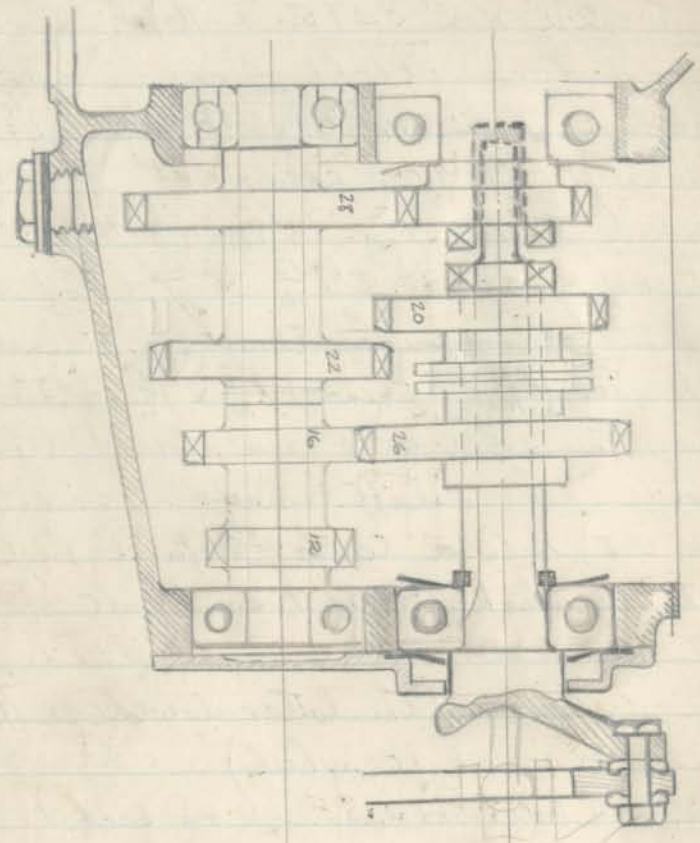


7 HP Gear Box



		9-44	10-54	12-54
Top.	1	4.89	5.4	4.5
2nd	1.82	8.9	9.82	8.2
1st.	3.25	15.89	17.55	14.6
R.	4.33			

Gear Ratios 7 HP Standard.

$$54 \times 81 = 740 \text{ cc}$$

Taking 100 LBS. MEP.

$$\text{BHP} = \frac{A \times 2 \times 0 \times 3.19 \times 100 \times 4 \times 1000}{792,000}$$

$$= 5.7 \text{ BHP} @ 1000 \text{ R.P.M. (calculating purposes)}$$

4 spd. gear box (Racers)

	10-4.5	or 12-54	
Top	4.5	5	4
3rd	6.75	7.5	6
2nd.	10.9	12.1	9.7
1st.	17.3	19.2	15.4
	no reverse		

3-speed box with 16-25 Top  
constant mesh wheels

Top.	4.0	4.5
2nd		6.36
1st		11.4
R.		15

Suggested modifications

- Inlet pipe ✓
- Exh. pipe ✓
- Crankshaft ✓
- Valves ✓
- Piston
- Conn. rod ✓ *Feb mod 2*
- Compression ratio
- Tappets ✓
- Valve springs ✓
- Crankshaft

Speed of bar with varying gears

① varying rpm  $27\frac{1}{2}$  dia

3.5	4.0	4.5	5.0	5.5	R.P.M
23.4	20.5	18.2	16.4	14.9	1000
46.8	41.0	36.4	32.8	29.8	2000
70.2	61.5	54.5	49.1	44.6	3000
93.6	82.0	72.8	65.5	59.5	4000
117.0	102.5	91.3	82.2	74.6	5000
			98.4	89.5	6000

7HP Racing Engine 2.2 x 3.4

Taking 100 LBS. MEP

$$BHP @ 4000 RPM = \frac{3.8^2 \times 3 \times 4000 \times 100 \times 4}{792,000}$$

$$= 23 HP \left( 5\frac{3}{4} \text{ per } 1000 RPM \text{ at above } 100 \text{ LBS. MEP} \right)$$

Inlet & exh. pipes

Inside dia of inlet  $1\frac{1}{32}$ " ( $1\frac{1}{2}$  x 18 SWG)

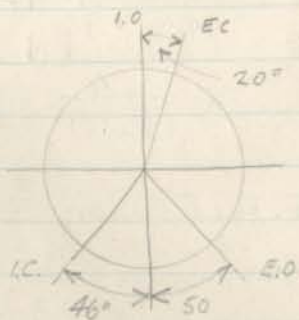
$$\text{Area} = .84 \text{ sq"} \text{ "}$$

Taking and inlet gas speed of 9000 ft per min piston speed =  $\frac{.84 \times 9000}{3.8}$

$$= 1990 \text{ feet per min}$$

$$= 3980 \text{ R.P.M.}$$

Valve timing



Tappet clearance  
".006"

Valves

Weight of valve = .084 LBS  
 " " valve spring cup =  
 " " " cotter =  
 " " stem cup =  
 " " tappet = .090  
 " " valve spring

by 2 lbs. complete wt. of  
 moving parts

Fastest speed = .117" in 10° of crank  
 (each cam)

1000 RPM = 16.6 R.P.S.

1 sec =  $\frac{1}{16.6}$  sec.

10° =  $\frac{1}{16.6 \times 36}$  sec =  $\frac{1}{600}$  sec.

.117" in  $\frac{1}{600}$  sec @ 1000 RPM

5.85 feet per sec. @ 1000 RPM

$$K.E. @ 4000 RPM = \frac{.2 \times (23.4)^2}{2 \times 32.2}$$

158 LBS

$$@ 5000 = \frac{.2 \times (29.2)^2}{2 \times 32.2}$$

26 LBS

$$@ 6000 = \frac{.2 \times (35)^2}{32.2}$$

3.8 LBS

Compression Ratio

Present head capacity = 44 cc

Using a  $\frac{1}{16}$ " washer takes off 35 cc.

Taking  $\frac{1}{16}$ " of eye head = 4 cc

leaving a capacity of 36.5 cc.

186.8 (swept volume)

$\frac{36.5}{223.3}$  cc.

$\frac{223.3}{36.5} = 6.1$

Valve springs

Required a spring

15/16 O.D.

$$\text{Length (fitted)} = 1.8''$$

$$\text{Load (fitted)} = 30 \text{ LBS}$$

To allow valve lift of  $\frac{3}{8}''$ 

$$11 \text{ swg.} = .116''$$

$$\alpha = \frac{64 W R^3 N}{G d^4} = \frac{64 \cdot 30 \cdot (.42)^3 \cdot 10}{12,500,000 \cdot (.116)^4}$$

$$= .627''$$

$$\frac{.627}{1.8} \text{ deflection to fit}$$

$$\frac{1.8}{2.427} \text{ fitted length}$$

$$\text{free length}$$

50 LBS with valve lifted  
70 lbs in up position

- 7

Using a 10 swg. spring

$$\alpha = \frac{64 \cdot 30 \cdot (.407)^3 \cdot 10}{12,500,000 \cdot (.128)^4}$$

$$= \frac{64 \cdot 30 \cdot (.0575) \cdot 10}{12,500,000 \cdot (.0002685)}$$

$$\frac{19,150 \times .0575}{12,500,000 \times .0002685} = .324$$

$$\frac{1.8}{.324}$$

$$\frac{2.124}{.324} = \text{free length.}$$

34.7 LBS. in  $\frac{3}{8}''$  lift92.75 lbs per in  $\alpha$ 

64.7 lbs with valve lifted.

$$S = \frac{W R}{.196 d^3} = \frac{64.7 \times .407}{.196 \cdot (.128)^3}$$

$$S = 64,000 \text{ steady load}$$

LBS. per  $\square''$

$$S = ut + \frac{1}{2} at^2$$

where

$S$  = distance travelled in feet

$u$  = initial velocity in feet per sec.

$a$  = acceleration in feet per sec per sec

$t$  = time in secs.

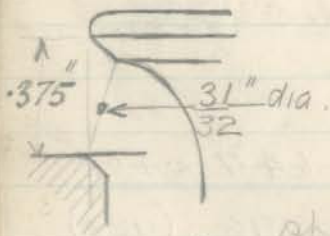
$$S = \frac{1}{2} at^2 = \frac{v^2}{2a} \quad (\text{where } v = \text{velocity in feet per sec.})$$

$$v = at.$$

Piston Speed of 7HP racer 3" stroke

$$= \frac{\text{R.P.M.}}{2} \text{ feet per min}$$

Speed of gas thro' valve seat (7HP racer)



Ring area = .96  
(counting only 2/3 as available = .64)

$$\text{speed} @ 1000 \text{ RPM.} = \frac{500}{.64} = \frac{\alpha}{3.8} \cdot \infty = 3000 \text{ feet per min}$$

Relations between power weight and speed

$$\text{Horsepower absorbed} = HP_f + HP_g + HP_a$$

where  $HP_f$  = horsepower required to overcome friction =  $\frac{G \cdot f \cdot V}{375c}$  where

$G$  = total weight in lbs.

$f$  = coefficient of friction (.01)

$V$  = speed in MPH

$c$  = efficiency (.80)

using  $c$  of as above  $HP_f = \frac{GV}{30,000}$

where  $HP_g$  = horsepower required to overcome gradient resistance =  $\frac{G \cdot \sin \alpha \cdot V}{300}$

where  $\alpha^\circ$  = angle of gradient

The foregoing can always be determined fairly simply