

was consequently very impure. Three thermometers were placed apparently at a distance of about 4 ft. or 5 ft. from the prism—one in the spectrum, and the other two in the shadow beside it—and the difference of temperature produced by the rays was noted. The bulbs of the thermometers were blackened; one of them measured $\frac{1}{2}$ in. in diameter, but the others were smaller. One and a half inches beyond the red there was a rise of $3\frac{1}{2}^{\circ}$ in 10 min., 1 in. beyond the red $5\frac{1}{2}^{\circ}$ in 13 min., and $\frac{1}{2}$ in. beyond the red $6\frac{1}{2}^{\circ}$ in 10 min. In the violet there was a rise of 1° in 15 min. The spectrum was about 3 in. long, and the heat rays could be detected a distance of $2\frac{1}{2}$ in. into the infra-red.

R. A. HOUSTOUN.

University of Glasgow, May 19.

Anti-Gas Fans.

IN a note in NATURE for May 13 you intimated that my "allegations" concerning the treatment of my anti-gas fans by the War Office and the suffering and loss of life thereby entailed could not be accepted without question, and you called upon the "well-accredited men of science," who, you say, largely staffed the Anti-Gas Service, to make a "plain statement of the facts." I waited to see if such a statement would be forthcoming, though I judged it scarcely likely; and now, since it has not appeared, I ask you, in fairness, to grant me space for a few remarks on your note.

You suggest that such an indictment as I have brought against the War Office, reinforced as it is with their own letters, reports, and pamphlets, can be refuted by the bare word of certain "well-accredited men of science." I pass over the implied slur on myself of being less well-accredited than they, my word of smaller value than theirs. No unprejudiced person who has read that indictment and that evidence with any care will agree with you that they can be thus easily disposed of.

In my dealings with the War Office I had to do with innumerable officials, some of them men of science, most not. From their behaviour I judged the larger number (and the exceptions were not, I regret to say, men of science) to be mere puppets, acting under the direction of some leading spirits behind. Who those leading spirits were I had no means of knowing; I was carefully kept in the dark. You, sir, intimate that they were "well-accredited men of science." If this was indeed so, then surely you will agree with me that, for the sake of science even more than in the interests of the nation at large, it is essential that this matter should not be hushed up, but that a public inquiry should be instituted. I am not only willing, but also most anxious to submit my case to some impartial tribunal. Will the men of science whom you have asked to speak, but who do not answer, come out into the open and join with me in demanding such an inquiry? If not, both the world of science and the general public will know what to think.

HERTHA AYRTON.

41 Norfolk Square, Hyde Park, W., May 23.

[WE did not express an opinion upon the charges made by Mrs. Ayrton, but limited ourselves to a statement of the indictment, and pointed out that it was really directed against the men of science associated with the Gas Service of the Army. Possibly these officers are not free to enter into a discussion of reasons for the neglect of the use of the fans, and nothing short of a public inquiry will elicit the whole of the facts in regard to them.—ED. NATURE.]

NO. 2640, VOL. 105]

A New Method for Approximate Evaluation of Definite Integrals between Finite Limits.

THE subject has a particular interest for naval architects, inasmuch as the majority of calculations relative to displacement, stability, strength, etc., of ships involve the finding of areas and volumes bounded by curved lines and surfaces.

The particular rule enunciated by Mr. A. F. Dufton in NATURE of May 20 has been in use at this college for some years, and gives very accurate results in obtaining areas and volumes, and also, by a further application, the positions of their centres of gravity.

The method of its derivation was from one of Tchebycheff's rules. $f(x)$ in this particular case is taken as $(a+bx+cx^2+dx^3+ex^4)$. It can readily be shown that the value of

$$\int_0^1 f(x)dx = \frac{1}{4}[f(x_1)+f(x_2)+f(x_3)+f(x_4)],$$

where

$$\Sigma x_1 = 2, \Sigma x_1^2 = \frac{4}{3}, \Sigma x_1^3 = 1, \Sigma x_1^4 = \frac{4}{5},$$

whence $x_1 = 0.1027$, $x_2 = 0.4062$, $x_3 = 0.5938$, and $x_4 = 0.8973$. The approximation to one-tenth, four-tenths, six-tenths, and nine-tenths was obvious, and all the more welcome because it is our usual practice to divide the ship's half-length into ten sections. No special sections have to be drawn, calculations being readily made with the aid of the existing drawings.

This rule was briefly referred to by Mr. W. J. Luke at a meeting of the Institution of Naval Architects in 1915 (Trans. I.N.A., vol. lviii., p. 210).

The application of Simpson's ordinary rule to find the area of a quadrant or semicircle, as quoted, manifestly shows Simpson's rule at its worst, owing to the wide divergence of the curve from the assumed curve from which the rule is derived. Where curves approximate to these forms, as in many sections of a ship, it is common practice in the use of this rule to interpose intermediate ordinates where the curve is "steep"—relative to the base line—to get greater accuracy.

An interesting paper dealing with this subject and giving a great variety of rules for approximate integration was read at the Institution of Naval Architects in 1908 (Trans. I.N.A., vol. i.) by Sir W. S. Abell entitled "Two Notes on Ship Calculations."

C. F. MERCHANT.

Royal Naval College, Greenwich, S.E.,

May 27.

Applied Science and Industrial Research.

YOUR correspondent Mr. J. W. Williamson says in NATURE of May 27 that much of my criticism of the Department of Scientific and Industrial Research "seems to lend colour" to current misconceptions of industrial research, which he proceeds to construct out of his own imagination, having first fathered them on me, and then submits that the cause of pure science is not well served by inconsiderate attacks on the industrial research movement, such as he would have it believed I made. I judge from this that he was not present at the meeting, and I therefore wish it to be known that the full text of my address to the National Union of Scientific Workers can be obtained by forwarding a stamped addressed foolscap cover to the General Secretary, 19 Tothill Street, Westminster, S.W.1. If Mr. Williamson will have the goodness to read it and the full report of the meeting published in the current issue of the *Scientific Worker*, the official organ of the union, and then say, if he still desires, what he objects to, it would help rather than confuse the issue.

FREDERICK SODDY.