Having your head examined.

By Tom Carnegie

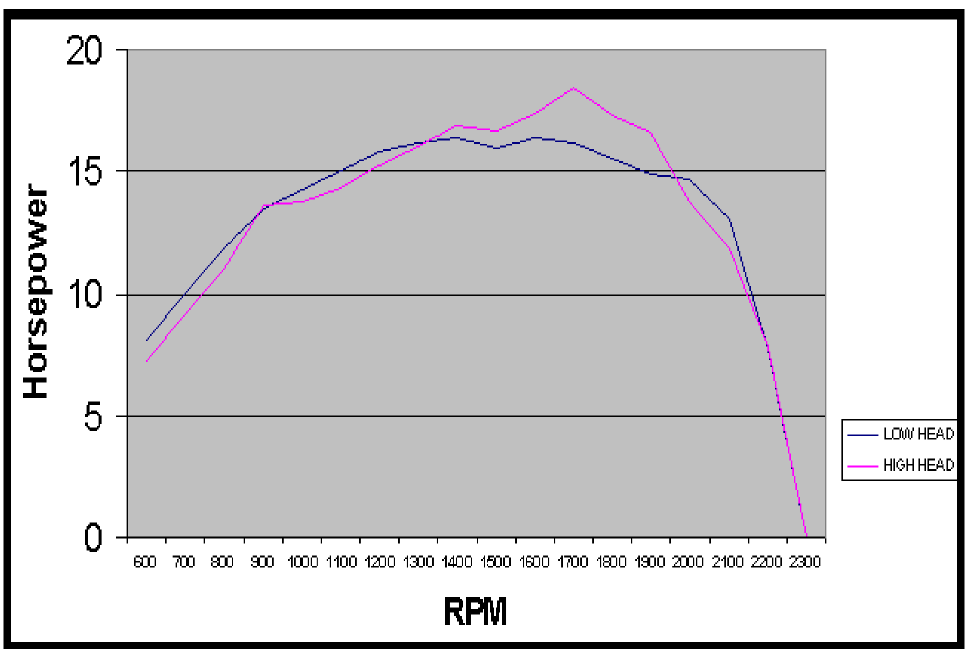
I have tested several different Model T cylinder heads on a dynamometer. The motor that I used for these tests is bored .040 oversize with Jahns aluminum pistons. The rods were bored improperly when they were rebabbitted, and are 1/16" short of their correct length, so the engine is a little shy of the amount of compression that it should have. The valves are stock, the porting is stock, the cam is an unreground original that I set up using the piston travel method. The manifolding is stock with a cast iron intake and stock exhaust pipe and muffler system.

Dyno Basics

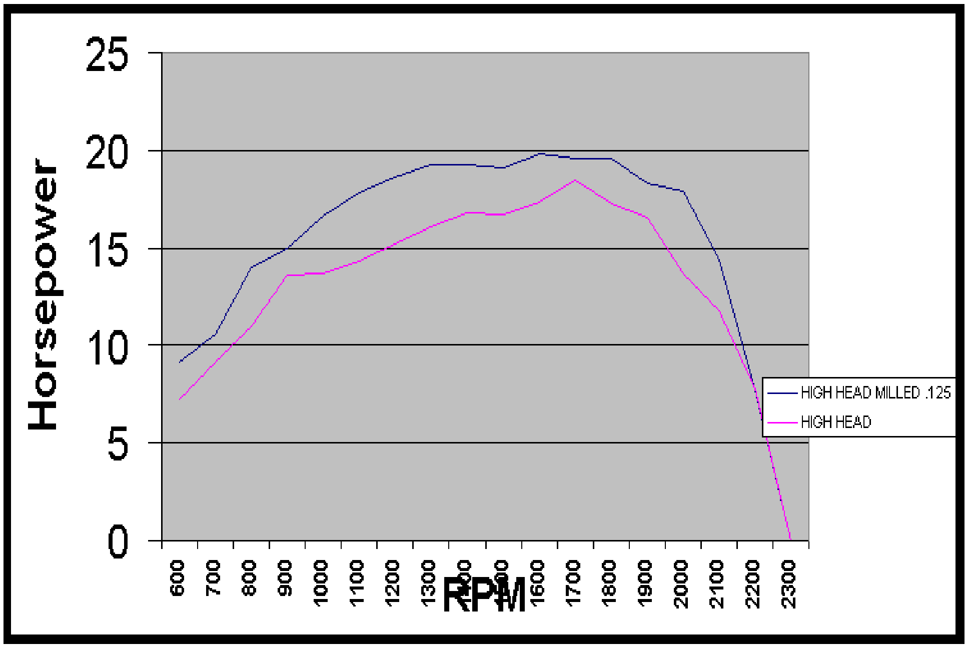
A dynamometer essentially does one thing. It measures torque at a given speed. If we know torque and speed (rpm's) we can calculate horsepower. For instance, a motor turning 101 rpm's and putting out 52 foot-pounds of torque would be putting out one horsepower. A motor putting out 52 foot-pounds of torque at 1010 rpm's would be putting out ten horsepower, 10100 rpm's 100 horsepower and so on. But there is more to the story than this.

Achieving a Standard

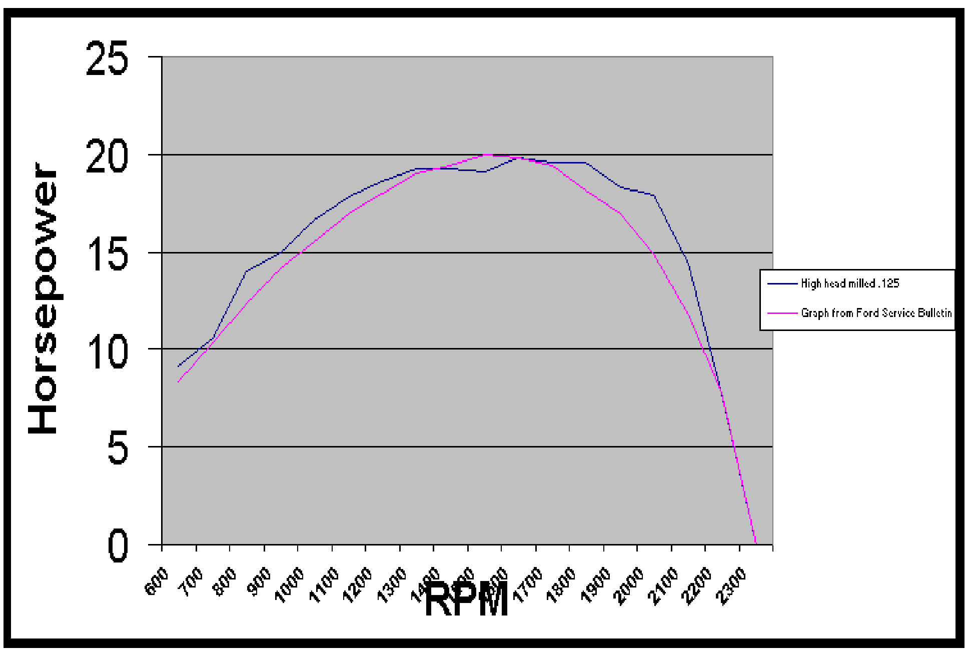
Different atmospheric conditions will effect how much power an engine will put out. In order to have a meaningful comparison between tests done on different days the horsepower ratings need to be corrected for ambient conditions. The folks at the S.A.E. have a whole set of formulas (that I won't go into right now) for correcting power readings to compensate for humidity, air pressure and temperature. Then if you take a reading on a warm muggy day the corrected readings should equal the corrected readings taken on a cool dry day. All of the following charts and graphs have been corrected to standard conditions.



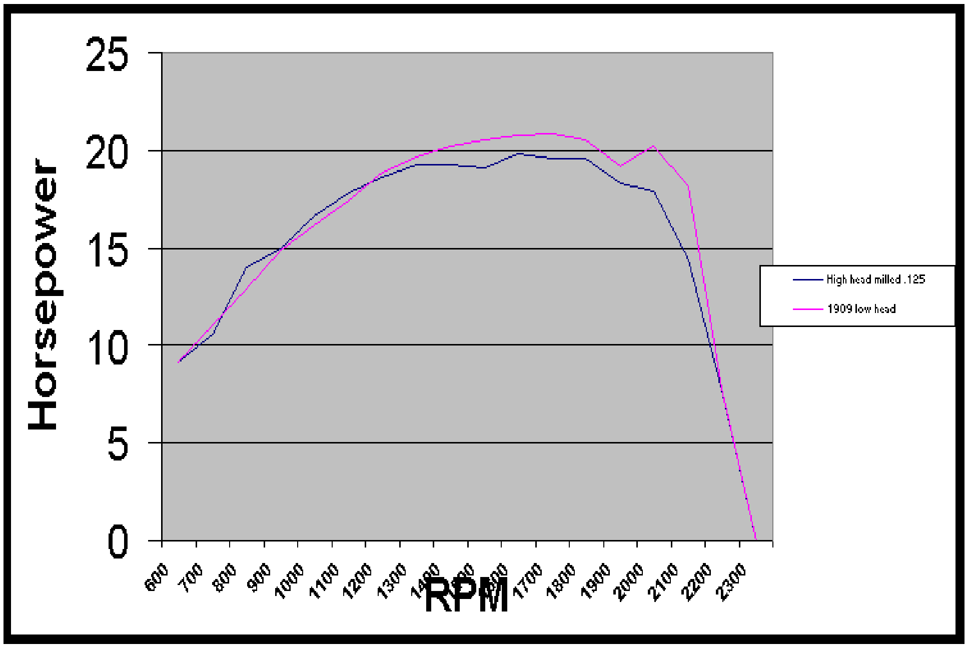
Graph one: This graph compares an unmilled low head to an unmilled high head. Although the maximum horsepower is lower on the low head, it has better torque on both the low and high end of the curve.



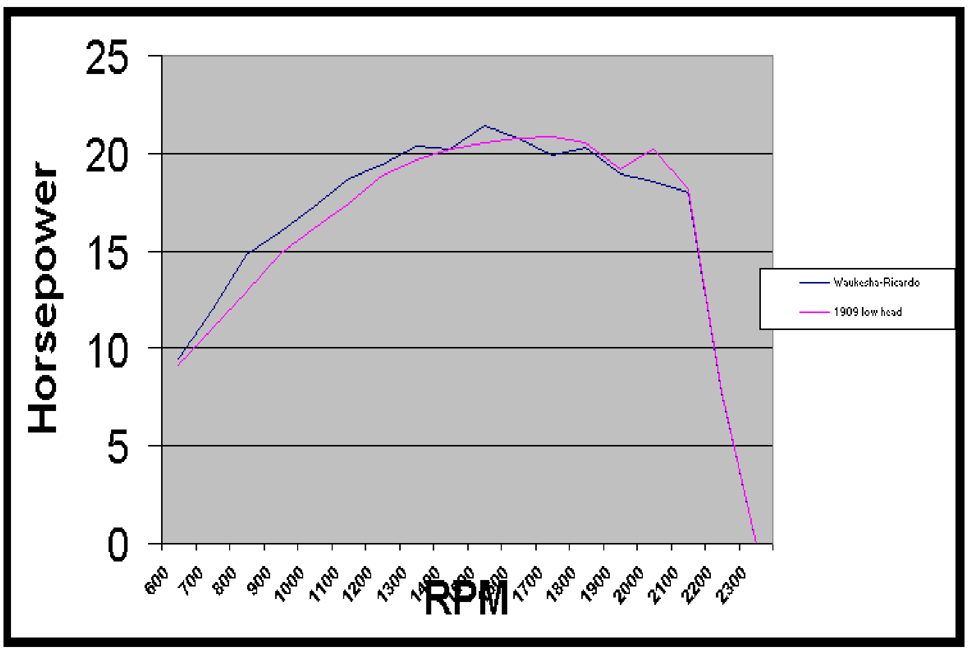
Graph two: This graph compares an unmilled high with a head milled .125". The milled head on this engine produced a near textbook power curve which peaks at 20 horsepower. The extra milling no doubt compensated for the short rods. (see text)



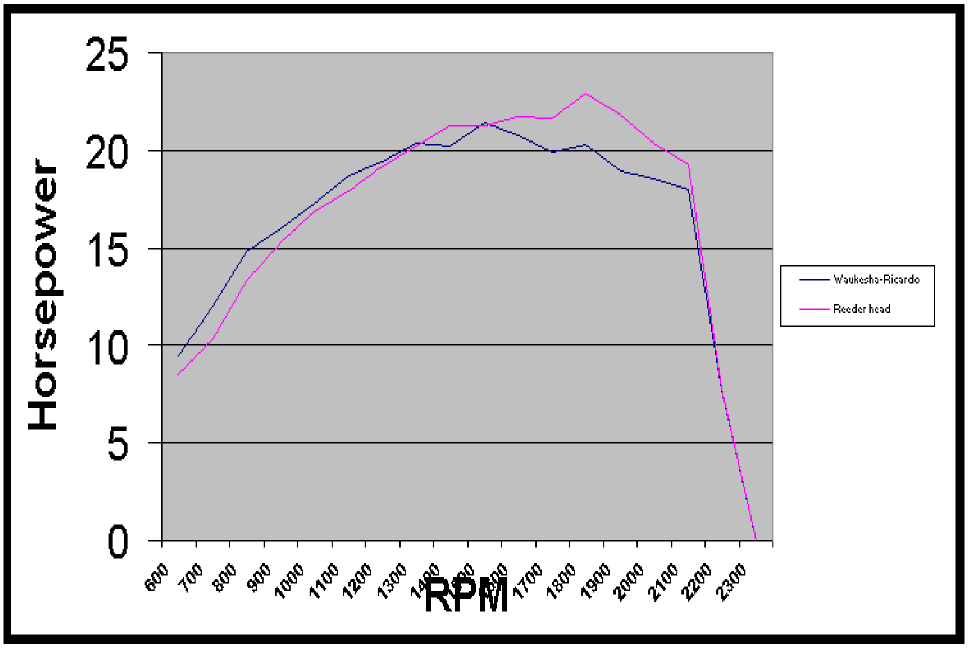
Graph three: This graph compares Ford's data from the Service Bulletins to a high head milled .125"



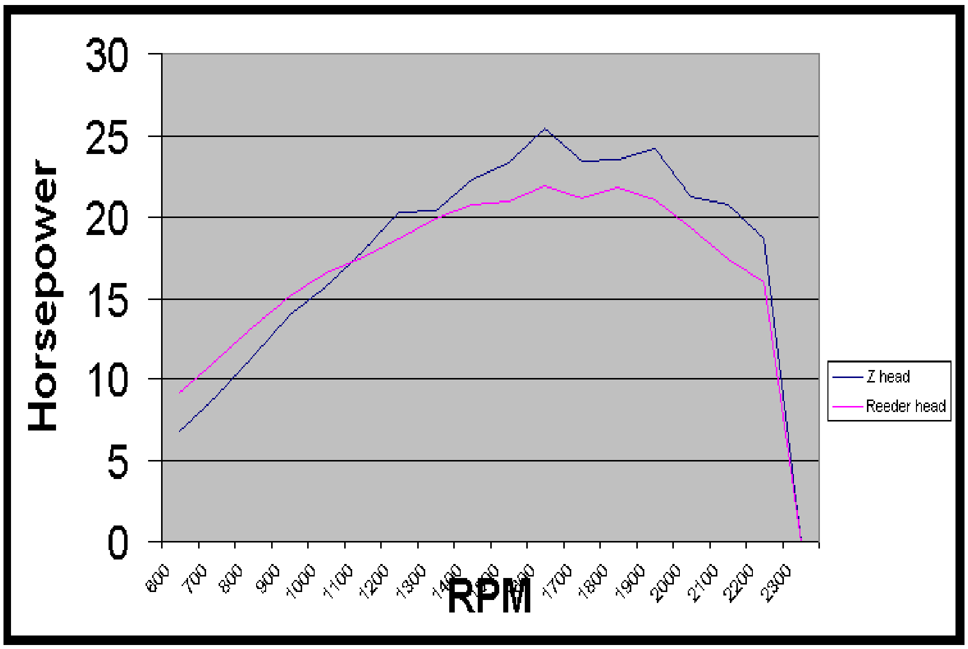
Graph four: This graph compares a 1909 head with a high head milled .125"



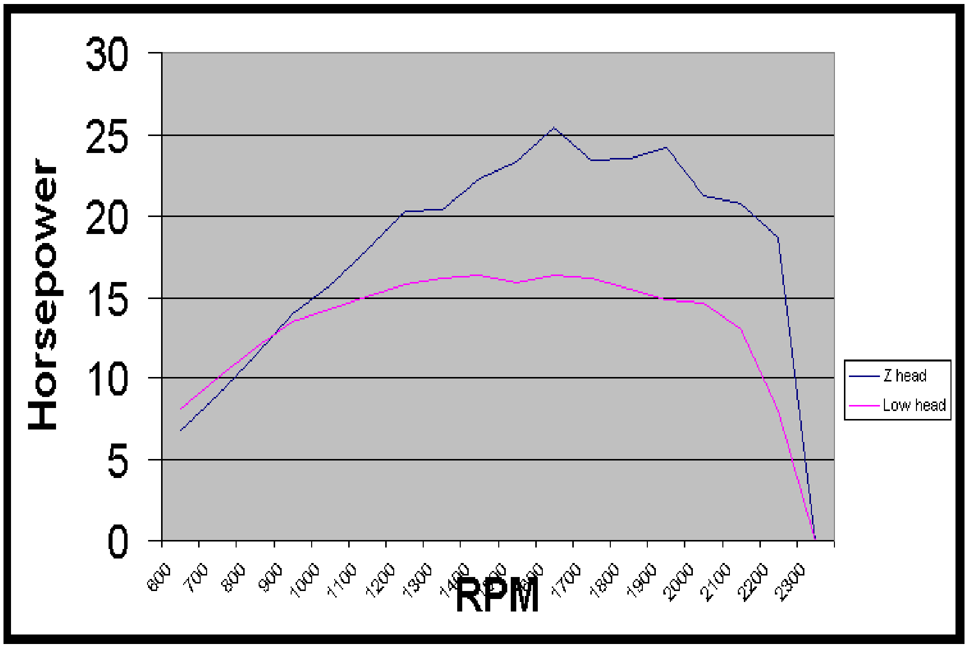
Graph five: Waukesha-Ricardo verses a 1909 head. Waukesha wins on the bottom end, Ford on the top.



Graph six: Reeder head and Waukesha-Ricardo. Wow! talk about some easy bolt on power.



Graph seven: The Reeder head is better on low end power, but for speed the Z-head is the champ.



Graph eight compares our first head with the last. We've come a long way.

Horsepower

RPM	Low head	High head	High head .125"	Waukesha Ricardo	Reeder Head	Z-head	MPH
600	8	7	9	9	8	7	15
700	10	9	11	12	10	9	17.5
800	12	11	14	15	13	11	20
900	14	14	15	16	15	14	22.5
1000	14	14	17	17	17	16	25
1100	15	14	18	19	18	18	27.5
1200	**16**	15	19	19	19	20	30
1300	**16**	16	19	20	20	20	32.5
1400	**16**	17	19	20	21	22	35
1500	**16**	17	19	**21**	21	23	37.5
1600	**16**	17	**20**	**21**	22	**25**	40
1700	**16**	**18**	**20**	20	22	23	42.5
1800	**16**	17	**20**	20	**23**	24	45
1900	15	17	18	19	22	24	47.5
2000	15	14	18	19	20	21	50
2100	13	13	14	18	19	21	52.5
2200	8	8	9	12	13	19	55

This chart shows the horsepower of the various heads. The highlight denotes the point of highest horsepower. For comparison sake I would consider the .125" head as being closest to the "correct" rating of a stock model T motor. The mph figures are for 40:11 ratio rear-end.

Torque

RPM	Low head	High head	High head .125"	Waukesha Ricardo	Reeder Head	Z-head	MPH
600	71	63	80	83	74	59	15
700	75	69	80	91	78	67	17.5

800	78	72	**92**	**98**	87	74	20
900	**79**	**79**	88	94	**89**	82	22.5
1000	75	72	88	91	**89**	83	25
1100	72	69	85	89	86	85	27.5
1200	69	67	82	85	84	**89**	30
1300	65	65	78	83	82	83	32.5
1400	62	63	72	76	80	84	35
1500	56	59	67	75	74	82	37.5
1600	54	57	65	68	71	84	40
1700	50	57	60	62	67	72	42.5
1800	45	51	57	59	67	69	45
1900	41	46	51	53	60	67	47.5
2000	38	36	47	49	54	56	50
2100	22	32	36	45	48	52	52.5
2200	19	18	22	32	38	45	55

The highlights denote the points of maximum torque. The mph figures are for 40:11 ratio rear-end. In actual use, with the unmilled high head, this test motor would propel my car about 48 miles per hour on a flat road in calm wind conditions.

Conclusion: I don't know what to make of all this. The most surprising thing to me was the poor performance of the low head. Most model T people will tell you that low heads run better than high heads. Maybe the short rods effected the low head disproportionally.