Chemistry, Physics, Technology, etc.

A DEVICE FOR DEMONSTRATING THE LAWS OF THE CENTRAL FORCES.

BY PROF. A. E. DOLBEAR.

The want of definiteness in the conditions under which experiments are usually made with the common turning-table, especially when applied to the demonstration of the laws of the central forces, has led me to devise the following modification of the apparatus for this work. The performance is good, and I therefore submit a description of it, for the benefit of those who teach mechanics, and especially for those who may study it in any of the various physical laboratories.

The usual form of apparatus for this work, as it is constructed by instrument makers, is too well known to be described here. The subjoined figure will sufficiently well indicate the modification so that any one possessing the common arrangement for raising a weight by the centrifugal force of a ball running upon a wire, can adapt his instrument to it. The frame work *a*, which is screwed to the shaft, has the upright posts *b b*, and the frame *c*, having a wire stretched upon it for the ball, *e*, to move upon. Instead of the usual weights to be raised I substitute a common spiral spring balance, *d*, which hangs from the top bar and is connected to the ball by a stout string tied to its hook, passing round the small pulley at the bottom and thence to the hook upon the ball.

It is evident that when the ball, *e*, moves toward the end of the wire the index of the scale will indicate the number of pounds pull. When the machine revolves the ball is driven outward, and of course pulls upon the scale, which in turn directly points with its index the number of pounds, or, in other words, the centrifugal force. It may be thought that when the scale itself is turning fast the index could not be seen; but, if one stands in such a position that the light from a window or a lamp will be reflected from its face to him, the index

and figures can be plainly seen, no matter how fast it goes. The radius of the circle described by the ball, e , can be found by adding to its distance from the centre of revolution, when at rest, the measured distance from zero on the scale to the number of pounds indicated. Then, if the weight of the ball itself is known, all the data for the demonstration are had at once. This form will easily permit of graphical construction for the results, which is quite an advantage for a learner.

CONVECTION APPLIED TO THE DETECTION OF HEAT:

From a Lecture on "The Sources of Heat."

By L. C. COOLEY, PH. D.

I have been thus careful to fully illustrate the production of air currents by changes of temperature in order that I may freely use this principle of convection to make visible to us all the delicate phenomena by which I hope to illustrate the fundamental principles in the science of heat.

Let me describe the instrument by which this novel application is made. You would, no doubt, at first view, pronounce it a form of Coulomb's Electrometer. You observe the slender needle suspended horizontally in this glass case, but you cannot observe the exceedingly delicate silk fibre by which it hangs. This needle is a glass tube. It was made by taking a very much thicker glass tube and, in the usual manner, drawing it out to this degree of fineness. It is about four and a half inches in length, and carries a pith ball at one end. This pith ball is blackened—it was rolled in dry lampblack—that it may be more easily seen. The needle, with its pith ball, together with the necessary cement and the varnish which covers it, weighs nearly one and a half grains. Just below the needle is a horizontal disk, the circumference of which is graduated, and the centre of which, when the instrument is level, is exactly in the prolongation of the vertical fibre which sustains the needle. In the cover of the glass case, and just over the zero of the scale below, is an opening through which a body may be thrust when we would bring it into the neighborhood of the pith ball. The motion of the needle will declare the presence of heat or cold. Here is a copper wire which I hold in my hand, and while uttering this sentence I am pressing the end of it gently against my face. Let me thrust it down upon the zero of the disk, the pith ball now standing at 20° away. The needle begins to swing. You