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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 309,

For the Week ending December 3, 1881.

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THE ACME OF MISINSTRUCTION.

The public schools of Philadelphia—some of them at least—have achieved the unenviable fame of having "about the vilest plan of education that was ever devised." So at least an indignant parent says, and the proof offered is, we trust, sufficient. We cannot bring ourselves to think that any school work can be worse.

Hearing his little girl sobbing over a rule which she was trying to commit to memory, he investigated the matter and found the words to run in this wise:

"Rule for Short Division Rule dash one write the divisor at the left of the dividend, semicolon, begin at the left hand, comma, and divide the number denoted by each figure of the dividend by the divisor, comma, and write the quotient beneath, period. Paragraph."

"2. If there is a remainder after any division comma, regard it as prefixed to the next figure comma and divide as before period. If any partial dividend is less than the divisor, comma, prefix it to the next figure, comma, and write a cipher in the quotient period."

"Paragraph Proof period dash multiply the quotient by the divisor, comma, and add the remainder, comma, if any, comma, to the product, period."

The teacher's object was not to reduce this particular ten-year old girl to idiocy or insanity by the quickest possible method; the aim was simply to insure the "correct" writing and pointing of the rule in the recitation room. All the children had to study rules that way; and though a Philadelphia lawyer could not easily follow the sense of a rule through such a jargon of words, it seems that Philadelphia children are compelled to; or, rather, they are compelled to memorize the jargon and the sense is disregarded. In the course of his inquiries the parent found that if a comma was left out in writing the rule, though the sense remained unchanged, the pupil suffered as much in loss of marks as though she had committed a vital blunder.

A more thoroughly foolish perversion of arithmetical instruction could not well be conceived. And the professional stupidity and formalism which could devise such an outrageous method of teaching one subject is from that achievement alone demonstrahly unfit to be trusted with any branch or department of instruction.

Taking the schools as they run, good, bad, and indifferent together, it is speaking within bounds to say that two-thirds of the work done in them might be wiped out and abolished to the benefit of the children. They might then have time to learn in a reasonable way some things worth their while to know, in the learning of which in a proper way they would be educated and not stultified, as they are under the more or less mitigated Philadelphia fashion now prevalent.

WATER FUEL ON A LOCOMOTIVE.

We learn from the *Tribune* and other papers that a locomotive in which neither wood nor coal will be burned is now in process of construction at the Grant Locomotive Works at Paterson, N. J. "In reality the fuel to be used is water," says the *Tribune*, and several of the other papers introduce their notices of the locomotive with the announcement, "The use of water as fuel." All this, coming in the dry season, is certainly very startling. But really no alarm need be felt about our Croton supply and our very useful rivers, for it is not exactly the water which is to be set on fire, but, as the *Tribune* explains, the water is first "decomposed in association with carbon, forming readily combustible gases, of which hydrogen is the chief." We are further relieved on learning that the project is in fact only the naphtha water vapor process which was about ten years ago fully tested at the Brooklyn Navy Yard, on the Battery, and elsewhere.

The explanation of former failures appears now to be that the older experimenters did not have the correct theory. The *Tribune* says: "The argument brought against the Holland," (naphtha steam) "process was that it was based on an erroneous principle, being in opposition to the law of conservation of energy. But it is answered that while the dissociation of steam must require as much energy as is later developed in the combustion of the hydrogen, that energy need not necessarily take the form of heat in the dissociation process. The form of energy which does take the place of the heat saved is stated to be chemical affinity." "The carbon of the naphtha gas, with which steam is brought in direct contact in the Holland process, lowers the dissociation temperature to 400° C. As the hydrogen resulting from the dissociation burns with a heat of nearly 8,000° C., a gain is effected, roughly speaking, of nineteen-twentieths of the whole heat."

The sentences quoted seem to be intended to represent that some new principle has been discovered relating to the decomposition of water, and that the Holland process effects a saving of nineteen-twentieths of the cost of heat by former processes. But there is nothing alluded to as of a scientific character which has not been familiar knowledge for a long time. As to the saving of heat it should be noticed that the nineteen-twentieths, roughly speaking, is only one side of the cost account. Admitting that nineteen-twentieths of the heat required to dissociate the elements of water would be "saved" when the elements were separated by an equivalent of chemical affinity, no advantage could be shown until it appeared that chemical affinity was cheaper than heat. Water at a freezing temperature may be decomposed by sodium or electricity, and the whole of the heat of dissociation be "saved;" in like manner the cost of going by the lightning express may be "saved" by taking the owl train. The accuracy of the figures, nineteen-twentieths, is not material to the argument, and it is not worth while to expose the fallacy of the calculation which has produced them.

The Holland apparatus, as described, seems to us somewhat crude in comparison with some others of a similar intent. He uses naphtha and water vapor under materially the same conditions as his predecessors, and even if he had discovered a new theory it is not likely that naphtha steam would behave differently on that account.

The most that can be reasonably hoped from the experiment is that it may result in some useful hint on the use of naphtha fuel in places where it is more needed than on a locomotive.

COMMANDER CHEYNE'S LECTURES.

The first of a series of lectures on Arctic Research was delivered in this city, November 17, by Commander Cheyne, of the British Navy. The lecture was illustrated by a series of beautifully colored vivid and spirited stereopticon pictures of Arctic scenes and incidents, in several of which certain of the objects were represented in motion while the general scene was at rest.

In substance, delivery, and illustration, the lecture was a notable and admirable innovation upon the usual custom in such cases. Though an old man Commander Cheyne retains much of the dash and vigor which he displayed years ago in the search for Sir John Franklin. His purpose in these lectures is to enlist the co-operation of our people in an expedition to the Pole, in which balloons are to be employed after reaching the coal deposits on Smith's Sound, 500 miles in a direct line from the Pole.

As our readers will remember, the plan of employing balloons in Arctic research, as proposed by Commander Cheyne, was described and illustrated in this paper two years ago (September 20, 1879).

THE RELATION OF AGRICULTURE AND MANUFACTURES TO POPULATION.

The Census Office has issued a bulletin presenting the results of a study of the statistics relative to the distribution and density of population last year, in comparison with the result of previous enumerations.

The settled area is taken to include all which contains a population of two or more to the square mile. Upon this definition the settled area of 1880 is mainly comprised in one large body lying eastward of the plains. Here reside 95 per cent of the total population of the country, the remainder being in detached bodies of comparatively small size, chiefly in Oregon and California.

Within the great settled area are several regions practically unsettled, like Southern Florida, the northern part of Maine, the Adirondack region in Northern New York, and Northern Wisconsin and Minnesota. Five grades of density are recognized, three of them denoting the predominance of agricultural pursuits. The first grade represents a sparse population—from 2 to 6 to the square mile. It is found mainly along the frontier, in Florida, Minnesota, Nebraska, Kansas, Texas, California, Colorado, Oregon, and the Territories. In these areas the population is sustained rather by the grazing industry than by agriculture. In some parts mining is obviously an industrial factor. The poorest tillage regions sink into this grade, which is not inconsiderably represented in some of the older States.

The second grade of population—6 to 18 to the square mile—indicates for the most part defined farms and plantations, and the systematic cultivation of the ground; but this, either in an early stage of settlement or upon more or less rugged soil. This grade is found largely in many of the Western and Southwestern States, and in the mountainous regions of the Atlantic slope.

The third grade—18 to 45 to the square mile—almost universally indicates a highly successful agriculture. Here and there the presence of petty mechanical industries raises a difficult farming or planting region into this grade of density of population, but in general, where manufactures exist at all, they induce a population of 45 or more to the square mile. Speaking broadly, agriculture in the United States is not carried to such a point as to afford employment and support to population in excess of that number. This third grade of population is predominant in Alabama, Delaware, Georgia, Illinois, Iowa, Kentucky, Maryland, Mississippi, Missouri, North and South Carolina, Tennessee, Virginia, and Wisconsin. Of the New England states, Maine, New Hampshire, and Vermont have also large tracts in this degree of settlement.

The fourth grade of settlement—45 to 90 to the square mile—almost universally indicates the existence of commercial and manufacturing industry and the multiplication of professional and personal services. This grade is found in excess of any other in Connecticut, Indiana, Maryland, Massachusetts, Michigan, New York, Ohio, and Pennsylvania.

The fifth grade—90 or more to the square mile—represents a very advanced condition of industry. In New Jersey and Rhode Island alone is this grade of settlement in excess of every other grade, indeed in excess of the sum of all the other grades. This degree of settlement is reached only where manufacturing and trading villages are numerous.

The States containing more than a thousand square miles in the fourth grade of settlement are Illinois, 13,500 square miles; Indiana, 24,810; Iowa, 1,100; Kentucky, 11,000; Maine, 2,795; Maryland, 6,860; Massachusetts, 4,840; Michigan, 16,630; Mississippi, 2,200; Missouri, 1,160; New Hampshire, 1,230; New Jersey, 2,440; New York, 33,000; North Carolina, 4,700; Ohio, 37,600; Pennsylvania, 20,