

Cube Root

Ex. 244,140,625 mark off by 3 digits at one time.

		(a)	(b)
244'140'625	625		
216		182	10800
28140			364
22328			11164
5812625		1865	4
5812625			1153200
- - - - -			9325
			1162525

All gases expand $\frac{1}{273}$ for every 1°C rise in temperature

(=37°)

540° units of heat (each sufficient to raise 1lb. of 1°C) are required to convert a pound of water into steam

Heat necessary to raise one gram of water from 0°C to 1°C is called a unit of heat or 1 calorie

−273°C or −460°F are supposed to be devoid of heat

Absolute temperature of boiling water equals 212°F + 460° = 672 (at atmospheric pressure)

772 ft. lbs. = 1 Unit of heat lbs. F°
1390 ft. lbs. = do lbs C°

$\frac{33000}{772} = 42.75 = 1$ HP

Absolute is pressure as ordinarily indicated by the pressure gauge + atmospheric pressure

966 units of heat are required to evaporate 1 lbs. of water at 212°F to 1 lbs. of steam at 212°F

Latent heat of steam at a given pressure, = 1114 − ·7t when t = temperature at that pressure

Total heat of evaporation form steam at any particular temperature = 1082 + ·3t appro

P × 144 × V = work done per lb of steam

when P = absolute pressure lbs. per
& V = volume of 1 lb in cu ft.

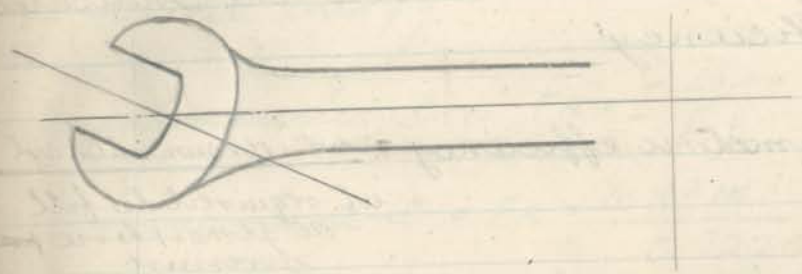
1 lb. of good coal gives 14500 units of heat on combustion $778 \times 14{,}000$
= 10,808,000 units of work

1 cubic foot of water weighs 62.32 lbs ($62\frac{1}{4}$)
1 gallon weighs 10 lbs
∴ 1 cubic foot = $6\frac{1}{4}$ gallons
1 ton = 224 gallons
1 cu ft = 1000 ozs.
1 gallon = 277.274 cu. ins

To find the weight of steam required per horsepower per hour.
= divide work done per horse power per hour by work done per lb of steam
Eg. Work per HP/hr = 33,000 x 60
= 1,980,000 ft. lbs. Work done per lb of steam at 100 lb p.s.i.
= 100 x 144 x 4·33 = 62352 ft lbs
∴ $\frac{1980000}{62352}$ = 31·7 lbs. = The weight of steam required per horsepower per hour under the above conditions

Algebraic Fractions:-

$$\frac{1}{2-x} = \frac{-1}{x-2} \quad \text{or} \quad = -\frac{1}{x-2}$$



Total efficiency = Air standard efficiency × relative efficiency × mechanical eff.

The A.S.E & R.E are usually taken together and called the Indicated Efficiency

$$\text{Volumetric efficiency} = \frac{\text{wt. drawn into cyl}}{\text{wt. required to fill at atmospheric pressure}}$$

3 causes of mechanical loss are :-
1) Piston friction
2) Bearing friction
3) Fluid friction

Torque. etc

$$HP = \frac{2\pi N \times M}{33{,}000} \qquad M = \frac{33{,}000 \times HP}{2\pi N}$$

where N = R.P.M & M = torque ~~of~~ in lb/ft

In twisting an elastic rod, work done $= \frac{1}{2} M \theta$ where θ = angle of twist in radians & M = maximum turning moment Also in compressing a spring etc Work $= \frac{1}{2} ML$

M = max. force applied in lbs.
L = distance in ft.

$$K.E = \frac{W V^2}{2g}$$

work done $= \frac{W}{2g}(v^2 - u^2)$ = change of kinetic energy

Angular acceleration $FR = I \frac{\omega}{t}$

Turning moment $= FR = \frac{\omega R^2 M}{t\ 32.2}$

First moment = MR
Second moment = $\frac{MR^2(W}{t\ 32.2}$

Centrifugal Force $= \frac{WN^2 r}{2935}$

W = weight in lbs.
N = revs. per min
r = radius of circle in feet

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Torque. etc

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Road Springs

e length and breadth of springs
ust be decided and the load to
arry assumed

Then $$N = \frac{1.5 W L}{f b t^2}$$

where N = no. of plates
f = stress
b = breadth in inches
t = thickness in dec
L = span in dec
W = load in lbs.

For this calculation the thickness
lso can be assumed and
adjusted afterwards to give
correct period of oscillation

Deflection

$$\alpha = \frac{W(L-l)^3}{42000\, n\, t^3 b}$$

α = deflection
W = load in tons
l = distance over clips