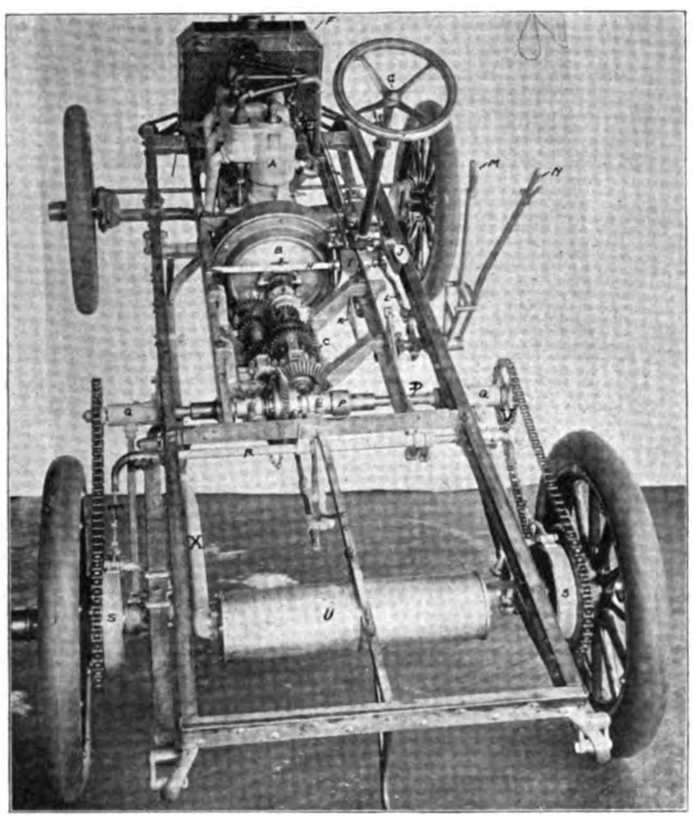
THE NEW 3-CYLINDER THOMAS TOURING CAR.

By GEO. H. KAUFMAN.

The coming year will show great advances in the mechanical construction of automobiles, both in their reliability, durability and economy.

The new Thomas Flyer is known as model 22 and has been designed with a view to elegance in appearance, ample power for all emergencies and especially to ride easily without vibration or noise. It has unusual speed for a touring car, which will be thoroughly appreciated by the enthusiast, who enjoys a rush through the country air occasionally, so as to feel the delightful sense of the powerful steed of steel beneath him leaving city, crossroad and telegraph pole rapidly behind him, as it speeds along almost silently and under his perfect control.

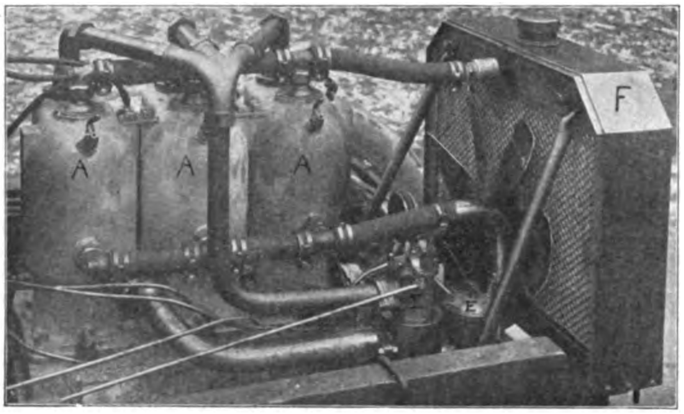


Plan of Chassis.

A, Engine. B, Clutch. C, Transmission Gear. D, Counter Shaft. E, Carbureter. F, Radiating Coil. G, Steering Post. H, Clutch Shifter Shaft. I, Clutch Pedal. J, Brake Pedal. K, Gear Shifter Latch Segment. L, Emergency Brake and Clutch Throwout. M, Brake Control Lever. N, Gear Control Lever. P, Counter Shaft Coupling. Q, End Journal. R, Emergency Brake Shaft. S, Emergency Brakes. T, Emergency Brake Cable. U. Muffler. V, Drive Sprocket. X, Exhaust Tube. Y, Z.

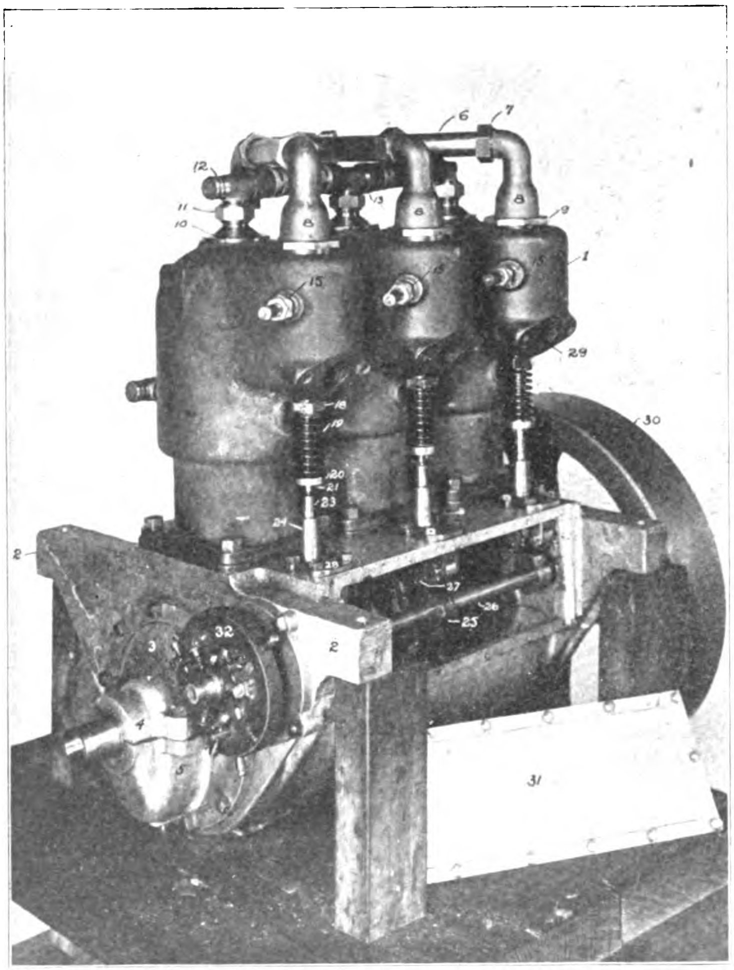
The main idea in the design of the new Thomas, which is manufactured by the well known E. R. Thomas Motor Co. of 1901 Niagara street, Buffalo, N. Y., has been to obtain the lightest possible weight per horsepower consistent with strength and ability to resist wear and tear. Light weight and high power means speed and capability of climbing any hill with ease and rapidity, the consumption of only a small amount of gasoline per mile run, and a very great decrease in the wear and tear on the tires, and not nearly so much liability of punctures, which is one of the most annoying things an automobilist has to contend with. It is also considered that the light car will not side-slip, and, if it does start, will not skid so badly, and be much more easily controlled than a very heavy one. The weight is 2,000 pounds, which, with the 24 horsepower of the motor, gives a horsepower for every 85 pounds of weight, which is believed to be a decided advance in American motor car building. The car seats five persons comfortably and lists at $2,500.

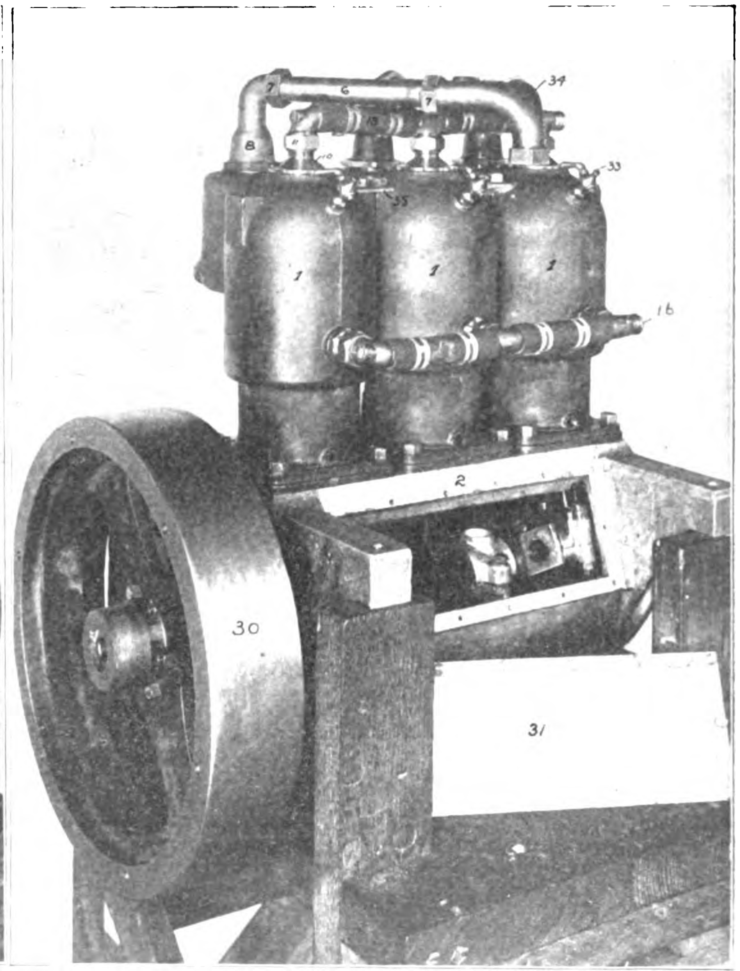
In general the car follows the lines of some of the latest European and American machines, with many special features and details of construction devised by the Thomas Company from their extended experience in manufacturing automobiles. The 3-cylinder motor has been adopted for some of the following reasons: It is believed to be simpler than using 4 cylinders, and still gives a very steady turning motion, while exceedingly light in weight for the power developed. As a precedent for its use and value its employment in some of the latest French and English models of Panhards, Napiers and other makes is cited. In the 3-cylinder engine the three crank throws are set 120 degrees apart, so that there is no dead center and the rotating parts are balanced and counterbalancing weights are dispensed with. The explosions at every two-thirds of a revolution give high, steady speed on level or hill, and the engine vibration is reduced to a minimum at any speed.



Enlarged View of 3-Cylinder Engine, Radiator and Fan.

The mechanical transmission of the car is from the vertical 3-cylinder engine in front, by a self-contained fly-wheel clutch to the change speed box, with a sliding transmission gear, three forward speeds and reverse, universal joints being employed between it and the fly-wheel and on the coun-





The Engines.

(1) Cylinder. (2) Crank Case. (3) Journal Boxes. (4) Journal Cap. (5) Oil Reservoir. (6) Inlet Gas Tube. (7) Inlet Gas Tube Nuts. (8) Inlet Gas Dome. (9) Inlet Dome Nut. (10) Water Outlet Dome. (11) Water Outlet Nut. (12) Water Outlet T. (13) Water Outlet Tube. (14) Water Outlet Tube Connections. (15) Spark Plug. (16) Water Inlet T. (17) Water Inlet Tube. (18) Exhaust Poppet Guide. (19) Exhaust Poppet Spring. (20) Exhaust Poppet Spring Seat. (21) Exhaust Poppet Key. (22) Exhaust Poppet. (23) Exhaust Plunger Rod. (24) Exhaust Plunger Guide. (25) Exhaust Cam. (26) Exhaust Cam Shaft. (27) Exhaust Rocker Arm. (28) Exhaust Rocker Arm Bracket. 29. Exhaust Port. (30) Flywheel. (31) Base Cover. (32) Spark Controller. (33) Relief Cock. (34) Inlet 3-Way Ell. (35) Cylinder Tie Plates.

tershaft, which is bevel gear driven, and by double chain drive to the rear wheels.

The speed that the car is capable of is 50 miles an hour, taking all ordinary hills on the high speed direct drive.

The illustrations show the well thought out design of the car plainly and the figures and letters all the various parts of the mechanism.

Fig. 1 is a complete plan of the chassis and machinery; Fig. 2 is a side elevation of the chassis from the inlet valve side of the engine and Fig. 3 a side elevation from the exhaust and side of engine. Fig. 4 is a view of the engine along exhaust valve side, and Fig. 5 the engine from the other side. Fig. 6 is the sliding transmission with mechanism exposed, and Fig. 8 is an enlarged view of inlet side of engine, showing honeycomb radiator, cooling fan, carbureter and piping.

The Frame.

The main frame as seen in the engraving, is built of steel plate with angle steel securely riveted at both the top and bottom to give it increased strength. It is three inches wide in the center and gradually tapers toward the end, where are fitted forged steel spring supports. The transverse members are angle steel firmly riveted. The two cross sections of steel in front, support the motors and gear box. The rear cross section supports the muffler, transmission control and rear step. The front end of the frame curves to make a clip for the springs. The frame is light but exceedingly strong and able to withstand the roughest usage.

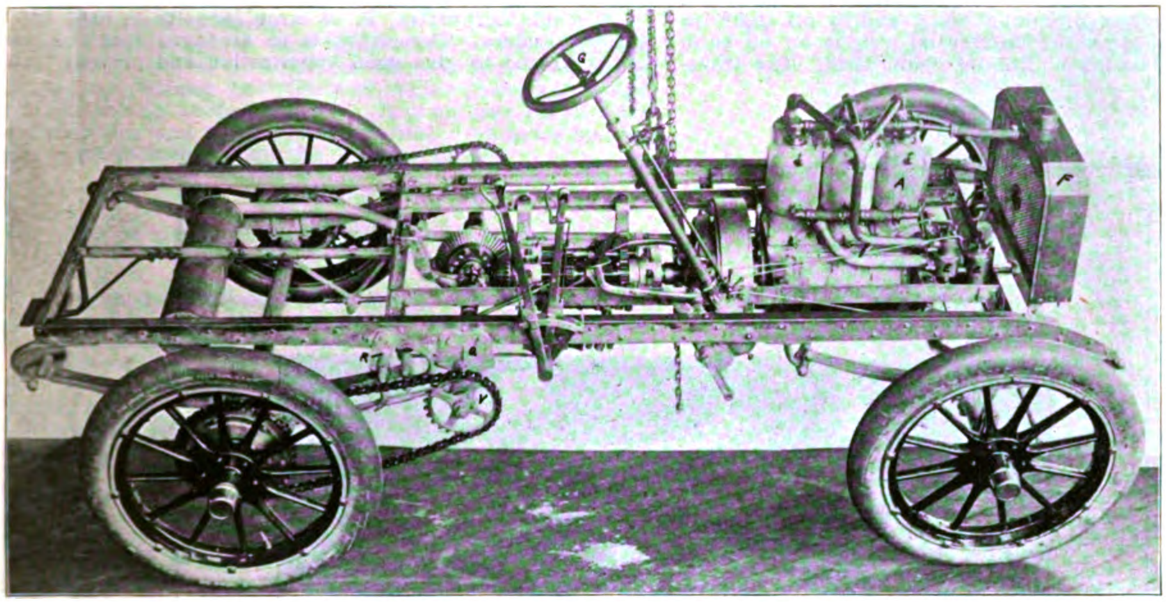
The springs are semi-elliptical and are made from the best steel, oil tempered expressly for this purpose, and with resilience enough to render the car exceedingly easy riding. The wheels are of the Salisbury wood artillery pattern, 32x4 inches, fitted with dust proof Timken roller bearings. They are fitted with 32x4-inch detachable tires, this large size having been very wisely determined upon so as to obviate punctures and wear and tear. It is a good point.

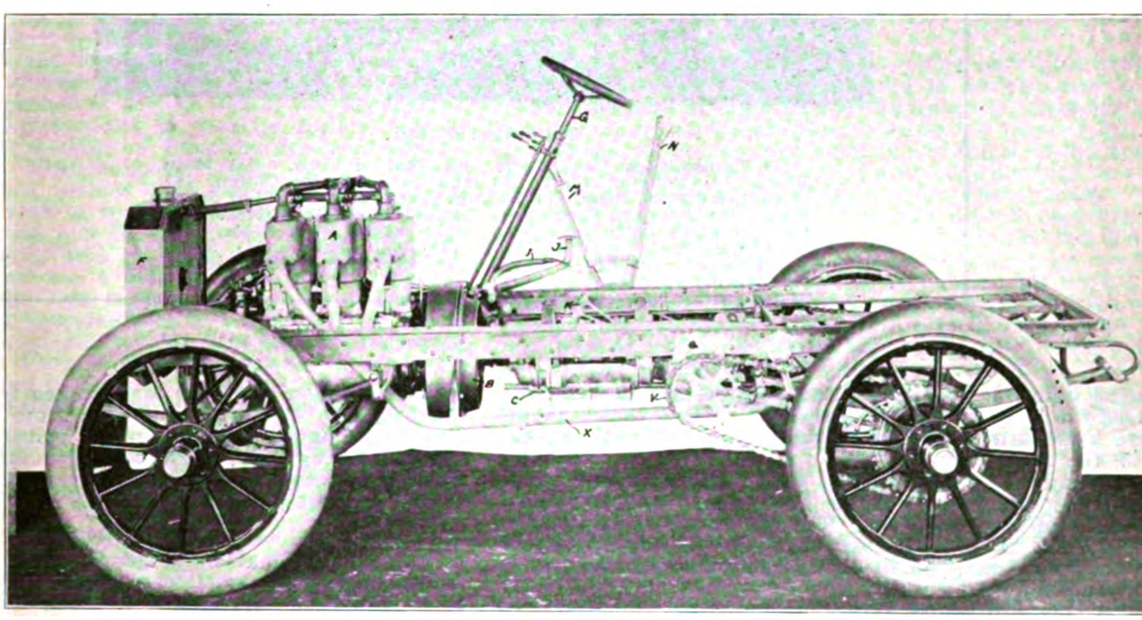
Axles.

The axles are unusually strong and are both made of tubular forged steel 2¼ inches in diameter. The spindle on the rear axle is 9½ inches long and has double roller bearings. The chain from the counterbalance runs between so that there may be as little friction as possible. The front axle curves downward to accommodate the motor base. This curve is the lowest point on the car, clearing the ground by 10 inches, bringing the center of gravity low. The steering knuckles are extra large, drop forged, a valuable feature, as everything depends sometimes on the steering gear. Hardened steel ground pin and bushings, which prevent and save wear, are used. The wheel base is long for comfort—84 inches, and the gauge 56½ inches.

The Engine.

The engine (A Fig. 1) is of the 3-cylinder vertical type as before stated. The cylinders are each 4½ inches bore to absolute size also. It has 5 rings which are machined perfectly accurately on the 3 wearing surfaces, top, bottom and circumference. The four rings on the upper end are compression rings and the fifth at the lower end aids in the proper lubrication of the cylinder, preventing fouling. The wrist pin in the cylinder is case hardened and ground true. The connecting rod is cast steel. The upper bearing is bronze, arranged to take up any wear easily. The lower bearing is bronze and babbit. The crank axles are of forged steel. The crank throws are bored out and drilled through, oil can come through to lubricate the bearings. The cylinders are mounted on a cast aluminum alloy base, 2. This base is mounted on two cross sections of the frame. The aluminum case is very light, but tough and strong. All the





Side Views of Classics.

A, Engine. B, Clutch. C, Transmission Gear. D, Counter Shaft. E, Carburetor. F, Radiating Coil. G, Steering Post. H, Clutch Shifter Shaft. I, Clutch Pedal. J, Brake Pedal. K, Gear Shifter Latch Segment. L, Emergency Brake and Clutch Throwout. M, Brake Control Lever. N, Gear Control Lever. P, Counter Shaft Coupling. Q, End Journal. R, Emergency Brake Shaft. S, Emergency Brakes. T, Emergency Brake Cable. U, Muffler. V, Drive Sprocket. X, Exhaust Tube.

by 5½ inches stroke, developing 24 horsepower. Each cylinder is cast separately. The head is part of the casting. It has no gasgets, the joints being ground to make a perfect union. The cylinder and valve chambers are amply water-jacketed. The intake valves at 8 are just over the exhaust valves at 18 and are easily accessible. The spark plugs, 15, screw into the valve chamber in such a position as to get a free flow of fresh gas at all times, and do not foul easily.

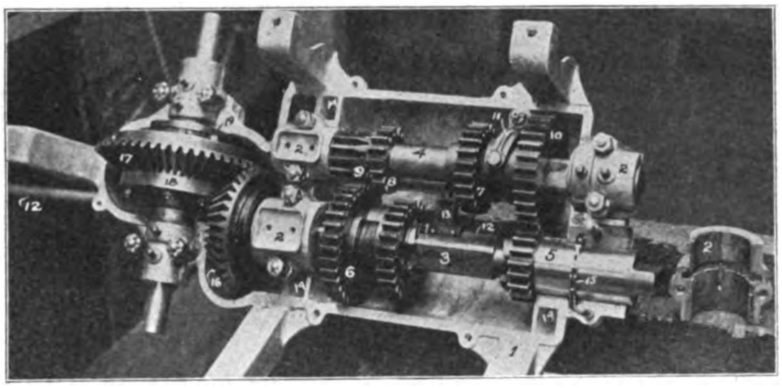
The mechanical work on the cylinder and piston is absolutely accurate. The cylinders are bored to a size correct to 1-200 of an inch and are then ground and lapped to absolute accuracy. The piston is turned, ground and lapped parts of the engine, valve mechanism, commutator, gasoline and water piping, are clearly shown and the numbers indicate each by reference to the caption.

Lubrication.

The crank shaft has four bearing supports. The two bearings outside the crank case are chain oiled. The two inner ones are oiled by splash lubrication. The oiling of the cylinders is force and sight feed. The force feed comes from the exhaust through a tube, and a hot water tube is also provided to keep the oil sufficiently fluid in cold weather, thus insuring perfect lubrication.

Transmission and Clutch.

The transmission, C, is by sliding gears, three speeds forward and reverse and grand direct when on the high speed. The fly-wheel, 30, with flange weighs 120 pounds. Two portions of the female part of the cone clutch are bolted to the fly-wheel direct. The transmission clutch, B, is self-contained in the fly-wheel and operates without exerting end thrust. This feature adds greatly to the life of the car. The clutch spring is adjustable. The clutch is never engaged unless the transmission gears are perfectly in mesh. By means of the safety device, the clutch must be disengaged before a change of speed gears is made, so there is no chance of stripping. The gears used in the transmission are milled from solid steel, all teeth are one inch face and six pitch. The journals are tempered, ground and hardened. The case is cast from aluminum alloy and is oil tight, so that all gears, including the differential, run in an oil bath. The four outside bearing points are chain oiled. The transmission oiling arrangement is so certain that the machine can be run 1,000 miles with one oiling. Fig 6 shows all the speed gear parts, which are numbered and refer to the key below the view.



Transmission Gear.

(1) Transmission Gear Case. (2) Journal Caps. (3) Main Shaft. (4) Counter Shaft. (5) High Speed Pinion Clutch. (6) High Speed Shift Gear. (7) Medium Speed Gear. (8) Slow Speed Gear. (9) Reverse Gear. (10) Counter Shaft Shift Gear. (11) Counter Shaft Shift Gear Yoke. (12) Gear Shift Rod. (13) Gear Shift Rack. (14) Oil Well. (15) Oil Chain. (16) Small Bevel Gear. (17) Large Bevel Gear. (18) Compensating Gear. (19) Thrust Bearings.

The power is transmitted to the countershaft D through two bevel gears, the one in the differential being of bronze, the other of hardened steel. The end thrust in each direction is taken up by large ball bearings. On the high speed the drive is direct, the secondary shafts being idle, saving noise and power.

The universal coupling between the clutch and transmission, and also one on either side of the differential in the countershaft, are for the purpose of counterbalancing any spring of the frame due to uneven roads. The countershaft D is supported at both ends by a large roller bearing box, dust proof.

The transmission of power to the rear wheels is by two chains of detachable roller link construction of ample size. The steel sprockets are interchangeable to suit fancy of the owner for speed or extreme hill climbing.

All axles of the motor, including the fly-wheel, all gearing of the transmission box, differential and the countershaft can be removed without disturbing the alignment and boxes.

Braking System.

Each car is equipped with four brakes, two on the countershaft and two on the rear wheels, S S. The two on the countershaft are applied by the right foot, pedal J, which throws out the clutch at the same time. All four brakes are applied at the same time by the emergency brake lever, which also throws out the clutch first. The system works equally well on the reverse.

Water-Cooling System.

The car is equipped with a honey-comb radiator, F, and fan and gear-driven pump off the main shaft, shown in the enlarged views, Fig. 8. The water capacity is five gallons and the plan of the water piping is shown plainly.

Ignition.

The jump spark system, using coil and batteries, is employed. The extra spark gaps are on the dashboard, facing the operator, so he can see at once if one cylinder is not firing properly.

Carbureter.

A single carbureter, E, of large capacity is used for the three cylinders. The piping is so arranged that the intake air is heated to give good vaporization and prevent trouble in cold weather. The hot air is taken from the cylinder at the exhaust. The inlet tubes run from the carbureter and divide into three branches to the cylinder, entering at the top of each cylinder, while the three exhausts can be seen running out from the side of the cylinders below the inlets to the exhaust pipe X.

Steering Device.

The Hindly light worm gear system is used, the worm being concave so that it can engage six teeth at one time. It is adjustable for any wear. Both the worm and sector are fully encased and running in oil, and the arrangement is exceedingly strong and rigid.

The dash is of a peculiar construction, curved at the top and sides. The coils, the force feed lubricator, extra spark gaps and the switch are housed under this dashboard.

The gasoline capacity of the tank is 15 gallons. It is under the driver's seat. In front of the dash is a small tank holding three gallons, which is fed through a tube from the main tank.

The starting crank is in front and the muffler, U, is bolted on the frame in the rear. It is of ample size and very noiseless, without noticeable back pressure.

The chains are tightened by a radius rod running on the rear axle between the two sets of roller bearings.

Body.

The body is of the king of Belgium type. The tonneau is extremely roomy, seating three full-grown people comfortably. The third seat is hinged to the door, lifting up against it out of sight when not in use. When let down in position it locks the door effectually. The backs of the seats are unusually high. The front seats are individual and are wider and deeper than is ordinarily seen. The upholstering is of hand-buffed leather, deeply tufted, with heavy roll on the edges.

The finish is of the highest coach quality, not less than 16 coats of color and varnish being used.

The car is artistically trimmed with brass moldings and rails. Accessibility has been made a feature of these cars. All the mechanism can be quickly reached. The engine hood is hinged through the center, so that both sides can be raised or removed entirely, giving perfect access to the motor, carbureter and other parts. The transmission is under the driver's feet and is also easily accessible. Those who have driven cars much will appreciate the advantages of getting at everything easily.

This Thomas model has been cleverly designed and shows much progress in American manufacture. The car is light, but very strong, has plenty of engine power and speed, but is under most perfect control. It is an easy car to drive and manipulate and will certainly become even more popular than its predecessors from the Thomas factory.

The Ignition of Gas in Explosive Motors.

Part II. By M. R. Arnoux.

This method comprises two schemes. The first is by an incandescent tube, the use of which is disappearing even for stationary motors, and the second is by a spiral of platinum wire rendered incandescent without the explosive chamber of the cylinder by the passage of a current of suitable strength, as proposed and employed by Sir William Siemens in 1879 and re-introduced by M. Wydts under the name of electro-catalytic ignition.

Ignition by incandescent tubes has two faults. First of all, the chances of fire due to the employment of burners under air pressure for maintaining the incandescence and the almost complete impossibility of satisfactorily advancing the spark, which as before shown has a great influence upon the amount of work obtainable from the explosion in the cylinder. It has been sought to vary the advance by the employment of tubes of refractory earths of sufficient length to altar the advance by displacing along the tube the zone of incandescence produced by the burners.

The adoption of the four-cycle system, with prior compression, proposed by Beau de Rochas in a note under date of Jan. 7th, 1862, and applied in 1876 by Otto to his gas engines, and generally employed to-day in gasoline motors, has reduced the numerous methods of firing the explosive mixture to two: First, by incandescence; second by the electric spark. But the tubes, besides being very fragile, are at the mercy of the least blow of wind as far as the zone of incandescence is concerned, and the regulation is far from easy. On the other hand, ignition by incandescence, as compared with electric ignition, has a very valuable quality; namely, it is remarkably sure and regular. Ignition by a platinum spiral maintained at incandescence within the cylinder has in consequence the advantage over tube ignition of obviating all danger of fire, but there is the same trouble in not being suitable for advancing the spark. M. Wydts, who has experimented with this system of sparking, has sought to provide for the advancing of the spark by displacing the platinum spiral in the tube which contains it and in its relation to the explosive chamber. But the difficulties of making this shifting of the spiral while keeping it absolutely air-tight have prevented success in this direction. In fact, in this method, like that of the incandescent tube, the least leakage is sufficient to stop the spark. With the tube it is necessary to reduce the spark advance to a minimum when starting the motor to escape a back-fire. The governing system in which the degree of compression is varied cannot be employed with this system of ignition. Furthermore, if, through leaky valves, the compression of the mixture falls to a point where the inflammable gases do not enter into contact with the incandescent part, there is no ignition. Finally, the slowness with which the spiral is heated by the current and the necessity of a continuous flow make the volume required much greater than with an electric spark igniter which will now be described.

Electric Ignition.

Sparking by electricity comprises two principal systems. First. Ignition by sparks jumping between the metallic points of a plug. Second. Ignition by a spark, caused by breaking the circuit, within the cylinder, of the current furnished by a magneto driven by the motor. The application to explosive motors of ignition by a spark jumping between the points of a plug dates back to the year 1859. It is due to Lenoir, who used a Ruhmkorff coil with vibrator to produce this spark. The spark leaps between the points of a plug, insulated with porcelain, which is almost identical in appearance with our modern plugs. We have examined one of these Lenoir plugs in which the porcelain was placed beside the points, one part of it being enamel, and in bell-shape, looking singularly like the construction of recently patented models. As the first Lenoir motor was a double action one, necessitating the employment of two plugs, a spark distributer placed in the secondary circuit of the coil, which operated continuously, acted as the distributer of the spark at the proper moment to each of the plugs. Considering the slow

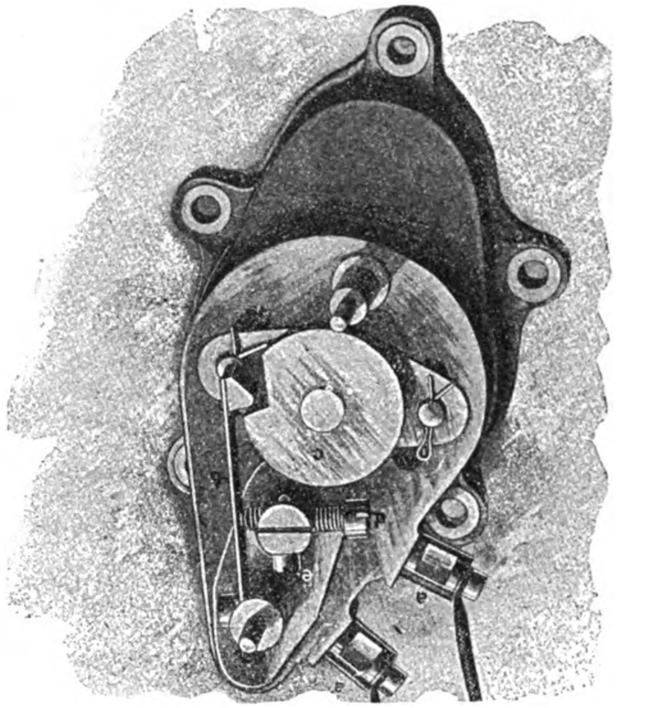


Fig. 3.

speed of Lenoir's first motor, this system gave good results, but his system has been abandoned in modern high speed motors, because of the continued variations in the moment of ignition, to which it gave rise, because the vibrator did not furnish sparks at the same point of the travel of the piston, the sparks themselves jumping at a variable distance between the metallic pieces of the vibrator, before their contact. Furthermore, this system required a very careful insulation of these pieces. These troubles disappeared when the distributer, or rather the igniter, as it is termed to-day by common usage, operated no longer on the secondary, but instead on the primary of the induction coil, which appears to have been applied also for the first time by Lenoir in 1883 in his second type of motor employing four cycles with compression. In this last arrangement of Lenoir's the inductive circuit is closed by a cam boss touching a spring at the required moment, which renders the consumption of current much more economical, because it is only used at the exact moment necessary for ignition. It is also on this same motor of Lenoir's of 1883 that we find the first idea of an arrangement for advancing the spark, but it is to De Dion and Bouton that we are indebted for the first practical application of the spark advance in 1894 to gasoline motors, and that, too, in such a simple and practical form that it has not been sensibly changed since that time, as can be seen by Fig. 3, which represents the first model of a variable spark advance invented by these constructors in 1894-95. In the model the contact and break of the primary current of the induction coil are produced by an elastic spring (b) which vibrates and comes into contact with the platinum point of a contact screw, when the point on the end of the vibrating spring falls into the notch arranged in the circular cam (c), which is suitably attached to the rod which operates it by the exhaust valve system. This arrangements acts in the double roll of igniter and vibrator if a condenser is placed in shunt between the terminals (a) (a') similar to those used on the electro-magnetic vibrator, which is then dispensed with.

The Contest Committee of the Automobile Club of America beg to announce that on March 15th and 16th, 1904, the Club will hold a contest for commercial vehicles of the light and heavy types.