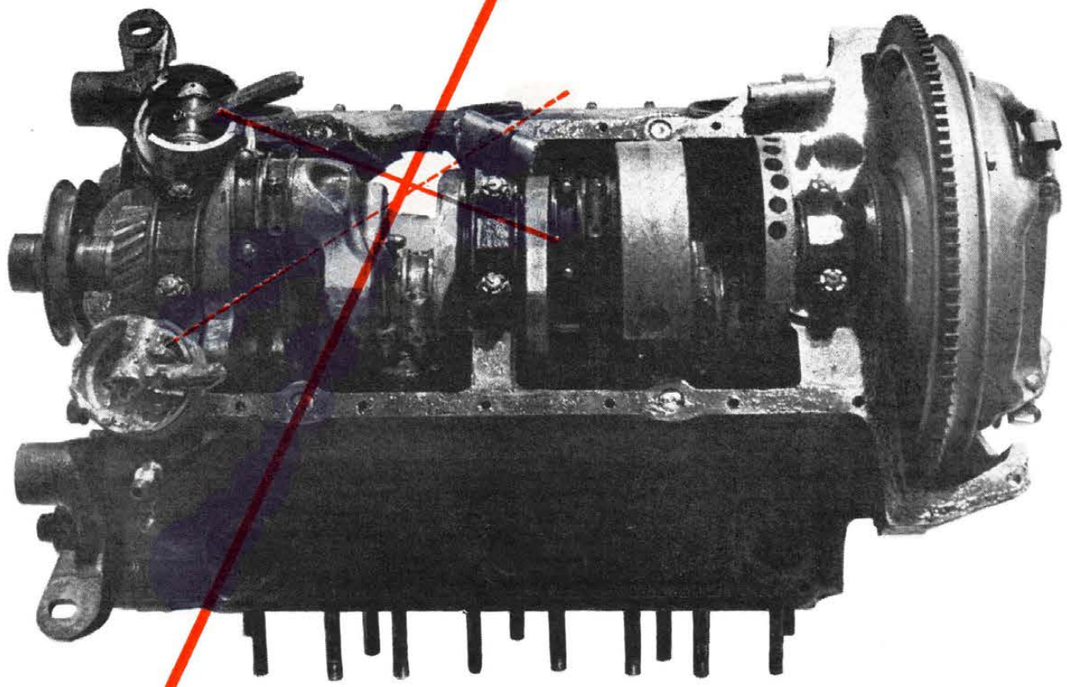


WHY ENGINES BLOW-UP

It usually is the little things that cause a piston to get punchy or make a valve lose its head **BY BILL TAYLOR**

MANY a racing fan has watched his favorite car lead the pack for lap after lap, then, with victory almost in reach, coast into the pits minus a piston or valve. Owners of commercial vehicles are hit where it hurts the most—right in the pocketbook—when a truck or bus engine playfully tosses a connecting rod through the crankcase. Even the private passenger car, though not usually subjected to the stress and strain of high rpm and heavy load, will occasionally experience an engine failure.

What is an engine failure? We're not referring to the numerous minor difficulties, particularly fuel and ignition, which merely cause a temporary reluctance to run. We're talking about those expensive noises and flying objects which signify severe damage or complete destruction. The cost of such a failure may range from one hundred dollars or less to patch up a passenger car engine to several thousand for the replacement of a heavy-duty Diesel commercial vehicle.

Operators of commercial vehicles, racing car owners, oil companies and automotive manufacturers are constantly studying failed parts to determine what made them fail and what can be done to prevent future trouble.

In order to see just what these scrap-iron sleuths are up against, let's look at some of the strange and awe-inspiring things that can happen when something lets go in an engine turning several thousand rpm. Most of the examples have been taken from large fleet operations but the same troubles crop up in every type of internal combustion engine.

THERE THEY BLOW

A cross-country bus halted at a railroad crossing. Starting across, the driver detected a slight knock coming from the engine compartment. Convinced that it was just a noisy air compressor, he continued his trip. A few minutes later, pandemonium broke out in the engine room. Oil poured from a jagged hole in the crankcase. Part of a badly mangled connecting rod protruded like a compound fracture. Half a piston lay on the ground a few feet behind the disabled coach.

After examining the ruined engine, maintenance men reconstructed the chain of events leading up to its demise. A worn connecting rod bearing had turned in the rod—just enough to cut off the flow of oil. Without lubrication, the connecting rod soon welded itself to the crankshaft. Something had to give—in this case the piston. Whipped around at terrific speed, the rod and half a piston did a thorough job of preparing a $2,500 engine for the scrap pile.

Or, take the case of the valve that lost its head. Bouncing up and down a thousand times a minute, a fatigued valve stem and head decided to part company. Caught between the cylinder head and piston, the valve head inflicted damage roughly comparable to what might have been caused by a large sledge hammer in the hands of the local strong man.

Our next example might be called "The Affair of the Hungry Mechanic." The hero of this little drama installed six pistons and connecting rods in a powerful Diesel. About the time he tightened the nuts on the fifth rod, the welcome toot of the lunch whistle interrupted proceedings. Returning from his meal contented and sleepy, our friend bolted the oil pan in place and finished assembling the engine. Fortunately, the loose connecting rod missed him as it punched its way through the crankcase.

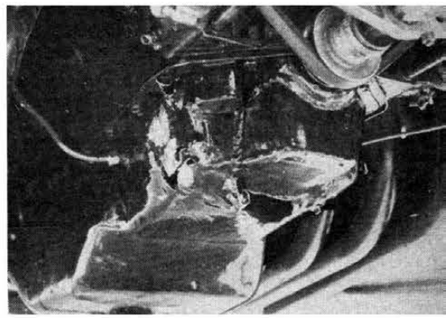
Another mechanic mislaid a small end wrench while rebuilding an engine. It showed up 29,000 miles later after being pushed by the camshaft through the side of the cylinder block.

Closer to home to the average motorist is the case of the driver who poured cold water in an overheated engine. It is safe to say that more cylinder blocks and heads are cracked from this one cause than from any other. While on the subject of cooling systems, we mustn't forget the character who blithely ignores the water temperature gauge and continues to operate a badly overheated engine. Scored pistons and cylinder walls are the inevitable result.

More than one mechanic has ruined a good engine merely by fitting main bearings upside down, thus cutting off the flow of oil. Even the seemingly trivial mistake of installing too long a bolt in the timing gear case on some engines can make mincemeat out of a set of gears in no time at all.

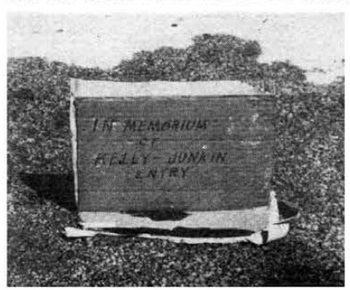
Parts sometimes fail because of faulty material. Shifting of the core in the casting process, improper heat treatment, and inaccurate machine work are among the causes contributing to engine failures. Despite careful factory inspection, faulty parts will occasionally show up to torment both the supplier and the ultimate user. One engine manufacturer recently rejected a number of crankshafts because they were ground a few thousandths undersize. Fleet operators picked them up at substantial savings, reground them to standard undersizes and put them to good use.

Engine designers must often accept the responsibility when their brain children go "kaput." One passenger car model of several years ago would occasionally cause its owners no little irritation by breaking connecting rods. Changing the design of the lower end of the rod cured the trouble. Many engines today are equipped with devices which cause the valves to rotate, reducing the tendency to stick or burn. The maker of one commercial engine decided to approach the problem from a different angle and secured the valves so that they couldn't turn. The idea was quickly dropped when the company began receiving pieces of valves from anguished owners.



At Bonneville's salt flats, where strenuous efforts are made to reach high speeds, shattered engines are a common sight. This one is a Dodge V-8, owned by Art Chrisman, which had a connecting rod punch through the pan at high rpm.

Oil spot on the Bonneville salt is marked with an improvised memorial to the hopes that blew up with the Kelly-Junkin entry's engine, which just couldn't take the strain demanded in the trials.



CRANKING IT TOO HARD

Racing cars and hot rods provide the best examples of engine failures due to exceeding the design limitations of power plants. Desire for that few extra miles per hour that spells the difference between first place and "also ran" leads car owners and mechanics to try everything conceivable to squeeze out the last few rpm. It's a tribute to the ruggedness of these engines that they stay together as often as they do. However, when one of these high-winding jobs does let go, it is usually a spectacular affair.

"Hopping up" stock engines is not confined to the hot rod set. Engine manufacturers increase the power of their products from year to year, and once in a while the results are unexpected and unhappy. One engine, widely used in trucks and buses, had its horsepower upped from slightly over 150 to well over 200 without any increase in displacement. Everybody was happy until main bearings began to fail and crankshafts started breaking. An improved main bearing and a redesigned crankshaft enabled the engine to stand up to its increased punch.

The foregoing examples are just a few of the many causes of engine destruction. The question of what can be done to minimize such troubles naturally arises. All along the line, from the blueprint and raw material stage, through the manufacturing process to the eventual owner, a multitude of safeguards protects the modern automotive engine.

"Quality control" is the term used by manufacturers to describe the tests and inspections aimed at eliminating defective parts. Samples of raw materials are examined to be sure they meet specifications, machined parts are measured with micrometers, and other components are

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MR. MURPHY'S CORDS

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upon delivery. The cheapest Murphy body in those days cost $5500.

Like the town cars, the two Murphy phaetons started out as identical creations. They were close-coupled and undoubtedly lower than any four-seater ever built in the U. S. A very important point was that the back-seat passengers sat as low as those in front. This was a real coachbuilding achievement, made possible by the Cord's lack of a bulky rear axle and differential and, therefore, of any need to have the seats clear the rear-end assembly. The phaeton's length was accentuated by a dead-straight, very narrow and conservative molding that ran the length of the body's belt-line. The body also was made to "read" longer by the addition of a trunk at the rear, nicely booted in white fabric. The folding top was a masterpiece of compactness.

These Murphy phaetons, once seen, are not easily forgotten. Their inspired lines, chiefly from the drawing boards of George McQuerry and Frank Hersey, expressed the ultimate in Murphy's stock in trade, which was "quiet elegance." On top of that, they had a *sporting* elegance that Detroit coachbuilders swore could only be conceived in the Southern California climate. If the lean, thoroughbred, 91-inch Millers could be translated into pleasure cars, they surely would look like this.

The only Murphy phaeton to come to light in recent years was restyled in the Thirties, probably by a used-car dealer who wanted to give the machine a flashier appeal. This car had grafted onto it the curved body molding of the Le Baron and Le Grande type that more or less repeats the curve of the fender-mounted spare. This was the sort of touch that violated Murphy's austere esthetic standards and would not have been indulged in even at customer request. The car showed up on a Hollywood used-car lot in 1952, later was sold by Mayfield Motors in Burbank, Calif., for a hefty, four-figure amount.

Its original Lycoming engine had grown weary and the phaeton's owner had taken the car to George McLain, formerly the Duesenberg factory mechanic in Hollywood, for a rejuvenating treatment. He retained the inboard front brakes but installed a Packard Super Eight engine and drive line, feeding it into a Ford rear axle adapted to take the Cord wire wheels. I drove the car and was thoroughly unimpressed by its acceleration, handling, and meager provision for driver comfort.

The Cord chassis' radical, highly experimental *design* commanded far more respect than its *execution* or general behavior did. What *made* the car was the great automotive architecture that was created for it. And so it follows that the Murphy firm, which designed the Cord's stock factory convertibles and its finest custom bodies, played a major part in making the Cord a classic. •

WHY ENGINES BLOW-UP

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tortured to destruction. Finally, thousands of hours are spent in dynamometer and road testing.

Some commercial fleets still aren't satisfied. Critical replacement parts, such as valves, connecting rods and crankshafts, are magnafluxed before being used. Many operators replace component parts and even complete engines at specified mileages to prevent expensive failures. Thorough maintenance and careful rebuilding of these powerplants assures service life equal to that of new engines.

Where certain parts are found to be chronic troublemakers, many users modify or redesign them to fit their own particular needs. So successful are some of these fixes that they are later incorporated in the design.

Correct lubrication is a "must" to men who measure profit or loss in cents per mile. Oil and filter change periods are often determined by laboratory analysis of used oil. Heavy-duty compounded oils are widely used by the nation's leading truck and bus operators.

To reduce the chance of failure due to driver abuse, many commercial engines are equipped with governors to limit engine speeds and automatic devices which sound a warning, then shut off the engine in the event of high water temperature or low oil pressure.

Major engine failures are comparatively rare in today's passenger cars, but garage operators along some of the nation's superhighways can display an interesting collection of parts which just weren't equal to 70-mph cruising speeds. These failures often follow a familiar pattern. The family car with a good many miles on the clock is released from its daily routine of short trips to the office, school or supermarket. That dirty radiator and those partially clogged oil passages, which weren't noticed before, suddenly become completely inadequate under sustained high speeds. An engine which was satisfied with a quart of oil in every four or five hundred miles of city driving is transformed into a guzzler which may drink its crankcase dry in an alarmingly short time. It doesn't require an engineering degree to picture the consequences.

Failures of this type can be prevented by the same sort of vigilance exercised by the largest fleet operators. Proper lubrication, periodic inspection and prompt replacement of worn or defective parts constitute the foundation of the best commercial preventive maintenance programs.

The same principles, properly applied, may determine whether a month or a year from now *your* engine will be purring quietly under the hood or rusting away in a junkyard beside the turnpike. •