

on the end of the bar while the owner did similar duty to the opposite wheel, and a few vigorous pulls brought it back to shape good enough so it was scarcely noticeable, except some cracked paint. When he got home he had the axle properly trussed, which, had it been done when the machine was built, it would not have bent.

We were only 2 miles from Pomona, and all down hill, so, wishing our friend good luck, we dropped down Garey avenue, into Pomona (named for the goddess of fruit), and after resting and reading a while we took some friends from where we were staying and drove over to Ontario, 6 miles distant, and up to the famous Euclid avenue, 7 miles long, reaching clear to the foot of the hills, and for nearly two-thirds of the way with a grade of about 150 feet to the mile, then it gets considerably steeper. It is a fine run back to the Ontario Hotel, where we stopped for dinner in the early evening; then back to Pomona, where we stayed over night and Christmas. Monday we returned to Los Angeles by the lower road through Lemon, Puente, Bassett, El Monte and reached the Chutes just in time to see Baldwin's air ship sail gracefully up from Chutes Park, hover over it, then, owing to the motor stopping, drifting away over Boyle Heights, and we returned home after having had a truly "Merry Christmas," and old "Betsey," who has faithfully performed her work, was left to the solitude of the barn.

At the first meeting of the county engineers and road superintendents, held at Utica, N. Y., recently, it was resolved that a communication be sent to the Legislature urging the appointment of a commission to recodify, condense and amend the existing highway laws to relieve the present chaotic condition of the same.

New Vehicles and Parts

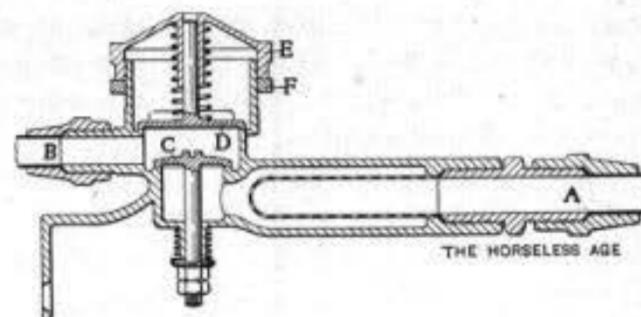
The 1905 Pope-Toledo.

The regular product of the Toledo factory of the Pope Motor Car Company for 1905 consists of two models of similar design, one of which is equipped with a motor of 30 and the other with one of 45 horse power. Except for size, the two are alike to the smallest detail. The engines have cylinder dimensions of $4\frac{1}{2} \times 5\frac{1}{4}$ inches and $5 \times 5\frac{3}{4}$ inches respectively. Each cylinder is cast separately, and is surrounded by a corrugated copper water jacket. The heads are detachable castings, which are secured to the top of the cylinder walls by steel studs and nuts. The valves are arranged in line with each other, the admission above the exhaust, the former being of the automatic type, and both seating within a port formed on the side of the cylinder head.

The crank shaft is provided with intermediate bearings between the cylinders. These and the end bearings are bronze bushed, and are divided horizontally, the upper portion of each being keyed in a web cast in the upper half of the crank case. Forged steel connecting rods are used, bushed with bronze. The pistons have five rings each, four at the top and one at the lower end, the latter serving as a wipe ring for lubrication.

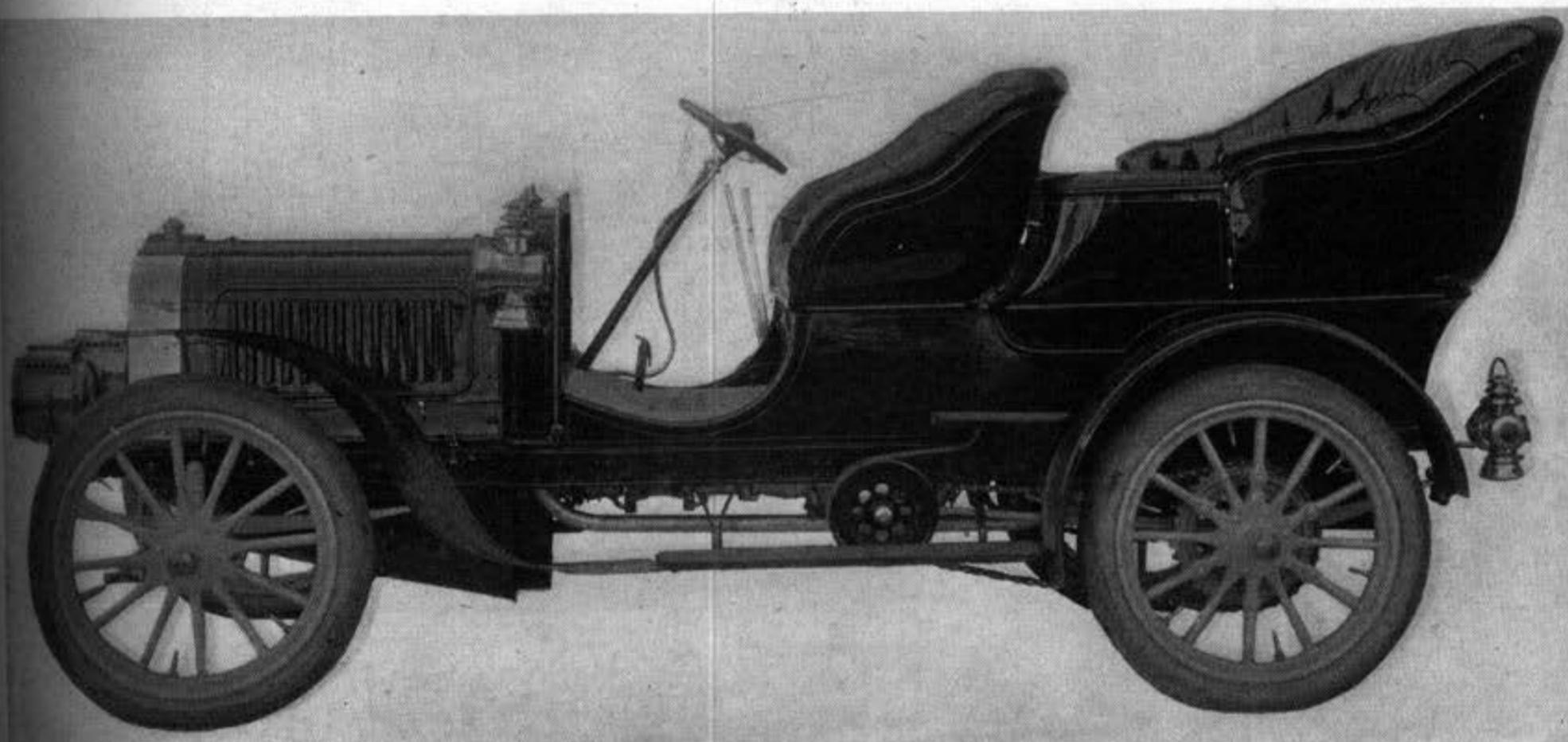
Jump spark ignition is employed, the primary current alone being commutated, and a multiple coil used. The spark plugs are located in the top of the cylinder heads, directly over the centre of the pistons.

This year the gasoline is fed to the carburetor from the tank at the rear of the frame by pressure from the exhaust. A check valve is used to prevent the ac-



GASOLINE FEED CHECK VALVE.

cumulation of an excessive pressure in the tank. A sectional view of the check valve is shown herewith. The pipe which connects with a nipple on one of the exhaust pipes is secured at A, and the end is covered by a strainer. The pressure of the exhaust lifts the poppet valve C, and the gases pass through the pipe B to the tank. Immediately over C is located a second poppet valve D, which is held to its seat by an adjustable spiral spring. When the pressure in the pipe B reaches a certain predetermined value the valve D opens and allows the gas to escape through openings in the cap E above. The cap is threaded on the outside of a cup within which the valve operates, and receives the thrust from one end of the valve spring. By turning it, therefore, the tension of the spring can be varied and the pressure carried in the tank altered accordingly. A lock nut F holds the cup in position. A "planetic" radiator, of the manufacturers' own design, which has been used by them for some three years past, is mounted at the front of the hood, and has connected to it at the top a pipe which runs to the outside of the valve ports on the cylinder heads, and at the bottom another pipe leading to the gear driven circulating pump, which in turn is piped to the bottom of the copper cylinder jackets. The hood is closed beneath by a curved dust pan extending from the bottom of the radiator to the forward



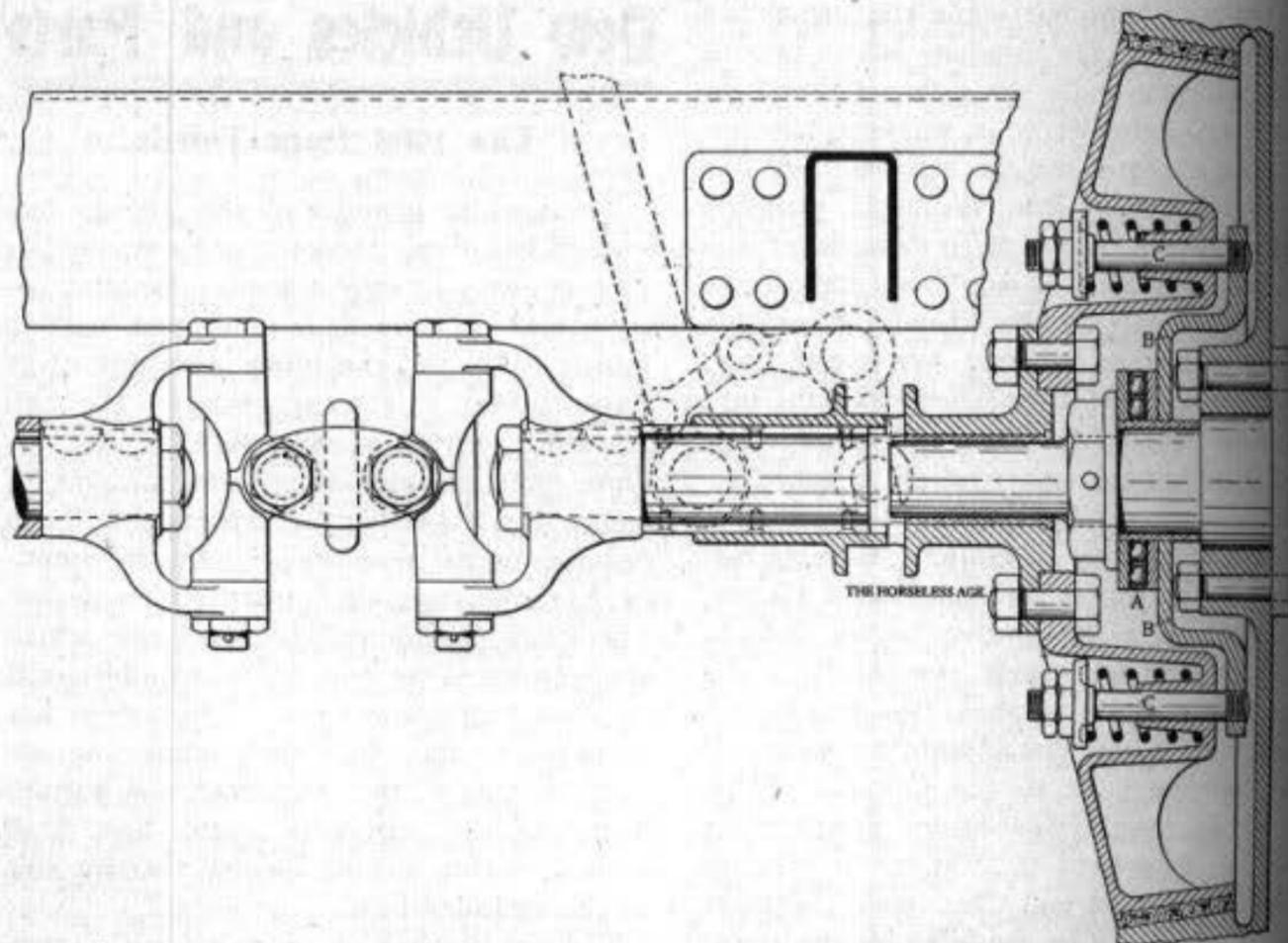
THIRTY HORSE POWER POPE-TOLEDO CAR.

edge of the flywheel, and at the back by a cast aluminum dash, which is curved backward at the edges, and encloses the spark coils and the oiling devices.

The flywheel is bolted to a flange formed on the crank shaft, and is turned out to form the driving member of the clutch. The driven member is a leather faced cone, having a bearing upon the end of the crank shaft. A bottom flange takes the thrust from the clutch springs through a ball thrust bearing provided with a double row of balls, which are held within a cage.

In the sketch herewith A designates the thrust bearing and B a cupped disc which bears upon the end of the crank shaft and against one side of the bearing A. Near its outer edge at equal distances apart are four stud bolts C, which are screwed into it and riveted over. These bolts pass through holes drilled through interior bosses in the bottom of the four cups formed in the clutch driven member. The clutch springs are located within the cups and bear against their bottom and against grooved washers held on the ends of the bolts by a double lock nut combination. The tendency of the springs is to draw the cup disc B and the clutch cone together, and consequently to engage the frictional driving surfaces. This construction is used to make the adjustment and renewal of clutch springs an easy matter. The various springs can be tightened by turning the nuts on the ends of the bolts, and in case of a break a spring may be removed without disturbing any other part.

The clutch operating mechanism consists of a collar fitting into a groove on the hub of the cone, which is provided with radial lugs. A forked yoke engages with these

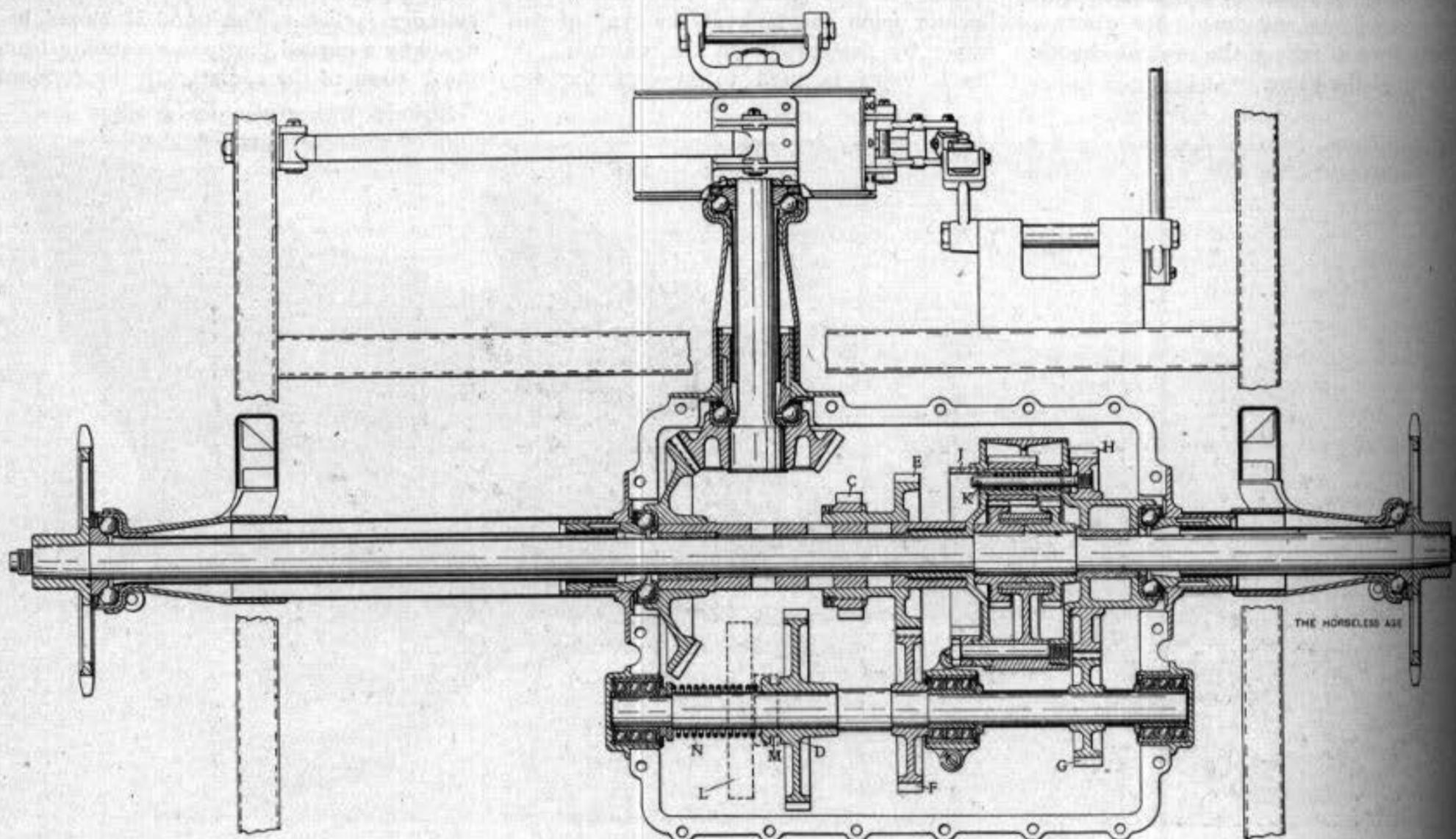


POPE-TOLEDO CLUTCH AND CARDAN SHAFT.

lugs and is connected by a system of links and levers to the clutch pedal at the base of the steering column.

Secured to the end of the driving shaft by means of a taper joint and double Woodruff keys is one yoke of a double universal joint. The crosses of the joints, which are offset to permit the use of single bolts through each arm, are connected by a single piece with a yoke formed on each end. The driven yoke of the second Cardan is keyed to the driving shaft, which extends into the gear box.

As was the case in the cars made by this company last year, the bevel gears are placed in front of the change speed gear, the shafts of the latter running crosswise of the car. The bevel driving pinion is therefore keyed to the end of the driving shaft, which projects through the front of the change gear case and runs on a double set of ball bearings. The shaft and its bearings are contained within a conical housing, which is fastened to the front of the gear case by means of bolts passing through a flange at the rear end and the forward wall of the



POPE-TOLEDO CHANGE SPEED AND DRIVING GEARS.

case. These two bearings serve also to take the end thrust from the bevel pinion, the race for the inner one being sunk into the hub of the pinion, so that the keys by which this part is secured to the driving shaft are called upon to withstand the strains of driving only.

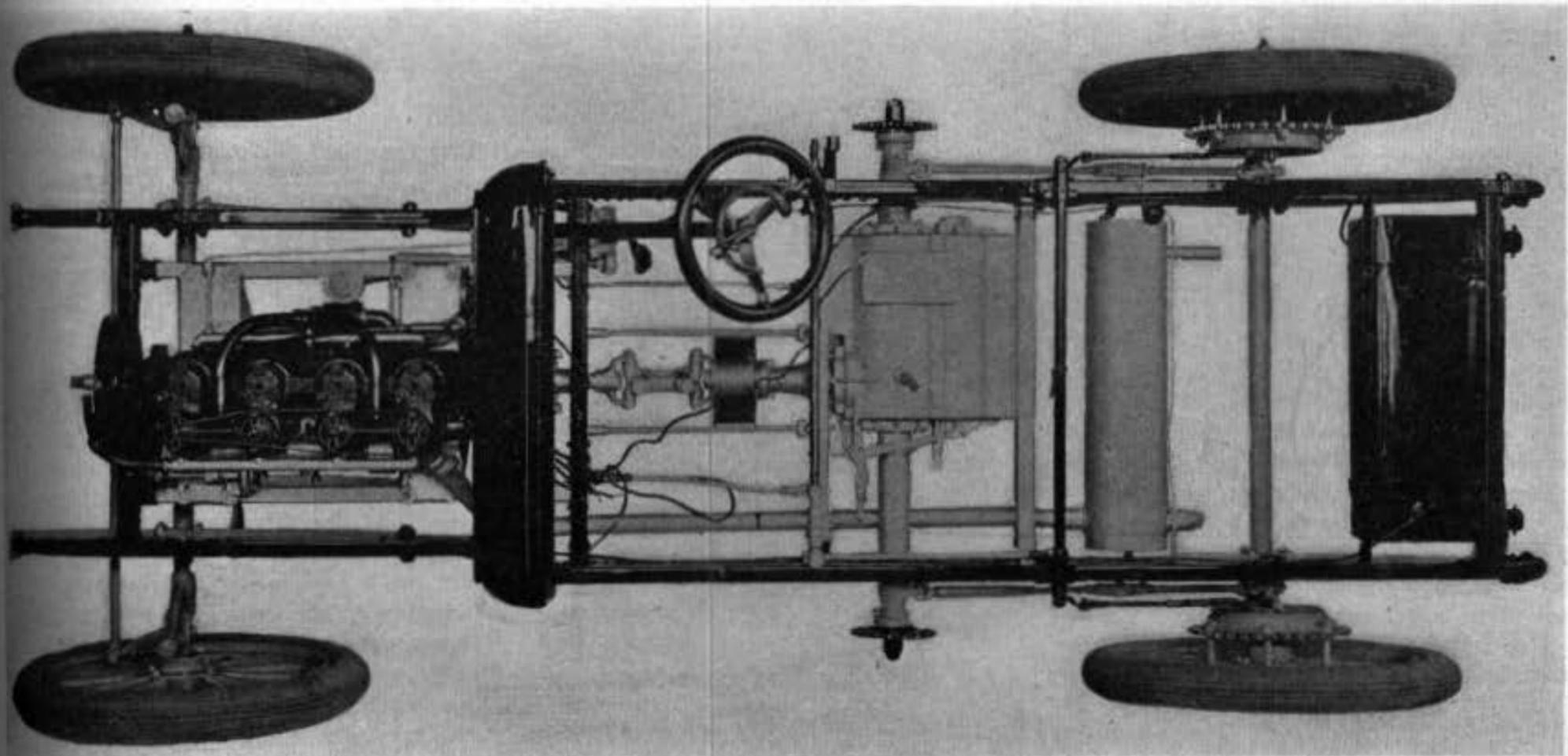
The gear case is located somewhat to the right of the longitudinal centre line of the car. It contains the differential and change speed gears, and is provided with two tubular extensions, secured to it by flanges, which form housings for the sprocket shafts and their bearings. They serve also as a means of supporting the case, being bolted at their outer ends to the side members of the frame. At the rear the gear case is bolted to a cross member. The ball bearings upon which the countershafts run are similar in design to those for the main driving shaft, and the bevel driven gear bears directly

speed the gears C and D are brought into mesh, and for the second the gears E and F. The third speed is obtained by bringing the pinion E into engagement with the internal gear J, which is bolted to the side of the differential housing. When this is done the pinion E presses against the ends of a series of pins K, which pass through the studs upon which the differential pinions revolve, and are secured to the gear H by a shoulder and screw thread. The effect of this is to slide the gear H along the hub of the differential housing, out of mesh with the gear A. The lay shaft is therefore disconnected, and the drive is direct from the bevel gears to the chain sprockets on the ends of the countershaft. When the pinion E is withdrawn from gear J, spiral springs which surround the pins K return the gear H to its former position, and bring it again into mesh with gear A.

of the latter outwardly. The driven sprockets are bolted to the rear wheels, which revolve on a tubular axle.

The front axle is tubular, and to its ends are brazed steering knuckles of the Le-moine type. Front and rear wheels revolve on ball bearings. The frame, which is of pressed steel, is carried on four semi-elliptic springs. The wheel base of the 30 horse power car is 100 inches and that of the 45 horse power car 104 inches. The gauge of each is standard.

The control mechanism consists of the clutch pedal, previously referred to, a fibre faced brake pedal, which acts upon a drum fixed to the driving shaft in front of the change gear box, a lever for applying the hub brakes and another for changing speeds. Steering is done by a worm and sector combination, and upon the inclined steering wheel are mounted two small



POPE-TOLEDO—PLAN VIEW OF CHASSIS.

against the race for the inner bearing of the left hand shaft. This gear is fastened upon a double keyed sleeve, which fits over the countershaft and is supported on the hub of the differential housing. Upon it moves the sliding member of the change gear group, which consists of two pinions and a shifting collar formed upon one hub. The lay shaft is located directly back of the countershaft, which in this case serves also as the driving and driven shaft of the change gear group, and is located in the same horizontal plane with it. The gears give three speeds forward and a reverse, the drive being direct and the lay shaft stationary when the third is in use.

For the first and second speeds ahead and the reverse the gears H and A in the sketch herewith remain in mesh and serve as the second reduction. For the first

The reverse is obtained by bringing pinion C into mesh with gear L, and pinion M into mesh with gear D, gear L and pinion M being fastened upon a short shaft in the bottom of the case. When the reverse is not in use the gear D is thrown out of mesh with M by a coiled spring N.

The lay shaft runs on three triple ball bearings, one at each end and the third near the centre. Each bearing contains three rows of seven-sixteenth inch balls, separated by washers and running between hardened steel bushings. The ends of the shaft are covered by caps, which screw into the gear case, to exclude dirt and retain the lubricant.

At the outer ends of the countershafts the ball bearings are placed very close to the centre line of the driving sprockets, this being accomplished by extending the hubs

levers, acting over notched sectors, which control the throttle and the time of ignition.

The body fitted to all regular models is of the side entrance tonneau type, the door being hinged at the rear. The front seat is divided to accommodate two, and the rear has room for three passengers. The car carries 4 gallons of water and 14 of gasoline, which in the case of the 30 horse power model is said to be sufficient fuel for 200 miles running.

Motorists in the neighborhood of Portland, Ore., have interested the authorities in the subject of oiled roads, and experiments are shortly to be made upon the St. Helena road to determine the desirability of extending the practice generally over the roads of the State.