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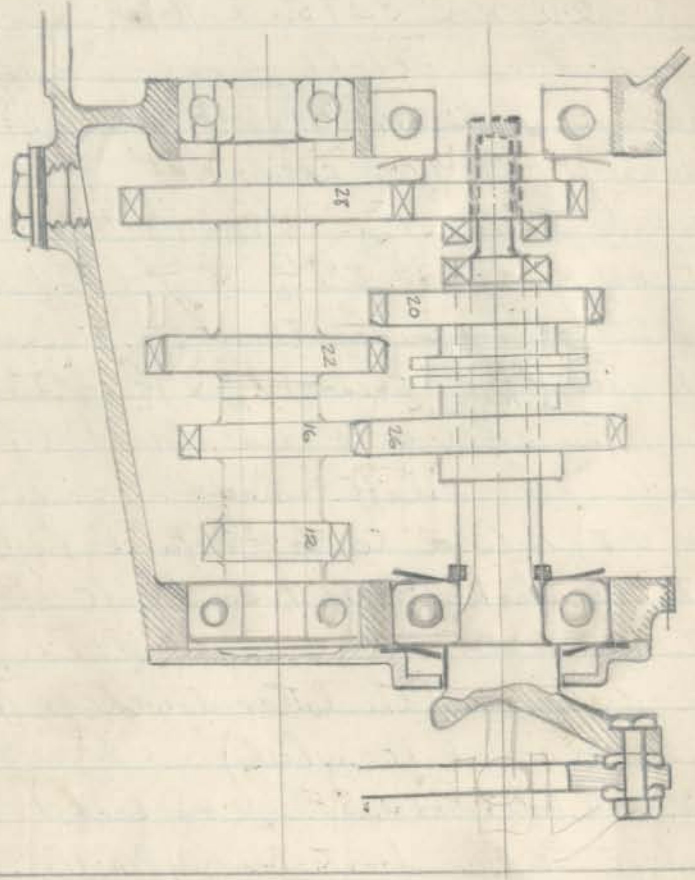
7 HP GEAR BOX



		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 x 81 = 740 cc

Taking 100 LBS. MEP.

$$BHP = \frac{A\,2\tfrac{1}{8}\odot \times 3.19 \times 100 \times 4 \times 1000}{792{,}000}$$

= 5.7 BHP @ 1000 RPM (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 Tooth constant mesh wheels

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

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Suggested modifications

- Inlet pipe ✓
- Exh. pipe ✓
- Camshaft ✓
- Valves ✓
- Piston
- Conn. rod — Spec mat?
- Compression ratio
- Tappets ✓
- Valve springs ✓
- Crankshaft

Speed of Car with varying gears @ varying rpm

27½ dia wheel

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

7 H.P. Racing Engine 2.2" x 3.4

Taking 100 LBS. MEP

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

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

Ind & exh. pipes

Inside dia of inlet $1\frac{1}{32}$" ($1\frac{1}{8}$ x 18 SWG)

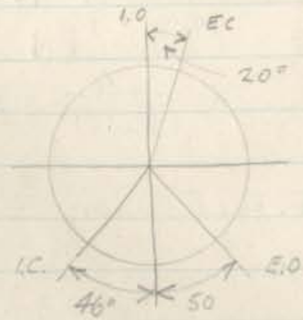
Area = .84 □"

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

= 1990 feet per min

= 3980 R.P.M.

Valve timing



tappet clearance

.006"

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Valves

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

Say ·2 lb. complete wt. of moving parts

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

1000 RPM = 16·6 R.P.S.

$1 \text{ rev} = \frac{1}{16{\cdot}6} \text{ sec.}$

$10° = \frac{1}{16{\cdot}6 \times 36} \text{ sec} = \frac{1}{600} \text{ sec.}$

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

5·85 feet per sec. @ 1000 RPM

K.E. @ 4000 RPM $= \frac{·2 \times (23{\cdot}4)^2}{2 \times 32{\cdot}2}$

1·58 LBS

@ 5000 $= \frac{·2 \times (29{\cdot}2)^2}{2 \times 32{\cdot}2}$

= 2·6 LBS

@ 6000 $= \frac{·2 \times (35)^2}{32{\cdot}2}$

3·8 LBS

Compression Ratio

Present head capacity = 44 cc
Using a $\frac{1}{16}$" washer takes off 3·5 cc.
Taking $\frac{1}{16}$" of cyl. head = 4 cc.

Leaving a capacity of 36·5 cc.

186·8 (swept volume)
36·5
223·3 cc.

$\frac{223{\cdot}3}{36{\cdot}5} = 6{\cdot}1$

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Valve springs

Required a spring
15/16 O.D.
Length (fitted) = 1.8"
Load (fitted) = 30 LBS
To allow valve lift of 3/8"
11 swg = .116"

$$\alpha = \frac{64\,W R^3 N}{G \cdot d^4} = \frac{64.30.(\cdot 42)^3\,10}{12{,}500{,}000.(\cdot 116)^4}$$

= ·627"

.627 deflection to fit
1.8 fitted length
2.427" free length

50 LBS with valve lifted
70 lbs in up position

Using a 10 swg spring

$$\alpha = \frac{64.30.(\cdot 407)^3\,10}{12{,}500{,}000.(\cdot 128)^4}$$

$$= \frac{64.30.(\cdot 0575).10}{12{,}500{,}000.(\cdot 0002685)}$$

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

1·8
·324
2·124 = free length.

34·7 LBS in 3/8" lift

92·75 lbs per in α

64·7 lbs with valve lifted.

$$S = \frac{W R}{\cdot 196\,d^3} = \frac{64\cdot 7 \times \cdot 407}{\cdot 196\,(\cdot 128)^3}$$

S = 64,000 steady load
LBS per □"

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$s = ut + \frac{1}{2}aT^2$

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.

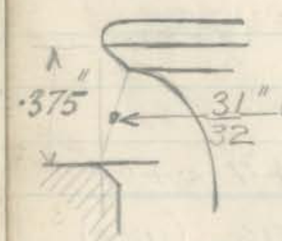
$s = \frac{1}{2}aT^2 = \frac{v^2}{2a}$ (where v = velocity in feet per sec.)

$v = aT.$

Piston Speed of 7HP racer 3" stroke

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

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



Ring area = ·96

(counting only 2/3 as available = ·64).

speed @ 1000 R.P.M.

$= \frac{\cdot 500}{\cdot 64} = \frac{x}{3 \cdot 8}$ ∴ x = 3000 feet per min

Relations between power weight and speed

Horsepower absorbed = $HP_f + HP_g + HP_a$

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

G = total weight in lbs.

f = coefficient of friction (·01)

V = speed in M.P.H

e = efficiency (·80)

using e & f as above $HP_f = \frac{GV}{30,000}$

where HP_g = horsepower required to over come gradient resistance $= \frac{G.\ Sin\alpha.\ V}{300}$

where $\alpha°$ = angle of gradient

The foregoing can always be determined fairly simply