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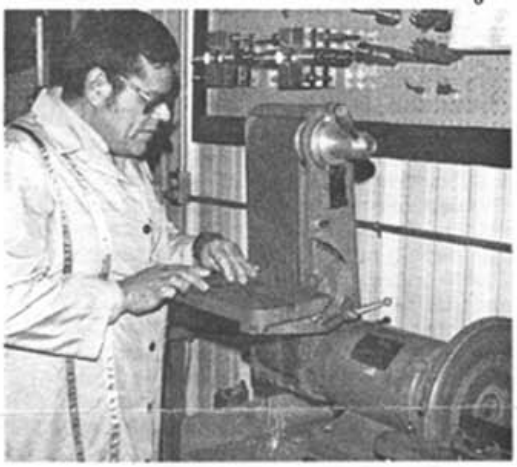

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counterweights on the ends which are not in line, but rather at opposite sides of the crank.

Since it is impractical to hang pistons, connecting rods, etc., on a crank and spin them outside an engine block, bobweights must be made up to simulate the exact weights as closely as possible.

Bobweights are two-piece affairs which when held onto a crank provide the engine balancing technician with a means to simulate 100% of the rotating weight and 50% of the reciprocating weight. To many the selection of bobweights may seem complicated. A Stewart-Warner brochure on balancing manages to explain the selection in rather simple terms.

"On the standard V-8 engine, the bobweight total consists of 100% of the rotating weight and 50%of the reciprocating weight. You have two rod and piston assemblies per throw on the standard V-8. The rotating weight would be the crank end of both rods and the bearing insert. The reciprocating weight would be the weight of one piston, one piston end of a rod, one set of rings, pin and pin locks (if used). This gives you 50%, or half of the actual weight for the reciprocating part. Use of the following list will give you percentages and also ensure that you do not forget to weigh any of the parts."

To compute the rotating weight (100%) the following weights must be included: the weight of the two crank rod ends, two sets of bearing inserts, two sets of lock nuts (if separate), and the oil (estimate).

To compute the reciprocating weight (50%) these weights must be taken into account: the weight of piston, piston pin, piston pin lock (if used), one set of piston rings and piston end of connecting rod.

Balancing of Vicky's piston assemblies began by weighing the pistons.

Hygema determined the lightest piston by separately weighing all eight pistons on a precision Stewart-Warner #600175 digital electronic scale, which is accurate to within half a gram. As each weight was recorded on the piston castings with a felt marker, a 6.5-gram variance was found. The largest tipped the scale at 665 grams and the lightest at 559.5. Normally, piston manufacturers maintain relatively close weight tolerances when building production-run pistons, but for enthusiasts who demand absolute balance, those standards fall short and additional machining is required to produce equalized weights.

The other internal engine components involved in balancing are the piston rings, pins (plus locks when used), connecting rods and connecting rod bearing inserts. Piston pins and rings, unlike pistons, are manufactured under extremely close tolerances and normally one pin or a set of rings won't vary more than half a gram from each other.

Machinist Jim Roach of the Classic Car Centre's staff carefully fly cut the insides of the seven heavier piston skirts on a lathe to match the 559.5 weight. Stewart-Warner warns that in extreme cases enough weight cannot be removed from the heaviest piston, thus either the lightest or the heaviest piston should be replaced with one which can be machined to the matching weight.

Pressing aluminum slugs into the piston pin of the lightest piston is another remedy yet it is not advised, under normal conditions, by Stewart-Warner. The balance equipment manufacturer also advises that the owner should be told when slugs are used since those two components (slugged pin and piston) should never be mixed with other piston assemblies or the engine will be out of balance.

Turning to the connecting rods, Hygema ground the balance pads on the big ends to matching weights on a belt sander. Then the small ends were equalized in a like manner using a rod weighing device in conjunction with the precision scale. Had pads not been cast into the rod design, all grinding would have been done along the length of the rods but not across the rods since grinding in that direction decreases rod strength and sets up focal points where internal stress can fracture rod castings.

Bobweights matching the piston assembly weight were assembled once all connecting rods were matchweighed. When bobweights spin they simulate the effect of the rod and piston assembly. Matchweights are small precision washer-like discs which permit one to add very small amounts of weight to the bobweights. Both bobweights and matchweights were stacked carefully in two equal stacks onto the digital scale until the exact piston assembly weights were matched. Four equal bobweights were required for Vicky's V-8 crank. The bobweights were then assembled onto the crank as it sat on trunnion bearing cradles and the balancing machine was actuated.

Within a short time Hygema was able to balance Vicky's crank assembly by taking metal from a couple of the crank counterweights, the torque converter plate, and the harmonic balancer. The crank spun smoothly at 6,000 rpm with the entire balancing procedure taking less than three hours total time, including a slight delay encountered when the rubber on the harmonic balancer was found to be loose from the metal. A quick trip to a local Ford dealer produced a new replacement part.

The V-8 engine is now fully and professionally balanced, and destined to run smoother, stronger and longer than even Ford would have thought possible.

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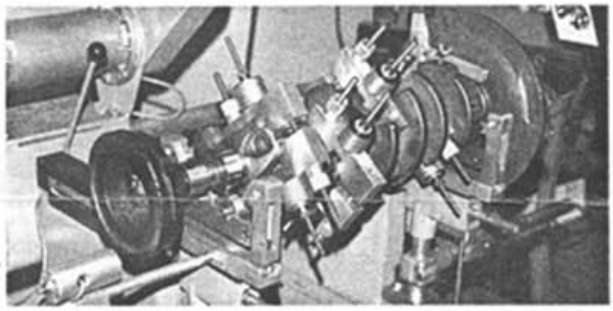

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7. Connecting rods were balanced by trimming appropriate amounts of metal from pads at both ends of the connecting rods.

8. A belt sander is recommended for removing weight from rod pads.

9. Bobweights at 2,017 grams were made up to simulate the piston assembly weights.

10. Each bobweight was set up across from its opposing counterweight.

11. Drilling was required on a couple of counterweights to get things into kilter.