

means improving the crop by choosing wheat that is immune from the effects of incidental causes which are part of the natural order and used to be instrumental in depressing the market yield. Moreover, when wheat was cheap there was a disposition only to sow it in the most favourable land, to withdraw the rest from wheat-cultivation, and thus to raise artificially the average yield per acre.

Considering all the circumstances, even as they were in 1906, it is surprising that any suggestion of law should come out of the figures at all. Improved knowledge among farmers may easily now have introduced variations which will form a systematic error in the comparison of facts with the calculations of either "theory"; consequently the investigation means rather more than comparing figures. The mere repetition of the process that was good enough for 1904 may be illusory in 1917, for causes which were not inherent in the original figures.

NAPIER SHAW.

#### A Frost Thistle: A Beautiful Effect of Freezing.

THE frost flower here photographed was entirely the result of a chance experiment, but it was so beautiful that it would be well worth repetition and detailed study.

So far as I can see, the sole factors necessary for the production of such an effect are a small amount of garden mould left standing in a little water (about



an inch in depth) in a small glass jar, and frosty weather. In this particular case the vessel was left out of doors on a window-sill during a recent frosty night in a state of tranquillity save for the occasional shakings caused by vehicles passing over the bridge below.

In the morning the water was frozen solid; the glass was intact, the ice having expanded upwards, doming the surface. Within the ice cylinder was a wonderfully perfect representation of a thistle flower, most delicately fashioned in gleaming threads of silvery whiteness and of exquisite beauty, all emanating from a fluffy-looking, opaque, central, domed nucleus.

In reality the threads were fine curved threads of gas (? air) radiating through the clear ice. As shown in the figure, those below curved downwards, those above upwards, for all the world like lines of force round a magnetic pole, but demonstrated by capillary

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tubes in ice. On closer examination I was, I believe, able to discover another essential feature in the phenomenon in the form of tiny specks of mud, one at the peripheral end of each gas-tube.

I submit the following explanation of the frost thistle.

It must be assumed that as freezing proceeds from without inwards, the gas-tubes also grew centripetally. The tiny particles of earth we believe to have determined the points of origin of minute gas bubbles. When the first shell of ice was formed, these bubbles would naturally, by the expansion of the ice, tend to be squeezed and compelled to elongate, and then to move in the direction of least resistance—*i.e.* inwards and towards the centre of the vessel. In other words, these silvery threads, curving, as they do, upwards from the bottom and downwards from the top, are graphs which indicate the progress of the congelation.

When the congelation had reached to about one-third of the radial distance to the centre, some change appears to have occurred, for the central ice-mass was no longer clear, but of a milky opaqueness, within which the gas-tubes could be no longer followed by the eye. This we attribute to the sudden solidification of a confined residual volume of liquid of enhanced salinity, which, at the moment of its change of state, yielded up its dissolved gases in countless bubbles of the minutest size. These, probably uniformly distributed throughout the central ice, produced its cloudiness.

May I add that this example of natural magic grew within a few yards of the site of Roger Bacon's study on Folly Bridge at Oxford?

R. T. GUNTHER.

#### NATIONAL RECONSTRUCTION.

IT is not too much to say that of all the subjects which claim careful consideration at the present time of discussion as to Imperial reconstruction, none is more important than education. It is true that the consequences of any change for the better or worse in educational matters will affect more directly the next generation than the present, but the clarification of men's minds and the settlement of a course of action in this direction are urgently desirable. For it is evident that opinion is still much divided as to the aims which ought to be kept in view, and until such divisions are practically healed the present wasteful conflict will go on.

The discussion which has been carried on during so many years by the partisans of classical studies on one hand, and the supporters of science on the other, is an indication that there is still much misunderstanding and exaggeration on both sides. The extremists on one side contend that Greek is an essential element in a liberal education, and talk of physical science as "gross materialism," while some of the extreme opponents of classical studies are not content with dropping Latin and Greek, but would turn schoolboys into technical chemists. It is to be hoped that the people with more moderate views, who fortunately seem to form the majority, will arrive before long at a generally acceptable compromise whereby the interests of a truly liberal education may be secured.

The advocates of the classical system have shown in recent utterances a moderation which