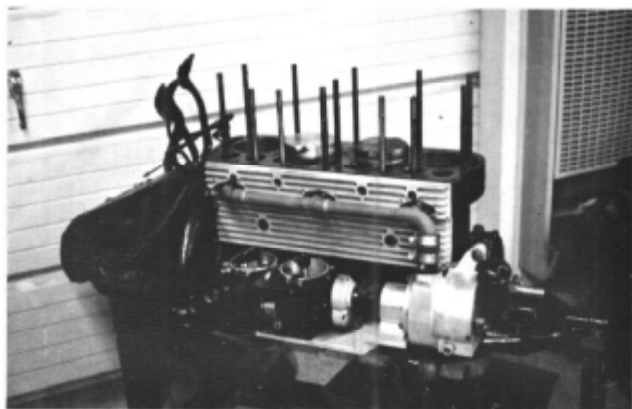
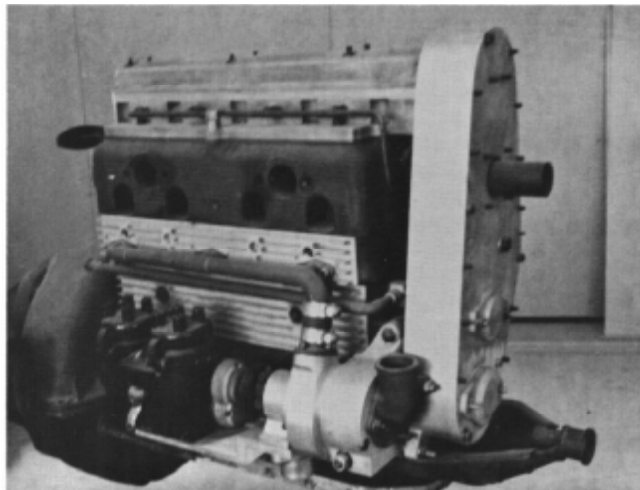


One of a Kind

AN OVERHEAD CAM RAJO BB

Photos and Text by Bruce McCalley

In almost any area there is an individual whose talents are outstanding in any given field. In the San Fernando Valley, that individual is Ellis Gray; the field is machine work. And, in this instance, the machine work is applied to the Model T Ford.



had plans for an overhead cam conversion. The pictures will tell a good deal of the story of this project, but there is far more than meets the eye.

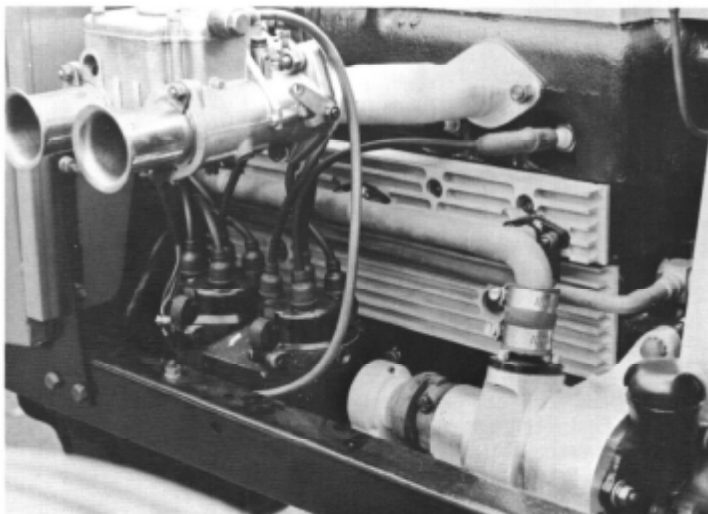
Starting with a 1926 T cylinder block, the following modifications have been made -

The cylinders were bored out and then sleeved down to just .060 over stock T bore. A 1928 Model A crankshaft was shortened by compressing the rear main bearing and then grinding the journal back to size. Steel counterweights were machined to fit and then welded in place. Passages were drilled for pressure lubrication to the rods, and

Southern California is the birthplace of hotrodding; the enthusiasm has long ago crept into the Model T Ford hobby. Fronty, Rajo, and other overhead valve setups, while not common, are no longer oddities. Mild hopping-up has become so commonplace that there have been Tours where a stock T might just as well have stayed home.

Needless to say, the more exotic heads have become scarce, if not impossible to find. When they are found, more often than not, parts are missing. Such was the case of the Rajo Model BB head which Ellis found. He had the head casting - that was all.

Most of us would have searched until we found the missing parts, or we would have given up. The bare casting was only a challenge to Ellis. He



the assembly dynamically balanced. Main bearings are hard babbitt. Ellis first solders copper screening into the bearing, then adds the babbitt. This gives a stronger base with less chance of pounding or cracking. The babbitt lining is relatively thin, aiding in cooling the bearing.

Aluminum connecting rods were machined from solid stock and are designed to take modern insert-type bearings from a Continental engine. The stroke is standard Model A. Pistons are special Jahns which pop up out of the block about 3/4 inch.

Early, straight-cut, timing gears were installed in order to be sure of accurate valve timing. These are stock T. Since this was set up to be an overhead cam conversion, the stock cam was replaced with a straight shaft. This shaft has the large timing gear at the front; an oil pump from a '54-55 Ford is driven from the rear, inside the transmission housing.

A new front gear case was machined from an aluminum block. This assembly has a water pump just aft of the gear housing, which pumps water through a manifold into the regular Ford freeze plug holes. To the rear of the water pump is a dual ignition distributor from

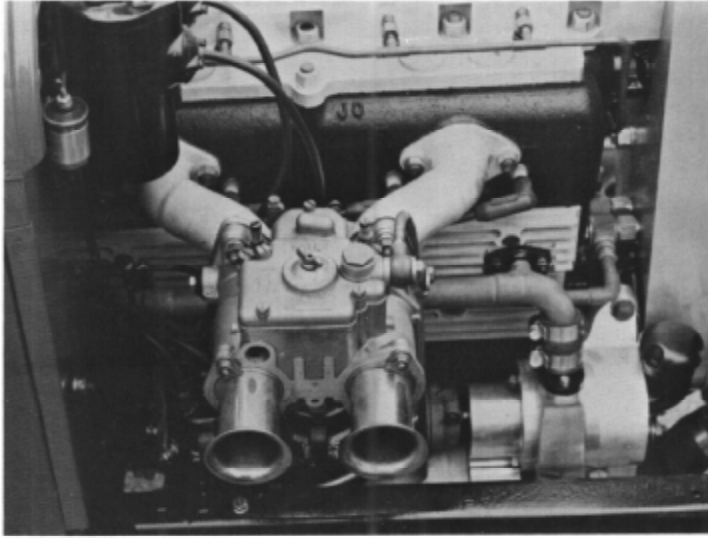


Top view of the engine shows the careful workmanship, typical of the whole car. The small pipe supplies oil to the camshaft bearings. The four plugs on the top plate cover the head bolts which thread into the old T valve guides.

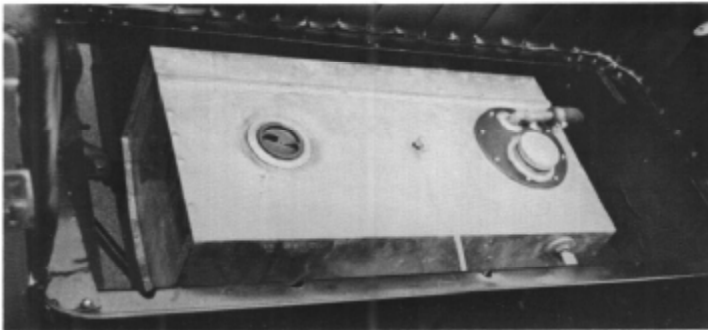


Counterweighted crankshaft is built up from 1928 Model A Ford. Shaft was shortened to fit T block by compressing the rear main and then grinding it back to size. Counterweights are steel and welded in place.

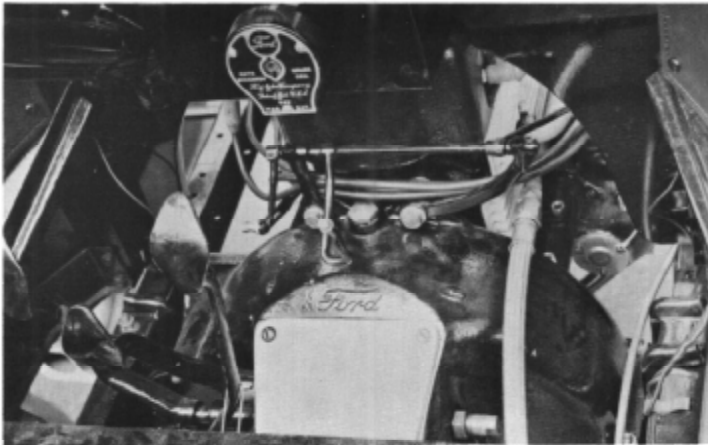




Carburetion is by modern Weber dual throat. This carburetor features interchangeable venturi so that it can be adapted to almost any engine displacement.



Combination gasoline and oil tank; the oil being on the right in this view. Air pressure from a hand pump forces gas to the carburetor.



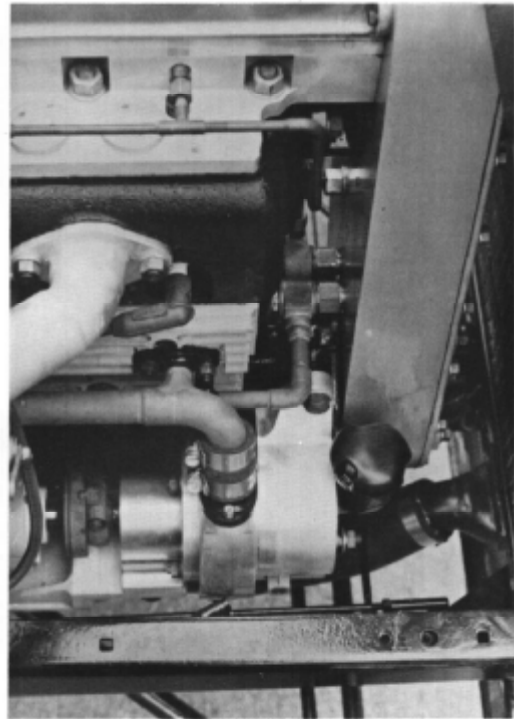
Rear view shows the linkage for the foot throttle. Both hand and foot throttle controls are operative. The large cable at the right is the oil supply line.

a Pierce-Arrow, driven through a reduction gear. This distributor has been modified using modern Mallory components, and features dual breaker points to feed two separate ignition systems for the two sets of spark plugs in the Rajo head.

The right side of the engine is enclosed with machined (not cast) aluminum covers.

The timing chain cover was machined from a solid billet. An oil pump from a 283 Chevrolet is located inside this cover, in addition to the idler and driving gears for the timing chain.

The stock T pan was modified by adding a baffle just forward of the flywheel. An oil-tight seal at this point allows the use of two separate oil systems; one for the engine proper, and one for the transmission. The engine is run "dry sump", that is, there is no oil in the crankcase. The oil pump at the rear of the cam-gear shaft acts as a scavenger, picking up oil that is



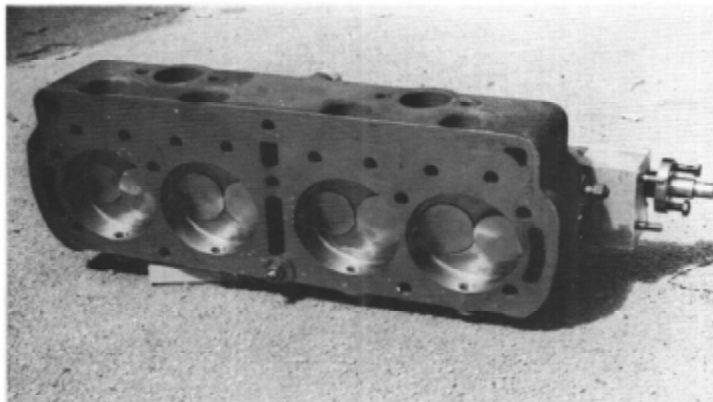
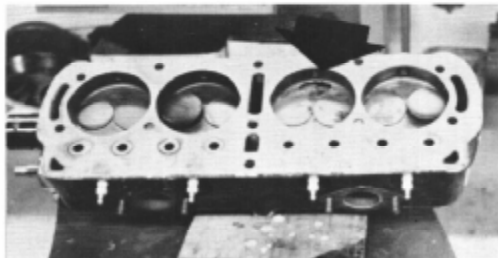
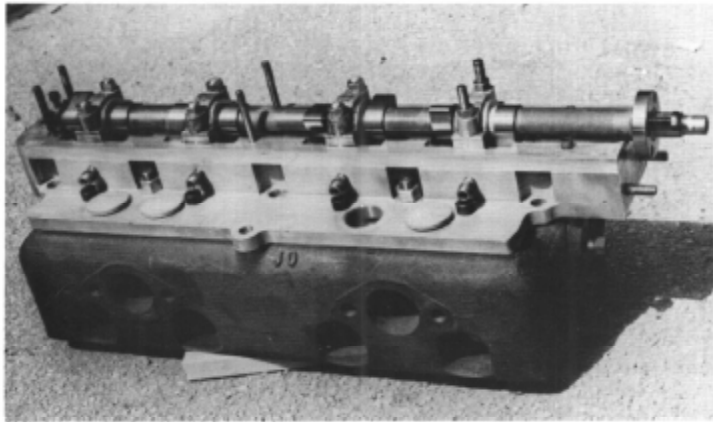
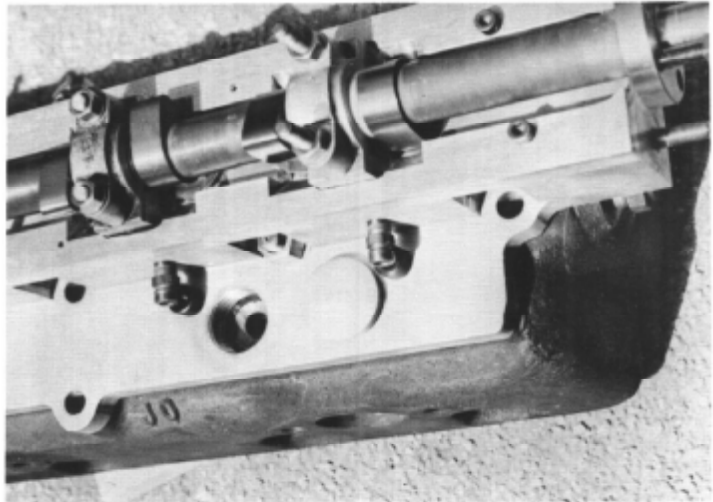
The water pump housing was machined from a solid piece of aluminum. Water is pumped into the engine through the three holes in the stock block which are normally sealed with Welch plugs. The smaller pipe, just below the water manifold, brings oil from the tank under the driver's seat to the pump in the timing chain cover.

caught in the pan and pumping it to an external oil tank under the driver's seat. The oil pump in the timing chain case picks up oil from the oil tank and forces it through the bearings, gears, etc. The transmission runs in automatic transmission fluid.

The transmission is made from standard T components, but has been modified to give a faster (less reduction) low-gear ratio. A Chicago Rawhide seal at the rear bearing (not a ball or roller type, but the usual sleeve type), plus O-rings at the pedal shafts, prevents any chance of oil leaking. There is no oil to be seen anywhere, we might add. The felt seal at the rear of the engine where the transmission cover fits, is standard. Here, Ellis has a very practical idea that will help anyone to get a good seal at this point. Instead of oiling the felt, or coating it with Permatex, he soaks it in varnish until it is thoroughly saturated. It is then hung up to dry. The outer surface dries first, leaving the felt saturated with fluid varnish. When installed, the compression breaks down the varnish covering and the fluid inside then sets up to make an excellent seal.

An aluminum billet was machined to support the camshaft on top of the Rajo head. The camshaft is full-race; is supported by four bearings, and is driven from the chain in the front case. A cover from a Jaguar was modified to enclose the camshaft. Valves are huge; the intakes are two inches across the heads; exhausts are only one and seven-eighths!

The head was modified by installing



During its first competition run, the Rajo casting failed. Prior to the failure, the car went like a rocket. The engine would easily reach 5000 rpm; probably much higher had it been let loose. The arrow shows where the head failed.

These views of the camshaft and bearing assembly show the careful attention to detail. Intake valves measure two inches across the face; exhausts, one and seven-eighths. The pistons enter the head, giving a compression ratio of 11.9 to 1!

adaptors so that long-reach 14mm spark plugs could be used. The stock Rajo BB head had two head bolts which passed through the intake passages. These were removed; studs installed in four of the now-unused valve guides in the block, and the holes in the head enlarged to accept them. A solid copper head gasket is used.

Carburetion is by Weber dual throat, mounted on a home-made intake manifold. The exhaust system is also a product of Ellis craftsmanship. The headers are left open for competition; an adaptor and muffler are used for the street.

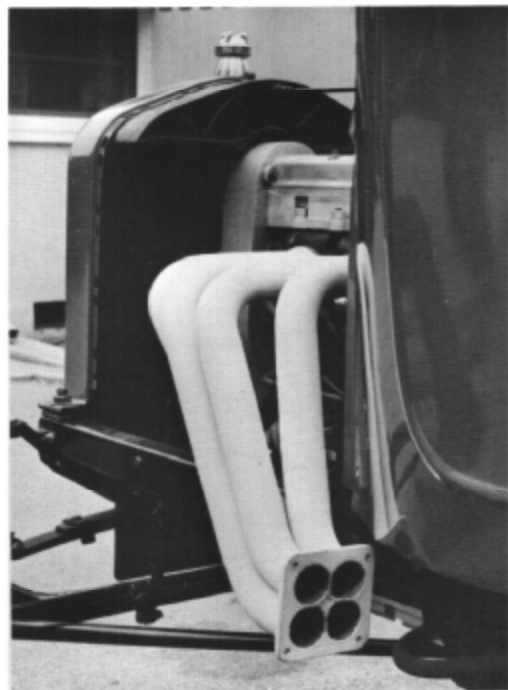
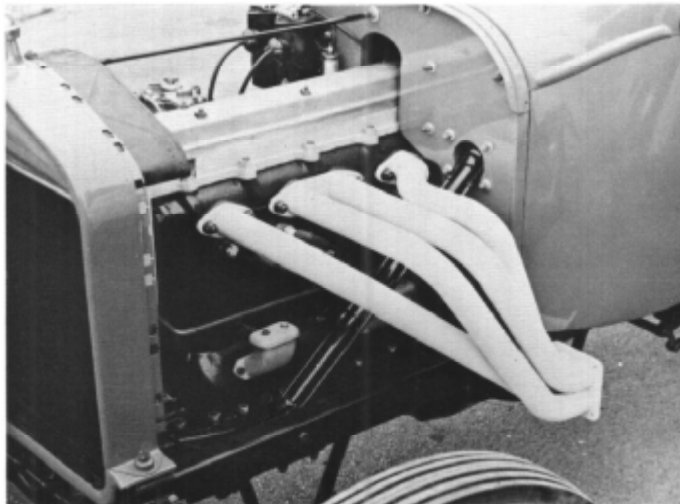
The drive shaft and rear end gears are stock T (ten tooth pinion, though). The two-speed rear end is a Perfecto, a high class Ruckstell product which overcame many of the shortcomings of the standard Ruckstell, such as the bronze casting which wears so much. The entire rear end has been modified to use modern ball and roller bearings, in the manner described in the March-April 1968 issue of this magazine.

As we said, the pictures tell the story. The workmanship cannot be described; a Swiss jeweler would be proud of the job.

The sad part of the story, though, is that the Rajo head casting failed on the first competition run. The high compression (11.9 to 1) broke through the head in number three cylinder. While out of the race, its first run was impressive. Undaunted, Ellis has plans to machine new liners for the head, weld them in place and . . . well, it's just got to be a winner. Wait until next year!



Perennial winner of the hill climb, Doc Pruden reacts as shown here at his first view of Ellis' car. Doc drives a DO Fronty race car, an exhibition in itself. He won again in the Modified Class.

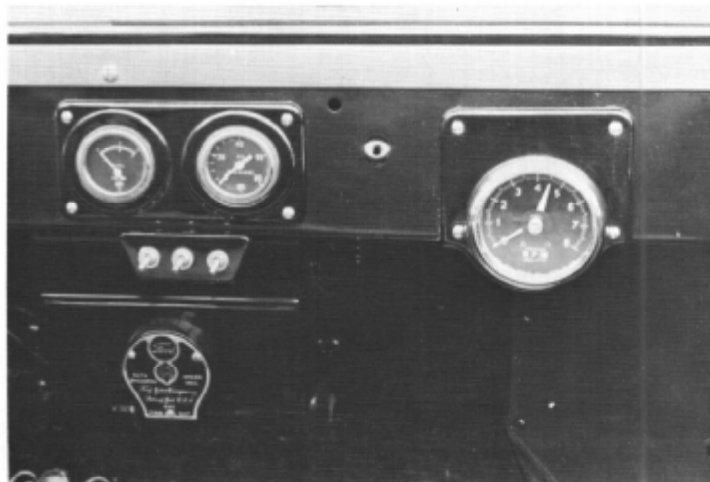
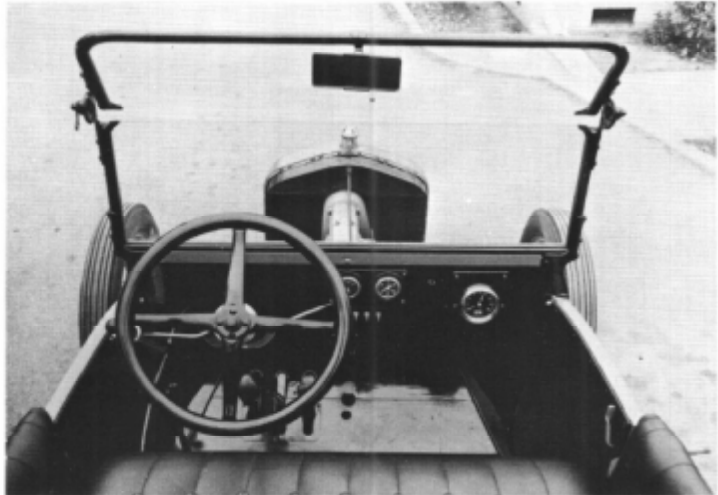




You just can't have a beautiful engine and put it just any old body. One must compliment the other. And it's hard to say which is the most outstanding.

The body is a 1922 Roadster, which when found, was in pretty bad shape. New wood, lots of metal work and a beautiful red paint job have resulted in the car you see here.

The chassis was lowered by using a "Dago" front axle and springs on which the eyes have been reversed, plus spindles from a 1926 Ford. The rear was lowered by using special



brackets for the spring perches. An additional stock rear cross member was added just ahead of the original one, allowing the spring to be mounted in a normal manner.

Oil and fuel pressure gauges are mounted in a stock switch plate. The tachometer is mounted in a stock speedometer mount. Ellis took great care to avoid drilling any new holes anywhere in the car so that it could be returned to stock condition with ease.

And if this series of pictures won't make you drool, you're too old!

