wasp's flight started from a crotch in a limb, it is possible that the locust was left in the crotch. The whole incident showed a perfect understanding, on the part of the wasp, of what he proposed to do, and the carrying-out of a preconceived plan of procedure without any stopping to think what he would do next. The only pauses were in going up the trunk of the tree.

C. G. ROCKWOOD, JR.

New York, Aug. 11.

A Good Word.

I SEE by your last issue that the Teachers' National Association indorsed the Blair bill. I am sorry to learn of this, as I think that bill is an imposition upon the intelligence of the people of this country.

In the first place, any State that cannot support schools in which to educate its children must be poor indeed; and, in the second place, any State that would accept national aid has not the spirit necessary to a sound government. We can plainly see where the most of that aid would go, and we do not feel like sending it into those States. I am aware that many will deem me unjust; but, be that as it may, I would never consent to the Blair bill, and I am sorry that my fellow-teachers ever gave their indorsement to such a bill, as by so doing it may have some weight in the future; but then teachers are only mortals, and many of them seem to have very poor judgment.

I am glad to see the position that *Science* takes in this matter, and you may rest assured that I shall be a life subscriber to that paper. I consider it the best paper published in this country for any advanced teacher or scientific man. I wish you the best of success.

JAMES LAWREY.

Fremont City, Io., Aug. 8.

The Formation and Dissipation of Sea-Water Ice.

SEA-WATER possesses several characteristics that make the operation of freezing different from that in the case of fresh water.

The density of sea-water increasing till the freezing-point is reached, it follows that its conversion into ice will take place beneath, instead of at the surface as in the case of fresh water. The freezing-point in most cases, then, should be situated near the bottom of the column of water, if not actually at it.

In equal thicknesses of fresh and sea water ice, two inches of the first will support a greater weight, without fracture, than an equal thickness of the latter; although it is quite possible, that, where greater thicknesses are concerned, the advantage may be in the opposite direction.

Sea-water ice is much less 'brittle' than that of fresh water; rising and falling under the influence of a heavy sea, and adapting itself to its undulations, in cases where fresh-water ice would be fractured: this is particularly noticeable in the earlier stages of its formation.

An inch of newly formed sea-water ice will not support a man's weight, and, in giving way beneath him, does so abruptly, without any warning preliminary fissures, leaving a cleanly cut hole of the same extent as the surface over which direct pressure was administered, and thus differs from fresh-water ice, which, on being fractured in this way, carries down a large portion of the surface beyond the area directly under pressure. We may therefore conclude that the cohesion amongst the particles in fresh-water ice is greater than in the case of sea-water, and possibly that the arrangement of the ice-crystals is different in each. Those in the case of fresh water, forming horizontally at the surface, overlap and bind each other together, whilst those from sea-water would seem to arrange themselves vertically, as a comparison of the fractures in each case will show.

The formation of a film of ice over a sheet of sea-water takes place indifferently, as to position, during calm weather; but, with a light breeze blowing, the permanent formation commences at the windward shore; narrow and rapidly lengthening 'streamers' form from the points of this shore; continuing, and growing very slowly narrower as it does so, it may reach a length of from four hundred to five hundred yards; then parallel streamers combine, till at last the entire surface is covered. A great peculiarity of the proceeding is the extreme narrowness of these streamers in comparison to their great length, and the consequently great cohesion that is capable of overcoming the strain that must be caused by even a light wind blowing over so lengthy a surface, whilst it is rising and falling to the pronounced ripple on the water's surface.

Recently formed sea-water ice is not of uniform texture throughout its depth. A section of four inches would be represented by a thin layer of partially decomposed ice, looking very much like thoroughly saturated snow; then about two inches of 'sodden' ice, occupying a condition intermediate between that of the surface film and fully formed ice, both in consistency and appearance; and, finally, the fully formed ice, having every appearance of fresh-water ice. These differences in the several strata of the ice do not continue, once the temperature of the air becomes very much lower than that of the water's freezing-point.

When the ice is first formed in tidal waters, that portion of it which is left aground above low-water mark freezes to the bottom (the temperature of the air being supposed to be below the water's freezing-point); so that, on the water rising again, it is left there, submerged. Over this, at the surface of the water, another ice-film is formed, which, on reaching the level of the submerged ice, is frozen to and remains with it in this position. This operation is repeated, till the result is, that a perpendicular wall of ice forms, whose outer limit is the low-water mark, terminated by a horizontal surface shorewards at the limit of high-water mark. The outcome of this peculiarity is, that the shore outline in winter undergoes a complete transformation, of more or less extent in accordance with the difference existing between high and low water mark. In the case of a mud or sand bottom, the ice, though freezing to it, possesses sufficient buoyancy to raise a film of mud or sand with it each time, till it is of sufficient thickness to counteract this tendency.

The explanation of this phenomenon seems to me to be as follows: in the first place, it is essential that the temperature of the air should be below the freezing-point of the water; and, in the next place, it is evident that the temperature of the earth forming the bottom must be above the freezing-point, else ice would form there; still, it need not be much above it, as the water, being very nearly at the temperature of its freezing-point, would reduce the surface of the bottom to that point, less the increase in temperature consequent on the convection of the earth's heat to that surface. The freezing-point of sea-water being 26°.7, the melting-point of sea-water ice 28°.8 (*Science*, ix. No. 228, x. No. 232), then, if the temperature of the bottom lies between these values, we can understand, that, when the formed ice is placed in contact with it by the falling tide, the temperature of the air reduces that of the water which is running off the ice as the tide leaves it, so that it freezes and cements the ice to the bottom. To free it again requires that the temperature of either the air or the water should rise above 28°.8, which, with the water at 26°.7 and the atmosphere below this point, is not possible: therefore our ice remains fast to the bottom.

Fresh water freezing, and its ice melting, at the same temperature, it cannot possibly freeze to the bottom; for, granting that the temperature of the water may be 32°, that of the bottom must be above, both on account of the water in contact with it being at a higher temperature than this, and because, even if we assume the temperature at 32° throughout, that of the bottom must be above this, owing to convection, as before stated. Anchor-ice does form in fresh water, but not on the bottom proper, as it attaches itself to bowlders or pebbles which are not themselves in perfectly continuous connection with the bottom proper, and are therefore largely surrounded by the water, and correspondingly affected by its temperature, whilst insensibly affected by convection; so that, if we can assume conditions under which the water's temperature would be below the freezing-point, we have those cases in which anchor-ice will form.

On account of the position of the freezing-point in a column of sea-water, it is possible, under certain conditions, for two films of ice to form, one below the other. This was actually observed to have taken place under the following conditions: the temperature