with racing cars the HPa is the main factor to contend with

$$HPa = \frac{Pa \cdot v}{550\,e} \quad \text{where}$$

Pa = 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	3.75
b) sports touring	8.00
c) touring	10.00

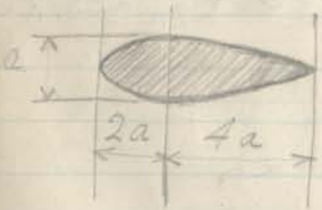
a) $HPa = \dfrac{.024\,V^2}{139}$

b) $HPa = \dfrac{.064\,V^2}{139}$

c) $HPa = \dfrac{.104\,V^2}{139}$

The Automobile Engr

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.

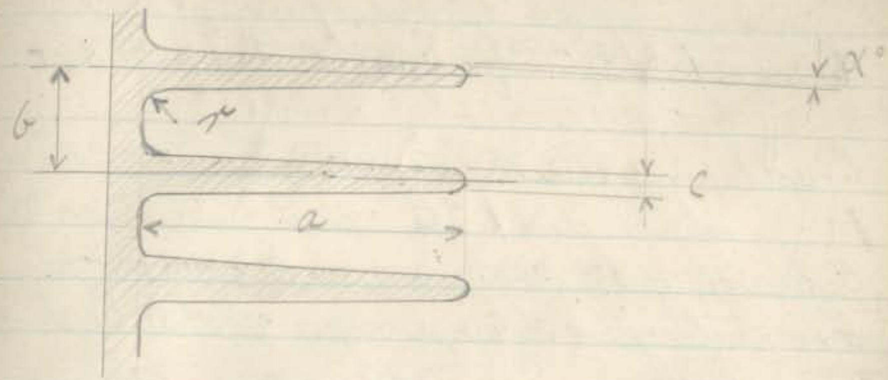
$$F = \frac{Wa}{g}$$

∴ Fa = inertia force in lbs.

$$= \cancel{\pi}\,\frac{W}{g}\cdot\frac{\pi^2 l N^2}{21.600}\left(\cos\theta + \frac{1}{2n}\cos 2\theta\right.$$

$$= 0{\cdot}0000142\, W l N^2 \left(\cos\theta + \frac{1}{2n}\cos.2\theta\right)$$

Piston acceleration
& inertia forces



where d = dia. of cyl in m.m.s

$a = {\cdot}35\, d$.
$b = {\cdot}10\, d$
$c = 2$ to $2\frac{1}{2}$ mm.
$r = {\cdot}018\, d$
$\alpha = 2^\circ$ to $2\frac{1}{2}^\circ$

} Das Motorrad

Fins for air-cooled cylinders

$$C = 2{\cdot}6\,(1000\,a)^{\cdot 82}$$

where C = current in amps
a = cross section in □"

Crankshaft for Engine $4\frac{3}{8}" \times 6" \times 4$

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

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

5 bearings.

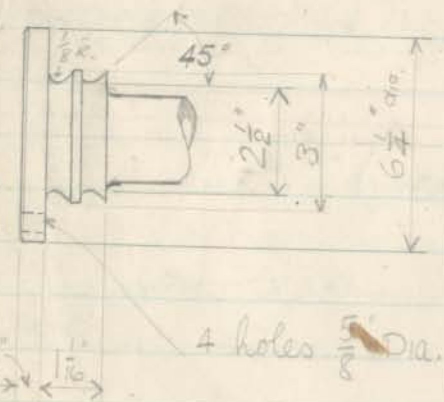
	Material
Front brg. $3\frac{1}{2}"$ long.	AS.20 (Austin spec)
3 cr. brgs. $2\frac{1}{4}"$ "	
Rear brg. 4" "	
Conn. rod brg. $2\frac{1}{4}$ "	

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

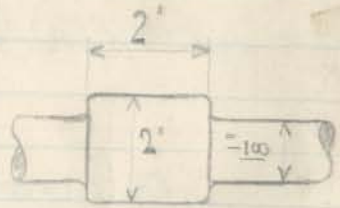
Pins drilled $1\frac{1}{4}"$ dia

Shaft drilled 1" dia.

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



Crankshaft End



Camshaft Brg.

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

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

$$\frac{64 \,.\, 32{\cdot}5 \,.\, ({\cdot}55)^3\, 10}{12{,}500{,}000 \times ({\cdot}160)^4}$$

$$\frac{64 \,.\, 32{\cdot}5 \,.\, {\cdot}166 \,.\, 10}{12{,}500{,}\cancel{000} \times {\cdot}\cancel{000}656}$$

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.

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

2) load with valve lifted = 66 LBS

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

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

	LBS.
Weight of valve, cups, & shims	= .146
Weight of tappet	= .086
$\frac{\text{Weight of spring (.082 lb)}}{2}$	= .041
	.273

Complete weight for purposes of calculating inertia forces = .273 LBS.

@ 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 H Sports valve

lifts ·137" in $\frac{1}{600}$ secs. @ 1000 RPM
6·85 feet per sec.

Wt. of Valve, tappets & ½ spring
= ·877

$$KE = \frac{\cdot 877 \times (20\cdot 5)}{2 \times 32\cdot 2}$$ @ 3000 RPM

5·74' lbs (per sec).

At half lift
at which spring load = 125

$$F = \frac{Wa}{g}$$

@ 3000 RPM.
a = a velocity 20·5 ft per sec. in
30° of camshaft or $\frac{1}{900}$ sec

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

$$\frac{\cdot 877 \times \cdot 01825}{32\cdot 2 \times (\cdot 0033)^2} = 50 \text{ LBS.}$$

@ 5000 RPM.
a ≑ a velocity of 29·2' per
sec. in 30° of camshaft or
$\frac{1}{500}$ secs.
or $$\frac{\cdot 0156'}{(\cdot 002)^2}$$

$$F = \frac{\cdot 0156 \times \cdot 273}{32\cdot 2 \times (\cdot 002)^2} = 33 \text{ LBS}$$