New Vehicles and Parts.

The 1906 Thomas Car.

The 1906 model of the E. R. Thomas Motor Company is a development of the company's last year's four cylinder car, embodying a number of improvements in detail, notably the adoption of Hess-Bright ball bearings in the transmission and on the axles. The engine is of 50 horse power nominal capacity. The change speed gear gives four forward speeds and one reverse, and the drive to the rear axle is by side chains.

ENGINE CONSTRUCTION.

The engine is a four cylinder one, of 5½ inches bore and stroke. The cylinders are cast separately, but integral with valve chambers, heads and jackets. The aluminum crank chamber is cast in two halves, the upper half being formed with four arms, by which the motor is supported on the main frame. The bearings for the crank shaft, five in number, are carried by the upper half of the casing, the lower half serving only as an oil well and a dust protector. The connecting rods are steel drop forgings, bushed with bronze at the wrist pin ends. All the other engine bearings are babbitted. The two outside bearings of the crank shaft are provided with large oil wells and chain oilers, which will operate for 1,000 miles. The bearings at both ends of the connecting rods are adjustable. The wrist pins, as well as the crank pins, are made hollow, the object being to secure lightness, and at the same time to aid in the dissipation of heat and the lubrication of the bearings. The wrist pin and crank pin bearings receive lubricant both from the inside and from the outside.

The inlet and exhaust valves are both mechanically operated, and are interchangeable; they are located on opposite sides of the cylinders. There is a separate covering for each cam, while the parts of the cam shaft between cams are exposed. Between the cam and push rods is inserted a short arm lever carrying the cam roller, these arms being pivoted in the housing for the cams. The two cam shafts are driven from the forward end of the crank shaft through fibre and cast steel gears, semi-enclosed. The drive of the cam shafts is direct, without intermediate pinions. The cam shaft bearings are babbitted and the forward ones are lubricated by means of grease cups, while the rest receive their lubrication from inside of the crank chamber. The caps over the valves are clamped in place by means of I section drop forged yokes. The heads of the water jackets are rounded, but the heads of the cylinders proper are flat.

The carburetor is located on the right hand side of the crank chamber, and connects to the inlet valves by a cast brass inlet manifold. The air for the carburetor is drawn in between the two rear cylinders, whereby it is heated to a slight degree. The throttle valve is formed integral with the carburetor, and is operated by a knobbed lever on the steering wheel through a pair of mitre gears. The gasoline tank, which has a capacity of 17 to 20 gallons, is located in the front seat.

IGNITION.

The ignition is on the high tension system, with spark plugs screwed into the sides of the inlet valve chambers. The commutator is located on the dashboard, in direct view of the driver. It is driven from the end of the exhaust cam shaft through bevel pinions, a short vertical compensating shaft and a pair of universal joints. The same sort of mechanism is used to drive a mechanical oiler on the dash from the inlet cam shaft. The high tension cables are led through a fibre tube on top of the cylinders, and the rest of the wiring is enclosed in copper tubes. The system of ignition is that known as the synchronized system, a high tension commutator being combined with a low tension interrupter, which combined instrument is attached to the dashboard and driven from the rear end of one of the cam shafts, as above described. The device is of cylindrical form, the rear portion being the interrupter and the forward portion the high tension commutator. The interrupter consists of a spring pressed square plunger mounted in a brass guide with removable cap, which rod in its revolution makes contact successively with four contact points or sectors secured in the hard rubber insulated housing. The device has five terminals, all of which are located on its cylindrical outer surface. Only a single coil is used, and the current for ignition is supplied by a storage battery carried on the step. The time of ignition is controlled by a lever on the steering wheel, where is also arranged the lever for operating the throttle valve.

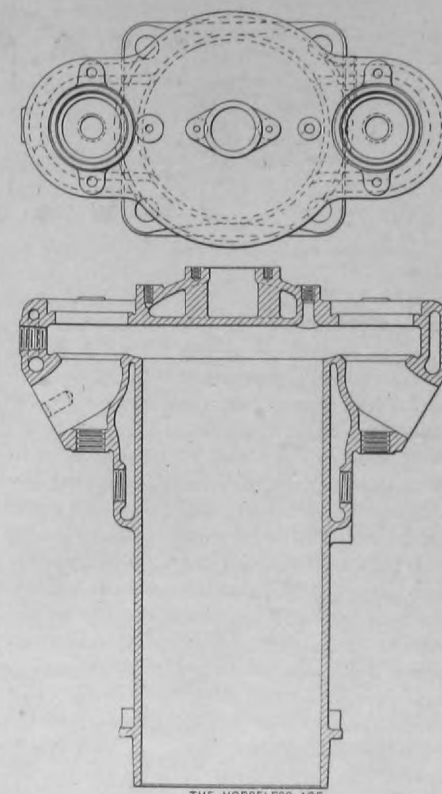


FIG. 2.—TOP VIEW AND SECTION OF CYLINDER.

COOLING APPARATUS.

Forced circulation is employed, and a cellular radiator of well known American make is provided at the forward end of the hood. It is carried upon the frame by a cold pressed steel cross member, secured to steel brackets, and is additionally secured by means of brace rods, provided with turnbuckle adjustment, these rods running between the upper portion of the radiator and the frame side members. The

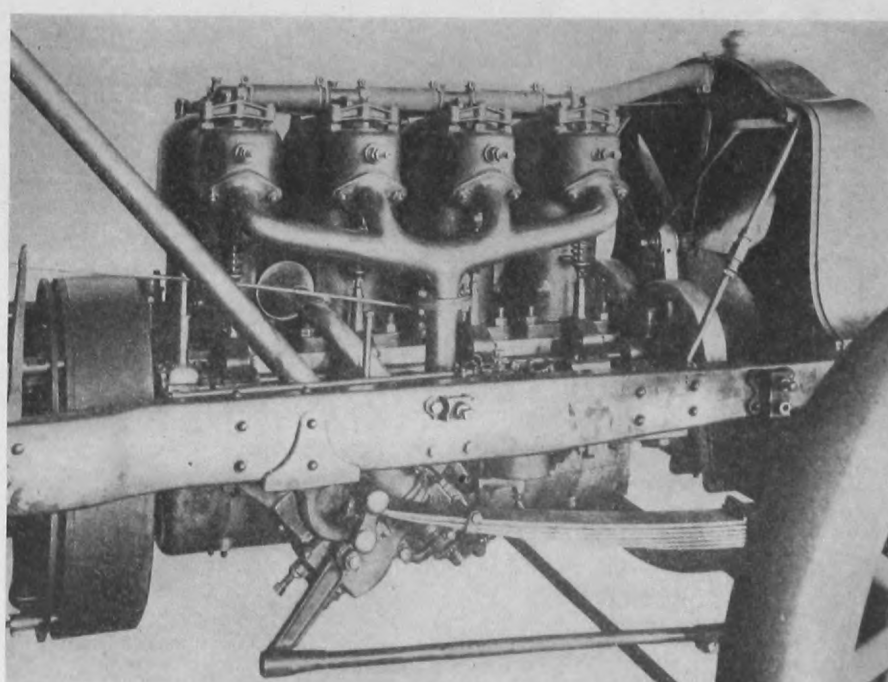


FIG. 1.—THOMAS ENGINE ON FRAME.

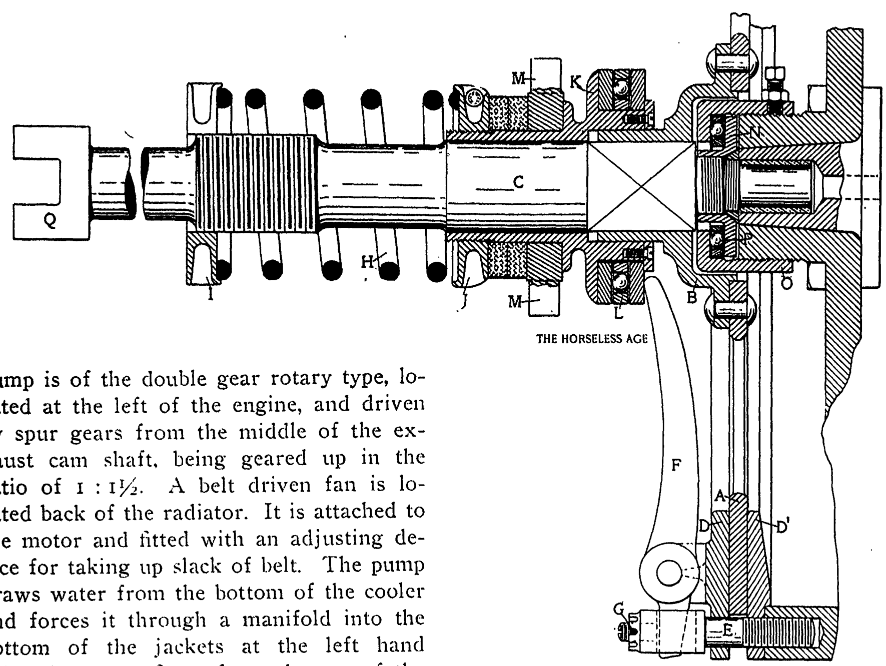


FIG. 3.—CLUTCH.

pump is of the double gear rotary type, located at the left of the engine, and driven by spur gears from the middle of the exhaust cam shaft, being geared up in the ratio of 1 : 1½. A belt driven fan is located back of the radiator. It is attached to the motor and fitted with an adjusting device for taking up slack of belt. The pump draws water from the bottom of the cooler and forces it through a manifold into the bottom of the jackets at the left hand side; the water flows from the top of the jackets to the top of the radiator through brass manifold outlet connections and a final connection of rubber hose to the radiator. The cylinder relief cocks are located over the exhaust passages, and can all be opened and closed simultaneously by means of a pull ring located at the front of the radiator. A coiled spring located back of the radiator automatically closes the cocks after the driver releases his hold of the ring. The exhaust from the engine is carried through a cast steel manifold with longitudinal cooling flanges, and through an exhaust pipe with easy curve to the muffler, which is located alongside of the change gear box at the left hand side. The muffler consists of four expansion chambers arranged in series. A cut-out is inserted in the muffler pipe just before it enters the muffler, which can be actuated by means of the foot button. The muffler is supported by steel straps attached to the side member of the frame and the gear box.

The engine is lubricated by means of a mechanically operated sight feed oiler with six feeds, secured to the dash at the right hand side, in plain view of the driver. One of the feeds leads to each one of the cylinders, the other two lead to the crank chamber. The drive of the lubricator has already been described.

CLUTCH.

The motor is provided with a 22 inch flywheel, weighing 120 pounds, which is keyed to a tapered portion of the crank shaft and bolted to a flange integral with the shaft. The driving clutch, which is of the disc type, is secured to the rear side of the flywheel. It consists of a spoked manganese bronze disc A secured to a steel hub or centre B, adapted to slide on a square portion of the clutch shaft C, which bronze disc may be clamped between two cast iron discs DD', drilled with a number of holes near their outer edges, through which pass bolts E screwed into the rim of the flywheel. The outer one, D, of the two cast iron discs is cast with lugs in which are pivoted double armed levers F, the short outer arms of which pass through rectangular holes through the heads of the bolts E, and press against set screws G in these heads. The long arms of these levers extend inward toward the clutch shaft and receive the pressure of the clutch spring H. This spring bears against an adjustable nut I at the rear end, and at the forward end presses against a nut J, screwed upon the sliding collar K on the clutch shaft. The forward end of this collar surrounds the steel hub B of the bronze disc and carries a ball thrust bearing L, through which it presses against the inner end of the levers F. The fork for disengaging the clutch engages with trunnions MM on a collar located in a groove formed by a flange on the sliding collar K and the nut J. A double fibre washer is placed in this groove beside the trunnion collar.

The clutch shaft at its forward end has a bearing inside the end of the crank shaft, which bearing receives oil from the crank chamber. A flanged collar N is screwed over the end of the shaft and secured by a reverse threaded, conical lock nut. A cup-shaped steel part O is screwed over the hub of the flywheel, and between the flange N and the cup O is placed a disc P, with steel balls on which the pressure of the clutch spring is taken up. It will be readily seen that the pressure of the clutch spring forces the three discs together and thus engages the clutch. By compressing the spring by means of the clutch pedal the pressure between the discs is relieved, and the clutch is disengaged. A number of small coiled springs (not shown in the illustration) are provided to separate the discs when the pressure is removed. The pressure of the clutch spring can be adjusted by means of the nut I.

CHANGE GEAR.

Between the clutch and the gear box is interposed a simple form of joint, the two parts of which, Q Q', are shown in the cut of the clutch and that of the change speed gear respectively. This joint makes it unnecessary to have the engine and gear box bearings absolutely in line. The change speed gear gives four forward speeds and one reverse. It is of the type in which two sliding sets are employed, which are operated by means of a single lever moving on a gridiron quadrant, or by what is frequently called the selective system. The two shifting rods are telescoped. The inner rod A, through the shifting fork C, shifts the set of spur gears D and E, by the former of which the low speed forward and reverse are obtained, and by the latter of which the second speed forward is secured. The tubular sliding rod B, through the fork F, shifts the spur wheel G, which gives the third forward speed, and which

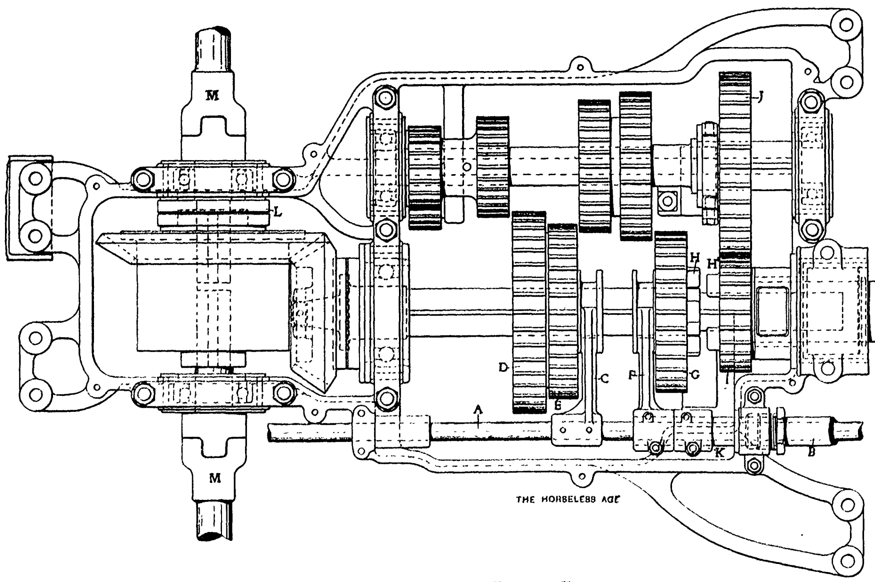


FIG. 4.—CHANGE SPEED GEAR.

has formed integral with it the clutch jaws H, which, when engaged with the corresponding clutch jaws H' on the clutch pinion I, connect the squared shaft directly to the clutch shaft, and thus give the direct drive of the high speed. The gear wheel K, through which the countershaft is driven, is mounted slidably on a square section of that shaft, and is provided with a grooved hub into which engages a shifting fork connecting with the collar K on the sliding rod B. It will be seen that if the rod B is moved to the right from the position in the drawing, the collar K is moved in the same direction, and the gear wheel J is thereby moved to the right out of mesh with the clutch pinion I. For this reason, when the direct drive is in action, the countershaft is entirely disconnected and remains stationary—an advantage from the standpoint of noiselessness and that of fuel economy. The gear J is automatically and positively returned into position when the direct drive is disengaged.

The pinions and gears of the change gear are made from drop forged blanks, cut with six pitch teeth and hardened. All are of 1¼ inch face. The first speed bears a ratio of 3.53 to the direct drive; the second a ratio of 2.15 and the third a ratio of 1.70. The reverse is still a little slower than the first speed forward. The intermediate pinion of the reverse is mounted in bearings at both ends.

An advantage of the selective system of operating change gears consists in the fact that one need not go through intermediate gears in changing from any one speed to any other. A necessary feature of such a system is a locking means for holding the inoperative sliding set rigidly in position. In addition, as with all sliding pinion change gears, an interlocking device between the clutch and the gear shafting mechanism is required, which prevents shifting the gear before the clutch is out, and engaging the clutch before the particular gear engaged is perfectly in mesh. Both of these locking means are plainly shown in Fig. 5.

INTERLOCKING MECHANISMS.

Referring to this Fig. 5, C is the tubular shaft of the change gear lever, which is capable of a sliding as well as a rocking motion. Secured to this shaft is a downwardly extending arm D, with two oppositely extending lateral pins, which are adapted to engage into slots on the brackets E and F, secured to the sliding rods A and B respectively. Extending forward from a cross member of the frame are two standards G and H, with a hollow hub at their forward end. The holes through these hubs are in line with the slots of the brackets E and F when the sliding rods are in their central position. Through the hubs of the standards G and E extend steel pins I, the heads of which pass through curved slots in sectors J, secured to the hollow shaft C, the fit of the pins in the slots being a sliding one, so that they do not interfere with the angular motion of the sectors J and shaft C. When the shaft C is pushed to the limit of its motion to the right (as shown in the photograph), by means of the gear changing lever, the pin extending to the right from the arm D is located in the slot on the bracket E, and if now the gear changing lever is moved either forward or back, the bracket E and the sliding rod A are given a corresponding motion, by which means the reverse and the first and second speeds forward may be obtained The same lateral motion of the shaft C which brought the pin on lever arm D into the slot on bracket E brought the stationary pin extending through the hub of the standard H into the slot on bracket F, and thereby entirely locked bracket F and tubular sliding rod B in position. The locking means for the sliding rod A are more clearly shown in the photograph, these locking means being actuated by a motion to the left of the tubular shaft C. The pin I then passes entirely through the hub of the standard G into the slot of bracket E, and holds the bracket rigidly in position. Thus it will be seen that while one of the sliding rods is connected to the shaft of the change gear

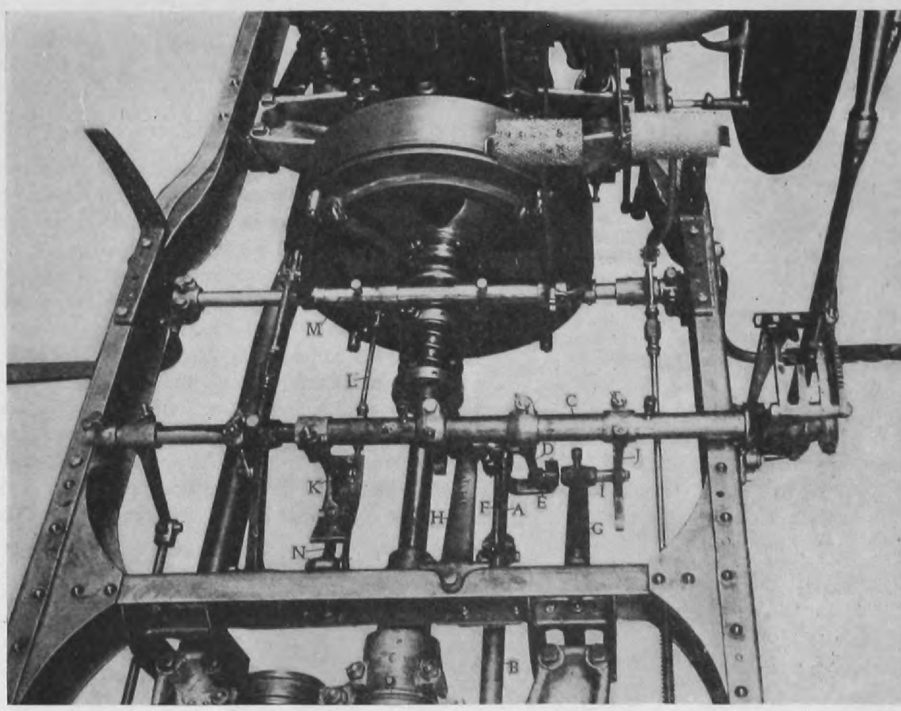


Fig. 5.—Interlocking Mechanisms.

lever, the other one is held absolutely stationary, and there is no danger of engaging two gears at the same time.

The clutch and gear shifting mechanism are interconnected by means of the sector K on the change gear lever shaft C and the rod L, which connects from an arm extending downward from the shaft M of the clutch pedal to a bell crank N pivoted to a cross member of the frame. The horizontal arm of the bell crank N is provided with a steel pin, and the sector is provided with holes, corresponding with the number of speeds, in which the pin may engage, thus preventing the shaft C from being turned when the clutch is in, and the clutch from being engaged unless the shaft C is in a certain definite angular position corresponding to full mesh of the gears.

All the bearings of the gear box are of the Hess-Bright non-adjustable type, and the same bearings are used on the countershaft and in the wheels. Both halves of the gear box are of aluminum, and the lower half is cast with four arms extending fore and aft, which rest in pressed steel hangers secured to the cross members of the frame. The two rear arms are arranged close together to secure in a measure the advantages of the three point support. The top half of the gear box is provided with a large inspection door, which can be quickly removed by giving a half turn to two locking bolts. In a rear compartment of the gear box are enclosed the bevel driving gears and the differential, the latter being of the spur pinion type. Universal couplings of the slot and tongue type are inserted in the shafts of the differential. The driving sprockets at the outer ends of the differential shafts are bell shaped to bring the driving pull in line with the centre of the ball bearings, and are bolted to hubs, which allows of easily interchanging sprockets. On the rear axle the chain pull comes between two bearings, so there can be no unsymmetrical loading of these bearings.

BRAKES.

Two pairs of brakes are provided, both acting on drums A (Fig. 6) bolted to the hubs of the rear wheels, to a flange of which drums the driven sprocket wheel B is bolted. A bracket C for supporting both brakes is bolted to the under side of the rear axle, and extends vertically downward therefrom. From this brake carrier C extend two lateral studs D D', which pass through oblong holes in the lugs E E' on the brake bands. Coiled springs F F' are provided to draw the lower part of the brake bands out of contact with the drum when the brakes are released The internal brake, which is the one usually employed, is of the expanding type, being actuated by a cam G, the shaft of which is mounted in a bearing formed on a bracket H clamped under the spring clips. This brake is actuated by a pedal. The outside brake is of the band type, consisting of the leather lined steel band I, which can be contracted on the drum. This brake is actuated through a

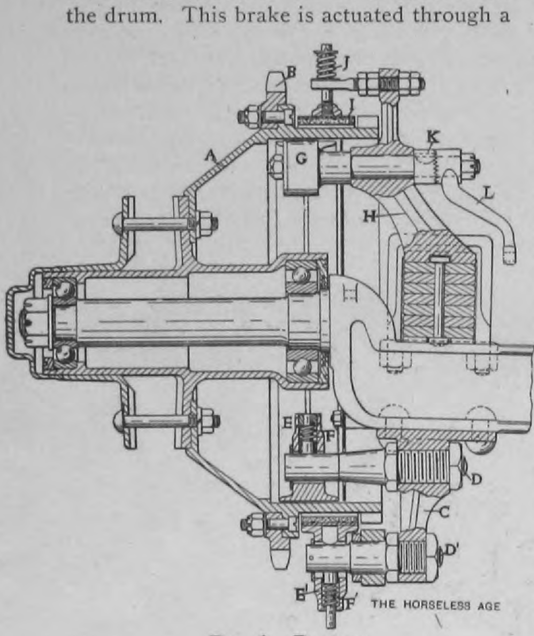


Fig. 6.—Brakes.

lever mechanism by means of a hand lever at the side of the seat and serves as the emergency brake. A small coiled spring I is provided to hold the upper portion of the brake band off of the brake drum when the

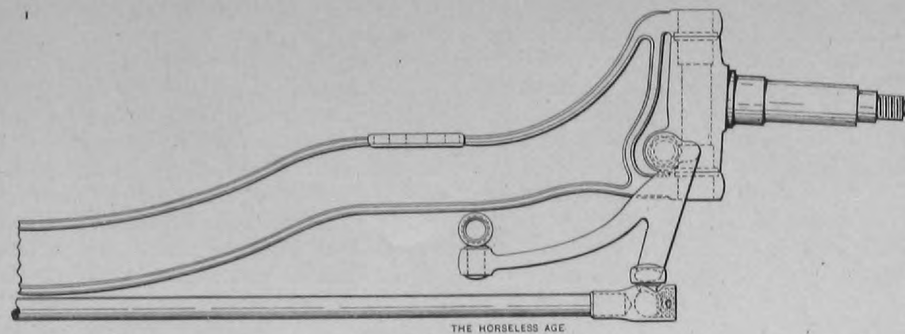


Fig. 7.—Half of Front Axle.

brake is not applied. A double adjustment for wear is provided in the brake mechanism. One adjustment consists in the two-piece hub K of the brake lever L, the two parts of which have their adjacent faces cut with V grooves, and are clamped together by means of a castellated nut secured with split pin. The other adjusting means is in the connecting links, and consists of a turnbuckle. The brake pressure is equalized by means of a balance lever connecting two lever arms at the inner ends of two hollow cross shafts. Similar equalizing mechanisms are provided for both sets of brakes, that for the band brake being in front of the frame cross member and that for the internal brake in the rear.

FRAME CONSTRUCTION.

The frame is of pressed steel construction and is narrowed slightly in front, to allow of turning in a small radius. There are three pressed steel frame cross members, one at the rear and two at the middle of the frame. No cross member is needed in front, as there the engine serves the purpose, its arms being fastened direct to the side members of the main frame. The main and side members of the frame are secured together with upper and lower gusset plates. The car has a wheel base of 117 inches. The frame is supported at both ends by semi-elliptic springs, 2¼ inches wide and 52 inches long, with 9 inches opening. The spring hangers are drop forged, and the one at the rear end of the

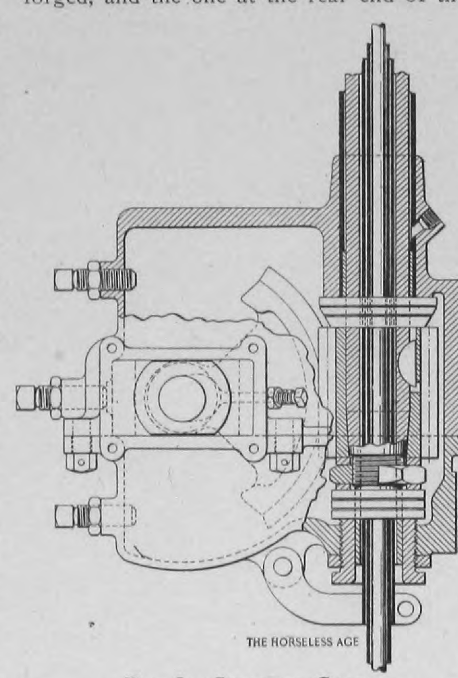


Fig. 8.—Steering Gear.

frame is of such shape as to act also as a gusset plate. Both axles are I section drop forgings, and the front axle has the steer-

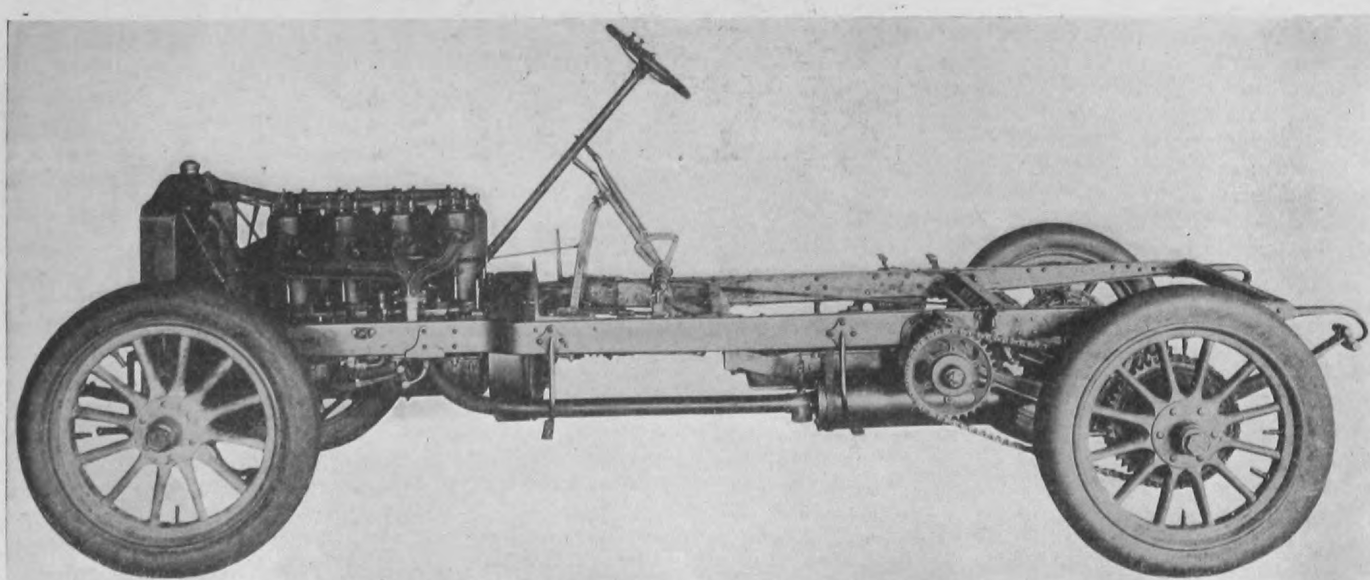


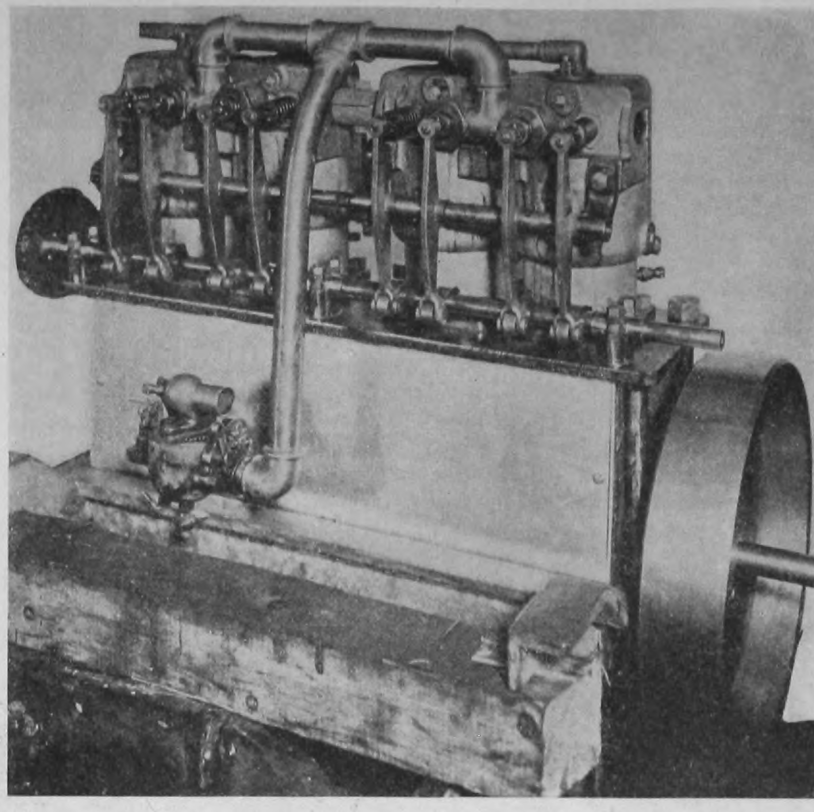
Fig. 9.—Side View of Thomas Chassis Complete.

ing yokes forged integral with it. The wheels are 34 inches in diameter, and shod with 4½ inch pneumatic tires; they are mounted on H-B ball bearings. The steering mechanism is the usual worm and sector gear, and is provided with means for adjustment.

The car is provided with an aluminum hollow dash, which has a tool compartment on either side. Mud guards and very large running boards are provided; and a tool chest and battery case are carried on the running boards on opposite sides. The body is built of heavy gauge sheet steel highly finished, and is large enough to seat seven persons comfortably. Two of the seats in the tonneau are of the revolving, collapsing type, and these are upholstered equally comfortable as the other seats. The tonneau is, of course, of the side entrance type.

The Dominick Gasoline Motors.

William Dominick & Co., of 243 Michigan avenue, Chicago, build four cylinder upright gasoline motors for automobiles and boats, in sizes ranging from 20 to 60 horse power. The motors are of somewhat unusual construction, having a steel base or foundation to which the cylinders are secured, while the crank shaft is enclosed in an aluminum case. The steel cylinder base is fastened to six steel pillars, to which are secured four aluminum plates, forming the case. By taking off these four plates or covers all of the bearings are made readily accessible. To get at the connecting rod bearings only one of the covers need be removed. The crank shaft is a nickel steel forging, and the connecting rods are also of steel and hollow. The flywheel is bolted to a flange forged on the shaft. On the engine shown the crank shaft bearings are 1 5-16 inches in diameter, the central one being 4 inches in length and the outside ones 3½ inches, while the crank pin bearings are 2 inches long. The cam shaft is supported in three self oiling bearings; the rocker arms, by which the valves are operated, are made of steel and are provided with cam rollers at their lower end and adjustable set screws, through which the valves are opened at the upper end. The valves are flat seated, and provided with long guides. All are mechanically operated, as will be seen from the illustration. By removing the cap of the connecting rod bearing the connecting rod and piston can be taken out without disturbing the crank shaft. The supporting arms can be made with different drop to suit different conditions. The weight of the 4x4 inch engine, which is illustrated herewith, is 275 pounds.



Dominick Twenty Horse Power Four Cylinder Motor.

The Stevens-Duryea Limousine.

The J. Stevens Arms and Tool Company, of Chicopee Falls, Mass., have decided to continue the model which they introduced at the beginning of the last season. They are now also building closed cars of the limousine type, in addition to their regular side entrance model, and a photograph of one of the former cars is shown herewith. The special feature of the Stevens-Duryea car is the "unit" arrangement of the engine, clutch housing and gear box, and the three point support of this unit on the frame. The drive to the rear axle is by shaft and bevel gears. In the design it has been the aim to avoid all unnecessary weight, and the chassis is one of the lightest on the market for the amount of power. The cylinders are cast individually, and the friction clutch is of the multiple disc type. Spark and throttle control levers are mounted on the steering wheel. The bonnet is of square shape, and the general appearance of the car resembles that of well known European models.

Stevens-Duryea Limousine.