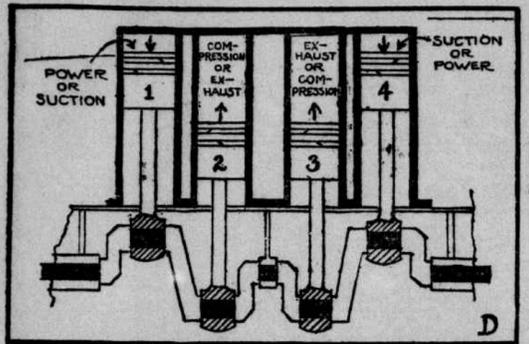


The Automobile Speaks

It tells you what it is, what it requires and it asks to be treated fairly.

By Frederick C. Guerrlich.

THUS far in explaining my engine I have referred to an engine with but one cylinder. I told you that there were four strokes in my cycle; namely, suction, compression, power and exhaust. I also mentioned that on only one stroke is power developed, the flywheel being required to store up power for use during the other strokes.



This was found to be a simple thing to do, as the four cylinders of the four engines could be put on a common crank case or base, and the four crankshafts could be united into a common crankshaft having four arms or cranks. Thus we have the four cylinder engine, which could also be called a "four engine" engine.

Please note the difference between the expression "four cycle," which was explained in my first talk, and "four cylinder." A twelve, an eight, a six or a four cylinder engine can be, and usually is, a four cycle engine, each of its cylinders having the four strokes of the cycle.

FIRING ORDER.

My designers having decided to have my engine of four smaller cylinders (or more), next had to decide in what order these cylinders were to have their power strokes. It was found that if they were to come in consecutive or 1, 2, 3, 4 order, the crankshaft would have to be designed so that pistons 1 and 3, of which the centre of the combined weight would be in front of the middle of the engine, would have to move in one direction together, while 2 and 4, whose centre of combined weight would be in the rear of the middle of the engine, would move in the other direction. This would result in a sort of rocking chair vibration. Therefore, it was decided to have pistons 1 and 4, and pistons 2 and 3, both of whose centres of combined weight would be at the middle of the engine, move together. The crankshaft therefore was built as in the illustration.

Now please observe that when piston 2 is down piston 3 is also down. As the power stroke ends when the piston is down and cannot begin when the piston is down, it will be seen that cylinders 2 and 3 cannot have the power stroke, or let us say "cannot fire" after each other. The same is true of 1 and 4, thus the cylinders cannot fire in 1, 2, 3, 4 order. By studying the illustration you will see that only two firing orders, by which is meant the order in which the cylinders fire, are possible; namely, 1, 2, 4, 3 or 1, 3, 2, 4.

THE FIRING ORDER.

As the suction, the compression and the exhaust strokes must come in the same order as the power strokes, or in the firing order, you can determine the firing order of your engine by slowly cranking the engine and watching the order in which the exhaust valves, or the inlet valves, raise, as this will show the order in which the exhaust or the suction strokes respectively come. The power strokes or the firing order must be the same as this. By studying the exhaust pipe or as it is called "exhaust manifold" you can determine which are the exhaust valves.

The spark must come when the piston is fully up on the completion of its compression stroke. When this is the case for cylinder No. 1 the fourth cylinder will have the piston up on the completion of the exhaust stroke. Therefore to set cylinder No. 1 ready to fire slowly crank the engine and watch No. 4 (not No. 1) exhaust valve. When it is raised both pistons 1 and 4 are coming up but No. 1 is on compression and No. 4 on exhaust. When the piston is fully up then No. 1 is ready for the spark or is ready to fire. When timing any ignition system you will have to proceed as explained.

TRUCK TIPS.

Kerosene as Tractor Fuel.

When kerosene is used as fuel in the motor tractor it should be noted that in many cases to change the oil in the crankcase after every twenty hours of running. This is because when it is not properly heated it mixes with the oil and destroys its lubricating qualities.

Mounting the Governor.

In mounting the flexible drive shafts of the governor care must be taken that there are no bends in the shaft within two inches of either end. The shaft must never be bent into a circle of less than ten inches in diameter. The proper practice is to make all bends as long and easy as possible.

Weight and Truck Capacity.

In selecting trucks the factors of weight and size of the products to be hauled must be carefully considered. A product that is bulky but light in weight calls for a comparatively light vehicle with large body capacity. On the other hand, the man who must haul heavy material that is compact in form will make a great mistake if he buys an ordinary light truck.

Trailer Costs.

When trailers of any type are being used in connection with truck service it is to be strongly recommended that all cost and operating records covering the trailers be kept separately from those of the powered vehicle.

The Cylinder Head.

The holding down nuts of the cylinder head should be tightened periodically if the cylinder head is taken off for any reason. In replacing the part should be tightened up again by screwing down opposite nuts. Each nut should be turned



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THE OUTLOOK FOR NEW ROADS IS GOOD

A Great Many of the Present Highways Are in Very Poor Condition.

The discussion about the costly highway situation in some States, with the talk at Washington of a Senatorial investigation into the application of Federal aid in road construction, has stirred highway officials, engineers, road builders and good road advocates to seek ways and means whereby highway departments may the more accurately arrive at a justifiable first cost of highway construction and methods of financing road work that will lighten the burden to the taxpayers.

J. E. Pennybacker, secretary of the Asphalt Association, New York city, former chief road economist for the United States Bureau of Public Roads and the American Automobile Association, has come forward with a plan, which he believes, no matter in what State it is applied, will tend to prevent burdensome conditions such as those in Arkansas.

Mr. Pennybacker advocates a more careful survey to determine justifiable first cost and the application of principles he has evolved as the result of years of study in road economics, to determine the length of time necessary to pay for an improvement and the rate at which the payments should be made. In regard to his remedy Mr. Pennybacker says: "Determination of justifiable outlay for a proposed highway improvement from anticipated service should call for at least as careful a survey and estimate as the engineer now provides for the engineering features preliminary to the construction of the highway. Millions of miles of earth roads and thousands of miles of lightly surfaced and poorly designed gravel and macadam roads impose upon the highway engineers of the nation the task of so parceling out highway revenue that it will be applied to the highways in proportion as they show traffic justification for improvement."

"To incorporate this requirement into highway engineering practice is to make the traffic unit as widely used as the customary unit of physical measurement. This measurement of justifiable outlay by the yardstick of traffic does not disregard the profound beneficial influence of the highway upon social life and educational development in rural districts, but inasmuch as they go hand in hand with traffic development the latter may in general be regarded as an index of both the direct and indirect value of the improvement."

"Motor vehicle traffic predominates to such an extent as to make logical the adoption of a system of measuring costs and justifiable outlay primarily in units derived from this class of traffic. Thus while the unit commonly used for horse drawn traffic is the ton mile and applies to load rather than to vehicle it is necessary to adopt a unit which will take into account the eight and a quarter million passenger automobiles now registered and the millions to come and which will allow credit to the highway for the saving in their operating cost. To substitute 'vehicle mile' would not fully meet this need, as the million trucks in use and those yet to come must be rated as deriving greater benefit individually than the passenger car. A simple plan sufficiently comprehensive to meet most needs is to retain the 'ton mile' as the unit of measurement but to regard each passenger car and each one and two horse vehicle as the equivalent of the one ton, while the motor truck and the heavy team outfit would be regarded as the equivalent of the vehicle weight plus the load in tons. This

SPLENDID RECORD OF MOTOR TRUCKS

Now It Is Necessary to Establish Operation on Scientific Basis.

Statistics for 1920 show that motor trucks carried more tonnage than either inland waterways or interurban trolley lines. Motor transport now ranks second only to rail transportation. In less than ten years' time motor transportation has grown from nothing to its present prominence. A concrete example of the remarkable growth is had in a check taken of traffic between Akron and Cleveland. In two years' time loaded truck tonnage increased approximately 200 per cent.

The rapid growth of the industry has been so pronounced that many vital problems have been only partially solved and its leaders face the task of retracing some of their strides in order to perfect weak spots in the structure. The travel and transport bureau of the R. F. Goodrich Rubber Company points out four problems that are up for solution now. They are: Formation of local associations to eliminate rate cutting and other harmful practices; expanding in the field of junction terminal transfer of freight; to break shippers of the "exclusive railroad" habit and educate them to use motor trucks for short hauls, and to warn truck operators against overloading and overspeeding in order not to antagonize highway authorities.

The highway improvement to be adopted it is assumed that the engineer will base his comparison upon a type or types of improvement which appear to him practicable if they can be financed out of the traffic saving. In other words this method leaves to the engineer the same discretion as he now customarily exercises in selection of design but subjects it to the test of financial justification. This saving in cost of traffic operation per ton mile when applied to the total existing and potential increase in ton miles gives the gross annual savings in traffic operation attributable to the improvement.

"The net annual saving in traffic operating costs is arrived at by deducting from the gross annual saving the increase in the annual highway budget for interest, maintenance and depreciation of the improvement. In order to obtain the annual cost chargeable to interest and depreciation it is necessary to estimate the economical life of the improvement contemplated and take the amount which at the end of the period will have discharged all interest and retired the principal.

Practical Paragraphs.

Transmission Noise.

A humming noise in the transmission case is very likely due to an excess of heavy grease. The case should never be more than two-thirds full, and oil is the proper lubricant, not grease. It is axiomatic that a noise in the gearbox means faulty lubrication somewhere.

Truck Tires.

For the man who drives a blue-heavy car the possibilities of truck pneumatics are worth consideration. These are now available in larger passenger car sizes, and they are much heavier than corresponding passenger car casings, insuring longer mileage at comparatively slight advance in cost.

Removing Bolt.

The one sure way of removing a bolt that has become rusted in place is to heat an open spanner that will fit the nut of the bolt and let it rest against the nut for several minutes. This will expand the nut without producing corresponding expansion of the bolt, and the former will come off easily.

Extra Lights.

An ingenious car owner recently equipped his bus with two extra lights, low down in the rear fender, completely illuminating the running board. He believes also that the lights make it safe to pass other cars at night and contribute to good running. They are controlled from the dash by an extra switch.

Wrench Adapters.

Some speed wrenches have sockets so deep that a small screw sinks all the way into the socket. Place a couple of nuts of the right size in the socket and they act as shims to obviate the trouble.

To Prevent Scratching.

If strips of brake lining are tied around the jaws of bars used to bend plated or enamelled levers, pedals, hand-light rods, etc., scratching will be prevented.

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Business with the NASH Motors Company is Good

We are receiving for April and May more orders for the Nash Six and Nash Four from our distributors and dealers than we will be able to fill, though this month our Kenosha factory is operating 79% normal and our new Milwaukee plant is gaining in production daily.

We are working toward greater production as quickly as possible.

Actual sales and delivery figures from our dealers show that many of them have sold more Nash cars in January, February and March of this year than they did in the corresponding months of last year.

They report better sales each month and each week.

The greater proportion have been Nash Six sales, of course, as we have not been able as yet to produce in our new plant enough Nash Fours to meet orders.

The big volume of Nash Six sales under conditions of the past few months is gratifying. It shows that conditions are improving and it shows most clearly the high regard motor car buyers have for this good car.

The Nash Six is a leader in sales today, and sales leadership now has a far greater meaning than last year.

Then, with countrywide demand for automobiles far in excess of the combined production of all factories, sales leadership meant simply leadership in production.

Now sales leadership means leadership in value. Buyers are purchasing on the basis of value alone. The cars that lead in sales today are the cars in their respective price fields that buyers agree possess the highest value for the money invested.

That is why this is a Nash Six market, and why the Nash Six is today one of the fastest selling motor cars in the country.

The exceptional worth of this car has found general recognition. Buyers have found that the Nash Six qualities of beauty, power and comfort can be approximated only in cars considerably higher in price.

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