

can in a horizontal position. Narrow strips of wood were nailed to the edges of the board to form a shallow ridge. One of these strips C was made adjustable. The blotting paper was moistened with water, and this was evaporated by blowing steam through the water in the can. The water vapour at a temperature of about 80° will stream steadily upwards from the surface of the can and flow over the board in an undulating cloud, separated from the surface of the board by a thin transparent layer of uncondensed vapour. On illuminating the cloud with a nearly horizontal beam of sunlight S, large patches of gradually changing colour appear when the eye E is directed slightly upwards towards the lower surface of the board. The beam of sunlight should be adjusted so that it just fails to illuminate the surface of the board, and the colours are best seen when this surface is blackened. The air around the board should also be quite undisturbed. These colours rival in brilliancy those to be seen on soap films, and present the features of sunset colours. It appears, then, that some of the brilliancy and extensiveness of sunset colours is due to a quiescent state or regular motion of the clouds or mist at sunset, and also to a distribution into layers of droplets of nearly uniform size.

F. W. JORDAN.

South-West Polytechnic, Chelsea, S.W.

Non-Poisonous Character of Nitroglycerin.

WITH regard to the dose of nitroglycerin referred to in the notice of a book in NATURE of July 22 (p. 560), it may be useful to have the facts correctly stated. The reference was clearly to a passage in the "Extra Pharmacopœia" (sixteenth edition, vol. i., p. 527), in which I say:—"An employé in the author's laboratory (1905) ate a piece of the nitroglycerin mass weighing about 2 oz., mistaking it for ordinary chocolate. A bad headache supervened, necessitating his lying down, but he was at work again on the following day."

The "mass" in question is composed of nitroglycerin with chocolate in the proportion of 1/100 grain in $2\frac{1}{2}$ grains; the amount of nitroglycerin consumed therefore by the predatory individual on that occasion was approximately $3\frac{1}{2}$ grains.

May I add that the young man was a German apprentice of mine, and that his exclamations in half-broken English, to the effect, "Mein Gott, I shall die, I shall die!" as he gavotted round the laboratory waving his arms about, were the cause of some mirth to bystanders. As things have turned out he possibly has died by now from the effects of nitroglycerin employed in another way.

Considering the powerful vasodilator action of this and allied drugs (the late Prof. Leech determined that the circulation is distinctly affected by even 1/1000 grain of nitroglycerin), it is of interest to realise to what a remarkable extent they are tolerated. Single doses of 5 grains and daily doses of 20 grains have been administered medicinally with safety, according to the *Brit. Med. J.*, Epitome ii., 1905, p. 52. Has any one of your readers any knowledge of higher amounts having been taken?

W. H. MARTINDALE.

10 New Cavendish Street, London, W.

MR. MARTINDALE'S extremely interesting letter supplies the clue as to how anyone could mistake nitroglycerin for chocolate, but as the book referred to gives no reference and omits the word "mass" after nitroglycerin, the ordinary reader will gain a somewhat confused idea as to the toxic action and characteristics of nitroglycerin.

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The Principle of Similitude.

IN NATURE of March 18, Lord Rayleigh gives this formula, $h = \kappa a \theta . F(abc/\kappa)$, considering heat, temperature, length, and time as four "independent" units.

If we suppose that only three of these quantities are "really independent," we obtain a different result. For example, if the temperature is defined as the mean kinetic energy of the molecules, the principle of similitude allows us only to affirm that $h = \kappa a \theta . F(v/\kappa a^2, ca^3)$.

D. RIABOUCHINSKY.

Aerodynamic Institute, Koutchino.

Structure of Hailstones.

WITH reference to the particularly violent hailstorm which passed over S.E. London on Saturday afternoon, July 24, I observed at Woolwich that the hailstones, apart from being very large, had a common shape and structure which may perhaps be worth recording. All the stones examined were either oval or pear-shaped, but not of uniform size; the broad half consisted of clear ice, while the other half was uniformly opaque or closely stratified with alternate layers of clear and opaque ice.

S. L. ELBORNE.

77 West Park, Eltham, S.E., July 26.

COTTON AS A HIGH EXPLOSIVE.

AT the recent meeting of the Society of Chemical Industry held at Manchester, Mr. W. F. Reid is reported to have made the statement that nitrated cotton is not a high explosive, though every chemist knows that it is the typical high explosive. The fact that certain newspaper writers have differentiated between nitrated cotton and nitrated benzene or toluene, or any other coal-tar derivative, has nothing to do with the differentiation of a high explosive (which is of itself nitrated, and contains within itself sufficient oxygen to allow of its explosion) and those mechanical mixtures, such as gunpowder, which have been now superseded. A letter from Sir William Ramsay published in the *Times* of July 19 makes all these matters perfectly plain, and no responsible person would dispute them. I was present in the House of Lords when Lord Charnwood brought his statement before that House, and I also heard the rest of the debate, including the answer of the Marquess of Crewe. The House, consisting of those who are necessarily laymen so far as their chemical knowledge is concerned, found some difficulty in following the arguments as to whether any substitute for cotton could be effectively used.

To the chemist the matter is perfectly plain, and it has been stated with some degree of precision in an article which appeared in NATURE of July 1. It is true, and has been admitted from the very start of what is now known as the "Cotton Campaign," that some form of nitrated cellulose can be made from anything which contains cellulose. There is not the slightest difference of scientific opinion on this matter, and every competent chemist will concur with what I say, but in practical matters things stand on a totally different footing. There must not only be a regularity of the supply of material, but there must be uniformity of quality; and, in the article already referred to, this point has been made tolerably

clear. It is by no means taking too high a position to state that, unless such uniformity is certain, the task of any works' manager will be so heavy and the risks which he will encounter so great that his factory will be endangered. Quite apart from this, even supposing he surmounts such obstacles, the material which he will produce will be markedly inferior to that which he can make in the ordinary course of his business. It has been quite rightly pointed out by people of expert knowledge and authority that the ballistics on which artillerists' calculations are based are demolished by any alteration in his charge. Sir William Ramsay is perfectly right in showing, not only that the pointing and therefore the sighting of the gun must be altered, but also that the chamber in which the explosive is fired must be enlarged if any form of nitro-cotton inferior to the standard material is used; and it is quite conceivable that the weight of the projectile and the pitch of the grooving would also have to be changed. Without going too closely into such highly technical matters, it can be said with full confidence that the gunner would have his trade to learn again, and this can scarcely be done in the midst of a war.

Many references have been made to the use of substitutes for cotton in the manufacture of nitro-cellulose, but they are all of a somewhat academic kind. As has been stated above, no one doubts that such things can be used, but it is a sort of misapplied ingenuity which seeks to find sources of cellulosic materials; such ingenuity would be quite thrown away on a practical maker. There is one possible danger, due entirely to the laxity of the control of the import of cotton at the beginning of the war; it is that between August 4 and the present date the German chemists have been sedulously endeavouring to utilise some such materials. Eleven months, now nearly twelve, is enough even for a German chemist to make some progress; and it may be that a nitro-cellulose of a sort may be being made in Germany now from material other than cotton. The fact remains, however, that the Germans are eagerly buying cotton, and are doing their utmost to obtain more than their legitimate share of the new crop which should be on the market in a month or two.

There is much truth in the statements which have been made in many periodicals—in the *Times* on several occasions and in the *Engineer* a good many months ago—to the effect that we English people have been a little too modest. Because of the great flood of genius which governed the German nation somewhere in the middle of the last century, and gave us those deathless names, Bunsen, Kekulé, Liebig, Meyer, and others, and because some of our present chemists of the highest rank were trained under these great men, the ordinary British public has been obsessed with the idea that chemistry is a German science. A very little knowledge of the history of chemistry would show that such a mistake is almost childish. Our French friends have claimed that chemistry is a French science, but those of us

who have read the work of Robert Boyle or have studied the work of Priestley, Cavendish, Berzelius, know very well that chemistry is cosmopolitan. The arrogance of German soldiers has been reflected in a similar arrogance of German chemists; and those eminent in our land whose names it would be impertinent to recite, as well as such of our colleagues now living, whether Scandinavian or Dutch, to whom again it would be improper to refer, have their own opinion as to the correctness of any claim by German chemists to a prerogative in science.

To return to the question of cotton, I think there is not the slightest doubt among those whose opinion is of value that raw cotton or cotton waste is absolutely essential for the production of a satisfactory propulsive explosive; and this view has been accepted by responsible statesmen in both Houses. Personally, investigations of this question through commercial channels have convinced me that this is a fact, and I am perfectly prepared to maintain it against anyone who claims an equal authority.

BERTRAM BLOUNT.

THE WAR AND CHEMICAL INDUSTRY.

ON the occasion of the annual meeting of the Society of Chemical Industry, of which an account appeared in *NATURE* of July 22, there was a notable change in the character of its business as compared with that of previous annual gatherings. We learn from Prof. Henderson's presidential address that, in the opinion of the society's council, too much of the time over which the meeting extends had hitherto been devoted to purely social functions, and that in the past no sufficient advantage had been taken of the opportunity afforded by such an assemblage of technologists to lecture them on matters which superior persons might hold to be for their general good. No doubt the council, like the rest of us, is impressed with the seriousness of the strenuous and critical times in which we are living. Whatever semblance of frivolity may have hitherto characterised these annual gatherings obviously would be out of place on the present occasion. Accordingly, with the co-operation of the Manchester section, a special programme was arranged which should at once be "topical" and illustrative of the good resolutions of the council.

Whether their hopes and wishes have been wholly realised may be open to doubt. Four special papers, in addition to the president's address, were presented for the consideration of the members. Naturally, since so much has been said during the past ten or eleven months concerning the relations, immediate and proximate, of applied chemistry to the war, and to matters arising, directly or indirectly, out of it, it was almost inevitable that this comprehensive subject should be the dominant feature of the communications. Prof. Henderson, as might be expected, could not refrain from some reference to a feeling of disappointment that fuller use had not been