rived; also by aid of (4) and Newton's third law, that "action and reaction are always equal and contrary" the problem of impact of two particles can be solved.

8. By pursuing the course outlined above, the student has to learn and thoroughly understand, only two simple formulas, $M = W/g$, $F = Ma$.

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GRAVITATION AND ELECTRICAL ACTION

In a paper to be published by the Academy of Science of St. Louis, evidence will be presented which appears to show conclusively, that gravitational attraction is diminished by electrical charges on the acting masses. The suspended masses of the Cavendish experiment are wholly enclosed in a shield of sheet metal. The small observation window is covered with wire gauze. When a knob terminal connected with the influence machine is moved towards or away from a knob terminal connected with the large attracting masses, the suspended masses slowly move to and fro around the vertical line of suspension. No disruptive discharges occur. It is found that gravitational attraction is decreased by either positive or negative electrification. By the to-and-fro movement of the knob terminal, the amplitude of vibration can be gradually increased from 2.5 minutes of arc to 50 minutes. It has been established by experimental methods that these results are not due to heat effects.

Francis E. Nipher

THE PRODUCTION OF RADIUM

To the Editor of Science: On page 799 of the June 2, 1916, issue of Science a statement is made in regard to the production of radium by the Standard Chemical Co. in the year 1915, which is not in accord with facts, and I wish to make this correction. The actual amount of radium produced by the Standard Chemical Co. during 1915 was slightly more than 3 grams of radium element and of this the larger proportion was produced in the first three months of the year from radium which was in process of treatment during the latter part of 1914.

In this same article the production of radium at a cost of $37,599 per gram by the National Radium Institute Inc. working in cooperation and under the supervision of the Bureau of Mines, is compared with the market price of radium of $120,000 a gram. The radium produced by the National Radium Institute was obtained from high-grade carnotite ore treated without concentration, and the cost of production under these conditions is not properly comparable to the cost of production or the selling price of radium from lower grade ore or concentrates.

Applying the Bureau of Mines process to unconcentrated ore containing about 1.5 per cent. of uranium oxide (which is higher than the average carnotite ore) makes the cost of production nearer $70,000 than $40,000 per gram. Since this is practically the condition under which commercial producers of radium must operate, it would be fairer to compare cost of production by the Bureau of Mines process on this basis, rather than on the basis of the uncommercial and somewhat artificial conditions, connected with the treatment of the 1,000 tons of high-grade ore. Concentration of the low-grade ore, if practised, naturally reduces the efficiency of extraction, and in this way would raise the cost of production.

While it is true that the war cut off practically the entire European market to radium producers, it must be added that the growing American market for radium has been very adversely influenced by the widespread publishing of statements, from the United States Bureau of Mines, similar to the statement in Science which we are criticizing. The general effect of these statements has been to lead prospective purchasers of radium to believe that radium would soon be available at enormously reduced prices. Emphasis being laid by the Bureau of Mines on the exceptionally low cost of production, and in general no mention being made of the fact that this low cost of production was in a large measure due to the abnormal and uncommercial conditions under which the Bureau operated.

As regards ore concentration it is also interesting to note that the method used by the Bureau of Mines is one which has been used