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# THE CO-OPERATOR

## *Its Aim • Its Object • Its Policy*

*By Benjamin Briscoe*

OUR aim and our hope is that through the columns of THE CO-OPERATOR we can bring together into closer communion all those of the MAXWELL FAITH—to the end that we may understand each other better, may work together with the utmost enthusiasm, and strive with greater energy toward the object of placing the Maxwell automobile on the very top round of the ladder of success.

The intent of this paper is, further, to kindle in every one of us a wholesome ambition, to fortify us in the strong belief—which we must have in order to succeed—that the Maxwell is The Best and that its makers are striving to be worthy of being considered the Greatest in the business.

Finally, the policy of this paper is to prove to all interested that The Welfare of One is the Welfare of All; to stimulate the highest degree of enthusiasm among all those who are connected in any way with the Maxwell-Briscoe Motor Company.

We believe that through a medium of this kind we can communicate with one another, to concrete our ideas, and so build up an organized force which unites makers with sellers and users of Maxwell automobiles, and which will be so powerful as to become a predominating influence in the automobile industry.

We desire that every one in any way connected with the Maxwell-Briscoe Motor Company and its product shall feel that he has an interest in this paper. We want ideas; we want suggestions; we want co-operation.

THE CO-OPERATOR will be divided into departments, each devoted to the interests of one branch of the business. The Mechanical Department; the Sales Department; the Accounting Department; the Parts and Accessories Department; the Owners of Maxwell Cars; and, above all, the Maxwell Dealer—all will have space at their disposal through which they may talk to other departments, to the end that harmonious effort may be directed toward securing not only the greatest volume of business but also the highest degree of satisfaction.

We intend to have this paper simple in design and plain and home-spun in its methods. We shall treat all topics a discussion of which will be helpful to the fraternity, and shall aim to make the publication so interesting that every one will look forward to it from issue to issue. In order to do this successfully we must have the aid particularly of our dealers and of their employees as well as the co-operation of our employees. We want to keep track of all the boys; we want them to feel that we all have an interest in their welfare.

Every member of the Maxwell-Briscoe Brotherhood should feel that he is, indeed, the editor-in-chief, and with this greeting we send THE CO-OPERATOR on its way, certain that its mission will be fulfilled.

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# *Unnecessary Abuse of the Motor*

By J. D. MAXWELL

ASIDE from the technical phase of the automobile question nothing is more important to the average operator than a knowledge of what *not* to do, as in my opinion more motors are ruined by careless and unnecessary tinkering than by neglect.

One of the most important things *not* to do is to require the motor to perform unnecessary work. It seems to be a mania on the part of many owners and operators to needlessly speed up their engines when the car is at rest for the purpose of locating fancied troubles or listening to the clatter of the valves, and I have known cases where motors have been run by chauffeurs, without load, at their maximum speed for intervals as long as ten minutes at a time.

Such perfomances are simply abuse and more actual damage is done to the motor in this way than would result from a hard day's use in actual service. It is therefore important that the operator familiarize himself with every detail of his engine and be able to distinguish between use and abuse. The slightest knock or unusual sound should be located and corrected, but to do this do not tinker with everything. Locate the cause first; be sure you are right and then go ahead, but in order to locate the cause do not run the motor at excessive speeds for unreasonable periods. Reason in all things is most important. Much can be written on this subject, but space forbids, but again I wish to caution the operator who persistently abuses his motor by needlessly racing it at every opportunity that he is destroying its life and its vitality.

If the owners of Maxwell cars will impress the above in their minds, and carefully study and intelligently carry out the instructions printed and furnished gratis by this company, I feel sure that their efforts will be more than repaid in satisfactory service, and the Maxwell will prove true to the axiom "Perfectly Simple and Simply Perfect."

# *Making an Automobile Sale*

By ERNEST COLER

MR. SMITH was from Missouri—not in the geographical sense, but he was one of those hard-headed business men who had to be shown every time, and who would circumnavigate a novel proposition with almost feline caution, especially when it involved the parting with some of Mr. Smith's hard-earned cash.

Now, Mr. Smith also was a suburbanite, which means that, like many other good providers, he had established his family abode in a place near the big city, thus becoming a victim of the commutation ticket and of the unfathomable wiles of railroad men. The depredations of the commutation ticket are simple, in that they compel you to pay the full price of your transportation, while you are left to your own devices about getting transportation. For the ways of railroads are many, and all are, as a rule, past ordinary human understanding. Mr. Smith, being well possessed of the circulating medium of the realm, of course had no occasion to grumble over the price, but the time question was with him a serious consideration and the nucleus around which hovered his tall-sized and daily growing grouch.

It was right here where the first of a series of mental suggestions made its appearance upon Mr. Smith, for invariably, after our friend had lost much time in waiting and considerable of his mental equipoise in profaning all railroads from the time of Stephenson down to our own day—particular vehemence being given to his reflections upon this road—he found Jones, his rival in business, at his office, and before it Jones' automobile, from the radiator of which the word "Maxwell" seemed to sneer at him in brazen impudence.

Though Smith had no experience of his own with automobiles, somewhere tucked away in the back of his head he had a pessimistic notion that motor cars were not altogether what they were cracked up to be, that they cost an awful lot of money for repairs and upkeep, et cetera, et cetera. He did not know exact figures, but there was a hazy idea that the owning of an automobile meant the sinful waste of much good money, and, as stated before, Smith was not given to extravagance, sinful or otherwise.

One morning, after Smith had become more than usually exasperated over the dilatory service of the aforementioned railroad, he read a Maxwell advertisement. "Here," thought Smith, "evidently is a fellow who earns his salt as an advertisement writer, for his song of praise surely is adorned liberally with superlatives." Which was mental suggestion number two.

Number three began its work when Mr. Smith, upon reaching his desk, spied the scintillating brass radiator-sign across the street. And forthwith Mr. Smith hied himself to the nearest Maxwell dealer.

The salesman was an affable young man, who knew not only his own car, but others as well, and Smith gathered a lot of information about automobiles that formerly was lacking in his store of knowledge. How fast would it go? Anywhere from four to forty miles an hour. And right here the young man demonstrated to Mr. Smith's satisfaction that the outside figure exceeded the best speed of his railroad train, with the advantage of individual and private transportation thrown in for good measure.

The salesman did not stop there, but he made Mr. Smith see himself touring the surrounding country on Sundays, with the faithful Mrs. Smith and three little Smiths, who graced the household in various sizes and ages. Smith began to feel interested. But what about repair bills? The young man in the show room knew all about them. They were small, and even the tire expense dwindled down to a small amount, because a tire could be retreaded many times, emerging from each vulcanizing job practically a new tire. But the salesman did not expect Smith to take his word alone as gospel truth. He invited his visitor to look over his letter files and to read many communications from Maxwell owners. "My bill for repairs for the past six months has been one dollar and ten cents," wrote one, and "I have not spent a dollar since I got my car," said another, all of which convinced Mr. Smith that there was, after all, more of real sport and genuine utility in the automobile than he had thought. Still, he was from Missouri. This was all well enough, he thought, but would it not be a good idea to take a look at cars of another make? The salesman thought it would be. In fact, it had been his intention to make this suggestion to Mr. Smith; "for," said he, "the more you see of other automobiles, the better will I like it, because it will bring you back all the sooner to the Maxwell." And Smith left, in quest of information about other cars.

Now, our friend, the salesman, was a live one, who thoroughly believed in the theory of putting his best toe forward and the best heel backward, where both could be seen to advantage, and had made it a habit at least to try to make two blades of grass grow where only one grew before. He also knew that procrastination was the thief of time and of automobile sales. In fact, the salesman was one of the few men who arrive at their own valuation not by the things they have done, but, rather, by the things they have left undone. And a wise young man he was! So a few days later he appeared in front of Mr. Smith's office and invited him out for a demonstration ride. This was suggestion number four, and Smith went.

Some demonstrations are demonstrations, and some are not. Our friend, the salesman, who had recognized in Smith the hard-headed business man he was, did not waste much breath in showing his customer the sentimental side of his arguments; but, instead, he presented to him the bare and unadorned matter-of-fact points about Maxwell cars, well knowing that this was what Smith was after.

It did not seem as though Smith had left many stones unturned in his endeavor to learn more about automobiles. He fairly bristled with variegated information — some twisted and some obviously wrong — which he had gathered in his meanderings from dealer to dealer, some of whom even fortified their arguments with demonstrations. But—Smith did not want a car of enormous horsepower, nor one so costly as to tear an avalanche out of his bank roll. He did not hanker after a car so complicated with brand-new and untried engineerings ideas that a yearly salary for an "expert" chauffeur would have to be tacked on to the purchase price. Not he. What he wanted—and by this time he really did want it—was an automobile that would take him and his family wherever they wanted to go, at little cost to his pocket, and without vexatious drawbacks.

Smith got what he wanted, or this story would not have been written. And, what is more, when, long after Smith had become a motorist, he met our salesman, he was actually grateful to him, for he had solved for him a problem, as satisfactorily as it can be solved only by

"The Maxwell"

# *The Evolution of the Automobile Buyer*

By A. B. BARKMAN

NO LESS rapid than the development of the industry itself has been the pace at which the general public has acquired a working knowledge of the principles that are involved in automobile design, construction, and operation. Only two years ago, the average visitor at the show room was as ignorant of the elementary features of the motor car as was the average salesman, who made up for the evident lack of information by the indiscriminate use of a maze of technical terms alike bewildering to the prospective customer and to himself.

The change is astounding. Here is a customer not only possessed of a tolerable smattering of automobile wisdom as far as constructional details are concerned—which in most cases has been acquired by intercourse with his motoring friends—but he also has learned a good deal about the processes of manufacture, and, perhaps, even of materials. In short, this new customer is a new figure, much more exacting than his predecessor. Mere smooth talk will not do for him; he is from Missouri and wants to be shown. Now, a customer like the prospective automobile buyer, who is about to spend his money for a machine of which he yet knows little, surely is entitled to an opportunity for investigation. The customer who wants to know, the crank, usually is the one who becomes the most satisfactory and satisfied customer in the end.

The salesman, to be successful with this new type of buyer, should be well fortified with a thorough knowledge of his own car and also be well posted on the important features of other cars, in order to be able to give satisfactory explanations. A close study of the technical literature issued by the Maxwell-Briscoe Motor Company will result in a more detailed knowledge of Maxwell construction and its many advantages. If you find any serious gaps in your Maxwell education, become friendly with THE CO-OPERATOR—whose business it is to help you.

There still will be people who want to buy racing automobiles, speed monsters, freaks, or whatever you may call them; and a few manufacturers will continue to cater to such demand as long as it can possibly be made to exist. But where in the past one man used to purchase a so-called racer there are to-day a hundred who refuse to invest in anything but a utility car. It is this class of purchasers in whom the real automobile industry finds its main support, and who will speak, and have spoken, the final word as to what kind of motor car is destined to survive in popular favor. High perfection is demanded and the freakish car of yesterday is superseded by its sturdy and more useful successor—the all-around reliable automobile, which has its most successful representative in the Maxwell cars.

It goes without saying that the customer's better understanding of automobiles becomes of benefit not only to the buyer, but also to the seller, since the purchaser now is abler than before to distinguish between mere claim and genuine merit, in a comparison of which the Maxwell cars invariably fare well in the judgment of the automobile-buying public.

again approaches the proportions of the specified orders on hand.

It is, therefore, in the dealer's interest to send in his orders early, specifying date of shipment and giving such other information as will enable us to ship the order without delay. In the case of Model LC, it should be stated distinctly whether the color is to be Maxwell green or Speedster red, or whether divided or single seat is wanted. In ordering tops, the order should state whether top only or top and storm front.

Full information should also be given concerning the routing of cars, since the dealer, very naturally, has more information about unloading facilities, etc., at his place than we could possibly possess.

All of this does, of course, not mean that we expect to be unable to make deliveries promptly, but the intention of the writer is, rather, to point the way in which our dealers may lighten for us a task which is not an easy one and which calls for the exercise of much judgment and discretion.

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# *Personal and Pertinent*

How much confidence is placed in the CO-OPERATOR is shown by a letter from one of our friends. We do not desire to make comments, but give the letter itself:

*"Dear Co-Operator:*

"I wish to write to you in regard to ——, who intends to come to New York, to see the Palace Show, and you, and I want you to give him a good going over on account of his continuous tinkering with his car. He will insist on opening his pet cocks every time he stops, even if he does not go over 100 yards; he must adjust the carburetor two or three times a day and take the top of the crankcase off, to see whether there is enough oil in the crankcase. In other words, he keeps the car always out of adjustment. Our machinist and I have all we can do to coax him out of this idea, but he has practically always got the car so that it will not run well. I would like to have you give him a good stiff lecture about leaving things that are all right alone, as it is all imagination; for if he would let the car alone, we know there would not be a thing the matter with it. But he is bound to get it out of order tinkering with it.

"Of course if you let him know that I have written to you, it will not do any good, so keep this letter strictly confidential."

The lecture will be given.

* * *

### POSITION OF SPARK PLUG

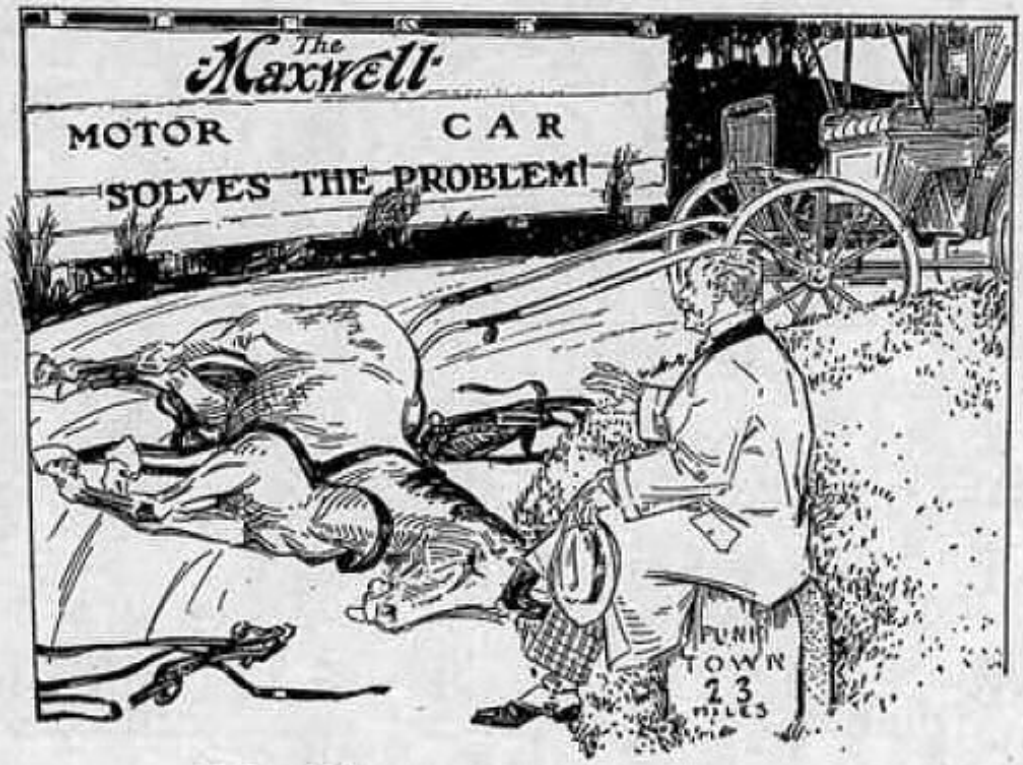
What truth is there in the claim that the most advantageous position for the spark plug is in the center of the combustion chamber? —James Quincy Bell, Tarrytown.

*Answer.*—None. If you consider that the speed of the piston rarely exceeds 1,200 feet a minute, while the rate of flame propagation is considerably over 3,000 feet a second, you will see that no matter at which point the spark is applied the ignition will occur sufficiently rapid for all purposes.

* * *

### DON'T RUB IT IN

Commiserate with your brother motorist whom you find kneeling in the dust of the road, belaboring a punctured tire. The nail manufacturer is a busy man, and there may be another nail farther down the pike for you. Pride goes before a puncture, and the haughty man is generally the first to find that he is out of gasoline.




# *The Horseman's Soliloquy*

By ERNEST COLER

(With apologies to William Shakespeare)

To buy, or not to buy, that is the question;
Whether 'tis nobler for a man to suffer
The impositions of a balking horse,
Or to take arms against a sea of troubles
And with a Maxwell end them? To swear,—to cuss,—
No more, and with a car to say I end
The meanness and the thousand fretfut tricks
That horses practice,—'tis a consummation
Devoutly to be wish'd. To chug,—to fly;—
To fly! Perchance to race! Aye, there's the rub;
For to acquire this state what fate may come
Ere I can shuffle off my habits old
Must give me pause; there's the respect
That renders prejudice of so long life;
For who would bear the ills and the delays,
The barbarous fits, the haughty independence,
The man-tormenting petulancies and
The want of power, possessed by horses,
Together with the toil that patient friends
Of such a transportation have,
When he himself could his releasement make
Owning a Maxwell? Who yet would use
This four-legged relic of our bygone days,
To grunt and sweat under a weary life,
But that the dread of new-discovered means—
(That frail and narrow fear from whose embrace
No bungling man can get)—puzzles the will
And makes us rather bear those ills we have
Than use inventions we know little of?
Thus indolence does stultify us all,
And thus the progress of tremendous strides
Is sicklied over with procrastination.
Yet enterprises of such pitch and moment
May have their currents turned aside,
But cannot be defeated.

# Our Line for 1908

## The Cornerstone of Maxwell Success

A two-cylinder, horizontal-opposed motor for all cars of twenty horsepower and under; and four-cylinder, vertical engines for all greater power demands.

Engine case and transmission case cast in one, resulting in greater strength and less weight.

Three-point suspension, a now widely imitated construction, affording the advantage of giving the frame and engine bed increased flexibility.

All-metal multiple-disc clutch; the lightest yet most tenacious clutch made.

Natural water circulation, making the use of a cumbersome pump unnecessary and doing away with cooling difficulties.

All-metal bodies, unbreakable, unshrinkable, everlasting.

### Maxwell Success

SUCCESS is spelled large in the history of the Maxwell-Briscoe Motor Company—justly so, because it is based on the firm foundation of a policy to build and sell a motor car that would solve the automobile problem. Such a problem has existed, and remained unsolved until the advent of the Maxwell, the first and only automobile embodying a really successful combination of moderate price and genuine efficiency. In creating a first-class motor car, of a design admirably adapted to the needs of the average motorist, and of a general construction to meet American road conditions, lies the chief reason for the Maxwell-Briscoe Motor Company's success, which has no precedent in the history of the American motor-car industry.

Maxwell reputation has been earned on the highways of the country, in the tough places, and on the mountain sides, where real horsepower and mechanical stamina count.

The approval of thousands of Maxwell owners gives eloquent testimony that the Maxwell is the most practical and most reliable car made to-day, a car that will give satisfactory service 365 days of every year, at a cost so low as to place the Maxwell in a class by itself, as the typical American utility automobile.

What adds significance to every other fact concerning Maxwell cars is the magnificent growth of the Maxwell-Briscoe Motor Company.

### Maxwell Growth

The demand for Maxwell cars has grown so rapidly that in addition to our factories at Tarrytown, N. Y.; Pawtucket, R. I.; and Chicago, Ill., we are erecting a fourth mammoth automobile plant at New Castle, Ind. This gigantic plant covers sixty-five acres of ground, and is, without doubt, the best equipped automobile factory in the world. The combined facilities will enable us to build 10,000 cars in a single season, and all parts entering into a complete Maxwell will be made at our own factories.

Born with the first Maxwell car made, Maxwell reputation has been duplicated and magnified in every one of the 10,000 Maxwell cars in operation to-day.

The Maxwell solves more of vexatious automobile problems, furnishes greater power for every pound of material used in its construction, and gives more satisfaction for every dollar of its cost, than any motor vehicle ever designed.

The brief description of our 1908 line in the subsequent pages is more in the nature of advance information, and, therefore, will not give the data that belong properly in the province of our regular catalogue. This catalogue not merely enumerates the specifi-

cations for our various models, but constitutes a popular and easily-understood exposition of the principles involved in motor-vehicle design, construction and operation. Every one interested in the purchase of an automobile should read the Maxwell catalogue, which—in text and illustrations alike—marshalls its facts in a simple and clear manner that alone is adapted to convey to the layman thorough and practically-useful knowledge of a subject with which he had previously possessed little or no familiarity.

The season of 1908 will see no radical deviations from previous Maxwell designs, and the few changes that have been made consist only in the refinement of details, as, for instance, in the lengthening of the wheel base of the two-cylinder $1450 touring car, and the addition of a running board to the $825 12-horsepower runabout.

It is our proud boast that the design of our cars has proved so perfect that no changes were necessary. But though Maxwell cars remain true to their own standard, they are still distinctive, different from other cars both in principle and in accomplishment.

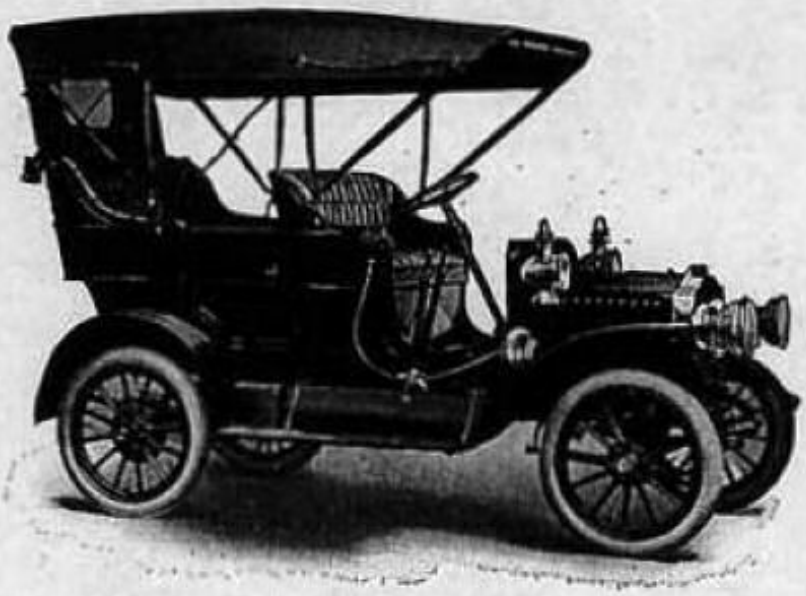
Our line for 1908 includes the time-tried and famous two-cylinder cars, models that have made the name Maxwell a household word with every motorist. In addition we offer the new Model D four-cylinder car of twenty-four horsepower, and the Model M, forty horsepower car. The twenty-four horsepower car is a newcomer, and will attract attention on account of its quality—Maxwell quality — and moderate price, $1750.

***Model LC.--12 HP., Two Passenger Runabout***

All the good qualities of the 20-HP. touring car are combined in this runabout, in even greater measure, because of the light weight of this vehicle. A handy little car, tire and fuel saving, with plenty of speed and endurance.

Two-cylinder, horizontal-opposed engine; bore, 4½ inches; stroke, 4 inches. Wheel base, 72 inches. Price, ..... $825

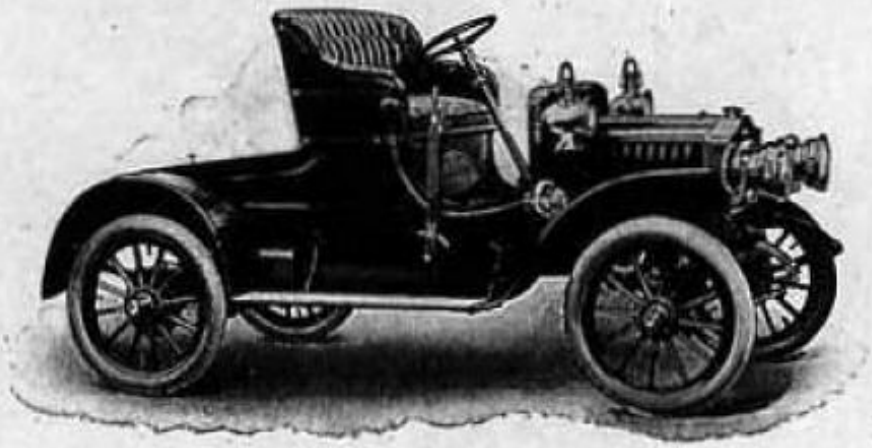
Top and Storm Front extra.



## *Model HC.--20-HP., Five Passenger Touring Car*

The ideal, all-around touring car, capable of negotiating any road. Hills have no terrors for it and its light weight makes it easy on tires.

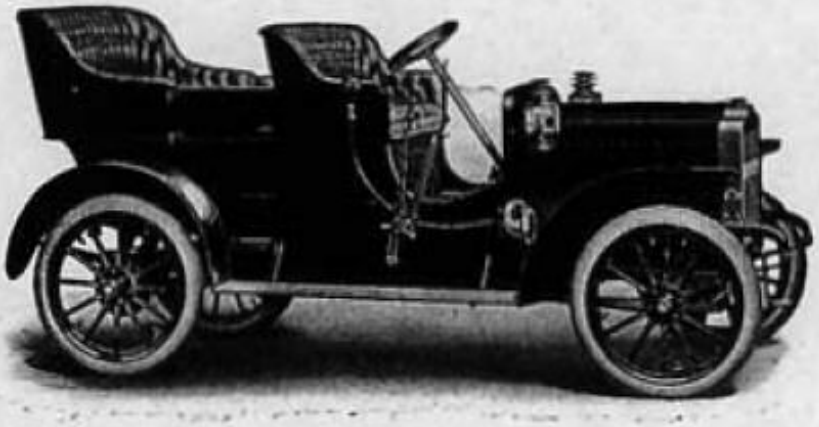
Two-cylinder horizontal-opposed engine; bore, 5 inches; stroke, 5 inches; wheel base, 90 inches. Price, with top, storm front, two acetylene-gas lamps and generator, three oil lamps, horn, full set of tools, and tire repair kit, ..... $1450



## *Model NC.--20-HP., Two Passenger Touring Runabout*

The same chassis as Model HC, but with touring box in rear, reducing weight and making it a touring car for two. This car has been named The "Doctor Maxwell," because of its extensive use by physicians.

Price, ..... $1350

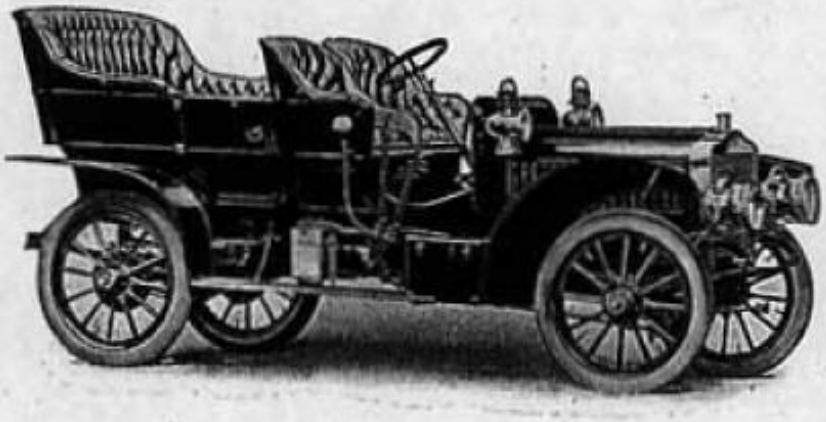


***Model D--24 HP., Five Passenger Touring Car.***

A positive revelation. Roomy, graceful, controllable. Powerful, yet extremely economical. Has no equal for flexibility and luxurious riding.

Four-cylinder, vertical engine; individual cylinders. Bore, 4¼ inches; stroke, 4½ inches. Wheel base, 96 inches. Price, ..... $1750

Gas lamps, top and storm front extra.



***Model M--40 HP., Touring Car.***

The perfection of a stylish and comfortable touring car. No amount of money can purchase greater autombile comfort combined with safety, speed, smooth running, flexibility and power.

Four-cylinder, vertical engine; individual cylinders. Bore, 5 inches; stroke, 5 inches. Wheel base, 104 inches. Price, ..... $3000

Price includes complete lamp equipment. Top and Storm Front extra.

# *Efficient Horsepower*

By A. B. BARKMAN

The question of how much of the power developed by the engine is actually delivered at the drive shaft of a motor car and the co-efficient ratios of powers and speeds when transmitted through the intermediate drives, presents a rather complex problem and one which a satisfactory solution in simple form to be understood by the average layman would require considerable explanation.

There is no type of reciprocating engine built, either steam, gas, caloric or hydraulic, that can deliver for work the total amount of energy or Indicated Horse Power (I.H.P.), developed within the cylinders, as a certain amount of power is required to operate the reciprocating parts of the engine itself before any power can be transmitted for the work to be performed.

The initial losses above referred to, incidental to the operation of the engine itself, may be termed initial friction, and represent the friction coming from tightness of pistons, shafts, bearings, valves, etc., and is generally believed to be constant, and consequently the power absorbed in overcoming this friction varies directly with the number of revolutions.

Owing to the difficulties in the way of experimental determination of the amount of initial friction, very little data is available, but from such experiments as have been made the value seems to be between 3.0 and 7.2 pounds per square inch of piston area. With a mean effective pressure (M.E.P.) of, say 60 pounds, which is a fair average, this would represent from five to twelve per cent, approximately, of the maximum I.H.P., varying directly as the revolutions and depending upon the design and mechanical efficiency of the engine.

The I.H.P. less the amount of initial friction, as stated above, would represent the Delivered Horse Power (D.H.P.), which is the actual amount of power that the engine delivers for work.

To determine the Brake Horse Power (B.H.P.) the mechanical efficiency of the engine has to be considered and no general rule can be given for this, as it may vary from a little less than 80% of the I.H.P. to as much as 88%. For the majority of engines of good design and in good condition run at speeds not unsuited to their design and for powers of not less than 20 B.H.P., the efficiency may be considered to be 85% within reasonable and close limits of accuracy. This figure is merely suggestive, as it is necessary to be familiar with the engine design and performances to correctly estimate the D.H.P. from the calculated I.H.P.

In addition to the initial friction, there are certain losses from power absorbed by pumps, dynamos, or other attachments, which may be driven direct from the engine, which represent approximately from .5 to .75 of 1%. In addition to the above there is the loss incidental to the load friction, which consists of the power lost in operating the bearings and gears in the transmission and differential. In a well-designed car with shaft drive, the sum total of all these would approximate from 25 to 30% of the D.H.P., leaving approximately 70% to 75% of the D.H.P. transmitted direct to the drive shaft.

A well-designed gas engine of 5-inch bore and 5-inch stroke, operated at 1,000 R.P.M., should develop in each cylinder 11.16 I.H.P., which with the initial friction, as mentioned above, taken as .075%, would leave an actual D.H.P. of 10.23 for each cylinder, or 20.46 for two cylinders, the rating we give our 20-H.P. cars of the two-cylinder type.

In using the intermediate speeds the H.P.,

per se, of the engine is not increased, as there is no mechanical device that will enable one to obtain more H.P. than the engine will develop. The increase in efficiency when working on the low gear is obtained by the use of the intermediate transmission, in reality a system of leverage, which enables the engine to perform more work, the engine running faster while the car runs slower; consequently more power and a greater tractive effort is transmitted to the rear wheels, although no more power per revolution is obtained from the engine. The principle is one of leverage and is the same as attempting to lift a weight with a block and fall, by means of which the average man can lift a weight of several tons, provided he has the proper system of leverage through the pulleys employed, although the strength of the man is not increased in performing the necessary amount of work.

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# *Location of the Engine*

That a stage of standardization in automobile design has been reached is shown by the general abandonment of many designs and devices that were tried in the earlier days of automobile development and have since been found wanting.

In similarity with the steam turbine, which in reality is only the perfection of the earliest form of steam engine, the time-tried horizontal-opposed type of gasoline engine, as used in the Maxwell automobile, still retains its superior efficiency, combining with it at the same time the greatest degree of accessibility. The horizontal engine possesses a number of advantages the full utilization of which, however, is made impossible in that type of car in which the engine is placed amidships, under the body. In placing the engine in this inaccessible position the early designer simply followed the practice established in the design of stationary engines. The result was a design satisfactory for the time, since nothing better was known and the advantages of a shaft drive had not yet become clear. Besides, the automobile engineer's mind was then burdened with other problems, of greater importance than the comfort of the passenger and the convenience of the operator.

When the engine is placed under the body, the foot boards at the front of the car have to be removed to make even a part of the front cylinder accessible, while it is necessary to remove the flooring of the tonneau in order to expose the rear cylinder to inspection. In either case it is necessary for the passengers to alight to give the operator opportunity to reach the particular part that requires adjustment.

In the Maxwell, the removal of only one side of the hood exposes the entire engine and transmission case. The occupants of the car need not be disturbed in the least—an item that should count heavily in a car that is designed to meet the requirements of a pleasure vehicle.

# Questions and Answers

### *Steel for Engine Cylinders*

A friend of mine is trying to convince me that steel cylinders are better for use in gasoline engines than cylinders made of castiron. He also says that Walter Christie's car is equipped with steel cylinders and steel pistons. What do you say?—M. Gowan, Philadelphia, Pa.

*Answer.*—This is by no means a new question; in fact, it is so old that most automobile designers have given their final answer by using gray castiron exclusively. Gray castiron contains a considerable percentage of free graphite, which acts as a lubricant and is therefore particularly adapted to the work of the internal-combustion engine. If a steel piston is used in a steel cylinder, seizing will be the inevitable result, with consequent overheating and ruin. Steel cylinders could not be made close fitting, so there will be poor compression and little power. In the Cristie car both cylinders and pistons are of steel, but the pistons have grooves into which bands of soft bronze have been cast, so that the contact is between bronze and steel. Call again.

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### *Converting Metric Measurements into Inches*

Please give an easy formula for converting millimeters into inches.—William Fitzgerald, New York.

*Answer.*—The process of conversion is a very simple one and requires nothing more than that you remember the figure 25.4. One inch is equal to 25.4 millimeters. By dividing a given metric measurement by 25.4, you have the equivalent in inches. Suppose the dimensions of a tire given as 760 x 90 millimeters.

$$760 \div 25.4 = 29\tfrac{7}{8}$$
$$90 \div 25.4 = 3\tfrac{1}{2}$$

which shows that a 760 x 90 millimeter tire is equal to the tire used on the Maxwell two-cylinder touring car; namely, approximately 30 x 3½ inches.

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### *Figuring Horse Power*

Can you give an easy way of figuring horsepower?—Ralph Smith, Spokane, Wash.

*Answer.*—Many methods are in use, each having its adherents. One method assumes in all cases an average effective pressure during the explosion stroke of 70 pounds per square inch. For easier figuring we will assume that the pressure is 35 pounds to the square inch and is exerted *every* revolution. Taking, as an example, the Model "M" Maxwell, having a 5-inch stroke, at 1,000 revolutions per minute the piston will travel 5,000 inches or approximately 417 feet a minute in its working direction. The bore also is 5 inches, which gives a piston area of 19.63 square inches. Multiplying the area by the pressure gives us $19.63 \times 35 = 687$ pounds. This, traveling 417 feet a minute results in $687 \times 417 = 386{,}479$ foot pounds. Since 33,000 foot pounds are the equivalent of one horsepower, $386{,}479 \div 33{,}000 = 11.7$ horsepower for a cylinder 5 x 5 working under the conditions given above.

Another method takes into consideration merely the cubic capacity of the cylinder, taking as its basis the fact that in the average automobile engine, at normal speed, 10 cubic inches of piston displacement represents one horsepower. Taking again a cylinder 5 x 5 inches, the formula takes this shape: The area of the piston is 19.63; this multiplied by the stroke, 5 inches, gives 98.15 cubic inches of cylinder capacity, or a little less than 10 horsepower. This mode of calculation, as you will note, does not take into account the element of piston speed, but assumes a certain speed as normal, so that if the engine is one of high speed the calculation will fall short of the horsepower actually developed.