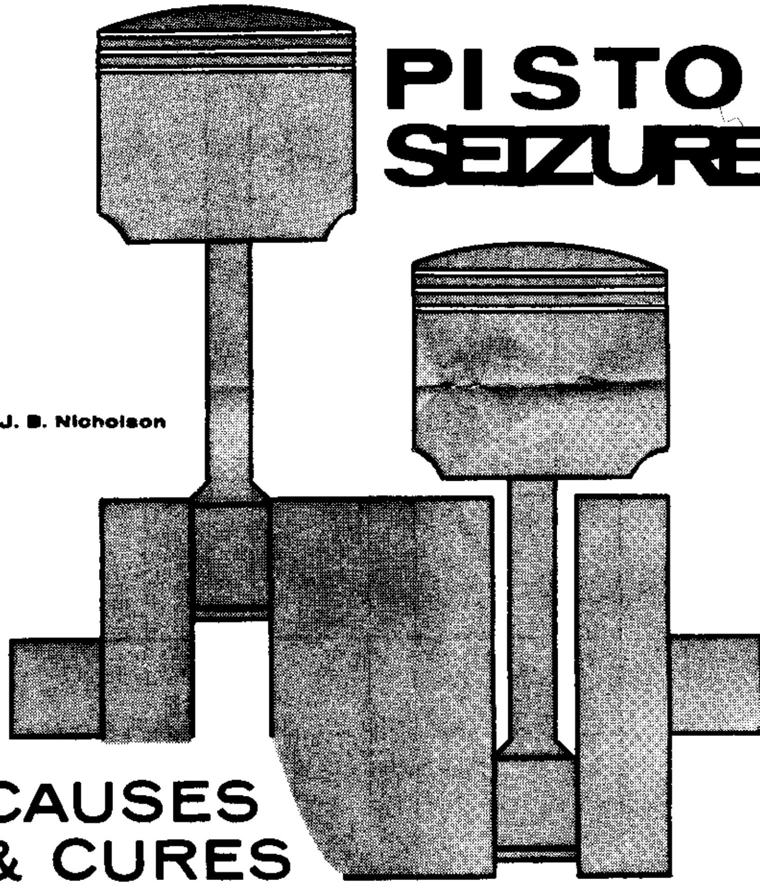
PISTON SEIZURES



CAUSES & CURES

By J. B. Nicholson

Piston seizures in automobile engines are quite rare compared to that same malfunction in motorcycle power plants. Here is a fairly typical letter received by CYCLE Magazine's technical department: "I have replaced three pistons in my 1964 twin because of seizure. The clearances were carefully checked and the motor was not overdriven. It seems to me that there is more piston trouble on large displacement motors that are seldom "opened up" than on small motors that are run full-throttle most of the time."

Unquestionably, water cooling with thermostatic control is what accounts for the freedom of piston trouble on automobile engines. Piston failures are invariably a result of excessive temperatures and a combination of factors can cause critical temperatures to be reached on a motorcycle engine quite unknown to the operator.

It is surprising that no manufacturer has yet fitted a temperature gauge to show cylinder head heat. Such a fitting would enable most piston failures to be avoided. Amongst the factors that influence operating temperatures are carburetor mixture, ignition timing, type of spark plug, piston and exhaust valve factors, as well as operating conditions.

The manufacturer of one well-known imported bike recently issued a bulletin after finally getting to the bottom of the piston problem. Recent models now come through with raised throttle needles and retarded ignition which reduce engine temperature and eliminate failures. Previously, piston seizure was experienced in the 70 mph range at not more than ⅓ throttle. Lab tests indicated too much heat under such conditions, thus the above corrections were instituted. (Initially, it was incorrectly suspected that the frequent piston seizures were due to an unsuitable "finishing form" and insufficient clearance. Correcting these features still did not clear up the trouble. Most seizures occurred on the left side piston because the right side obtains additional lubricant from oil sprayed from the pressure fed right side main bearing. An oil spray hole was introduced in the big end of the left hand side rod to balance cylinder lubrication.)

The view of course is commonly held that it is only necessary to have an adequately large main jet to ensure cool running. On large motors, with large bore carburetors, it must be appreciated that the needle position which controls the mixture until very nearly ¾ throttle, involves speeds as high as 85-90 still being on the needle. A weak needle setting probably has been the cause of piston failures on many engines because of the mistaken impression that the main jet size was the only factor to be considered. Generally, it has been assumed that setting the needle sufficiently high to avoid hesitation when accelerating provided a suitable mixture in the medium speed range. It is now evident that this is not thoroughly reliable. The Amal Monobloc carburetor does provide a slight momentary enriching of the mixture when the throttle is opened because of the small cross-bore hole in the needle jet that allows an extra fuel supply when the throttle is suddenly opened. Taking this into account, riders who do considerable cruising in the mid throttle range in particular, will be well advised to check on the needle setting and if in doubt raise needles a notch. There is no point of course in an excessively rich mixture which will be indicated by lumpy running, plug sooting, or heavy fuel consumption.

Spark plug pre-ignition is a common cause of overheating and piston failure. As a general rule the coolest running plug that can be used consistent with reasonably clean running should be fitted.

Some engines are more critical to ignition timing than others. Many manufacturers in their original instructions specify checking the timing at the static retarded setting whereas it is of course the running advanced setting that is critical. Equipment is now available for Triumph and B.S.A. twin models for using a stroboscopic light for timing setting and this equipment is highly recommended.

Timing should of course be checked on both cylinders. It is not uncommon to find an appreciable variation in setting between cylinders. On early magneto equipment models, this fault is usually in the magneto end plate due to lack of concentricity between the bearing race and the cam ring housing. On the later battery ignition models with twin sets of points, minor breaker plate irregularities account for timing variation and uniformity is achieved by varying the gap setting on the two sets of points as required. An exception to this arrangement is found on the Norton Electra where the mounting of one set of points is adjustable so that uniform timing can be achieved without alteration of point gap.

The question as to why many smaller motors seem to withstand full throttle operation without piston trouble is an interesting one. Small motors generally have a better cooling-area-to-displacement ratio than large motors and although a lot of full throttle work is done, on the average, there is not a great deal of sustained full throttle operation. Brief periods of full throttle followed by shutting down do not involve maximum sustained piston temperatures. **This type of operation simply does not result in as much piston trouble as steady cruising**, even at less than full throttle, where under certain conditions, temperatures will steadily climb to the danger point.

A factor not to be overlooked by riders who use their machines for long distance cruising is the matter of compression ratio. There is appreciably more likelihood of overheating and piston trouble with a 9:1 ratio than an 8 or 8½:1. -And even greater with higher compressions.

Everything points to the desirability of temperature gauge equipment for motorcycles so that riders will be able to tell when to roll back the throttle and save a lot of piston grief. ◀