these lines will be equal in length to b,d and d,a respectively. Therefore, since b,d was proved to be equal to d,a the weight will equal the resistance.

3. Bisect AC in G; G is the centre of gravity of the square. Produce EB to intersect AC in F. Let w equal the weight of the squares. The force acting along FB will equal $q+w+3q+w=4q+2w$.

Take moments around G;

$(3q+w)\,AG-(4q+2w)FG-qGC=0$

But $AG=GC$

$\therefore\ FG=\frac{1}{2}AG.$

4. Since their velocities at the moment of collision were equal, had no collision occurred the first particle on arriving at B would have had the initial velocity (here zero) of the second particle.

$\therefore$ height of $B=384^2\div 2g=2304$.

5. Let g′ be the value of g resolved along CB

" g″ " " " " " CA

$$\therefore \frac{g''}{g'} = \frac{z}{x} \quad - \ - \ - \ - \ - \ - \ (i)$$

$$\sqrt{\frac{2x}{g''}}=\sqrt{\frac{2z}{g'}}-\sqrt{\frac{2y}{g'}} \quad - \ - \ - \ (ii)$$

$$\therefore \frac{\sqrt{z}}{\sqrt{x}} = \frac{\sqrt{x}}{\sqrt{z}-\sqrt{y}}$$

$\therefore z-\sqrt{(yz)}=x$

$\therefore (z-x)^2=yz.$

6. Resolving the initial velocity horizontally and vertically gives for the latter component 160 ft. per second, hence the time of flight from A to B would be $2(160\div g)=10$, therefore the time of the second particle's flight was $\frac{1}{2}(10-4)=3$ seconds and therefore the height of the point of collision was $3\times 160-16\times 9=336$ ft.

7. Let c equal the contents of the body in cubic feet, the weight of the body when immersed in water will be decreased by 1000 c oz. Hence when immersed in the first liquid its weight will be decreased by (1000 c+1) oz., and when immersed in the second liquid by (1000 c—1) oz., these therefore will be the respective weights of c cubic feet of each of the liquids

$$\therefore \frac{1000c+1}{1000c-1}=\frac{1000t+1}{1000t-1}$$

$\therefore\ c=t.$

8. 15 lbs. per square inch is 34560 oz. per square foot, therefore pressure at the surface is 34560 oz. per square foot and at a depth of 7 feet in the liquid it is (7000s+34560) oz. per square foot, s being the specific gravity of the liquid.

Writing *a.u.c.* for "air in unimmersed cone"

and *a.i.c.* for "air in immersed cone"

height *a.u.c.* : height of *a.i.c.* : : 7 feet 7 in. : 7 ft. : : 13 : 12

Similar solids are in the triplicate ratio of their like linear dimensions

$\therefore$ volume of *a.u.c.* : volume of *a.i.c.* : : $13^3 : 12^3$: : 2197 : 1728

$\therefore$ by Boyle's Law

7000s+34560 : 34560 : : 2197 : 1728

$\therefore S=1.34.$

NOTES.

1. Using the system of notation explained in solutions Nos. 2 and 3, page 239 of the August No., this solution becomes (nj^2+20j^3); $B+mj$; $C+20j^3$; $G+(5\sqrt{3}+5j^3)$; $A=0$

$\therefore\ n=5\sqrt{3}$

$m=45,$

and $AC=2CB.$

Some of our readers seem troubled about taking moments; it is simply the principle of the lever the point about which the moments are taken corresponding to the fulcrum. Treat AB as a lever with fulcrum at G, (iii) shows where an upward force of 45 lbs. (m = 45) must be applied to balance a downward force of 20 lbs. at B and one of 5 lbs. at A. (iv) is the statement of the relative distances of this point from A and B. Again in 3 treat AC as a lever with fulcrum at G, find where an upward force of $4q+2w$ (the force exerted by the string) must be applied to balance two downward forces one 3q + w at A, the other q at C.