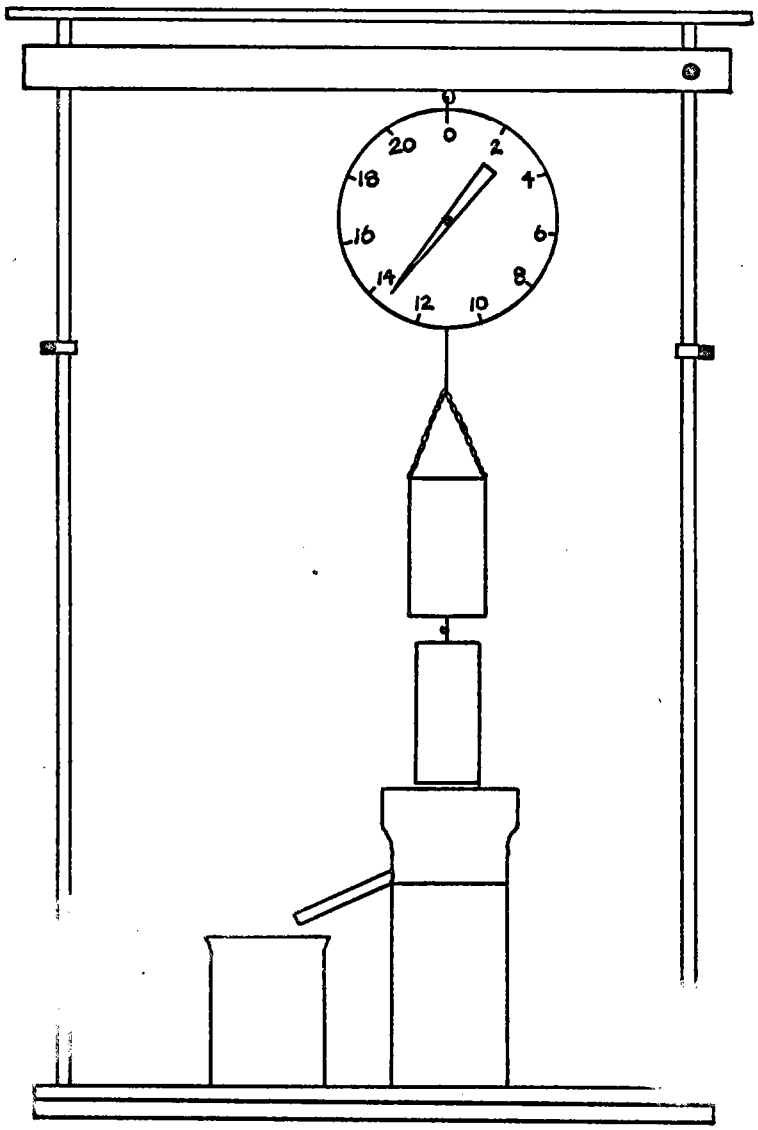
M-9: ARCHIMEDES PRINCIPLE PAGE 63

ABSTRACT: A cylindrical object is weighed in air and then when submerged in water. The loss in weight is recovered when the displaced volume of water is added.A simple, quantitative, vivid demonstration useful for 104, 100A and 110.

EQUIPMENT: 1) Cylindrical object with equal volume can, large dial spring scale, special overflow beaker, 2-500 ml beakers, special stand. (Welch #1093)



DEMONSTRATION: We wish to show that the force exerted upon an object immersed in a fluid (the buoyant force) is exactly equal to the weight of the displaced fluid (in this case water). To this end we:

1) fill the overflow beaker with water until water begins to flow out the spout,

2) show that the object exactly fits into the can (proving that the volume of the can and the object are the same),

3) hang the can on the scale with the object suspended below the can and record the weight. (it reads about 13.2 in arbitary units)

4) now loosen the clamp and lower the apparatus so that the object is completely immersed in the water but not touching the bottom, there is a stop on the stand marking the correct location

5) read the scale again (about 9.7 units) the difference between these two is the buoyant force

6) while the object is still submerged fill the can with water. The scale reading will now increase to the original value showing that the weight of the displaced fluid has exactly compensated for the buoyant force.

This is a very straightforward, quantitative, nearly foolproof demonstration and is highly recommended.

DIFFICULTIES: 1) Make sure to check the zero point of the scale. It can be changed by rotating the face with respect to the spring.

2) The scale is qraduated in arbitrary units which, if you insist, are 1 unit = 100 x 980 dynes.

3) Do not put the object inside the cylinder when you return the apparatus as the left over moisture corrodes everything.