Cambridge University Press
978-1-108-07061-4 - Motor Vehicles and Motors: Their Design, Construction and Working by Steam, Oil and Electricity: Volume 2
W. Worby Beaumont
Excerpt
More information

Introduction

THE past two years have been marked by a greater activity in motor vehicle manufacture and use than most people expected, and perhaps by nearly as much as could be hoped for by those who properly realized the inevitable results of the triumphs of the years 1895-6. **Industrial activity**

The great spread of the area of strenuous emulation to the United States, Belgium, and over larger parts of France and of Germany and Italy, has given rise to a rapidity of development that could not take place with a costly thing unless really wanted.

Petrol The pleasure vehicle has occupied by far the most attention, and the petrol motor car has received, for various reasons, by far the greatest support—the great races and the great feats of long journey endurance have been performed by petrol cars.

The steam car has also received unstinted inventive attention, and great feats have been performed by some of them, while at least two types of car have renewed confidence in the possible practical value of this form of motor. For the propulsion of the heavier cars, steam has had but one serious rival, and at the present time the continuance of that rivalry is watched with the interest which is proportional to the importance of the result. **Steam** In the opinion, however, of some of the best informed, and of those capable of estimating the value of apparent success of one type and of partial failure of another, the internal combustion motor is the more likely to reach commercial success in the end—for the largest field of employment, though not for all purposes.

Many things have been done with electrical vehicles in the past two years, and much practical success has been achieved. **Electrical** Commercial success in some respects has been attained, though it be in a field in which the user has been in a position to esteem convenience, ease, and comfort as of higher importance than lowness of cost per mile run, or distance covered.

The distinguishing feature of the development of the automobile since the appearance of the first volume of this book is the enormous increase **Increase of power** in the power with which it is now possible to furnish a vehicle weighing not more than a ton. This has been the outcome of the construction of the voiturette and the racing car. The most powerful cars at the beginning of 1900 were the Mors 12 HP. racing car, Panhard & Levassor 16 HP. racing cars, Peugeot 18 HP., and Cannstadt 24 HP., the greatest average speed in March, 1900, over the Nice racecourse of 150 miles being then 36·6 miles by a Panhard & Levassor, but 37 miles average was reached by a Perfecta tricycle, carrying no less than 4½ declared HP. In the same races a Perfecta quadricycle carried 6 HP.

The Renault light car, with a De Dion-Bouton motor of only 2¼ nominal HP., had already appeared, and had reached an average speed of 23·75 miles per hour in a run of 64·62 miles from Paris to Rambouillet. Other light cars then designed with the object of meeting the demand for a car to carry two at moderate cost were the Decauville, the Mors, the Peugeot, the Panhard (Krebs) light car, and the De Dion-Bouton voiturette, the last with a 3 HP. motor. There were also the beginnings in this direction made in England with the Daimler light belt-driven car with a 6 HP. motor, the same power as that which only a little more than a year before was employed in the Panhard & Levassor racing cars.

Horse power

These light cars were soon made to carry larger and larger engines, modifications being of course made in the change-speed gear. Thus did the racing tricycle, the quadricycle, and the voiturette open the eyes of designers to the extraordinary capabilities of light but well made frames and gearing, and the possibilities of the quadruple cylinder engine for driving them. The racing car of to-day, with a body carrying only two seats, has from 60 to 120 HP. engines, and has reached on the road a speed of over 80 miles per hour.

There had, of course, all this time been the Benz light cars, but their design did not lend itself to the enormous increase of engine power possible with the others.

As I write, the Automobile Club of Great Britain and Ireland is busy in the preparations for the race of the year, namely, that for the Gordon-Bennet cup, which was won in 1902 by a Napier car, driven by Mr. S. F. Edge. The entries for this race include cars from France, Germany, Italy, Belgium, Austria, Switzerland, the United States, and England, some of them having engines declared by the makers to be able to give off 100 B.HP., and all of them being only 1,000 kilogrammes, or under one ton in weight.

These facts serve to show how great has been the development of the car for pleasure and racing purposes, and how great the possibilities in the application of the experience gained in the construction of vehicles for other purposes.

These other purposes include the passenger car, cab, brougham, victoria, omnibus, and the like, for everyday purposes, vehicles which must be trustworthy for all occasions.

Next, and even more numerous, are the vehicles, large and small, for hundreds of different business purposes, the leading qualification of which must be trustworthiness, almost every other necessary qualification being either secondary to this, or contributing to it.

Commercial vehicles

Further, there are the heavy vehicles for loads of over a ton and up to, say, four or five tons. Even for many of these the experience gained in the development of the racing car has been of great value ; but for the very heavy work done by the steam wagon or lorry, the light steam vehicle experience affords less help, although even here the modern light high-speed engine, high quality gear construction, and boiler pipe and cooler construction are pointers which may, and even have been regarded as of the greatest importance by those who are not incapable of seeing that traction engine and railway locomotive experience may be most usefully supplemented by that afforded by the modern types of motor wagon.

It is not, however, probable that any very long continued commercial success will attend the use of the very heavy motor wagon for conducting a heavy regular goods transport service between any two or more places. The heavy or medium heavy load vehicle will be of great and increasing value, but the heavy motor wagon, with or without its trailer, running anything like regular services dealing with daily consignments or large total weights, cannot be a commerical success on common roads. Where such conditions of large transport trade along definite and constantly traversed routes obtain, then the conditions are those requiring railways, tramways, or tram-plate ways. From some great trading centres to places scattered all round the centre and within such distances as are short relatively to the collection and delivery distances, the motor wagon will do useful and paying work. Even for this, however, the tram-plate way is necessary for that part of the road which is constantly traversed, and in many cases this might, and should be, on a new road, not the common highway.

Heavy vehicles and frequency of service

The motor wagon for loads of up to, say, three tons will, however, have a very wide field of usefulness in connexion with numerous trades and manufactures, the goods or products of which require distribution in all directions and to consumers' premises.

The vehicle for moderate weight and moderate or even low speed will be the commercially successful vehicle, and the traction engine, with its slow-speed engine, heavy-type boiler, enormous and heavy gear, and its train of wagons, is not the precursor of this type of vehicle.

The things which have led to the developments at first mentioned, the developments themselves as shown by structural detail, and some indications as to the trend of improvements and invention, will form the subjects of this volume, in which descriptions will be illustrated as far as possible by engravings, which, through various circumstances which will be readily understood, must be a few months behind the maker of the things illustrated.

Attention will be directed to some of those essential elements in the organism of the automobile which have undergone most improvement or have been the subject of most investigation or experiment.

Cambridge University Press
978-1-108-07061-4 - Motor Vehicles and Motors: Their Design, Construction and Working by Steam, Oil and Electricity: Volume 2
W. Worby Beaumont
Excerpt
More information

Chapter I

LIGHT PETROL MOTOR VEHICLES

IN chapter xiv. of vol. i. several different types of the light petrol vehicle were described, the first being the little Decauville car. This was a clever car, and was fully illustrated. Its remarkable handiness was well displayed in numerous trials and gymkhanas, but it was of a type which has not survived, though the influence of its design is still traceable. It was fitted with an air-cooled motor and with a form of change-speed gear which was defective as to the size of its smaller wheels and pinions, as to the mode of shifting them (pp. 218 to 223), which involved passing one pinion through the teeth of two wheels to make one change, and as to the absence of all protection of motor and gear from dust and mud. It was consequently very noisy, and the small gear wore quickly. The car was, however, one of the first driven by a bevel wheel on a live axle, was light and easy running and not costly. Modern practice covers all such gears, and uses water cooling for the motor instead of air cooling.

Decauville

The Mors light car, illustrated in the same chapter, was of a type which has not survived, except with considerable modification, the greatest change being the use of a vertical engine in place of the horizontal engine then used, and of much higher power. The 4 HP. is no longer made, and all the Mors cars now belong to another class, which will be dealt with hereafter.

Mors

The Daimler light car, in which the gear was belt driven and carried by an independent short bogie frame, on which the car body was supported by inverted leaf springs, has not survived, and no sufficient efforts appear to have been made to develop the leading ideas embodied in it. It was the first car in which the belt was given a good length, and a comparatively small modification would have converted it into a useful single belt car.

Daimler

Belts have, however, fallen into disuse, although a few cars are still driven by them, including some of the Benz, the Pick light car, some of the Delahaye, and some other simple light cars. The belt was seldom used properly, generally too short and too narrow, but it is a simple, flexible and quiet drive, and is very likely to be revived for some kinds of light vehicles.

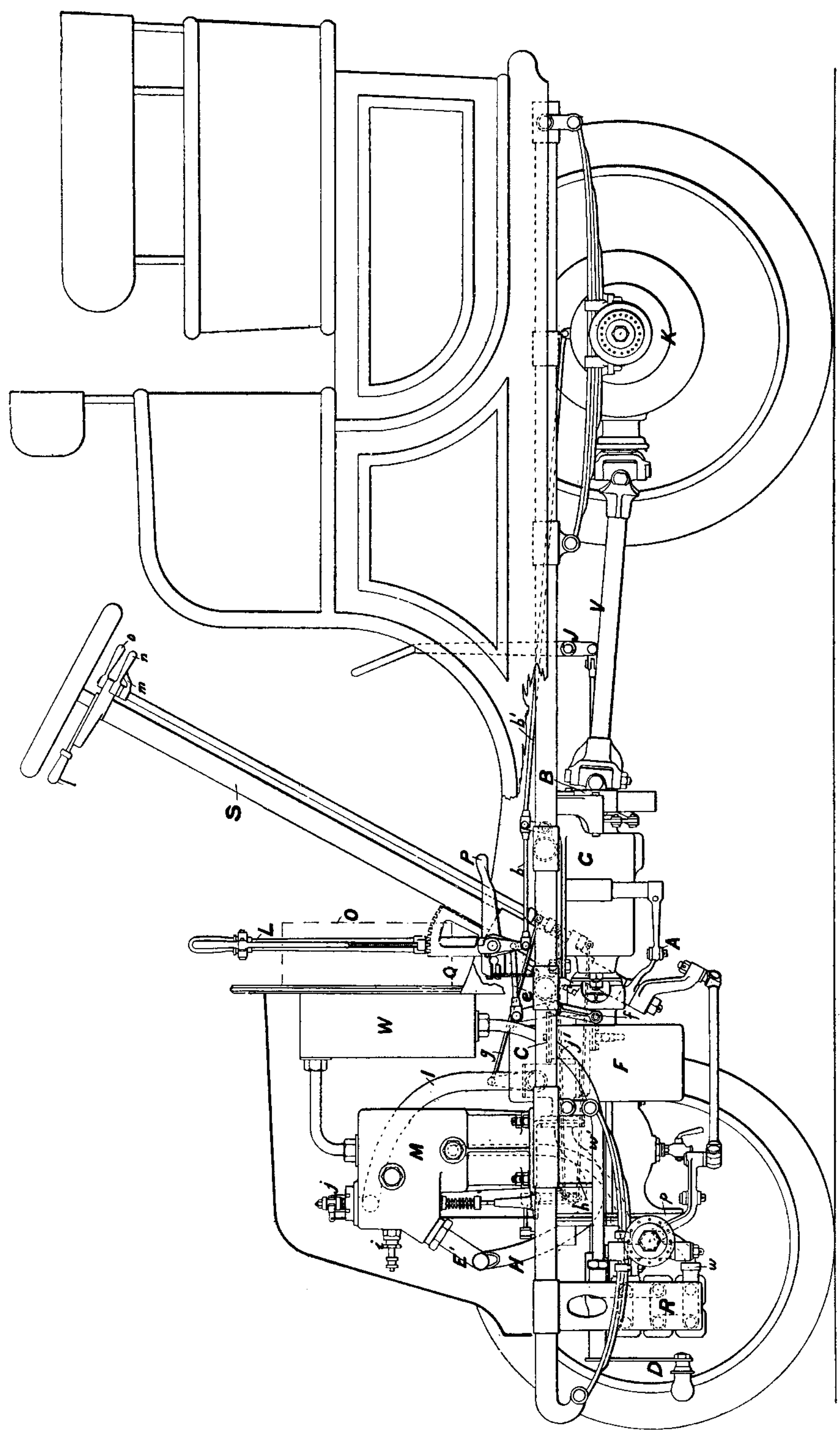


Fig. 1.—The Darracq Light Car with 6½ HP. Motor-Elevation (*see* p. 6).

The Darracq-Bollee (p. 233) was another of the light cars exhibited in Paris in 1899–1900. It was fitted with a pair of five-step coned pulleys, with an ingeniously arranged belt shifter for changing speeds. The gear driven by the driven belt pulley was enclosed, and was only for a single and final speed reduction. The belt arrangement might have survived for the purposes of some light vehicles, but the car was fitted with a single cylinder air cooled motor, and the exigencies of design put the fly-wheel outside the frame. The car soon ceased to be made, and was replaced by a light car entirely different and of novel design, gear driven throughout, and of remarkably light construction. Illustrations of this car will be found on pages 6 to 13.

Renault

The Renault light car (p. 237) was the forerunner of a type which has been and is followed on a very large scale. It is still in general principles of design of transmission gear the same now as in 1900, a fact which speaks highly for the designer.

The Accles-Turrell light belt-driven car (p. 239) has ceased to be made, but as a heavier chain-driven car it is now made from new designs.

The Peugeot light car (p. 246), with horizontal engine with valve gear driven by a tongue in a snitch groove in the fly-wheel, has also, as might be expected, given place to a different design with vertical engine of the De Dion-Bouton high-speed type placed in the front of the car.

Another type of light car, an elegant little car, was the Panhard & Levassor, Krebs' 4 HP. car (p. 248), in which a Krebs motor and gear were placed under the seat and the steering wheels were on a through axle, pivoted by a spring across it at its centre. A car similar to this was offered by one firm in England during 1902.

De Dion

The De Dion-Bouton voiturette (p. 255), like all the others, has grown in power from 3 to 6 or 8 HP., and the all-prevailing front position of the motor has been adopted.

Such were the light cars dealt with in the book which was completed before March, 1900, or five years ago.

The changes in these will be shown as far as possible, and some of the reasons for them by the engravings now to be described.

The Darracq Light Car

Although the Darracq light car which appeared in the latter part of 1900 was a complete reversal of the policy of the Darracq-Bollee of the year before, and was in many respects a great advance on most of the preceding designs, it nevertheless showed that the little Renault car had proved a pathmaker. The path was adopted, and the Darracq design paved the way for very much that has followed, not only in the chainless type of light and heavier car, but in careful attention to the minutiæ of a design made complete before the drawings were put into the works.

The Darracq car shown by Figs. 1 to 9 was the embodiment of a consistent attempt to combine satisfactory arrangement of essential organs

Cambridge University Press
978-1-108-07061-4 - Motor Vehicles and Motors: Their Design, Construction and Working by Steam, Oil and Electricity: Volume 2
W. Worby Beaumont
Excerpt
More information

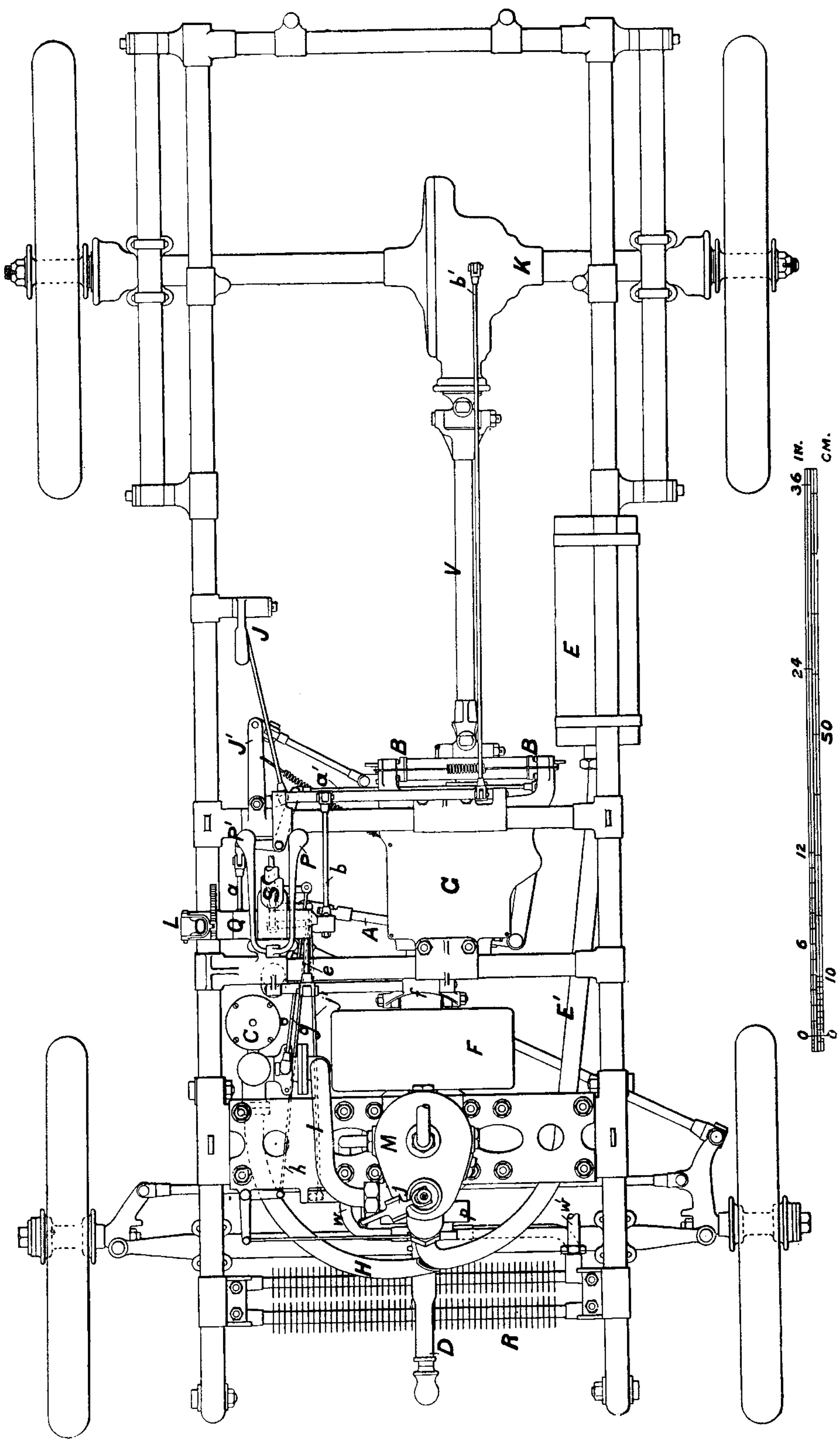


FIG. 2.—THE DARRACQ LIGHT CAR WITH $6\frac{1}{2}$-HP. MOTOR : PLAN.

with extreme lightness of parts and workshop facility of construction. It was a great attempt toward a standardization which must be studied by all manufacturers who aim at low cost of production of a machine of high qualifications.

It in its turn has become a pointer, and although the first cars showed defects in several respects, they were mostly those which naturally resulted from a bold attempt at lightness, defects which the designer of the original could most easily remedy. Some of the defects were due to the use of materials which would not stand the test of the very severe work to which almost every part of a motor carriage must submit.

Design material wear

Beautifully made malleable iron castings were employed, but in the bevel wheel, driving wheel and case, and elsewhere, it was not, on the one hand, stiff enough, and on the other, even where case-hardened, not the material for the work, which requires good steel hardened. The differential gear was too light and too small; the bearing which carried the spindle of the driving bevel pinion was of insufficient length, and would have been better if a plain bearing; the pins of the universal joints of the coupling or tail-driving rod were too small, although mere calculation of the torque effort they had to transmit would have shown them to be of ample size. They wanted larger diameter merely to give larger surface, and this same reason for more ample dimensions was found in several details.

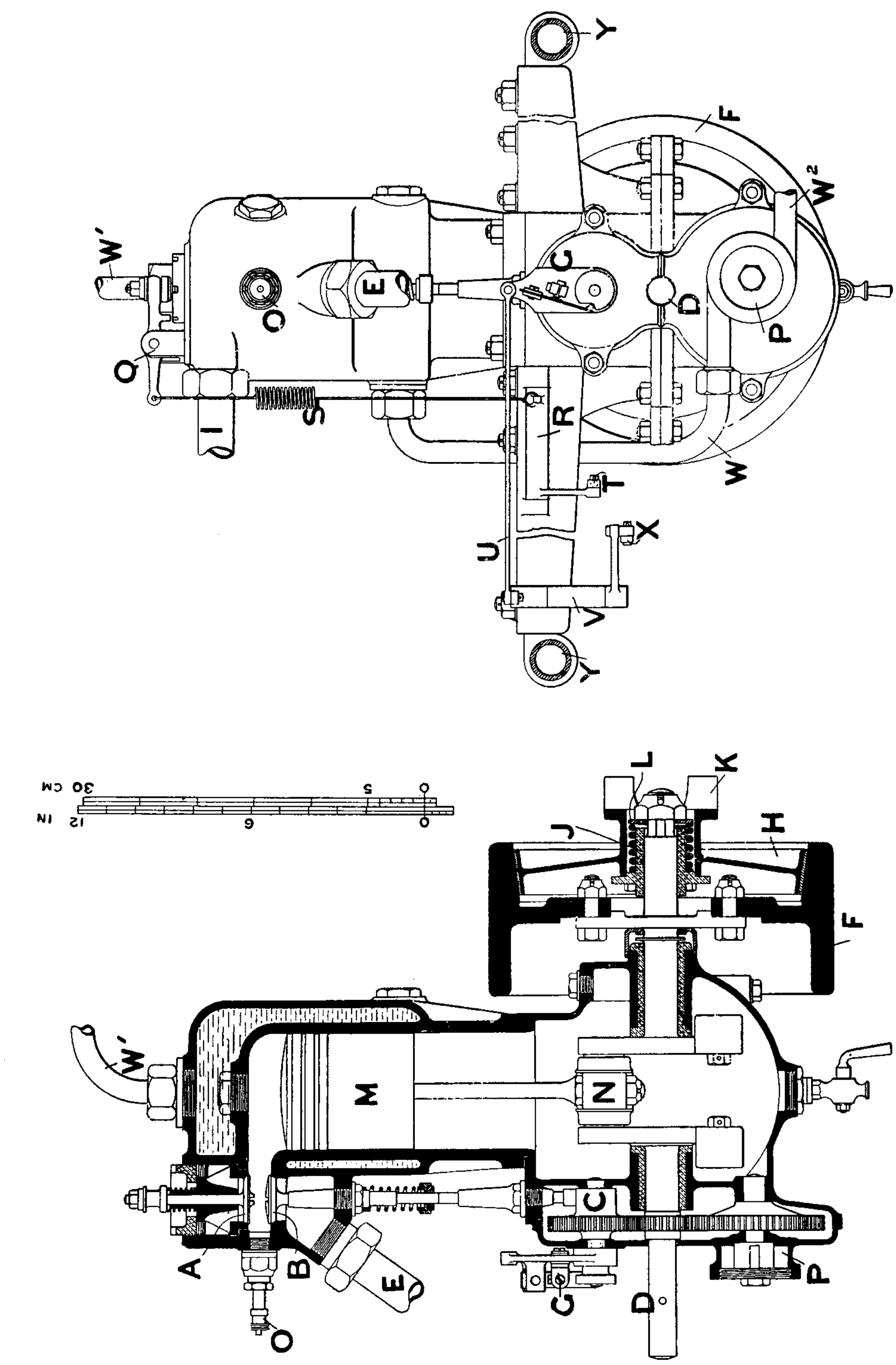
The drawings herein given of this car are interesting for these very reasons, and the success of the most recent of the Darracq designs has shown this conspicuously.

The car illustrated by Figs. 1 to 9 is that of the type purchased by Mr. Claude Johnson, and used by him in all weathers in travelling over the course of the Glasgow trials when he was organizing the arrangements and obtaining the road guide particulars for them. The arrangement of mechanism in this car is shown by Figs. 1 and 2, and details of the engine and transmission gear by Figs. 3 to 9. From Figs. 1 to 9 it will be seen that the chief items of the mechanism are attached to a rectangular underframe constructed of steel tubing, while the final transmission to the driving wheels is effected by means of a jointed tail shaft and bevel gearing on the live rear axle.

Engine

The motor M is mounted towards the front of the frame on a light pressed-steel base (see Figs. 2 and 4), and, together with the water tank, W and carburettor C, is enclosed within a light sheet-metal bonnet. As will be gathered from Figs. 3 and 4, the motor is of the single cylinder vertical type, water-cooled and fitted with electric ignition. The cylinder is 3·94 in diam. (100mm.), the stroke the same, and the engine is rated at 6·5 B.HP. at 1,400 revs. per minute. The induction and exhaust valves A and B are superimposed, the former being automatic, and the latter mechanically operated by means of a cam C on a short spindle driven at half the speed of the crankshaft; this spindle at its exterior end also carries the make and break circuit switch G for the electric ignition.

The cooling water for the cylinder jacket is circulated by the gear-



Figs. 3 & 4.—The $6\frac{1}{2}$-HP. Petrol Motor of the Darracq Light Car, 1900–1.

driven centrifugal pump P, which sucks from the tank W, Fig. 1, by way of the radiator R, and pumps through the jacket and thence into the tank by pipe W[1]. The speed and power of the motor may be adjusted by the driver by controlling the lift of the admission valve and by adjusting the point of ignition, these operations being effected by means of the hand-levers O and N on the steering pillar. The lift of the admission valve is decreased by increasing the tension of the spring S, Fig. 4. The mixture is taken from the carburettor C, which is of the float feed spraying type, by way of pipe I, Figs. 1 and 2, and the exhaust passes by pipe E, Fig. 4, and E′, Fig. 2, into the silencer E, which is attached to one of the main tubes of the underframe. The petrol supply is carried in the tank O, Fig. 1, mounted on the dashboard. The power is transmitted from motor to change-speed gear through the cone clutch H in the fly-wheel F, the cones being engaged by the spring L. The claw coupling K M, Figs. 3 and 6, transmits from the clutch to the first motion shaft U, Fig. 6, which may be engaged with the second motion shaft I by one of three sets of spur-wheels and pinions for forward driving, or a third pinion K, Fig. 6 may be engaged with the wheel and pinion of the slowest forward speed when these are out of gear with each other, in order to impart a reverse motion to the car. As shown in Fig. 6, the slow-speed wheel and pinion are in gear for forward motion. By moving P a little way towards I this wheel and pinion are out of gear with each other but are connected with the wide pinion K, so that a reverse motion is imparted to P when K is forced into gear with them. The power is conveyed from the shaft I to the bevel gear B C, Fig. 8, by means of the tailshaft V, Figs. 1 and 2, which is provided with Hook joints at either end. The wheel C of the bevel gear is mounted on the box D containing the differential gear on the live axle F, and the axle runs in ball bearings carried in the tubes E, to which the spring plates H are attached, and are joined at the centre by the gear enclosing case K. The shafts of the change-speed gear and the bevel pinion B run in ball bearings.

Engine control

Trans-mission gearing

The three forward speeds are engaged from the hand lever 1, Fig. 1, below the steering wheel, motion being conveyed through the link A (Figs. 1, 2, 5 and 6) and bell crank N to the sliding gear sleeve P, Fig. 6. The reverse pinion is brought into gear by means of the lever J, Figs. 1 and 2, and rocking arm J, Fig. 6. The vehicle is controlled by double acting brakes, which were at the time of the design among the best then made. It has since been flattered in the sincerest way. It is seen at B B on the end of the second motion shaft of the change gear (Figs. 1, 5 and 7). Its action is obvious. A coil band-brake I, Fig. 8, acting on the exterior of the differential gear box D, is put into action by the pedal P. The brake B B, which is shown in detail in Figs. 5 and 7, is operated from the hand-lever L, (Figs. 1 and 2). It consists of a drum, C, and two blocks, B B, pivoted on levers F F′, which are in turn pivoted at G G on extensions from the gear box. The levers carrying the blocks B are coupled by the link passing across from E to F, Fig. 5, and the lever E, which pivots on an extension of the

Brakes