SIMPLE EXPERIMENTS IN PHYSICS.

BY GEO. M. HOPKINS.

Impulses which, occurring singly or at irregular intervals, are incapable of producing any noticeable effects, may, when made regularly, under favorable circumstances, yield astonishing results. The rattling of church windows by air waves generated by a particular pipe of the organ, a bridge strained or broken by the regular tramp of soldiers or by the trotting of horses, the vibration of a six or eight story building by a wagon rumbling over the pavement, a factory vibrated to a dangerous degree by machinery contained within its walls, a mill shaken from foundation to roof by air waves generated by water falling over a dam, are all familiar examples of the power of regular or harmonic vibrations.

Harmonic vibrations result from regularly recurring impulses, which may be very slight indeed, but when the effects of the impulses are added one to another, the accumulation of power is sometimes very great.

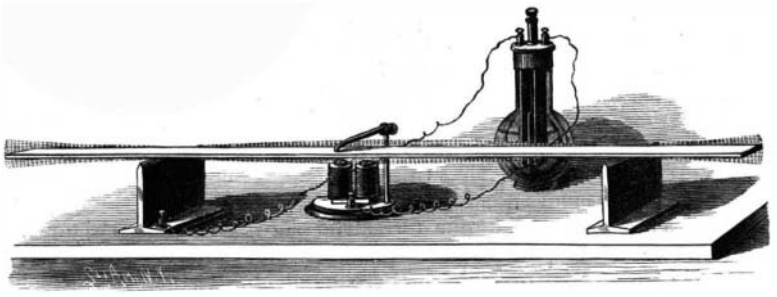
To secure cumulative effects, the impulses must not only be regular in their occurrence, but the body receiving the impulses must be able to respond, its vibratory period must correspond with the period of the impulses And further than this, the impulses must bear a certain relation to a particular phase of the vibration, in order that they may act upon the vibrating body in such a way as to augment its motion rather than diminish it.

There are railroad bridges that vibrate alarmingly when crossed by locomotives running at a certain speed, the vibrations being caused by the comparatively slight lack of balance in the driving wheels and connecting rods. For this reason the speed is restricted on such bridges.

During the early tests of the East River bridge between New York and Brooklyn it was found that the structure was so massive and its vibratory period so slow that it could not be injuriously affected by the marching of men or the trotting of horses; consequently, travel proceeds on this bridge as upon any highway.

A well known English physicist is reported to have said that with suitable appliances he could break an iron girder by pelting it with pith balls. An experiment of this kind would certainly show in a striking manner the effects of very slight rhythmic impulses. As it is manifestly impracticable to perform such an experiment, an easier method of illustrating harmonic vibrations must be sought.

In the accompanying engravings, Fig. 1 shows how a bar of steel may be set in active vibration by drops of water. The bar is supported at nodal points upon angular pieces of wood. Above the center of the bar is arranged a faucet, which communicates with the water supply. The bar is first vibrated by hand, and the faucet is adjusted so that the water drops in unison with the vibrations of the bar. The motion of the bar is then stopped, and the water is allowed to drop on it. The bar soon begins to vibrate, and in a short time the vibration acquires considerable amplitude. In Fig. 2 is shown an experiment in which the intermittent pull of an electro-magnet is made to accomplish the same thing. In this case the steel bar forms a part of the circuit. The magnet is provided with a light wooden spring-pressed arm, carrying a contact point and a conductor. This arm is arranged to follow the bar up and down through the upper half of its excursion, breaking the contact at the median position of the bar. The magnet becomes alternately magnetized and demagnetized, and the bar is alternately pulled down and released. The bar used in these experiments is ¼ in. thick, 1¼ in. wide, and 8 ft. long. A much larger bar might be used. Without doubt, even an iron girder of great size and weight might be set in active vibration by the same means.



Fi . 2.—VIBRATION BY MAGNETIC IMPULSE.

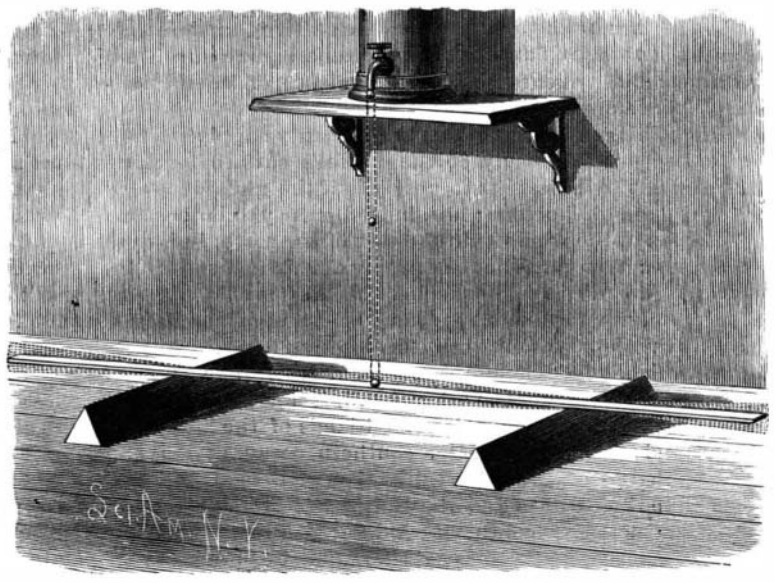


Fig. 1.—HARMONIC VIBRATION.

THE NEW DIEULAFOY HALLS AT THE LOUVRE.

Our readers will remember that we several months ago published an account of the travels of Madam Jane Dieulafoy, the young and intrepid explorer, who shared with her husband the fatigue and perils of the interesting excavations made in Susiana by the expedition of which he had command.

Mr. and Mrs. Dieulafoy have deposited the curious collection brought back by them in that part of the Louvre that had been put at their disposal. An inauguration of the halls that will henceforth bear the name of their organizers took place quite recently. The objects exhibited therein were discovered at 1,300 feet from the Persian Gulf, in a country in which no roads are laid out, and in which means of communication are consequently wanting. The whole had to be transported on camel back to a distance of 240 miles. From this may be seen how difficult was the undertaking, and what energy had to be displayed for several consecutive years, in order to make it a success.

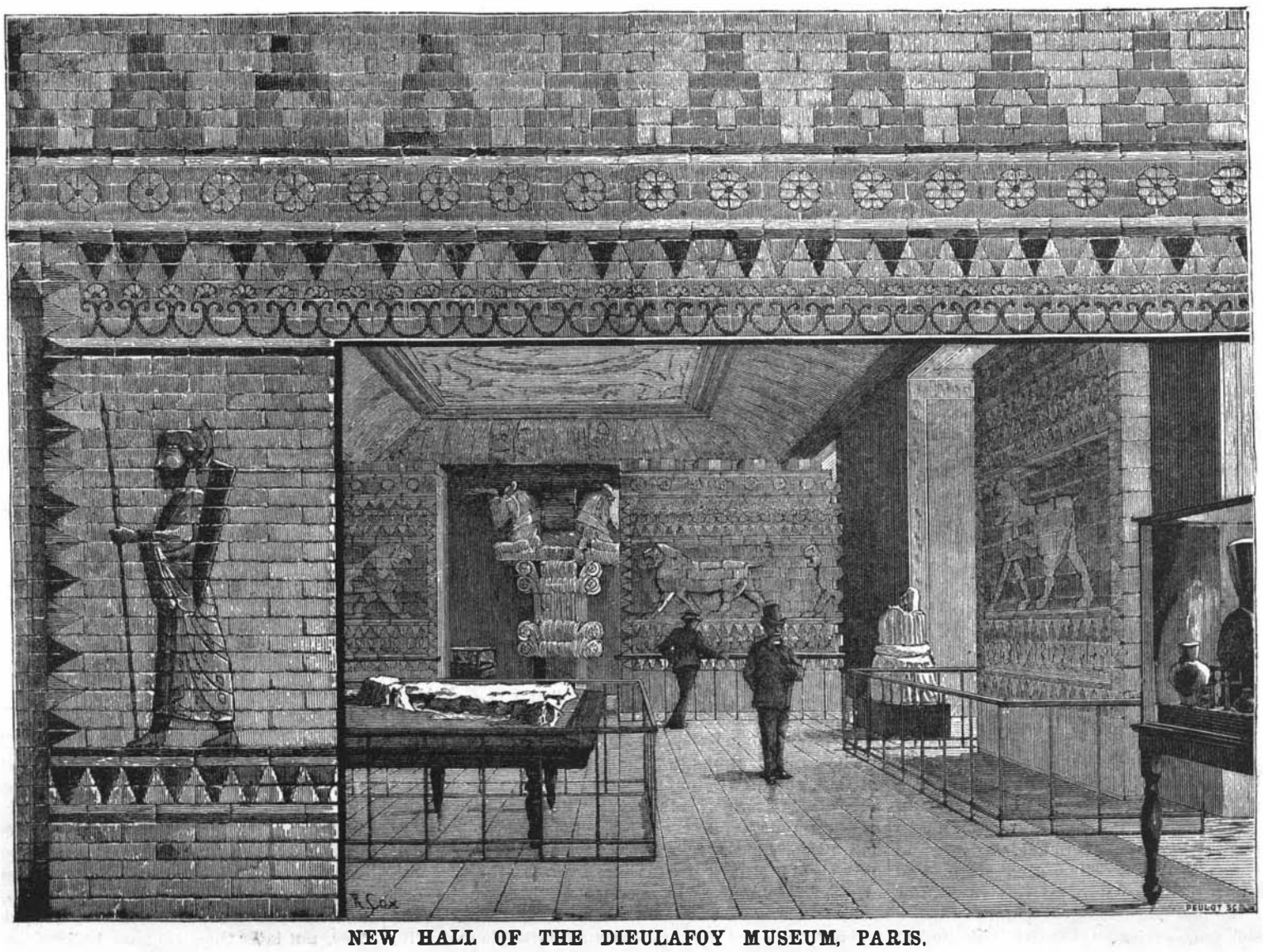
As may be seen from an examination of our engraving, the Dieulafoy halls contain some exceedingly curious objects. Among other things, there are fragments of walls, and even entire walls from the palace of Darius, and glazed bricks set off with ornaments of wonderful coloring. On one side we see lions, and on the other archers in profile holding their weapons in hand.

The sides of the two halls are hidden by these walls, the aspect of which is very pleasing and harmonious. Their facing is of a turquois blue color, and the black-visaged figures are clad in yellow and white, with the skirt escutcheoned with the three towers of Susa. In the rear of the museum we remark a colossal capital formed of oxen's heads.

The decoration of the halls in which are grouped so many interesting souvenirs of a vanished civilization is in the Persian style, and the ornamentation has been very conscientiously elaborated.

Clothed in the male costume that she usually wears, and a buttonhole decorated with the ribbon of the Legion of Honor, Madam Dieulafoy did the honors of the halls to the few privileged invitees who were present at the inauguration.—*Le Monde Illustre.*

NEXT to moral weakness, a fear of the difficulties to to be met is, undoubtedly, the most unfortunate mental trait of any young person.



NEW HALL OF THE DIEULAFOY MUSEUM, PARIS.