A Catalog of the WHITE STEAM CARS

Model "M" and Model "O"

1909

"The Distinctively American Car"

THE WHITE COMPANY

CLEVELAND, OHIO

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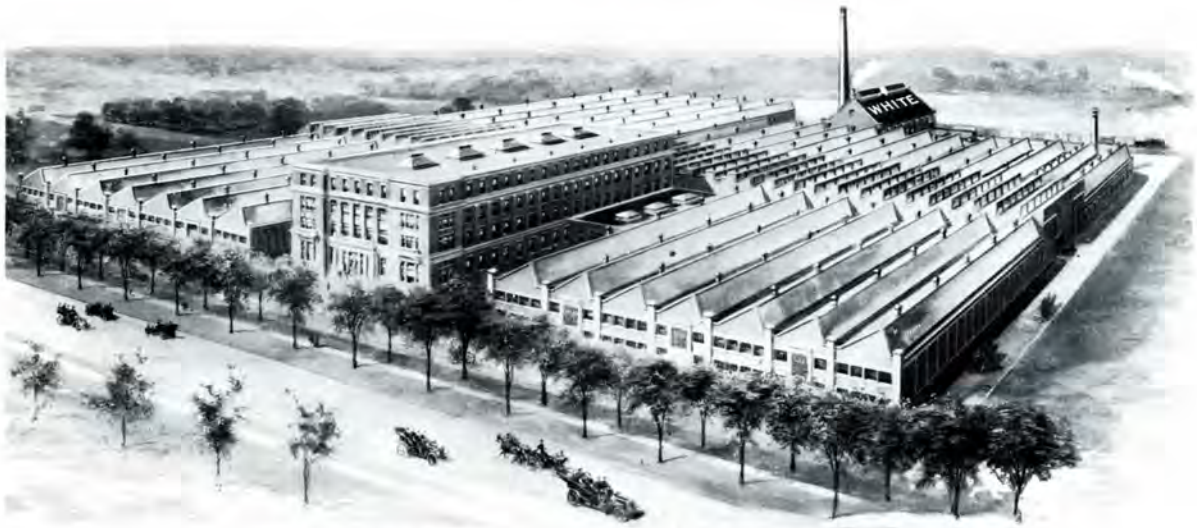

THE FACTORY OF THE WHITE COMPANY, CLEVELAND, OHIO

ANNOUNCEMENT

THE White Steam Cars for 1909 are built in two distinct models which, although differing from each other widely in power, in size and in price, resemble each other in their general lines of construction. The principal structural change in the new cars, as compared with previous White models, is in the engine. In place of the Stephenson type of valve motion previously used, another standard type, the Joy valve motion, has been adopted. The new construction has resulted in a further simplification of the engine, making it lighter, much more compact and even stronger than before.

The larger of the new White cars, known as the Model "M," is rated at 40 steam horse-power. This rating, like that of our small car, is based on the actual power delivered at the rear wheels, not merely on formulas, or on the power delivered at the engine. The prices for the Model "M" cars, f.o.b. Cleveland, are as follows: with seven-passenger or five-passenger touring body, $4,000; with limousine body, $4,800; with landaulet body, $5,000. The wheel base of the Model "M" is 122 inches; the front tires are 36 x 4″, and the rear tires, 36 x 5″. The dimensions of the engine are as follows: stroke, 4½″; high-pressure cylinder, 3″ bore; low-pressure cylinder, 5″ bore.

The smaller of the new White cars, known as the Model "O," is rated at 20 steam horse-power. The prices of the Model "O" cars, f.o.b. Cleveland, are as follows: with touring car or runabout body, $2,000; with limousine body, $2,800. The wheel base of the Model "O" is 104″; the tires, both front and rear, are 32 x 3½″. The dimensions of the engine are: stroke, 3″; high-pressure cylinder, 2½″ bore; low-pressure cylinder, 4¼″ bore.

In the following pages, the two new models are fully described and illustrated and the advantages of the White are set forth in considerable detail.

FIG. 1. MODEL "M" FORTY HORSE-POWER WHITE CAR WITH PULLMAN BODY, $4000
Equipped as shown above

THE ADVANTAGES OF THE WHITE STEAM CAR

MAX PEMBERTON, the famous English novelist, in an article which appeared recently in the London *Sphere*, summarized his experience with his White Steam Car as follows:

"I can name no objection to the White Steam Car. I have discovered no defect in it, no difficulty in its handling, no set-off whatsoever to its incontestable advantages."

Because the White does possess "incontestable advantages" and because our customers are always ready to speak of the car in terms such as above quoted, our cars have long enjoyed a wide popularity. We have made and sold more large touring cars than any other manufacturer in the country and we are the only American makers who sell cars in quantities in foreign countries.

As the record of the White Steam Car during the nine years that it has been before the public is fully treated in the White BULLETINS and in other publications of the company, this catalog will be devoted mainly to a consideration of the mechanical features of the car.

The principal advantages of the White Steam Car are as follows:

All variations of speed are obtained without the shifting of gears.

The speed of the car responds instantly to the throttle.

It is free from vibration.

It is noiseless.

It is smokeless and odorless.

The engine can never be "stalled."

It starts from the seat—no "cranking."

It is easiest on tires.

The power is transmitted positively without the use of a friction clutch.

It is unequaled for hill-climbing.

It is the simplest car to operate.

It is the safest car for the passengers as well as for other users of the highway.

In the next few pages, we shall consider the several advantages one by one, in order that they may be made clear to those who are not familiar with the White Steam Car of to-day.

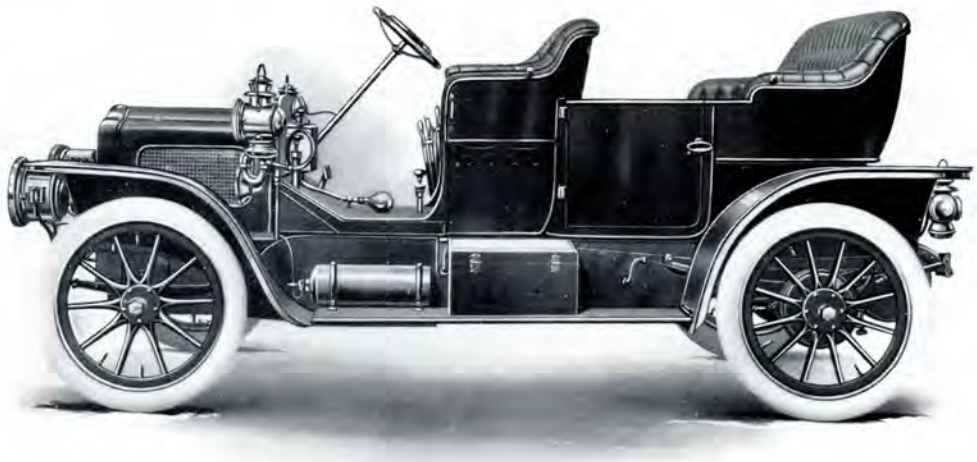

FIG. 2. MODEL "O" TWENTY HORSE-POWER WHITE TOURING CAR, $2000
Equipped as shown above

VARIATIONS OF SPEED OBTAINED WITHOUT SHIFTING OF GEARS

Each cylinder of the White Steam Car is delivering power all of the time; that is, there is steam pressure back of each piston pushing it in the direction in which it is going, whether moving up or down. As there are two cylinders in the White engine, the crank-shaft is receiving power at all times from two sources. This last statement should be qualified to this extent—at the instant when the connecting rod of a cylinder is on dead center, that cylinder is not delivering any power, but as the cranks are set 90° apart, only one of them can be on dead center at a time and, therefore, there is one cylinder delivering power even at the instant when the other is not doing so. Therefore, the supply of power from the two cylinders is absolutely continuous and no fly-wheel is needed. It is also evident that power will be delivered by the engine, no matter at what speed it may be turning.

The driver of a White can operate his car at any rate of speed desired—from a "crawl" to the highest speed of which the car is capable—simply by varying the speed of the engine. This is done by means of the throttle, the action of which is to vary the amount of steam admitted to the cylinders.

Each cylinder of a gasoline engine can deliver power not more than one-fourth of the time, because its cycle of operation is as follows: On the first outward stroke of the piston, a charge of gas is drawn in; on the first inward stroke, the charge of gas is compressed; on the second outward stroke, the charge is exploded by means of a spark, and power is produced; on the second inward stroke, the burnt gases are expelled, and then the cycle commences anew. In practice, the valves are so timed that power is actually delivered by each cylinder during considerably less than one-fourth of the time.

Therefore, in a four-cylinder gasoline engine this condition exists—there are only two impulses of power for each revolution of the crank-shaft and there are considerable periods of "no power" between them. In order that the engine may continue to turn during these intervals of "no power," it is necessary to store up power, and this is done by adding a heavy fly-wheel. In order that the fly-wheel may store up any con-

FIG. 3. MODEL "M" FORTY HORSE-POWER WHITE CAR WITH TOURING BODY, $4000
Equipped as shown above

siderable amount of power, it must turn at a very high rate of speed.

In the six-cylinder car the power impulses of the cylinders overlap, yet there are periods when the power being delivered is very small and, therefore, it is still necessary to use a fly-wheel, although the latter is generally lighter than in the four-cylinder car. In either case, the energy stored up in the fly-wheel must be sufficient to carry the engine and its load over the periods of "no power" (in the case of the four-cylinder) or the periods of "little power" (in the case of the six-cylinder).

It is thus evident that to get power from a gasoline engine it must be run at a comparatively high rate of speed. On the other hand, the speed of the car itself must be frequently varied and in order that this may be accomplished, all of the larger gasoline cars are provided with either three or four sets of gears of different ratios (in addition to the gear used in reversing). The driver of a gasoline car, in order to secure any considerable variation in the speed of the car, must shift gears, that is, he must disconnect his engine from one set of gears and connect it with another, so that the engine may continue to turn at a relatively constant speed.

With the six-cylinder car, a somewhat wider range of speed is obtainable without the changing of gears than in the case of the four-cylinder car, and its qualities approach nearer to those of the White, yet it is a matter of dispute between the manufacturers of gasoline cars whether the advantage gained by the addition of two extra cylinders counterbalances the greater weight, cost and complexity involved.

THE SPEED OF THE CAR RESPONDS INSTANTLY TO THE THROTTLE

The speed of the steam engine—and, consequently, the speed of the car—responds instantly to the amount of steam that is admitted by the throttle to the cylinders. As we have shown, the speed of the gasoline car depends largely upon the gear ratio which is being used between the engine and the rear wheels. Therefore, in order to secure any wide variation in the speed of the car, it is necessary to shift gears. Futhermore, even within the ranges of speed obtainable on any one set of gears, the speed of the gasoline car does not respond as promptly to the throttle as does the speed of the steam car.

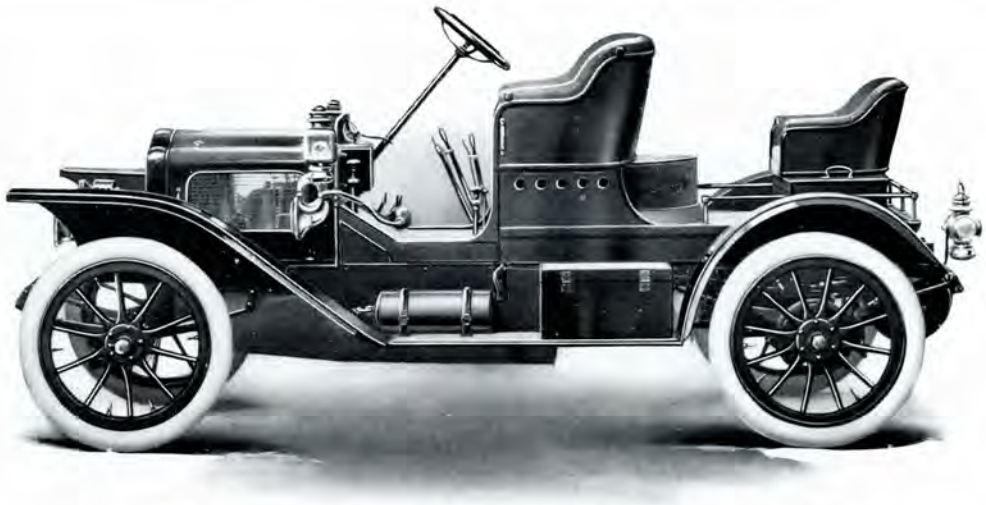

FIG. 4. MODEL "O" TWENTY HORSE-POWER WHITE RUNABOUT, $2000
Equipped as shown above

IT IS FREE FROM VIBRATION

Owing to the fact that the power is being applied continuously, the mechanism of the White car is entirely free from vibration. In the gasoline car the power is applied intermittently and considerable vibration inevitably results.

IT IS NOISELESS

There is no source of loud noise in the White. In the gasoline car, a muffler must be provided for taking care of the explosions within the cylinders. As the load increases, the muffler does its work with decreasing efficiency. When the muffler is "cut out," as is a common practice with drivers when starting, climbing hills, or under other conditions of hard pulling, loud and unpleasant noise results. The reason for "cutting out" the muffler when considerable power is needed is that it causes back-pressure in the cylinders, reducing the power of the engine.

IT IS SMOKELESS AND ODORLESS

In the White there is no source of smoke or of smell. The gasoline used in the burner is consumed without producing any smoke or bad odor. In the gasoline car, the combustion of the gasoline takes place within the cylinder, where there is necessarily present varying amounts of lubricating oil. If this lubricating oil is at all in excess, it burns with the gasoline, causing unpleasant smoke and smell. Formerly, not very much attention was paid to this feature, but since the park police in a number of cities have started to arrest and prosecute the drivers of smoky automobiles, the freedom of the White from smoke and smell has been more widely appreciated than ever before.

THE ENGINE CANNOT BE STALLED

As the steam pressure in the White car is always available, there is no way in which the engine can be "stalled." Even in such a case as the sudden giving out of the fuel, there will be no sudden failure of power, but the only result will be a gradual reduction of steam pressure and the operator can continue for some distance before the steam is entirely used up. The gasoline engine "stalls" without warning when the fuel supply is exhausted (or momentarily shut off), when the spark fails, when the speed of the engine is allowed to fall off, or when it is overloaded.

FIG. 5. MODEL "M" FORTY HORSE-POWER WHITE LIMOUSINE, $4800
Equipped as shown above

IT STARTS FROM THE SEAT—NO "CRANKING"

To start the White car, the operator pushes down the simpling lever and opens the throttle, and the car starts without jerk. By pushing down the "simpling lever," the high-pressure steam is admitted to both cylinders and the torque of the engine is enormously increased (when starting, great torque is particularly desirable). Another reason for admitting the high-pressure steam to both cylinders is that if the high-pressure connecting rod should happen to be exactly on dead center, the car would nevertheless start easily.

To start a gasoline engine, it is usually necessary to perform the operation of "cranking." This process consists of turning over the engine by means of a crank until a charge is drawn into a cylinder, compressed and exploded by the spark. If n charge of gas is already compressed, the engine may be started on the first turn. If the cylinders are cold, or if any other condition is not exactly what it should be, the engine will start only after varying amounts of time and labor have been expended. That the operation of cranking a gasoline car is a serious proposition is indicated by the statistics of the insurance companies, which show that from 30 per cent. to 45 per cent. of all accidents arising from the use or misuse of automobiles are due to cranking.

The operator of a gasoline car, having started his engine, proceeds to "speed it up" so that it may develop the power necessary for starting the car. Then the clutch is engaged and the car starts, generally with a jerk. If the car happens to be on an up grade or in heavy sand or mud, the difficulties of coupling the rapidly moving engine to the heavy stationary load are increased and the strains on all parts of the car are of greater severity.

FIG. 6. MODEL "O" TWENTY HORSE-POWER WHITE TOWN CAR, $2800
Equipped as shown above

IT IS EASIEST ON TIRES

For the reason that the White car runs without vibration, that it starts without jerk, and that it is not subjected to the jolts resulting from the changing of gears, tires last much longer on the White than on any other car of similar weight.

POWER IS TRANSMITTED WITHOUT THE USE OF A FRICTION CLUTCH

In the White car there is no friction clutch. It is possible to run the engine free—that is, disconnected from the rest of the driving gear. But when the car is started, and while it is in operation, the engine is connected positively with the rear axle and there can be no trouble or loss of power owing to the slipping of a friction clutch. As is well known, every gasoline car has some type of friction clutch, which is used when starting to connect the moving engine to the stationary load, and which is also used to disconnect the engine from the transmission while changes of gear are being effected.

UNEQUALED FOR HILL CLIMBING

The superiority of the White for hill-climbing, and for other kinds of hard pulling, is very generally recognized. The White engine has the unique quality that, as its speed is reduced, its power does not drop off proportionately, or may not drop off at all. This is because, in ordinary running, the full steam pressure in the generator is not utilized. The throttle, when only partly opened, acts somewhat like a "reducing valve," so that the pressure of the steam as it enters the engine may be much less than that in the generator. When the throttle is opened wide, the engine receives the full steam pressure. In this way, *more* power may be secured without increasing the speed of the engine, or the *same* power

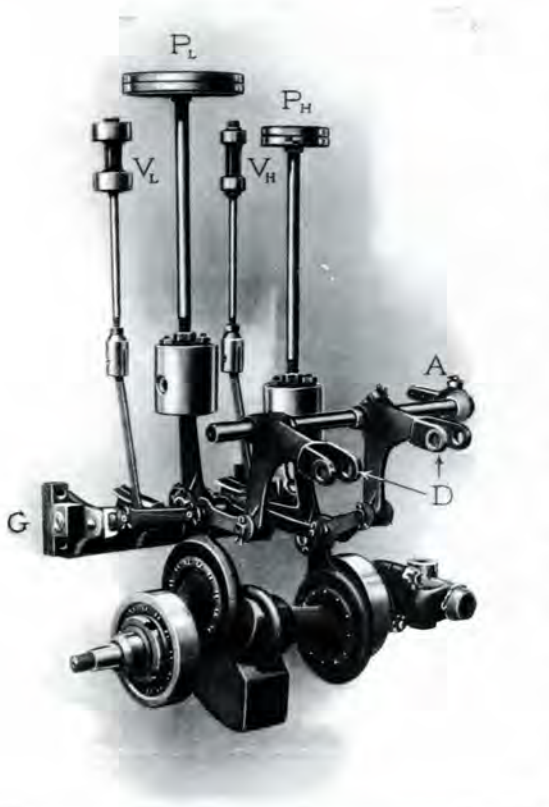

Fig. 7. THE WORKING PARTS OF THE WHITE STEAM ENGINE

P_H—High-Pressure Piston
P_L—Low-Pressure Piston
V_H—High-Pressure Valve
V_L—Low-Pressure Valve
G—Valve Guide, by tilting which the Engine is reversed
A—Rocker-Arm which drives the Oiler
D—Rocker-Arms which drive the Pumps

may be secured even if the speed is reduced. No other car possesses this quality and, therefore, no other car acts as well on hills as does the White.

THE SIMPLEST CAR TO OPERATE

The driver of a White, in order to adapt the speed of his car to varying road conditions, has nothing to handle except his throttle. The temperature and pressure of the steam in the generator remain constant, regardless of the running conditions, without in any way engaging or requiring the attention of the driver. On the other hand, the driver of a gasoline car, in order to accommodate the speed of his machine to varying road conditions, must operate (1) the throttle, (2) the spark control, (3) the gear-shifting lever and (4) the clutch.

SAFEST CAR FOR PASSENGERS AND OTHER USERS OF THE HIGHWAYS

The passengers in a White car are quite immune from the danger of being involved in a grade-crossing accident. First of all, as the car is noiseless, it is easy to hear the warning signals or the noise made by an approaching train or electric car. Secondly, as the engine cannot be "stalled," there is no chance that the power will fail suddenly and that the car will stop at some critical time, as on a railroad crossing or in front of a trolley car. Thirdly, the driver of a White car is more likely to slow up when nearing a railroad crossing, or even to stop his car to make sure that the coast is clear, because this does not involve any trouble on his part. On the other hand, the driver of a gasoline car, knowing that to slow down or to stop his car means the trouble of shifting gears on restarting, is more likely to "take a chance."

The greater safety to other users of the highway is because of the better consideration which the driver of a White can show to those who are driving horses. Not only is it no trouble for the White driver to stop his car, but also when his car stops his engine stops, too. The driver of a gasoline car may stop his car, but he is naturally reluctant to stop his engine, because that means he must get out and crank before restarting. If his engine is left running the noise and the smell scare nervous horses almost as much as if the car were moving. Again, the driver of a White is more likely to stop on a steep up-grade, when necessary, or to drive off the road into heavy sand or mud, because he can restart from such a position without trouble.

CONSTRUCTION OF THE WHITE STEAM CAR

THE method of operation of the White Steam Car may be described as follows: Water is pumped from the water tank through the regulating devices into the top coil of the generator. These regulating devices divert part or all of the water back to the tank, permitting to pass through them to the generator only such an amount as the running conditions at the moment may make necessary. The passage of the varying amounts of water through the regulating devices controls the amount of fuel supplied to the burner. By this automatic control of the water and of the fuel, the temperature and pressure of the steam remain absolutely constant, no matter what the running conditions may be. Steam issues from the lower coil of the generator and goes to the engine. The steam, on leaving the engine, passes to the condenser at the front of the car. Here all, or the greater part, of the steam is condensed into water and is pumped back to the tank to be used over and over again. These processes go on without in any way requiring the attention of the operator, except that he regulates the speed and power of the engine by means of the throttle.

We shall now consider the details of construction of the various parts of the car. The power plants of our 40 horse-power Model "M" and of our 20 horse-power Model "O" are absolutely identical except in size and, therefore, the following detailed description applies equally to both models. It is worthy of more than passing attention that, in order to double the capacity of the White power plant, it is not necessary to add to the number of parts, but simply to increase their size. It indicates that the design of the power plant has been thoroughly standardized and that it is ideal for automobile service.

THE ENGINE

The engine construction is very clearly shown in Figs. 7, 8, 9, 10 and 11. Fig. 7 shows all the working parts of the White engine—crank-shaft, pistons, crossheads, connecting rods, valve mechanism and pump levers.

The crank-shaft is a short one-piece forging with but two main bearings, as shown in Fig. 8.

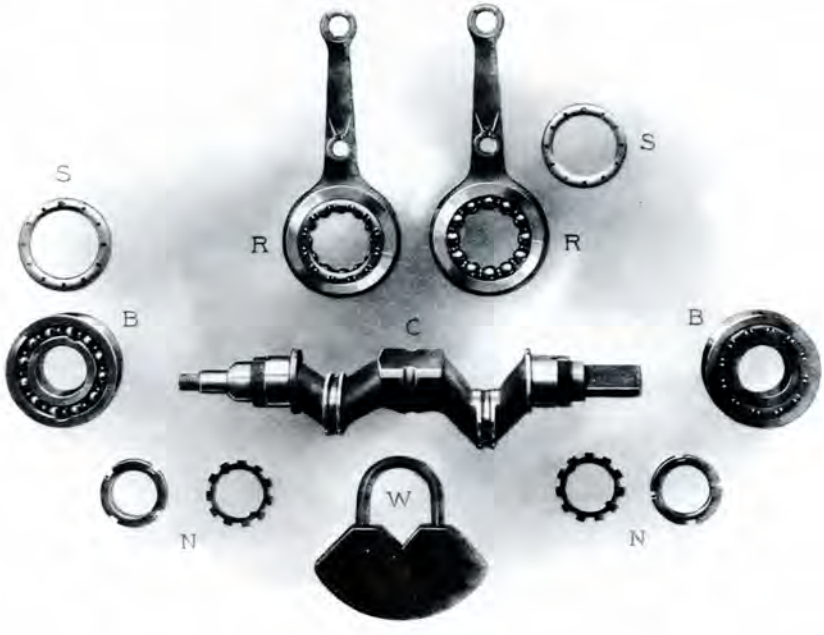

Fig. 8. THE CRANK-SHAFT AND ALL THE PARTS ATTACHED THERETO

C—Crank-Shaft
B, B—Crank-Shaft Bearings
N, N—Lock Nuts and Washers
W—Counterweight
R, R—Connecting Rods with Ball-Bearings in place
S, S—Ball Retainers

This is a most advantageous construction, because when three or more bearings are used in any shaft there is always a possibility that they may get out of alignment. The main bearings are of the annular type and may be removed from the crank-shaft by taking off the lock nuts and lock washers, N, N, in Fig. 8. The main bearings and the connecting-rod bearings are fitted with ball separators and the balls are of extra large size. The connecting rods are one-piece forgings.

If will be noted that the valves are driven from the connecting rods. This construction is known as the Joy valve motion, which has long been a standard form in steam engineering practice. (In former White models, the Stephenson type of valve motion was used, necessitating a number of eccentrics on the crank-shaft. The adoption of the Joy valve motion has greatly simplified the engine construction, reducing the number of parts and also the size and weight of the engine.)

FIG. 9. LEFT SIDE OF THE WHITE STEAM ENGINE, WITH PUMP COVERS REMOVED

Both the high-pressure valve and the low-pressure valve are of a type known as piston valves. The steam pressure is the same on all sides of a valve of this type so that the power necessary to operate it is negligible. Steam is admitted through the center of the valves and exhausts at the ends. The pressure on the valve stuffing boxes is thus reduced to that of the exhaust from the respective cylinders.

The small arm (A in Fig. 7) on the end of the pump rocker-shaft is connected by means of a rod to a ratchet device, which drives the oiler placed on the dashboard. The pulley on the forward end of the crank-shaft drives the fan-shaft by means of a belt. The fan-shaft bearing is not held rigidly in place, but is pivoted eccentrically and a spring bears upon it in such a way that the belt is always kept tight. The function of the fan is to draw a current of air through the spaces between the tubes of the condenser, thus aiding the process of condensation.

The crank-case of the engine is made in one piece, but ready access may be had to all parts within by the removal of the side and bottom plates, and the crank-shaft may be taken out through either end. The new engine permits of a pleasing and symmetrical arrangement of the necessary piping and everything under the bonnet is easily accessible. Stuffing-boxes are fitted to the upper end of the slides in which the cross-heads travel, so that no oil may be splattered out of the crank-case. The pumps are enclosed so that they may be kept free from dust, yet they are readily accessible, as shown in Fig. 9. There are the most thorough provisions for

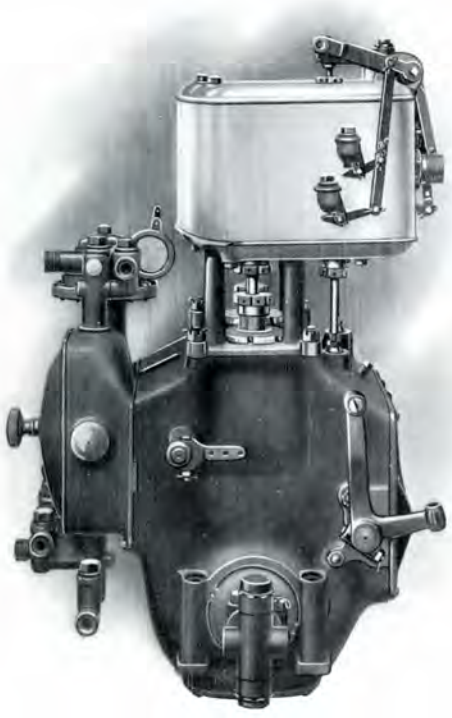

FIG. 10. REAR VIEW OF THE WHITE STEAM ENGINE

keeping the pumps and all parts within the crank-case well lubricated.

The cylinders are provided with relief valves for getting rid of any water which may be in the cylinders when starting the engine "cold." Before admitting steam to the engine, these valves are opened momentarily by means of a little lever on the dash, and the entering steam quickly and effectually removes the water.

The exhaust pipe from the engine to the condenser is located on the right-hand side. Within this exhaust pipe there is a coil of piping, through which the water from the pumps circulates on its way to the generator. This arrangement thus constitutes a neat and compact feed-water heater which performs the double function of heating the feed-water and of aiding the process of condensation.

The engine is so adjusted that it runs normally on "cut-off"—that is, the admission of the steam to each cylinder is stopped before the end of the stroke and the steam then works expansively for the balance of the stroke. In starting the engine, the pushing of the simpling pedal, besides admitting the steam directly to both cylinders, allows the engine to take steam during the full stroke. There is also a "cut-off" pedal which, when pressed, admits steam during the full working stroke. This "cut-off" pedal is used only when slow, hard pulling is required, as in climbing particularly steep grades or running over very heavy roads. An interesting feature of the Joy valve mechanism is that, when the "cut-off" is changed, the "lead" of the valves remains unchanged and the engine thus runs more smoothly on "cut-off" than was possible when the Stephenson type of valve mechanism was employed. The engine is reversed and the

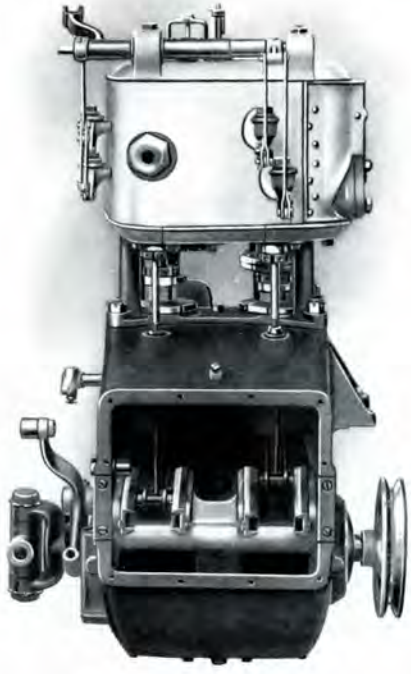

FIG. 11. RIGHT SIDE OF THE WHITE STEAM ENGINE, WITH SIDE-PLATE REMOVED FROM THE CRANK-CASE, SHOWING THE VALVE GUIDE

"cut-off" is changed by simply changing the tilt of the guide, G, in Fig. 7.

The engine is supported on two cross-members of the frame, which are so placed that the entire weight of the engine is behind the front axle, as is shown in Figs. 15 and 16. The engine is so hung that the driving shaft is perfectly horizontal, and as there is neither clutch nor transmission gear on the White, the drive is direct and positive from the engine through the driving shaft to the rear axle.

THE GENERATOR

The White generator may be described as the fundamental distinguishing feature of the White Steam Car. No other steam automobile, or, in fact, no other steam power plant is, or ever was, provided with such a device. As there are still some people who believe that the White generator in some way resembles the ordinary boiler, we would like to state most emphatically that there is no point of resemblance between the two, except that they both perform the function of converting water into steam. The essential points of difference between the two may be summarized as follows:

1. In the White generator, the water is at the top and the steam at the bottom. In the ordinary boiler, the water is at the bottom and the steam at the top.

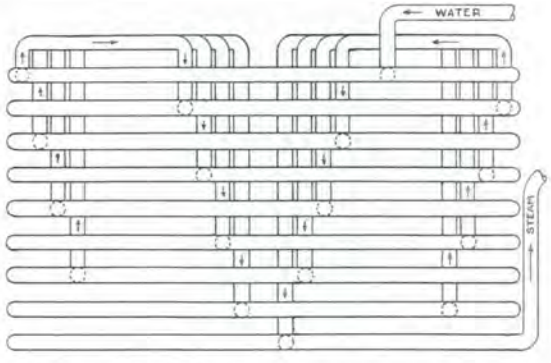

FIG. 12. DIAGRAM SHOWING THE CIRCULATION THROUGH THE WHITE GENERATOR

FIG. 13. THE WHITE GENERATOR

2. In the White generator, the relative amount of water and of steam is not at all important. In the ordinary boiler it is necessary that the water be kept at a certain definite level.

3. The White generator contains only a very little water and steam at any given time. The ordinary boiler contains great quantities of both.

4. With the White generator, a full pressure of steam may be obtained in a very few minutes. In the ordinary boiler considerable time is necessary to obtain full steam pressure.

5. The White generator has only twelve joints. The ordinary boiler has several hundred joints and the boilers in some of the early steam automobiles had several thousand joints.

6. The joints in the White generator are at the top, where they are not subjected to very much heat. In the ordinary boiler, about one-half of the joints are exposed to the hottest part of the fire.

7. The joints in the White generator are much stronger than it is possible to make them in the ordinary boiler.

8. In the White generator, the water must enter the coldest part and be forced gradually to the hottest part. In the ordinary boiler, if the water level is allowed to run low, the entering water comes into contact at once with the hottest parts of the boiler.

The structural features of the White gener-

ator, as well as its lack of resemblance to the ordinary boiler, will be made clear by the following description and by an inspection of Figs. 12 and 13. The generator consists of nine coils of steel tubing placed one above the other and connected in series. If the whole were to be unwound and straightened out, it would be seen that the generator is made up of a single long piece of tubing. In both the Model "M" and Model "O" cars the generator tubing is of one-half inch internal diameter, but the length of tubing differs, of course, for the two models.

Fig. 12 shows diagrammatically the circulation of the water and steam through the generator. It will be seen that the water or steam, in order to pass from one coil to that next below, must be forced up to a level above the top coil and must then pass down again. This feature is an important element in the construction of the generator, as it prevents water from descending by gravity and renders the circulation down through the generator dependent upon the action of the pumps.

In operation, water is pumped into the upper coil and steam issues from the lower coil. The precise point at which the water "flashes" into steam has never been definitely determined, but it probably varies with different running conditions.

There is but a very small quantity of water and steam in the generator at any given moment (in the larger car, the total capacity of the generator is less than one-third of a cubic foot), but the process of making steam is so rapid that steam is always available in the quantity which the running conditions may make necessary. It is also evident that, because of the small capacity of the generator, very little time is necessary for "getting up steam."

The strength of the tubing used in the White generator is greater than can be definitely determined by any available testing apparatus. Prof. R. C. Carpenter, working in the laboratories of Cornell University, found that the tubing withstood a pressure of 18,900 pounds per square inch without showing any signs of rupture. The tests could not be continued with higher pressures, owing to the limitations of the testing apparatus. It should be thoroughly understood, however, that the safety of the White generator does not depend upon the integrity of the tubing. In other words, if the tubing should rupture there would be absolutely no chance of harm to the occupants of the car. There would be no more inconvenience caused by the "giving way" of a White generator while the car was traveling along the road than would result from the breaking of some part of the engine. The late Prof. R. H. Thurston, in discussing this subject, said, "If a rupture is effected, it will not result in anything more serious than a split tube in which the rent acts as a self-provided safety valve." It has already been pointed out that there is comparatively little water and steam in the generator. In this respect it differs radically from all other forms of steam-making devices, for the ordinary boiler, besides being a steam-maker, serves also

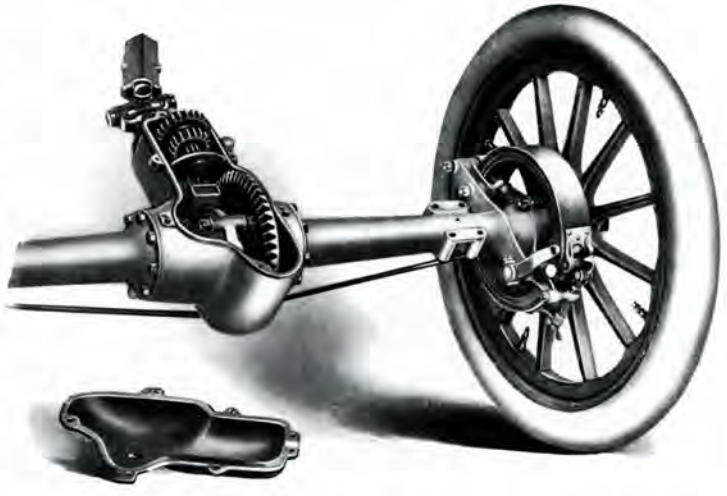

FIG. 14. REAR AXLE AND BRAKE CONSTRUCTION OF THE MODEL "O" WHITE CAR

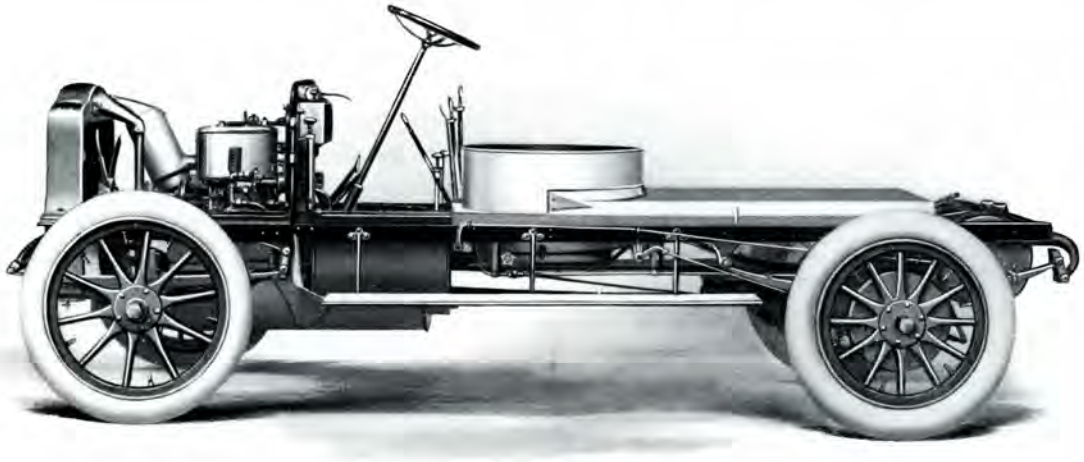

FIG. 15. CHASSIS OF THE MODEL "M" FORTY HORSE-POWER WHITE CAR
The chassis is the same for all the styles of Model "M" cars shown in this catalog

as a reservoir for a considerable volume of both water and steam. The explosion of an ordinary boiler—due generally to the failure of one or more of the hundreds of joints—is dangerous, not so much because of the escape of the steam already formed, but because there is present a very large volume of water which passes into steam as soon as it is relieved of pressure.

There has never been an accident caused by the generator of a White Steam Car—and there are over 6,000 cars of this make in use. Unfortunately, however, other makes of steam cars have been built with ordinary boilers. From time to time accidents to these obsolete types of "steam automobiles" are reported and some people conclude that a White is involved.

No one would judge the gasoline cars of to-day by the characteristics of those built several years ago, yet it is a singular fact that some people entertain a prejudice against the White of to-day based solely on a knowledge that some of the early crude makes of steam cars were unsatisfactory and, in some cases, even dangerous.

HIGH EFFICIENCY

To those who are familiar with the ordinary types of steam machinery, the economy and efficiency of the White engine and the White generator are matters of great interest. Professor Carpenter, in a paper read before the American Society of Mechanical Engineers, reported that the White power-plant (generator, engine and all accessories) develops one actual horse-power for each 14.3 pounds of weight.

Professor Carpenter further reported that, in the extensive tests which he had conducted, the White power-plant showed a water consumption of but 11.96 pounds per horse-power per hour. This record is equaled only by that of the largest triple-expansion condensing engines.

Owing to the high economy of the White engine, it is possible to condense almost all of the steam and, therefore, great mileage is obtained on one filling of the water tank. The exact mileage depends upon the running conditions, but it is a conservative statement that a White car will make any ordinary day's trip on a tank of water.

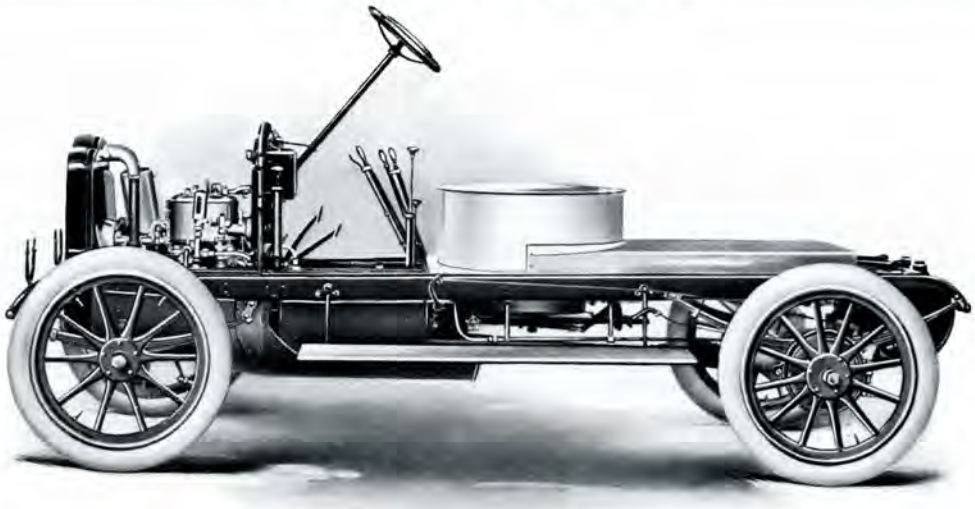

FIG. 16. CHASSIS OF THE MODEL "O" TWENTY HORSE-POWER WHITE CAR
The chassis is the same for all the styles of Model "O" cars except the runabout

THE BURNER

Beneath the generator is located the burner. The fuel, gasoline, is supplied to the burner under a moderate pressure, which is maintained by the air-pump attached to the engine. The fuel first passes through the vaporizer and then, in the form of a gas, enters the burner, where it mixes freely with the air and burns with a blue flame, giving perfect combustion. The products of combustion pass upward through the coils of the generator, which abstract practically all of the heat from them. The gases are then conducted downward through an annular flue surrounding the generator and are conducted to the rear of the car, where they are dissipated without their escape being in any way noticeable—in contrast with the tendency of the gasoline car to leave ill-smelling smoke in its wake.

This difference in favor of the White, as already explained, is due to the fact that the combustion of gasoline alone does not create any objectionable fumes, while the combustion of gasoline and lubricating oil, which takes place within the cylinders of the gasoline engine, results in both smoke and smell.

The generator and the flue surrounding it, as well as the flue beneath the car, are completely insulated with asbestos, and so thoroughly have we worked out this important detail in our new models that those parts of the car which are nearest the generator do not, when touched, give any indication of being even warm. We believe that in the White car the products of combustion from the burner are disposed of much more satisfactorily than are the products of combustion from the cylinders of the gasoline car. In either case, approximately the same amount of heat has to be disposed of, but in the gasoline car additional difficulties are introduced, because the products are smoky and ill-smelling and also because the exhaust must be muffled in order not to offend the ears of the passengers in the car more than necessary.

A simple device used in connection with the burner is the pilot light. While the car is in use, a tiny flame burns here, performing the two-fold function of keeping the vaporizer hot and lighting the burner whenever fuel is supplied to the latter.

The vaporizer is a steel forging with a number of passages bored through it, and the fuel, passing through the vaporizer on its way to the burner,

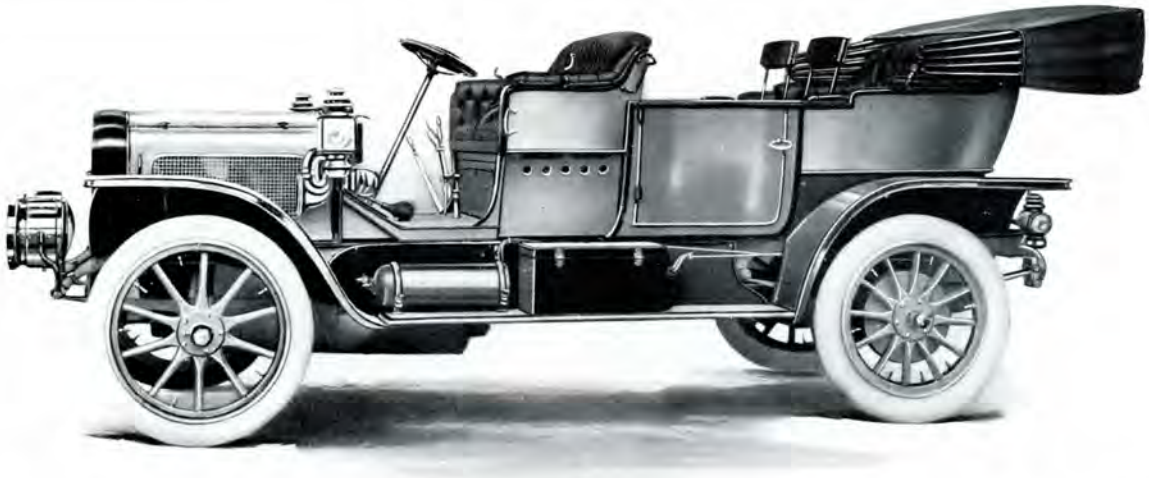

FIG. 17. MODEL "M" FORTY HORSE-POWER WHITE CAR WITH PULLMAN BODY, EQUIPPED WITH CAPE TOP
There is an extra charge for the cape top

is converted by the heat from a liquid to a gas.

In starting the car when perfectly "cold," the first step is to light the pilot light. Within three or four minutes the vaporizer becomes heated and the main fuel supply is then turned on. The steam pressure rapidly mounts up, and, within not more than ten minutes from the time that a match is touched to the pilot light, the car is ready for the road. Thereafter, the car may be left standing for long periods and when the driver is ready to resume his journey, all he need do is to open the throttle and run the engine for a minute or two, when normal conditions of steam pressure and temperature are restored. As already pointed out, there is no operation in connection with the White corresponding to "cranking."

THE REGULATION

The system of regulation, whereby the temperature and pressure of the steam are kept constant without in any way engaging or requiring the attention of the operator, is the same in the new models as in the 1908 machines, except that the water passes first through the regulating devices and then through the feed-water heater, instead of vice versa, as formerly. By this new arrangement the water diverted back to the tank has not had its temperature increased, as the only water passing through the feed-water heater is that which goes to the generator. To describe briefly the scheme of regulating, the supply of water to the generator and the supply of fuel to the burner are so controlled as always to be in perfect balance with each other. As soon as the steam pressure rises appreciably above the normal working pressure, both supplies are at once cut off. As soon as the pressure drops at all below the normal, both water and fuel are supplied in proportionate quantities. The devices which regulate the fuel supply and the water supply are positive in their action, contain no delicate parts and depend for their operation only on temperature and pressure, forces which are absolute in their behavior. External atmospheric or climatic conditions in no way influence the action of the regulating devices. In the gasoline car, as is well known, each change in atmospheric or climatic conditions affects the carbureter.

FUEL AND WATER TANKS

The gasoline tank, made of pressed steel, is hung in a well-protected position between the rear of the frame and one of the cross braces

FIG. 18. MODEL "O" TWENTY HORSE-POWER WHITE CAR, EQUIPPED WITH CAPE TOP
There is an extra charge for the cape top

connecting the sides of the frame. The tank is divided into two compartments, one of them being of much larger capacity than the other. Ordinarily the burner is supplied only from the large compartment. The small compartment thus serves as an "emergency tank," to be utilized in the event of the giving out of the fuel in the other compartment.

The water tank is located under the foot boards on the left hand side of the car, as shown in Figs. 15 and 16.

OTHER STRUCTURAL FEATURES

Hitherto we have spoken only of those features which are peculiar to the White car. In describing those features of the White which are common to all automobiles, such as brakes, axles, wheels, oiling system, etc., it is difficult to do justice to the subject. The specifications of two different automobiles may read much the same, yet as regards suitability for hard service, there may be no comparison between the two. For example, a certain car may have a "shaft drive," but the shaft is set at such an angle as to involve considerable wear at the universal joints and much loss of power. Therefore, when we specify that the White has a shaft drive, we wish to emphasize that the driving-shaft from engine to rear axle is horizontal and that the universal joints have practically no work to do. Similarly, while almost every machine has "two independent sets of brakes," one must compare the unusually large brake surfaces on the White with the corresponding parts in other machines to fully appreciate this feature of the White car. Moreover, it is difficult in a printed description to give an adequate idea of many other White features, such as the extreme luxury of the upholstering and the refinement of every detail of body construction.

In short, the correct designing of the many parts entering into the construction of an automobile and the proper solution of the thousand and one problems arising within the factory, such as the correct selection of special steels for the various parts and their proper heat-treatment, can be expected only from companies which have been building cars in large quantities for a number of years. In this connection we would again point out that, during the nine years that the White Steam Car has been before the public, we have built more large touring cars than any other concern in the country. The purchaser of a White, therefore, receives the benefit of an experience in designing and building not obtainable elsewhere.

FIG. 19. MODEL "M" FORTY HORSE-POWER WHITE LANDAULET, $5000
Equipped as shown above

OTHER PHASES OF WHITE DESIRABILITY

IN THE preceding pages we have spoken only of the mechanical features of the car, but there are additional factors which should incline the purchaser toward the White. First of all is its splendid record of successful every-day service in the hands of thousands of private owners. It is difficult to secure exact statistics regarding the mileage and service secured by automobile owners as a class, but every indication justifies the statement that a far greater percentage of the owners of White cars go on long, hard tours than is the case with owners of any other make of car, and the White is driven over the country roads a little later in the fall and a little earlier in the spring than other cars. It is a matter of record that a majority of the pioneer tours into regions previously unknown to motorists have been made by owners of White cars.

Another factor to be kept in mind is the remarkable record of the White in public contests Its victories in hill-climbing have been so persistent that most, if not all, the events in hill-climbing contests are "open for gasoline cars only." In reliability and endurance contests the record of White victories is practically unbroken, and it may be said of these contests in general that the more severe the conditions and the more rigid the rules, the more impressive has been the performance of the White.

The fact that the White is the only American car which is sold in quantities in foreign countries is of considerable significance, as is the very decided preference shown toward the White by the government authorities in this country.

Finally, we would call attention to the far-reaching scope of our organization. Besides our own branch houses, we have agents in every important city, so that the White tourist, wherever he may be, is assured of receiving the best of service.

FIG. 20. MODEL "O" TWENTY HORSE-POWER WHITE LANDAULET, $2900
Equipped as shown above

TOURING BUREAU OF THE WHITE COMPANY

OWING to the fact that there are more White cars in use than of any other make and also to the fact that all White owners are distinguished for their ceaseless touring activities, this company maintains a Touring Bureau for the collection and distribution of touring data. An important phase of the work of this bureau is the issuing of the White Route Books, which give detailed road directions for important touring routes. The White Route Books are conceded by all to be the best of their kind ever issued. Seven numbers of the White Route Book have been issued, covering the following routes:

No. 1—New York to the Berkshire Hills via Poughkeepsie and return by way of Hudson, Kingston, Newburgh and Tuxedo.

No. 2—New York to Norfolk, Va., including the route to and from Philadelphia, Gettysburg, Harrisburg, Hagerstown, Winchester, etc.

No. 3—New York to Boston and Boston to New York.

No. 4—Philadelphia to Cape Charles and Baltimore to Halltown.

No. 5—Buffalo to Albany, Albany to Buffalo, New York to Albany, Albany to New York, and Albany to Quebec.

No. 6—Philadelphia to Savannah via Hagerstown, Wheeling, Cincinnati, Louisville, Nashville and Atlanta.

No. 7—Chicago to Niagara Falls and return, Harrisburg to Cleveland and Pittsburg to Washington, Pa.

Copies of these route books will be furnished, without charge, on application to the home office, to any of the branches or agencies of this company, or to the Touring Bureau of THE WHITE COMPANY, 1402 Broadway, New York.

SPECIFICATIONS MODEL "M" WHITE STEAM CAR

40 Steam Horse-Power

Diameter of High-Pressure Cylinder	3 inches	Front Springs	44 inches
Diameter of Low-Pressure Cylinder	5 inches	Rear Springs	56 inches
Stroke	4½ inches	Hand Brake—Internal expanding brake acting within drums on rear wheels.	
Internal Diameter of Generator Tubing	½ inch	Foot Brake—External contracting brake acting on drums on rear wheels.	
Wheel-Base	122 inches	Gasoline Tank Capacity	22 gallons
Front Tires	36x4 inches	Water Tank Capacity	18 gallons
Rear Tires	36x5 inches	Minimum Clearance	10½ inches
		Body	See Illustrations

Regular equipment consists of acetylene lamps, prestolite tank, lamp brackets, piping, tire holders and coat rail.

SPECIFICATIONS MODEL "O" WHITE STEAM CAR

20 Steam Horse-Power

Diameter of High-Pressure Cylinder	2½ inches	Front Springs	37 inches
Diameter of Low-Pressure Cylinder	4¼ inches	Rear Springs	45 inches
Stroke	3 inches	Hand Brake—Internal expanding brake acting within drums on rear wheels.	
Internal Diameter of Generator Tubing	½ inch	Foot Brake—External contracting brake, acting on drums on rear wheels.	
Wheel-Base	104 inches	Gasoline Tank Capacity	15 gallons
Front Tires	32x3½ inches	Water Tank Capacity	13 gallons
Rear Tires	32x3½ inches	Minimum Clearance	10 inches
		Body	See Illustrations

Regular equipment consists of acetylene lamps, prestolite tank, lamp brackets, piping and coat rail.

All prices herein quoted are F. O. B. Cleveland

W A R R A N T Y

ALL the parts of the White Steam Car, Models "M" and "O," are waranted by the seller against defects in workmanship or material, for the season of 1909, ending December 31, 1909, as follows:

Upon the return to that office of The White Company from which the car was purchased (the said offices being as follows: The Home Office, at Cleveland, Ohio, and the branch offices at New York, Chicago, San Francisco, Boston, Philadelphia, Cleveland, Pittsburg, Atlanta and London) of any broken or defective part within said period, transportation prepaid, the same will be repaired or a corresponding new part will be supplied free of charge, f.o.b. said office, if, upon inspection, the failure of said part is shown to be due to defect in material or workmanship, and not due to abnormal use, misuse, neglect, or accident; but we assume no responsibility for any labor or damage of any kind except as above provided.

We make no warranty whatever with respect to tires, rims, gauges, lamps and other equipment not manufactured by us.

The condition of this warranty is such that if the motor vehicle to which it applies is altered or repaired outside of our factory, offices, or distributing points, our liability under this warranty shall cease.

The purchaser understands and agrees that no warranty of any kind, of White Steam Cars, is made or authorized to be made by The White Company other than that hereinabove set forth.

THE WHITE COMPANY