and for his examiners. The different methods of approaching the subject have now had a fair trial, and, if geometry is any longer to educate the reasoning faculties, it remains for the Mathematical Association to choose the best method, and to recommend it until a better appears.

Yours faithfully, W. F. B.

ARITHMETIC IN ELEMENTARY SCHOOLS.

Dear Sir,—Many members of the M.A. must be working in schools in which there are scholars from the elementary schools. The experience of the writer has led him to the conclusion that little or no attempt is made in elementary schools to teach Arithmetic on modern lines. Thus a considerable amount of time has to be taken up in training these boys in methods which should have been placed before them quite at the beginning.

The attention of the teachers in elementary schools should be drawn to the fact that multiplication should be begun with the highest digit and not with the digit of least importance. It is astonishing that the old method is not dead: it is very much alive, especially amongst the female teachers. Pupil teachers who attend secondary schools for a portion of their time where modern methods are in use are sent to be trained to teach Arithmetic in the elementary school to which they are attached. Here the master or mistress persists in the old ways, and when the pupil teachers are called upon to give a lesson in Arithmetic they must not run counter to their instructors, and so the blunders are perpetuated. Enquiry has been made of former pupils, who are at this moment in Training Colleges in London and elsewhere, as to the methods in favour at the schools they attend during their training. "Oh, we are still in the dark up there, we stick to our unit digit." A teacher, who was being helped to prepare for the Certificate Examination, had his attention drawn to the same fact. "Yes," said he, "I have seen it done like that, and I suppose it has its advantages, but when I am giving a lesson I drop into the old method." In cases of this kind what seems to be wanted is a little energetic action on the part of His Majesty's Inspectors. If these gentlemen will administer the necessary amount of shocks things may improve, and if they will steadily set their faces against the use of some abominable text-books much may be done.

Decimals are taken in hand as though the pupils were being initiated into processes absolutely new, and the place values of digits are not properly enforced. As a result, the child who is being stuffed with multiplication sees "one of those d——d dots," as a former Chancellor of the Exchequer is said to have described them, suddenly appear in the product, its position having been fixed by the usual jargon.

In what sort of condition is a boy, who has been so treated, to tackle a simple bit of contracted work? Elaborate directions in carrying out contracted work are not necessary when place values of digits are properly grasped. There is a great saving of time, and logarithms come on the scene without much delay.

"Shop" subtraction is not taught in the place of the ancient method, and Italian Division is ignored, because the teacher has not been accustomed to the method and will not practise it. It is doubtful if any one ever goes back to the cumbrous old method who has once broken away from it. It is sometimes stated that it is more difficult to detect a mistake in division done in the Italian fashion, but familiarity with the method cures this weakness.

The elementary scholar now and again does some wonderful things in division.

It must be remembered that the boys who come from elementary schools to secondary are sometimes the pick of the schools from which they come,

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and are generally the holders of County Council and other scholarships. If the early methods of these boys are not up to date there is waste all the way round—waste that can be prevented if those in authority will see to it.—Yours faithfully, T. C. PHILPOTT.

Queen Mary's School, Basingstoke.

THE PILLORY.

DEAR SIR,—I send the following question from the last *Responsions* Arithmetic paper. You may find it worth printing in the "pillory."

The hands of a clock are together at 22 minutes past 4. Is the clock slow or fast, *and how much does it lose or gain in an hour of true time?* The italics are mine.—Yours faithfully, G. P. BLAKE.

Bradfield College.

ANSWER TO QUERY.

[**67, p. 330, vol. v.**] This theorem is due to Mr. V. Ramaswami Aiyar. It appears in an article contributed to the *Proc. Ed. M. Soc.*, 1896-7.

My proof of the theorem is given in the *Ed. Times Reprint*, Vol. 17, June 1910. It depends on the fact that the common pedal circle of F, F' (the auxiliary circle of the in-conic) cuts the medial or N.P. circle in ω, ω', the *orthopoles* of OF, OF'; *i.e.* the points whose Simson lines (in the medial circle) are parallel to OF, OF'. When ω' coincides with ω, then OF' falls on OF, and hence the well-known theorem: If FF' passes through O, the pedal circle of FF' *touches* the medial circle.

Feuerbach's theorem is, of course, a particular case.

May I be permitted to state what is known at present of this very curious and interesting 'orthopole'?

(The initial N. stands for Professor J. Neuberg; G. for the present writer.)

1. If Ap, Bq, Cr be $\perp$rs on a given line L, then the $\perp$rs from p, q, r on BC, CA, AB respectively are concurrent at a point ω called the orthopole of L. (N.)

2. L being $px+qy+rz=0$ (in barycentric coordinates), ω is given by

$$2\Delta x = q(r-p)ca\cos B - r(p-q)ab\cos C + a^2bc\cos B\cos C. \quad \text{(G.)}$$

3. If L cuts the circle ABC in T, T', then ω is the point of intersection of the Simson lines of T, T'. (N.)

If θ_1, θ_2, θ_3; λ, μ, ν; λ', μ', ν' are the direction angles of TT' and the Simson lines, then for ω,

$$\alpha = 2R\cos\theta\sin\lambda\sin\lambda', \text{ etc.} \quad \text{(G.)}$$

4. For the quadrilateral formed by L and the sides of ABC, the common R.A. of the three diameter circles passes through ω. (N.)

The power of ω for these three circles $=2d\delta$, where d, δ are $\perp$rs from O and ω on L; also $\delta = 2R\cos\theta\cos\theta_2\cos\theta_3$. (G.)

5. The most remarkable of all the properties of the orthopole is that discovered by M. T. Lemoyne.

Lemoyne's Theorem. The power of ω for the pedal circle of every point F on L is constant. The three diameter circles are pedal circles, so that this common power $=2d\delta$.

6. Another noteworthy property has been recently published by Prof. Neuberg.

Neuberg's Theorem. If parallel forces $\cos\theta_2\cos\theta_3\sin A$, etc., be applied at the vertices of the pedal triangle of any point F on L, then their centre is a fixed point, the orthopole.