different molecules must have a definite localization in the biophore, new molecules added being so arranged that the biophore can divide into two similar parts. The biophore is thus a morphological and not a chemical unit, and there is no such thing as "living substance." The biophore grows by the formation within it of new molecules, and not by the addition to it of preformed molecules. Life, therefore, implies not only certain chemical substances, but also a definite localization (organization) of the molecules of these substances in the biophore, and the biophore bears to biology exactly the same relation as the molecule bears to chemistry. There is thus a definite distinction between living and non-living things.

Professor DELÉPINE said he had not come prepared to take part in the discussion, but had paid some attention several years ago to the question so ably treated by Dr. Haldane and to some of the arguments so skilfully arrayed by Dr. Weizmann. He could not help feeling that very little progress had been made by the vitalistic and mechanistic theories since the early days of Greek philosophy. The chemical theory had been clearly outlined by Anaxagoras when he maintained that living and dead bodies were composed of the same elements and differed only owing to a difference in the proportions and grouping of these elements. Descartes, whose mechanistic theory received so much attention, fell into a trap when he compared living bodies to automata animated by non-luminous heat such as is produced during the fermentation of grape juice. The comparison of life to a fermentation was a shrewd guess, but was a dangerous weapon to use in support of the mechanistic theory, for the purely chemical theory of life obtained its strongest support in the doctrine of spontaneous generation, and received a serious blow when it was shown that fermentation is dependent on growth and multiplication of living organisms. The vitalistic theories had from a purely scientific point of view the disadvantage of being almost always associated with religious dogmas. The animism of Stahl united together an unconscious vital force with the conscious rational self or soul, a view which was opposed on account of its materialistic or pantheistic tendencies. To this theory the Montpellier school opposed a vitalistic theory recognizing two forces or principles or man, the one conscious and rational, the other other instinctive. This theory was strongly opposed by several eminent theologians and a pope. It must be admitted that none of the theories of life had up to the present time been capable of experimental scientific proof. On this ground Professor Delépine admitted himself an agnostic, following in this respect Claude Bernard, who believed that the vital force so called was of the nature of the primary causes which must remain outside the range of scientific investigation, notwithstanding the fact that phenomena occurring in living bodies could be accurately studied by the application of physico-chemical experimental methods. But, while preserving an agnostic position as regards the nature of life, it was possible to admit certain essential differences between living and dead matter. Living matter was characterized by phenomena of growth and reproduction which had never been observed in dead matter. The division of one drop of water into two drops was not comparable to the fission of the simplest protozoan. The subdivision of the drop of water was not spontaneous, and could not go on indefinitely, and, if pushed to the extreme, would only end in dissociation of its elements; even after this, the total weight of the elements would be the same as that of the original drop. The elementary living organism, when it divided by fission, gave rise ultimately to an infinitely larger mass of living matter composed of units retaining the characters of the ancestors. This living matter was composed of the same elements as dead matter, but these elements were constantly entering and leaving the living organism, which, nevertheless, retained its individuality and activities.

Professor LOVEDAY, of Sheffield, suggested that in Dr. Haldane's, as in other vitalistic arguments, there was some confusion between a metaphysical criticism of concepts and a question simply of scientific method, and that if physico-chemical notions were to be ejected from physiology on the ground that they were abstract, the vitalist's own notions would have to be ejected on the same ground, so long as he abstracted from consciousness.

Dr. HALDANE, in reply, said his contention was an

attempt to find the true way of looking at the facts, so that they could interpret what they observed. To introduce vital force and ask them to measure it was to confuse the whole question, and much of his paper had been directed to showing that the conception of a special vital force introduced among other forces was an impossible one. The conception of vitalism defined a way of looking at the facts which did not introduce a new force, and which in no way contradicted the principles of physical science; but, on the other hand, the principles of physics and chemistry were unable to throw light on the special features of life as compared with a simply mechanical process. Dr. Weizmann had made, he considered, a most able defence of the mechanistic theory. He had, indeed, said all that could be said for it, but the fact remained that it failed to provide the means of solving physiological problems when they looked at them with a view to interpreting all they were able to observe. Life also, he contended, should be studied in higher organisms, where they could observe what was taking place, and not in minute specks of protoplasm, as Dr. Weizmann had suggested.

THE MOTOR SHOW :

FROM THE MEDICAL MAN'S POINT OF VIEW.

By H. MASSAC BUIST.

THE International Motor Carriage Show, which closes at Olympia, Kensington, on Saturday night, and which is the tenth of the series promoted by the Society of Motor Manufacturers and Traders, under the patronage of the King, surpasses all previous ones, whether we review the products of the home or of the foreign industries, in the directness of its appeal to the medical man. When we reflect that four-cylinder cars like the three-seater 20-h.p. Ford from America can be retailed complete to-day for £150—otherwise for the price of a brougham and horse, each of not too good a quality—and that the range of service of such mechanical vehicles and their power to economize time is infinitely superior to anything that a single or several quadrupeds can do, it becomes a matter of mere self-interest for the medical man, and especially for the country practitioner, to pay a little attention to what is being achieved by this wonderful new industry.

If one's investigations are conducted merely on the lines of seeing how much can be got for how little money, one must begin a study of the show by examining the heralds of a coming cross-bred type of engineering constructional practice between motor cycle and motor car. Quite frankly, however, one will not pretend that makers in general have yet had sufficient experience in this class of machine to enable it to be confidently recommended to any members of the medical profession, since they naturally require vehicles that have been tested to such an all-round extent that they can be depended on as absolutely as railway trains. Of this newest development of the motor industry it must be recorded that no such thing can be said about it conscientiously at its present stage.

LONG-STROKE ENGINES.

On the other hand, a very notable feature of the show is the class of article available for an inclusive sum of from £185 to £285. If we confine our investigations to four-cylinder cars, we find that practically only a couple of makes under this head come from the Continent, one of the most distinctive of these, from the constructional point of view, being the four-cylinder block-engined Sizaire type; this is notable as being the first coming from France that follows the current British practice of using a chain-drive for mushroom valve gear. As, however, in the case of the 200-guinea four-cylinder, two-seater, Manchester-built, worm-driven Belsize car, the class of roller chain used for driving these valves is not of the heavy sort employed by most makers who are taking to this practice, such as notably the Benz, Wolsley, Sunbeam, Crossley, and kindred concerns. The Sizaire is further conspicuous (even in a year when the motor with a long piston travel in relation to the cylinder bore is more in evidence than ever) in that, with a bore measurement of only 70 mm., the piston displacement is 170 mm.; whereas if one regards English practice all round it is discovered that the most daring exponents of the long-stroke motor

are the Sunbeam Company, and that in their four-guinea or 12 to 16-h.p. model, the piston travel is not more than 150 mm. though the bore is 80 mm. Practically everybody who has had anything to do with a car appreciates, of course, the great gain of a long stroke when it comes to the hills, but what they rightly object to is the comparative coarseness that has hitherto gone with it; but now, notably by the lightening of such reciprocating parts as connecting-rods and pistons, and by the building of very stout crank-shafts, as well as supplying them with two bearings to every crank throw, makers of the better classes of cars have discovered how to produce long-stroke motors that shall, nevertheless, not be coarse in service, no matter at what speeds or loads.

THE NEW FOUR-CYLINDER CLASS.

If the products of the European industry be considered, one arrives at the conclusion that it is scarcely possible to get a four-seater car capable of work on give-and-take roads and of good wearing life for less than £285 complete, though one can get two-seaters cheaper. For the sum stated, however, there are now brought forward the 11.9-h.p. four-cylinder Arrol-Johnston car with unit bed-plate construction for the motor, crank chamber, fly-wheel pit and gear-box, slipper type of bonnet that renders the motor accessible from three of its four sides, and dashboard cooler, but not with front wheel brakes, which are no longer fitted by the firm unless specially ordered. A standard vehicle of this type, with two-seater body, has travelled at over fifty miles an hour for six consecutive hours on the track at Brooklands by way of demonstrating the worth of the maker's guarantee that machines of this size with four-seater bodies shall be capable of speeds of forty miles an hour. 1912, of course, will be the year during which a great many manufacturers will bring out, for competition purposes at any rate, machines of from 60 to 69 mm. cylinder bore, such as come under the three-guinea tax. Such is the efficiency of European construction that in some of these we are getting as good results as the Americans achieve with very much larger engines. In this smaller class of car, too, there is the 10-h.p. Austin by a first-class British firm, notable as being about the only English maker that adopts the practice most generally followed in America of having the four cylinders cast separately. This particular little vehicle is a new type, inasmuch as, though staged at a former show, it was sold practically only for service in the colonies that it might have a twelvemonth's test in the hands of private users under the very much more severe conditions of use that obtain overseas; hence the firm is now quite sure of itself in introducing this machine to the home public. In this class also is the four-seater Humber, retailed complete with accessories at £285. But perhaps a more notable feature of this firm's 1912 policy is that for about £40 more it supplies a 14-h.p. vehicle with a worm drive. All its models this year have detachable wire wheels of the suspension type, the Rudge-Whitworth variety being standardized by the Wolseley, Daimler and Crossley among many other firms, while the Dunlop sort are being standardized, among others, by the Minerva Company, which also introduces from Belgium a worm drive of the overhead sort.

AN ORIGINAL COMBINATION.

Quite one of the most striking British novelties in this low-priced class, however, is the vehicle with which the Birmingham Small Arms Company signalizes its re-entry to the motor industry in a manner which really represents its first proper start. It is of normal 14-h.p., with a cylinder-bore measurement of 75 mm. and a piston travel of 114 mm., the casting being done in pairs and the motor being of the sleeve-valve Daimler-Knight sort, while the power transmission is fresh, in that it combines a three forward speed gear-box controlled on the gate change principle with an overhead worm drive in the rear live axle casting. The suspension at the back is new to European practice, but is practically a copy of the Ford principle, though the front springing is of the conventional British sort. But for the fact of a worm drive of the overhead type being employed, of course the transmission mechanism would be on the principles employed by quite 40 per cent. of the popular as well as of the costly American

types of cars, among which may be placed the Flanders, the E.M.F., and the Packard sort, that are not represented within the building at Olympia, and the Overland type that is staged within the main building. Theorists, of course, have always said that this is a bad way of constructing, because there is so much unsprung weight, and that in the guise, too, of vital functional parts. But theorists have long since proven themselves very worthless guides when motor matters are concerned, for if we had ever listened to them we should never have had the light, portable, liquid fuel, internal-combustion engine of to-day. The point it is necessary to emphasize at the moment is that this principle of light, compact, rigid, and wellnigh silent, three-speed gear-box, in conjunction with the rear live axle, has not only been exploited successfully for several years past in this country by the Sheffield Simplex firm, but is used alike on the dearest and on the cheapest forms of cars, and to a wholesale extent, in America, a big majority of such machines being employed in daily service in districts where real roads are not, and where often there are no tracks whatever. Thus it is quite idle to look askance at the development on mere theoretical grounds. Theory has been upset once more in a fresh phase of European motor-car development. The Birmingham Small Arms enterprise is, therefore, notable in introducing an exceptional combination of features calculated to achieve the most refined running, for the Ford car has already proved how efficient is the form of suspension used for the rear by the firm, yet the whole English car is retailed complete as a chassis for only £250, or with four-seated body, hood, screen, lamps, and all accessories for £325.

Special features and exceptional cases apart, of course, it is quite obvious that the American motor industry has got the small car trade in its hands, because we have to remember that the majority of machines made in the United States have really good stuff in them. The manner in which this can be done at the price at which the vehicles are retailed is to be accounted for in a number of ways, including the fact that the biggest makers pool their orders for raw materials so that they buy sometimes a million, sometimes two million pounds' worth of steel at a single commission; in consequence of this the manufacturers can, of course, give them the best possible terms, and the motor manufacturer gets the precise quality of steel most suitable to each particular part of car mechanism. In addition, the American buying public is educated to the point of accepting standardized productions to a vastly greater extent than the British, and in consequence of this the output of the individual manufacturer in America can be much bigger than is possible in Europe.

THE BETTER-CLASS VEHICLES.

Altogether the show leads one to the conclusion that the most creditable productions of the world's motor industry at the moment are the cars that range in cost between £300 and £450 each complete. This category contains practically the cream of the products of all the firms of longest established repute, from Adler, Benz, and Mercedes in Germany, Panhard, Peugeot, Clément, Gladiator, Vinot, Darracq, Chenard-Walker, Lorraine-Dietrich, and De Dion in France, to Daimler, Wolseley, Napier, Siddeley-Deasy, Straker-Squire, Austin, Sunbeam, Argyle, Clément-Talbot, and the rest in England, as well as the Minerva from Belgium and the F.I.A.T., S.C.A.T., and Lancia from Italy. Many of those firms make cheaper as well as dearer cars, but in none of the categories do they surpass the achievement embodied in the middle-priced machines, among which will be found some of the most notable fresh mechanical features—as, for instance, the introduction of the single-sleeve valve Argyle motor, that combines the patented principles of Mr. Peter Burt of Glasgow and Mr. J. H. K. McCollum of Toronto; this type is being manufactured in Switzerland under licence, too, by the Piccard-Pictet firm. The principle is that the one sleeve does not merely slide straight up and down; it also partly turns in the process, so that if a pencil were kept stationary at one point and the sleeve made to perform a complete cycle of its operation there would be pencilled on the sleeve the mark of an ellipse. This twisting motion, of course, greatly facilitates oiling. I have tried this machine on the road, and would therefore mention incidentally that, alike in silence and in performance, it utterly eclipses the best that has yet

come from the Scottish firm that is responsible for its production.

A SIMPLE NEW-STYLE ENGINE.

The new 20-h.p. four-cylinder Darracq car likewise shows that the policy of this firm (whose enterprise gave the motor world the pressed-steel frame) is not only changed in that the engine is put under a shoe-shaped bonnet hinged to the dash, and thus made accessible from three sides (the cooler and the gravity-fed petrol tank being in the dashboard), but there is now employed for the power transmission an overhead worm drive—the first to come to us from the Continent—while the rear suspension is by three-quarter elliptic springs, the under members of which are hung below the axle, in place of being seated upon it. This principle is likewise adopted this year by the Wolseley Company for two of its models, in that it has certain advantages; nor must we forget that several years ago in some six-cylinder Napier cars the semi-elliptic springs employed at the back were also underhung. But the great novelty of this 20-h.p. Darracq chassis is the motor, which has neither sliding sleeve, mushroom form, nor piston valves, but a single cylindrical horizontal shaft cut in D-section opposite each cylinder port and rotated by skew gear, thus greatly reducing the total number of parts embodied in the motor and providing a working operation as silent as in any new-style engines of the day. When, in the process of rotating this shaft, the flat or front portion of the D-section comes opposite its corresponding valve port, there is formed a free passage between that port and, as the case may be, either the mixture intake pipe from the carburettor or the exhaust gas pipe. A somewhat allied form of rotary valve engine, but one scarcely so simple in character, is likewise introduced by the Itala firm.

EMANCIPATION FROM PREJUDICE.

General emancipation from the prejudice that there was only one possible way of furnishing satisfactory valves to internal combustion liquid fuel engines is manifest, moreover, in the introduction by Panhard of another and still more popular type of double-sliding sleeve Knight system motor on the 15-h.p. vehicle, which is the chief novelty of that firm's programme. Its clutch details are particularly worthy of study, as are those on the new Vauxhall chassis, in which the discs work in dry graphite, need no attention, and are so gentle in their engagement that it is scarcely possible, even for a clumsy beginner, to damage the gears in changing them. In regard to fresh engine practice, too, the Siddleley-Deasy Company fits its two largest models with Daimler-built, double-sleeve valve engines respectively of 18-24 and 24-30 nominal horse power, the larger being the first six-cylinder vehicle put on the market by the Siddleley-Deasy firm, while both these new-style machines have the new Daimler crankshaft vibration damper which takes the simple form of a light, many having disc clutch always in engagement, half of the plates on the front end of the crank-shaft, and the other half on the fan-belt pulley. Practically all crank shafts have what are styled critical speeds, and this has presented one of the most complicated problems to automobile engineers, for at these critical speeds crankshafts, particularly of the long, high-speed six-cylinder sort, thrash or vibrate pronouncedly. The Daimler type of clutch vibration damper is not so rigidly self-engaged but that the momentum of the outer rim creates a tendency for the plates to slip if the crank-shaft of the engine suddenly changes its angular velocity, the consequent drag damping out the growth of excessive rim amplitude whenever the explosion impulses on the crank-shaft happen, as at the so-called critical speed, to synchronize with the natural period of the shaft.

NEW WAYS OF TRANSMITTING POWER.

One comes next to a consideration of power transmission, wherein the changes have not been numerous, though a growing tendency is to be observed in ordinary types of gear-boxes to place the lay shaft below the primary one. Apart from such amazing compactness of construction as is possible to achieve without sacrificing strength by combining change-speed box with the bevel or worm housing in the rear live axle (as in the practice of the Birmingham Small Arms, the Sheffield Simplex, the Overland, the Flanders, and the E.M.F.),

remarkably compact, rigid, and therefore correspondingly quieter gear construction has been found possible (by the Vauxhall firm, for example), thanks to use of air-hardened German steels, with which the spur wheels can be made of approximately half the former width. There is, besides, the new 15 h.p. Lancia car from Italy, which is a light medium-powered machine that can be driven on a gearless drive for over 95 per cent. of its work without calling for the motor to be unduly flexible or straining it in any way, the reason being that, of four forward speeds, two give a through drive. Another notable attempt to get a silent gear-box is represented by the Maudslay practice, which does not furnish a single direct drive, but which goes on the lines of the latest motor omnibus practice in employing silent chains in the gear-box, the different series being connected, according to which gear is wanted, by means of dogs on the shafts. The Davies chain-driven gear-box, on the other hand, gives on chainless, otherwise gearless, drive, the top forward speed.

A POSITIVE SELF-STARTER.

There is a growing tendency to employ electric lighting for motor vehicles, though most of such apparatus is yet too expensive and heavy to become really generally used. Several firms, such as the Adams and the S.C.A.T. Company, fit as a standard different types of starting apparatus for the engines on the compressed air principle. But the greatest novelty in this connexion is that of the Cadillac firm, which employs an electric starter; it differs from all others in its big reserve capacity, for if the motor is giving trouble, instead of soon exhausting your stored energy in turning over the crank, there is sufficient electricity available to rotate the crank shaft under full compression for quite twenty consecutive minutes. This apparatus also supplants the magneto and coil and accumulator ignition machines, because it fires the mixture in the cylinders, and it also lights the vehicle entirely. The whole device is fitted as a standard practice, and starting handles are not provided on these cars. It is certain that in a year or two practically the last bane of motoring, the starting handle, will disappear from all cars. When we consider the increasing employment of detachable wire wheels which are being made by a number of specialists nowadays, and which can be fashioned also of the wooden variety for those who prefer it, and also the use, though perhaps to a lesser degree, of detachable rims, it must be regarded as possible nowadays for men to economize the services of a man-servant when motoring, for practically no physical effort is needed either to start the engine or to change tyres. When, however, this practice becomes quite common, as it is bound to do presently, there will have to be provided by makers locks to keep the bonnets down, since the practice of stealing magneto machines and spare wheels from cars left standing by the roadside is becoming quite a specialized form of robbery.

In a subsequent retrospective article one may review certain special cars that are staged at the moment at Olympia. In the meantime the exigencies of space allow only of a review of general tendencies and outstanding developments.

BRITISH MEDICAL BENEVOLENT FUND.

At the October meeting of the committee 34 cases were considered and grants amounting to £253 made to 26 of the applicants. As the treasurer had reported that the account at the bank was already overdrawn to the extent of £95, the total deficit is now £348.

Additional help is urgently needed, for applications at this time of the year are not only very numerous, but of a most distressing nature. Contributions may be sent to the Honorary Treasurer, Dr. Samuel West, 15, Winpole Street, London, W.

1. Daughter, aged 66, of late M.D.St. Andrews. Only income a small annuity purchased by friends, and is in such poor health that work is impossible. Relieved four times, £48. Voted £12.

2. Daughter, aged 60, of late F.R.C.S. Has maintained herself as companion, housekeeper, etc., for several years, but for the last eighteen months has been unable to obtain any rest. Relieved twice, £10. Voted £5.