeter are located on the dash.

Voltage Regulation

The voltage is regulated as well as the amperage. When the battery is nearly discharged, a heavy output will flow from the generator. As the battery fills, the generator output is lessened.

12-Volt System

The starting and lighting system is of the 12-volt type recognized as being superior to the 6-volt type. The 12-volt system is lighter in weight than the 6-volt system, and allows smaller wire to be used.

Flat Filament Light Bulbs

The head lamps are equipped with flat filament bulbs, which diffuse the light to the sides of the road in an extraordinary manner.

Horn Lock

The horn switch is so connected with the locking device that the horn cannot be blown when the ignition is cut off, thus insuring against the horn being blown when the owner leaves his car in the street, etc.

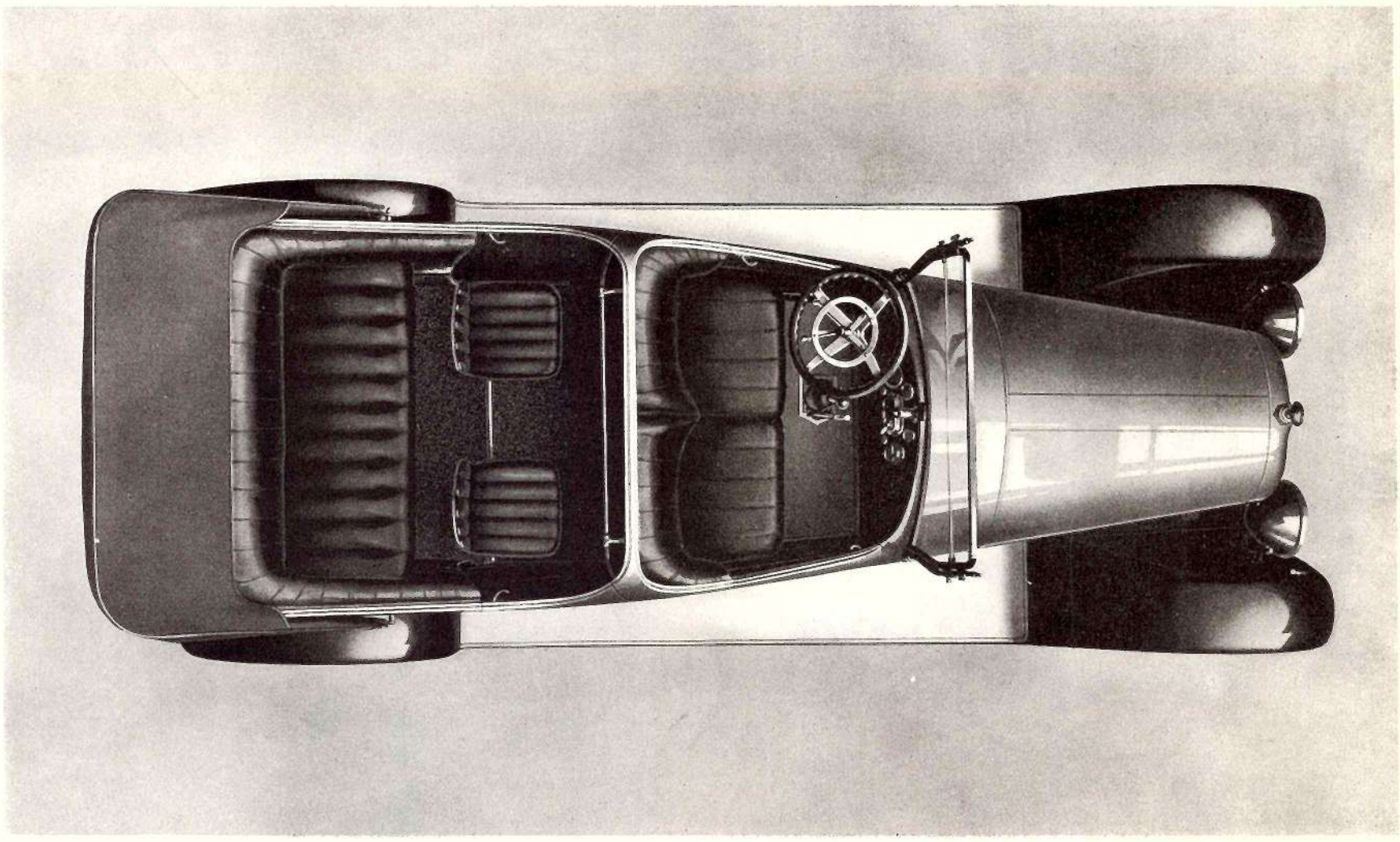
Starting Operation

Direct Engagement

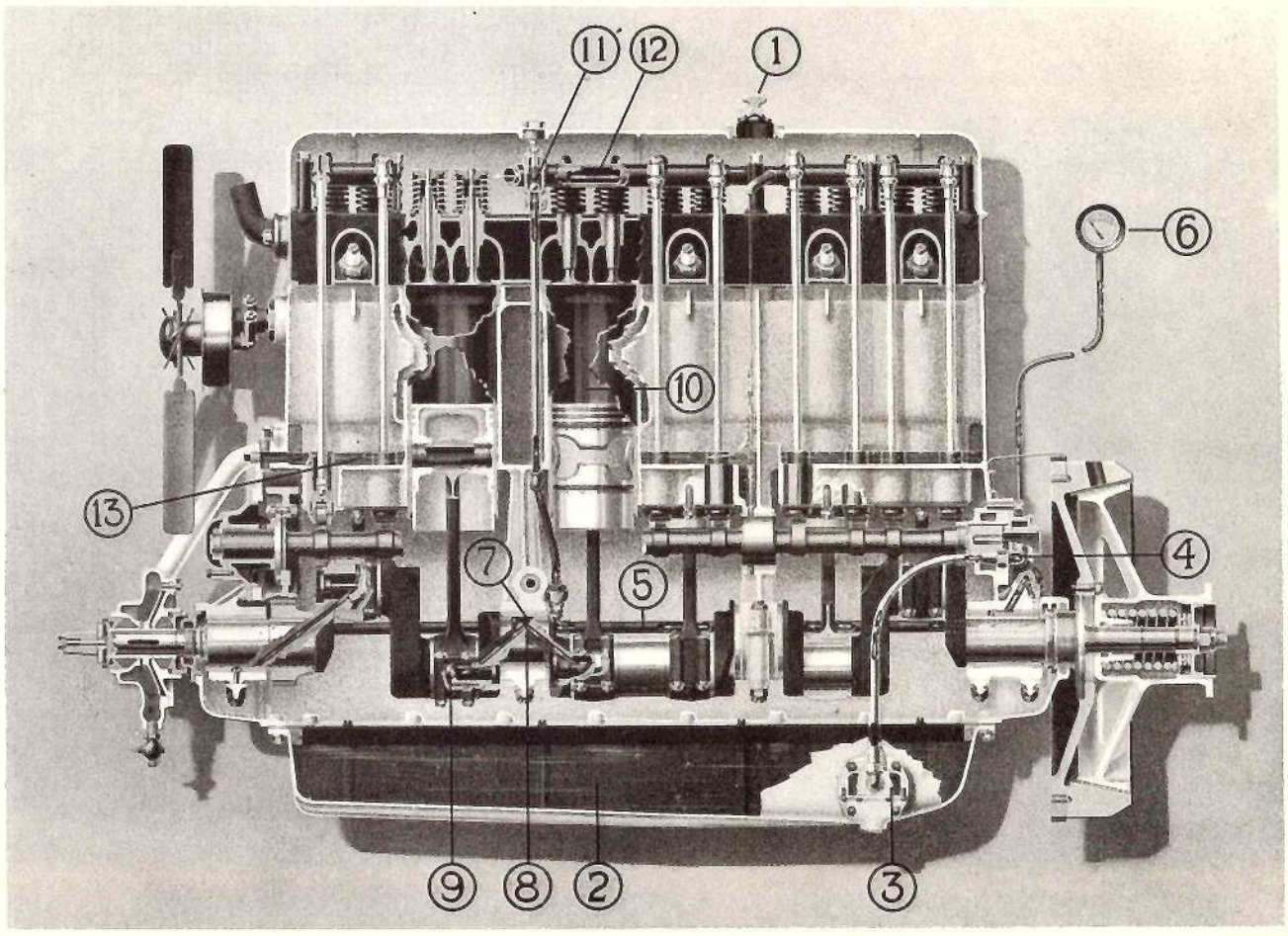
The starting motor is operated by a foot pedal. It is attached so as to engage a ring gear on the flywheel for starting the engine. No gears are necessary beyond the enmeshing gear to the flywheel.

Starter Actuated Electrically

It is actuated electrically. The enmeshing gear is on the end of the armature shaft and when the current is supplied to the starter motor, this pinion is drawn into mesh with the flywheel gear. Upon



The seven-passenger body affords room and comfort— the spare seats fold out of the way, or the car can be furnished in five-passenger type without extra seats



1 Oil is supplied through *the filler* on top of the motor flowing down around the valve push rods into—

2 A large capacity cast aluminum *oil pan*, cooled and stiffened by large ribs along the base.

3 The oil is thoroughly screened and passes through the throttle-controlled *regulator* before it flows to—

4 The *gear pump* on the rear of the camshaft. The regulator is simply a special form of stop cock, which reduces the amount of oil flowing to the pump when the throttle is closed.

5 Oil is fed to the *main feed pipe* under pressure, which pressure can always be noted on the—

6 *Pressure gauge* on the dash, furnishing a constant check on the system.

7 Oil is conducted from the main feed pipe to the center of each of the four *main crankshaft bearing bushings*. A circular groove around the bushing is thus filled with oil under pressure from which oil spreads over and thoroughly lubricates the surface of the bushing. Also—

8 Oil is forced into the *hollow crankshaft* as it revolves, through a hole which constantly registers with the groove in the bushing.

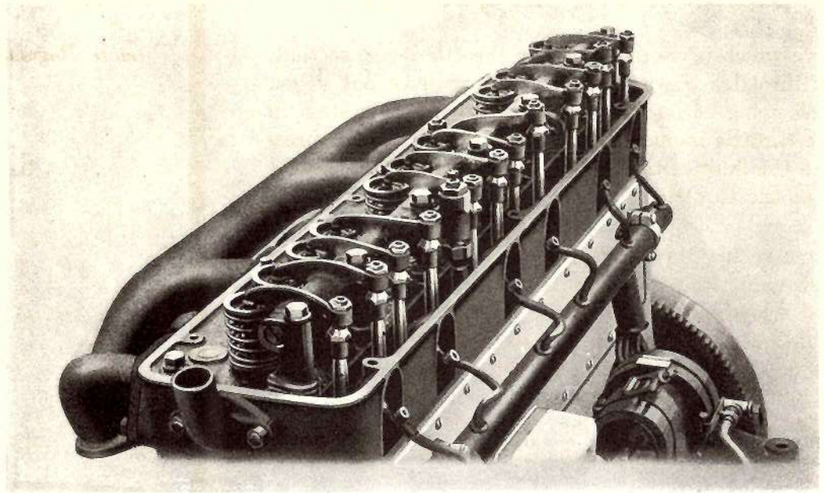
9 At the *connecting rod bearing*, this action is reversed, oil leaving the shaft through a hole in the center of the bearing surface and spreading over the surface of the bushing.

10 The throw-off lubricates the *cylinder walls* and piston pin bushing. The piston is provided with special means of effectively scraping excess oil from the cylinder walls.

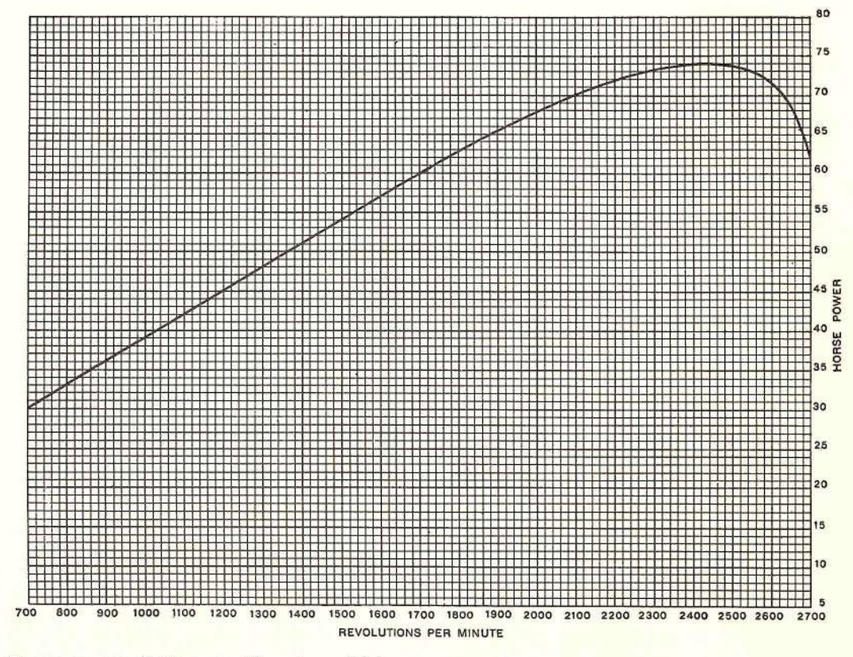
11 The maximum pressure in the main feed pipe is limited by the ball *check valve*, which is adjustable without removing the motor cap.

12 The excess circulates through the *hollow rocker arm shaft*, lubricating the valve rockers and contacts.

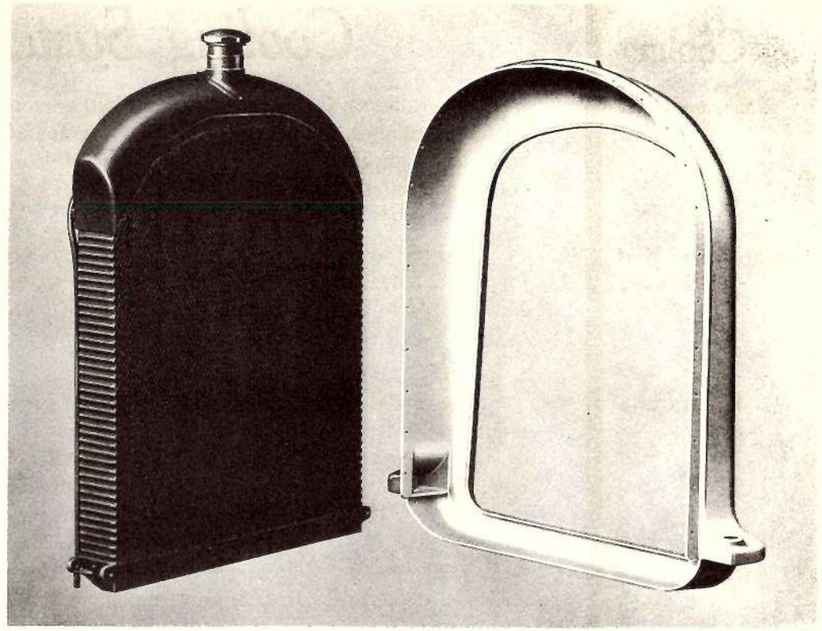
13 Oil which escapes from this shaft flows down along the valve push rods into an *oil container* above the valve tappets, cams, and cam shaft, which provides a constant head of oil for these and also for the front motor gears.



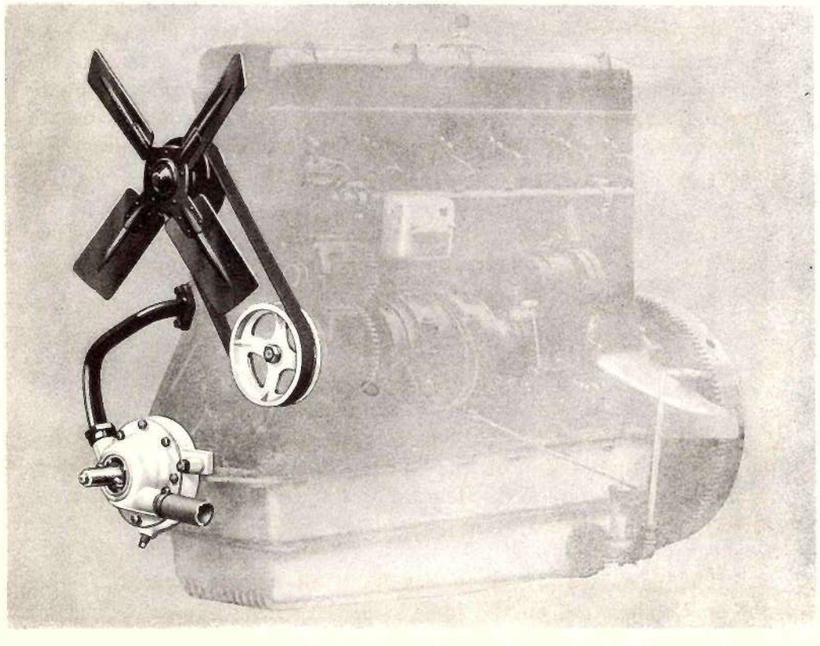
The Marmon 34 motor is of the valve-in-head type. The shaft which carries the rockers is hollow and fed with oil from the pressure-regulating valve of the main lubrication system. Note the tappet adjusting screws



Power curve of Marmon 34 motor which develops 74 horsepower at 2450 r. p. m.



The radiator core is contained in an aluminum shell—and is suspended so it is not affected by road shocks



Front view of motor showing pump mounting on end of crankshaft and short piping; also large diameter fan pulleys

Cooling System

Aluminum Outer Shell

The radiator is cellular, of abundant cooling capacity, mounted within a cast aluminum outer shell of graceful design, providing a substantial support for the forward end of the hood. The radiator core is mounted on a trunnion so as to be least affected by shocks.

Cooling System Most Efficient

The fact that the engine cylinder castings are of aluminum allows for a great deal more efficiency in cooling. The tests made with the Marmon 34 to ascertain the efficiency of the cooling system have more than satisfied every claim of the designer.

Water Pump

The cast aluminum water pump is on the forward end of the motor, mounted directly on the crankshaft extension. The water pump is of unique design in that the impeller is made integral with a bronze bushing which fits over the front extension of the crankshaft, to which it is keyed. The large size packing glands come on the outside of this bushing, so that water never gets to the steel parts and the glands can be tightened easily. By this method of construction the water-touching surfaces are entirely bronze and aluminum, and danger of scaling or rust accumulation is obviated. The bearing surfaces for the pump are of extraordinary lengths and the stuffing boxes are easily accessible.

The large belt-driven fan provides a continuous circulation of cool air. The pulleys driving the fan are of large diameter, which means ease on bearings and longer life to the belt.

No Louvres in Hood Necessary

Cooling system has six gallons water capacity. The radiation, due to aluminum construction, is so perfect that no louvres in the hood are necessary. The air circulation around the motor is unobstructed. Splash guards are fastened inside of the front springs to prevent the radiator being clogged with mud, and sheet aluminum plates cover the spaces between the motor and frame sides.

Oil Reservoir Air Cooled

The ribbed bottom of the aluminum oil reservoir extends below, where it receives free circulation of air, thus cooling the oil supply.

Ignition

Bosch Magneto

The Bosch straight high tension system is used and the efficiency of the instrument used on the Marmon 34 is such that no battery connections are employed. The car is started on the magneto, a hot spark being generated at low speed.

Wiring Very Simple

The magneto is set on the left-hand side of the motor and, since the spark plugs are on the same side, the wiring is extremely short and simple. The spark plugs enter each cylinder between the two valves and almost central with the firing chamber. Spark plug used is ⅞-inch diameter, 18 S. A. E. thread.

Motor Oiling System

Pressure Regulation

There is a valve which is operated by the throttle lever, so that, when the motor is throttled down, the oil supply will be cut down, with just enough oil going through to keep the oil in the system in suspension. As the throttle is opened, the valve opens and the pressure increases, up to the limit of the safety valve, in proportion to the degree of opening of the throttle.

This allows for a regulation of oil pressure in direct ratio to the power produced, providing a high pressure to be carried when the throttle is open and a low pressure when the throttle is closed. This means that the more heavily a bearing is loaded, the more oil is fed to it, so that the motor secures abundant lubrication when most needed, and smoking at low speed is prevented. The flow of oil is so properly regulated at all speeds that carbon deposit is greatly reduced. A sight gauge on the motor indicates the quantity of oil in the reservoir.

Oil Pump and Reservoir

The oil pump is of the gear type and is located outside the motor case driven by an extension on the rear end of the camshaft.

The oil reservoir is fastened to the bottom of the motor. A screen, readily removable through the side of the reservoir for cleaning strains the oil before it enters the pump. The oil capacity is 3½ gallons. A baffle-plate covers the oil reservoir to prevent "swishing" of the oil. The bottom of the oil reservoir is ribbed and exposed to the air for cooling.

Oil Tubes

Oil tubes are cast in position in the aluminum case.

Methods of Filling

The oil is poured into the top of the engine through a combination breather and filler cap in the aluminum valve cover, draining down over the valve mechanism into the oil reservoir.

Gear Ratios

Gear Ratios

The standard gear ratios for the Touring and "Club" Roadster models are: direct, 3.69 to 1; second speed, 6.01 to 1; first speed, 12.4 to 1; reverse, 15.94 to 1.

For limousines or for cars to be used in very hilly sections, special gear ratios as follows may be furnished: direct 4.00 to 1; second speed, 6.52 to 1; first speed, 13.44 to 1; reverse, 17.28 to 1.

Frame

A New Design

The design and construction of the frame of the Marmon 34 mark a distinct advance in the art of motor-car building. It is the result of thoughtful analysis of conventional design with a view of eliminating needless parts and doing away with unnecessary weight, squeaks, and rattles.

Z-Section Frame 10 inches Deep

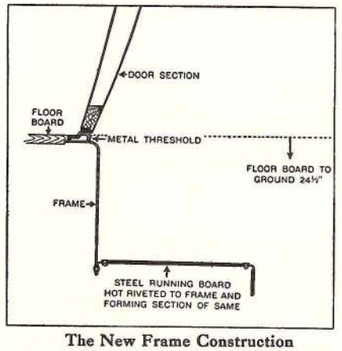
The chassis frame of the Marmon 34 is Z-shape, of 25-point carbon steel, the side rails being 4 inches wide on top and 10 inches deep, combining the wide running boards as a part of it, hot riveted to the lower edge of the frame and across it at each end where the running boards curve up to meet the fenders. The frame is formed so that its vertical web is directly under the outer edge of the body and because of the great increase in rigidity secured in this construction there is no need for the heavy wooden sills of the conventional body.

Short Turning Radius

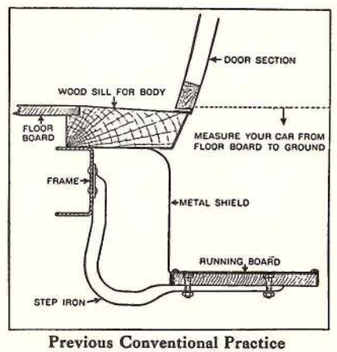
The forward end of the frame is reinforced and is narrowed, giving a short turning radius.

Cross Members

The motor support is on two pressed steel cross members, the rear one being braced or stayed to the center cross member, which takes the driving thrust, adding stiffness and strength at this point. The cross member just forward of the rear end forms the heel board of the rear seat, thus utilizing for strength what in the conventional construction is simply a body part.



The New Frame Construction



Previous Conventional Practice

Needless Parts Omitted—Weight Reduced

This design does away with the necessity of heavy wooden sills of the conventional body; it does away with step hangers and the side shields; it does away with forgings or irons to support the fenders, and with the heel board of the rear seat. None of the above omitted parts add anything to the strength and rigidity of the conventional frame, but they do furnish numerous joints and connections which set up many squeaks and rattles, which are also eliminated in this new construction. In this design the deep frame side in itself gives greater rigidity and this difference in vertical strength is further increased by the reinforcement which the running board itself forms. As a whole, the frame is very much stronger and lighter.

Steering Gear

Steering Gear Car Easy to Handle

"It is the easiest handling car of American manufacture that I have ever driven," said a motor-car engineer who got his training in Europe and is now technical editor for several motor magazines in this country, after he had driven his first day's journey in the Marmon 34.

We know it is not an idle boast when we claim the Marmon 34 is more easily handled and with greater safety and comfort than usual, due to the perfect balance, absence of rear end side sway and the marine thrust bearings of the steering spindles.

Worm and Worm Wheel Construction

The steering gear is irreversible, of the worm and worm wheel construction. There are large bearings, with ample provision for lubrication. The steering wheel is 18 inches in diameter, with solid spider and corrugated grip. The horn button is located in the center on top of the wheel. The column, of large diameter, is enameled black. The spark and throttle levers are located on the steering wheel and held by friction.

Controls

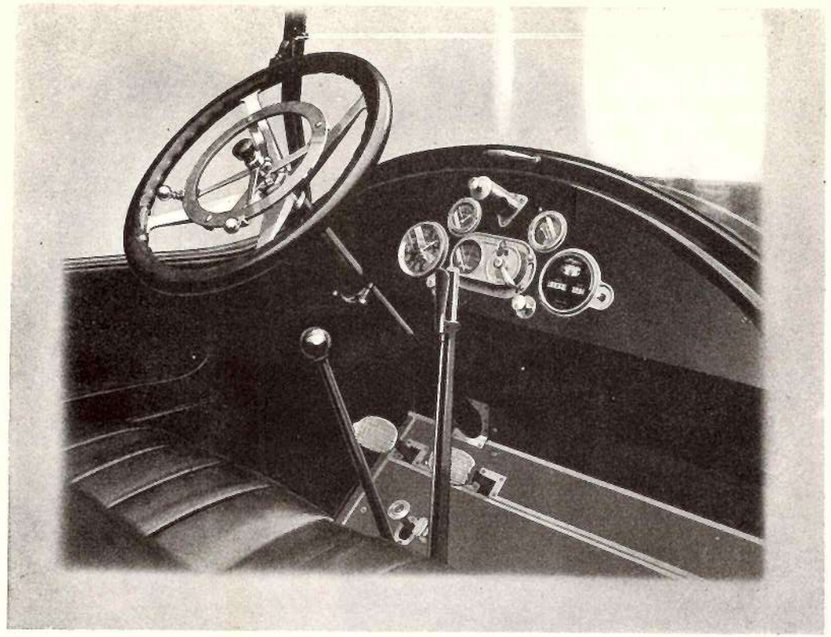
Left Drive, Levers in Center

The Marmon 34 is driven from the left side, with the control levers in the center. It is a notable fact that the levers have been placed with a view of making them most convenient for the driver to reach. The driver will naturally drop his hand from the steering wheel to the emergency brake lever or the gear control lever. It is to be doubted if any other car has as convenient a gearshift or one that is as easy to handle as the Marmon 34. The carburetor adjusting buttons are on the cowl dash, within easy reach of the driver, as are the lighting and ignition switches.

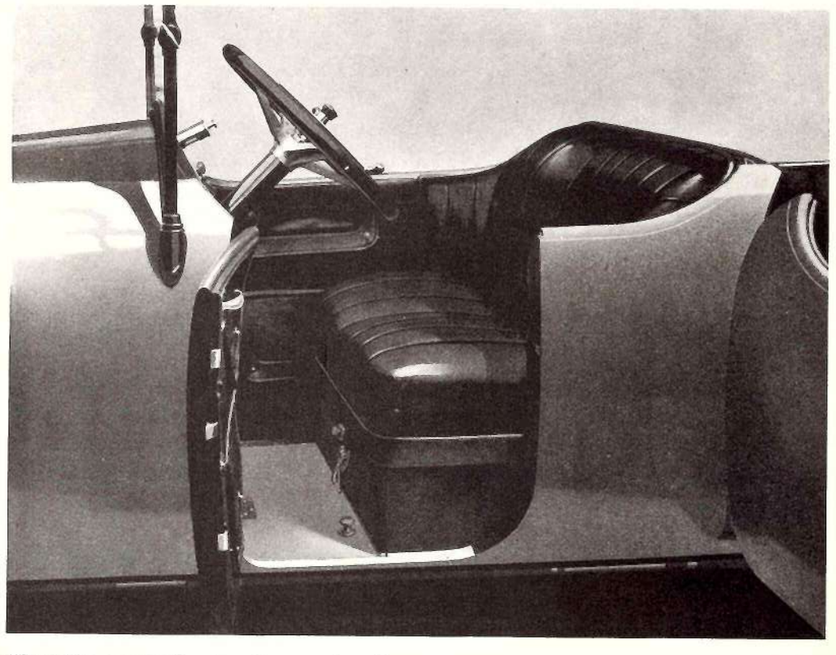
Convenient Controls

All in all, the convenience of control of the Marmon 34 is quite remarkable, and one should sit in the driver's seat to fully appreciate the extent to which the designers have gone to look to the comfort of the driver.

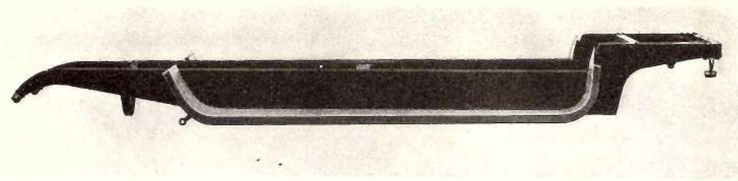
The left foot pedal operates the clutch, the right foot pedal operates the service brake. There is an accelerator pedal between the brake and clutch pedals with a foot rest, so that it is easy to operate. In order to allow the greatest ease and comfort of driving, the clutch pedal levers have been compounded, so that a very light foot pressure will disengage the clutch. It is possible for a woman to handle the car on long journeys without fatigue.



Every control is within easy reach of the driver—he does not have to shift his position to change gears or reach switches

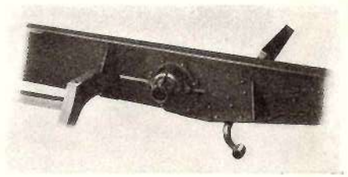


The wide, roomy front seat—easy to get in or out—will appeal especially to the man who drives his own car

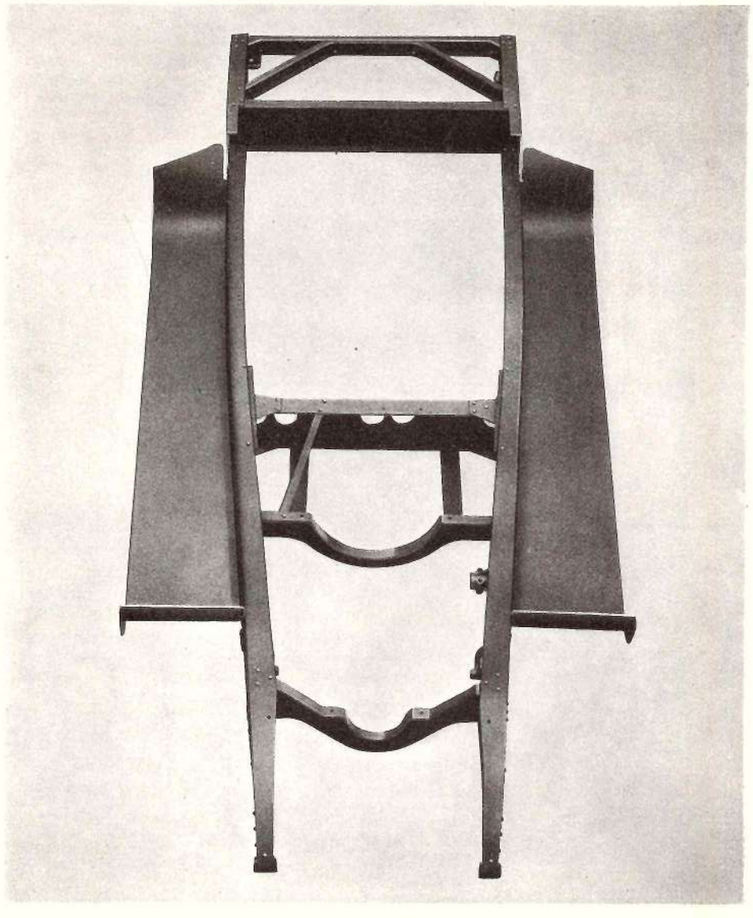


The Marmon 34 frame—showing the extraordinary depth of the side members

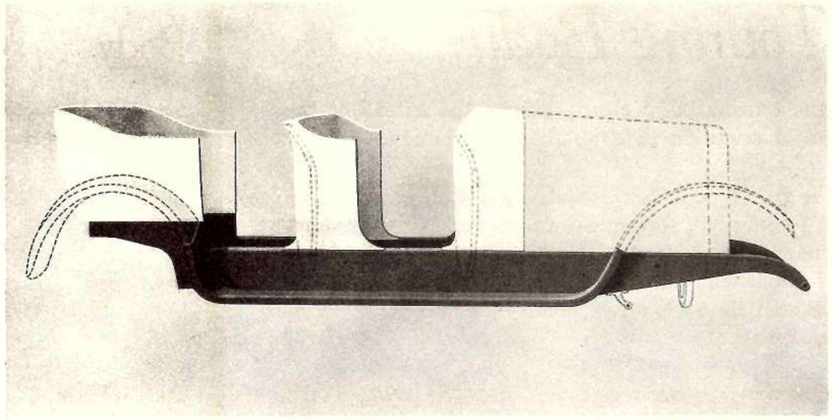
The frame is braced exceedingly well—yet is light in weight



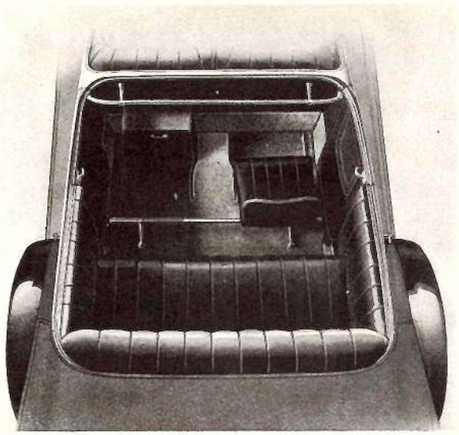
The steering gear is rigidly supported



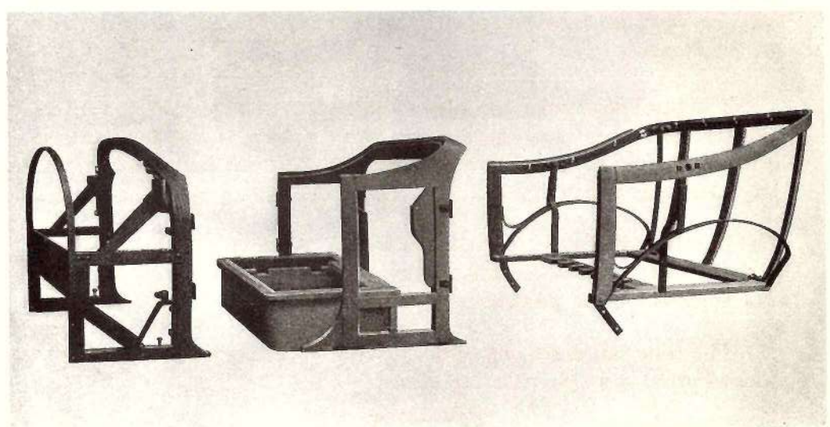
Plan view frame—note the wide running board riveted to the frame, the bracing, the narrow front



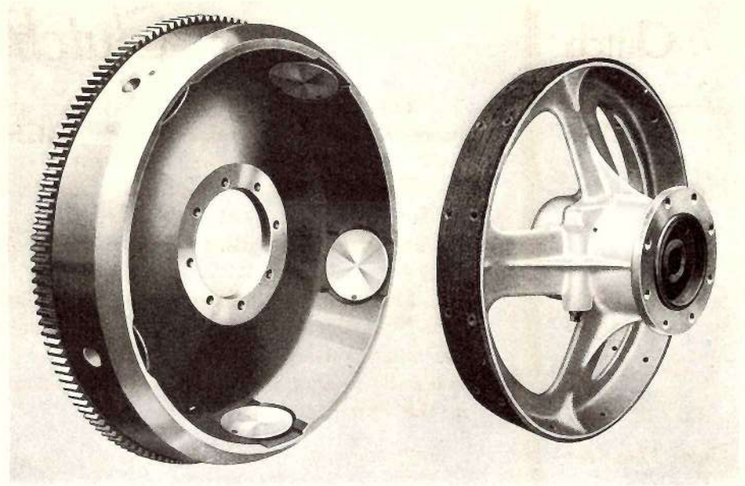
The three-piece aluminum body is bolted direct to the frame



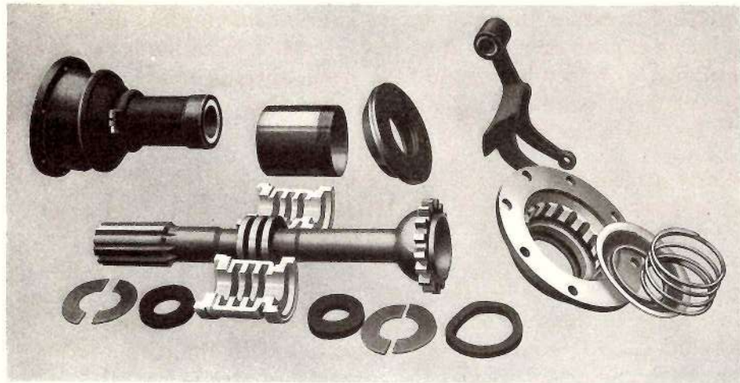
The spare seats fold out of the way when not in use



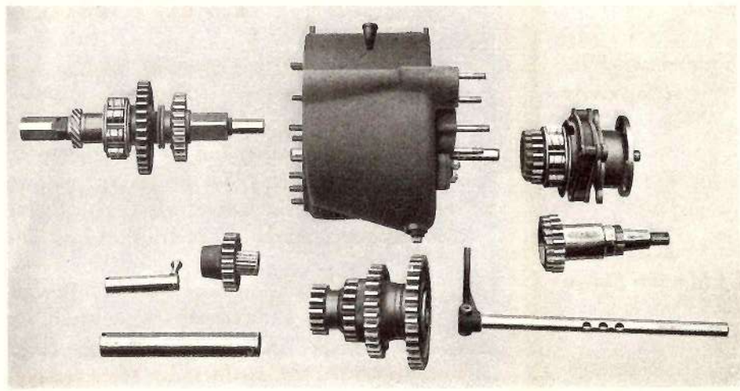
Frame work for the body sections, seasoned white ash, firmly braced



The Marmon cone clutch, with relieving springs in the flywheel, allows a perfect engagement



The clutch throw-out mechanism is of new design. Note the marine-type thrust bearing for clutch release — runs in oil



The transmission is quiet and efficient and operates in oil rather than grease

Clutch

Marmon Type of Cone Clutch

Clutch

The cone clutch of special design, which has been employed so successfully on the previous models of Marmon cars, is continued.

The clutch cone is of aluminum and the cushion springs are located in the flywheel instead of beneath the asbestos cone facing. There are five spring steel discs within the cone of the flywheel.

Gradual Yielding Engagement

The center of surface of each disc is above the true surface of the inner cone. As the clutch engages, the discs act as relieving springs and as the clutch pushes the cone into complete engagement, the discs yield gradually so that the whole face of the cone engages the entire surface in the flywheel.

Clutch Throw-out

The clutch throw-out collar is a beautiful piece of mechanism — extremely logical in design. The function of the throw-out collar is to release the clutch while the gears are being shifted. In the Marmon 34 it is located on the drive shaft between the clutch and transmission. Again we see the marine type thrust bearing being used. There are three ring collars cut on the steel shaft. These fit into a white die-cast bronze bushing, made to a free fit and with ample lubricating facilities. This bushing is covered by a spun tube steel sleeve on which a collar of larger diameter is secured. A sheet of wood fibre, one-quarter inch thick, is riveted to the sleeve.

Only Slight Pressure Required

A shoe attached to the clutch pedal works against the wood fibre and the adjustment is so perfect that the slightest pressure of the shoe against the fibre stops the spinning of the collar. When the clutch is engaged, the shaft either runs free in the loose bushing, or carries the bushing with it, without friction loss, there being one-eighth inch clearance between the shoe and the fibre. The gears shift smoothly. The forward end of the drive shaft connecting with the clutch cone has a universal action in oil and the rear splined end is carried in a universal joint immediately forward of the transmission.

Transmission

Transmission Held in Suspension

The transmission is novel in the manner of suspension and its location. It is located amidship on the forward end of the torque tube just back of the cross member in the center of the car. It is not fastened rigidly to the frame, but is freely held in suspension by a ball-and-socket joint, which takes up the driving and brake thrust. This location puts all of the universals (two) ahead of the transmission. This also insures a minimum of friction loss.

Of Marmon Design

The transmission is of Marmon design and construction, selective type, three speeds forward and reverse, compactly mounted in a cast aluminum case. The gears are of special heat-treated steel and each tooth is tested for hardness by the sclerscope. The shafts and bearings are large, well proportioned, and the lubrication is medium weight cylinder oil instead of grease.

Body

Scientific Construction No Sills under Body

Touring Body

The design of the touring body clearly shows the extent of the effort to build a car of scientific light-weight construction.

The shape of the frame permits the body to rest directly on the frame, giving a solid foundation, so that no wooden sills or sub-frames are used, as in ordinary construction. The floor boards of the body are set directly on the frame. The rear cushion rests directly on the kick-up of the frame, and the steel cross member at that point forms the heel board of the rear seat.

Body in Three Pieces Bolted Directly to Frame

The touring body is made in three pieces: (1) The cowl, (2) the front seat, and (3) the tonneau seat. Any one unit may be removed by loosening a few bolts, without disturbing the other units.

The body units fasten directly to the frame and the floor of the body is on a level with the top of the side members, 24½ inches from the ground, being solid, non-rattling and allowing for a very low center of gravity. The doors are carried on invisible hinges set in between the units, with cast aluminum scuff plates set in on the frame.

Body of Aluminum

The body units are of hammered sheet aluminum built over substantial, strongly-braced wood framing of thoroughly seasoned straight grain ash. The sheet aluminum construction results in a light and rigid body, which takes and retains a high finish.

Squeaks and Rattles Eliminated

Owing to the rigidity of the frame and construction by which the body units are bolted directly to it, weaving and racking of the body, as in conventional construction, is avoided and consequent squeaks and rattles eliminated. The close fit of the doors is maintained and they do not rattle or fly open.

In the Marmon 34 the passengers ride deep in the car and are at about conversational height with any one standing on the ground at the side. The passenger position is extremely comfortable, the seats being of good height, due to the fact that the floor rests directly on the frame.

Extra Seats Fold Out of Way

The front seat accommodates two passengers, the rear seat accommodates three and two spare seats can be brought into use. These extra seats fold forward, into the back of the front seats—out of the way and concealed.

Adjustable Footrail

One of the distinctive features of the tonneau is the adjustable footrail, which may be shifted in three positions to suit the convenience and comfort of the passengers. It gives "comfort for any length."

The robe rail is set out sufficiently far from the back of the front seat to provide ample carrying space.

Upholstery Removable

The upholstery of the Marmon 34 touring car is unique in that it can be easily removed from the car. It is made in sections and fitted

Touring Body

in place securely. The parts are made interchangeable, so that the factory can supply new sections of upholstery if desired.

Durable Construction

Both front seat and rear seat back cushions are upholstered over frames containing long spiral springs and with high-piled white curled hair. This results in soft spring seat backs of most substantial and durable construction.

Upholstery Easily Changed

One advantage in this upholstery is the ease with which it may all be removed should the body be dented or should the upholstery be damaged. With this arrangement a change in material or color of upholstery may be made readily by simply having an extra set of upholstery, the panels and cushions being interchangeable. This does not apply to the upholstery of the extra seats.

Best of Materials Used

Hand-buffed, long-grained semi-bright black finish leather is used, the tufting being in long straight pipes. Only the best of white curled hair and the best of coiled springs are used in the cushions and seat backs. The cushions are deep and luxurious.

Flush Finish

The upholstery is flush on the inside of the body rather than being brought over the edges in a roll. By the use of leather molding no tacks are visible.

Floor Coverings

Linoleum, metal bound, covers the floor in front, also the running boards; mohair brussels carpet is used in the tonneau.

Fenders

Constructed of Aluminum

The gracefully crowned fenders are one piece pressed aluminum, very light in weight, yet rigid and strong, bolting directly to the frame and running board. No fender irons are necessary and consequently are not used. The head lamp support is on a pressed steel bracket placed underneath each front fender.

The Hood

Aluminum Hood

Following out the program of the use of lighter materials wherever possible, the hood is of aluminum carefully fitted to prevent noises. The panel on the top is bolted to the dash and radiator and invisible waterproof hinges are used between the center and side panels.

Rear Axle

Tubular Propeller Shaft

The drive or propeller shaft within the torque tube is of steel tubing having forged ends welded to it. This gives us a very substantial propeller shaft which, because of its large diameter and being tubular, eliminates springing and whipping between the bearings.

Unique Transmission Location

The forward end of the torque tube carries the transmission case. On one side of the transmission case a ball-and-socket bar is secured through which the driving force is transmitted to the cross member of the frame. By this construction the transmission is a unit with the rear axle system, but it is at the forward end of the torque tube, thus reducing unsprung weight as compared with a rear system which carries the transmission adjoining the differential housing. Radius rods extend from the axle ends to the forward end of the torque tube, thus holding the axle housing and the torque tube in perfect alignment.

No Grease in Rear System

A feature of this rear axle system lies in the fact that medium weight oil instead of grease is used for lubrication without any danger of leaking either at the joints or out through the axle ends.

Large Bearings Used

Each rear wheel is carried on a large annular ball bearing. This construction eliminates friction and saves power.

Front Axle

New Style Steering Spindle

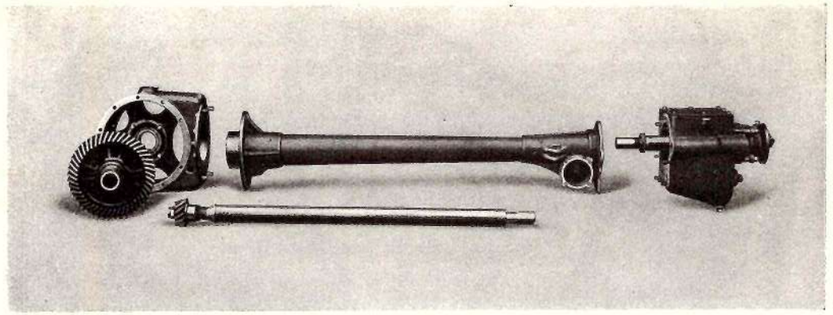
The front axle is a steel forging — I-beam in section. Of special interest is the steering knuckle — a double spindle knuckle — which is a one-piece forging of chrome vanadium steel. The spindle over which the wheel is fitted is conventional. The other end of the L-shaped knuckle fits into a split phosphor-bronze bushing, which goes into the eye of the axle.

Marine Type Thrust Bearings

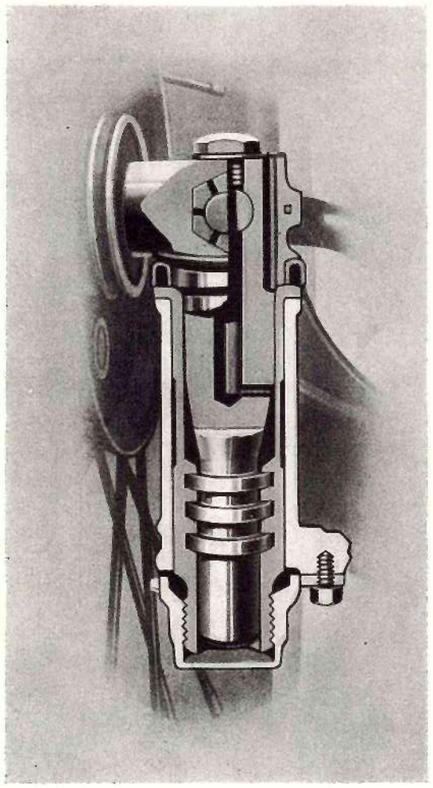
It is machined so that there are three ring thrust bearings for taking the vertical thrust. The side thrust is taken by the large side surfaces. This is the same principle of thrust bearing that is used on propeller shaft drives in marine work. A split phosphor-bronze bushing is fitted into place and the bearing surface is steel to phosphor-bronze with provision for a very easy renewal of the bronze bushing should it be necessary.

Oiling Provision

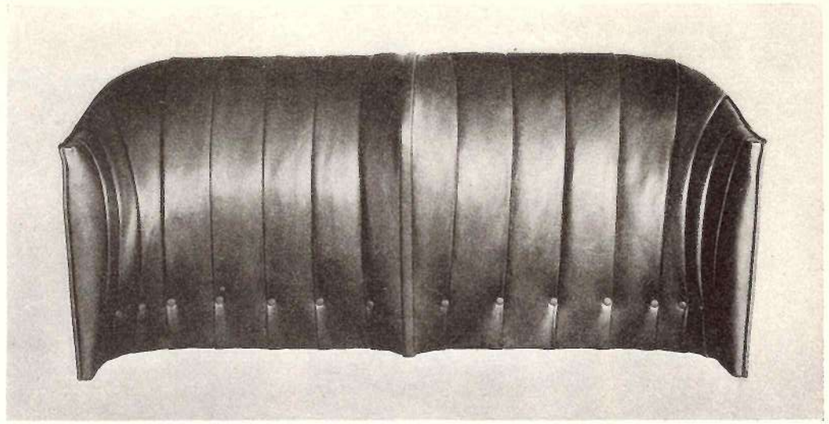
This construction provides an oil reservoir which holds medium-weight cylinder oil and keeps the bearing surfaces amply lubricated for long periods without attention. A copper gasket at the bottom with an acorn nut and a felt gasket at the top prevent leakage of oil. This front axle steering spindle design makes for great durability, strength, and ease of operation.



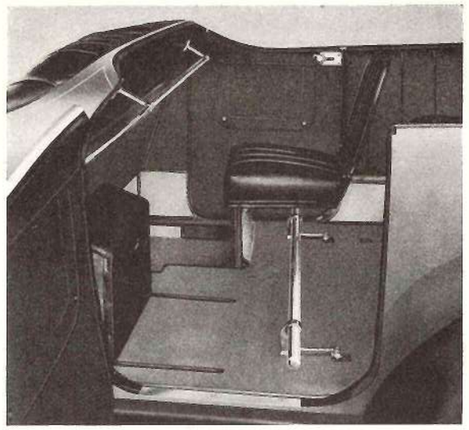
Torque tube, differential and case, propeller shaft and transmission assembly



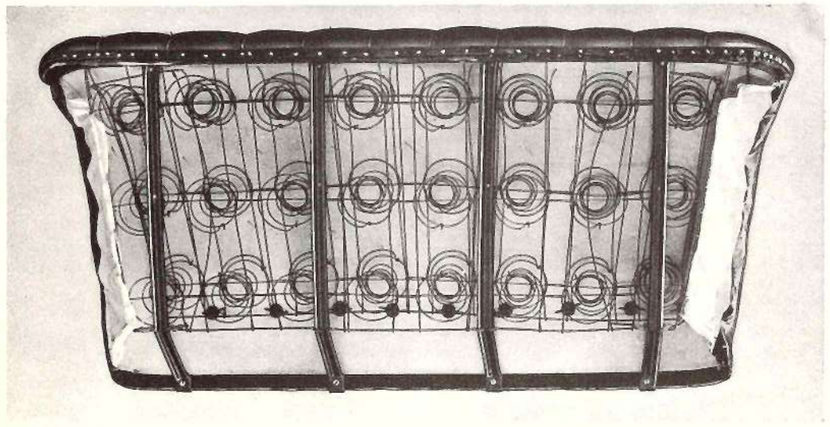
The front steering spindle of new design makes easy steering. It runs in an oil bath — requiring refilling only at long intervals. Great strength and durability



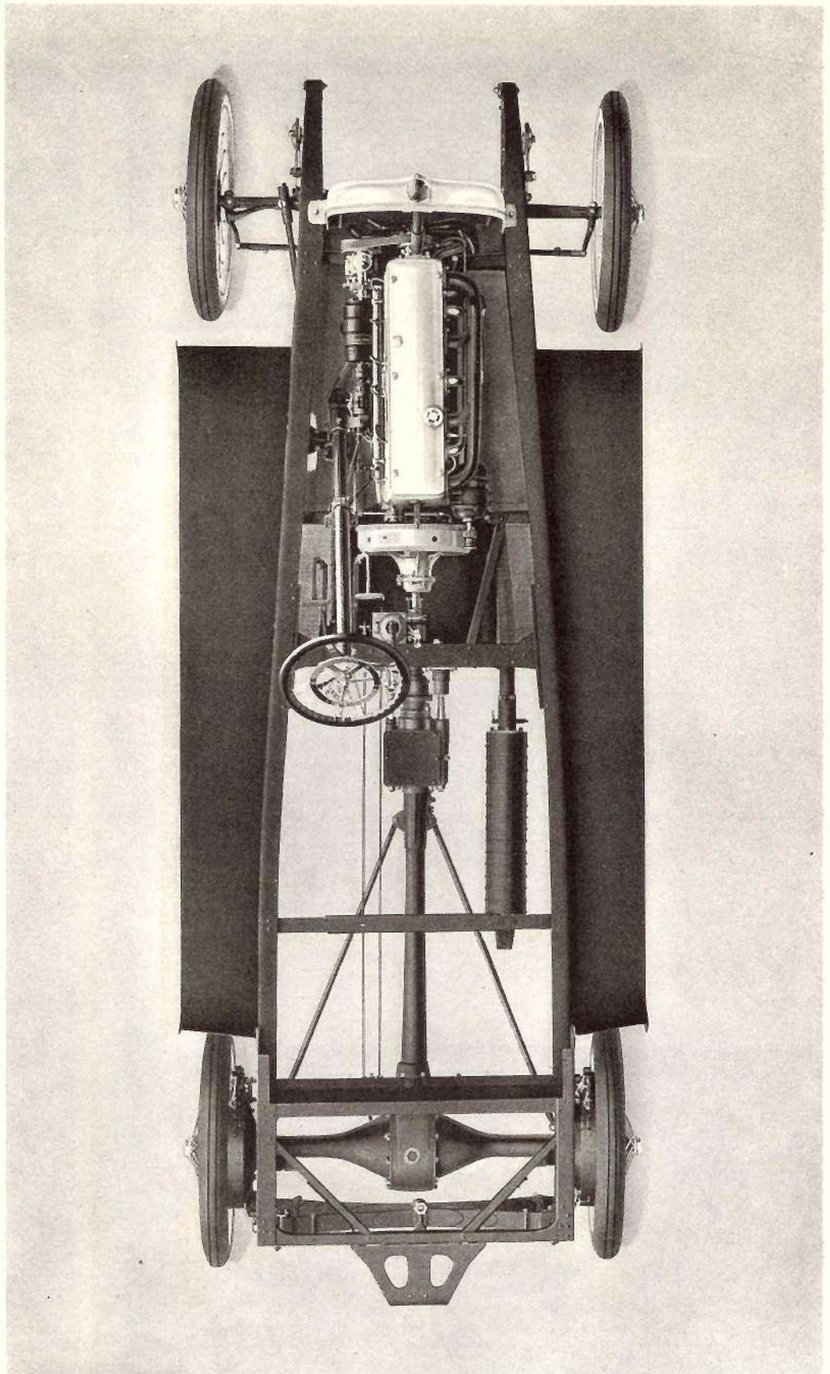
Removable upholstery adds refinement and convenience in a new way



The folding seats are comfortable, with plenty of room for all passengers

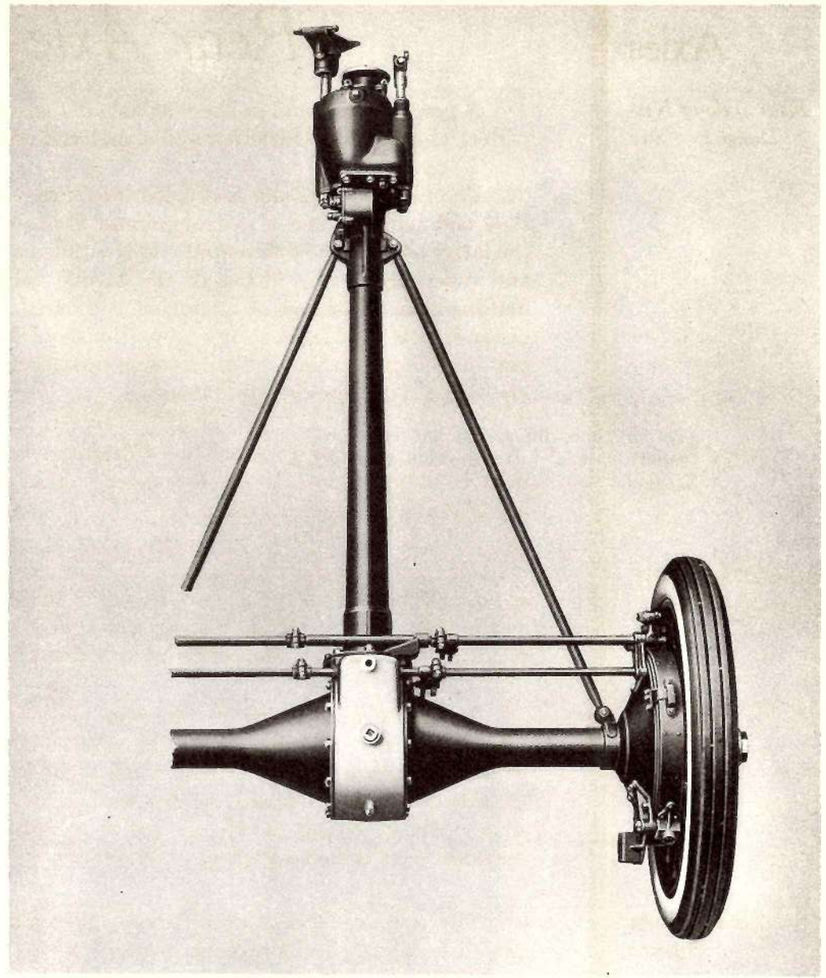


The upholstery is made complete on a form ready to fasten in the car—and is of the best materials

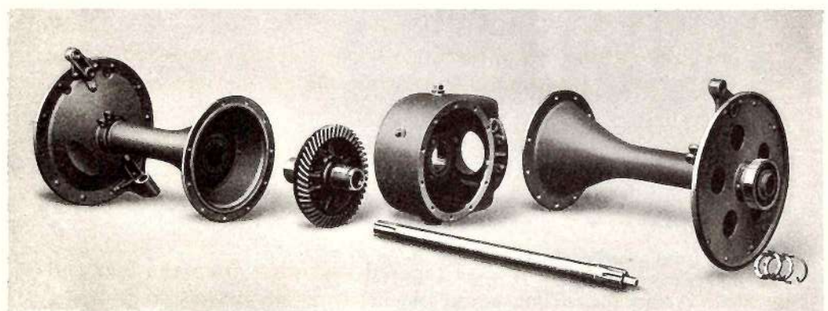


Top View Chassis

Strength, simplicity, and lightness characterize the chassis—all parts are readily accessible



The drive is taken through the torque tube, which carries the transmission. The whole driving system runs in oil instead of grease, as is required in ordinary design



The rear axle housing is in three sections. Note the spiral bevel gears, large axle shafts, and pressed steel brake supports

Rear Axle

Rear Axle of New Design in Three Sections

A new idea is found in the rear axle design which makes for more perfect alignment, less friction and a material decrease in weight.

The rear axle housing is divided into three sections — two drawn steel end supports and a cast aluminum distance piece in the center, the latter housing the differential. It is in the machining of these parts and especially in the fitting of the torque tube to the differential housing that perfection of alignment is secured. The cast aluminum distance piece is of extra strong proportions and carries one of the bearings for the differential, the other being carried in a substantial bearing seat secured within the steel housing.

Rigid Bearing Support

This bearing support for the differential is more rigid and firm than is obtained by the usual construction of overhanging bearings in conventional types of rear axles.

Large Live Axles

The axle is of the three-quarter floating type, the live axles being of large proportions made from a forging — the ends having six splines — the outer ends carrying a taper which draws into the wheel hub, making a very secure connection at this point.

Oil Leaking Prevented

Machined steel inserts in the ends of the drawn steel housings, firmly secured by welding, form the wheel supports. Stuffing boxes within the housing prevent leaking of oil. The axle shafts have flat top threads at the point where the felt washer comes in contact with the shaft. These threads constantly act as a worm pump, washing the lubricant back into the housing.

Strong Brake Supports

The combined brake drum cover and brake support is made of two dish-shaped steel pressings riveted together and mounted on a steel sleeve, which in turn is riveted and welded to the steel axle housing. This forms a very rigid and strong support, not only for the brakes but for the lower half of the rear springs. The brakes are operated with a single rod for each pair of brakes and without equalizers. Experience has shown that these brakes operate with greater certainty of equal braking on both wheels than has been possible with equalizers.

Simple Brake Adjustments

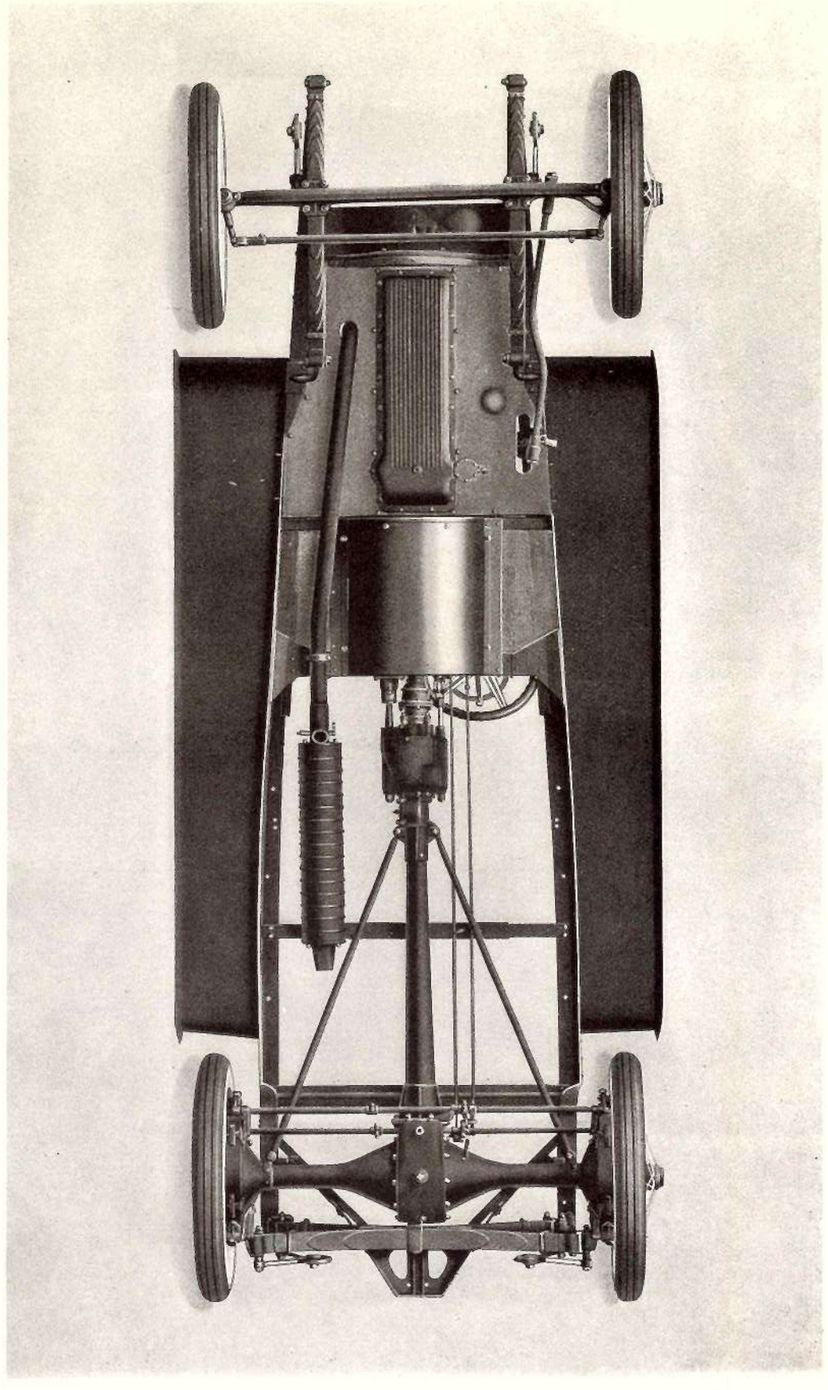
The brake drums are pressed steel very securely attached to the wire wheel hubs. Brake adjustments are simple and accessible.

Helical Gear Drive

The drive is through helical gears and the mounting of the differental and pinion is so accurately made and so firmly and rigidly supported that no adjustment is needed and none is provided.

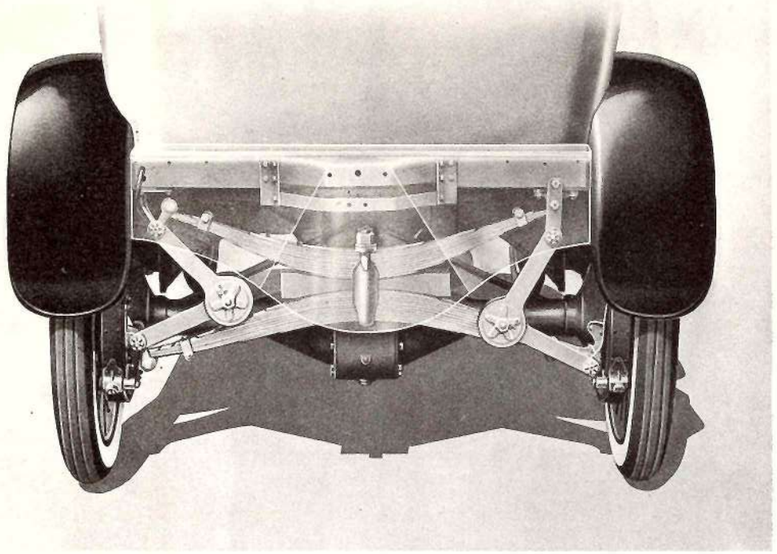
Torque Tube

The torque tube is of steel tapered somewhat from the rear end to the forward end. The rear end carries a substantial steel fitting with which it is secured to the differential housing, and which also carries two large ball bearings — one a thrust bearing and one an annular bearing immediately back of the driving pinion.

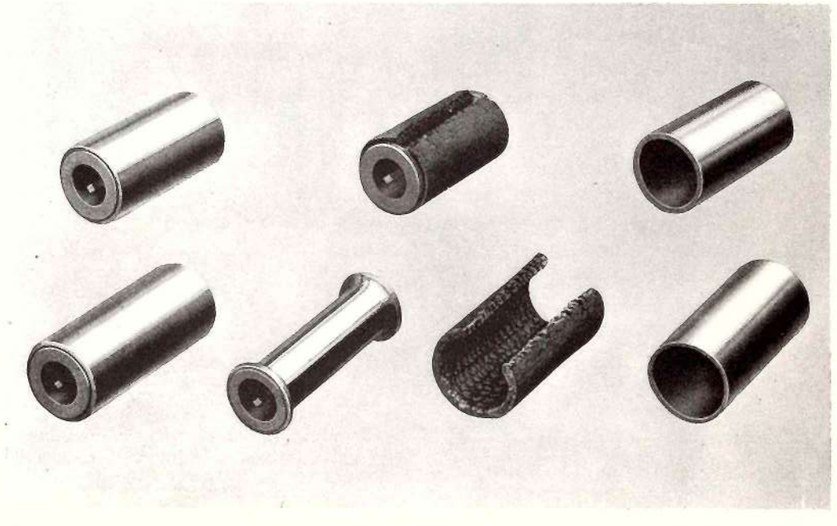


Bottom View Chassis

The motor and clutch are well protected and the whole layout is clean cut



The new Marmon spring suspension allows a new degree of passenger comfort by eliminating sidesway



Oilless spring bushings help make the Marmon 34 "the car that practically takes care of itself"

Rear Springs

We again see the work of the careful designer in the rear springs of the Marmon 34. The springs are of compound cantilever cross suspension type, located to the rear of the tonneau—at the extreme end of the frame. These are two semi-elliptical springs mounted transversely, clipped together in the center.

Rear Springs, New Type Construction

One end of the upper spring is shackled to the frame, while the other end is attached rigidly with the usual "I" bolt. The upper half of the spring is 39¼ inches long, the lower half 45 inches long. These springs are each 2½ inches wide.

One End Shackled, the other Rigid

The lower spring is secured to the rear wheel brake drum covers in the same manner — one end shackled, the other end rigid.

As the two fixed ends are on the same side of the car, there is almost a perfect vertical motion of the body and sidesway is eliminated.

Action of Maple Cam

A maple cam, double wedge shape, is placed in the center between the springs. This cam permits a soft, flexible spring to be used for normal conditions, yet when deep holes are encountered the cam serves to stiffen the spring the more the later is compressed. By this graduated increase in resistance, the spring gives ideal riding qualities.

Advantages

This method of rear spring suspension results in a reduction of weight and less unsprung weight; its location and peculiar method of mounting results in less violent spring action over rough roads; does away with sidesway, which means that the car handles with marvelous ease on the road, and effects a great saving in the wear of rear tires. The riding qualities of the Marmon 34 are different and better than any car we have ever produced. No other car can compare with it.

Front Springs

Springs Self-Lubricating

The front springs are semi-elliptic, 39 1/16 inches long by 2 inches wide, mounted above the front axle. These springs are very carefully designed to give easy riding at all speeds and steadiness at high speeds.

The front and rear springs of the Marmon 34 are self-lubricating, this feature being provided by means of grooves between the leaves filled with graphite. This lubrication eliminates squeaks and adds to the life of the springs, maintaining proper spring action for long periods without attention.

Oilless Spring Bushings

Bushings for the springs are dustproof and require no lubrication. Each bushing consists of a steel outer casing and a steel inner casing, with a Thermoid bushing between. The steel inner casing of the bushing carries two keys which fit into the key-ways of the spring bolt. The movement and wear is therefore taken by the Thermoid bushing. The advantages of this construction lie in the fact that the Thermoid bushing does not require lubrication and does not become noisy.

FLOYD CLYMER'S Popular Motor Books

AUBURN INSTRUCTION BOOK

This is a reprint of the original care and operation manual covering Series 8-88 Auburn 8 in-line models. This 56-page book is complete with text and illustrations, including charts, drawings and full information covering every phase of the operation and care of Auburn Straight Eight models.

It is also a valuable book for the owner of other model Auburns manufactured during the twenties. It is a "must" for the Auburn owner, the collector and/or the historian, and enthusiasts will likewise find it a book well worth having in their library. Order AU-8-88. .....**Postpaid $2.00.**

THE CAST IRON WONDER (CHEVROLET'S FABULOUS SIX)

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This is a reproduction of the fantastic Locomobile catalog published each year for several years when it was one of America's most famous quality cars. This large 200-page book gives all data on various models and there are over 100 photos, sketches and drawings. It is a "must" for the enthusiast and collector. .....**Postpaid $3.00.**

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We have included in the original book several interesting ads, photos and specifications of bther Knight-powered cars, including the Stearns, Sterling, Silent, Stoddard-Dayton, Brewster, Columbia, Edwards, Falcon, Comet, Handley, Knight Special, Lyons, Moline, Russell, Garford and others.

Here is a book that every Knight engine enthusiast will treasure, as well as every collector, old car enthusiast and historian. Order WK-29.

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100 OF THE WORLD'S FINEST CARS

This is one of the most unique and fascinating books we have been privileged to publish in the past 20 years. The authors, three Frenchmen, are among the most informed auto historians in the world. We knew that any selection of any number of the "Finest" would be a matter of great critical comment but we feel that the authors have made one of the most interesting compilations possible. There are names and descriptions of cars almost unheard of: **Beverly-Barnes, Omega, Elizalde, Diana, Ruxton, Triumph Dolomite, Rochet-Schneider** sprinkled among the familiar **Duesenberg, Cord, Rolls Royce** and **Mercedes** that we are accustomed to seeing in classic lists. We know that you will spend more than a hundred happy hours learning about 100 of the World's Finest Cars in this big 8½" x 11" volume. The hundreds of photographs, drawings and advertisements used to illustrate the book add to its nostalgic interest inasmuch as they date from the time the cars themselves were popular. Most of these illustrations have never been published in the United States. This is truly an exceptional book that should be in the hands of every automobile enthusiast and collector. .....**Postpaid $4.00**

HOW TO RESTORE THE MODEL A FORD

If you have had the desire to embark on a restoration project of any sort but have been deterred by the involved search to unearth the original specifications which must precede such a pastime, you will appreciate the latest publication to be issued by Floyd Clymer. Whether or not you own a Model A Ford or contemplate the purchase of one for any purpose, the book, HOW TO RESTORE THE MODEL A FORD is a most intriguing volume. It contains exact specifications of all Model A's, from 1927 to 1931, all models, including station wagons, the dates on which innovations and changes were made in the model year, reprints of Ford Shop Service Bulletins showing procedures and methods, paint charts and formulas, an upholstery guide, wiring diagrams, parts numbering systems and every conceivable detail the Model A fancier would require as a guide to complete restoration of minor repairs.

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This is the most fantastic book ever published on the Model A Ford. It is a "monster" with 560 pages and over 300 photographs, charts, and drawings. Written in 1929 and 1930 near the end of Model A production by S.A.E. member, Victor Page, who was then considered the most outstanding authority on Model A Ford cars.

Among the 300 illustrations there are many cutaway views of engine, transmission, differential, carburetor, wheels, drop center rims, truck 2-speed auxiliary transmission, power take-off, and water cooling system. Data on refitting bearings and all about the electric system, including wiring diagrams, disc and single plate clutches, steering gear.

A "must" for every owner, restorer, collector, mechanic, enthusiast and historian.....**Postpaid $5.00**

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Covers all passenger models with full details as to care and proper maintenance of these popular 114" wheelbase Ford V8 cars. The book gives information suitable for owners of all V8 Fords of the thirties. Chock full of photos, charts, drawings. Excellent for collectors, enthusiasts and historians, 64 pages.

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WIRELESS AND RADIO ALBUM

A newly published volume in Floyd Clymer's Americana collection, A PICTORIAL ALBUM OF WIRELESS AND RADIO—1905-1928, is another historical 'first' for this firm. The Album which contains more than a thousand actual photographs of operating wireless and radio equipment has been compiled around the unique collection of broadcast, receiving and experimental equipment belonging to Harold S. Greenwood, Arcadia, California. This collection of several thousand individual components and complete units is unique, and represents, as far as is known, the largest such grouping of historical radio material in the world. Each component is in operable condition and has been fully and authentically restored to new-like appearance.

Since his High School days, Greenwood has been an ardent radio amateur broadcaster and operated a radio parts wholesale establishment for more than 25 years. His interest in the preservation of typical pieces of equipment dates from his youth and the concise historical notes which accompany the photographs are his personal recollections in many cases.

In addition to photographs of this fabulous collection a selected number of advertisements, dating as far back as World War I, representing the leading firms and their products have been reproduced. Radio Corporation of America, Marconi, Tuska, DeForest, Atwater Kent and Crosley are a few of the pioneer firms whose receiving sets are shown and which will certainly stir nostalgic feelings in the generation which sat up till 2:00 AM "getting Des Moines," "tuning in Honolulu," or the K.C. Night Hawks or Amos and Andy. Crystal sets, Headphones, Battery Eliminators, Loop Antennas, The E. I. Co., Superheterodyne, Neuterodyne and Spark Transmitters are other subjects calculated to set memories in motion. A collector's dream.

Both as sheer entertainment and an educational documentary, the Album of Wireless and Radio deserves a place on every Americana bookshelf.

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Gives all details as to tire and rim sizes used on all makes of cars and trucks from 1915 to 1927 inc., both high pressure and balloons. Also applies to other prior and later year cars. Ads of early tires and rims. Contents include 27 balloon tire sizes on 1925, 1926 and 1927 cars, balloons and cars that use them, sizes and markings, repair tips and shop equipment, index to all pneumatic tire companies and manufacturers, pneumatic tire and rim sizes for all 1917 to 1924 U.S. cars, wheel alignment and balloon change overs, solid and pneumatic tire sizes for 1924 to 1926 trucks, twelve years of tire price changes. Also a 17-page supplement on excellent information from another book on tire problems, care and repairing tips and procedures. Many early tire ads, drawings and photos. Fine rim illustrations of many makes and styles. 224 pages. A real find for the historical car owner, collector or enthusiast.....Postpaid $4.00

BASIC AUTOMOTIVE HANDBOOK
How Your Car Operates From A to Z

Here is the ideal book for those who say "I don't know the first thing about a car," but who would like to have a working knowledge of its fundamentals. Written in easy-to-understand layman's language, the handbook covers every part and function of the car from the fuel tank to the exhaust pipe. And, it is carried out in a unique fashion which permits the reader to become as technically involved as he desires. Each factual explanation is followed by a discussion of theory and a deeper penetration of the subject, which can be skipped by those who are interested only in the "how" rather than the "why."

Profusely illustrated with hundreds of line drawings, cutaways and photographs, the BASIC AUTOMOTIVE HANDBOOK is an excellent manual for the teen-ager, students and the non-mechanically minded. The chapters on driver education and the practical aspects of owning a car alone are worth the price of the entire book to people in this category. Women will especially enjoy reading this book so that they may more clearly understand what makes their car "tick." It explains in every-day, simple and non-technical language the many things so many want to know. If there is someone in your family who is about to have a car for the first time, this handbook should be in his or her possession. Valuable also for libraries, driving schools and lecturers.....**Postpaid $3.00.**

MODEL T MEMORIES

Here is the book with Floyd Clymer's experiences with early Model Ts. As a kid dealer for Ford, he tells of his interesting and humorous T experiences—his races, his troubles, his meeting with Henry Ford, his only major accident (in a T), trials and tribulations of early T owners. Chock full of photos and cartoons. Also includes Les Henry's wonderful and unique story, "The Ubiquitous Model T," with full information on all T models, engine numbers, technical information and valuable data for every T owner, collector, enthusiast and historian. 112 large pages. .....**Postpaid $2.00**

MODEL "T" FORD DATA AND SERVICE MANUAL

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