

with racing cars. The H_p is
 the main factor to contend with

$$H_p = \frac{P_a \cdot v}{550 e} \quad \text{where}$$

P_a = resistance in lbs

v = speed in feet per sec.

Air resistance to flat plates

MPH	LBS. per ft ²	MPH	LBS. per ft ²
50	8.00	70	15.7
52.5	8.8	72.5	16.8
55	9.7	75	18.0
57.5	10.6	77.5	19.2
60	11.5	80	20.5
62.5	12.5	82.5	21.8
65	13.5	85	23.1
67.5	14.6	87.5	24.5

90 MPH = 25.9 LBS. per ft²

100 MPH = 32 "

120 MPH = 46 "

For M/C. work

A in Square feet

a) racing

b) sports touring

c) touring

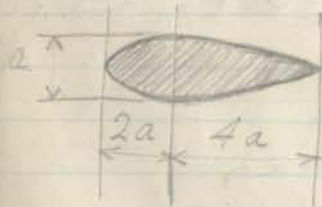
13.75
8.00
10.00

$$a) H_p = \frac{.024 V^2}{139}$$

$$b) H_p = \frac{.064 V^2}{139}$$

$$c) H_p = \frac{.104 V^2}{139}$$

True streamline form ?



Borlase Matthews

$$a = \frac{\pi^2 N^2 l}{21,600} \left(\cos \theta + \frac{1}{2n} \cos 2\theta \right)$$

feet per second per sec.

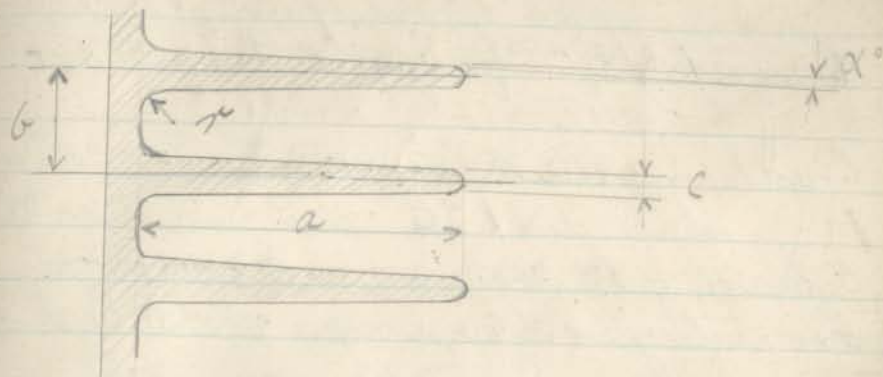
$$F = \frac{W a}{g}$$

F_a = inertia force in lbs.

$$= \frac{W}{g} \cdot \frac{\pi^2 l N^2}{21,600} \left(\cos \theta + \frac{1}{2n} \cos 2\theta \right)$$

$$= 0.0000142 W l N^2 \left(\cos \theta + \frac{1}{2n} \cos 2\theta \right)$$

Piston acceleration
& inertia forces



where d_c = dia. of cyl in mm.

$$a = .35 d_c$$

$$b = .10 d_c$$

$$c = 2 \text{ to } 2\frac{1}{2} \text{ mm.}$$

$$r = .018 d_c$$

$$\alpha = 2^\circ \text{ to } 2\frac{1}{2}^\circ$$

Fins for air-cooled cylinders

$$C = 2.6 (1000 a)^{.82}$$

where C = current in amps
 a = cross section in \square''

Cranksaft. for Engine $4\frac{3}{8} \times 6 \times 4$

Crankpin dia. $2\frac{1}{4}$ "

shaft dia: $2\frac{1}{4}$ "

5 bearings

Front brg. $3\frac{1}{2}$ " long.

3 cr. brgs. $2\frac{1}{2}$ " "

Rear brg. 4"

conn. rod brg. $2\frac{1}{4}$ "

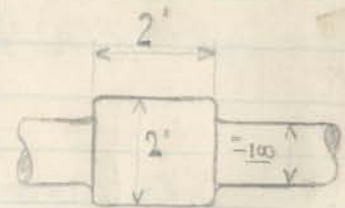
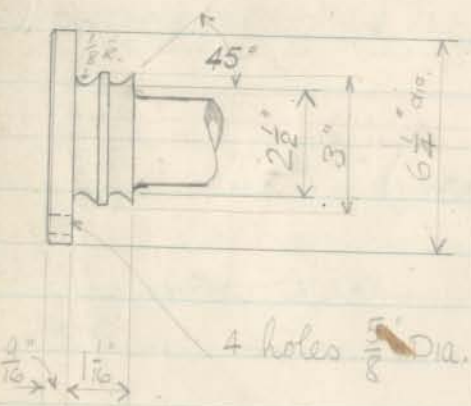
Webs $1" \times 2\frac{3}{4}"$

Pins drilled $\frac{1}{4}"$ dia.

Shaft drilled $1"$ dia.

$\frac{1}{4}"$ dia oil holes in webs & bearings.

Material
A.S. 20 (Austenitic)



Crankshaft. Brg.

Crankshaft End

also see page 68.

Sports 20HP Valve Spring

Fitted length $2\frac{9}{16}" = 96\frac{1}{2}$ LBS

Mean coil dia = 1.1

Load at $2\frac{13}{16}" = 64$ LBS.

130 LBS per in deflection

8 S.W.G = .160"

10 coils

Actual

$$\alpha = \frac{64 W(R)^3 N}{12,500,000 \times (d)^4}$$

$$\frac{64 \cdot 32.5 \cdot (.55)^3 \cdot 10}{12,500,000 \times (.160)^4}$$

$$\frac{64 \cdot 32.5 \cdot 155 \cdot 10}{12,500,000 \times .000656}$$

3140

$$\alpha = \frac{64 \cdot 32 \cdot (.4)^3 \cdot 9}{12,500,000 \times (d)^4}$$

$$1) = \frac{1170}{12,500,000 \times .000181}$$

$$= \frac{1170}{2260} = .52''$$

load with valve lifted = 55 LBS.

$$\alpha = \frac{1170 \cdot 10}{12,500,000 \times .00026} = .325''$$

2) load with valve lifted = 66 LBS.

$$1) S = \frac{55 \times .4}{.196 \times .000181} = 62,000$$

$$2) S = \frac{66 \times .4}{.196 \times .000268} = 50,000$$

Weight of valve, cups & shims	=	.146	LBS.
Weight of tappet	=	.086	
Weight of spring (.082 ^{lb})	=	.041	
		<u>2</u>	
			.273

complete weight for purposes
of calculating inertia force
= .273 LBS.

C 5000 R.P.M. velocity of tappet
reaches 29.2 feet per sec.
at which speed

$$K.E. = \frac{.273 \times (29.2)^2}{2 \times 32.2} = 3.6 \text{ LBS}$$

20 # Sports valve

lifts .137" in $\frac{1}{600}$ secs. @ 1000 RPM
6.85 feet per sec.

Wt. of Valve tappets & $\frac{1}{2}$ spring
= .877

$$KE = \frac{.877 \times (20.5)}{2 \times 32.2} \text{ @ } 3000 \text{ RPM}$$

5.74 lbs (per sec)

At half lift
at which spring load = 125

$$F = \frac{W a}{A g}$$

@ 3000 RPM.
a = a velocity 20.5 ft per sec. in
30° of camshaft or $\frac{1}{900}$ sec

$$\text{or } \frac{.01825'}{(.003)^2} =$$

$$\frac{.877 \times .01825}{32.2 \times (.0033)^2} = 50 \text{ LBS.}$$

@ 5000 RPM.

a = a velocity of 29.2' per
sec. in 30° of camshaft or
 $\frac{1}{500}$ secs.

$$\text{or } \frac{.0156'}{(.002)^2} =$$

$$F = \frac{.0156 \times .273}{32.2 \times (.002)^2} = 33 \text{ LBS}$$