MOTOR CAR SILENCE IS REALLY CONTINUOUS NOISE

Over 200,000 Sounds Each Minute in a 12-Cylinder Car at 20 Miles per Hour Are Blended Into Pleasant Hum.

By A. LUDLOW CLAYDEN, of "The Automobile."

For the quietness of the modern automobile engineers have hardly received the credit that is properly their due; the immense difficulties with which they have had to contend only appear on a close examination. Some interesting figures can be obtained by calculating the number of opportunities for noise production that exist in a chassis, and the comparative frequency of each gives an opportunity for some "noise analyses" which are instructive.

Just to take a few striking cases, in order to show the idea. Suppose a twelve cylinder chassis geared between four and five to one on high and running at twenty miles an hour with 34 inch tires. Using round figures, we know that the engine fires six times in each crankshaft revolution, that the road wheel revolves 247 times per minute, and if the gear is 4 5-11 to 1 the crankshaft revolutions per minute will be just about 1,100. To simplify the argument, suppose it is 1,000 revolutions per minute, then the number of explosions per minute will be 6,000, or no less than 100 per second.

Taking a further step, each valve is opened and closed once to each explosion; so at a rate of 100 explosions per second there are 200 valve lifting motions performed and 200 valve closings. The crankshaft revolves twice to each explosion and the piston makes four complete strokes, hence the 100 explosions per second represent 400 piston strokes in the different cylinders. Meanwhile the breaker mechanism must operate the contacts in the ignition device 100 times. If a chain front end is used the crankshaft sprocket will have about twenty teeth and will revolve 1,000 times in the minute, so there will be 20,000 engagements of chain link with sprocket tooth on the crankshaft pinion; on the camshaft sprocket, and on any other intermediate pinion an equal number of contacts must take place.

Thus, neglecting any other parts in addition to those mentioned, with a twelve cylinder car running at twenty miles per hour there are 2,000 things happening every second which have possibilities for noise production; and each minute there will be 120,000.

Of course, what happens is that each minute sound blends with the others, so that the resulting sound is practically continuous and capable of being described as a low hum. Even to-day the predominant sound is almost always that of the escaping exhaust gases and at certain speeds the hiss of the air entering the carbureter.

There are many other small joints and connections on the engine which might be included. The generator brushes make and break contact on the commutator bars, the gears in the oil pump can be heard if you run the pump alone in a quiet room, there is probably a bevel geared head for the ignition which runs at a fairly high speed, and so on. Altogether it is not too much to say that a twelve cylinder engine at 20 m. p. h. performs 150,000 operations per minute, each of which could make an audible noise if it were not for the care taken to prevent it. And that engine is comparable with a water tank with 150,000 holes in the bottom, each closed by a cork of clever design and fine workmanship. Any falling off in quality of work means a loose cork and a leaking noise. As, for instance, a single loose lifter in the valve gear is instantly noticeable as a steady tap, tap, tap.

But though the engine perhaps contains the greatest possibilities for noise making, it is by no means all. In the gearset, in the rear axle, in the universals and in every bearing there is opportunity for sound production. To do a little more rough calculation let us consider the constant mesh gears in the gearset, one of the most troublesome parts from a noise viewpoint, though one which the average user never thinks about. Suppose there are twenty teeth on the pinion of the constant mesh gear pair, which is about the normal number. Then, since our engine is running at 1,000 r. p. m. there will be 20,000 tooth contacts per minute.

Next take the countershaft. This runs more slowly, say half the speed of the main shaft, and it drives the reverse pinion. Suppose there are sixteen teeth in the reverse pinion, which is about as small as it could well be, then there will be 500 times sixteen, or 8,000 tooth contacts at this point.

Following the gear train through, the next step is the bevel drive of the rear axle. About as small a number of teeth as the pinion is likely to have is thirteen, twelve being the irreducible minimum. Thirteen teeth at 1,000 r. p. m. means 13,000 cotacts a minute, and adding the contacts of teeth in the gearset we get a total of gear tooth contacts per minute of 41,000.

Another fruitful source of an audible though quite pleasant sound is ball bearings. Each bearing contains a number of balls that carry the load when they are on one side of the shaft and have no load on them when on the opposite side. As each ball runs into the half where it is carrying the load it is compressed slightly; in other words it suffers a minute shock. Again, as it runs out of the loaded side into the half of the race where there is no pressure on it, it expands and thus creates another slight shock. Taking a very low estimate, this means that each ball bearing in the chasis on the average creates eight or ten tiny vibrations every revolution, roller bearings doing exactly the same thing of course.

In the gearset there are two bearings at least on the main shaft which make 1,000 r. p. m. or a total of 16,000 shocks per minute. On the countershaft there will be another pair of bearings which run at half speed and so cause half the number of shocks, of 8,000, giving a total of 24,000 per minute for the gearset. In the rear axle there will be two races making 1,000 a minute on the bevel pinion shaft, giving another 16,000, and the two bearings supporting the differential, together with the two at the outer ends of the axle drive shafts, will account for another 8,000 shocks. This is figuring on a semi-floating axle; if it is floating another 4,000 is to be added.

In the front wheels there will be at least four races of ball or roller bearings, and these will cause another 8,000 shocks between them. This completes the consideration of the principal parts of the chassis, with the exception of the universal joints, but as the stress on these is steady and does not vary in direction there is no reason why they should produce any sound, however small.

In the foregoing many other possible sources of sound have been neglected. For example, there are probably gears to drive the speedometer, there may be ball bearings in the generator, there are ball thrust bearings which can make a sound if they are not perfect in manufacture and there are the engine auxiliaries already mentioned. One other thing which ought to be considered is the cooling fan, which makes a hum by the action of its blades and also has to stand for at least 24,000 vibrations in the ball bearings which carry it, although, of course, like all other bearing variations, the amount of each is practically molecular in smallness.

Adding up all the sources of sound itemized we get the surprising total of 217,000 things which happen every minute, each of which taken individually is able to cause a sound. In an automobile running at twenty miles per hour the hum which one hears is composed of nearly a quarter of a million individual sounds.

An experiment which may serve to illustrate what happens is to hold down the loud pedal of a piano and then to strike every note simultaneously. After the first crash has died away all the strings will be vibrating and a low sound will be heard that is a blend of all the chords and discords of the keyboard. With the standard piano this is only a blend of eighty-four notes as compared with the 217,000 of the car.

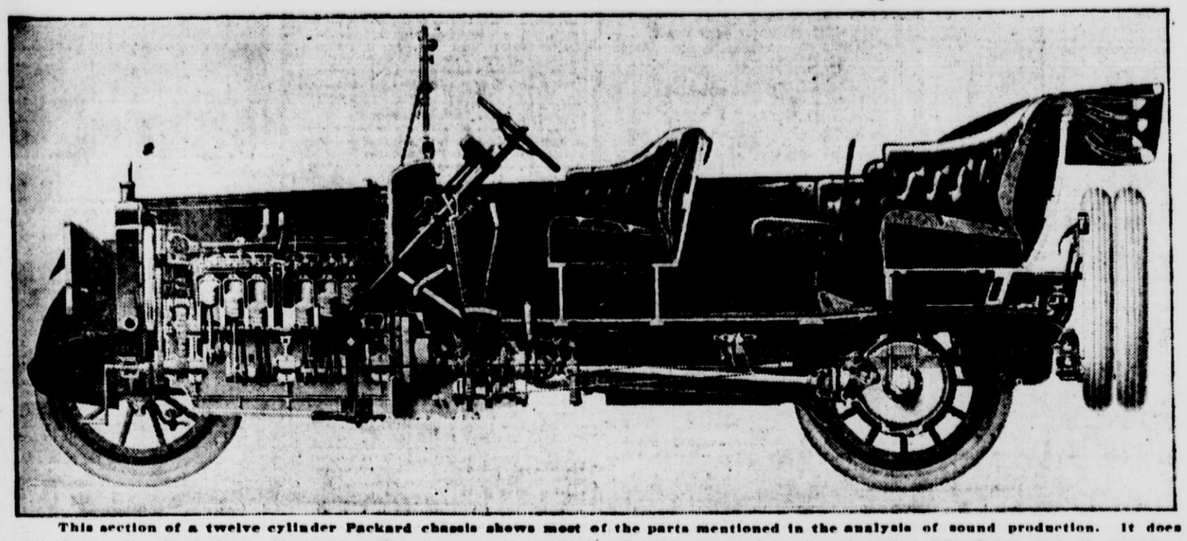
Another rather interesting thought is that each of the 217,000 sounds taken alone, if they could be isolated, would produce a recognizable note. The smallest number of vibrations per second that is distinguishable as a steady note is sixteen, and this is said to be the pitch of the note made by a big bee. The middle C of a piano should give 512 vibrations per second, and the high C 1,024 vibrations, while the highest pitch which any human ear can catch as a sound at all is 40,000 vibrations per second. In an automobile a definite note is to be avoided, and the reason that gears are such a particularly troublesome part to quiet is because they readily produce a note which is within the scale to which the ear is accustomed. For instance, as the middle C has 512 vibrations per second, this corresponds to a gear with twenty teeth running at 1,536 revolutions per minute. Accuracy in workmanship can minimize the shock which occurs as each pair of teeth engage, and the use of large pitch, so as to reduce the number of vibrations per second by cutting down the number of teeth, lower the pitch of the note. A lower pitch not only is less irritating to the ear but it blends more readily with the other sounds, hence the reason that coarse pitch gears often operate with such desirable quietness.

In the days when motoring was new S. F. Edge of Napier fame once said that there is in this world no such thing as silence, there is only continuity of noise. It is a succinct phrase and its truth is perhaps enhanced by the figures itemized above.

SOUNDS PER MINUTE MADE BY ALL PARTS OF 12-CYLINDER CAR AT 20 M.P.H.

Explosions	6,000
Valves and tappets	24,000
Reversing piston direction	24,000
Breaker mechanism	6,000
Timing gear	60,000
Gearset and bevel drive	41,000
Bearings throughout car	56,000
Total	217,000

HIGH ART IN ENGINEERING KEEPS THIS QUIET.



This section of a twelve cylinder Packard chassis shows most of the parts mentioned in the analysis of sound production. It does not show quite all of them. However, sufficient appear to emphasize the immense amount of engineering knowledge and of manufacturing skill which make possible the extreme quietness of this and other high grade chassis.

NEW JEFFERY PLANS VERY INTERESTING

William Poertner, Local Representative, Enthusiastic Over Outlook.

A bigger, greater Jeffery organization is seen by automobile prophets as a result of the recent sale of the mammoth Kenosha manufacturing plant. Foremost among the purchasers of The Thomas B. Jeffery Company is Charles W. Nash of Flint, Mich., a man with a nationwide reputation for his constructive conservatism in the motor car industry. Mr. Nash takes active charge of the management of the big plant on August 1, at which time his connection with the General Motors Company will be completely severed.

Announcement of the sale of the company, which is capitalized at $3,000,000, came as a surprise to the automobile world. Exact figures giving the price paid for the entire stock were not made public.

The present directors, Charles T. Jeffery, Harold W. Jeffery and Thomas H. Kearney, will continue for some time as directors of the new company. Under the new regime, the aggressive policy of expansion inaugurated during the recent years by the Jeffery Company, will be carried forward on an even greater scale.

The change in control, it is said, will not in the slightest degree affect the real policies for which the Jeffery family has long stood. There is nothing in connection with the stock transfer which smacks in the least of financial manipulation. It is not a merger in any sense of the word nor are any future combinations contemplated. The men who are at the head of the organization are practical automobile men who understand the needs of the business. They are close to the motor public and they will continue to insist on the same high ideals of equality that have built the Jeffery Company to its present place of leadership.

William C. Poertner, president of the Poertner Motor Car Company, Incorporated, distributor for Jeffery motor cars and trucks, was enthusiastic over the news from Kenosha. He predicted under the new control a rapid development and further expansion of the Jeffery concern, which has been so marked during the last several years.

English Trucks Here.

M. E. Grable, well known in the local truck trade, has been made general manager of the Burford & Co., Ltd., of London, England, and Fremont, Ohio, manufacturers of the famous line of Burford one to seven ton trucks, and has opened salesrooms at 1874 Broadway. He will handle the territory east of Pittsburg.

This truck had its severest test at the front in this great war, where a great number are used by the armies. The company recently sold 100 trucks to the British Government.

New Home and Agent for Chalmers Cars.

Here is the new home of the Chalmers car. This splendid building came into possession of C. T. Silver on January 1, 1914. With its costly marble showroom, beautiful fixtures and fine equipment it represents an investment of over $2,000,000. From a service standpoint this building is one of the best equipped in the world and the change which places it at the service of Chalmers owners is a lucky one for them. In addition to this building Mr. Silver will shortly announce details concerning a mammoth service station centrally located, covering a larger area of ground than that occupied by any other service station in the industry, where ground floor facilities will be ideal for quick service to Chalmers owners.

Service is a hobby with Mr. Silver and he attributes the great success which he has attained to it. He feels his responsibility to the man who purchases a car through his firm and makes every effort to render service of a satisfactory order. In this respect he has the hearty cooperation of the Chalmers Motor Company. Another point in connection with Silver's service that will be appreciated by Chalmers users is that all purchasers of cars are entitled to service at any of Mr. Silver's branch houses which he maintains in other towns and cities adjacent to New York.

Mr. Silver entered the automobile business in 1909 as a salesman. A year later found him operating on his own account as a sub-agent for Overland in Brooklyn. A year later the Willys-Overland landed him as a distributer for their line in the metropolitan district. His success was meteoric. During the last six years he has sold $20,000,000 worth of cars and when he signed up for the Chalmers line a week ago he put his pen to a contract the biggest ever made by the Chalmers Company. It calls for 10 per cent. of the Chalmers output and will total upward of $6,250,000.

Mr. Silver's territory on the Chalmers takes in New York, Long Island, Staten Island, part of New Jersey and part of Connecticut. Mr. Silver will also take care of the Atlantic seaboard on Chalmers parts.

150 Studebakers in Climb.

Under perhaps the most dramatic circumstances ever attending the opening of a new highway, 200 automobiles, 150 of which were Studebakers, participated in a parade from Colorado Springs to Pike's Peak, July 15, and successfully ascended the new Pike's Peak Highway for the first time.

The celebration marked the formal dedication of the new highway, which is the highest and in many respects the most delightful motor road in the world. The summit of Pike's Peak is 14,150 feet above the level of the sea.

BUY YOUR CAR NOW FOR TOURING WEEK

Cease Being a Prospect and Get Into the Owner Class and Enjoy Life.

One of the big ideas brought out at the world salesmanship congress at Detroit the week of July 15 was "proper salesmanship through concerted individual cooperation with the sales department reduces number of calls necessary to make sales." With forty-two local salesmen, Norval A. Hawkins, general sales manager for the Ford Motor Car Company, was able to reduce the number of calls and interviews to sell a Ford from twelve to five. He found that most of his salesmen thought it necessary to cultivate the acquaintance of every one of their prospects before they actually started to sell the car. Most of these salesmen started in to tell the prospect about almost everything else except why he should buy an automobile.

There is a lesson in this story to every reader of our automobile news. The automobile manufacturers state that more cars are sold every year because of the motor car desire creating articles written by automobile editors than by all of their advertising copy put together.

Men like John N. Willys of the Overland Company, Roy D. Chapin of the Hudson, Hugh Chalmers of the Chalmers, Alvon MacCauley of the Packard, Harry Ford of the Saxon, A. G. Seiberling of the Haynes, E. A. Erskine of Studebaker, Robt. Revschaw of the Reo, A. F. Knoblock of Cole, W. E. Stalnaker of the Paterfinder, F. H. Lewis of the Hollier S. W. L. Colt of the Colt-Stratton Company, New York; Lee Anderson of the Hupmobile, A. I. Philp of the Dodge, Harry Newman of Chicago, W. E. Flanders of the Maxwell, K. P. Dryesdale of the Cadillac, frankly admit that much of their success in selling cars is due directly to the publicity given by the leading automobile editors of America.

Many of our readers have read this page for years and each many times has made up his mind to buy a car now, but for some reason or another that day has not yet arrived.

Manufacturers of automobiles and accessories are cooperating to make August 6 to 12 national touring week, and the automobile editors have been called upon to create the desire in the minds of their readers to buy cars now—before August 6—in order to be in line to enjoy a special automobile tour during national touring week. Almost every reader of this page can well afford to own a car at from $350 to $3,500.

This too is just the proper time to buy a car. August, September and October are by far the best and most enjoyable motoring months of the year—the roads are in the best possible condition and the dealer can give more time and service to new car owners during these months than any others.

The leading automobile editors of this country are cooperating to give motorists special touring information to be used during touring week, and this means it will be a big success.

Take a tip from the automobile editor. Read carefully the advertisements of the car manufacturers appearing in these columns. These are the manufacturers' silent salesmen. Pick out the one that tells you the best story—the one that appeals to you. Telephone that dealer for a demonstration. Then buy a car and be with us on a tour national touring week, August 6 to 12.

NEW FEATS BY KING EIGHT.

Record Climb of Lookout Mountain "In High."

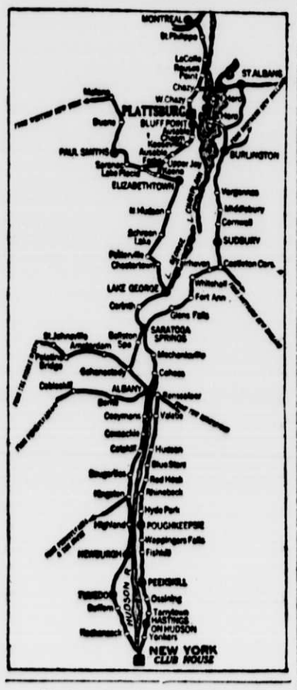
Joseph Porter of the King Car Corporation, which handles the King Eight car for this territory at Broadway and Fifty-second street, returned last week from the West, where another King car gave a sterling account of itself in two hard tests. While the trip primarily was to open a new agency in Denver, the prospect of climbing Lookout Mountain in high gear and also scaling the heights of Pike's Peak were too alluring to Mr. Porter to be overlooked.

Lookout Mountain is 9,000 feet high, and is reached by a winding road which has an average grade of 7½ per cent. from the town of Golden. Mr. Porter and three friends made the fifty-six mile round trip to the top of this mountain in high gear—the first time the feat has ever been accomplished, so far as is known.

Not satisfied with this performance, which created widespread interest in that section, Mr. Porter and his party tackled Pike's Peak, and drove to within fifty feet of the Tip Top House in second gear, or higher than any other car ever climbed in that gear, according to the supervisor in charge of the road work there.

"The proposed races to the summit of Pike's Peak will be worth going miles to see," says Mr. Porter. "There is a wonderful stretch of road that will furnish a great test of power and skill."

YOUR PLATTSBURG TRIP.



Dodge Car in the Desert.

Some idea of what is to be found in the way of mountain scenery, roads, reptiles and other things along the Mexican border is vividly portrayed in the window of the Colt-Stratton Company, the Dodge Bros. motor car dealers, Broadway at Fifty-seventh street. The window display, which has attracted thousands of pedestrians, is considered most elaborate and effective.

The scene is remarkably true to life. A vast desert land is shown, a steep and rocky mountain looming in the foreground.

COAST TO COAST "IN HIGH."

Pathfinder Twin Six Making a Remarkable Run.

Among the most extraordinary long distance stunts ever accomplished in the United States by a motor car is the present cross-country run on high gear of a stock twin-six car manufactured by the Pathfinder Company of Indianapolis, Ind. Driver Weidley started the already famous car from San Diego, Cal., July 3. His destination is this city. Despatches from day to day report that he is taking the steepest grades with ease; throttling down, stopping and starting readily, and making upward of two hundred miles a day strictly on high gear. The gear box of the car was sealed by the American Automobile Association officially before starting, and the seal will remain intact until the finish. It is not a speed test. It is to prove the endurance qualities of the car, and also its power and flexibility in high gear; and, most important of all, to register the gasolene mileage of a Pathfinder Twin-Six under the severest possible conditions.

The car arrived at Sterling, Colo., Friday, July 21, travelling at the rate of 11 8-10 miles an hour on one gallon of gasolene.

Ryan Has a "Grant Special."

While a few years ago motorists seldom ordered special bodies built for any but high priced American or imported chasses, there is now quite a decided tendency toward custom made coachwork for owners of moderate priced and lighter vehicles. One striking example of this is a neat four passenger body on a Grant Six chassis, just finished up for Joseph J. Ryan, son of Thomas Fortune Ryan, the capitalist.

Motor Movies.

Before he became an automobile merchant G. F. Bailey was a golfer of considerable reputation. He was known as "the mashie king" because of his uncanny proficiency with this weapon. Now all his "approaching," "pulling," "slicing" and "putting" are confined to automobile prospects. Speaking of his golf game friends used to say that some day he would be a great automobile man.