their work or advice. What wonder, then, that the public, which sees through this kind of thing, should tend to despise, not only scientific men, but science itself?

It is idle to disguise the fact that recent events have filled most educated persons with a sense of extreme resentment against the administration of this country—a resentment which I have heard expressed by numbers of persons—civilians and soldiers. It is felt by many (and I am one of them) that we live under the rule of the invertebrates. The people who administer the country are not the best, the most vigorous, and the most sagacious of men. They are too often the time-servers and the mediocrities. The maladministration of scientific affairs is only one of the many forms of maladministration; but, on the whole, I think it is perhaps the most important form, because it gives to the mind of the whole nation a lower, a meaner, and a thoroughly sentimental and unpractical turn. For more than half a century before the war England has ceased to be an intellectual nation; the public at large has remained indifferent to science, art, literature, invention, and all the great intellectual pursuits, and has given itself up to game-playing, party politics, faddism, and a debased drama. We are now paying the penalty, and, if I do not mistake, will have to pay a heavier one before the end. If we have produced great men their names are unknown to the multitude, while the wire-pullers, the sentimentalist, and the hypocrites sit on high. That is my own summing up of the British nation of to-day—and I know that many agree with me. I am also of opinion that when our soldiers return from this war there will be something very like a revolution against the class of men who at present misgovern us in almost every-thing.

Sir William Crookes suggests a Ministry of Science and representation of science on the Privy Council. But in the light of our present experience are these likely to help us in any way? The Board of Education was appointed partly for this purpose, and what does it do for the worker? It has formulated a contributory pension scheme, but I believe nothing else. The able editorials in *NATURE* of November 24 and December 2, 1915, well define the position of science in this country to-day; but no reform is likely to be effected so long as men of science themselves do not insist upon it. What is required is a small association of strong men banded together for the express purpose of forcing the pace without fear or favour, and in spite of twaddlers who now paralyse all efforts at improvement. I would suggest at once the following programme:—

(1) Direct payment by the State for non-remunerative scientific work which has been of benefit to the public at large.

(2) Invariable payment by Government departments and public bodies for all scientific expert advice or assistance whatever.

(3) No issue of Government grants for expenses of researches without a fixed payment of, say, 50 per cent. to the workers themselves for their expenditure of time on the work.

(4) Control by the State over the sweating system now employed by universities and numerous public bodies in connection with scientific workers of all kinds.

Sir William Crookes thinks that our national attitude towards science "can only be rectified slowly, step by step." But war is a rapid arbiter, and the sword does not wait for the armour to be girded on. If I mistake not, we have not much time left for repentance.

RONALD ROSS.

January 3.

NO. 2411, VOL. 96]

Germany's Supplies of Nitric Acid.

AN article in the *Times* of January 6 deals with the resources in Germany for producing nitric acid. Formerly, the major part of the world's supply of nitrates came from the *caliche* beds on the west of the Andes, but of recent years, as is well known, nitric acid and nitrates have been manufactured by the electric process of Birkeland and Eyde in various parts of Norway. Franck and Caro, some years ago, introduced a process whereby ammonia can be produced from calcium carbide, after conversion into calcium cyanamide. The Ostwald-Kaiser process of partially oxidising ammonia by passing it along with air over platinum or other contact substances, afforded a practical means of producing cheap nitric acid. Then the discovery of Haber and Le Rossignol, that nitrogen and hydrogen could be combined in presence of contact agents under high pressure, and at moderate temperatures, made it possible to synthesise ammonia more cheaply than it could be obtained by recovery from gasworks liquors.

It is understood that the German Government subsidised the Badische factory to the extent of 100 million marks at the beginning of the war, so that no shortage in their supplies should occur. They claim to be producing sulphate of ammonium, according to Mr. D. Milne Watson, at the rate of 300,000 tons a year, and it is not impossible, provided they can get sufficient sulphuric acid. Mr. A. E. Barton, who has just returned from a visit to Norway and Sweden, learned that the increase in the Badische Company's output of ammonium sulphate was 200,000 tons; they had formerly manufactured 150,000 tons a year. Plant of 10,000 h.p. is being erected, too, in Westphalia, to produce ammonia by the carbide process; the result is expected to be the production of 200,000 tons of concentrated nitric acid a year. Other two works, one in Bavaria, and the other near Cologne, produce between them 45,000 tons of cyanamide.

Had our Government taken the steps which were urged upon them in August, 1914, to prevent Chile saltpetre from entering Germany, in all probability there would have been a shortage of nitric acid in Germany. That shortage is now not likely to occur.

W. R.

National Technical Training.

WITH reference to the recent leading articles dealing with the position of science and industry in this country, attention may usefully be directed to the system under which the work of the smaller technical schools is conducted.

At present it is generally admitted that our workpeople are not very scientific, and their trades unions do not appear to realise how much might be done if the various industries had colleges of their own. The only chance a workman has therefore of learning the technical portion of his business is by attending evening classes at the smaller technical colleges, and it is with these schools I would like to deal, since the subject is now of considerable importance.

At most of these places so many subjects are taught that they resemble museums of applied education more than anything else, and the principals in charge of them, and the inspectors who frequently inspect them, have generally no knowledge of *technical work*, or *business experience*. Why there are so many inspectors nobody knows, or what becomes of their reports. Further, the old system of examination has been given up, and "student hours" are made such a fetish, that I have seen classes opened and closed as many as seven times during a session; closed when one

out of six students failed to appear, reopened again later.

The London County Council has recently tried to centralise its system of teaching, and heads of departments find themselves dispensed with after perhaps eight years' hard work. This is a serious state of matters, as it shakes one's confidence in technical teaching as a profession. In many schools there is no pension.

From the nature of their appointments the teachers are not allowed to do outside work, yet specialists are sometimes engaged to lecture because they have outside experience. If more security was offered to teachers, and if they could keep in touch with the outside world, workpeople would go to their classes. Under the present system large sums have to be spent advertising these schools which should not require it. There has been a great deal too much of the village schoolmaster attitude, and it is surely a mistake to allow technical work to fall into the hands of such people.

W. H. F. MURDOCH.

Westerlea, Millhill.

WAR ECONOMY AND AGRICULTURAL EDUCATION.

THE necessity for economy is having the interesting result of showing the relative values attached by county councils to the things over which they have control. When economy becomes necessary one first of all cuts off the things that do not matter, so as to keep hold of those that count.

The present attitude of the county councils towards agricultural education affords a case in point. Considerable sums of money, known as the "whisky money," have been placed by the Treasury in the hands of the county councils for purposes of technical education. Over the spending of the money the taxpayer retained no adequate control, so that the county council can, if it likes, simply apply this money to the reduction of the local rates. Most county councils, of course, have not taken this narrow view, but have conscientiously fostered technical education, with the result that a number of good agricultural colleges and departments of universities are now in existence doing very useful work. But a few have thought of little more than relieving the rates, and, while this course is undoubtedly popular with a certain section of the community, it cannot be described as wise.

A recent instance is furnished by the action of the East Sussex County Council in closing the Uckfield Agricultural College. By a curious anomaly Sussex is divided for educational purposes into two areas, each under wholly distinct administration. East Sussex has tried to run elementary education and higher education on its own account, and has not co-operated with any of its neighbours in the matter. It had an agricultural college at Uckfield which admittedly did useful work: the number of students was well maintained, and grants were earned from the

Board of Agriculture. As a war economy the college has been closed. There is, we understand, no suggestion of inefficiency on the part of the staff: had that existed of course the matter would have been different. Nor was there any widespread demand on the part of East Sussex farmers that their sons should be saved from the possibility of receiving agricultural education. The whole thing appears to have been done by the education committee without reference to anyone, and without any other reason than economy.

Now this action is very serious, more indeed than appears at first sight. An agricultural college is not simply a building—which is at least permanent; it comprises also fields, crops, livestock, etc., which are not permanent, and, once sold into other hands, can scarcely be got together again. To restart the college would be a difficult business. The committee, in short, for the sake of a small saving now, is piling up difficulties in the way of any future attempts at agricultural education that may be made by more enlightened successors. If the college had been paid for exclusively by the East Sussex ratepayers we might leave the matter in their hands. But it has not: the whole State has paid a good deal. The very important question is raised whether an education committee of a county council ought to have the power to close an institution subsidised by the State, and whether the State ought not to have the power of veto.

We believe that East Sussex is the only place where an agricultural college has been closed by the county council, but in another instance—again a case where a county council is split into sections for purposes of education—the expert agricultural organiser has been dismissed on the score, not of inefficiency, which would have been a satisfactory reason had it existed, but of economy. This section of the county will save the organiser's salary—which was not very great—but every agricultural college has mentally noted the fact, and it is scarcely likely that they would recommend competent students to enter the service of that particular body in future. Again the State ought to have the power of veto, for here also it has provided part at least of the funds.

It appears to be only in cases where a county is split up into sections that these unfortunate incidents occur. In larger areas larger ideas prevail, and the further question arises whether it is right that education, which is essentially a matter for the future—and in which, therefore, the large idea is indispensable—should be in the hands of a small committee representing a small area, and we fear animated by rather small ideas? It would seem that better results could be obtained by working over larger areas, for there alone is the hope of finding enough men with ideas and ideals to serve on the committees, and to protect the lecturers and organisers who are honestly trying to do their best for the agricultural community.