SIMPLE EXPERIMENTS IN PHYSICS.

BY GEO. M. HOPKINS.

Although there is no shorter or quicker route for the descent of a falling body than that of a plumb line, it has been shown that a body projected horizontally with whatever force, and describing a long trajectory, will reach the earth in exactly the same time as another similar body simply dropped from the same height. There are many simple and ingenious devices for demonstrating this fact. If the experiment could be brought within convenient compass for observation, nothing would be better for the purpose than an ordinary gun, with powder as the propelling power, but this is of course out of the question. It is therefore necessary to resort to apparatus which may be used in an ordinary room, so that both projected and falling ball may be seen and heard. The apparatus is still a gun, but a very harmless and inexpensive one. It is a modified "Quaker gun," a well known toy used for shooting marbles.

Fig. 1 is a perspective view of the gun, showing it immediately after its discharge, and Fig. 2 is a longitudinal section showing the gun ready to be discharged. The gun consists of a wooden barrel chambered at the muzzle to receive the marble and provided with a rod attached to the breech piece, extending into the barrel and arranged to be propelled forward by a strong elastic rubber cord stretched over the breech piece, with its ends nailed to the sides of the gun barrel.

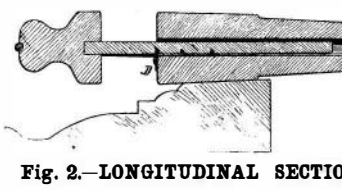


Fig. 2.—LONGITUDINAL SECTION OF GUN.

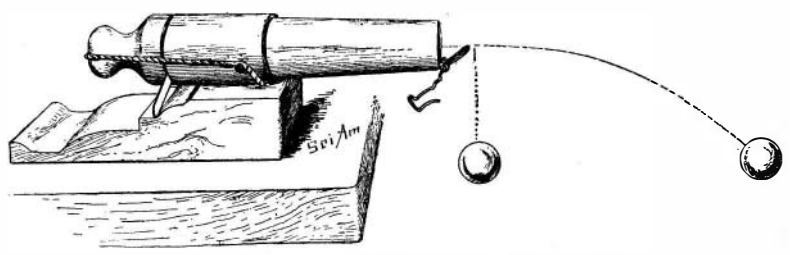


Fig. 1.—FALLING AND PROJECTED BALL.

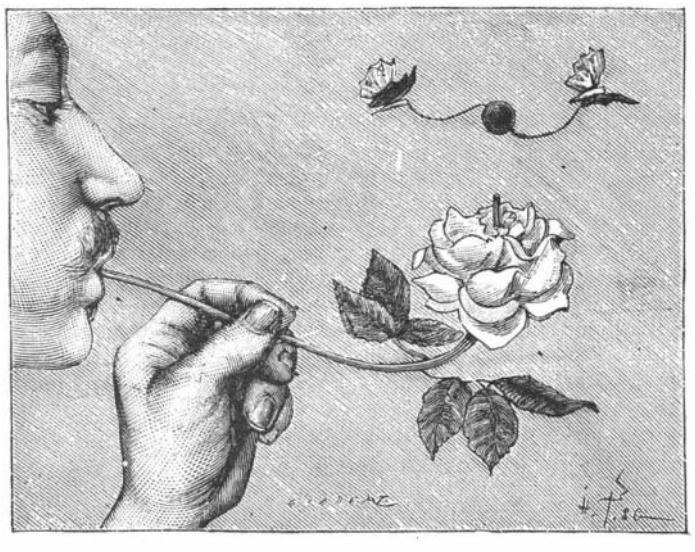
Two changes only are required to adapt the gun to scientific use. First, the notching of the rod passing through the barrel and the application of the trigger, D, for engaging the notches, and second, the support for the falling ball at the muzzle of the gun. The trigger, D, is merely a strip of sheet metal pivoted to the end of the barrel by an ordinary screw. In the muzzle of the gun at the under side is formed a slot, A, and in the end of the gun on opposite sides of the slot are inserted eyes, B. In these eyes is journaled a wire support, C, which supports the ball to be dropped at one side of the muzzle out of the path of the projected ball. The wire support, C, forms a lever, one end of which projects into slot in the barrel and is held by the ball in the muzzle. When the rod in the barrel is liberated by pulling the trigger, D, the ball in the muzzle is projected, thereby releasing the wire support, which immediately turns and allows the other ball to drop. It will be noticed that both balls reach the floor at exactly the same time, without regard to the amount of force applied to the projected ball.

The falling ball is impelled by the force of gravitation only. The projected ball is acted upon by two independent forces—the force of gravitation, which draws it toward the earth, and the projecting force, which tends to move it in a horizontal line. The projecting force is concerned only in carrying the ball horizontally forward, and does not in any way interfere with the action of gravitation, but gravitation brings the ball gradually nearer the earth, until it finally strikes, the force with which it strikes being the resultant of the two forces acting upon it.

THE MAGIC ROSE.

All our readers know the experiment which is familiar to rifle and pistol marksmen, and in which an egg shell is made to remain in equilibrium at the top of a jet of water. A very light ball of cork, or even a pellet made of bread crumbs, is capable of resting in equilibrium in a current of air, and the method of performing the experiment we have already given in a preceding number. One of our readers, Mr. Martinaud, an electrician, sends us, under the name of the "magic rose," a charming little device based upon the same principle. The apparatus is not new, but is none the less interesting, and is not much known. The artificial rose, which is of paper, is traversed by a metallic tube that forms its stalk. This tube, on the one hand, extends slightly beyond the petals of the flower, and on the other is prolonged in such a way that it can be held in the mouth, the flower being at a distance of about ten inches from the eyes.

If the tube be blown into regularly, and a small elder pith ball, to which two artificial butterflies are affixed by slender wires, be placed over the flower, the ball, when well centered in the current of air, will remain suspended therein at an inch or so from the flower. As the current of air is invisible, the effect produced is very surprising, and the butterflies, incessantly in motion, appear to be engaged in rifling the flower of sweets, after the manner of living ones.



THE MAGIC ROSE.

It sometimes happens that the ball revolves in the current and carries along the butterflies, which thus describe a circumference around an axis. It is unnecessary to say that the blowing must be done with great regularity.—*La Nature.*

Blisters on Panels.

This is a subject which has puzzled a great many, and various have been the different explanations given concerning the cause and remedy; we propose among the others to give what we believe is one great cause, and that is the direct influence of the sun's rays. We have noticed that in nearly every instance the blisters show themselves during the summer months. We have also noticed that immediately after a shower, when the carriage has been exposed to the rain and then left standing with great drops of water on the panels, the danger is greatest, although the theory has been that the shower has cooled them off; we think different, in at least this respect. The rain may have cooled the great body of the surface off, but where the spots of water are allowed to remain, and the full force of the sun is brought to bear upon them, they are then converted into what might be called suctions; the heat is in a measure concentrated into a small surface, which in the act of drying draws the softened paint up into what we call blisters; that is our opinion, formed after some little observation.

After the blister is once allowed to dry, there is no way to get it down; any attempt to do so would break it off, as it then becomes brittle, exactly as it does when you blister with the iron or lamp when burning off. In this case, if taken in time, it has this advantage over the other: it is not burnt paint as the other is, but simply softened up and drawn; it looks as though it was twice as large as the other, but in reality is not; by simply pressing down on it while it is hot you can restore it to its place, of course with the loss of considerable of its luster; it will naturally show where it has been, but will not be a blank space, as it would be if allowed to flake off. Another way blisters are liable to form is to allow the job to stand either in the coach house or shop near a window; the sun is very likely to form a focus on some of the panes, and, striking on the panels of the body, or, as in some cases, on the carriage parts, the rays are concentrated on one particular spot, acting just as though it was what in our boyhood days we used to call a burning glass.

The safest way to guard against all danger is, be careful about how the carriage is subjected to either the rain or heat. If caught in a shower, have a chamois skin with you; it will not take very long to dry the surface off, and then you are sure you are running no risks. If compelled to stand any length of time in the sun, turn the carriage around once in a while, so as to allow the sides to cool alternately. The danger is not near so great when the painting has been done properly on the job. Never allow the carriage to stand in the coach house near a window, unless you have a cover for the exposed parts, or curtains on the windows, and above all do not cool your carriage off too suddenly while it is heated, by dashing water over it in that condition; let it cool off gradually by standing in a shady place, or at least until you can bear your hand on it without almost burning it. The reason is that the varnish and paint is softened up so that the sudden reaction will be very likely to cause it to crack, if not to flake off altogether. Water should never be allowed to dry on a carriage, either by the action of the sun or atmosphere, but should be dried off with a chamois.—*Carriage Monthly.*

The Coolest Town in the World.

In the Berlin *Meteorologische Zeitschrift* for June, so says *Nature*, Dr. Hann gives an interesting account of the winter temperature of Werchojansk (Siberia), deduced from several years' observations. The town, which lies in the valley of the Jana, about 9 feet above the level of the river, in latitude 67° 34′ N., longitude 133° 51′ E., and at a height of about 350 feet above the sea, has the greatest winter cold that is known to exist upon the globe. Monthly means of —58° F. occur even in December, a mean temperature which has been observed nowhere else in the polar regions; and minima of —76° are usual for the three winter months (December-February). In the year 1886 March also had a minimum —77°, and during that year December and January never had a minimum above —76°, while in January, 1885, the temperature of —89° was recorded. These extreme readings are hardly credible, yet the thermometers have been verified at the St. Petersburg Observatory. To add to the misery of the inhabitants, at some seasons the houses are inundated by the overflow of the river. The yearly range of cloud is characteristic of the climate; in the winter season the mean only amounts to about three-tenths in each month.

Artificial Emeralds.

At a recent session of the French Academy of Sciences, Mr. Daubree, in behalf of Messrs. Hautefeuille and Perrey, presented an interesting note on the production of emeralds. These learned chemists have succeeded in producing very beautiful crystals of emerald by fusing silica, alumina, and glucina (with traces of oxide of chromium) with acid molybdate of lithia. The materials were heated to a temperature of from 600° to 700° for fifteen days.

There were obtained 15 grammes of small crystals of about a millimeter, having all the mineralogical and physical characters of the natural emerald. The longer the operation is continued, the larger the crystals become.—*Annales Industrielles.*

THE MAGIC ROSE BUSH.

In lectures on chemistry, the professor, in speaking of aniline colors, in order to give an idea of the coloring power of certain of these substances, performs the following experiment:

Upon a sheet of paper, he throws some aniline red, which, as well known, comes in the form of iridescent crystals. He shakes the surplus off the paper into the bottle, so that it would be thought that nothing remained on the paper. If, however, alcohol, in which aniline colors are very soluble, be poured over the paper, the latter immediately becomes red.

This experiment may be varied as follows: Instead of scattering the aniline over paper, it is dusted over the flowers of a white rosebush, and the flowers are shaken so as to render the dust invisible, and then, when a visit is received from an amateur of horticulture, we tell him that we have a magic rose bush in our garden, the flowers of which become red when alcohol or cologne is poured over them. The experiment is performed with the aid of a perfumery vaporizer, and the phenomenon causes great surprise to the spectators who are not in the secret.—*La Nature.*

THE MAGIC ROSE BUSH.