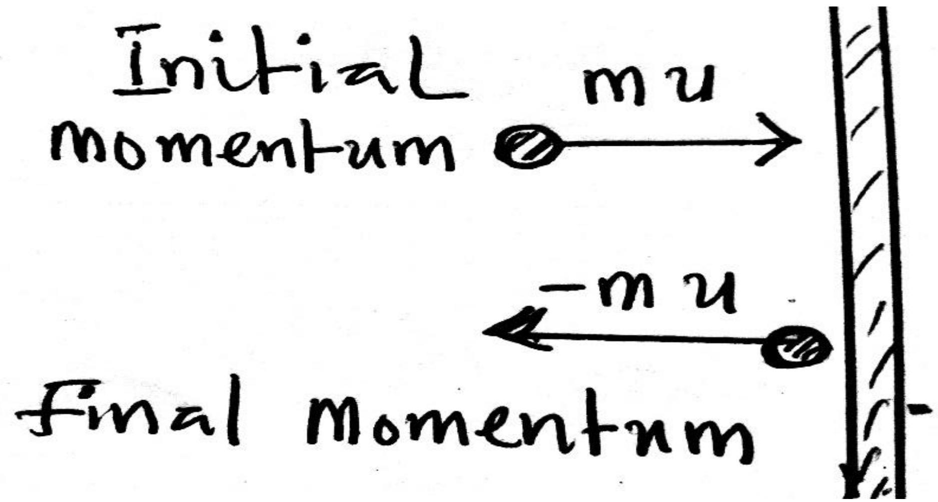
# FORCE EXERTED ON WALL




Momentum change = $mU - (-mU)$

$= 2\,mU$

$\therefore$ Force exerted on the wall $= \dfrac{change\ of\ momentum}{time}$

$= \dfrac{2mU}{t}$

# FORCE DUE TO WATER FLOW

Force f = momentum change per second of water

$$= \frac{change\ of\ momentum}{time}$$

$$= \frac{mass \times velocity\ change}{time}$$

= mass per sec × velocity change

**Example.**

Suppose water flows out of a pipe at 2kgs$^{-1}$ and its velocity changes from 5 ms$^{-1}$ to zero on hitting the wall. Calculate the force exerted on the wall

# Assignment I

A hose- pipe ejects water at a speed of 20 $cms^{-1}$ through a hole of area 100 $cm^2$. If the water strikes the wall normally, calculate the force on the wall in Newton assuming the velocity of the water normal to the wall is zero after collision. [Density of water $\rho_w = 1\ gcm^{-3}$]

Answer: 0.4 N

# Assignment II

Water is pumped through a hose pipe at the rate of 75litres per min. and issues from the nozzle with a velocity. Find

1. The force of reaction on the nozzle in N
2. The useful power of the pump in watts [1litre = 1kg]

Answer: 25 N 250 W

# <u>CALIBRATION OF A SPRING BALANCE (Elasticity)</u>

## HOOKE'S LAW

*"the extension produced in any elastic material (wire) is directly proportional to the force or tension in the wire if the elastic limit is not exceeded"*

If a wire extends by an amount **x** metres when a force **F** is applied, then within Hooke's limit of elasticity

$$\mathbf{F \; \alpha \; x}$$

$$\mathbf{F = k\,x}$$

Where **k** = constant of proportionality or spring constant

Or Stiffness

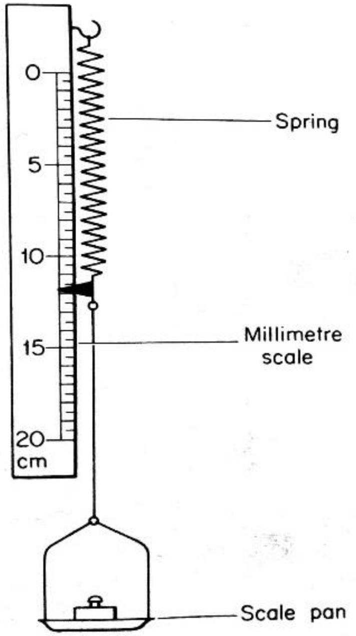
# THE HELICAL SPRING

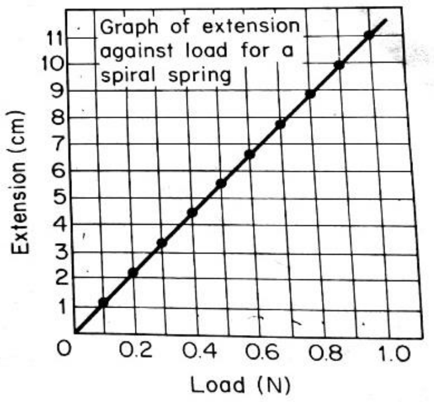
From Hooke's law

$$F = kx \quad \ldots\ldots\ldots\ldots (1)$$

$$\Rightarrow k = \frac{F}{X}, \qquad \text{Unit of } k = N\ m^{-1}$$

## CALIBRATED SPRING AND CALIBRATED GRAPH



From equation (1); A graph of extension plotted against force gives a straight line graph through the origin with slope, **S** as

$$S = \mathbf{k^{-1}} \qquad \mathrm{mN^{-1}}$$

The calibrated spring balance together with the calibrated graph can be used to measure unknown weight of a body in Newtons, and thus the mass of the body by simply dividing by g

**ILLUSTRATION**

Extension of spring, x = 5 cm, Corresponding force 0.49 N

$$\therefore \text{ Mass, } m = \frac{F}{g} = \frac{0.49}{9.8} = 0.05 \text{ kg}$$

END OF LESSON TWO