wherever possible results have been found by rational rather than empirical methods. The design of a steam boiler, so far as strength is concerned, is a matter in which the designer has but small latitude. In this country he has generally to make the results of his calculations conform to the rules of the Board of Trade, or of Lloyd's Committee, or of both. Hence the book will be of greater service to the student than to the practical designer, although there is much in it which will appeal to the latter also.

Naturally much reference has been made to the Massachusetts Boiler Rules, which have been used as a model by many States and adopted bodily by others. It is of interest to note that, with certain exemptions, these rules provide that all boilers shall be inspected when installed and annually thereafter by the inspection department of the district police, under supervision of the chief inspector of boilers. In this country the periodic inspection of land boilers is left to the owner, who generally delegates the matter to his insurance company. If the boiler is not insured, periodic and competent inspection may, or may not, be carried out, and depends entirely on the owner's workmen or engineer.

The book is well illustrated and contains several fully worked out designs. These, and the methods of calculation, are of considerable interest and will be of service to engineers in this country who wish to acquaint themselves with up-to-date American practice in boiler design.

Mechanical Drawing, with Special Reference to the Needs of Mining Students. By J. Husband. Pp. 79. (London: Edward Arnold, 1915.) Price 3s. net.

READERS of this excellent text-book will have a feeling of satisfaction that a piece of good work, evidently much needed, has been conceived and carried out in a thoroughly efficient manner. Teachers and students connected with mining and colliery engineering are much indebted to the author for putting at their disposal, in a convenient form, material which will specially appeal to them and will prove most helpful in the drawing classes and an incentive to study.

The course is progressive, beginning with some excellent advice on the selection and manipulation of drawing instruments. The well-executed drawings are fully and clearly detailed and dimensioned, and the descriptions are always suggestive in pointing out the leading features of a design, and are models of conciseness and lucidity.

The examples selected are welcome on account of their freshness, importance, and suitability. In order to give an idea of the scope of the work we may instance the plates on bolt and rivet fastenings; built-up work, such as stanchions, girders and pump quadrants; pedestals, shafts and axles for wagons and winding engines; mine cages and colliery tubs; haulage clips and safety hooks; mine pumps; pneumatic hammer drills.

We strongly recommend teachers of elementary machine drawing to consult this most useful manual.

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LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

The Use of Cotton for the Production of Explosives.

WHILE in no way attempting to dispute the authority of the writer of the article on gun-cotton in NATURE of July 1, I should like to take the opportunity of expressing my surprise at the conclusions there reached. On general grounds one would anticipate that plant-products, such as cellulose and alcohols, could be prepared in any country, so long as plants grew; they stand in sharp distinction from metals and petrol, which are not of universal occurrence.

It scarcely seems likely that the suitability of cotton as the cellulose basis for certain explosives can be due entirely to chemical peculiarities, for although cotton is a typical cellulose it contains many impurities—mineral salts, dead protoplasm, cuticle, waxes. These cannot all be entirely removed in course of manufacture, and it is presumably their presence which necessitates the very careful blending employed in preparing cotton for nitration. It seems more likely that the matter is one of physical properties, the thin-walled, hollow, pitted cylinders of the cotton hairs offering a large surface to reagents.

But if this were the prime advantage of cotton, it is not one which need inhibit the use of other forms of cellulose for the making of "gun-cotton." Even the best cotton is by no means uniform from hair to hair, and the waste cotton used for nitration is still more irregular; consequently, it seems likely that an artificial cellulose might be made even more uniform than cotton. It would scarcely be possible to make such a product with the same ratio of surface to mass as is found in natural cotton hairs, but this ratio could at least be made constant, e.g. by dissolving the cellulose and squirting thin threads of it, in the form of "artificial silk." The trade in these artificial silks is mainly Continental, and has been developing rapidly during the last ten years, so that there should be no lack of knowledge of the process in Germany.

Undoubtedly "gun-cotton" made in this way would be quite different from true gun-cotton. All values would have to be re-computed; the trajectory, with the sighting and timing, would be altered, and a great deal of extra work would be thrown on all concerned, but with all submission to the chemists, to whose domain this matter belongs, I venture to think that it may be possible to turn out perfectly uniform "gun-cotton" with cellulose derived from plants other than cotton. The question of cost is immaterial in the circumstances, and although it cannot be doubted that the cutting off of Germany's cotton supplies would hinder the German guns, yet it seems likely that a fairly effective substitute might be devised by the nation of technologists.

Carlyle may be quoted in this connection. "Interrupted Commerce and the British Navy shut us out from saltpetre; and without saltpetre there is no gunpowder. Republican Science again sits meditative. . . . What of saltpetre is essential the Republic shall not want."

W. LAWRENCE BALLS.

Little Shelford, Cambridge, July 7.

I HAVE read not only with interest, but also, I hope, with some instruction to myself, the admirable letter from Mr. Balls which you have been kind enough to let me see. I am entirely in accord with him in his