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THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 388,

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NON-COMBUSTIBLE FABRICS.

Notwithstanding all that has been written or said about rendering dress goods and curtains non-combustible, the subject does not excite as much public interest as it deserves. We have often referred to the subject, but the following paper by Dr. P. Rabe, in the *Industrie Blaetter*, will prove of interest:

Gay Lussac succeeded in rendering fabrics totally incombustible by soaking them in a 7 per cent solution of sulphate of ammonia. In 1838 the Paris police made the use of uninflammable material compulsory on the stage. This process, however, did not work well, for in course of time the ammonia partially escaped and the sulphuric acid that remained destroyed the fiber. Then, too, the goods gradually lost their non-combustibility by use. Chevalier tried to avoid this by employing a mixture of sulphate of ammonia and borax, but this injured the fabric likewise. After the burning of the Munich Theater Fuchs recommended a coating of waterglass for protecting easily combustible substances. But since the heat causes the waterglass to peel off it affords little protection. Versmann and Oppenheim first made experiments on a large scale, and found that four salts were suitable for impregnating fabrics, viz.: 1. Phosphate of ammonia. 2. Phosphate of ammonia with salammoniac. 3. Sulphate of ammonia. 4. Tungstate of soda. For articles that require starch, only the last is suitable; it has in fact been used in England for twenty years. Abel impregnated fabrics with silicate of lead by first saturating them with sugar of lead, then dipping them in waterglass solution and washing. Subsequently a series of other substances were recommended, the most important of which will be found at the close of this article.

Means have also been discovered for protecting woodwork from burning. Usually it has been attempted to gain this end by means of a paint. Nickle's process, which has been used a good deal in Strassburg, consists in adding to the lime used for whitewashing an equal weight of chloride of calcium solution of 14° B., and applying the whitewash in the usual manner. Another wash used in Westphalia consists of 2½ parts of salammoniac, 1 part of sulphate of zinc, 2 parts of carpenter's glue, 20 parts of zinc white, and 30 parts of water. Patera in Vienna has used with success a mixture of 2 parts of gypsum and one part of sulphate of ammonia in 3 parts of water. J. A. Martin recommends 15 parts of salammoniac, 5 parts of boracic acid, 50 parts of glue, and 1½ parts of gelatine in 100 parts of water, to which is added enough pulverized lime to bring it to the proper consistency.

Schussel and Thouret have rendered wood incombustible by impregnating it with this mixture. To 16 parts of a phosphoric acid solution of 16° B., and 2½ parts of carbonate of ammonia, are added 6 parts of a solution of salammoniac of 10° B., and 1 part of gum arabic. The dried wood is put in this liquid for at least twenty-four hours, then allowed to dry, and painted with oil paint.

There is no doubt that impregnation protects the wood from fire better than any kind of paint, and will no doubt become very important in the future. Probably the rather costly mixture of Schussel and Thouret may be replaced by other substances that are of scarcely any value for other uses, such as the still unused portions of the Stassfurt salts, and the enormous quantity of waste chloride of calcium made in some manufactures. Instead of saturating the wood by simply dipping it into the liquid, it would be better to force it in by atmospheric pressure. In a similar manner wood is already impregnated on a large scale to protect it from decay, and the works where railroad ties are prepared should not permit the preparation of fireproof lumber for building purposes to slip through its hands. The same substances that prevent its burning also protect it from dry rot. It is to be hoped that the use of impregnated fireproof lumber shall not be limited to theaters and similar buildings, but come into general use.

IMPREGNATING LIQUIDS FOR FABRICS.

DISCOVERER	COMPOSITION.
Versmann and Oppenheim.	Solution of tungstate of soda of 28° Twaddle with 3 per cent phosphate of soda.
Nicoll.	6 parts alum, 2 parts borax, 1 part tungstate of soda, 1 part dextrine in soap water.
Siebdrath.	5 parts alum, 5 parts phosphate of ammonia, in 100 parts water.
Patera.	3 parts borax, 2½ parts sulphate magnesia, in 20 parts of water.
Martin.	8 parts sulphate of ammonia, 2¼ parts carbonate of ammonia, 3 parts of boracic acid, 2 parts borax, 2 parts starch, and 100 parts of water.

DEFECTIVE INSTRUCTION IN READING.

The census enumerators found in the common schools, two years ago, close upon ten million pupils. In the high schools there may have been a million more. Let it be granted as no fault of the schools that—as school officers tell us—the lower half of this vast number are too young or have been too little at school to have learned to read more than a hundred or two of the simplest English words. How about the upper half? How many of them know, or are likely ever to know, how to read—that is, to read to good purpose?

As a rough estimate, based upon not a little practical knowledge of the instruction given in our schools and its results, we should say not one-half, including college graduates as well as the graduates of lower schools. In truth, it is the exception when a student learns how to read in school. As a rule, the schools do not teach reading in any strict sense of the term, even when they spend much time in formally drilling their pupils to call off with more or less of elocutionary effect the words of a printed exercise. We have known those who might win prizes for that sort of display, who yet had but the vaguest idea of the essentials of the art of reading. Indeed, their notion of reading is much like that of the young man who protested that he could not see why some people called Euclid "hard reading." He had read a whole book at a sitting, and without the slightest difficulty. That reading implied understanding, had never occurred to him.

The crowning defect of the instruction in reading given in schools could not be more forcibly illustrated. To recognize the words at sight, as words, is the grand object; and when this has been accomplished it is taken for granted that there is no more to be done. The usual matter of the reading exercises makes the delusion easier. At best the selections are purely literary, employing a literary vocabulary, and allowing a wide range of vague comprehension to pass for understanding. When one who has been taught to read in this way (and the majority are) essays, to read matter requiring clearness and precision of thought, or an exact understanding of facts or principles, he is all at sea. He thinks he knows how to read, but he does not. He may be able to call off the words with the utmost readiness; but there is no real reading, for there is no full and clear understanding. The unschooled mechanic, who has ploddingly read for specific information upon subjects he has wanted to master, seeking for knowledge he needed to use, may mispronounce half the words, and yet be the better reader, for he will not be content with empty sounds. To him reading is a means to an end, not an end in itself.

We have sometimes thought that if our common schools should aim first of all and all the time simply to teach pupils to read, the public benefit would be greater than is obtained under the more ambitious system which now prevails. Such teaching would be useful so far as it went, and it would go further for all practical purposes, educational or otherwise, than the delusive smattering of many things which the majority of pupils now get; for it would necessitate a systematic building up of a comprehensive vocabulary every word of which would have to be objectively taught and variously illustrated until its meaning should be as fully comprehended as the pupil's age and capacity might make possible, and also a constant practice in the recognition of known truths and in the acquisition of exact knowledge in and from print.

If all school children were thus taught to read a death blow would be struck to the production of what forms the bulk of the popular literature of the present time, for its market would be spoiled; at the same time the level of popular intelligence would be materially raised, and something like a revolution wrought in social, industrial, and political affairs by exacter habits of popular thinking and speaking. Half the mistakes, misunderstandings, and conflicts which spoil the peace of society arise from the inability of most people to give or follow exact directions, written or spoken. Strictly speaking, the average reader does not know how to read.

LIVE STOCK IN THE UNITED STATES.

A census bulletin gives the statistics of live stock in each of the States and Territories, exclusive of ranche stock and the horses, mules, cows, and swine (in cities or elsewhere), belonging to persons not owning or occupying farms. The totals are: horses, 10,357,981; mules and asses, 1,812,932; working oxen, 993,970; milch cows, 12,443,593; other cattle, 22,488,590; sheep, 35,195,656; swine, 47,683,951. The percentage of increase during the ten years from 1870 to 1880 was: horses, 45; mules and asses, 61; working oxen, (decrease), 25; cows, 39; other cattle, 66; sheep, 24; swine, 90.

The State having the largest number of horses on farms is Illinois, 1,023,082. New York's number is 610,358. If the horses in our cities and employed on the canals were added the showing would be very different. The horses in the other leading States number as follows: Texas, 806,099; Iowa, 792,322; Ohio, 736,478; Missouri, 667,776; Indiana, 581,444; Pennsylvania, 533,578. Missouri leads in mules and asses, with 192,027; Tennessee has 173,488; Texas, 132,581; Georgia, 132,078; Mississippi, 129,778; Illinois, 123,278; Alabama, 121,081; Kentucky, 116,653; Texas has the largest number of working oxen, 90,603; the other States having more than fifty thousand each are: Alabama, 75,534; Mississippi, 61,705; Virginia, 54,769; North Carolina, 50,188; and Georgia, 50,026.

New York leads enormously in milch cows, with 1,437,855; then comes Illinois, 865,913; Iowa, 854,187, Pennsylvania, 854,156; Ohio, 767,043; Missouri, 661,405; Texas, 606,717; no other has half a million, though that number is approached by Indiana, 494,944, and by Wisconsin, 478,374. In "other cattle" Texas leads with 3,387,967, and five other States have over a million each: Iowa, 1,755,343; Illinois, 1,515,063; Missouri, 1,410,507; Ohio, 1,084,917; and Kansas, 1,015,935. Ohio leads in sheep, with 4,902,486; then come California, 4,152,349; Texas, 2,411,887; Michigan, 2,189,389; New Mexico, 2,088,831; Pennsylvania, 1,776,598; New York, 1,715,180; Missouri, 1,411,298; Wisconsin, 1,336,807; and Indiana, Illinois, Kentucky, and Oregon, with over a million each. Iowa leads in swine, with 6,034,316; Illinois has