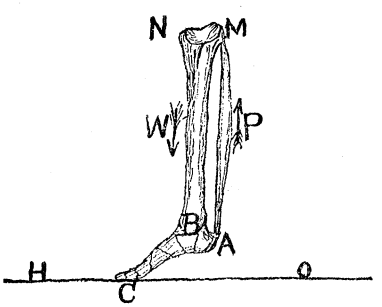
tremely large. Travelling even at the rate of forty miles an hour, these moths must have been on the wing at least twenty-four hours, in many cases exposed to the rain. The specimens captured seemed by no means exhausted, and could probably have prolonged their flight to a much greater distance. It has seemed best to place this occurrence on record even at this late day, as showing how readily islands may receive important additions to their fauna from very distant quarters. FREDERIC A. LUCAS.

Washington, March 30.

On tiptoe.

The letter of Prof. F. C. Van Dyck (*Science*, ix. p. 235) in relation to the mechanical problem involved in standing on tiptoe seems to be somewhat misleading, in so far as he insists that it is *not* a lever of the *second* order. As the lever of the second order is defined to be that in which the weight, or resistance to be overcome, is between the fulcrum and the power, and as in this case the ground is the fulcrum, and the power is applied at the heel, it is evidently a lever of the second order. Moreover, if the power applied at the heel reacted on something exterior to the bony mechanism, the case would be simple and obvious. But inasmuch as the power, or contracting muscle of the calf of the leg, is attached both to the heel and to the head of the tibia, the efficacy of the power is thereby modified. But it does not alter the defined order of lever: it merely augments, to the extent of the reaction, the resistance to be overcome in raising the weight resting on the ankle.



Thus, in the annexed figure, assuming that the forces producing equilibrium act in parallel directions, and regarding it as a lever of the second order, in which C is the fulcrum or centre of moments, for conditions of equilibrium we have, $P \times CA = W \times CB + P \times CB \therefore P \times CA - P \times CB = W \times CB \therefore P \times AB = W \times CB \therefore P : W :: CB : AB$. Hence, while by the position of the fulcrum C it is actually a lever of the *second* order, yet, by virtue of the reaction of P, it is mechanically *equivalent* to a lever of the *first* order.

In an analogous manner, it seems to me that the confusion and perplexity in relation to the 'boat-oar' problem might be cleared up (vide *Phil. mag.*, xxiii. pp. 58, 224, 1887). It is scarcely necessary to add that the foregoing solution of this problem is very old: if I am not mistaken, it may be found in one of the editions of Dr. Golding Bird's 'Elements of natural philosophy,' published more than twenty years ago. JOHN LECONTE.

Berkeley, Cal., March 23.

The loss of the Tonquin.

It has generally been stated that the Tonquin, which figures so prominently in the history of the north-west coast, was destroyed at Nootka. Bancroft accepts this version in his 'History of the north-west coast' (1884); while others, following Greenow (1840), place the occurrence at Clayoquot, both these places being on the west coast of Vancouver Island. The facts so far as known, however, appear to me to point to Na-wī-tī, on the north coast of Vancouver Island, as the true locality.

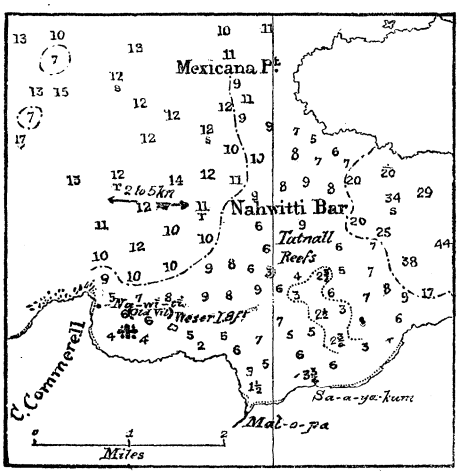
The Tonquin, it may be remembered, was a vessel of 290 tons burden, belonging to Astor's American fur company. After reaching Astoria, in the mouth of the Columbia, in 1811, she was despatched on a trading-voyage to the north, leaving Astoria on June 5. It is unnecessary to detail the circumstances leading up to the attack on the vessel while at anchor, the massacre of the crew, and the subsequent explosion of the magazine, by which the vessel was destroyed and a large number of natives who had crowded on board were killed. The facts were subsequently obtained from a Chehalis Indian interpreter, who alone escaped, and are recorded by Ross Cox and by Franchere in 'The Columbia River' (1832) and 'Narrative of a voyage to the north-west coast of America' (1854) respectively. The name of the locality, as given by the Chehalis interpreter, is alone sufficiently distinctive, and I can account for the circumstance that its correspondence with Na-wī-tī has, so far as I am aware, been overlooked, only by the fact that this name has not usually appeared on the maps, though to be found as 'Nahwitti' on the detailed charts of the coast. Bancroft, indeed, denies the existence of any such name as that given by the interpreter and adopted by Franchere, and afterwards by Irving in 'Astoria' (*op. cit.*, p. 155).

The Indians known as the Nawitti by the whites, comprising the Tlā-tlī-sī-Kwila and Ne-kum'-ke-līs-la septs or tribes of the Kwakiool people, now together inhabit a village named by them Mel'-oopa, on the south-east side of Hope Island. Their original town was, however, situated on a small rocky peninsula on the east side of Cape Commerell, which forms the north point of Vancouver Island. Here remains of old houses are yet to be seen, and the place was and still is by the Indians known as Na-wī-tī.

Ross Cox, who came into personal contact with the escaped Chehalis interpreter, writes of the loss of the Tonquin, "A few days after their departure from the Columbia, they anchored opposite a large Indian village, named New-Whitty, in the vicinity of Nootka, where Mr. McKay immediately opened a smart trade with the natives." After giving the relation of the interpreter as to the massacre and explosion, he describes the escape of three (four according to Franchere) of the crew in a boat: "They rowed hard for the mouth of the harbor, with the intention, as is supposed, of coasting along the shore to the Columbia; but after passing the bar, a head wind and flowing tide drove them back, and compelled them to land late at night in a small cove," where they were afterwards found and killed by the natives. Franchere's version of the story is much the same with that of Cox, except that he gives the name as 'Newity,' and in another place as 'Newitti' (*op. cit.*, p. 180).

Though moderately well sheltered, the little bay at Na-wi-ti is stated in the *Vancouver pilot* to be unsuited for an anchorage by reason of its rocky bottom. It is nevertheless the first place on the north shore in which a seaman would naturally seek for an anchorage after rounding Cape Scott in the absence of a chart, and was, besides, adapted to the purpose of the traders as being the site of a large village. The mention by Cox of a bar over which a strong tide runs, again agrees with the fact of the existence of the notable 'Nahwitti Bar' of the charts, of which the writer had a somewhat perilous experience ten years ago, while bars are not found at the entrances of Nootka or Clayoquot sounds.

When at Na-wi-ti in 1885, I learned from the Indians that some disastrous event had happened at this place, but could not learn its precise nature. Dr. Franz Boas informs me that he also was unable to gather any thing definite on the subject from the natives. It is probable, however, that the shelling



of this village by a gunboat, which occurred about forty years after the loss of the Tonquin, may have since become confounded with that event, if it really happened at this place.

The point at which the Tonquin is supposed to have been destroyed is indicated by the asterisk on the accompanying plan, which is based on Admiralty chart No. 582. GEORGE M. DAWSON.

Geol. surv. Can., March 30.

A sensitive wind-vane.

The liquid damper suggested by 'T. C. M.' in *Science*, No. 217, certainly furnishes a complete and satisfactory solution of the wind-vane problem. This device is a customary method of checking oscillations, and its application to the wind-vane was made about ten years ago by Mr. J. W. Osborne, who constructed and used such an apparatus (*Amer. assoc. report*, 1878). His definition of an ideal vane agrees entirely with the conditions laid down by Professor Mendenhall, and is worth quoting: "A perfect wind-vane should instantly respond to the slightest change in the direction of the wind, and should remain stationary when it has made the necessary angular movement."

A single, but perhaps not unimportant, exception may be taken to Professor Mendenhall's solution,—"to use a *small* and extremely light vane." Lightness is, of course, a desideratum in order to reduce friction, but length is also requisite in order to give sufficient gyratory force for very light winds. The vane may be extremely light, and yet not small. Mr. Osborne's vane, designed to realize his definition, was *seven feet long*, and weighed only three ounces. Sensitiveness is increased, 1°, by increasing the moment of rotation; 2°, by diminishing the friction. An addition to the length of a vane, if it is of light material and mounted on friction-rollers, may add more to the sensitiveness by increasing the moment of rotation than it will subtract by increasing the friction. G. E. CURTIS.

Washington, D.C., April 4.

The difficulties which have been discussed in the last few numbers of *Science* in regard to a sensitive wind-vane are avoided at Blue Hill observatory by having the wind-vane self-recording.

The recording is by the Draper method; viz., a cylinder is attached to the spindle of the vane, and a stationary pencil (except that it is slowly dropped by clock-work) records the oscillations of the wind on the cylinder. The vane is thin metal, has a divided tail, and is sensitive to the lightest wind. In order to determine the direction of the lightest or most violent wind, a line is drawn through the centre of the oscillations recorded on the cylinder. It is not uncommon for scud-clouds to drive by almost touching the top of Blue Hill; and, by means of a mirror devised for measuring cloud-movements, their motion can be determined within one or two degrees of arc. I have made a number of such measurements, and find that they correspond almost exactly with the centre of the wind-oscillations on the cylinder, determined in degrees of arc.

This method of recording the wind-direction is simple, accurate, and easily managed, and I do not think it would cost very much more than the method Professor Mendenhall suggests of fitting up the vane. Hence I hope, if improvements in wind-vanes are attempted by the signal service, they will turn their attention to the very desirable method of continuous registration. H. HELM CLAYTON.

Blue Hill meteor. observ., April 3.

Physiology of plants.

I notice that in a review in *Nature* of the 26th of August, 1886 (p. 381), of Dr. Vines's 'Lectures on the physiology of plants,' it is stated that the view that "the cell-wall is produced by the actual conversion of a layer of protoplasm," and that "the starch which is formed in chlorophyll corpuscles under the influence of light is also the product of such a dissociation of protoplasm," is "the most striking novelty which will be found by English readers" in Dr. Vines's book, "and, though propounded some years ago in Germany, has now, we believe, appeared for the first time in an English text-book."

In reference to this, will you kindly allow me to point out that the above view was propounded by myself, and will be found fully set forth, along with an explanation of the chemical reactions involved, on pp. 218–223 of my book, 'Light the dominant force of the universe' (London, Sampson Low & Co., 1882). W. SEDGWICK.

Calcutta, Feb. 15.