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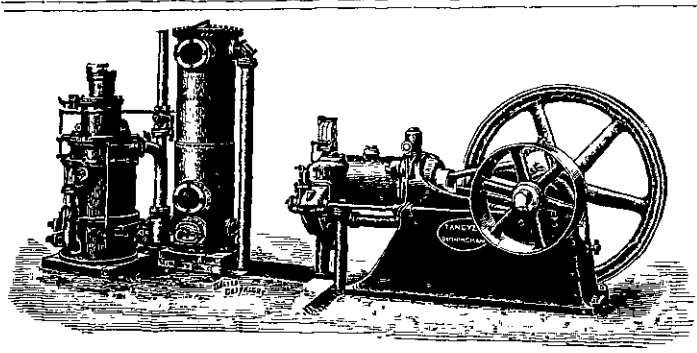

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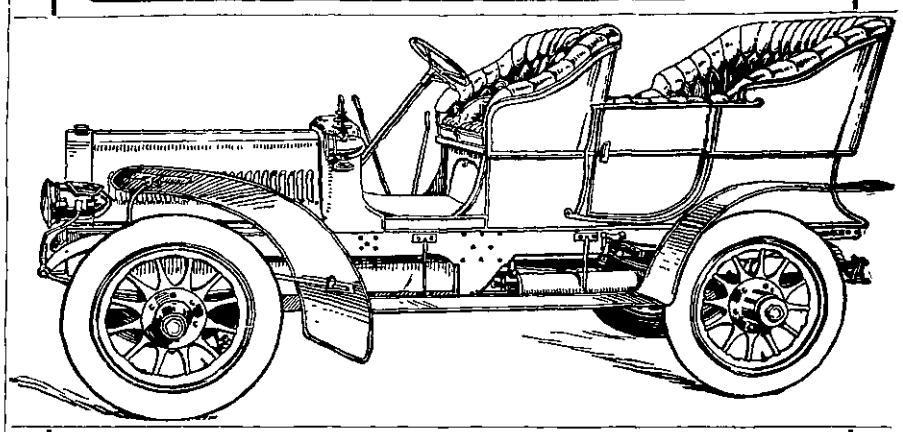

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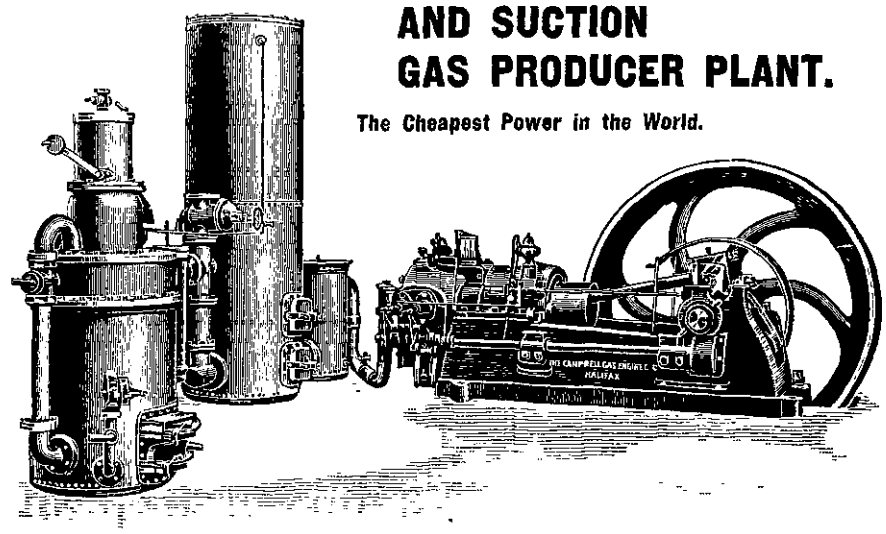

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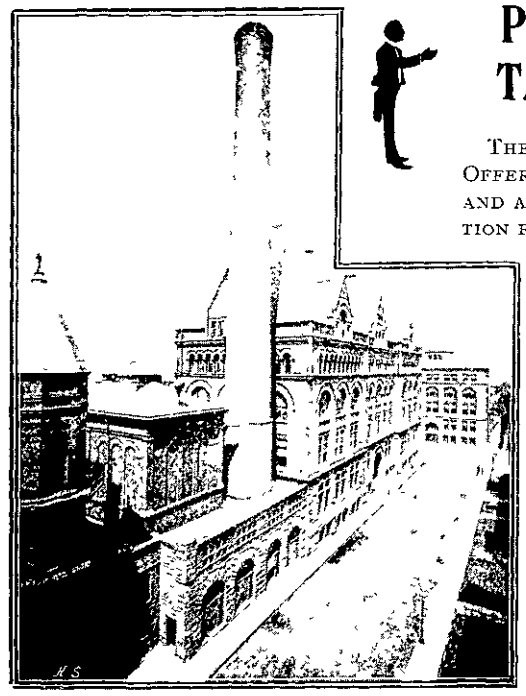

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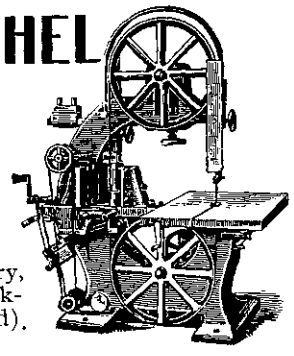

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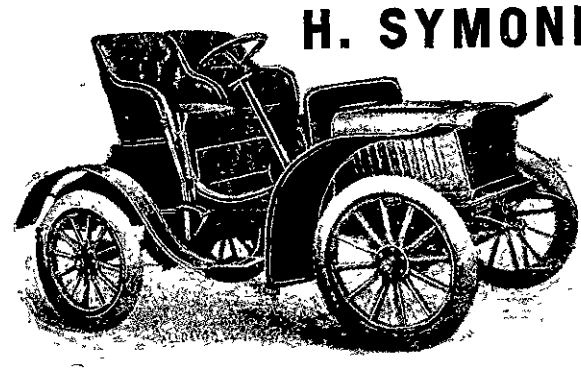

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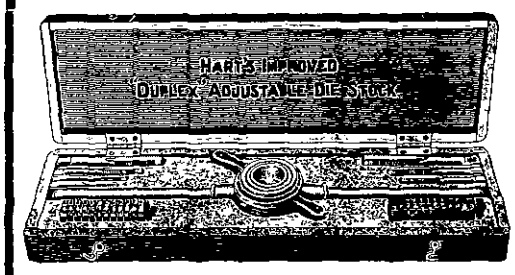

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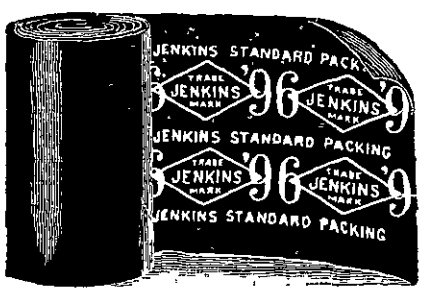

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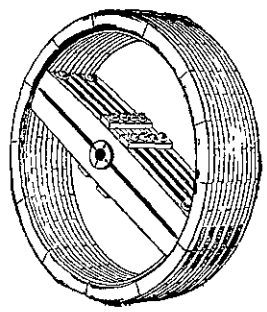

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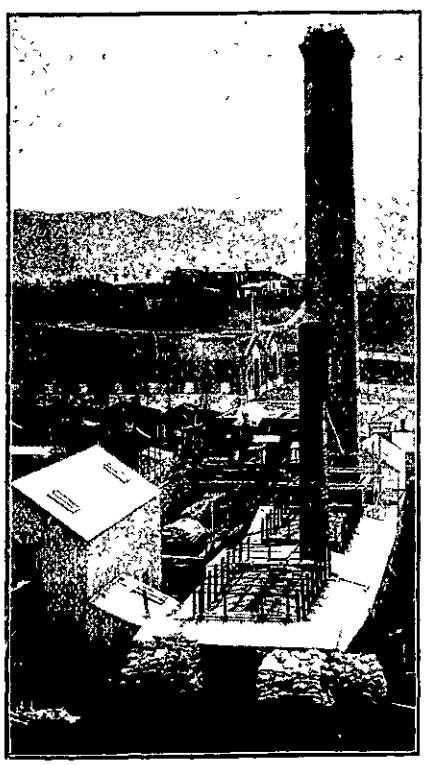

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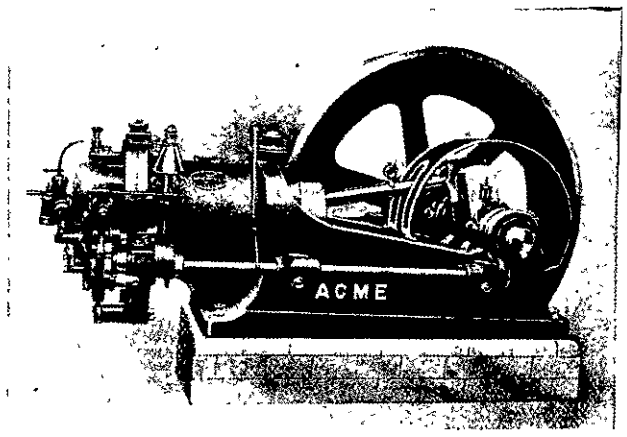

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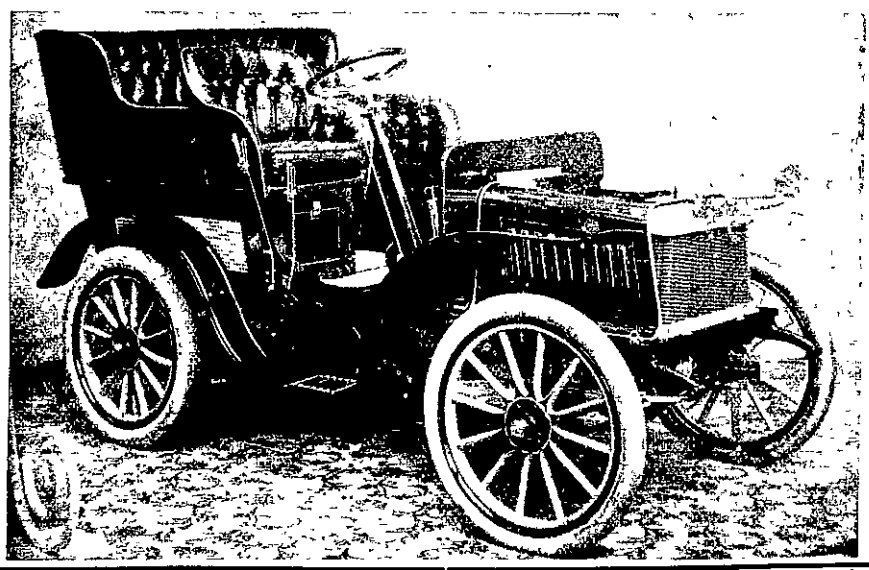

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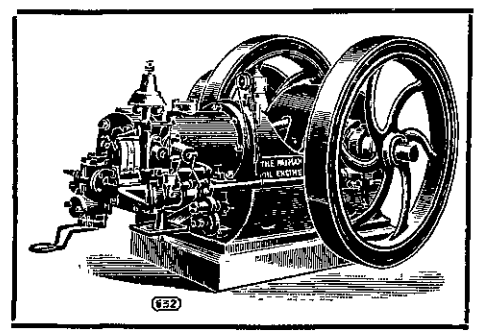

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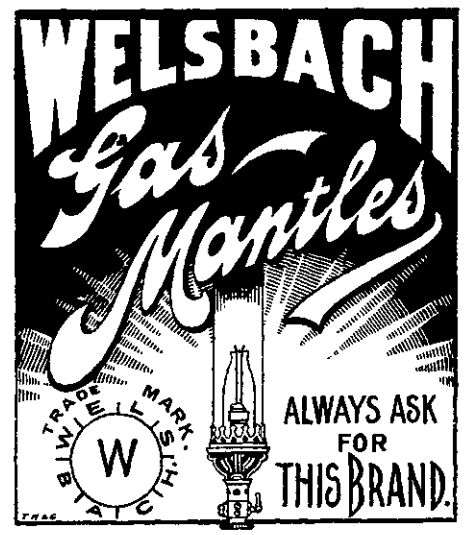

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BRIEF FOREWORD.

THE usual number of our pages has been nearly doubled for this issue. Nevertheless, we have been compelled to hold over for future publication many subjects and illustrations of an interesting nature. We desire to thank the secretaries of the various automobile clubs, and also private contributors, for prompt and valuable assistance tendered.

THE STANDARD CAR.

ELSEWHERE in the present issue we have illustrated and described individual cars, that represent the progress in the art of automobile manufacture; and it is, therefore, our purpose in the present article merely to outline what might be called the type touring car, as evolved during the past ten years of the industry.

The standard car at the opening of the year 1906 is a four-cylinder touring car of 24 to 28 horse power, weighing from 2,000 to 2,200 pounds, or a 30 to 35 horse power machine, weighing from 2,200 to 2,400 pounds. The four-cylinder motor is housed in a bonnet at the front, and the power is transmitted through a three-speed, sliding-gear transmission by shaft drive and bevel gears to a live rear axle. The wheels are distinctly larger, being 32 to 34 inches in diameter, with large tyres, 4 or 4½ inches in diameter. The standard car shows marked improvement in the arrangements for lubrication of the engines, a continuous circulation being secured by some form of mechanical force-feed oiler, the oil passing through sight feed glasses carried at the front of the machine on the dashboard. The familiar leather-lined cone clutch has given place to a multiple-disc clutch, and as the discs run continually in oil, there is a certain amount of slip when the discs are first compressed, so that the clutch takes hold without jar or jerk. This renders it possible to start a car on the high speed from a standstill. Although the majority of the cars still make use of cooling water and a centrifugal circulating pump, there is evidence that the air-cooled motor may ultimately become the prevailing type, even for the high-powered car. Two makers exhibit this year six-cylinder, air-cooled motors. They were encouraged to take this step by the good results that have been obtained by air-cooled motors in the various reliability and economy runs that have been held during the past year. Another make secures its cooling effects by permitting the cylinders themselves to revolve; but practically all of the others make use of fans, one of the few exceptions being that of a light four-cylinder runabout, one of which performed the feat of crossing the United States. There is no question that the air-cooled car has falsified the predictions of failure which have been made freely in the past; and the good results secured are to be attributed to a careful study of conditions and well-thought-out design.

We notice that the standard touring car for 1906 is fitted with spring-separated ball bearings in the transmission and the wheels, with the choice of roller bearings for the rear axle, wheels, and countershaft. Ball bearings have been in use now for two seasons, and may be considered as standard practice. The greater ease and smoothness of running are attributed to shock absorbers, re-bound checking devices, and pneumatic tyres of large diameter.

The standard car depends for ignition upon the jump spark, with high-tension magneto or storage battery. The valves are mechanically operated and are interchangeable, two sets being used, one on each side of the motor. The type car may carry either cellular radiators or those of the finned tube pattern, while some of the cars use flattened tubes provided with radiating fins. The type car carries two separate brakes, one of the expanding ring type, the other a band brake, acting within and on the outside of a drum on the rear wheel. The band brake, worked by a pedal, is for ordinary use, and the expanding ring brake, which is applied by the hand, is used for emergency. Finally, we note that the engine is controlled by separate spark and throttle levers, mounted on stationary sectors in the steering wheel.

It is a matter of congratulation that the industry has now grown to such proportions that the manufacurers are enabled to turn out a standard car which is at once superior in construction and lower in price.

THE SUN'S HEAT.

How does the sun maintain its heat? This has always been a problem of intense interest to the human mind. It was at first supposed, naively, that the sun's heat was maintained by ordinary chemical combustion; that the sun was a burning fire, and that when the coal, or what not, which the sun was composed, was consumed, there would be an end of light and heat and life. This belief was shown to be untenable, among others by Professor Tait who said: "Take (in mass equal to the sun's mass) the most energetic chemicals known to us and the proper proportion for giving the greatest amount of heat by actual chemical combination and, so far as we yet know their properties, we cannot see the means of supplying the sun's present waste for even 5,000 years. . . . . It is quite obvious that the heat of the sun cannot possibly be supplied by any chemical process of which we have the slightest conception. . . . This question is quite unanswerable, unless there be chemical agencies at work in the sun of a far more powerful order than anything we meet with on the earth's surface."

Next it was supposed that the meteorites falling into the sun could generate heat sufficient to maintain its energy. This also was disproved. Finally then came Helmholtz's theory, based upon the nebular hypothesis, that the heat of the sun might be maintained by its own contraction from a nebular condition. It is not too much to say that in recent years this has been the accepted theory of science, It has always been burdened, however, by the fact that, on this basis, the sun could not have maintained its energy and have illuminated the earth in the past for a time sufficient to account for the observed geological changes. Professor Young says in his "General Astronomy," "No conclusion of geometry is more certain than this that the contraction of the sun to its present size, from a diameter even many times greater than Neptune's orbit cannot have been emitting heat at its present rate for more than 18,000,000 years, *if its heat has really been generated in this manner.*

Finally, Lord Kelvin has calculated the energy lost in the concentration of the sun from a condition of infinite dispersion with the conclusion that it is "on the whole probable that the sun has not illuminated the earth for 100,000,000 years, and almost certain that he has not done so for 500,000,000 years. As for the future we may say with equal certainty that inhabitants of the earth cannot continue to enjoy the light and heat essential to their life for many million years longer, unless sources now unknown to us are prepared in the great store houses of creation."

We shall see that in radioactivity we have, probably, an additional store of energy. We know that there exists in the sun enormous quantities of the element helium. We know, also, that helium is a decomposition product from radioactive substances,—and finally we know that radioactive substances generate enormous quantities of heat. It is, therefore, possible, and even likely, that there exist in the sun's mass large quantities of radioactive matter, and on this supposition it is easily possible to increase to an enormous extent the duration of the sun's age and heat in the past, and its maintenance for untold millions of years in the future.

It may be shown that the presence of 3.6 grams of radium in each cubic metre of the sun's mass is sufficient to account for its present rate of emission of energy, or, calculated in another way, that 2.5 parts by weight of radioactive matter in a million would keep the sun going. Rutherford concludes that if the energy resident in the atoms of the elements is available in the sun that the time during which the sun may continue to radiate at its present rate may be as much as 500 times longer than the maximum limit afforded by Lord Kelvin.

We see thus that the depressing conclusion of the older science that the earth must come to an end in a time short in comparison with its past duration, was unwarranted. It may, however, be objected to this conclusion that if the sun possesses radioactivity, this radioactivity ought to be perceptible on earth. But this is not so, for even the most penetrating rays, the *gamma*-rays, would be practically stopped and absorbed by the earth's atmosphere which is equivalent to 30 inches of mercury.

Paragrams.

"Swapping horses" used to be more common than now. Exchanging cars is a practice some motorists with a love of novelty and change are trying to inaugurate.

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Queen Margherita of Italy intends next year to make an incognito motor tour from New York to San Francisco, where she and her suite of cars will embark for Japan, which she will "do" thoroughly by motor.

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The *Paris Herald*, commenting on the Olympia Show, says, "the people were pushing and shoving as though they were taking part in a football match, and I am sorry to say the well-dressed women were as bad as the men."

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The Italian Government offers a subsidy of 500 lire (£20) for each ⅛ths of a mile opened to the transport by motor of passengers or merchandise. In Great Britain a new line of motor omnibuses is fought and often suppressed by small local authorities whose interests are vested in horse-omnibus or tram services.

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Many tailors state that after their customers buy a motor car their chest measurements increase as much as two inches in a year. They say it is not a question of the use of the chest muscles in driving, so much as the deep-breathing exercises involved in passing rapidly through the air. This, perhaps, explains why so many persons with delicate lungs and weak chests have benefited so considerably by motoring.

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A letter lies on our desk at the moment of writing from a friend who as a forlorn hope for tuberculosis took some two years since to motoring. He now writes, "A motor car is a sure cure for consumption. I am perfectly well, have changed from a sallow wreck to a rugged man, look fifteen years younger, and despite my fifty-two years feel like a mere lad."

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The British Government allows the road tools of Ceylon to be put up at auction annually and sold to the highest bidder. The toll speculator is always a native, and the prices realised by the sale of road tolls has gone up since the motorist appeared on the scene to be mulcted at all possible points on the road. How the moribund Highways Protection League would rejoice at the introduction of this system into Great Britain.

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A solar reflector furnace has been designed for the purpose of obtaining very high temperatures. Temperatures above 3,500° C.—higher than that of the electric furnace—are looked for, says the *Engineer*. The reflector is built up of 6,170 elementary mirrors, each 122 mm. by 100 mm. (4.8 in. by 3.957 in.), arranged side by side in parallel rows, and are attached by threaded standards to a series of parallel angle irons which run horizontally across the frame. The width at the top is 35ft., at base 18ft., and depth 3cft. With a previously constructed and much smaller furnace on similar lines a temperature of 2,000° C. was obtained.

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From a census of opinion taken at Olympia we are convinced that the car between 15 and 18-h.p. is destined to be the most popular vehicle for England. It is sufficiently speedy for most, it picks up well after a check and is very suitable for English roads. The "carriage and pair" motorist will, of course, want something livelier, of bigger horse power, but the car we have named is a very suitable type

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New languages still find supporters. One that is now fast becoming first· favourite is Esperanto. Writing from the Esperanto Club, London, Mr. G. L. Brown states that of the 1200 languages already spoken, "none are suitable for use by all nations." This it is attempted to remedy by Esperanto. Since it may interest our readers we append herewith a sample :—"De tridek jarog en Germanujo tre progresadis la kemiaj industrioj. La valoro de la elportado, kin jam en 1880 superis per 125 milionoj da frankoj la valoron de la enportado, nune superas la enportadon per pli of 230 milionoj." When this is translated it means: "For the last 30 years the chemical industries have very considerably progressed in Germany. The value of the exports, which in 1880 already exceeded the value of the imports by 125 millions of francs, now surpasses the import by more than 230 millions."

"Where there were ten years ago a thousand mockers of the machine which crawled from London to Brighton, there are to-day thousands of motor devotees fascinated by the plastic ease of its movement, the swiftness of its progress, its obedience, and reliability," is the comment of the *Daily Chronicle*.

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One notable advance of last year was made by the general and practical plan of quoting a price for cars fitted with all the equipment necessary to make them "ready for the road." The old plan, so much for the chassis, a further sum for the body, and sundry extras for lamps, horns, tyres, etc., was unsatisfactory to most buyers. The fastidious, however, can always specify certain makes of lamps, horns, tyres, and other "etceteras."

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The Darracq concern has been successfully floated as an English company, at a capital of £375,000, as preferred ordinary shares, and £150,000 5 per cent. debentures. The old 6 per cent. preference capital will be redeemed, but the £275,000 of ordinary shares will be untouched. The net profits of this great concern for the last three years: £100,275, £112,313, and £152,663 respectively. A total of £365,151.

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New spinning mills in England now being erected number 16, and some of these are nearly ready for work. Their total equipment is 1,650,000 spindles, and all will use Egyptian cotton. The average cost of a mill at the present time is about 24/- a spindle.

Air hoists are referred to in an article in the *Engineering Magazine* by F. A. Waldron, who says the air hoist has been developed along the lines which the market has demanded, but except in foundry work, to which it is peculiarly adapted, it is not generally so popular as the electric hoist. It is used in the plunger and motor form, in places where electricity is not obtainable, or where work requiring the use of the hoist will not warrant the expense of an electric installation.

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The New Zealand Government recently invited tenders—first, for a direct steam service between New Zealand ports and South Africa; second, for a service between New Zealand ports and South Africa, via Fremantle, with permission to call at one other port in Australia. The steamers are to be fitted with refrigerators to carry frozen meat and produce. The rates of freight from New Zealand to Fremantle are not to exceed the rates current from time to time from Sydney and Melbourne to Fremantle. A deposit of £2000 is to accompany each tender, and in the case of the successful tenderer to be returned upon completion of a satisfactory charter. Tenders will be received by the Secretary for Industries and Commerce, Wellington, or the High Commissioner in London.

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The history of the pendulum practically begins with Galileo's beautiful discovery of the isochronism of the pendulum from the swinging chandelier in the church at Pisa. This discovery was of great value in many respects, but in none more so than in its application to the measurement of time. Soon after that great discovery the English clock maker, Graham, invented the mercurial pendulum, by which the variation in its length caused by the difference in temperature was fully compensated, and some years later, Harrison, another English clock maker, invented a compensated pendulum, which consisted of a series of metal bars having different coefficients of expansion; so that two hundred years ago, as it is to-day, the pendulum was the nearest perfect of all the devices that have been employed for governing or controlling the motions of a clock mechanism. The above is an extract from a paper read by Ambrose Swasey before the American Society of Mechanical Engineers.

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Spider lines in optical instruments are the only threads available for their special purpose. The spider lines mostly used are from one-fifth to one-seventh of a thousandth part of an inch (.0002 in. to .00014 in.) in diameter, and in addition to their strength and elasticity, they have the peculiar property of withstanding great changes of temperature; and often when measuring the sun spots, although the heat is so intense as to crack the lenses of a micrometer eye-piece, the spider lines are not in the least injured. The threads of the silkworm, although of great value as a commercial product, are so coarse and rough compared with the silk of the spider that they cannot be used in such instruments. Platinum wires are made sufficiently fine, and make most excellent cross wires for instruments where low magnifying powers are used, yet as the power increases they become in appearance rough and imperfect. Spider lines, although but a fraction of a thousandth of an inch in diameter, are made up of several thousands of microscopic streams of fluid, which unite and form a single line, and it is because of this that they remain true and round under the highest magnifying power. An instance of the durability of spider lines is found at the Alleghany Observatory, where the same set of lines in the micrometer of the transit instrument has been in use since 1859. The placing of the spider lines in the micrometers is a work of great delicacy, and in some micrometers there are as many as thirty, which form a reticule, with lines two one-thousandths of an inch apart and parallel with each other, under the highest magnifying power.

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The Panama Canal is likely to be a very costly undertaking for the United States Government, and the time of its building will probably be equal to that of a generation, if present estimates are correct, states *Page's Magazine*. Mr. F. J. Wallace, the chief engineer of the Isthmian Canal Commission, has reported that a sea-level water-way across the isthmus, although it would cost far more and take much longer to complete than the three other canal projects under consideration, would in the end be best. In his opinion, the cost of the sea-level canal would be about 60,000,000 as against £40,000,000 for a 0-ft. level canal, and he thinks that twenty years would elapse before its completion, or ten years more than for a canal with locks.

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The preservation of posts set in concrete is vouched for by *Machinery*, which regards the use of concrete for this purpose as one of its most interesting applications. A post that is set in the ground unprotected would soon rot away. A wooden post treated with tar and set in a hole on a flat stone and surrounded by a firmly tamped bed of concrete is practically indestructible, and will furnish a sound, substantial foundation for some years to come. The same plan is used to some extent in the setting of iron standards for supporting overhead electric conductors. The small diameter of the pole does not give the necessary stability to prevent its being racked out of place by the surging of the trolly wire; but if an ordinary hole dug for such a pole is fitted with concrete, it forms a mass 25 in. or 30 in. in diameter and of a length equal to the depth of the hole, which is solidly united to the pole, giving the latter several times the stability that it would have if set in earth alone. Moreover, the concrete preserves the iron, and it might reasonably be expected that poles so set may rust away above ground before the portion protected by concrete is appreciably affected.

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The new Lodge and Shiply lathe recognises the electric motor in its design, states the *American Machinist*, for an extension of the stool beyond the headstock end is provided to carry the motor, which drives a gear upon a sleeve, concentric with, but not touching, the lathe spindle. This gear takes the place of a belt pulley, which is employed when the lathe is to be belt-driven. In freeing the spindle from all belting a good feature is introduced, and so is the method of combining an electric drive by simply replacing the belt pulley. The lathe spindle is turned, in fact, by an equal couple by means of a clutch, and there is no driving pressure on its bearings. This must tend both to accuracy of performance and durability. In all classes of machinery, side pressure has been recognised as more or less harmful, and it has been strongly urged as a reason in favour of the cycloidal form of tooth as compared with the involute form, which has been supposed to possess greater lateral thrust. Probably the side thrust has been exaggerated in comparison with the ordinary pressure on the bearings that accompanies any kind of gearing. Of course, says our contemporary, one always wishes to minimise these unbalanced pressures, but it cannot always be so completely effected as by the sleeve pulley of the Lodge and Shiply lathes.

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For the prevention of sea-sickness, an ingenious apparatus has been introduced by a naval engineer in Hamburg. The method employed is to largely augment the oscillation period of the rolling movement of a ship, and at the same time to diminish the amplitude of oscillation. These effects are based on the gyroscopic action of a flywheel installed on board, and maintaining rapid rotation. A pendulating movement is performed by the vertical axis of the apparatus in the central plane of the ship. On account of the rapid, continuous oscillations of the wheel, the vessel is rendered insensitive to the effect of wave motion so as to practically eliminate any rolling movement.

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Among gramaphone users the new post card record is much in demand. This interesting novelty which is now obtainable in Melbourne, consists of an ordinary picture postcard, on one side of which is attached a small thin disc record of a celluloid-like substance. The card can be transmitted by post, and is usable by the recipient in any gramaphone.

Progress of the Motor.

LOOKING BACKWARDS IN 1905.

A RETROSPECT OF THE YEAR'S CONSTRUCTION AND EVENTS.

A BRIEF glance at the more notable features of improvement in motor-car design during 1905 will not be without interest to many readers. There is evident a steadily growing tendency towards simplicity, and freaks of construction are rarely seen. There are, too, many improvements in detail, and, at least in large cars, more uniformity of design. For certain types of engines most makers are in accord on the efficiency of such essential points as the pressed steel frame, long wheel bases, magneto ignition, and the mechanical inlet valve. The cars now built are chiefly of four classes, which may be differentiated as follows :—(1) Light single-cylinder runabouts ; (2) medium power two-cylinder cars ; (3) four-cylinder cars of medium power, including a few three-cylinder cars ; (4) high-powered four-cylinder cars, including a few six-cylinders.

THE ENGINES.

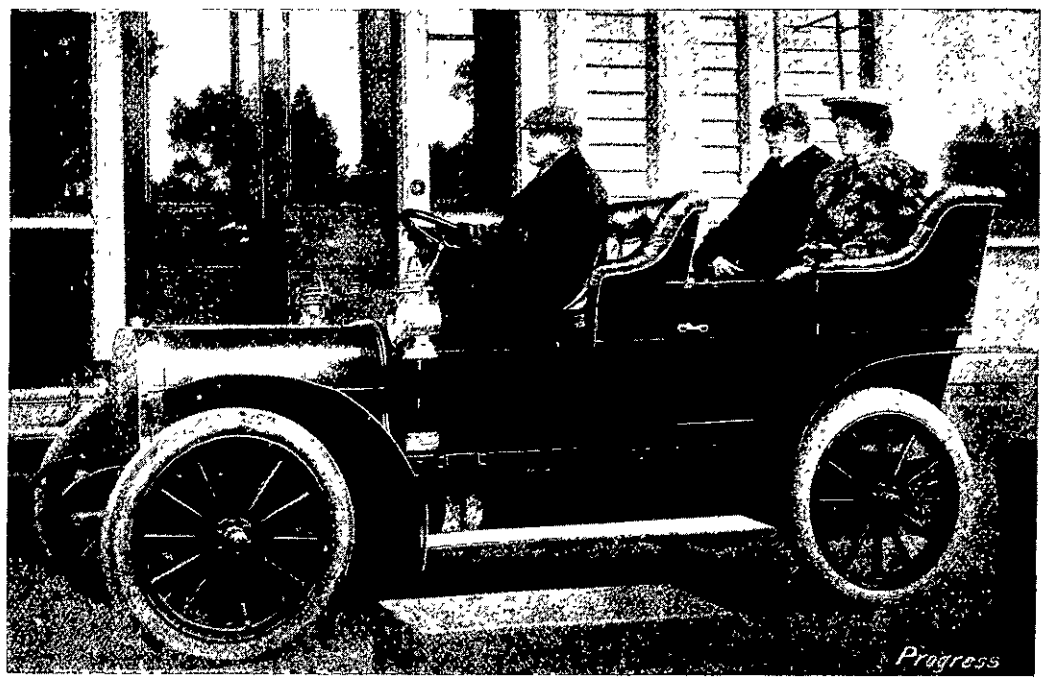
Engines of two or four cylinders are the most in vogue, except, of course, in cars of small horse power, and have been immensely improved in smoothness of working. Three-cylinder engines have found but few advocates, although their efficiency and capabilities have been amply demonstrated by several makers. They are, however, apt to be regarded as a compromise between the two and four-cylinder engines, without the economy of the first or the smoothness of running of the second. The six-cylinder engine is as yet only found in a few cars of the most expensive type, but it has decided advantages which may encourage its adoption in less luxurious cars. Separately cast cylinders are coming into favour, perhaps because they are cheaper, and permit a bearing between each crank. There is also a growing tendency to place the valve chambers on opposite sides. Mechanically secured water jackets are giving way to jackets cast round cylinders. Cam shafts and gears are not generally enclosed in a gear case. Pipework is improved, pipes are shorter, and of larger diameter. On engines with two or more cylinders, the mechanical valve is gradually being displaced by the automatic inlet valve. Another important improvement, although not as general as might be liked, is that accessibility of the crank chamber, crank shaft, and big end bearings has been studied by designs which permit the dropping of the lower half of the crank case without dismounting everything else.

IGNITION.

In the electrical accessories a marked improvement is evident, the most notable feature regarding ignition being the increasing adoption of the magneto system, with, in some cases, accumulators as a standby. Many makers have, however, entirely abandoned the latter. In multi-cylinder engines with accumulator ignition, the use of only one trembler with distribution mechanism is extending. The "make-and-break" system of commutators has been practically superseded by the "wipe" system.

CARBURISATION.

Improvements in carburisation are not much "en evidence" and the automatic carburetter is fairly generally adopted. Carburetters are now found in positions giving equal lengths of induction pipes. They are simpler, although nearly all now attempt to automatically obtain a constant mixture at all speeds of the engine. This is due to the demand for quiet running at low speeds.



HIS EXCELLENCY THE GOVERNOR, LORD PLUNKET, AND HIS 14–16-H.P. ARGYLL. [*Sarony, Photo.*

THE RT. HON. R. J. SEDDON TOURING THE WEST COAST ON A 10-H.P. PEUGEOT. [*Sarony, Photo.*

WATER CIRCULATION.

Although still very far from being obsolete the old type of flanged radiator is steadily being displaced by the tubular or honeycomb type of cooler. The appearace of the flanged radiator has in many cases been improved, and in some instances it is encased in a metal frame which also forms the water tank. In most cars some type of induced draught is adopted. The majority of cars have one fan, some two—one behind the radiator and another formed by the flywheel arms. Scant attention, however, is paid by some firms to the proper fitting of their fans ; so long as a small fan rotates somewhere about the square radiator that is, it seems, all that they seek. The attempt to break up and delay the current of air on its way through the radiator by means of spirals is a step in the right direction. Although "pump" circulation is most generally employed, the "natural" (thermo-syphon) system of cooling has several notable adherents. A satisfactory feature is that gear or chain drive is gradually superseding the old system of the friction-driven pump.

TRANSMISSION.

Although no remarkable advances have been made, or can be expected, it would appear that more care has been bestowed upon this part of the motor car mechanism than on any other. There is a continuance of the praiseworthy attempt to reduce the number of steps. The problem is becoming more involved to those who are anxious for the minimum number of gears in mesh, not only on "top-notch," but also on speeds where power waste is most to be avoided—the hill-climbing gears.

The cause of the worm drive, so firmly and successfully espoused by two English firms, has not obtained any fresh converts, but transmission by a more or less centrally placed chain is certainly on the increase for cars of moderate or low power. Finality in clutches has not yet been reached. The

metal-to-metal expanding clutch has not met with the general acceptance which was prophesied for it by enthusiasts, and many makers of repute continue to fit the leather clutch. The adoption of a universal joint between clutch and gear box, enabling the former to be easily withdrawn without disturbing the latter, is becoming a very general feature. In gear boxes the pattern with two sliding sleeves seems the most popular, and there is a laudable desire to avoid bringing lever through the bottom of the gear box. Almost all the larger cars have ball bearings to the gear-shafts. When live axles are used, the driving wheels most frequently run on extensions of the axle sleeve. Several forms of spring drive in connection with propeller shafts are noticeable. The friction surfaces of brakes are now more frequently renewable, and in some the means of adjustment are really convenient.

Absence of Noise.

Motor cars have been considerably quietened during the last year or so, and it is rather interesting to examine how the noise has been eliminated. Most carburetters are now fitted with the automatic air regulator, a device which is certainly a great step to producing a quiet engine. Another point to look to is the valve-gearing. At one time there was not very much attention paid in this direction, and the half-time wheels were made very small, with the result that they rang and chattered in a most objectionable way. Now, however, we find very broad gear wheels; fibre wheels are also largely used, and consequently the valve gearing of the modern car runs as quietly as a clock. Outside road wheel brakes are a frequent source of noise, as, after they have worn a little, they rattle in an annoying manner. Now, however, the external expanding brake is almost universally used, and of course, if properly constructed, there can be no rattle about them. In the latest models of most manufactures long pistons are used, as it is found that they do away to a large extent with the objectionable knocking noise in fast-running engines.

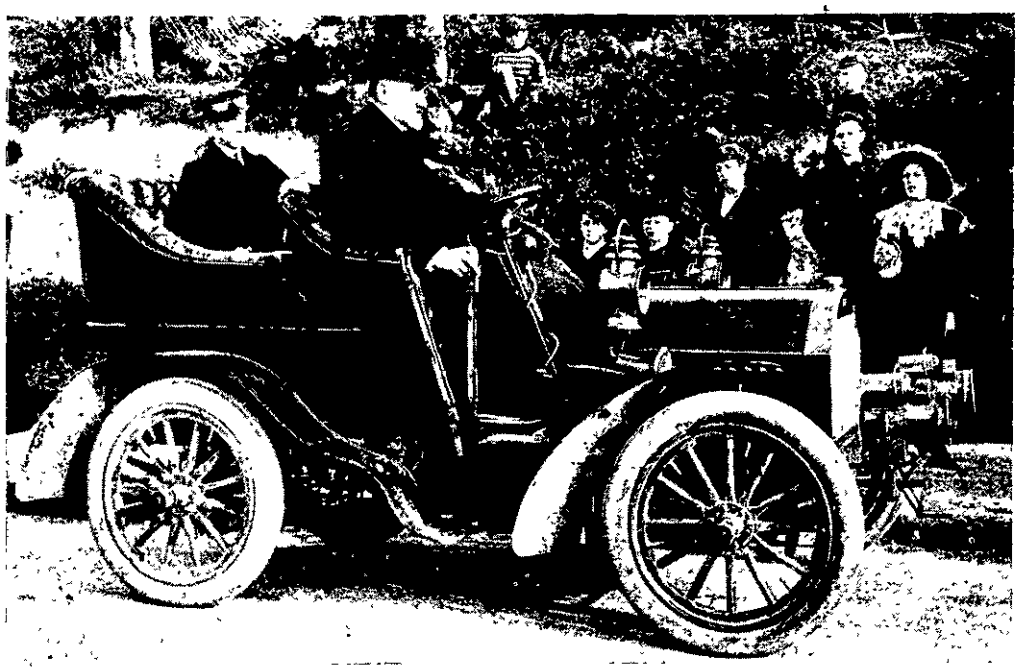
The Shape of the Bonnet.

A distinct improvement is seen in the shape of the bonnet fitted to many of the 1905 models. In numerous cases they are of the square type, which accords with the present fashion, and in some cases very much like those seen on the small cars of 1904. Slight changes have been made, however, which tend to improve the naturally ungraceful lines of this type of bonnet, and to give it a neater and less bulky appearance. The square bonnet came into existence with the honeycomb radiator, and it is largely through the continued use of this type of cooler or its equivalent that the shape has been retained. The chief mechanical reason for its use is that it affords a position for the radiator in which this part is protected to a large extent from dust and dirt, and yet subjected to a good natural draught. The arrangement also provides easier access to the forward end of the crank shaft than when the radiator is hung below the frame, and reduces the lengths of piping in the circulation system to a minimum. So far as the accessibility of the motor is concerned, it would seem that something is lost, for the radiator in front, the mudguards over the front wheels on either sides, and the dash board at the rear enclose it in a fenced-in space, as it were, and considerable reaching must be done to get at the lower parts.

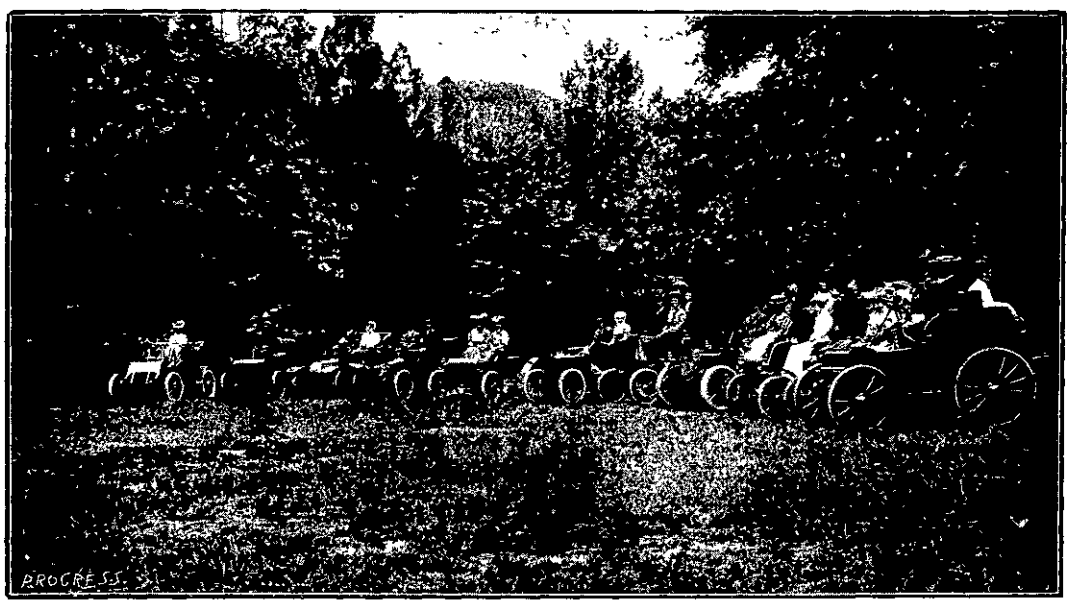
There are many over-cautious people who imagine that the purchase of a car is a risky investment.

Where are the Steam Cars?

Steam cars in the early days of motoring received a considerable set-back by the introduction of a number of cheap, light runabouts which ran well for a time, but soon got out of order, and gave steam cars a bad name. There is, however, now on the market a much better class of car, in which the principal defects of the earlier types have been overcome. The boiler has been replaced by a steam generator that instantly flashes the water into steam, and the control of the fire, water, and oil is automatic. Condensers are also fitted, and the mechanism of the car has been simplified as well as strengthened. Among the principal objections to the steam car is the relatively small storage capacty for water and fuel. Some cars are, however, designed to carry sufficient of both to travel 150 miles. The machinery occupies more space than that of the petrol car of approximately the same horse power, thereby limiting the available room on the car. The machinery is also more complicated than that of a petrol car, and more liable to get out of order, the pilot light especially being a part that frequently gives trouble. Moreover, the cost of running per road mile is greater than that of a petrol car of similar capacity and carrying power.



HON. T. W. HISLOP'S 12-H.P. LOCOMOBILE. MR. HISLOP HAS RECENTLY COMPLETED THE TRIP TO ROTORUA AND BACK, 1,110 MILES, WITHOUT A MISHAP. [*Sarony, Photo.*



MEET OF THE NELSON AUTOMOBILE ASSOCIATION. [*Photo by Mr. M. A. Jenny.*

The Nelson Automobile Association.

The Nelson Automobile Association is a progressive New Zealand body. Mr. M. A. Jenny, who was also chiefly instrumental in founding the similar association at Canterbury, established this club in June 1904. Although at present only a small body of about 20 members, there is every reason to expect its steady growth. Any owner or part owner of a car, any lady or gentleman interested in motoring, as well as importers of cars, are eligible for election as members. At present the officers are:—President, Dr. P. H. Barr; Vice-Presidents, Dr. Deck, Dr. Moore, Dr. Andrews. Dr. Gibbs, and Mr. A. P. Lucas; Committee, Messrs. Moore, Mercer, Glasgow, A. P. Lucas, Martin, Vining, Bisley and Dr. Andrew; Examiner, Mr. M. A. Jenny; Hon. Secretary and Treasurer, Mr. M. A. Jenny.

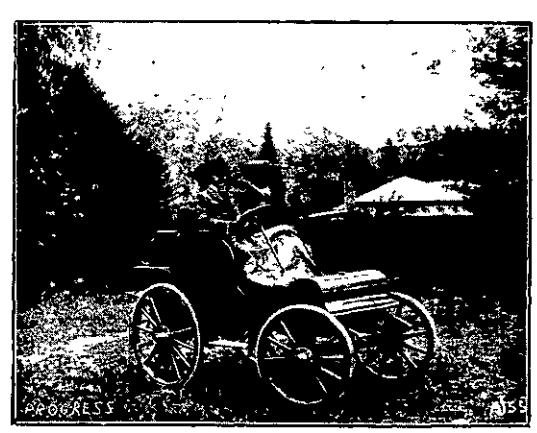
The Vanishing Horse.

As many as 25,420 horses have been diverted from the tramways of the United Kingdom in the six years since 1898. The number employed in the year that ended March 31 was only 13,357.

Electrical energy is expanding so rapidly that 1,780 miles of tramway routes are now worked by electricity, and only 209 miles by horse traction.

The converted sinner makes the best saint. Hence France and the Marquis de Dion are now the greatest enemies to speed-race sinners. Says the Marquis, "Speed—what is speed? Speed can be had easily enough." This is true—now. But if France had not five years' motor racing behind her she would not find speed in a car so easy to obtain. America, on the contrary, is voting solid for speed. Mr. Clarence G. Dinsmore says, "International races do for motors what the Derby does for horses." Mr. Charles Glidden thinks discontinuance of road racing would lower the standard of motor breeding. American importers of French cars say that if France persists in an anti-speed programme it will have a disastrous effect on the French industry.

A leading American motor paper, commenting on the fact that three Americans drove foreign cars in the Vanderbilt Cup race, calls it a parody on patriotism, and says Foxhall Keene, John Warden, and George Heath, risking life and limb that an American trophy might not be won by America, "may be good sportsmen, but they are mighty poor Americans."



THE PRESIDENT OF THE NELSON AUTOMOBILE ASSOCIATION AND HIS NEW ARROL-JOHNSTON CAR.
[*Photo by Mr. M. A. Jenny.*

LAYING UP A MOTOR CAR FOR THE WINTER.

By Herbert L. Towel.

Before considering the working parts of the car, it is well to remove all loose parts and accessories, such as the horn, lamps, baskets, floor mats and spare parts. The lamps should be emptied of carbide or oil, the oil lamps washed with gasolene, and the bright parts polished. The horn may be polished also, and the floor mats cleaned of oil so far as possible, as the oil ruins rubber.

Next to be considered are the tyres. A common, but shiftless and wasteful, practice is to leave the tyres on the wheels, merely jacking up the axles so that they may be deflated. When tyres are left on the wheels, the inner and outer tubes are liable to stick together, and the rubber may crack and rot, especially if exposed to warmth or sunlight. The body should be jacked up, preferably under the frame, so as to relieve the springs, and the tyres taken off. Clean the cases or outer tubes, and examine both the cases and the air tubes for cuts and leaks. Repair these carefully, as directed by the makers, and wrap the inner tubes in French chalk or flour of sulphur, folding them loosely, not creasing. Wrap the cases in cloth,and put all away in a dark cool place. If the treads are worn down so that the fabric is exposed, the cases should be sent to the makers to have new treads vulcanised on, assuming that they are otherwise in good condition. This must be done as soon as the fabric shows itself, as otherwise the fabric will rot and be impossible to repair. Next to depreciation, the tyre bill is the largest item in the expense account of the average car, and it is well worth while to give the tyres all needful attention.

Empty the water and gasolene tanks, and see that no water remains in radiator, pipes or cylinders to freeze and make trouble. Empty the carburetter, flush it with gasolene and see that no water gets into it during the subsequent processes.

Take off the wheels, and clean and oil the hub bearings. If the latter have balls and are adjustable, take out the balls and examine them and the cups and cones for wear, using, if possible, a micrometer to caliper the balls. If the balls in any bearing show the slightest signs of wear, replace the whole set in that bearing, being sure that the new balls caliper alike within one-half of a thousandth of an inch. Ball bearings should be packed with grease or vaseline, rather than oiled, and should run very slightly loose.

Drain all oil from the motor-crank case, from the gear case and from the oil cups and tanks. Squirt kerosene into the motor cylinders and crank the motor rapidly by hand, with the spark plugs out to relieve the compression. This cuts the oil and half-burnt residuum from the cylinder walls and piston rings. Flush out the crank case and gear case with kerosene, and remove any accumulated dirt. Pour kerosene into the oil cups, etc., and see that it flows or is pumped to all the bearings. If it fails to reach any bearing, it may be that the duct is stopped by dirt or waste. Investigate and remedy. If the shaft bearings are oiled by splash, squirt kerosene into them freely. If you know your car, you may take the shafts out for inspection, but the novice will find this a troublesome job. Planetary gears may be flushed with kerosene, unless they have rawhide pinions, in which case they should never be touched with oil or other liquids. If wick feed or wipers are used, wash them with kerosene or gasolene.

When the motor and gear case have been cleaned, oil them with small quantities of the lubricants proper to each.

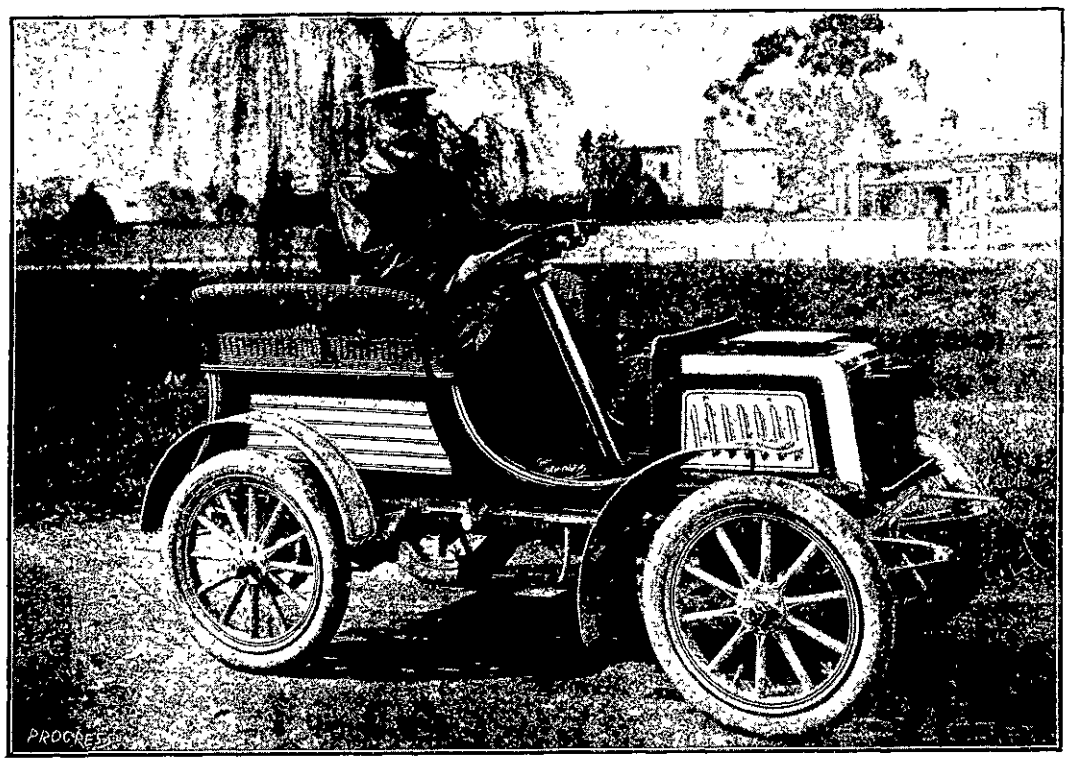
If you have a steam machine, the scale inside the boiler may be softened with kerosene by first filling the boiler nearly full of water, when cold, then introducing about a pint of kerosene, then running off the water slowly. As the kerosene floats on the water, it will reach all the scale in the boiler from top to bottom. The boiler should be left full of water, not empty. The burner, pilot light and vaporiser should be cleaned inside and out.

Drain the differential case; wash it with kerosene, and oil afresh, as above; and apply the same treatment to all the bearings in steering gear, countershaft, control mechanism, etc.

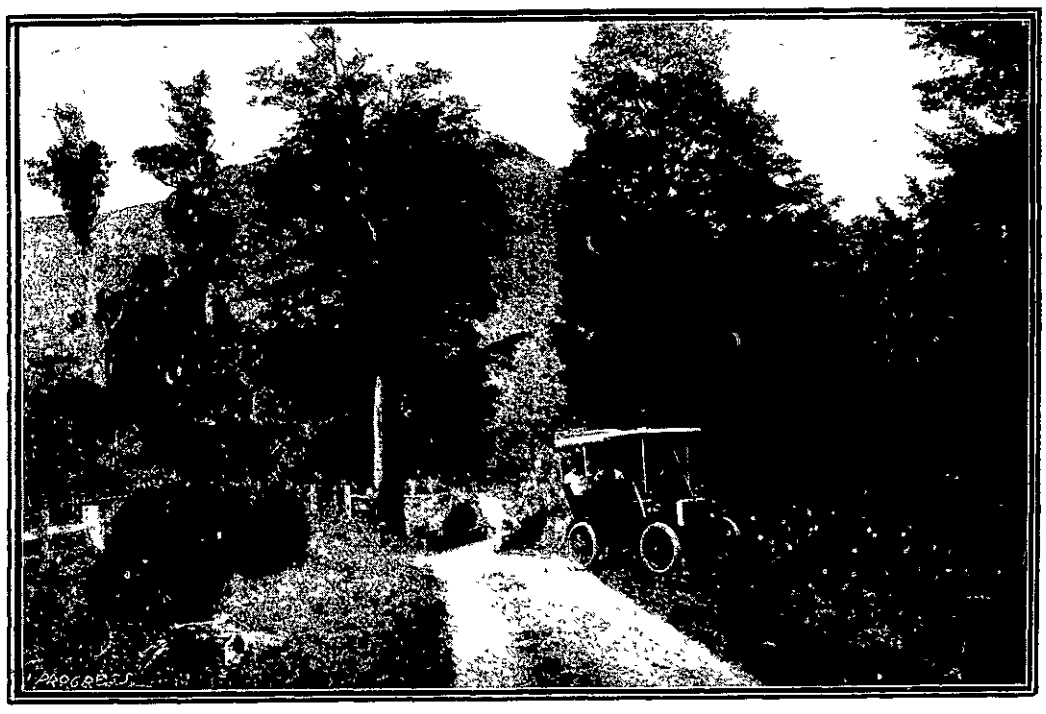
Disconnect the batteries and clean the electrical apparatus as may be needed. Storage batteries should be fully charged and given a small freshening charge about once a month, when not in use, or else should be slowly discharged and the plates washed, dried and laid away. The former treatment is preferable. The batteries, whether dry or storage, should be left in a cool place, and if they are removed from the car one should not forget to tag the various wires.

Finally, give the body and running gear a good cleaning, which for the body may be followed up with a very little furniture polish or boiled linseed oil and a thorough rubbing with dry cheesecloth or chamois. Polish the bright parts about the gear, and grease the iron parts freely with vaseline.

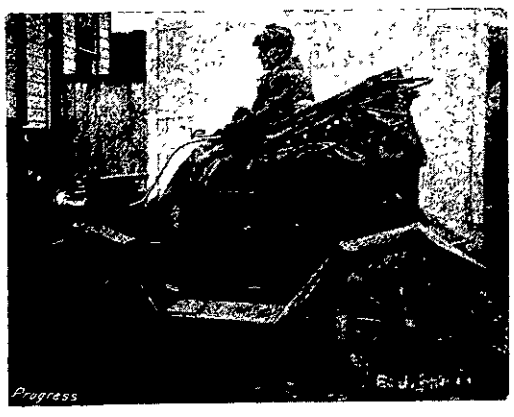
Treated as above, your car will stand through the winter or through the year without deterioration, and will be ready for businesss as soon as the tanks are filled.



THE SECRETARY OF THE NELSON AUTOMOBILE ASSOCIATION, MR. M. A. JENNY, AND HIS 6-H.P. DARRACQ.



A HALT ON THE NELSON–BLENHEIM ROAD. [*Photo by Mr. M. A. Jenny.*



THE 7-H.P. OLDSMOBILE OF DR. PURDY, WELLINGTON.

The Nomenclature of Automobiles.

By Robert Bruce.

A few practically minded men on two continents have been at work more or less continually on some type or other of self-moving apparatus, for use on the highways, for upwards of a century. But for the greater part of the time, their efforts met with scant, short-lived encouragement. The engineering and mechanical foundations for new and independent systems of locomotion were slowly laid, while to constructive genius, busy with problems of more immediate promise, these were things of occasional speculation and experiment.

The progress of the last ten years of the nineteenth century brought new and vital life into the field. Electricity extended and specialised its usefulness, co-operative means adapted steam power nearer to the special requirements of road travel, and the all-round possibilities of the hydrocarbons were demonstrated. Mechanically propelled road devices began to appear on all sides, in this and other countries, not infrequently bearing names as new and strange as themselves. The philologist was not called into consultation. Not only complete machines, but individual parts and fittings, were treated in the same manner. Out of the abundance of the offering many survived, but none triumphed. An element of grim humour was invariably developed from any situation requiring legal definition of the new vehicle types. The powers that be—from national governments to everyday patrolmen—suffered humiliation alike, being bound by a sort of conventionality unknown in the wider freedom of press and public. In England, not long ago, electric machines were, practically,

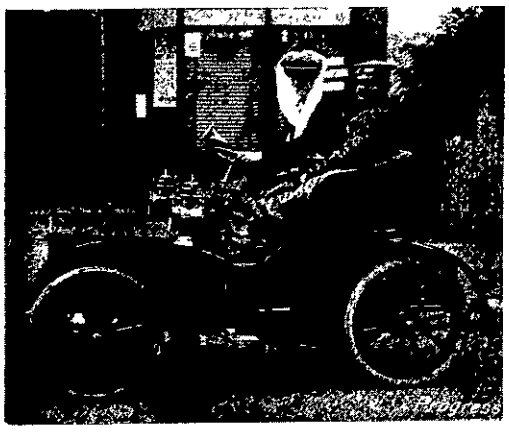
outside the pale of municipal legislation, but those of the steam type might have been classed as "wild animals" under Section 64 of the Penal Code, which read:—

> "Any person who drives or leads along the public highway a wild and dangerous animal, or a vehicle or engine propelled by steam, except upon a railrod, unless a person of mature age shall precede such animal, vehicle or engine by at least one-eighth of a mile, carrying a red light if in the night time, or a red flag if in the day time, and gives warning to all persons whom he meets travelling along such highway, shall be guilty of a misdemeanour."

This statute was inserted in the Penal Code many years ago, as a protection to pedestrians and drivers of horses from dummy and traction engines using the streets and roads. There is no record of the conviction of the driver of a private steam driven vehicle under its provisions.

On the other side of the water ,also, they have had their share of trouble, but less so in America than elsewhere, since the term motor car has been, and still continues, most frequently in use in the United States. The German war office has come close to the original idea in the use of the literal equivalent for self-driver, while the European police have classed them variously, but in the main as "power cars," "power vehicle" and "power cycles."

French experts, without referring to animate or inanimate objects, whether masculine or feminine, in the Council of State in France had recently to decide the question whether the new words designating motor vehicles should in official documents be masculine or feminine. They were deemed masculine, despite that many words of similar formation are feminine. A tourist desiring to cross the Upper Danube with his six-horse-power machine, brought a new problem in classification to the ferryman, whose tariff did not provide for any such passenger. Had he known the capacity of the vehicle, he would very likely have charged accordingly; but he was



MR. GEO. BRADLEY ON A 5-H.P. HUMBERETTE.

circumspectly cautious, and made out a ticket for a "go cart drawn by hand." These instances are simply typical and might be multiplied indefinitely, as showing the confusion in the eyes of the public and of the law, concerning car natures and uses, and how popular opinion combines with the usual grotesqueness of the various types and models to burden us with unsuitable and unreasonable names. Inasmuch as these things will not wait until the dictionaries have passed upon them, the best course would seem to be the adoption of the most acceptable forms.

It is important to keep clearly in mind the difference between "type" and "model" in motor construction. Of the first there are necessarily few, since type follows the broad lines of propelling powers; while of the latter there are multitudes since model is any particular subdivision of type, wherever and in whatever way developed. The only safely existing types in the United States today are most accurately and conveniently characterised as electric, steam, and gasolene motor vehicles—which broad terms are commonly used by the industry itself. But the fancy of the public is not thus easily satisfied. It is not content short of seizing every appellation in sight, and occasionally evolving an entirely new one, using each and all with unrestrained freedom. At first the term "horseless carriage" was the most popular since the novelty of the new locomotion seemed to be in its independence of the usual animal power. But this phrase has since been practically dropped through the weight of its own inaccuracy, its exclusiveness being disputed all along the line, from the ox-drawn conveyance of the American farm to the jinrikisha of Japan and the baby carriage of the world over. It became fatally irrelevant. The prefix "auto" found a surer hold. It not only expresses the idea of self-sufficiency of power which, though not entirely true, will remain the popular conception for a long time to come; but it lends itself to endless, fairly sensible adaptations. Several of these, particularly such as stand for the machine itself, are already established, among them:—

1. "Automobile." This is at once the most common and the most traduced term of them all. It is philologically at fault, being incongruous Greek and Latin, filtered through the French, but with a vitality promising to survive.
2. "Autodrome," literally self-running.
3. "Autobaine," automatic wagon.

Each of the two last named has an advantage in that its component parts are hewn from the same linguistic quarry. But both are lacking in adaptation. "Autodrome" might do for the vehicle itself, even as "hippodrome"; but rules of grammar would be shattered in an attempt to make a verb of it, or to aptly name its driver. "Autobaine," "autobainer," "autobaineress," and "autobaining" (the suggestions of an eminent mechanical engineer), might be regarded as right and proper; but how much would be left of the series after a decade's contact with the shortening tendencies of modern speech, is open to question. On the other hand, "automobile," "automobiling," and "automobilist," (the latter suitable for a person of either sex), are already popularly acceptable. These are long words, it is true, but they roll more readily from the tongue's end, and are less troublesome than most shorter ones could ever become.

The "auto" is being more fixed daily because of its use as part of the names of different motor mechanisms. Auto-bus, auto-bell, auto-delivery and auto-patrol have come to be used without the quotation marks which invariably accompanied their earliest service. "Auto-gondola" and "auto-fiacre" are, however, yet in the grip of the quotation marks.

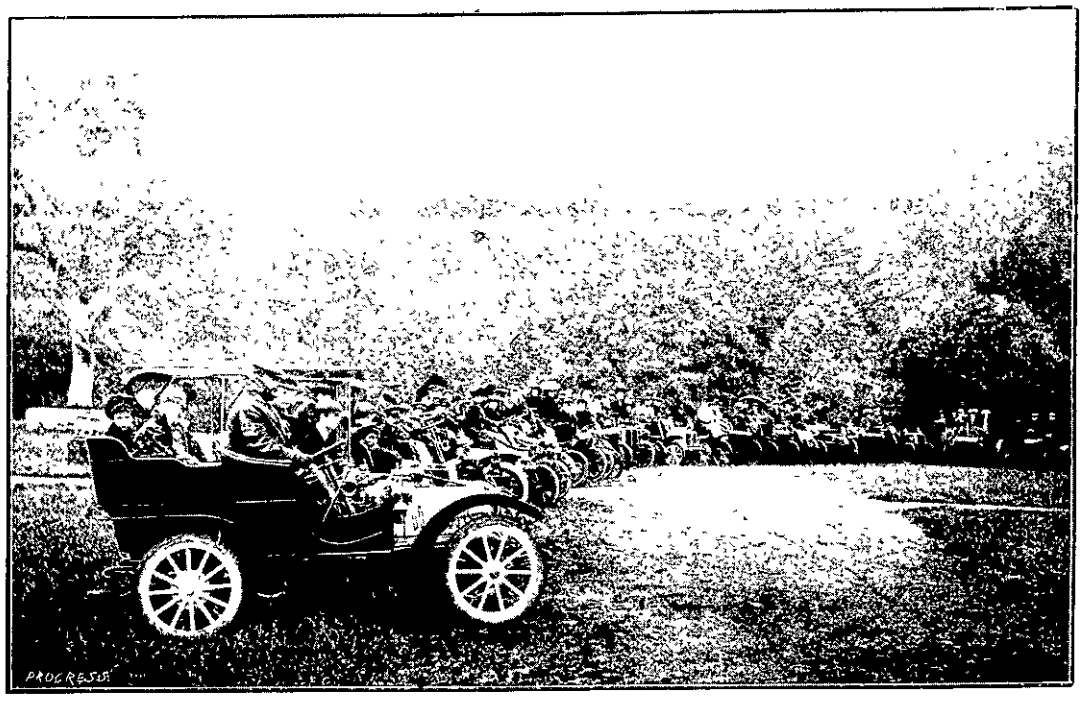
"Mobile" has somewhat the same advantage of adaptability as "auto," and its use is broadening partly for that reason. The common root of move, motion, motor and mobile, namely "mo," still survives by itself, only in the classification of books. But it has already been drawn upon to form "autmo," and "trimoto," the latter the trade mark name of an individual product. In the present freedom of word-making, it would be difficult to disenfranchise either of them. "Electromobile" is in serious daily service, but "pushamobile" is still in the hands of the wits of the press.

Out of the crucible of longer use and more serious thinking, the better of all these terms will pass with the unlamented "horseless carriage." The most reasonable of the compounds of "auto" will never be headed by the schoolmasters, and one need not be surprised to hear the bare prefix itself more often in the future than in the past. The great danger is irresponsible word-mongering—"automob," a Boston offering, for example. The astonishing Reuben's attempt to do the square thing, with "orter be mules" as the result, is preferable to that. Spared the irresponsible and the outrageous, neither the new sport itself nor its followers will be harmed by a nomenclature broadened to suit its modest every-day needs.

THE CANTERBURY AUTOMOBILE ASSOCIATION.

The Canterbury Automobile Association.

This is one of the most flourishing organisations for the encouragement of motoring. The Canterbury Automobile Association was formed principally for protection purposes. The founder was Mr. M. A. Jenny, and the initial meeting to form the Association was held in October, 1903. The membership recently stood at ninety-two, and the present officers are as follows:—President, Dr. Thacker; Vice-Presidents, Dr. C. M. Anderson, Dr. Diamond,R. M. MacDonald, Dr. Matson, W. E. Thompson; Committee, Messrs. G. Palmer, E. Sandstein, J. H. Parker, H. Thompson, W. E.



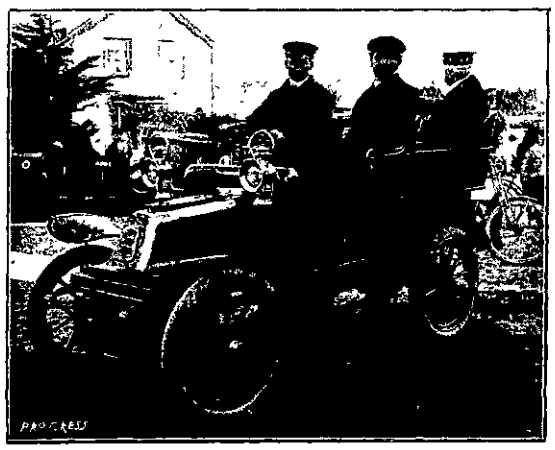
THE AUCKLAND AUTOMOBILE ASSOCIATION.

Mills, Dr. R. W. Anderson, Dr. F. G. Gibson; Treasurer, H. J. Ranger; Secretary, E. Nordon. The Association has an official garage, situated in Worcester street, Christchurch, and attached thereto are Club rooms with all conveniences. Visiting motorists are welcome to the use of these rooms, which contain maps of the various parts of Canterbury.

At South Canterbury there is also an Automobile Club, founded by Dr. Barclay, the pioneer of motoring in the district. Briefly speaking, the objects of the Club may be summarised as better roads, more bridges, and a general use of lights by vehicles using the roads after sunset.

The Auckland Automobile Association.

Being formed in May, 1902, the Auckland Automobile Association is probably the first body of its kind established in the Southern Hemisphere. A goodly number of motorists are enrolled, who, besides owners or part owners of cars, include importers, and any person interested in the sport. Motor cyclists are also eligible for election. A subscription of £1 1s. per annum is charged, country members paying only half this amount. Every member, however, must at once appear for examination on being notified by the Secretary. The examination comprises the theory and practice of motor driving (steam, electric or petroleum). The following are the office-bearers.— Patron, His Excellency the Governor, Lord Plunket; Vice-Patron, Sir John Logan Campbell; President, W. B. Leyland, Esq.; Vice-Presidents, Drs. Knight and Purchas, and A. Meyers, Esq. (Mayor of Auckland); Committee, Drs. Purchas and Knight, Messrs. Chatteris, A. Skeates, Petford and Stuart Milne; Hon. Treasurer, J. A. Moody, Esq.; Hon. Secretary, A. Cleave, Esq. A meeting of the members is held at the Club Rooms, 52 Queen street, Auckland, on the second Tuesday in every month at 8 p.m., and the monthly run is held on the following Saturday afternoon.



MR. W. G. T. GOODMAN, DUNEDIN, AND HIS 8-H.P. DE DION.

The Proper Number of Cylinders.

WITHOUT peering too far ahead into the realm of the turbine, some authorities state that the ideal engine is a two-cylinder one which shall run as smoothly as the four. It is not an impossible ideal, they say, but it cannot be regarded as a practical one at present, because no such engine has been made, and it is questionable whether it would be worth while to make one, because the only objection to four-cylinders worth mentioning is the extra complication. A two-cylinder engine which gave the same results as the four could scarcely be a simple, single-acting type. The question arises whether the three cylinder engine can be taken as a reasonable compromise between the two and the four. In regard to the three-cylinder engines a great deal of misunderstanding undoubtedly exists. Those who ardently believe in them say that they are better in every way than four-cylinder engines. Those who object to them imply that they are no good at all. As is generally the case, the truth lies midway between the two. For balance of reciprocating and revolving parts the three-cylinder engine has not been proved equal to a four, and when the distributing element of the explosion behind the piston is introduced, the four-cylinder is unquestionably the better engine, so far as absence of vibration and higher frequency of impulse are concerned. So far as smoothness of running is concerned, it may be said the more cylinders the better, as their turning effort of the engine becomes more and more nearly constant. On the other hand, it is found that the four-cylinder engine is a wonderfully satisfactory compromise, because it gives much freedom from vibration at all speeds, and it is not unduly complicated. Undoubtedly six or more cylinders have certain advantages of their own, but these engines are far above the average requirements.

OFFICERS OF THE CANTERBURY AUTOMOBILE ASSOCIATION. [*Standish & Preece, Photo.*

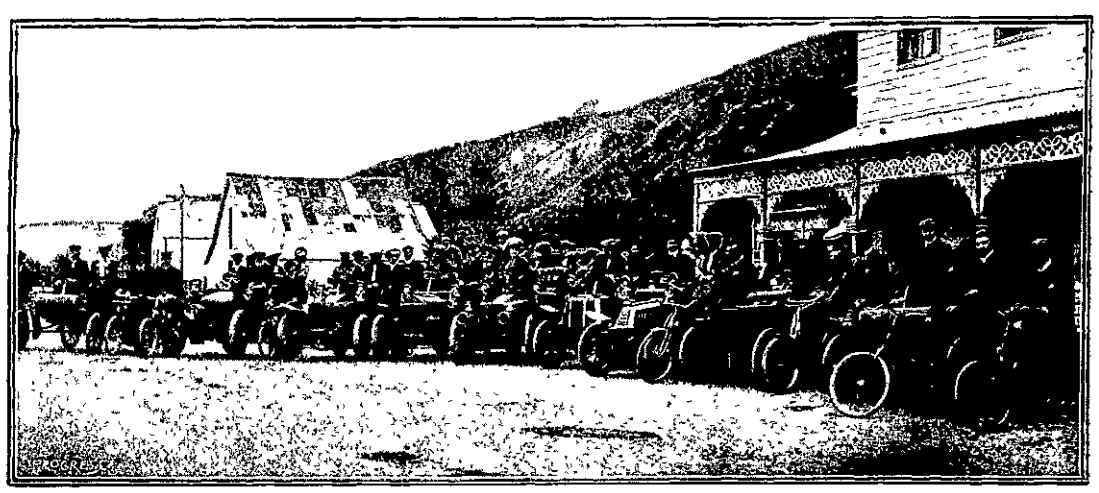
Back Row—E. SANDSTEIN, W. E. MILLS, J. H. PARKER, DR. F. G. GIBSON, H. THOMPSON.
Front Row—R. M. MACDONALD (Vice-President), A. E. G. RHODES (Vice-President), DR. THACKER (President), E. NORDEN (Secretary), W. E. THOMPSON (Vice-President).

The question, therefore, is which is the better compromise, three cylinders or four The three-cylinder engine is the simpler. It is not quite so smooth in running and, of course, at any speed, it must propel its car with three blows or explosions, where in a four-cylinder car there would be four of the same effort, but of less individual intensity; consequently, in this respect the three-cylinder engine must always be inferior to the four. This, however, in itself is not a great matter. Wonderfully smooth running has been obtained with one or two makes of three-cylinder engines, and while it might have been even better with four, the results were so good that the makers were justified in their contention that, so far as their particular engine was concerned, all average requirements were met by its excellence of running. There seems little doubt, however, that four or more cylinders will be used by those who, ignoring all other considerations, require the utmost possible smoothness of running, and this must remain the case till it is demonstrated that the three-cylinder engine is practically as good as the four.

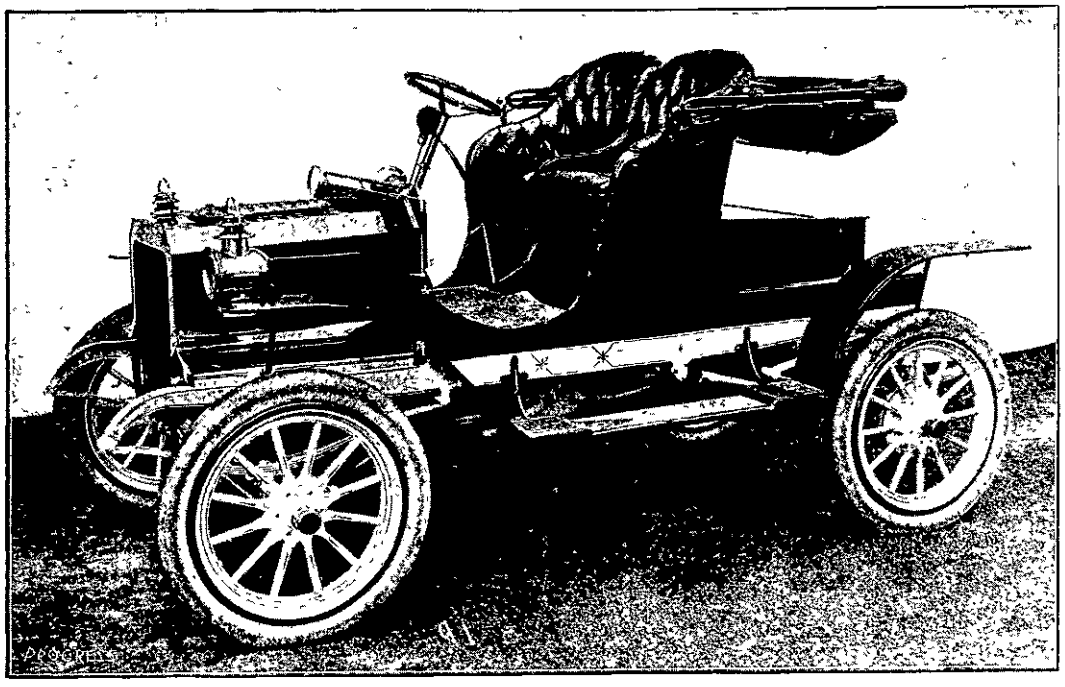
Motor Trams.

The number of municipal authorities who are considering the advisability of propelling their horse tramcars by petrol motors is steadily increasing, and there is likely in the near future to be a big demand for serviceable motors for this purpose. We do not advocate the construction of petrol motor or electric tramways, but we must admit that where a tramway is in existence the most economical means of furnishing the public with a fast and efficient passenger service is by fitting the horse trams with petrol motors. The experiences of Perth, Scotland, on the whole, went to show that this can be successfully done. It is somewhat surprising that those municipalities who have electrified their old horse tramway routes did not first of all experiment with petrol motors. To an engineer all things are possible. If a petrol motor will, and does, drive a 36-passenger 'bus easily and safely up and down gradients of 1 in 10, where it is admittedly dangerous to use electric tramcars, there is no reason to doubt its ability to successfully adapt itself to horse tramcars and thus save the enormous expense of reconstructing and equipping electrical tram routes. Certainly a tramcar has not the mobility of movement that a motor 'bus has, but the latter may be used to compensate for this disadvantage, and act as feeder to the tramway and render unnecessary any further tramway extensions. In England motor tramcars are constructed should existing horse trams not be deemed sufficiently strong for motor propulsion, but whether new motor trams are purchased or old trams are fitted with motors, the saving by using the existing tramway lines and the benefit to the public of increased and more rapid travelling facilities will be enormous. In a report on the International Tramways Exhibition in London, which Councillors James Macfarlane, W. F. Russell, and John Dallas have submitted to the Glasgow Tramways Committee, they suggest that in any further extensions of the tramways, consideration should be given as to whether it might not be wise to apply motor power to the cars in these outlying districts, instead of equipping an overhead system.

The directors and shareholders in the Daimler Motor Company are to be heartily congratulated on the splendid year's business they have had. A net profit of £83,167 has been earned. The prosperity of the company may be ascribed to the 35–40 h.p. model which has had such a triumphal series of successes.



MEET OF THE DUNEDIN AUTOMOBILE ASSOCIATION [*Guy, Photo.*



16-H.P. 2-CYLINDER CONVERTIBLE REO.

The Reo Car.

Reo motors are manufactured by Mr. R. E. Olds, who made the early models of Oldsmobiles, and is the father of the American motor-car trade. He has always aimed at turning out a simple and reliable car at a popular price. The Reo car although only produced twelve months ago for the first time has proved a *winner* in every sense of the word.

Reo cars are made in four types—the 16-h.p. two-cylinder touring car; the 8-h.p. runabout; the 24-h.p. touring car, and the 16-h.p. 'bus, carrying 10 passengers.

All parts of the Reo cars are made unusually accessible. Our illustrations, supplied by the Scott Motor and Cycle Co., show a 16-h.p. convertible Reo as a fast two-seater and tonneau.

Wellington Automobile Club.

The Wellington Automobile Club was formed in July last by Mr. C. M. Banks, the present Secretary. His Excellency the Governor, Lord Plunket, is Patron of the Club, and the other officers are:—President, His Worship the Mayor; Vice-Presidents, Drs. Collins and Young, Messrs. A. de B. Brandon, C. Elgar, T. M. Wilford, M.H.R., and W. H. P. Barber, M.H.R.; Hon. Treasurer, Mr. H. R. Dix; Auditors, Messrs. H. Wardell and F. N. R. Meadows; General Committee, Messrs. R. T. Turnbull, J. H. Owen, T. Inglis, J. N. Palmer and Dr. Purdy.

There are now 39 members, of whom 30 own cars, and it is expected that both the membership and the number of cars will largely increase every year, as there is no doubt that present-day cars are in every respect satisfactory, and motoring has an undeniable fascination for old and young persons of both sexes.

Is it Safe to Buy?

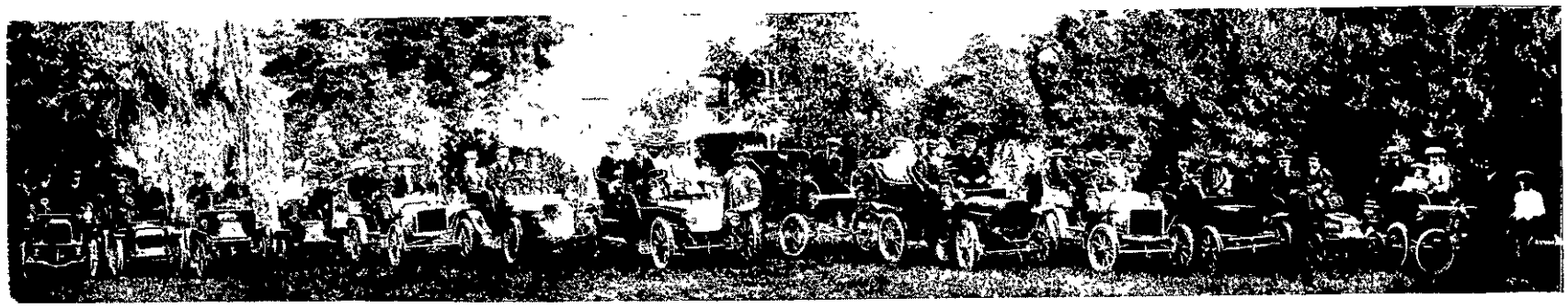
Many believe that ere long some startling improvements may be introduced that will render the car of to-day obsolete. Anyhow, they affirm, a great drop in values will be experienced. Such opinions, however, are utterly fallacious. So satisfactory a stage of development in the motor car has been reached that sudden changes in construction cannot be expected. Generally the building of cars is now proceeding on well-recognised lines. Only after prolonged experiments are suggested improvements accepted, and their adoption in vehicles is gradual. In fact, at no stage of automobile history has a sudden depreciation in values been experienced, and it is the remotest of possibilities to-day.

Not for a moment, however, must it be imagined that a stage of finality has been reached; nothing of the kind. But prospective purchasers can banish all fears that a car will ever be rendered out of date before it is many months old by some unexpected and drastic change. There is no reason to doubt that the development of the car is now proceeding on thoroughly sound principles. With modern cars the trials which so frequently beset the unlucky motorist of three or four years ago seldom occur. One reason for this immunity from trouble is that makers generally have now thoroughly mastered the art of balancing the motor, the benefits of which are most to be noticed in the four-cylinder type. The net result has given a steady-running and flexible engine, which only requires a properly graded carburetter to ensure its working as responsively to the throttle as a steam engine.

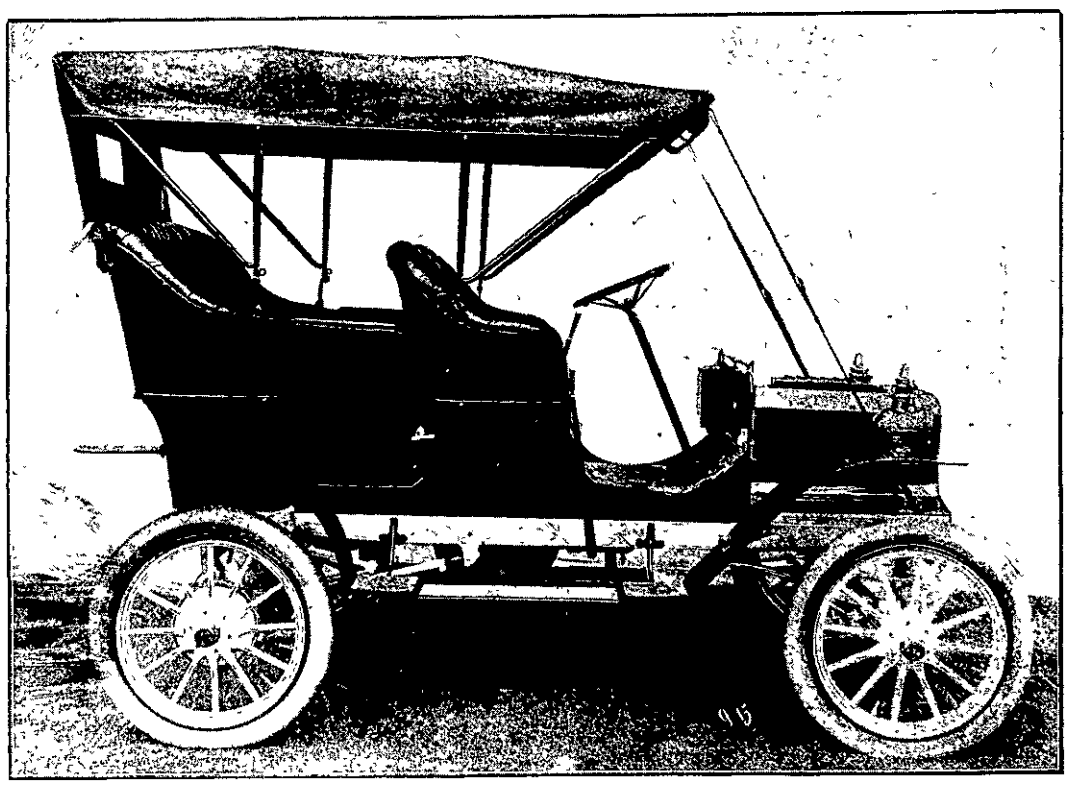
Another cause of trouble—ignition faults—has been well-nigh removed by the perfecting of many minor details in the electrical outfit which in the early days were of inferior make, and not warranted to stand vibration or rough usage. The perfected system now adopted for insulating the wires is one very pertinent to the success of modern ignition. Great strides, too, have also been made in another important item of the electrical outfit—the commutator. Improved carburetters, cam, and cam shafts, and a better selection of material for special purposes have contributed their share to the common end of the designer—a reliable and durable machine. Development is also taking place in the clutch and the sliding change-speed gear, but the process of evolution is necessarily slow. Perfection or finality has not been reached, but will, if ever, only be attained by a gradual and natural development.

Quite an up-to-date workshop is to be seen at the Theatre Royal, Melbourne. It is presided over by Mr. W. Osborne, who is ever on the lookout for novelties. These are keenly appreciated by Mr. Bland Holt, who is a keen advocate of them. An original conception whereby a stage effect is improved, or has eliminated from it the element of chance, finds instant favour with the lessee of the Royal.

An ill-conditioned farmer with a team of walking horses on a narrow road had prevented a motorist from passing him over a space of five or six miles. At last the farmer let the car by. But this promptly stopped short in front of the waggon. To the farmer's shouts to get out of the way the motorist politely said "Sorry not to oblige you, the car has broken down." The farmer swore a half hour and perspired another half hour to remove the obstacle in front of his horses. When the motorist thought the yokel sufficiently punished he released his brakes and soon sped out of sight.



THE WELLINGTON AUTOMOBILE CLUB AT "THE OAKS," TAITA. [*Sarony, Photo.*



16-H.P. REO CONVERTED TO TONNEAU WITH HOOD.

The Smoky Exhaust Nuisance.

THE emission of unburnt, or partially burnt, evil-smelling smoke, with the exhaust gases, either in town or country, is a serious source of annoyance to road users. There is, however, no excuse for anyone to regularly permit smoke to pour out with the exhaust from his car. The whole cause, it is perhaps superfluous to mention, is superfluity of lubricating oil in the cylinders. When the engine is fitted with a lubricating system by which the oil is measured out in doses of the required amount, and is delivered regularly by a forced feed to the cylinders, there is practically no difficulty. In this case, if the feed is adjusted in the first instance until the car runs smokelessly, no smoke need be feared.

Where ordinary splash lubrication is employed, the level of the oil in the crank-chamber must be carefully adjusted, as well as the rate at which fresh oil is fed into it. With those requirements properly attended to there will be no smoky exhaust. It should not be forgotten, however, that with any gravity-feed device, what is a proper adjustment in cold weather will not answer in hot weather, as the viscosity of lubricating oil varies considerably with the temperature. Even though the same grade of oil is regularly used, a certain amount of adjustment is occasionally necessary.

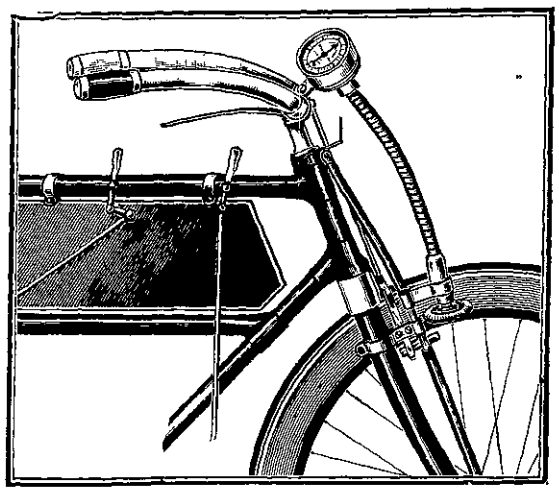
If the lubrication is properly managed, the exhaust should be unobjectionable, except, possibly, when the engine first starts running. To avoid this, the engine should be started in the garage, and any oil that may have settled in the exhaust passages allowed to escape before taking the car out. Final exhaust pipes, fitted so that the gases issue straight out behind the vehicle, should also be avoided.

A Cheap Screen.

A medical motorist, writing to the *British Medical Journal*, mentions an invention of his own peculiarly suited to a small-power doctor's car. This consists of a glass screen fitted at an inclined angle so that the top of the screen comes just over the heads of those occupying the front seats, protecting them from wind and rain, and offering little wind-resistance seeing that the wind plays along instead of directly on it. The doctor mentions that his own is of ordinary window glass, cost but a few shillings, and he allowed the carpenter who made it to take out a patent.

Know Your Speed.

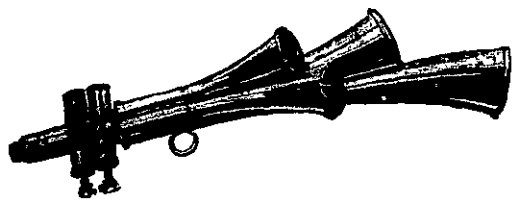
An effective and accurate speed indicator is an accessory that undoubtedly adds much to the pleasures of the push-pedal and the motor bicycle. Such an instrument is illustrated herewith, the originator being Mr. Robert Goodlad, an experienced English chronometer maker. The indicator is attached to the cycle by means of a strong clamp fastening on the front fork, just below the crown. The mechanism comprises a miniature centrifugal fan, revolving in an air-tight compartment. The air pressure created impinges on a small arm like a windmill sail, which is free to revolve and turn a pointer on an indicating dial, showing the various speeds, according to the velocity of the fan. Between the windmill arm and the pointer intervenes a fine hair spring, fitted on an eccentric cam, by which its pressure is raised to bring the pointer back to normal, as the speed of the fan is varied by the speed of the road wheel. The transmission is by friction pulley, which is held in contact with the rim of the road wheel by suitable clips, and thence by encased flexible shaft to indicator, which may be clipped in any convenient position to the handle bar.



NEW SPEED INDICATOR.

Four-note Horn.

Dunhill's four-note horn is an attractive novelty for enthusiastic motorists. The horn is fastened to the steering wheel, and is connected by means of a flexible tube with a bellows secured beneath the footboard. The bellows are worked by a plunger,

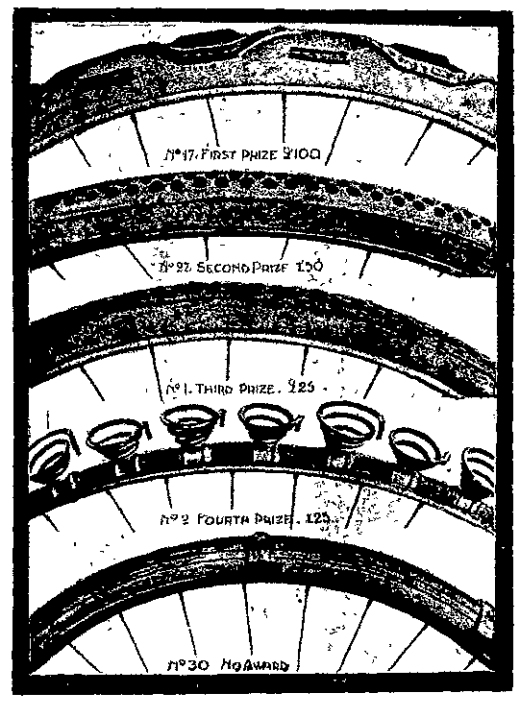


A NEW HORN.

placed within easy reach of the foot, and supply the pressure of air to blow the horn. The four notes are produced by pressing piston keys similar to those used on a cornet. With this instrument one can play all the tuneful coaching calls so familiar in the last decade.

Non-skids for Motor Cycles.

In a competition recently instituted in England, to test the suitability of the various forms of non-skids for motor cycles, 33 devices were entered. The successful contrivances are illustrated herewith. The highest award was obtained by a smooth-treaded rubber tyre, on which was sewn a narrow serpentine band of rubber. In actual manufacture this band is, of course, moulded on the tread. Second prize was awarded to the Grose steel-studded leather band. The device that secured the third prize has the merit of simplicity, for it is nothing but a number of small metal bolts pushed through the cover from the inside, and secured in place by nuts on the outside. Most curious of all is the spring tyre of Mr. W. H. Robson, which secured fourth prize. The spiral springs are detachable and are fixed to the special rim by wedges. It is said to be a splendid non-slipper, and is, of course, unpuncturable. Its chief defect is the noise the springs make upon all roads, but particularly upon stone sets.



EXAMPLES OF NON-SKIDS.

The judges were at first disposed to be sceptical of the value of this device, but in practical use they found it to be more resilient than many of the pneumatic-shod wheels to which anti-side-slipping appliances had been fitted, and, had the springs withstood hard usage on the road, this exhibit might have taken a higher place. It is the best non-slipper tried, and no grease, mud or dust were met with that it failed to negotiate; it is at its best on very uneven surfaces, and at its worst on well-laid stone sets. It is, however, decidedly slower than a pneumatic, and the "dragging" is very perceptible, especially uphill.

Steel for Motor Car Use.

Among the improvements gradually being introduced in the higher priced cars, the most important, but the most difficult to see, are improvements in the quality of the metal employed. Already the demand for the highest possible class of shock-resisting material which modern automobilism has created has produced a considerable effect on the manufacture of the higher grades of steel. Some idea of the importance of the motoring industry to the up-to-date steel maker can be gathered from the paper read by Dr. Leon Guillett on "Steel Used for Motor Car Construction in France" at last year's meeting of the Iron and Steel Institute (Eng.). The chief steels used are nickel steels, chrome steels, silicon steels, chrome-nickel steels, and steels of mysterious composition. The use of steels with a low content of both carbon and nickel has become general in the motor-car industry, but when it is desirable to avoid the operations of case-hardening and quenching a steel containing 7 per cent. of nickel and 0.12 per cent. of carbon may be used. Steels with a low nickel content (1 to 6 per cent.) and a medium percentage of carbon (0.25 to 0.4) are employed chiefly for shafts, forgings, axle-journals, axles, bearingsand various sections. The use of steels containing from 10 to 30 per cent. of nickel has been abandoned, but those containing from 32 to 36 per cent. with 0.12 to 0.2 per cent. of carbon have an important application in making valves. Chrome steels are employed for bearings, and silicon steels for springs and gearing. Tungsten steels might serve the same purpose, but they would be more expensive. Chrome nickel steels come in for use in shafts and journals (with C 0.25—0.45, Ni 5—6, Cr. 0.5—1.0 per cent.), and for axles and for valves (with C 0.55—0.75, Ni 21—23, Cr. 1.5—2.5 per cent.). Then there is the new "UY," with remarkable properties and mysterious composition, which is being used for crank shafts and gearing.

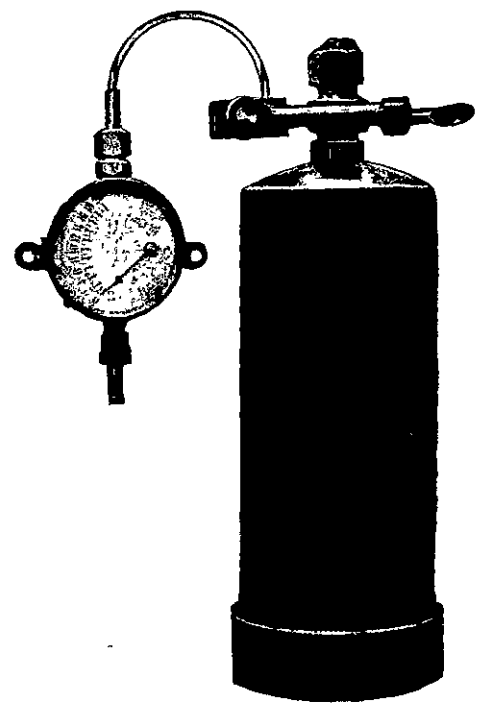
Royal Motorists.

King Edward, who keeps a careful motor log book, and has completed a large number of car miles, said recently in a private letter, "I am grateful to the motor car, since it has permitted me to see my country as I should never otherwise have been able to see it. And I think my country very beautiful."

King Alphonso, of Spain, has just had his first experience of a motor car and balloon chase, and offered several valuable prizes and enjoyed the sport immensely. The chase was organised at Madrid in honour of the President of the French Republic, and King Alphonso drove his car for six hours, and when he caught a balloon His Majesty personally assisted the balloonists in their descent and deflation manœuvres with the zest, ardour, and muscular enthusiasm for which he is notable.

Acetylene for Motor Lamps.

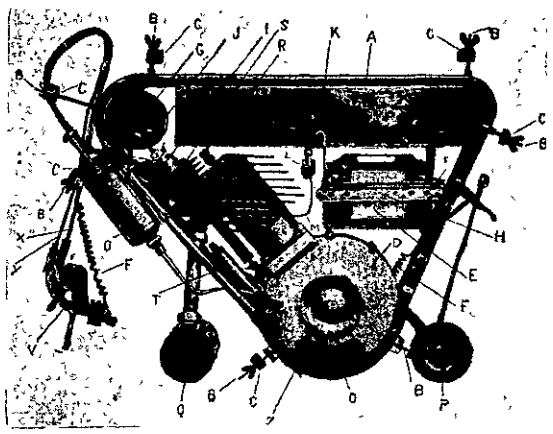
In none of its many fields of application has dissolved acetylene proved more successful than in motor car lighting. It does away with the necessity for charging, cleaning out and recharging generators, and avoids waste, smell and burner troubles. The process is, briefly, as follows:—The containers are filled with a porous material, soaked with a chemical which has the peculiar quality of dissolving 100 times its own bulk of acetylene under slight pressure. As this pressure is released, acetylene is given off as pure dry gas. In Great Britain the sole right for the manufacture and supply of dissolved acetylene in a form suitable for lighting motor cars and such vehicles has been acquired by Alfred Dunhill, Ltd.



CONTAINER FOR DISSOLVED CARBIDE. WILL LIGHT AN ACETYLENE LAMP FOR 40 HOURS.

THE MOTOSACOCHE.

Motor cycles of to-day are considerably over weighted and over powered, and while manufacturers have been making heavier cycles, with higher powered motors to drive them, Messrs. Dufaux & Co., of Geneva, have solved the problem from a totally different standpoint. Their Motosacoche is a complete motor attachment containing accumulators, coil, fuel, and oil tanks, etc., enclosed between two enamel plates or protectors, and having a total weight of 32lbs. The whole mechanism is built into a tubular steel frame similar in shape to the ordinary roadster cycle, and is capable of being attached to the latter by means of seven sets of winged screws in the short space of



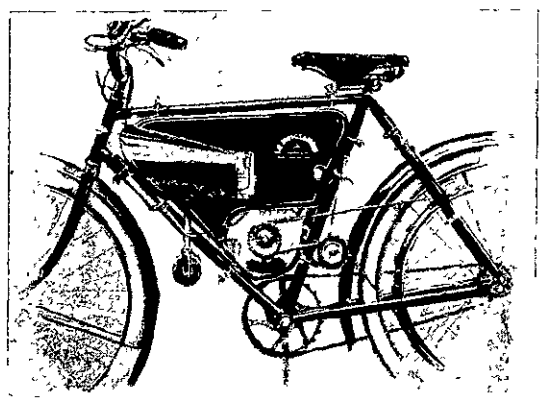
THE MOTOSACOCHE.

five minutes, and detached therefrom in sixty seconds. This tubular steel frame plays a most important part, as the manner in which it is attached to the bicycle makes the cycle frame considerably stronger. If a simple bow string is added to the front forks, a bicycle is stronger many times than if without the Motosacoche attachment. Another important part that this tubular frame plays is to absolutely absorb all vibration, because being practically suspended inside the cycle frame by the winged screws the shocks caused by the explosion never reach the frame of the cycle at all. The silencer is so effectual that by properly regulating the control levers almost silent running can be attained.

In looking over the Motosacoche one is struck forcibly with the simplicity of the arrangement, nearly all wiring and connections being dispensed with, and the evidence of perfect workmanship displayed. Perhaps this is not so surprising when we remember that the factory of Messrs. Dufaux & Co. is in Geneva, "where the watches come from." It seems hard to believe that a cycle with the Motosacoche attached, the total weight being about 60lbs., can as satisfactorily do the work as the heavy motor cycle, weighing anything from 130 to 180lbs. or more, yet it appears quite possible after examining its record of performances, amongst which are to be found the following:—Great Endurance Race, Paris, 1903, of 620 miles, 1st and 2nd prizes; 1st gold medal for regularity of speed; 1st gold medal of the Automobile Club of France, beating 127 competitors from all countries; Endurance Race, Milan to Nice, 1904, gold medal, diploma of honour, highest awards; Road Race Trelex, St. Cergues, 1st and 2nd prize. Coming nearer home, the Motosacoche matched against all competitors, some on motors developing 3½ h.p., came 1st and 2nd in the Kemsley Cup, Sydney to Melbourne, a distance of 620 miles, portions of which contain the worst roads in the colonies.

It is pleasant to note that the inventors are meeting with the success they deserve, as they have received the largest motor order on record, viz.—12,000 Motosacoches from the Automobile Club of France.

We are indebted to Messrs. Herbert H. Smith for the accompanying illustrations.



THE MOTOSACOCHE ATTACHED TO AN ORDINARY BICYCLE.

Struggle for Speed.

NEW RAILS AND ENGINES FOR THE NORTH-WESTERN RAILWAY.

The great engineering works at Crewe, the hub of the London and North-Western Railway system, are now in a ferment of activity. One cause of this is the recent decision of the company to relay the permanent way of their trunk lines with 95lb. bull-headed steel rails, the present 90lb rails not being sufficiently strong to bear the largely increasing and faster traffic.

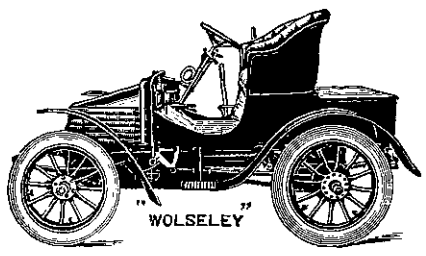
The task is a gigantic one, as at least 400 miles of line, all double, and in many parts quadruple, has to be entirely relaid without the daily traffic being interrupted. It is not likely that the work will be actually taken in hand before the spring.

Meantime the company's employees at Crewe have plenty of work before them in the rolling of their new rails.

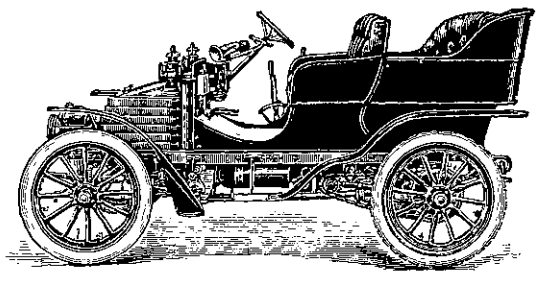
Another part of the renovation of this line, providing additional work at Crewe, is the changing of the type of locomotive. Mr. Whale, who succeeded Mr. Webb as chief mechanical engineer, is introducing, instead of the three and four cylinder compound engines, a less complicated but tremendously powerful locomotive adapted to the new conditions of traffic.

Wolseley Cars.

The 6-h.p. light car has been produced to meet the demand for a light, two-seated vehicle that can be easily driven, and looked after by the owner without necessitating the employment of a chauffeur, and with this view the design has been worked out on the simplest possible lines, while the construction is of a substantial character, making the car a most serviceable one for hard wear and tear in all weathers. This type of car has been largely adopted by doctors and professional men for business purposes, as by its use it has been found possible to effect a saving of many hours in a day's work.



WOLSELEY 6-H.P. LIGHT CAR.

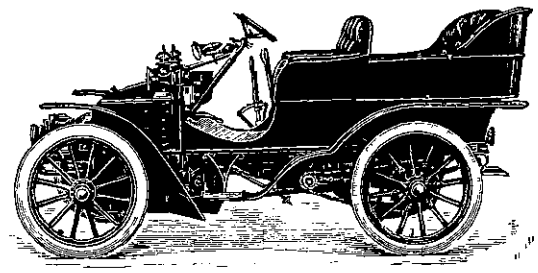


WOLSELEY 8-H.P. TONNEAU.

A vehicle of this type can also be fitted with a hood and weather screen, so that the passengers are entirely protected in bad weather. Since its introduction, this car has been most successful, and has secured the highest awards in various reliability trial runs and hill-climbing competitions. Two styles of body are made (Roi de Belge bucket seat and phæton), either of which may be fitted at the puchaser's option. The selection must be made when the order is placed.

The 8-h.p. tonneau is a new improved type of light, four-seated car, capable of maintaining a good average speed on the level, and possessing excellent hill-climbing qualities. This car has lately been entirely re-designed to supersede the old 7½-h.p., and is now practically a small model of the 12-h.p. car. The wheel base has been lengthened, and particular attention paid to the suspension of the car, thus making it very smooth and easy running. The motor and gearing are entirely enclosed and protected from mud and dust by a detachable shield. The chassis is so arranged that all mechanism lies below the frame, thus making it possible for many different styles of body to be fitted.

The 12-h.p. tonneau car is shown fitted with the type of body most generally used, and is one of the most popular motor vehicles in use at the present time. Since its introduction, this car has always been conspicuous for its consistent

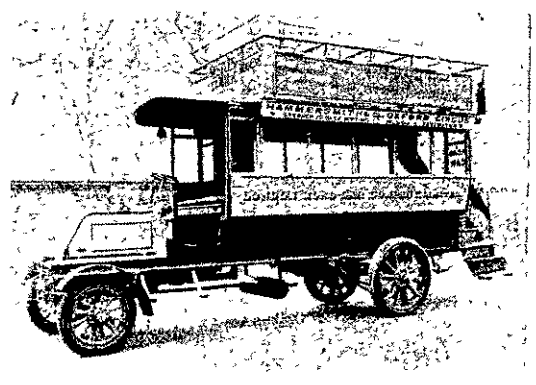


WOLSELEY 12-H.P. TONNEAU.

reliability and hill-climbing qualities. It is purposely constructed as simply as possible, without sacrifice of efficiency, so that it is possible for the owner to quickly learn how to drive and attend to what adjustments may be needed from time to time. In public reliability trials and hill-climbing competitions during the past three years Wolseley cars have created a remarkable record, having secured eleven gold medals and two silver medals in open competition with every well-known make of car. The chassis is so arranged that all mechanism lies below the frame, which makes it possible for any type of body to be fitted.

Prosperity is shown in the balance-sheet of Argyll Motors, Ltd., which shows a net profit of £26,633 on the year's work. Among the assets are the new works at Alexandria, valued at £64,538, and new machinery plant, etc., £57,635, a total of £122 173.

Diamond tools have been ably discussed by Mr. G. C. Henning before the American Society of Mechanical Engineers. It appears that hard rubber paper, hard stone, and hardened steel cannot be readily worked by the use of steel tools. Tools of a much harder material are required, and for this reason diamond is used. The diamond is of two kinds, totally different in appearance and quality. Black diamond has a very dark purple brown colour, is an amorphous, granular stone, with rarely any crystallisation visible or traceable, and is called carbon or black diamond. It is the hardest material known, and has great strength. Bort, on the other hand, is entirely crystalline, and generally transparent, and of all colours of the rainbow. Some are as clear and transparent as glass, and this kind is considered harder than any other bort, except some which is almost black. Bort is extremely brittle, and is readily fractured or split in the three directions of its cleavage planes parallel to the sides of the octahedral crystal, in which shape it is most commonly found. The dodecahedral crystals are also readily "cleaved" in a similar manner. In spite of the very great hardness of all kinds of diamonds, they are readily sawn, drilled, cut, and polished; carbon (black diamond) cannot, however, be polished, as is the case with bort. Diamond cuts diamond, while steel saws and drills and cast-iron discs, charged with diamond dust, are used for the other operations. All kinds of grinding wheels, being made of extremely hard materials, are most readily kept free from filling or glazing, and imperfect shape by diamond tools. In certain classes of work, where great accuracy and precision are primary requirements, or extremely fine lines are essential, the diamond is the only material that answers the purpose. Thus lithographers, engravers, and scale-markers use them for fine work.



24-PASSENGER STRAKER-SQUIRE 'BUS, FITTED WITH 24-H.P. ENGINE. 400 OF THESE 'BUSES HAVE BEEN ORDERED BY LONDON OMNIBUS PROPRIETORS.

MOTOR-CAR OUTING.

Several Wellington gentlemen had a very successful motor-car trip to Palmerston North and back, on the 9th and 10th ulto. The party, numbering eleven, were carried by three cars under the guiding hands of Mr. A. de B. Brandon, who drove an Argyll, and Messrs. Meadows and Matthews, who each drove a Cadillac. The journey up on the Friday was particularly enjoyable, the weather being fine, though dull, and the roads were in good order. Those who had not previously crossed the Paekakariki hill were astonished and delighted at the magnificent panorama of sea and coast line which suddenly opens out on reaching the top. The many pieces of flat, straight road met with subsequently were bowled over at a good

AT PORIRUA.

rate of speed, with the exhilarating effect known only to the motorist—result, everyone arrived in high spirits. Though there was heavy downpour in Palmerston on Friday night the return journey on Saturday was commenced with a clearing sky, and every prospect of good weather. After leaving Palmerston the roads were quite dry, showing that the previous night's rain was not general. The weather continued fine until some miles past Otaki; indeed, at Levin the cars left in clouds of dust. Before reaching Paraparaumu very dirty weather was run into, and, thereafter, it became gradually worse. There were, of course, some of the mishaps inseparable from such a trip. The most serious was a bad puncture which befell one of Mr. Meadow's tyres when descending the Paekakariki hill on the return journey. It was pitch dark and raining heavily, and the damage was repaired under trying conditions. The cars, however, all arrived safely, and even the unpleasant termination of the trip was enjoyed as an "experience." Incidents of the trip are shown in our illustrations; that entitled "halt by the wayside" being a snapshot of some of the party gathered round a car whilst a small repair was being effected on the trip to Palmerston.

Early in 1905, a powerful motor steam fire engine of, Messrs. Merryweather and Sons' "Fire King" pattern was supplied to the London Fire Brigade. This machine has done good service, and the London County Council has just placed an order for a second one with the same firm. Solid rubber tyres will be fitted, those on the rear wheels being of the twin pattern, to prevent side slip. Compared with motor engines of German and other foreign make this machine shows the decided superiority of British engineering skill. A German motor engine just put into service in a Continental city has a pumping capacity of 220 gallons per minute against the "Fire King's" 500 gallons, while its weight is about the same — just over four tons. The speed of the German engine is twelve miles and a-half per hour, against the English twenty to thirty miles, and, while the latter will carry two officers and six firemen, as well as 1000ft. of hose and all appliances for working, the German engine has to have a separate tender for the transport of the firemen and equipment. Other British towns which have recently ordered motor engines are Edinburgh, Glasgow, Cardiff, Aberdare, and Grimsby.

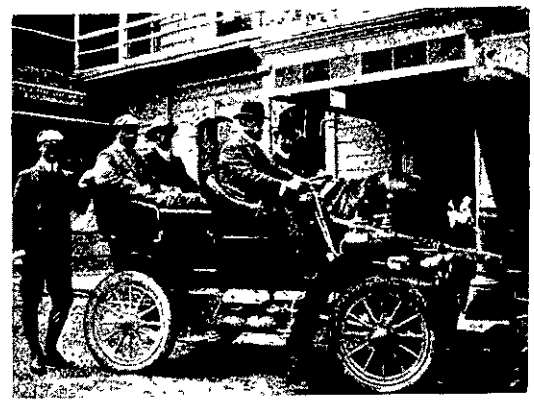
According to the Sydney "*Bulletin*" the latest development of the automobile is the "Turret Car", an armoured fighting machine carrying a field piece and capable of travelling 25 miles an hour. The gun is mounted on a revolving turret, and the drivers and crew are under cover of ½-inch pressed steel shields with curving edges. The machine has been submitted to very severe tests over ploughed fields and across broken country, on rough roads and grass land, and averaged a speed of 25 miles an hour. It can take guns wherever horses can, and at three times the speed, and as long as fuel lasts, without growing tired as the animal does. It has all the advantages of the armoured train without its fatal drawback, the limitation to rails that can be torn up. The car can go anywhere, and manœuvre as desired, and it brings to land warfare all the excitement of sea fighting. Cavalry can only go till the horses are worn out; a force of fighting cars can raid indefinately as long as fuel lasts. The men can sleep or at least rest, while rushing at 25 miles an hour to another spot to strike a fresh blow.

The Ford Car.

The general manager of the Ford Motor Company (Mr. Henry Ford) has been identified with gas-engine construction as pertaining to automobiles since 1892, when he built his first machine, which is still in active use and doing satisfactory work. Mr. Ford built the machine which held the world's championship for 25 miles, made on a circular track in 1901, and he will be remembered by most automobile sportsmen as the builder of the famous No. 999, which held the world's then speed record which was obtained in New York on July 25th, 1903, thus making the mile in 55 4-5th seconds on a circular track Mr Ford has never ceased in his endeavours to produce a perfect automobile From time to time he has designed and built at least a dozen different machines, only to see fresh opportunities for improvement where most men would have rested on self-satisfied "oars." When the two-cylinder-opposed engine was put on the market wise men shook their heads at such an innovation in the prevailing type, but

HALT BY THE WAYSIDE.

it has proved a great step towards simplicity, flexibility and reliability. The Ford holds an established position in America for its compactness, safety and its low cost of maintenance. Mr. Ford claims to have proved that the multiplication of cylinders, when accompanied by simplicity of design, has not only increased the flexibility and power of the car, but has reduced the motorist's troubles and increased his confidence in his ability to always "get there" on time. Among the Ford models for 1906 we may mention model "K" having a luxurious body for five passengers, weighing 2000 lbs., with 114-inch wheel base, six-cylinder vertical motor, 4½ inch bore by 4¼ inch stroke, 40-h.p. actual, improved planetary transmission, and possessing a speed of from 50 miles an hour down to four miles per hour on the high gear. We understand that a local Wellington company has secured the sole representation for New Zealand for the Ford Motor Company, and that they have already placed orders, and that large stocks of these and other models for 1906 make will shortly be landing in the colony.



12-H.P. SINGLE-CYLINDER CADILLAC: MESSRS. BEATTIE, WATSON, MCKNIGHT AND LANG, PALMERSTON NORTH.

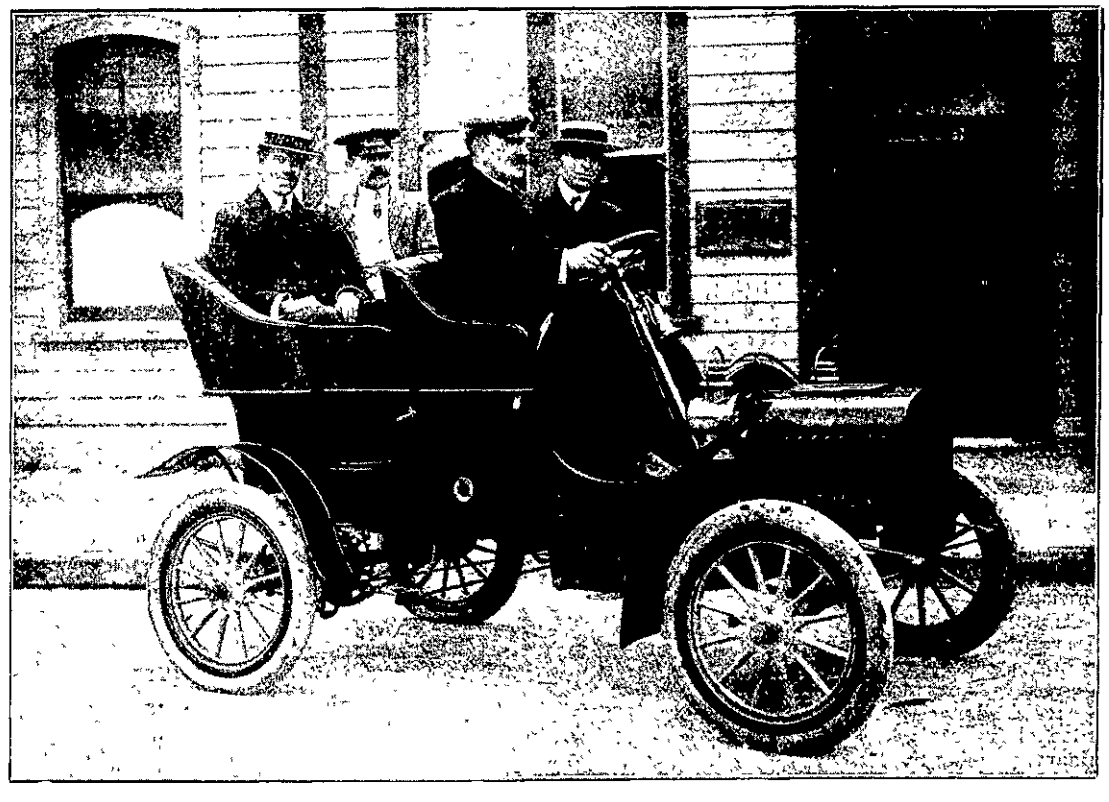
Great Ports of the World.

The commerce of the great ports of the world is the subject of a very interesting report which has been issued by the Washington Bureau of Commercial Statistics.

Taking the aggregate of the imports and exports of the different ports, it is shown that the two most important ports are London first and Liverpool second, with New York a good third

In the order of aggregate trade the various ports are as follows:—

London	..	£260,915,000
Liverpool	..	260,103,000
New York	..	221,396,000
Hamburg	..	196,303,000
Antwerp	..	197,223,000
Marseilles	..	86,311,000
Calcutta	.	58,881,000
Bombay	..	51,054,000
Singapore	..	42,794,000
Sydney ..	..	37,792,000
Shanghai	..	37,628,000
Alexandria	..	33,030,000
Melbourne	..	30,612,000
Montreal	..	29,680,000
Capetown	..	26,595,000



12-H.P. 2-CYLINDER FORD: MESSRS. RAYWARD ("PROGRESS"), FOURLONGE, TOOGOOD AND MCHENRY. [*Hardie Shaw, Photo.*

THE MODERN MOTOR CAR.

ITS PRINCIPAL FEATURES BRIEFLY DESCRIBED.

The Transmission.

Considerable variety is evident in the method of transmitting the engine power to the road wheels, or, as it is termed, the transmission gear. The majority of cars, however, employ either side chain transmission, generally called the "Panhard" type, or the cardan shaft transmission. In the first system power is conveyed by a longitudinal shaft and bevel gearing to a transverse or cross shaft. At each end of this shaft chain wheels are fitted, the drive then being by chain to another and larger chain wheel bolted to the driving wheel. Each driving wheel is so fitted, the wheels being independent of each other and free to revolve on the stationary axle. Amongst cars using transmission with side chains as in fig. 1, are the Albion, Beaufort, Brooke, De Dietrich, Durkopp, Fiat, German, Gladiator, James and Brown, Leon Bollee, Maudslay, Mercedes, M.M.C., Napier, Panhard, Peugeot, Pipe, Daimler, Star, Sunbeam, etc., In the other system what is termed a "live" axle is used, i.e., the axle and two driving wheels all revolve together, the engine motion, as before, being transmitted by a longitudinal shaft and a bevel gear. Cars using cardan shaft or "live" axle drive, as in fig. 2, are the

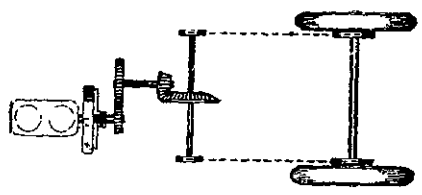


Fig. 1.—Side chain transmission.

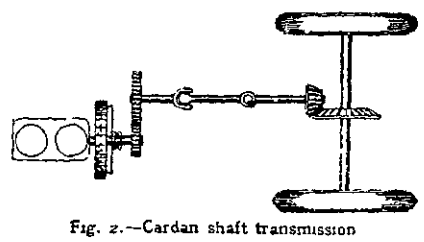


Fig. 2.—Cardan shaft transmission

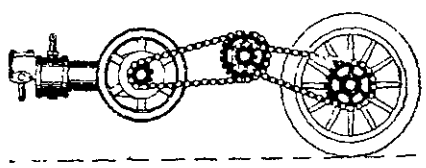


Fig. 3.—Chain drive with countershaft.

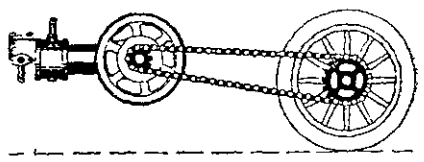


Fig. 4.—Direct central chain drive

Argyll, Ariel, Belsize, Clement, Decauville, De Dion, Dennis, Darracq, Elswick, George Richard Brasier, Humber, Renault, Rykneld, Simms-Welbeck, Speedwell, Spyker, Swift, Talbot, Thornycroft, Vulcan, etc. Another system is the chain drive with countershaft, as in fig. 3, which is found in the Siddeley, Wolseley, Belsize Junior, etc. Fig. 4 illustrates the direct drive with central chain from the engine to the back live axle. This system, which is used on the Cadillac, Duryea, Ford, Oldsmobile, Rational, Vauxhall, etc., gives a very high efficiency.

Carburetters.

The carburetter, or mixer, sometimes termed the vaporiser, is the arrangement for mixing the gas vapour with the required quantity of air, and delivering the proper quantity of correct explosive mixture to the engine according to the speed and power called for. What is known as a surface carburetter is simply a form of tank in which arrangement is made for drawing in-coming air either over or through the petrol. This type of carburetter is now practically obsolete, the spray carburetter, sometimes called the float feed, being generally employed. The chief advantage of the spray carburetters is that they can be adjusted to use petrol or alcohol of any density, or even paraffin, after preliminary warming by a few minutes on petrol. The worst fault with this carburetter, unless provided with an auxiliary air-inlet, is that it will not generate the mixture in constant proportions at varying speeds, giving too rich a mixture at high speed, which, if corrected, renders the mixture weak at low speeds.

Ignition Systems.

For firing or igniting the explosive mixture of gas and common air in the combustion chamber of a petrol engine, electric methods are now exclusively employed. Of these the most generally adopted is the high tension or battery method, in which a low-tension current generated by a chemical battery, or stored and drawn from an accumulator or storage battery, is transformed by means of an induction coil into a current of extremely high voltage, and consequently possessing the power to overcome high resistances such as that formed by the air-gap at the sparking plug points. The sparking plug is built up in many forms, but all consist of a small central rod or wire; to one end is fixed a terminal, to which the high tension wire from the coil is attached. This central core is passed through a tube of porcelain mica, asbestos, or other non-conducting material capable of resisting great heat. The core and its insulating tube are fastened into a socket which in turn is screwed into the combustion chamber. The current from the high tension coil flows down the centre conductor, finds itself compelled to jump the small gap between the points of the plug, causing the spark which ignites the gas. In ordinary high tension ignition there is, of course, considerable time-lag between the making of the contact in the primary circuit and the rise of the magnetic flux in the coil sufficient to draw the trembler and break the circuit, whereupon the ignition spark occurs, and it is principally this time-lag that makes it necessary to provide a means of varying the time at which the primary circuit is closed, or, in other words, providing a means of compensating for this time-lag. As everyone is aware a careless driver can set up enormous strains on the crank shafts and other parts of the engine by running an engine with the ignition set too early, as many broken crank shafts have testified.

The Timing Gear.

An important factor in controlling the efficiency of the petrol motor is the correct working of the timing gear. As only one explosion takes place for every two revolutions of the flywheel which is attached to the main crank shaft, a second shaft, called the half time shaft, is used for the purpose of opening the inlet and exhaust valves. This is connected by gear wheels to the main crank shaft, the gear being so proportioned that it revolves only once while the main shaft revolves twice. Both inlet and outlet valves consist of a disc with a bevel surface, fitting into a circular hole, which leads into the combustion chamber. Through this disc a stem projects downwards and rests on the tip of a rod placed in such a position that the lower end of it is thrust up by the projecting part of the cam passing under and allowing it to drop again, when it seats itself by means of a powerful spring. With every revolution of the half time shaft this operation is repeated, so that the inlet and exhaust valves are opened and closed once for every two revolutions of the flywheel. The two valves are similar in construction, but the cams which work them are set in opposite positions on the half time shaft, so that the inlet valve is open only during the induction stroke of the engine, and the exhaust valve is open only during the exhaust stroke, so that the back pressure that would otherwise be caused by a cylinder full of gas is averted.

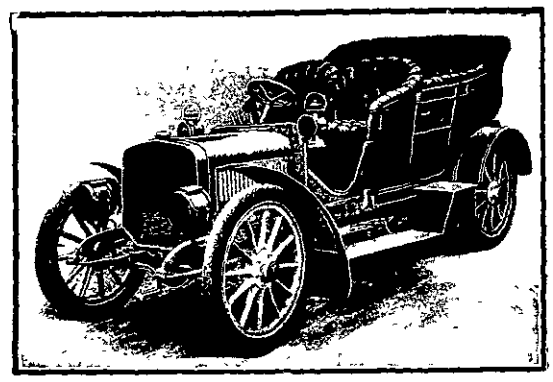
Governing.

With regard to system of governing, one method is to vary the amount of lift on the inlet valve itself. This method, however, reduces the compression, and therefore the economy of the motor. Another method is to vary the lift of the exhaust valve, thus retaining more or less of the exhaust gases in the cylinder, which prevents a fresh charge from entering until they are expanded below the atmospheric pressure. In either case the centrifugal governor is used to vary the lift of the valves. A device called the accelerator is fixed in some cars to cut out the governor and render it inactive. The speed of the engine is then increased above normal.

Change Speed Gear.

The gear box, after the engine, is a very important part of the car, but has been a weak link in a good many. When correctly designed and constructed of the right material it should give no trouble whatever. All kinds of devices have been made to obtain a variable speed ratio between the engine and road wheels, but the Panhard system is one of the most popular. The disadvantage of the Panhard system is the liability, not only of novices but also of skilled drivers, to miss their gear, —i.e., they do not make the desired change when they endeavour to do so, and have to come down to lower gear than that required. This usually happens on an uphill grade. With most forms of sliding gears it is necessary in changing to pick up any intermediate gear that may come before the desired one. For instance, if when running on the fourth speed it is necessary to stop for any reason, such as the traffic or a restive horse, and it is necessary to get into the first gear to start again, the driver has to get into his second gear, then out of that into his third, then out of that into the fourth, in some cases a most troublesome proceeding. To get over this difficulty good designers are arranging their change gear so that the driver can pass from one speed to any other without passing through intermediate gears.

Motor-car owners are quick to see the value of a simple and reliable transmission gear, and, consequently, the Argyll system has a large share of the public favour on that account. No gear wheels

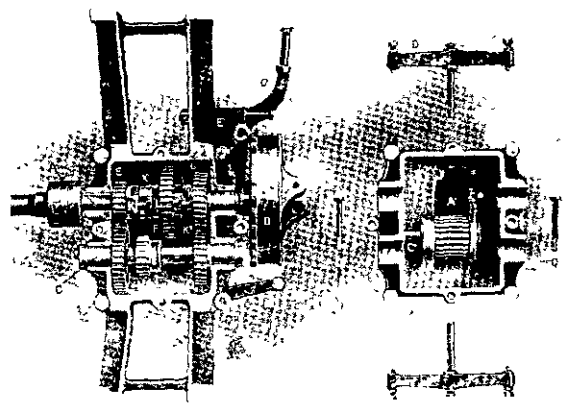


Ford 35-H.P. touring car.

have to be thrown into mesh, and the necessity of crossing through gear wheels in passing from a low to a high set is quite done away with, besides which a neutral point is given between each of the three forward speeds, and, most important of all, the Argyll has an arrangement of levers by which the novice operator will not spoil any of the wheels by the inevitable mistakes made when learning to operate, or in putting into operation the wrong set of speed wheels Further advantages in these gears are .—no notches to find in quadrant, gears cannot bind, if car stops while changing, it is impossible to put in the reverse by mistake, direct drive on the speed, exceptional accessibility, changes are made without clatter or noise.

Differential Gear.

The differential gear appears to mystify most people, and is one of the least generally understood parts of the power-transmitting mechanism of a motor car In a car having side chain drive this gear is situated on the countershaft carrying the sprockets. In a gear driven car it is usually located at the centre of the live back axle. Its object is to vary automatically each driving wheel's relation to the other, according to the requirements of the moment. The car never proceeds far in a straight line, but is either owing to turns in the road or the necessity for avoiding traffic, constantly describing a series of curves. Now, it can be easily seen that the



The Argyll Gear Box.

A *Universal Sliding Coupling*
B *Main Shaft*
C *Counter Shaft*
D *Brake Drum and Sprag Ratchet*
E *3rd Speed Pinion and Shaft*
F *1st Speed Wheel*
G *2nd Speed Wheel*
H *Counter Shaft Speed Wheel*
I *1st Speed Pinion*
J *2nd Speed Pinion*
K *3rd Speed Clutches*
K1 *3rd Speed Engaging Clutches*
K2 *2nd Speed Engaging Clutches*
K3 *2nd Speed Clutches*
L *Actuating Fork (Main Shaft)*
L1 *Actuating Fork (Counter Shaft)*
M *1st Speed Bell Crank*
N *Sprag Ratchet*
O *2nd and 3rd Speed Bell Crank*
P *Clutch Shaft*
Q *Bearing Joint Bolts*
A1 *Reversing Pinion*
B1 *Gear Box Cover*
C1 *Reversing Spindle*
D1 *Gear Box Cover Clamps*
E1 *Gear Box*

wheel which for the time being is on the inside of the curve, has a shorter distance to travel in a given time than its fellow on the outside, and consequently requires to run at a slower speed, or, like the man at the inner end of a rank of soldiers when wheeling, to "mark time." Where both wheels are rigidly connected and unable to turn independently, one or both must slip on the road surface, to the destruction of the tyres and the discomfort of the passengers. The tendency has been to make these differential gears too small for the work they are called on to perform, but this defect has been remedied in most cars.

Water Cooling.

Some system of cylinder cooling is necessary to the proper working of the petrol engine. Cooling may be by air or water. Air cooling, which is only used on small-powered engines, may be by simple radiation (as on the motor bicycle), or by a forced draught from a fan or scoop arranged to supply a current of cold air to the outside of the cylinder and combustion chamber. Water cooling is effected by causing a constantly moving or circuating body of water to flow through an outer chamber or jacket surrounding the cylinder and combustion chamber. In gravity, or thermo, feed, a tank is placed above the water jacket; as it is heated by the engine it rises, and emerging from the top, finds its way through radiators back to the tank. Forced circulation by pump, however, is preferable. Sometimes it is so arranged that if the pump fail, natural circulation will take place. It is possible to keep the water too cold. If the temperature of the water is below that at which the vapour is formed, a large proportion of the heat generated by the combustion goes to heat the cylinder walls. The circulating system should be designed to prevent air locks, and an air cock should be provided at the highest point of the system and a drain cock at the lowest, so that for cleansing purposes and in frosty weather the water can be easily run off. The car should have not less than half a gallon of water per indicated horse power. The temperature of the water leaving the cylinder jacket should be about 170 degrees Fah.

Lubrication.

Pure gravity feed consists of a sight feed cup of toughened glass with a metal cap, in which is a little shuttered air-hole, the closing of which regulates the supply through the tube beneath the cup to the part to be lubricated. This is the simplest form of gravity feed. Splash lubrication is very universal for all bearings inside the motor, such as those for the crank-shaft, cam-shaft, and cams enclosed gears and the lower ends of the connecting rods. It simply consists of a bath of oil inside the crank chamber, the cranks dashing the oil over all the working parts. It is a dirty but thoroughly effective system, and is also used for the differential gear and the change speed gearing. In the physical system, means are employed to utilise the pressure from the exhaust or water system; under this action special means are employed to force the oil along the branch pipes leading from the lubricator. In pressure feed the reservoir may be placed in any position, and below the level of the parts to be oiled. In this case either the oil is forced through the pipes by an automatic force feed pump worked by the engine, or part of the exhaust gas is diverted through a non-return valve into a reservoir, maintaining a pressure on the oil of two to four pounds, as may be required.

The Clutch.

A satisfactory clutch is one of the most difficult things to secure. The ordinary type of cone cutch, which is covered with leather, can rarely be maintained in a normal condition, for the following reasons:—A great command over the car, especially in driving through traffic, is secured by allowing the clutch to slip. When the slipping has been going on for some time the clutch will not grip at all, or it grips violently or harshly. The result is that driving is not only most unpleasant, but is very injurious to the car itself.

Frames.

The frames are built up in a number of ways.

(a) Lengths of channel steel, shaped section, united at the angles of their ends, and cross pieces with strong angle pieces or braces.

(b) As described, but armoured internally with ash, which greatly increases the strength with very little weight.

(c) Built of ash and armoured on both sides with steel flitches with channel steel arms or cross pieces.

(d) Tubing frames screwed into joints which also make joint with cross pieces and stays.

(e) And lastly, the one-piece pressed steel frame, perhaps the strongest and lightest of them all.

With regard to the wheelbase, the longer this is, the steadier the car, and the greater security from side slips.

Greater care must, however, be paid to securing sufficient strength on account of the extra length.

Silencers.

A perfect silencer should muffle all exhaust noises without setting up any back pressure whatever. This is effected, first, by gradual expansion in a closed chamber divided up into a series of freely inter-connecting expansion chambers, and secondly, by turning the stream of gases at a right angle to its last direction, and splitting it up into smaller streams.

Brakes.

Double-acting brakes are now fitted with a pair of metal clips arranged about the brake drum, and hinged together at one end. The motion of the brake pedal causes mechanism independent of the remainder of the braking mechanism to close the two halves inwards and grip the brake drum. This arrangement is equally effective in either direction. Expanding internal brakes are coming largely into use, one advantage being that they can be cased in away from the dirt; but a disadvantage is the adjustment, which is not so easy as external.

Bearings.

The types used for motor cars are plain, roller and ball. There is still a diversity of opinion amongst makers as to the best. For heavy cars excellent results without risks can be obtained from plain bearings, constructed of phosphor or manganese bronze. Roller bearings are usually fixed on back live axles and give good results. With ball bearings there is always a certain amount of risk of a ball breaking and playing havoc with its cone and journal, especially in the case of a wheel hub.

Steering.

It is, above all things, necessary that the steering of an automobile be steady, and, in order that this steadiness may be obtained, some device must be employed which inequality of road surface will not affect. This is obtained in practice by employing a worm gear for operating the steering arms attached to the axles of the front wheels. The irreversibility of the worm gearing provides against shock being carried back to the driver, and at the same time the screw action of the worm provides a powerful control over the direction of the wheels. For light cars it is not always deemed necessary to employ such a complicated arrangement, and tiller or side lever steering is fitted.

Springs.

Springs should be designed to swallow and conceal the inequalities of the road, and should rapidly absorb the work done on it while moving rapidly under the force applied to bend it. They should not oscillate much after each road "bump" has passed, and should be deflected through half their working distance when fully loaded. Springs are being made much longer now, which is a distinct improvement. The frame of the car should be slightly higher at the back from the road than the front end, so that when fully loaded the frame should be parallel with the ground. Cars can be made, and are being made, to run on solid tyres with comfort. It is, however, useless simply buying a standard pattern car and fitting solid tyres to it. Makers of pneumatic-tyred cars have counted too much on the tyres for shock-absorbing power.

While it is considered the proper thing to make bitter war on automobiles in the country, the fact remains that no other single interest is probably doing so much for farmers, the country and all concerned on behalf of good roads as the automobile. A powerful sentiment is being encouraged by automobile owners who have health, influence and ability to hasten the long-needed improvement.

There are also inspiring young engineers to make new discoveries in inventions and machinery. Hiram Maxim says:—"No other form of power producing apparatus in existence is as simple in concrete, and few more complicated in abstract have been invented since James Watt's first steam engine. It marks the greatest epoch in mechanics."

Steam automobiles were first used on country roads in England nearly three-quarters of a century ago, but it is only since the new inventions for using gasolene and electricity in producing powers that the recent stupendous progress has been made possible. In Europe kings, princes and millionaires have spent liberally to develop the industry in their various countries.

Twelve months ago "stagnation of design" was the stumbling-block of the British motor maker. The tendency to copy a certain type of popular radiator, body, or engine design seriously interfered with originality and invention. We are getting bravely away from this, and the motor engineer and body-builder alike are daring to think for themselves to the great advantage of motor evolution.

The All-British Argyll.

From all accounts, the success of the Argyll car on the English and colonial markets has been phenomenal, and it is affirmed to-day that the Argyll is one of the most popular All-British cars manufactured. One of the items that have contributed to the popularity of the Argyll is its simple and satisfactory transmission arrangement and gear box, as described in another column.

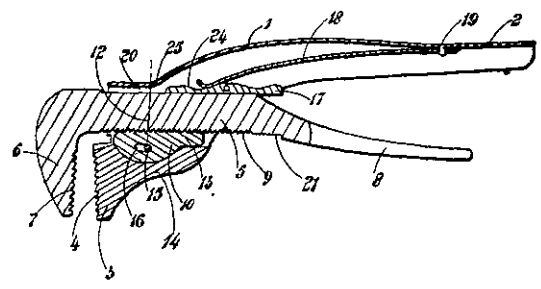
In addition to this capital gear box, the Argyll possesses many other features to recommend it—pressed steel chassis frame; tonneau bends of pressed steel, carefully tinned before painting, thus giving a roomy body for small weight; flexible engines, light weight per b.h.b., and consequently less tyre trouble. All parts are interchangeable and there is excellent coach work.

Argyll cars have scored heavily in reliability trials from 1901 to date, the most important being:—full marks for absolute non-stop run Glasgow to London, won by 10-12-h.p. car; John O'Groats to Land's End record, won by a 12-14-h.p. car, beating the previous record of Mr. Cecil Edge by three hours, twenty minutes.

The car illustrated elsewhere is a 2-cylinder 10-12-h.p. giving 13 b.h.p.; other types made are 12-14-h.p. 3-cylinder, 16-20-h.p. 4-cylinder, 20-24-h.p. 4-cylinder touring cars, and 10-12-h.p. and 12-14-h.p. 2-cylinder vans.

Carroll Patent Shifting Spanner and Pipe Wrench.

A large number of tools designed to fulfil the dual purpose of spanner and pipe wrench have been invented from time to time, but none are likely to become so popular as the Carroll patent shifting spanner and pipe wrench. This tool is the invention of Mr. Carroll, and arises from his knowledge of engineers' requirements derived from a long period of practical experience. The tool, as shown in our illustration, is constructed with one of the jaws (3) secured in a frame (20) upon a handle (1) the opposing jaw (6) is upon the stem (5) of another handle (8), which slides through the frame and has teeth (9) upon one edge. These teeth engage in a semi-circular rocking-piece (10) which fits in a corresponding recess in a frame. By this arrangement,



when the tool is used as a pipe wrench, the pipe is released by the jaws when the grip of the hand upon the handles is released. An important advantage of the tool is the ease of adjustment which can be effected when the tool is held in one hand—the tool being turned with its back edge down. When pressure is placed upon the edge of the handle stem at 21 it brings the teeth thereon out of engagement with the teeth in the rocking-piece against the pressure of the spring (18) which spring bears against the slidable wedge-piece (17). The handle stem can then be moved through the frame by the thumb in either direction to adjust the distance apart of the jaws (6) and (3). The tool has been patented in all the chief manufacturing countries of the world, and arrangements are now being made for placing it upon the market.

Municipalities have a right to insist upon the abatement of black smoke by all users of steam boilers, without regard to the purposes for which the steam is used, or the means to be adopted for abatement. This, because smoke is a public nuisance, and because it can be abated without hardship to the owner of the plant. Nevertheless, when the evil is present, and has been present for a period of years, it is not good policy to be too radical in the enforcement of the statutes. The law should be definite and stringent, and the penalties adequate, but they should be enforced with discretion by officials who have some technical and practical knowledge of smoke abatement. It is absurd to talk of putting this matter into the hands of the police or of the health officer. The official having charge of this work should be a trained engineer, if possible, a technically educated man, and he should be entirely above influence in any of its guises.

Alldays Motors.

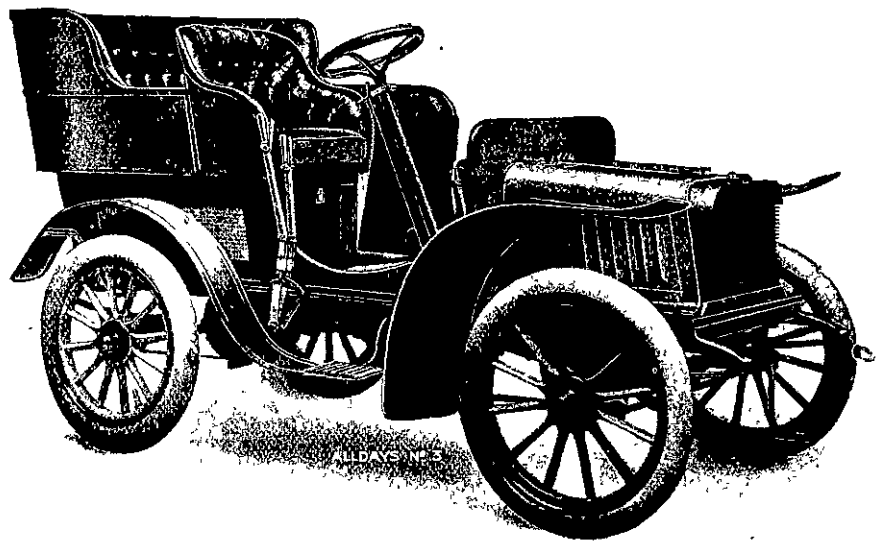
In 1901, when a few of the old-established engineering firms in England were turning their attention to the possibilities of the motor for domestic and commercial uses, Mr. J. E. Jenkinson, the managing director of Messrs. Jenkinson & Co., Ltd., of Wellington and Masterton, Wairarapa, looked in that direction for the supply of a high class of car, but still at a moderate figure, and eventually negotiations were successfully completed with Messrs. Alldays & Onions Pneumatic Engineering Company, Ltd., of Birmingham, the makers of the now famous Alldays motors. Established in 1650 (over two and a half centuries), the excellence of their metal-working and engineering specialities is known to engineering concerns throughout the world. That the selection of the Alldays cars has been a judicious one is splendidly exemplified in the success of the machines already in use in the Wairarapa. One particular instance is worthy of note a 10-12-h.p. double-cylinder Alldays tonneau recently supplied to Dr. M. a'Beckett McCarthy, successfully climbed, without changing from direct drive, a hill that all other cars, including some rated up to 20 h.p., had to change gears to surmount, even without passengers. This climb on direct drive is all the more remarkable as the car carried five persons up. A special and valuable feature on the Alldays car is a sprag which prevents any possibility of the car running back should it be necessary to stop on a grade. This sprag acts independently of the three powerful metal-to-metal expanding brakes. Three speeds forward and one reverse are effected by Panhard gears of generous proportions, the drive is direct on high speed by universally jointed cardan shaft, thus avoiding necessity of exposed chains. The wide tread, 4ft. 8in., is specially noticeable, and although this is optional, it must effect a considerable saving in tyres. Another convenient arrangement made by Messrs. Jenkinson & Co., Ltd., with the manufacturers is that the finish and upholstering is executed to purchaser's individual wishes, and comprehensive stocks of duplicate and spare parts are consigned with each car. For domestic, professional, or business uses the Alldays motors seem to be all that is desired. The contour of the bodywork is pleasing, and ample accommodation is provided for luggage when touring. We have to thank Messrs Jenkinson & Co., Ltd., for the above illustration.

National Gas Engine.

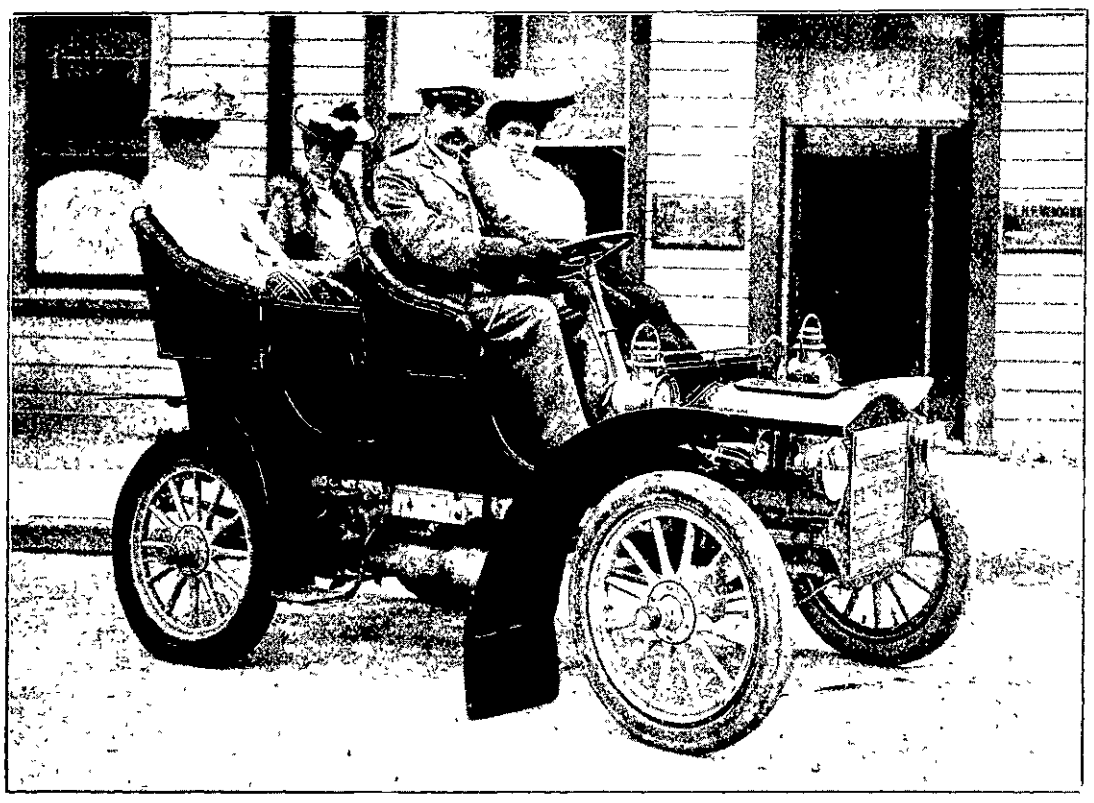
The National Gas Engine Company was organised in 1889 for the purpose of making gas engines on the Otto cycle, with several improvements patented by Mr. Henry N. Bickerton, who had previously been connected with the manufacture of gas engines for a number of years. The engine then produced by the Company very soon became widely known as the "National Improved Otto," and almost immediately occupied a front rank in the gas-engine world. The addition of other improvements to the Otto cycle has given such satisfaction to purchasers that the demand is even now constantly in advance of the supply, notwithstanding the continued extensions being made at the works in Ashton-under-Lyne, England.

In order to meet this growing demand, and to ensure the making of gas engines in an economic and highly efficient manner, the National Gas Engine Company was in the year 1897 formed into a limited Company. Two gentlemen of long experience in connection with the trade then joined the Board—viz., Mr. Henry Prescott and Mr. H. W Bradley. Again in the year 1900, owing to the continued increase in the demand for National engines, a further re-construction was made, increasing the capital considerably, and immediately afterwards a gentleman of world-wide reputation in connection with gas engines was added to the directorate—viz , Mr. Dugal Clerk.

The National gas engines are designed from one standard type, which must prove that every detail has been arrived at after great consideration Th e small engines have identically the same features throughout as the larger engines. The following are a few of the important features embodied in the National gas engine —perfect regulation of speed at different powers, easy and safe starting by inexperienced hands, durable ignition tubes, gas consumption strictly in accordance with the power used, every convenience for cleaning necessary parts, perfect self-lubrication without waste, highest-class workmanship with simplicity of construction, magneto-electric ignition fitted to all the larger size engines. In designing these engines the paramount necessity of ensuring permanent successful working has been carefully observed.



10-H.P. 2-CYLINDER ALLDAYS.



MR F. N. R. MEADOWS AND HIS 12-H.P. CADILLAC; MRS. MEADOWS AND THE MISSES VON DADELSZEN.
[*Hardie Shaw, Photo.*

F.N. Motor Cycles.

The Fabrique Nationale people, Liege, Belgium, are well-known makers of motor cycles. They do not make these motors for racing purposes, but aim at producing only machines for touring purposes.

The latest model for 1906 is a four-cylinder motor, for which they claim many advantages over the single-cylinder motors. Heretofore, the four-cylinders have only been used in the construction of motor cars; but anyone who has had experience in using them will at once recognise their advantages. The analysis of its working shows that one-half revolution of the motor corresponds with one stroke of one of the four cylinders. Therefore, the explosion, instead of being used once for two revolutions as in the mono-cylinder motor of the same power, is divided into four equal parts. This ensures a much more continuous and regular transmission of the power given out by the motor; furthermore, the use of the four-cylinder motor allows an almost perfect balance to be attained between the various working parts. This is impossible with any number of cylinders less than four, and for this reason alone the four-cylinder motor has great advantages, greatly minimising the vibration and eliminating the strain on the frame of the machine. The transmission of this new four-cylinder machine is on the bevel-gear system. The whole arrangement is protected by a dustproof case filled with grease to ensure efficient lubrication of the various parts. The use of this mode of transmission necessitates a great regularity of movement, and this is one reason why the four-cylinder motor has been adopted. To avoid the shocks due to the explosions in the motor being transmitted to the bevelled gears, an elastic coupling contained within the fly wheel is interposed between them. The four-cylinder machine is fitted with a magnetic ignition, and a pair of elastic front forks. This fork embodies a combination of steel springs and some rubber plugs; it has for its object the avoiding of jerks. This useful effect is only produced in the plane of the steering of the machine, and in no way affects the steering. The fork is noiseless in its action, and the way in which it conduces to steady running of the motor is very remarkable.

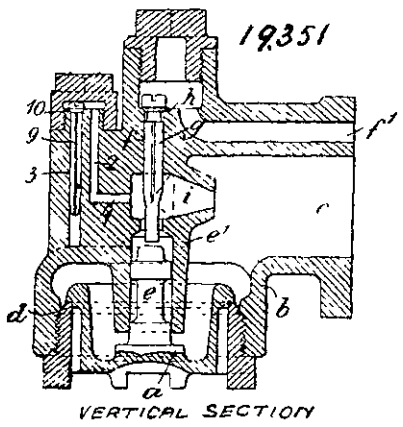
The machine is also fitted with an automatic carburetter, so that the gas is automatically made with the right amount of air and naphtha. Lubrication of the motor is worked by one pump from the front of the machine. There is perfect safety in descending steep hills, for the machine is provided with two very powerful brakes (band and rim).

An illustration of this machine will be found on page 118.

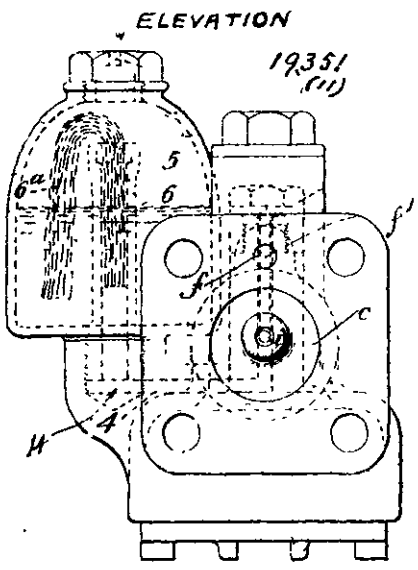
There is ample room for improvement in the brakes usually employed on road vehicles, Some of the patterns now in use were probably familiar to prehistoric man. So, at least, thinks Mr. P. B. Curtain, of 60 Queen-street, Melbourne, who is interested in an automatic brake, principally for heavy vehicles, that promises to be widely used. When a vehicle to which the device is attached is descending a gradient, or when the speed of the horse or horses is reduced, the brake acts automatically, by means of the pressure on the breeching in a one-horse vehicle, and the backward pull on the collars when two horses are used. If desired, the brake can also be worked by a foot or hand lever, and can be locked on or off when necessary.

ABRIDGMENTS OF INTERESTING PATENT SPECIFICATIONS.

No. 19,351, dated September 8th, 1904, W. M. Smith.—Lubricating locomotive cylinders.—In order to prevent a vacuum being formed in the working cylinders of locomotive engines when running with steam shut off, provision has been made for the admission of air or steam to the cylinders usually through the steam chests This invention has reference to means for also admitting

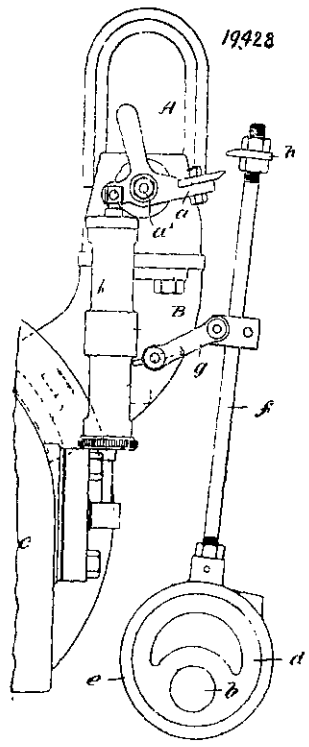


lubricant to the cylinders when they are running with steam shut off. In the drawings (a) is a valve sliding in a casing (b) the interior of which communicates by a branch (c) with the steam space of the steam chest of the locomotive. The valve (a), which closes on a seat (d), is subject on its outer side to the pressure of the atmosphere, and on its inner side to the pressure of the steam chest. The stem (e) of the valve slides in a guide (e1) in line with a steam inlet passage (f) connected by a passage (f1) to the steam space of the boiler., (g) is a valve closing on a seat at (h) and extending almost into contact with the end of a valve stem (e); when the valve (g) is opened steam passes through the passage (f) and nozzle (i) into the branch (c). Connected with the nozzle (i) through passages 1, 2, 3 and 4 is a lubricant-containing chamber (5); the passage (4) connects with the bottom of an upwardly extending open-ended tube (6) within the chamber (5) into which lubricant is syphoned by a wick (6a). When the pressure in the steam chest becomes less than the atmospheric pressure owing to the regulator being shut while the engine is running, the air valve (a) will open, admitting air, and will force from its seat the steam valve (g), which will allow steam from the boiler to pass through the passages (f and f1) into

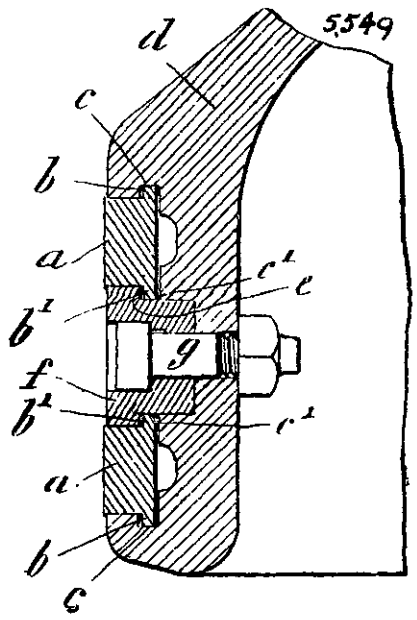


the nozzle (i) at the same time the lubricant contained in the tube (6) will be forced, by the pressure of the atmosphere through the passages (4 and 3) past the valve (9), which will be lifted from its seat and thence through the passages (2 and 1) into the nozzle (i), where it will mix with the steam.

No. 19,428, dated September 9th, 1905. A. R. Bellamy.—Ignition mechanism.—The oscillation of the trip lever (a) of the magneto-generating machine is effected as follows:—On the side shaft (b) of the stationary gas engine, an eccentric (d) and strap (e) are mounted, the strap having a rod (f) which is connected at some part of its length to a link (g) pivoted to a bracket (B). The upper end of the eccentric rod (f) carries its tappet (h) adjustable on the rod. As the sheave of the eccentric revolves with the shaft (d) the upper end of the rod, owing to its connection with the link (g), describes a closed curve, the curve being towards the trip lever (a) on its downward stroke and away from it on its upward stroke. Suitable buffer springs are provided in the casing (k).



No. 5,549, dated March 16th, 1905. Gordon and McKechnie, of Messrs. Vickers, Sons and Maxim.—Piston rings for pistons made in one piece.—Each ring (a) split in any usual way has flanges (b, b1), of which b fits in a groove (c) in the side of the recess in the piston (d) while b1 fits in a like groove (c1) formed between the flange (e) of the retaining ring (f) and the recessed portion of the piston. The ring



is preferably of cast iron, and is made in two or more sections, each bolted to the piston by two or more bolts such as g, the nuts of which are locked in any suitable manner. The clearance of flanges (b, b1) in the grooves (c, c1) respectively is sufficient to allow radial movement of the piston rings, but insufficient to allow of the rings being forced against the inner surface of the cylinder more than is advantageous.

No. 17,172, dated August 5th, 1905.—Radiator.—W. H. Kitto and another.—The radiator is of the

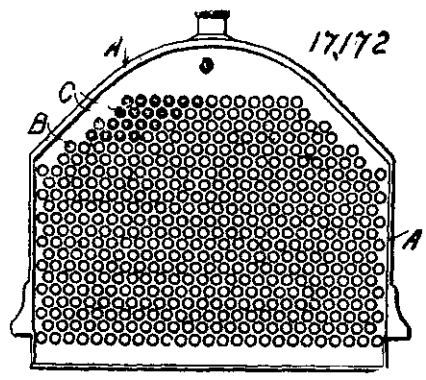


Fig. 1.

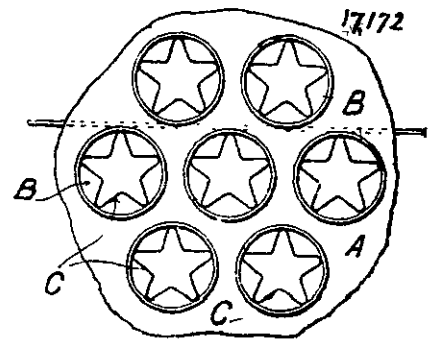


Fig. 2.

well-known type in which a number of tubes (B) are situated in a chamber (a), through which the liquid to be cooled is circulated whilst air passes through the tubes. To render the tubes (b) more effective a crimped or corrugated strip of metal is placed within each tube, as shown at c. Fig. 2 is an enlarged view of several of the tubes.

Niagara's Drying Up.

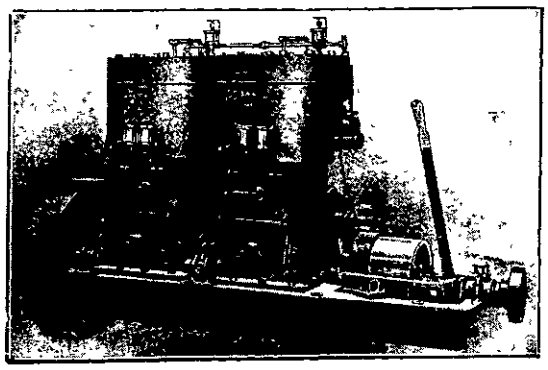
As to the possibility of the destruction of Niagara Falls, a lecturer stated that in 1885 Mr. Evershed thought he was taking a very safe line in saying that for power purposes no more than 4 per cent. would be required. If 150,000 h.p. were produced, the daily demand would be 11,000 cubic feet per second, which was 5 per cent. of the mean flow, or not 7 per cent. of the minimum flow. The development of 650,000 h.p. demanded 48,000 cubic feet per second, or 21½ per cent. of the mean flow and 30 per cent. of the minimum flow. It was obvious that when the whole of the machinery was in working order the alteration in the appearance of the falls would be striking. Taking into account the water used for the Welland Canal and Chicago drainage and other canals projected, the total diversion of water would be at least 41 per cent. of the minimum flow. Nor was the end of projects for the diversion yet in sight, so that there seemed likely to be a fulfilment of Lord Kelvin's prophecy that before long Niagara would be a dry ravine.

A wind pressure indicator for railway use has been introduced. The event leading to its invention occurred during a gale in February, 1903, when a train was blown over on Levens Viaduct, on the Furness line, England. Now there is an instrument which will automatically warn the signalmen on duty at Cark and Plumpton when there is a wind pressure of sufficient force to be dangerous. The indicator consists of a combined wind-pressure gauge and recorder, and is connected with an electric arrangement, by means of which bells are set in motion at distant signal cabins. These bells will continue to ring as long as the velocity of the wind on the viaduct is dangerous to passing trains.

The Stolze gas turbine was invented by Dr. Stolze as far back as 1873, and the principal underlying its construction consists in compressing atmospheric air to, say, one and one-half atmospheres above atmospheric pressure, and in heating this compressed air so as to cause it to assume a two or two-and-one-half fold volume, with the same tension, after which the air tension is allowed to drop again to atmospheric pressure. The excess of work performed over the absorbed energy is thus due to the increase in volume resulting from the heating. Two sets of turbines of different designs are mounted on a common shaft. One of these serves as an air compresser, while the other drives the shaft by means of the heated air. Each set consists of several rows of guiding vanes, fitted to the engine casing, and of several rows of running vanes of a corresponding design, secured to a common rotating cone, which turns with the shaft. One of these turbine systems draws in the fresh air, compresses it to a given tension through a pre-heater (heated with exhaust gases), and drives the greater part of it into a chamber lined with refractory material. The smaller is conveyed beneath the grate of a producer, where it serves to volatilise the fuel. The gas thus formed penetrates into the chamber mentioned, to be burnt there by the compressed air in suitable burners and converted into carbonic acid and water vapour, while evolving large amounts of heat. These gases next enter the second turbine system, where they are allowed to expand in traversing the various steps, thus performing useful work. The process is thus analogous to the cycle performed in all internal combustion engines. A distinguishing feature is, however, that the mixing takes place after compressing.

The White Marine Motor.

The White motor, illustrated below, possesses many distinguishing features. Each engine is equipped with the White patent overflow suction feed. After once opening the valve, the feed requires no further attention, and it also does away with any chance of having gasolene leak from the valve into the boat. The White is equipped with electrical ignition and self-cleaning electrodes. Heat, rust, grease and soot cannot collect upon or in any manner affect the working of the ignitor. The contact points do not wear out or become battered with use, and do not have to be removed or cleaned. A ball-governor is used embodying the principles adopted in the Corliss engine. The speed can be instantly changed and regulated by the operator, and the governor will maintain the speed without further attention. The engine is built on the four-cycle principle, taking an explosion in each cylinder at every other revolution, and it is designed



LATEST TYPE OF WHITE 4-CYCLE MARINE MOTOR.

especially for marine purposes, being made as light as practicable, and with the centre of gravity as low as possible.

The method of supplying gasolene for the engine is free from danger. The gasolene tank is placed in the bow of the boat below the level of the engine. No match or flame is used in starting. A special feature of this engine is that under no condition can there be a premature or back explosion. This is an essential point in the safe and economical running of an engine. With the White method of gasolene feed there is absolutely no chance for a leak of gasolene from the feed valve into the boat.

At Belfast, Ireland, was recently tested a steam engine said to be the most economical ever built. The lowest steam consumption per horse power was 8.585 pounds, obtained in one of a series of runs. Nearly as good results were obtained in two other tests, and all were excellent. The engine is an inverted vertical cross-compound marine type, rated at 500 h.p. at 100 revolutions per minute, with a steam pressure of 120 pounds, and was built by Messrs. Cole, Marchant and Morley, of Bradford, England.

CONSIDERATIONS FOR A PROSPECTIVE PURCHASER.

By W. Russell Grimwade, B.Sc., F.C.S., in the *Scientific Australian.*

This contribution is from the pen of a motorist of considerable practical experience. It treats interestingly of the salient points to be considered by an intending purchaser who desires to choose a car with his eyes open.

The main difficulty in the way of offering advice to an intending buyer of a motor car is the consideration of price, and it is such a dominating factor that in this article it will be neglected, and advice on minor points offered. When it is quite settled how much money is going to be spent, and what amount of luxury is desired, the relative merits of various types of cars may be discussed. At the outset it should be understood that, broadly speaking, the bigger the car the greater the comfort and the cost of upkeep. Steam and electric cars are for the time being out of it, and, unless a man is or wishes to appear peculiar, petrol cars only are considered. Instances are often met with where a man after long delay makes up his mind to buy a car, and, after inspection, decides on a big powerful four-cylinder machine. This is always a pity for several reasons. The car is from the start in the hands of beginners, and suffers accordingly, and the owner is dissatisfied because the machine is not performing as well with him as it should. Moreover, a great deal of pleasure is lost by an introduction to motoring by a powerful machine. If a more modest car be made the medium of initiation, the full joys of anticipation may be had, and as the car is changed for something better the goal of one's ambition is reached by stages, and each acquisition yields its own peculiar pleasures. If a car is to be used as a vehicle only, and to be driven exclusively by a motorman, this does not apply with such force, and there is no reason, why luxury should be bought by degrees—the passenger never feels the need of " more power " as forcibly as the driver. It is an excellent plan for a man wishing to enjoy the full pleasures of motoring to start off with a single cylinder, carry on to a twin cylinder and so work up to a four. Experience in driving and the general management of a car can be well and inexpensively gained by driving somebody else's machine, but as owners are inclined to be exclusive this is not always possible. It is preferable to be reasonable with one's desires, and buy a small second-hand car for a start, and when some knowledge has been gained, to exchange it for a larger one. That is, of course, assuming that the owner wishes to drive himself, and does not intend to employ a professional driver. When an owner is driven only, and never drives, more than half the pleasure of motoring is lost, and the car becomes merely a vehicle of convenience, and, moreover, it is well for an owner not to be absolutely dependent on his motor man, as many fine cars are not doing themselves credit because their entire management is left in irresponsible hands.

Upkeep is a very important item, and should be considered before purchase. Apart from depreciation, it is a fair thing to assume that in Melbourne a small runabout car can be run for a total cost of not more than twopence per mile all the year round, on figures of a year's running, and includes everything—i.e., petrol, lubricants, tyres, renewals, repairs and insurance. Depreciation is a decreasing item, and may be considered to approximate the total running cost, so an expenditure of fourpence a mile will easily cover the maintenance of a small machine. These figures are only approximately true for an annual mileage of from 6000 to 10,000. The maintenance of large cars is, as a rule, more than proportional to their size, and in many instances runs up to over a shilling per mile. Tyres are a very expensive item, and alone cost more than fuel, but the expense they entail is dependent upon the care and skill of the driver,

In selecting a car, special attention should be paid to :—(1) Accessibility of the engine and running mechanism ; (2) clearance of the car above the ground ; (3) ability of the car to run slowly on the top gear ; (4) type of gear box and the ease with which gears are changed ; (5) the efficiency of the water circulation and the cooling powers ; (6) electrical connections and wiring. Accessibility is a very important point, as the running mechanism should by its position invite inspection. If access to vital parts necessitates the dismantling of rods and levers, their attention is unconsciously postponed, and the lack of a drop of oil leads to wear and early replacement. Some cars seem to be put together in a very awkward manner, and the writer has known an instance where the whole crank chamber had to be removed to allow of a bolt in the pump mechanism being replaced. The cost of such small replacements is often considered excessive, because the time spent in getting at the job and the subsequent reassembling is overlooked.

For country use the height of the undergear from the ground should be noted, but it must be admitted that it is surprising what rough tracks can be negotiated with good driving, with a clearance of only a few inches.

Some makers apparently design with speed as the only object. This may be very desirable on occasions, but for town or rough country use a car should not be fast beyond its power on its top gear. The lower the gear the more latitude there is in the range of speeds obtainable, and the car that is moderately geared is infinitely more comfortable to drive than the very fast one.

The gear box of a car is perhaps its most crucial part, and special attention should be paid to it. Several makers fit patent gear boxes, and those that are successful are vastly superior to the original Panhard gear box. With the latter type the skill of the driver is everything, and in expert hands they wear well and suffer no damage, but there are few gear boxes of this type that do not show heavy wear after having been in constant use for a year or so.

The water circulation and cooling of the engine should be ample, as they are often severely taxed on north wind summer days. Radiators fitted with fans for a forced draught are in vogue at present, but the fan is an additional running part that is apt to be a nuisance, and, as some big firms contrive to do without it, why should it not be omitted altogether ? The engine should be able to run in the car when stationary for at least thirty minutes without causing the water to boil.

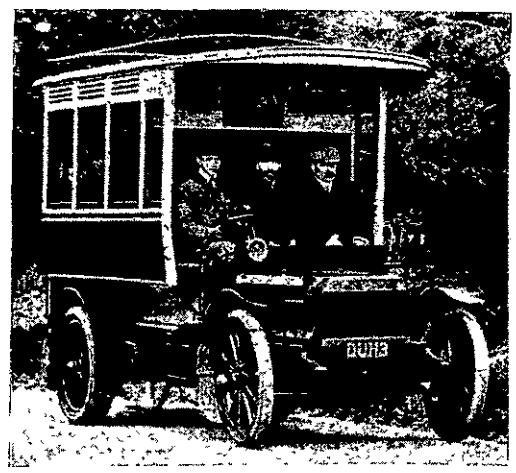
The details of the electrical portions of a car are big factors in its reliability. Cheap wires, poor switches, and insecure terminals often cause a stop on the roadside, and although they do not take long to rectify when discovered, they are often difficult to find, and are always a cause of annoyance.

The carriage springs of a car should be tested by a buyer by riding in the back seat when driving over a rough road at a moderate pace, and it should be remembered that, apart from the comfort of good springs, they are largely responsible for the life of the contained machinery.

The Motor Omnibus.

The motor omnibus has an enthusiastic advocate in Mr. E. L. Holmes, of Melbourne. His evidence before the Railway Standing Committee was of a very interesting character, and forms a valuable summary of the advantages of this successful means of modern locomotion. In the course of a lengthy communication, Mr. Holmes states that the motor 'bus has long passed out of its experimental stage. In London alone, on October 19th last, no less than 149 modern motor 'buses were in active operation, and so great is the demand that it is estimated that over 2000 vehicles are on order for use in Great Britain. As an instance of the importance of this form of locomotion, Mr. Holmes points to the rapid increase by the large English railway companies, especially the Great Western, of feeder services of motor 'buses to connect their lines with small towns and villages.

Mr. Holmes continues as follows :—" That London 'bus companies and English railway companies



A TYPICAL " FEEDER " OF THE GREAT WESTERN RAILWAY.

have adopted the motor 'bus largely, and cannot obtain supplies fast enough, does not seem to carry the weight in argument which it undoubtedly should. Expert evidence shows that 10d. per mile is full cost of running motor 'buses, allowing most liberally for depreciation, and yet local authorities hesitate, and in many cases " land " their citizens with " electrical " white elephants. A recent illustration of this has been shown at Oxford (Eng.), where the Council called for comparative reports on motor 'buses and electric trams. The town clerk summarised the reports as follows .—

	Motor 'Buses.	Electric Trams.	Electric Trams.
Length of road served	9	10	8¼
No. of vehicles ..	17	25	23
Seating capacity	34	48	48
No. of passengers	4,580,000	5,294,016	4,784,016
No. of miles run	490,000	661,752	577,752
Traffic receipts per mile run ..	11d.	10d.	10d.
Working expenses per mile run ..	8.70d.	6d.	6d.
Capital expenditure	£20,000	£130,147	£116,147
Total traffic receipts	£22,520	£27,573	£24,073
Total working expenses	£17,750	£16,544	£14,444
Loan charges, 6%	£1,200	£7,809	£6,969
Profit	£3,570	£3,220	£2,660

A receiver of stolen cars has been discovered in Chicago. At his establishment is a complete equipment for re-modelling, re-painting, and faking stolen cars, so that their owners cannot possibly recognise them. In the suburbs of Chicago a company of motor cracksmen attacks and robs passing motorists to such an extent that shot guns and revolvers are regarded by Chicagoans as essential motor accessories.

WHAT WE OWE TO INVENTORS AND PATENTS.

The following paragraphs, culled from the speeches and writings of statesmen and men who have achieved distinction in arts and science, are published to show the appreciation due to inventors, the dignity of their calling, and their claims upon the consideration of their fellow-countrymen.

Hon. Robert S. Taylor.

"In the light of the reflections which this occasion suggests, we can faintly realise how vast is the obligation which we owe to inventors. Not a garment that we wear, not a meal that we eat, not a paper that we read, not a tool that we use, not a journey that we take, but that makes us a debtor to some inventor's thoughts."

President McKinley.

"Our future progress and prosperity depend upon our ability to equal, if not surpass, other nations in the enlargement and advance of science, industry, and commerce. To invention we must turn as the most powerful aid in the accomplishment of such a result."

Professor Thurston, M.A., LL.D.

"One ton of engine to-day does the work of eight or ten in the time of Watt; one pound of fuel or steam gives to-day ten times the power then obtained from it. A half-ounce of fuel on board ship will now transport a ton of cargo over a mile of ocean."

Octave Chaunte.
(*President, Society Civil Engineers.*)

"It is now possible to carry across the Atlantic 2,200 tons of freight, with 800 tons of coal, where in 1870 it was only possible to carry 800 tons of freight with 2,200 tons of coal."

Sir Henry Bessemer.

"I do not know a single instance of an invention having been published and given freely to the world, and being taken up by a manufacturer. I have myself proposed to manufacturers many things which I was convinced were of use, but I do not know of one instance in which my suggestions have been tried; but had I patented an invention and saw no means of recouping myself except by forcing, as it were, some manufacturer to take it up, I should have found some one who would have taken it up on the offer of some advantage from me. Then the invention becomes at once introduced, and the public admits its value."

Walker's Text Book On Patents.

"The right of property, which an inventor has in his invention, is excelled in point of dignity by no other property right whatever. The benefits which he confers are greater than those which he receives, He walks everywhere erect, and scatters abroad the knowledge which he created. He confers upon mankind a new means of lessening toil or of increasing comfort, and what he gives cannot be destroyed by use nor lost by misfortune. It is henceforth an indestructible heritage of posterity. Side by side stand the inventor and author. Their labour is the most dignified and the most honourable of all labour, and the resulting prosperity is most perfectly theirs."

Commissioner Holt.

"The truth is, and there is no avoiding it, that you cannot disconnect in this country inventions, manufactures, and agriculture. They are inter-dependent co-equal factors in producing our prosperity and our happiness; and so with regard to the other industries of the country, patents are directly connected with them all, and absolutely necessary to their successful pursuit. That nation which gets most of the world's trade is to be the first power of the globe. It is to be obtained only by encouraging the inventive genius of our citizens by protecting the patent system of the country, nd all that is involved and comprehended in that system."

Hon. James A. Tawney.

"There has never been in the history of the world a more impressive illustration of the value to a nation of that generous public policy which gave control to the man of the Products of his mind than is shown by our progress under the patent system. The genius of invention is the mainspring of advance in our material civilisation, the foundation of that prosperity on which culture must rest for its solid support."

Hon. Benjamin Butterworth.

"But for the patent system only an infinitesimal part of the triumph of inventive genius would have been accomplished, and if we could cut the ground from beneath the material prosperity of the age, there is no way in which this could be more effectively done than by the repeal of our patent laws."

Hon. Karekiyo Takahashi.

"It is only since Commodore Perry, in 1854, opened the ports of Japan to foreign commerce that the Japanese have been trying to become a great nation, and we looked about us to see what nations are the greatest, so that we could be like them; and we said, 'There is the United States, not much more than one hundred years old, and America was discovered less than four hundred years ago; and we said what is it that makes the United States such a great nation? And we investigated and found that it was patents, and we will have patents.'"

Examiner Pierce, in commenting thereon, said, "Not in all history is there an instance of such unbiassed testimony to the value and worth of the patent system as practised in the United States."

Newell Dwight Hillis.

"Every new tool that is invented, every new business that has developed carries with it a hundred new positions and openings for young men."

W. E. Simonds.

"A vastly large number of inventions are of a greater value than the public dreams, and those which seem to fall dead, contain within them seeds of suggestion, which later live and grow to rich fruition."

Lord Bacon.

"The introduction of great inventions appears one of the most distinguished of human actions, and the ancients so considered it; for they assigned divine honours to the authors of inventions, but only heroic honours to those who displayed civil merit. And if anyone rightly compares them he will find the judgment of antiquity to be correct, for the benefits derived from inventions may extend to mankind in general, but civil benefits to particular lands alone; the latter, moreover, last but for a time, the former for ever."

Commissioner Duell.

"Few men, I believe, have thought of the actual money value of patents. The mind cannot measure it. It would be safe to say that they are worth 500 dollars on an average, and if so, we have as the value of the patented inventions upon that basis, not reckoning cost, 115,000,000 dollars the actual saleable value. Others would put the average value of patents very much higher."

Senator Platt.

"I have heard it argued that we had approached the perfection of patent system; that there were now no worlds to conquer; that nature had no more secrets to bestow upon mankind for their benefit. So far from this being the case, we stand but in the very vestibule of the great storehouse of nature's secrets. We have but gathered a few pebbles along the shore on which beats a limitless sea. There is no limit to the evolution of human invention until it reaches the realm of the infinite.

"Every round of the ladder on which we have climbed to national pre-eminence is a patented invention, and every sign board which points to a greater future of achievement and progress shows that the path continues to lead through the field of invention. We stand to-day in the gateway of a most marvellous future. Let us hope that eyes may be given us to see that the inscription above the gate reads, 'Protection to the Patent system, and all that it comprehends and involves.'"

Rice Machinery and Windmills in Siam.

Of late years the cultivation of rice has been extending in several countries outside the Celestial Empire, notably in Siam and Indo-China, and with the increasing area of land being put under this cereal there is a growing scarcity of manual labour as well as of draught animals, the number of which is undergoing a steady diminution. According to the French Consul in Bangkok, the difficulties represented by the shortness of the labour supply in Siam are so serious that in the absence of sufficient immigration of Chinese coolies the only way of properly cultivating and preparing rice is by the employment of suitable machinery, although he admits that so far as the tilling of the land is concerned, the soft clayey nature of the soil offers many difficulties. Nevertheless, he is convinced that these could be overcome by engineers who would be prepared to spend a year in Siam in view of studying the means of adapting machinery to the various processes at present performed by hand, and he holds out excellent hopes for manufacturers of such mechanism, who would find an equally large market in Indo-China and other countries in the Far East. There is also a large opening for windmills in the Menam Valley, as well as in Cochin China, Cambodia, and Tonkin, where the vast wind swept plains are specially favourable to the employment of such appliances. No serious efforts have yet been made to introduce wind-mills the growers apparently being disposed to wait for the carrying out of certain irrigation works which will take several years to complete; but if manufacturers of windmills could induce a number of growers to purchase a single wind engine for experimental purposes there is no doubt that its advantages would be quickly appreciated, alike for the irrigation of the rice fields during the dry season, and at other times for driving rice thrashing decorticating, and other mechanism. In the opinion of the French Consul there is much to be done by those agricultural engineering firms who will take a close and intelligent interest in the requirements of rice-growers in the Far East.

A Great Technical Institute.

Writing in the *Magazine of Commerce*, Mr. J. H. Reynolds, principal of the Manchester Municipal School of Technology, says.—The courses of instruction in the school are directed more especially to the requirments of the industries of south-east Lancashire, of which Manchester is the commercial centre.

These embrace a wide range of subjects, and include mechanical engineering, electrical engineering and general technical physics, sanitary engineering, industrial and general technical chemistry, inclusive of the bleaching, dyeing, printing and finishing of textiles, paper manufacture, brewing and metallurgy, and the manufacture of textiles. In the course of an exhaustive description of the appliances used Mr. Reynolds remarks:—

The equipment of the school is on a scale of considerable magnitude, and, indeed, it exceeds that of any English institution devoted to technological teaching.

The workshops are well fitted up with modern tools, and the engineering shop has a special tool room, in which a complete installation of American fine-grinding machines, by the Brown and Sharpe Manufacturing Company, offers facilities for carrying on standardised work according to modern methods. A smithy, which contains eleven forges, by the Buffalo Forge Company, and a large hearth and a steam hammer, gives accommodation to twelve students at one time; and a similar number of students can be dealt with in the foundry.

The equipment of the electrical engineering department embraces the most modern English, American and continental plant and appliances.

Automatic Stamp-Selling Machine.

From communications received by the Frisco mail by Mr. Dickie, of the staff of the General Post Office, it would seem that the automatic stamp-selling machine—the joint invention of that gentleman and Mr. H. Brown, photographer, of Upper Willis street— is going to prove a really good thing for the inventors. When Mr. Dickie visited San Francisco a few weeks ago he met a Mrs. Kermode, of Tasmania, who was so struck with the invention that she acquired the patent rights for all those countries in which it had not been protected by the inventors, and she is to use her best endeavours to have the machine taken up in America and elsewhere. In a letter received from New York, Mrs. Kermode writes that she had an interview with the Chief Postmaster of Canada, at Ottawa, and he had been greatly impressed with the possibilities of the machine. It appeared to him to be complete, yet simple, it could be manufactured at a nominal cost, and there was apparent impossibility of its getting out of order. Another letter, dated December 10th, says that the Minister had written, stating that the Canadian Government was willing to order a hundred machines if they could be manufactured cheaply. The writer said they were getting an estimate, and if the Canadian Government accepted, and Mr. Dickie agreed to the offer, it meant everything to the life of the machine. The letter further stated that the Dominion officials had tested the machine, and were convinced that it was a really fine invention. Negotiations were also proceeding with the head officials at Washington, where further success was expected The stamp-selling machine in question was exhibited in the portico of the General Post Office in Wellington for some time, where it dispensed penny stamps with great promptitude on the penny-in-the-slot principle. It proved a very great convenience to the public—particularly after office hours, and on Sundays—and very many would have liked to have seen such a machine permanently installed.

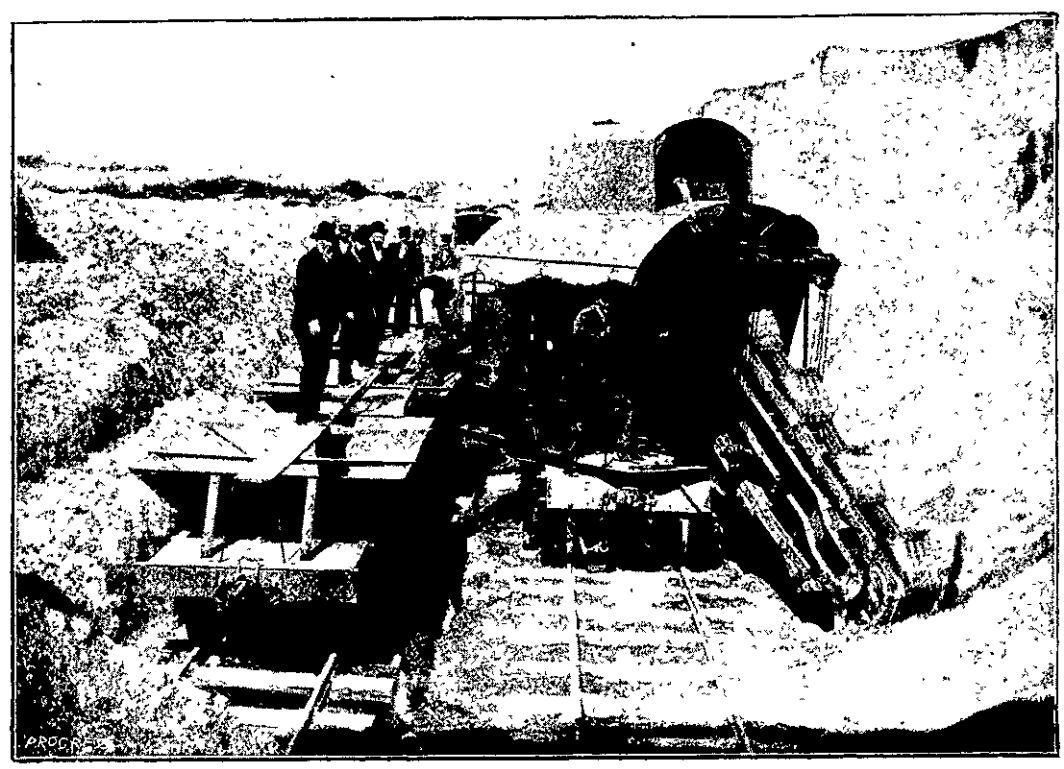
It would be most interesting were some motorist with plenty of time at his disposal, to keep a strict account for six months of his runs, their complete cost, and all details, and then draw up a contrasting itemised bill of what his trips would have come to had he and his passengers travelled first class by rail.

Inventions.

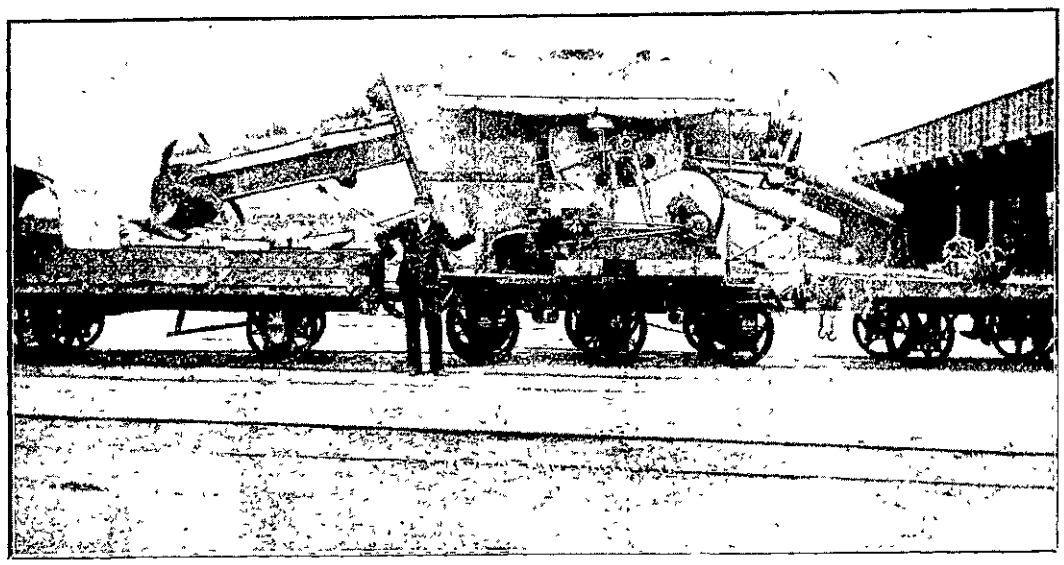
THE QUERTIER EXCAVATOR AND BALLAST FILLER.

Our illustrations show a most ingenious machine invented and designed by Mr. Hilary Quertier, for the purpose of excavating gravel ballast and delivering it into trucks. It will be seen that the machine is carried upon a railroad truck, and comprises a chain of buckets by which the gravel is taken out of the pit, or from a working face alongside the line, and delivered to a screen by which it is separated according to size of the stones, and then delivered into ballast trucks which, for convenience, are run upon a separate track parallel with the rails upon which runs the excavator. By this method the excavator can be taken along a train of trucks, filling one after the other from the working face, the machine being "locomoted" by ingeniously contrived driving gear from an oil engine, which is used as the motor power for the machine. If desired the ballast, instead of being put through the screen, may be delivered directly into shutes conducting it to the ballast trucks.

In evidence of the great saving effected by the employment of this apparatus, it may be cited that on the 23rd January last at Edievale, in eight hours, the Quertier excavator, working in a pit of an average depth of 2ft. 6in., excavated and filled 72 ballast trucks, containing a total of 360 cubic yards, the only labour employed being one driver and one truckman to load. The same quantity of ballast filled by manual labour in the same time would require at least 28 men. The relative cost being ten times as great by manual labour as by the machine. The illustrations show the machine made up in a train for travelling and at work in a gravel pit.



THE QUERTIER EXCAVATOR AT WORK IN A GRAVEL PIT.



THE QUERTIER EXCAVATOR READY FOR TRAVELLING.

The Escalator, or Moving Stairway.—In the large buildings of New Zealand, the general means of transit to and from the different floors is per the ordinary elevator. In America, however, the elevator promises to have a powerful competitor in the escalator, or moving stairway. This contrivance, which in outside appearance exactly resembles an ordinary stairway, may be described as a continuous series of rigid steps placed above an endless sprocket chain. Its capacity for passenger carrying is, of course, dependent upon the speed. Travelling at the normal rate of slightly over one mile per hour. The power required to drive the escalator, including hand rails, is normal—less than 10 h.p.; to this must be added the duty, depending upon the number of passengers. The escalator may be constructed as one continuous machine, with landings at each floor, and so arranged that steps which carry passengers up may perform a like service later in carrying others down; or separate machines may be installed in various locations affording the best opportunity for displaying merchandise. The motion of the escalator is so smooth and constant that it does not interpose the least obstacle to the free movement ot the passenger, who may walk in either directions or assume any attitude to the same degree as upon a stationary staircase. The apparatus is noiseless in operation, and is in constant motion, with a speed at which the passenger may with facility step upon or from it, and in absolute safety. After a very few trips upon the escalator all novel sensation disappears, and its use evokes no other than attends the use of a stationary staircase.

The "Hampel" Manure Distributor is one of the latest machines introduced into England by Messrs. J. and H. Keyworth and Co., of Tarleton street, Liverpool. This can be used for sowing superphosphates, kainite, ground lime, bones and all kinds of artificial manures, its leading advantages being lightness of draught, simplicity of construction, equality of distribution, and capability of adjustment. The machine has a hexagon steel sowing shaft with small iron spades, a second shaft being provided for the purpose of stirring damp manures. It sows 8ft. wide, weighs 4 cwt., and is priced at £10.

A new process in the manufacture of copper tubes, sheets, and wire has just been perfected by Mr. Sherard Cowper-Coles, metallurgist, of London, which is likely to effect some remarkable reductions of cost and extension of the use of copper. By a new method of electro-deposition, for which the inventor holds patents in all parts of the world, the finished tubes, sheet, and wire can be produced in one operation, including the refining from crude copper. It is claimed that the process is at least ten times faster than any existing electrolytic process, whilst the plant required is simple and free from mechanical complications, and in consequence the cost of the production is enormously reduced.

Acetylene Purification.

P. Gril proposes in his French patent, 334111 of 1903, to extract from crude acetylene made from calcium carbide, the organic compounds of sulphur, the basic compounds ormed by polymerisation, and the phosphine which it usually contains. For this purpose ten parts of chromic acid are dissolved in thirty parts of nitric acid, and the solution is absorbed in 100 parts of kieselguhr. Messrs. L. M. Bullier and L. Maquenne, who have investigated the origin of the impurities usually present in crude acetylene made from calcium carbide, state that the compounds of phosphorus come from the calcium phosphide in the latter material. They find that this phosphide, and the analogous calcium sulphide, only occur in carbide when it is made by the usual "basic" process—*i.e.*, when the charge fed into the electric furnace contains lime in excess. If the carbide were prepared with carbon in excess it would not be so contaminated. The white haze which is produced when C_2H_2 containing PH_3 (phosphine) is burnt in a closed room, consists of ammonium phosphate. Ammonia is of itself an objectionable gas, and if it enters into a purifier containing material intended to extract phosphorus, it reacts with that material and lowers its efficiency. The source of the sulphur is not yet traced. The SH_2 was formerly said to come from calcium monosulphide, or from aluminium sulphide; but it appears more likely that it is formed when a triple compound of carbon, sulphur, and calcium comes in contact with water. A troublesome mechanical impurity is lime dust from the gas generator, which is difficult to remove even by a water washer, and is visible in the luminous acetylene flame if the gas has been passed through tubes containing wool moistened with HCl or H_2SO_4. The lime dust deposits at the burner orifices and gradually decreases their effective diameter.

Luigi Mascarelli has examined the "explosive compound" formed, amongst other substances, on slowly passing acetylene through nitric acid of specific gravity 1.52, and finds it to have the composition $C_4H_2O_7N_6$. When heated with caustic potash this substance gives off ammonia, and on being heated with light petroleum it also suffers decomposition.

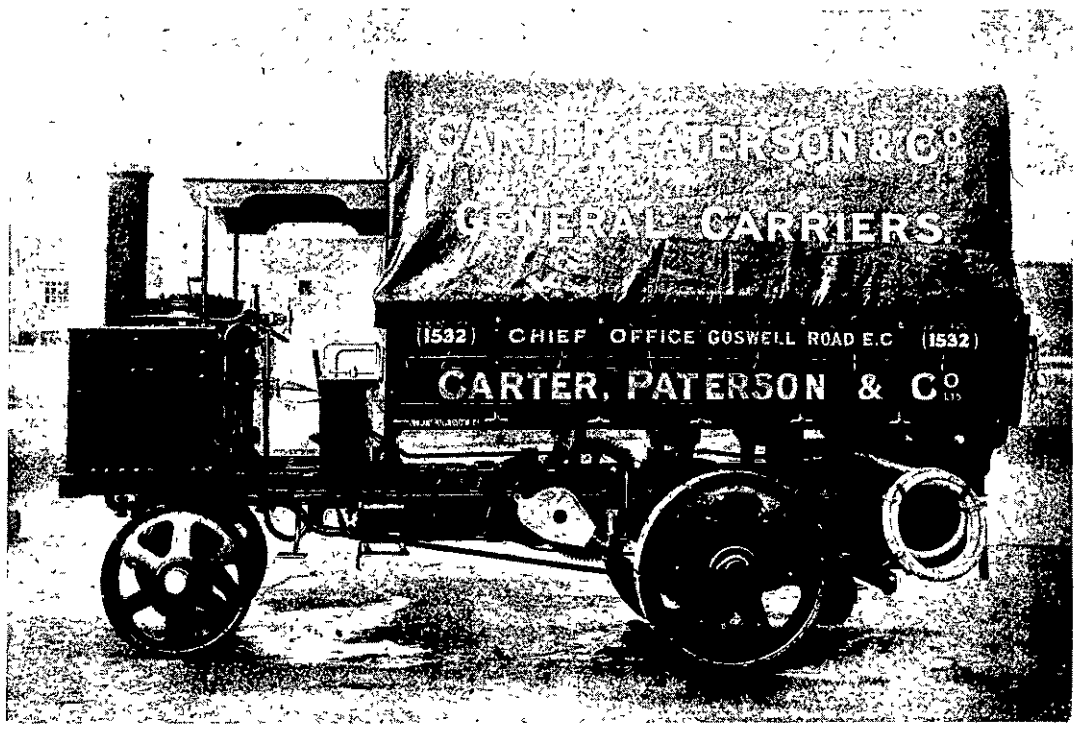
The Financial News has unearthed a proposition which should render the financial future of shipping enterprises magnificent in the extreme. It appears that a Victorian genius suggests coating the bottom of steamers with quicksilver, thereby forming a magnificent amalgamating plate, to gather the gold as the boat travelled. On arrival at the port of destination the cargo is discharged and the ship goes into dock for a clean-up. The author of this brilliant idea has, our contemporary states, expressed his desire to accept the position of battery manager and amalgamator. But he is not at all up-to-date. He should issue a circular and become his own ship-owner, and then secure a dry dock, thus keeping the wealth "in the family."

Commercial Motor Vehicles.

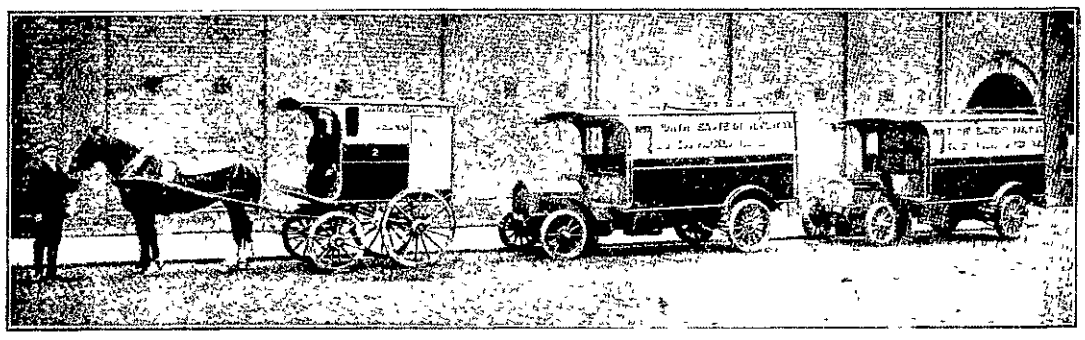
Great advances have been made in the production of the mechanically propelled vehicle for commercial purposes, such as the motor lorry, van and omnibus. For the heavier types of such vehicles, steam is the most useful motive power, particularly in British practice. For the lighter vehicles, which are in many cases merely developments of the ordinary private car, the internal combustion engine is generally employed. There is no doubt that before long the brewer, miller, farmer, builder, contractor, and hosts of others will recognise the merits and advantages of the motor vehicle much more largely than they do to-day.

A large number of steam and petrol vehicles are now in successful use for public service work. These carry from fourteen to forty-two passengers, or an even greater equivalent amount of goods; most of these are doing splendid work, and showing a satisfactory return for capital invested. Among the numerous advantages that the motor vehicle has over the horse are that it is more expeditious, has a larger range of action, and is considerably cheaper for transport. It can be worked at its maximum power all day without tiring, and does not require days of rest between two hard days' work.

Moreover, an auto vehicle can do the work of five to seven horses, and thus by displacing these and their equivalent lorries, from the streets, the congestion in traffic becomes less. Only when actually working is fuel required, and the more fuel used, the more work done. When not in use, the motor vehicle requires very little attention and no keep. It can be manipulated with much greater ease and certainty, and in cases of emergency can be stopped in a space equal to its own length when travelling at a speed of ten miles an hour, without excessive exertion on the part of the driver. Only half the room is required in traffic; it can in every case be much more easily managed, and it can with safety travel much above horse speed if desired. Last, but not least, the commercial motor vehicle is a first-class advertising medium, thus bringing business to the firm using it.



THE STRAKER 5-TON STEAM WAGGON.



THE OLD AND NEW: AN INTERESTING COMPARISON. EACH OF THESE STRAKER VANS IS ABLE TO REPLACE FOUR 1-HORSE VANS.

The Up-Keep of a Motor.

The opinions expressed by various people on the subject of the cost of running a motor car are as diverse as are those given utterance to on many other questions about which there is public controversy. Time, no doubt, will dispel many impressions that now exist, but in the interval those who know little or nothing about motors will continue to proclaim their views, right or wrong. It has been said the Victorian Government's motor car cannot be run at a less cost than £5 per week, and that two years of work will reduce its value by four-fifths of the original cost. These statements have been made on what is regarded by some as good authority, and the result of an idea becoming current to this effect has been to deter some people from buying for the present—that is, until they could learn more about it. A Melbourne motorist who was spoken to lately on the specific point whether cars do or do not cost £5 per week for up-keep, says that the answer depends largely upon circumstances. The size and make of the motor, as well as the nature of the work, must, he said, all be taken into consideration; but under ordinary conditions no car should take £5 per week for its support. Many of the up-to-date cars will run 20 miles with the consumption of one gallon of petrol, while some require two or three times as much. "The Government car which is of modern build and possesses the latest improvements, will consume about one gallon of petrol on a twenty-mile run. If it is going to cost £5 a week for running expenses it will have to travel 2000 miles during that period, and I do not think Mr. Bent has in contemplation such a liberal use of the motor he has bought for Government requirements. Some of the large cars do, I know, cost even more than £5 per week for driving power, but the one I refer to is not of that class."

Touching upon another subject the speaker said that the life of a car is necessarily a matter that depends on how it is made and of what class of material its parts are composed. "If a car is cheap it must, to an extent, be nasty; therefore, the question of up-keep and wear and tear largely depends upon this point also. Again," he continues, "much of the durability of a car is a matter of treatment, and so also is the running cost. If the parts are kept well oiled and clean it wears less quickly, and it runs more smoothly. Smooth running means less driving power required, and that, of course, means less cost.

In the course of an interesting article on the openings of trade in Japan, now that the war has come to an end, the "World's Carriers" says:—"It is more in the capacity of agents and middlemen that European (or American) capitalists may look for benefit from the increased prosperity of the country. For some time to come their position in this respect will be unassailable. The lax business morals of the Japanese trader have put him more or less at the mercy of the foreign middleman. Practically, all the Japanese trade passes through the hands of foreigners. There are hardly half-a-dozen firms in the Empire—and those are almost without exception the nominees of the Japanese Government—that are able to give orders or make contracts with the great European and Americans firms. So bad a reputation has the ordinary Japanese trader that no English house will take notice of his communications, if he tries to ideal with it directly. He is always referred to the Yokohama or Tokio agent of the house. However high Japan's prestige may be raised as a great power, there is no prospect of her business good name being accepted at a much higher valuation for a long time to come, and thus the prospects for reliable and capable foreigners are distinctly good."

Wireless photographs are the latest discovery in the electrical world, and, according to Nicola Tesla, the day is not far distant when one may sit in one of New Zealand's cities and have his photograph immediately transmitted by a wireless system to London, or any other place in the world. Tesla and his assistants are carrying on experiments now at Wardencliffe, L.I., and everyone down that way is consumed with curiosity over the strange flashes that have gone forth in the night from the laboratory.

NOTICE TO ADVERTISERS.

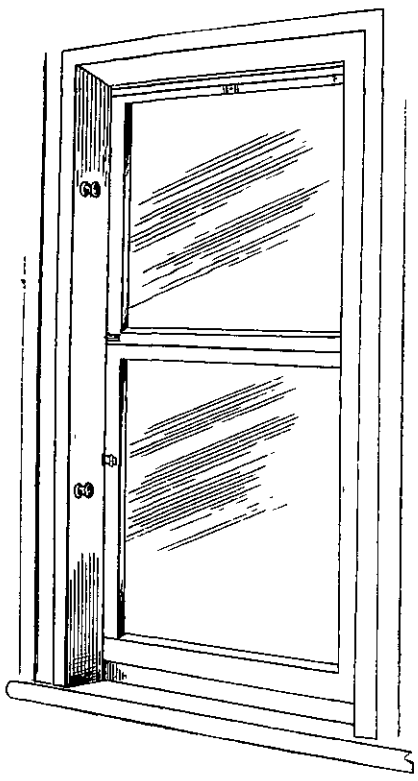
Change Advertisements for next issue should reach "Progress" Office not later than the 10th inst., otherwise they will have to be held over.

TWELVE DURKOPP 24-H.P. 4-CYLINDER OMNIBUSES, BELONGING TO THE LONDON ROAD CAR COMPANY, LTD., BEING PART OF AN ORDER FOR FIFTY-ONE SIMILAR VEHICLES.

New Window Construction.

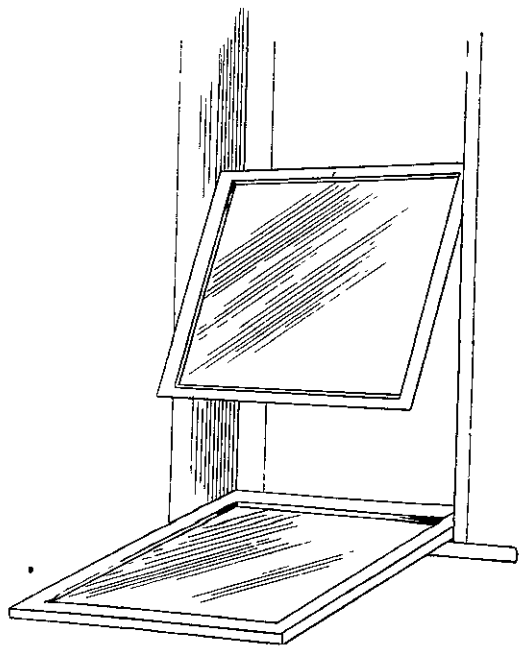
(ROBERTS' PATENT).

The importance of a constant supply of fresh air to, and the withdrawal of impure air from, occupied rooms cannot be too highly estimated. The old-fashioned sliding sash window lamentably fails for this purpose, for the reason that an open window usually results in a dangerous draught or cannot be used in bad weather.



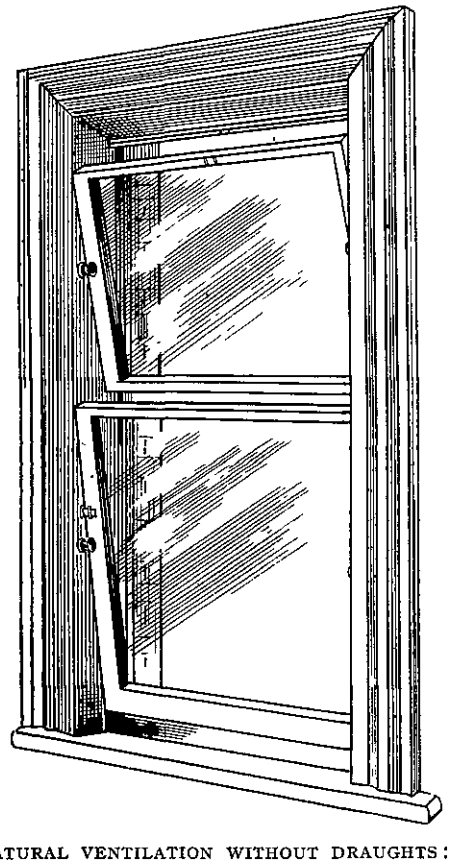
PERFECTLY WEATHERTIGHT AND NON-RATTLING: SASHES CLOSED.

Mr. Roberts is a civil engineer, who has devoted serious study to the problem of ventilation, and he has succeeded in designing a window which has already been largely adopted, and which is certain to advance in popular favour as its merits become generally known. Roberts' patent window, as shown in our illustrations, has two superposed sashes, each pivoted at its lower end in the frame, and capable of being securely closed, as shown in fig. 1, or inclined inwardly to an angle, as shown in fig. 2, in which position free inlet for air is provided without the possibility of down or side draughts, while vitiated air is allowed to escape. When turned at right angles upon their pivots, as shown in fig. 3, both upper and lower sashes may be cleaned upon both sides of the glass from the inside of the room. Provision is made for the almost instantaneous



OUTSIDE EASILY CLEANED FROM INSIDE: SASHES LAID FOR CLEANING PURPOSES.

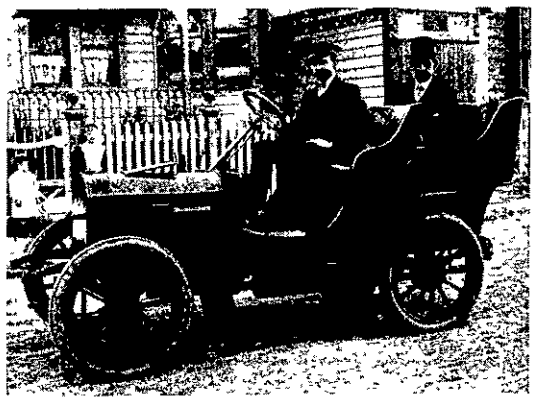
removal of the sashes from the frame when occasion demands. Sash weights are not required with the Roberts' window, but they may be readily attached if it is desired to make the sashes to slide as well as to turn upon their pivots.



NATURAL VENTILATION WITHOUT DRAUGHTS: SASHES OPEN FOR VENTILATION.

The Velox Car.

The Velox four-cylinder, four-seated tonneau car, illustrated below, has engines of 12 h p. The cylinders are mounted on the main frame, thereby giving a great clearance. The cylinders are cast separately, and the special features of the engine are as follows:—Mechanically operated valves, thermo water circulation (doing away with pump trouble), honeycomb radiator with fan cooling. The engine once started will always restart on



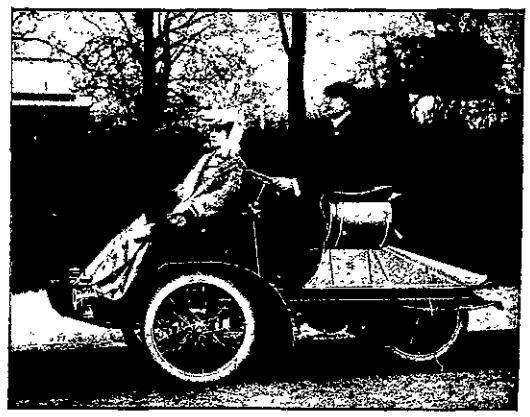
4-CYLINDER 12-H.P. VELOX.

switch, and it is unnecessary for the driver to leave his seat. Being a slow-running engine the Velox is economical in fuel and repairs, and all parts are exceedingly accessible. There are three speeds ahead and one reverse, and it is possible to run on the top speed, 40 miles, down to 4 miles, on the high gear. The Velox is in reality as flexible as any steam car. The carburetter is by Longuemere. The wheels are 30in., all equal, the brakes are expanding, three running in oil and encased. There is a direct propeller drive, consequently, there is no chain to get clogged with dirt and oil. The engine is very silent. The upholstering of the car is in rich Turkey red leather to match the slightly darker red of the car. The frame is of the latest pressed steel, without brazing, the joints being riveted, thus conducing to extreme durability. Messrs. A. W. Schaef & Co. furnished us with the accompanying illustration of the Velox. This car is certainly a novelty, inasmuch that it has the first four-cylinder 12-h.p. engine to arrive in the colony.

During the recent German manœuvres a new invention, called the microphotoscope, which consists of a map printed on glass and illuminated with a small electric lamp, was used in night marches with much success. The apparatus is about the size of an ordinary cigarette case.

A Two-Cylinder Rexette.

For the man of moderate means who has not the wherewithal to purchase a motor car, a tempting substitute is offered by the new type of Rexette (illustrated herewith). This serviceable and compact little vehicle has made more difficult than ever the problem of solving where the motor cycle ends and the motor car begins. Three persons can be



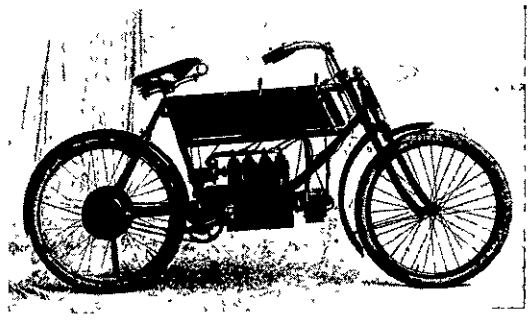
2-CYLINDER REXETTE.

accommodated in the coach-built body, and the front seat holds two additional passengers. The frame is of steel tube, the lugs and brackets carrying the engine, gear box, springs, etc., being brazed into position, so as to make them integral with the frame, the absence of clips making for greater security. The engine, of 8 h.p., is of the inclined twin-cylinder or V type, and is situated immediately beneath the driver's seat. A spray carburetter, and electric ignition of the high-tension coil and accumulator systems are employed. Attached to the left-hand side of the engine is the change-speed gear box, wherein is contained the necessary train of wheels for transmitting the power to the rear road wheel at different speeds. There are two speeds forward, the slowest of which is capable of propelling the vehicle at a speed of fourteen miles an hour, while the top speed is equal to thirty miles per hour. The steering is of the rack and pinion type so largely used on small cars, and there are two powerful band brakes operating on the rear wheel hub.

It is stated that the natives of the Cook Islands are showing a growing inclination to have their lands surveyed and dealt with by the Land Titles Court, while numerous applications have been received during recent months from persons desirous of taking up land in the Islands. Arrangements are being made to prepare information for intending settlers.

The fruit trade of the Islands is steadily increasing, and consideration is now being given by the New Zealand Government to the fostering and development of the trade. It is probable that a trial monthly service will be run to the Islands by the Union Company for a few months next season.

A comprehensive scheme dealing with the question of education in the Islands has been considered by the Government, but further information will be obtained before the matter is definitely settled.



F.N. 4-CYLINDER MOTOR CYCLE, AS DESCRIBED ON PAGE 112.

Electric ignition as applied to acetylene is a recent development, by means of which acetylene can be instantly lighted by turning a key or pressing a button. It is claimed that a considerable saving of carbide attends the use of this device, inasmuch as the lighting and extinguishing is done in a way that tends to limit lighting to the actual requirements instead of being needlessly extended. The method was recently demonstrated at the ninth annual meeting of the International (American) Acetylene Association.

Applications for Patents.

The following list of applications for Patents filed in New Zealand during the month ending 12th February, has been specially prepared for Progress.

20563—Butler, H. M. Leeds, England: Vehicle axle.
20564—Armstrong, S., Te Uku, N.Z.: Leg-rope grip.
20565—Bradfield, A., junr., Ratanui, N.Z.: Lifting-jack attachment.
20566—Halpin, B., and Rashleigh, J. H., Palmerston North, N.Z.: Butter cutter.
20567—Parsons, W., Papanui, N.Z.. Curing milk fever in cows.
20568—Bywater, J. D., Christchurch, N.Z.: Mowing machine.
20569—Cowdery, J. P., Christchurch, N.Z.,: Oiling axles of vehicles.
20570—Park, J. R., Wellington, N.Z.: Carburetting air and producing gas. (A. J. Way).
20571—Easton, J. A. and Greenfield, J., Dunedin, N.Z.: Feed reservoir and box for horses.
20572—Payne, F. W., Dunedin, N.Z.. Dredging tumbler.
20573—Gordon, F. E. A., Palmerston North, N.Z.: Metal polish.
20574—Pomeroy, Invercargill, N.Z.. Signal lamp.
20575—Mitchell, H., Invercargill, N.Z.: Brooch fastening.
20576—Bower, D., Dunedin, N.Z.: Milk strainer.
20577—Wood, A., Dunedin, N.Z.: Acetylene generator.
20578—Whitney, A., Melbourne, Vic.: Target and shooting range.
20579—Hogan, M., Edendale,. Grain and seed cleaner.
20580—McKenzie, D., Auckland, N.Z.,. Easy chair.
20581—Quertier, H., Dunedin, N.Z.. Rail cleaner for tramway.
20582—Fabian, C. H., Wellington, N.Z.: Plant protector and support.
20583—Phillips, E., Melbourne, Vic.. Treating ores. (H. F. Brown).
20584—Rigby, E. J., Malvern, Vic.: Fluid feed for operating hammer rock drills.
20585—Brooks, J., Chicago, U.S.A.: Flasks or cores for castings.
20586—Phillips, E., Melbourne, Vic.: Treatment of ores. (P. Gredt).
20587—Snodgrass, J., Johannesburg, Transvaal: Precipitating gold and silver from cyanide solutions.
20588—Hampton, E. J., Wellington, N.Z.: Window fastener.
20589—Ingle, J. and Green, W. J., London, England. Cask, etc., branding machine.
20590—Johnston, A. L., St. Louis, U.S.A.. Corrugated bars.
20591—Hughes, W. E., Wellington, N.Z.: Boot or shoe tree. (Industrial Patent, Limited).
20592—Hughes, W. E., Wellington, N.Z.,: Alternating current electric motor. (W. M. Bradshaw).
20593—McGregor, A. and Macdonald, T. F.,Geraldton, Queensland, and Parkes, J. N. and Mehan, J. K., Townsville, Queensland: Diving dress.
20594—Hamilton, B. T. and Stroud, L., London, England: Locking device. (Date applied for under section 106, 2nd February, 1905).
20595—Buhne, F. W., Frieburg, Germany: Pipe joint.
20596—Little, J. R., Gisborne, N.Z.: Steriliser.
20597—Pulman, G., Auckland, N.Z.: Curving attachment to planing, etc., machines.
20598—Ritchie, E. J., Christchurch, N.Z.: Egg-trap nest.
20599—Bryers, J. J., Rawene, N.Z.: Fire escape.
20600—Osborne, G., Tinwald, N.Z.: Liquid sprayer,
20601—Fowler, J. W., Whangarei Heads, N.Z.: Buffer attachment to doors.
20602—Frost, A. S., New Plymouth, N.Z.: Instrument for ringing cattle.
20603—Dow, J. C. D., Auckland, N.Z.: Liquid measurer and draw-off.
20604—Fitchett, A. W. G., Wellington, N.Z.: Dish washer. (Mound City Dish Washer Co. E. A. Casey).
20605—Meddings, W. G., Auckland, N.Z.: Recording breakage of fire prevention sprinkler.
20606—Godward, E. R., Invercargill, N.Z.: Gas hanging.
20607—Godward, E. R., Invercargill, N.Z.: Deck or verandah chair.
20608—Dunne, R., Dunedin, N.Z.: Brooch.
20609—Dunne, R., Dunedin, N.Z.: Sleeve-cuff protector.
20610—Bassett, T., Christchurch, N.Z.: Draft of binders, etc. (C. H. McCormick).
20611—Woodward, J. A., Auckland, N.Z.: Brace and trouser adjustment.
20612—Stephenson, J. F., Glenferrie, Vic.: Bedstead and mattress.
20613—Steele, F., Port Chalmers, N.Z.: Lobster trap.
20614—Strachan, J., Roslyn, N.Z.: Fan.
20615—Speden, A. L., Timaru, N.Z.: door lock.
20616—Driffield, T. and Johns, P. T., Wellington, N.Z.: Chimney top.
20617—Corrigan, S. B., Manaia, N.Z.: Solution for potato blight.
20618—Healey, W. J., Invercargill, N.Z.:Brooch fastening.
20619—Glossop, J., Dunedin, N.Z.: Sock.
20620—Marks, H. J., Toowoomba, Queensland: Hanging windows, etc.
20621—Marks, H. J., Toowoomba, Queensland: Chimney top and ventilator.
20622—Taylor, A, Dunedin, N.Z.. Flushing cistern.
20623—Knox, K., Otaki N.Z. · Candle holder.
20624—George, T. R., Onehunga, N.Z.: Gauge for bowls.
20625—McKinnon, D., Christchurch, N.Z.: Seed sower.
20626—Masson, J. R., Melbourne, Victoria: Recovery of gold and antimony.
20627—Hunter, R. T., Eaglescliffe, England: Construction of roofing, etc.
20628—Campbell, J. P., Wellington, N.Z. Equalising load in electric current circuit. (R. Braun).
20629—Wood, W. H., Petersburg, South Australia: Railway brake.
20630—McGinn, P. J., Salisbury, Rhodesia, S.A.: Vehicle balance adjustment.
20631—Jenkins, W., Sheffield, Tasmania: Boot sole attachment.
20632—Daly, M., Burwood East, Vic.: Windmill mechanism.
20633—Henderson, W.E., Nhill, Vic.. Sheep shears.
20634—Alcock, F. A., Melbourne, Vic.: Billiard table pocket.
20635—Boggiano, E., Rome, Italy Vote recorder.
20636—Baird, D. S., Toronto, Canada. Loose-leaf binder.
20637—Raymond, F. V., Invercargill, N.Z.: Hair curler.
20638—Goddard, H. A., Concord, N.S.W. Building in concrete.
20639—McKenzie, R., Invercargill, N.Z.. artificial minnow head.
20640—Brady, J. F., Chicago, U.S.A.: Steam turbine.
20641—Cummings, R. A., Beaver, U.S.A. · concrete column.
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20650—McDonald, H. E., Petone, N.Z.: Egg carrier.
20651—Oddie, Waikino, N.Z. · Pressure vat.
20652—Bassett, T., Christchurch, N.Z.: Hay rake.
20653—Bird, D. H. Waimate, N.Z.: Seed sower.
20654—James, A. and Brooks, C. J., London, England · Extracting gold.
20655—Ashcroft, A., Auckland, N.Z.: Bicycle and motor wheel hub.
20656—Droutlege, H., Auckland, N.Z.: Number registering and recording machine.
20657—Bent, H. J., Oamaru, N.Z.: Printing rule.
20658—Godward, Invercargill, N.Z.: Egg beater.
20659—Sloane, H., Christchurch, N.Z.: Tube cutter.
20660—Crook, E., South Yarra, Vic.: Boot upper.
20661—Trewhella, B. and W., trading as Trewhella Bros., Trentham, Vic. · Lever jack.
20662—Kenna, P. A., Sydney, N.S.W.: Tobacco pipe.
20663—Von Mylius, C. H. and T. P., Burnley, Vic.: Smoke-consuming furance.
20664—Burt, W. S., Albury, N.S.W.: Wheel for vehicles. (Date applied for under section 106, 19th January, 1906.
20665—McLellan, M., Dunedin, N.Z.: Polishing compound.
20666—Smith, R. B. Beverley, W.A.: Plough and cultivator.
20667—Rodgers, T. A., Tuapeka West, N.Z.: Joining railway rails.
20668—Booth, G. T., Christchurch, N.Z.: California thistle exterminator.
20669—Gayner, T. H. B., Melbourne, Vic.: Sealing punctures in tyres.
20670—Evans, E. A., Balaclava, Vic.: Clip fastener for cord of spring blind.
20671—Townsend, A. E., Dunedin, N.Z.: Boot or shoe heel.
20672—Burgoyne, L. H., Clevedon, N.Z.: Card game.
20673—Trevellian, F. H., Dunedin, N.Z.: Cash register.
20674—Gilmour, W. T., Auckland, N.Z.: Nib-releasing penholder.
20675—Nelson, G., Napier, N.Z.: Cooling cylinder of gas compressor.
20676—Tucker, H. B. and Jack, A., Palmerston North, N.Z.: Rim protector for motor-car wheel.
20677—Sutcliffe, G. H. and Mounce, J., Auckland, N.Z.: Operating number of rock drills together.
20678—Lee, S. G. and Wathew, T. J., Auckland, N.Z.: Kerosene tin holder.
20679—Jack, A., Palmerston North, N.Z.: Generating gas from hydro-carbon oil.
20680—Colquhoun, D., Dunedin, N.Z.: Game marker.
20681—Finnigan, T. K., Koroit, Vic.: Saddle.
20682—Higgins, C. L., Montreal, Canada: Overshoe.
20683—Holmes, G. B., and Allen, A. D., Wellington, N.Z.: Trolley head.
20684—Playter, H. C. and Pomeroy, P. L., Dunedin, N.Z.: Picture-frame cramp.
20685—Wilkinson, J., Paeroa, N.Z.: Monowheel vehicle.
20686—Trevethick, J., Auckland, N.Z.: Broom or brush manufacture.
20687—Evans, G. F., Balaclava, Vic.: Preventing opening of window sash.
20688—Williams, R., Dunedin, N.Z.: Hot well.
20689—Williams, R., Dunedin, N.Z.: Sifting screen.
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20691—Castle, F. and Garvey, Auckland, N.Z.: Tool and pencil sharpener.
20692—Robertson, J. and Wheeler, W. C. Clevedon, N.Z.: Skim-milk box and pump.
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20694—Holland, J. E., Kaiapoi, N.Z.: Tool for withdrawing fencing staple.
20695—Quinnell, Wellington, N.Z.: Milk pail and stool.
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20706—Parker, S., Devonport, and Johnson, W., Mt. Roskill, N.Z.: Window screen.
20707—Warren, G. R., Onehunga, N.Z.:
20708—Jordon, W. H., Christchurch, N.Z.: Cooking range.
20709—Kellam, A. E., Sydney, N.S.W.: Brooch and pin fastener.
20710—Chisholm, L., Wellington, N.Z.: Oil can.
20711—Robertson, J., Waitati, N.Z.: Driving ditch plough elevator.

Full particulars and copies of the drawings and specifications in connection with the above applications, which have been completed and accepted, can be obtained from Baldwin & Rayward, Patent Attorneys, Wellington, Auckland, Christchurch, Dunedin, &c.

NAVY SHOOTING IMPROVERS.

A Blue Book has been issued by the Admiralty giving the results of gun-laying tests with heavy guns during the present year. It is noted that there is a great improvement in the results as compared to former years.

On the East India station the "Perseus" obtained the comparative best record, for her forty-three gunners made a score of 100.09, with an average of 66.66 points per man. The "Iphigenia" obtained the Order of Merit on the China station with a 91.40 score, and the "Pelorus," in South African waters, was awarded the same distinction for 74.58.

Petty-Officer W. J. Squibb, of H.M.S. "Illustrious," was the best individual gunner, making 88.14 points with the 12in. Mark VIII. gun.

At the Auckland branch of the American School of Correspondence classes have been inaugurated for instruction in automobile management and electric street-car driving.

Business Notices.

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The Editor invites contributions (which must bear name and address of sender, not necessarily for publication) dealing with progress made in any process or method directly or indirectly connected with mechanical, industrial or commercial work. In no case can rejected copy be returned unless accompanied by addressed envelope bearing half-penny stamp, neither can the Editor enter into correspondence concerning rejected contributions.

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A gas-stove burner was treated in a practical way in a recent paper read by Mr. R S. Thompson, New York. He said that if a burner secures the combustion of all the gas which passes through it without the production of carbon monoxide, it has done all that can be done. Talk about burners which burn large quantities of air is all nonsense. A cubic foot of gas in complete combustion combines with a fixed quantity of oxygen. This quantity cannot be increased or decreased. If the quantity of air supplied is insufficient, part of the gas will be unburned. If the air is supplied in excess of requirements, the excess of air will not be used. If more air is mixed with the gas than required, combustion will be imperfect, and part of the gas will be unburned. A perfect gas flame is a clear blue and perfectly transparent. A white or yellow flame, or a milky blue flame, indicates imperfect combustion Sometimes a gas flame seems blue, but by holding an object on the other side it will be found it is not transparent. This indicates imperfect combustion. If the flame "blows" or "lifts" away from the burner it shows too much air, and consequently imperfect combustion. If the fire "streaks up" in long ragged flames there is imperfect combustion. If any portion of the burned gas mixes with the fresh gas, it poisons the latter, and there is imperfect combustion, for a small amount of carbon dioxide mixed with gas renders the whole mixture incombustible.

The first Continental steam railway is seventy years old in this year of 1906. George Stephenson's line between Darlington and Stockton had been built ten years before any European State ventured to imitate the daring example. Belgium took the lead, and opened the first short track from Brussels to Malines, about thirteen miles, on May 5, 1835. *Engineering* records that fearsome predictions were made as to what would happen in consequence of this terrific innovation It was to "ruin agriculture and cause the death of cattle grazing in the fields, owing to their digestion being upset by passing trains!" These warnings came, not from the unlettered mob, but from "*men of the highest intellectual standing!*" Pessimistic croakers are a widely diffused race, and they rarely repent. To-day Belgium has more than 2600 miles of track, and a railway department which employs nearly 63,000 men. Belgium has more railways in proportion to territory than any other country, the lowest rates in Europe, and the Government revenue from the State lines is very considerable. Germany also commenced making railways in 1835, France and Austria in 1838. But next to England, and before any other country in Europe, came the United States, which had the first railway with locomotive traction—the South Carolina railroad—constructed in 1828-30.

About a pound of radium Professor Curie estimates, has resulted from the work of the last three years in Germany and France. America's stock of radium salt, reduced to the strength known as one-million, would half fill a lady's thimble. So far the radium harvest has evidently not been very abundant.

The new Springfield rifle is said to be able, at a distance of fifty feet, to penetrate 55 one-inch boards set one inch apart. It gives a muzzle velocity of 2,300 feet per second, and will project a ball a distance of five miles.

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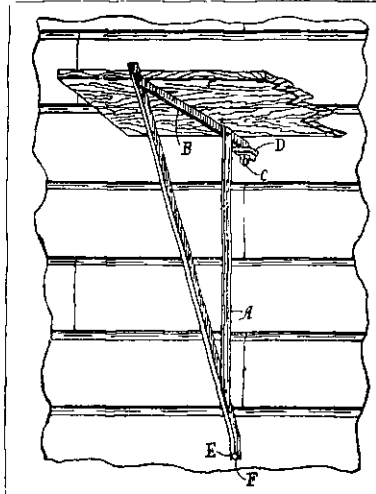

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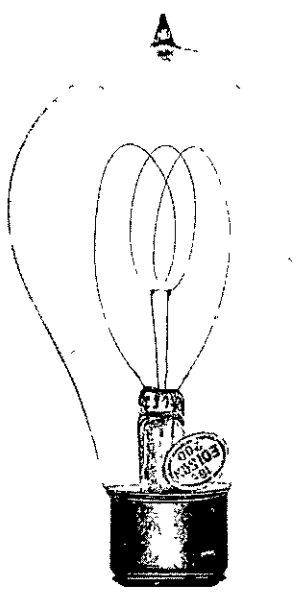

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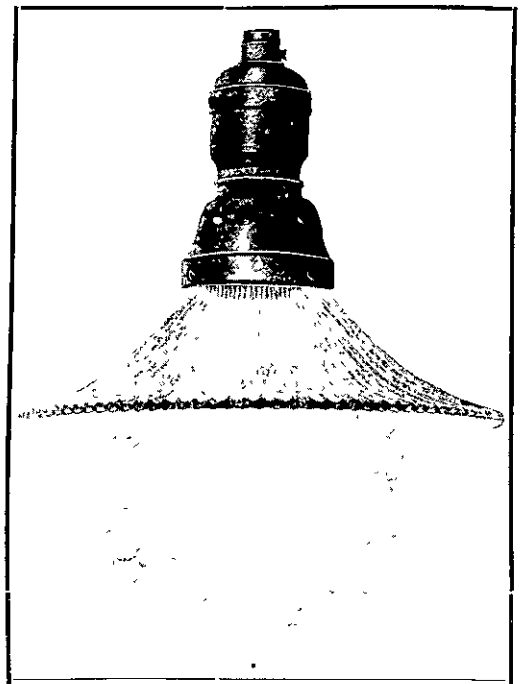

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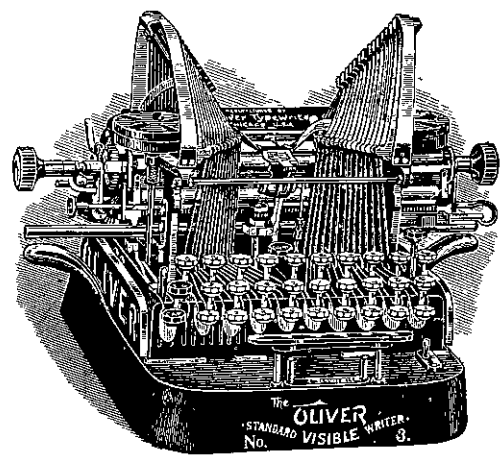

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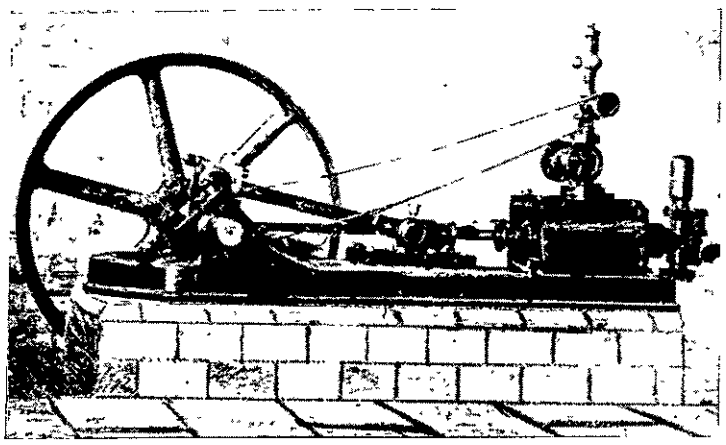

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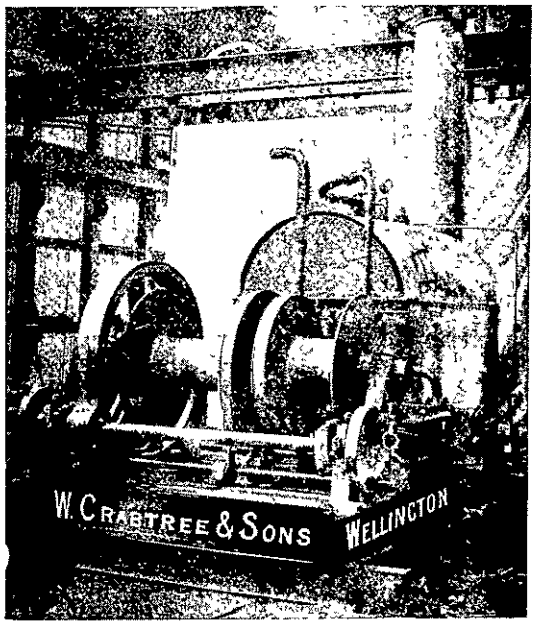

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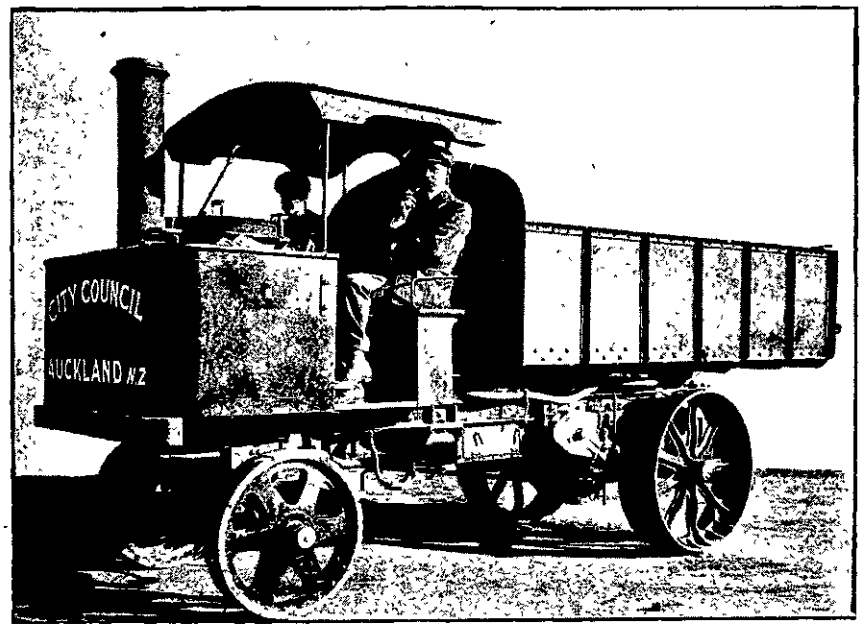

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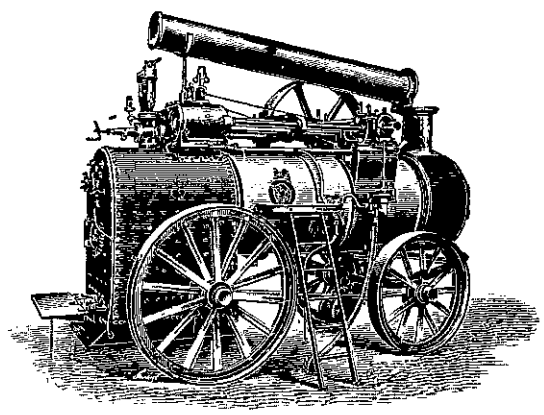

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