the wind-mill. The two separate flues to the fireplace might prevent the draught from being interfered with by the axle. But would not a fire in a grist-mill be dangerous?

The hearth of the fireplace was elevated above the floor, as in a forge. The building had two stories above the ground. Its total height is about twenty-five feet.

The stones, many of them granite, show no drill-marks and no marks of an axe, but do show marks of the hammer. C. S. Peirce.

THE 'HOOD' OF THE HOODED SEAL,[1] CYSTOPHORA CRISTATA.

All the figures of the hooded seal which I have seen represent the animal with a great bunch on the top of its head. This bunch is made to vary somewhat in shape, size, and position, in the different illustrations; but all agree in placing it on top of the head, no part ever protruding beyond the jaw. It is sometimes pictured as extending transversely across the crown, sometimes as a double or single roll reaching from the nose to the occiput. The earliest delineation of it which has fallen under my observation is that given by the old missionary, Hans Egede, in his description of Greenland, published in 1741 (fig. 1). Crantz, who was also for many years a missionary in Greenland, said, "The forehead is furnished with a thick folded skin, which the animal can draw over its eyes like a cap, to protect them from stones or sand driven about by the surf in a storm." And even Dr. Rink, in his recent excellent work on Danish Greenland, says that this seal 'is well known from the bladder on its forehead.' In Griffith's

Fig. 1.

'Cuvier' it is stated that the hooded seal "has the power of bringing a fold of skin placed on the forehead, forward, so as to cover the eyes, which it does when threatened, or about to be struck. . . . When at rest, or drawn back, it considerably enlarges the apparent size of the neck and shoulders." The only adult hooded seal, so far as I am aware, possessed by any museum in America, is in the American museum of natural history at Central Park, New York. Its head is very well represented in the accompanying drawing (fig. 2).

Fig. 2.

Determined to visit the seal-fishery in person, I set sail from Halifax in February, 1883, proceeding northward from Newfoundland in the cabin of the ill-fated Proteus, in her annual cruise to the sealing-grounds. On the 18th of March, after a somewhat laborious walk over an ice-floe, I found myself face to face with a family of hoods, and discovered that the male, — a huge beast, bigger than an ox, — instead of having a crest, or fold of skin, on the top of his head, was provided with a great proboscis, suggesting that of the sea-elephant of the antarctic (fig. 3). He looked on with apparent indifference, while his mate, solicitous for her young, advanced to meet me, growling fiercely, and displaying her sharp, curved teeth. Wishing to observe her actions, I annoyed her for a few minutes with my gaff, — a proceeding which it is by no means safe to undertake with the male. While this encounter, in which she was the aggressive party, was in progress, her spouse began to manifest symptoms of uneasiness, and finally became very much enraged, though he did not attempt to drag his ponderous body to the scene of the conflict. He at first showed his displeasure by frowning, and wrinkling the skin on his long snout. The tip of the proboscis was then inflated and emptied several times in rapid succession, after which the entire 'hood' was partially inflated. In

[1] Abstract of a paper read before the Biological section of the American association, Sept. 9, 1884.

addition to its numerous and ever-changing contractions, there was one rather constant constriction about opposite the nostrils, incompletely dividing it transversely into two portions, the anterior of which, though dark in color, much resembles a bladder, and explains the vulgar epithet, 'bladder-nose,' often applied to this species. A curious fact observed was, that, during the alternate filling and emptying of the sac, a noise was produced which closely resembled that of bubbles of air rushing into a bottle from which a liquid is being poured. It was a loud, gurgling sound, audible at a distance of twenty-five metres or upwards. On approaching nearer, the animal became furious. He inflated his 'hood' to such an extent that all traces of constriction were obliterated, and, by a series of ugly tosses of the head, kept it swinging from side to side.

During the ten days that followed, about

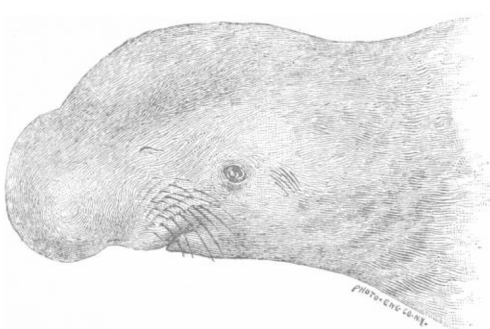

FIG. 3.

fifteen thousand seals were killed and hauled aboard by the crew of the Proteus; and I had ample opportunities for observing their actions both upon the ice and in the water. I therefore state, without fear of contradiction, that it is utterly impossible for the animal to arrange his head-gear in the manner shown in fig. 2, or, for that matter, in any figure that I have seen.

The largest males which I killed measured ten feet in total length (from tip of nose to end of hind-flipper), and eight feet in girth. I think that they do not attain their full growth until ten or twelve years of age. In the largest individual measured the uninflated proboscis extended two hundred and twenty-five millimetres (nearly nine inches) in front of the upper lip. The height of the proboscis midway between the nostrils and tip was two hundred and thirty millimetres; height at mouth, three hundred and twenty millimetres. This curious development is purely a sexual character, no trace of it existing in the female. It begins to appear in the third year, when, by passing the fingers into the nostrils, it may be detected as a small sac at the extreme end of the nose, divided longitudinally by the nasal

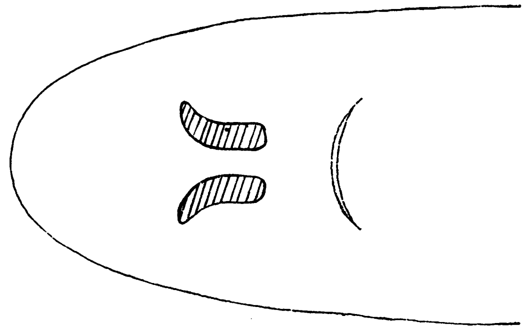

FIG. 4.

septum into two distinct chambers, which remain distinct throughout the animal's life. So far as I was able to ascertain from the examination of a very large number of individuals, it continues to grow for ten or twelve years.

Dissection of the proboscis, when in the adult condition, shows it to be a loose muscular bag, covered with the skin of the nose, and lined with a continuation of the nasal mucous membrane. It is completely divided for its entire length into two parallel chambers by a thin partition, which consists chiefly of two layers of mucous membrane, and is continuous with the nasal septum. The nostrils (fig. 4) are capable of closure by the contraction of muscular fibres, which are so arranged as to act as sphincters. To prevent interference in breathing by the falling together of the walls of this

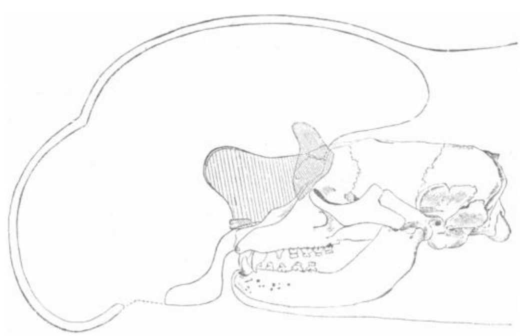

FIG. 5.

redundant bag, the roof of the proboscis is supported by three large and stout cartilages, — one median and two lateral (fig. 5). The median or septal cartilage, which is a continuation of the mesethmoid, rises above the plane of the top of the skull, and extends forward beyond the jaw. A bilateral expansion of its base in front forms a firm supporting pad, resting upon the pre-maxillary bones. The two remaining cartilages are paired.

Since returning from the seal-fishery, I have examined the accessible works that would be likely to mention this curious appendage, but have failed to discover any thing approaching an accurate or complete description of it. That given by Fabricius more than a century ago is one of the best All writers whose accounts I have seen, including the most recent, agree in failing to express the chief characteristic of the animal, which is, that the so-called 'hood' of the male is an inflatable proboscis, protruding considerably beyond the mouth, which it overhangs.

C. Hart Merriam, M.D.

MEASURING EARTHQUAKES.[1]

In view of the recent earthquake in England, and the still more recent shakings which parts of this country have experienced, a notice of the above work will be of especial interest. Professor Ewing's long residence in Japan as professor of mechanical engineering in the University of Tokio, and his active labors in connection with the Seismological society there, of which he was vice-president, entitle him to speak with authority on this subject. Indeed, in this matter of the exact measurement of the motion of the ground during an earthquake, seismologists the world over must look for enlightenment to young Japan, whose Seismological society, under the guidance of the foreign professors in her university and her college of engineering, has in this particular branch far outstripped European seismologists.

In chapter i. Professor Ewing gives a *résumé* of the theory of waves in an elastic solid, as applied by Hopkins, in the British association report for 1847, to the case of terrestrial disturbances; "since it both teaches the earthquake-observer what to look for, and guides him in the interpretation of his results." This shows how, from a single sudden disturbance, two series of waves will set out in all directions,— the first or normal waves consisting of compression and expansion of the material in the direction of transit; the second or transverse waves travelling more slowly, and consisting of motion of distortion at right angles to the line of transit, — also how these waves may be reflected or refracted at the bounding-surfaces between different strata, and thus by successive reflections be reduplicated; so that, at a distant point, the vibrations will probably be far different from (in number, order, phase, and period), and generally much more complicated than, those at the origin. Add to this the effect of imperfect elasticity, and the condition that the original disturbance may be a series of slips along a whole line or 'fault,' and nothing further could be desired to give confusion to the vibrations.

Chapters ii. and iii. deal with instruments for measuring the horizontal motion of the ground. At the outset Professor Ewing notes the difficulties in the way of getting a steady point, or something 'to tie to,' while every thing around is being shaken; and the characteristic feature of every seismometer is its method of supporting a heavy mass so that it will remain steady, receiving no impulse (save what is unavoidable through friction) while the system that supports it is being shaken. As the 'horizontal pendulum' seismograph in one of its forms is considered the best, and has given the greater part of the records obtained, its essential feature is here shown in fig. 1. Popularly it might be termed a heavy weight, swinging on a gate. It is a heavy mass, pivoted upon a vertical axis through *d*, upon a frame free to move about the vertical axis *bc*. The long light reed multiplies the motion, and records it upon a rotating smoked-glass plate by the steel pointer on its end. This reed is pivoted at *d*, with most of its weight taken up by the coil-spring, whose tension is adjustable at *e*. The parts of this supporting lever and long reed are so proportioned that in the vertical axis through *d* lies the centre of percussion relative to the axis *bc*: hence, if this is shaken through *bc* at right angles to the plane of the lever, the vertical through *d* will be of itself the axis of instantaneous rotation, independent of the heavy mass pivoted there; hence the latter will receive no impulse at right angles to

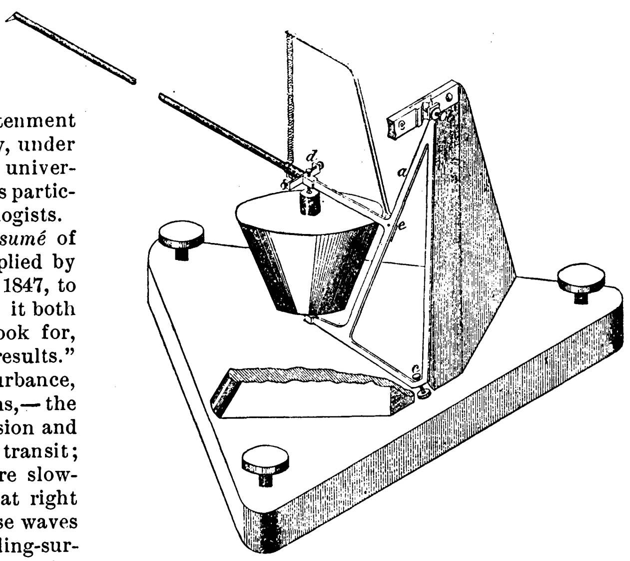

Fig. 1.

[1] *Memoirs of the science department, Tôkiô Daigaku* (*University of Tôkiô*), *No.* 9. *Earthquake measurement.* By J. A. Ewing, B.Sc., F.R.S.E. Tôkiô, *Tôkiô Daigaku*, 1883. 12+92 p., 23 large plates. 4°.