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THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 338,

For the Week ending June 24, 1882.

Price 10 cents. For sale by all newsdealers.

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, 2½ 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

5,170,266: Missouri, 4,553,123; Indiana, 3,186,416; Ohio, 3,141,333; Tennessee, 2,158,169; Texas, 1,954,948; Arkansas, 1,565,098; Alabama, 1,252,462; Georgia, 1,471,003; Mississippi, 1,151,818; Nebraska, 1,241,914; Pennsylvania, 1,187,968, Wisconsin, 1,128,825. Michigan and Virginia approach the million, but no others do. There was an increase in the number of working oxen in fifteen States, all southern except Michigan.

The Franklin Institute on "the Legalizing of Theft."

At a special meeting of the Franklin Institute, May 24, the following resolution was adopted:

WHEREAS, By a vote of the House of Representatives of the United States, taken on the 15th day of May, 1882, a bill was passed to amend the United States patent laws—which amendment takes away almost the entire protection granted by letters patent to property acquired by invention, and in effect legalizes theft; and

WHEREAS, It is manifest that any such enactment as will relieve the possessor of a fraudulently made article from all liability as a party to the infringement, will render the protection heretofore guaranteed by letters patent as utterly inadequate as though no patent existed; and

WHEREAS, The unparalleled advances that have been made by this nation in every department of science and industry are due solely and unquestionably to the wise provisions of our patent laws, and all legislation that in any degree detracts from the protection now afforded to inventors would paralyze all the industries which by protected ingenuity have become monuments to American progress, and sources of incalculable wealth to the nation;

Resolved, That it is the sense of the Franklin Institute, of the State of Pennsylvania, for the Promotion of the Mechanic Arts, that the amendment to section 4,919 of the Revised Statutes, relating to the recovery of damages for the infringement of patents, which passed the House of Representatives May 15th, 1882:

Is a violation of the rights insured to the holders of patents under the laws of the United States;

Is a deprivation of the remedies which are essential to the maintenance of those rights;

Is a breach of the contract with patentees made by the laws relating to patents;

Is injurious to the interests of inventors and patentees, with no compensating advantages to any other honest persons;

And is destructive of the system of patents in the United States, which has done more than any other one thing for the promotion of the mechanic arts and the advancement of the material interests of the country.

Prof. Wm. B. Rogers.

Prof. William B. Rogers, one of the founders of the Boston Institute of Technology, and for many years its president, died suddenly, May 30, while addressing the graduating class.

Prof. Rogers was born in Philadelphia, in 1805, and, like his three brothers, early distinguished himself in scientific pursuits. His first lectures on science were delivered in the Maryland Institute in 1827, and two years later he succeeded his father, Dr. P. K. Rogers, as Professor of Natural Philosophy and Chemistry in William and Mary College. In 1835 he accepted the chair of natural philosophy and geology in the University of Virginia, a place which he filled till 1853, when he removed to Boston, where he has since resided. He analyzed the waters of the mineral springs in Virginia in 1835, and organized the State Geological Survey, at the head of which he remained till it was discontinued in 1842. He delivered a course of lectures in 1862, before the Lowell Institute in Boston, on the application of science to the arts, and from 1862 to 1868 was President of the Boston Institute of Technology. He was elected President of the American Association for the Advancement of Science in 1875, and at the time of his death was President of the National Academy of Sciences. As an author he produced a treatise on the "Strength of Materials" (1838); "Elements of Mechanical Philosophy" (1852); and many scientific papers.

John Franklin Gray.

Dr. John F. Gray, the father of homeopathy in America, died in this city, June 5. He was born in Sherbourne, N. Y., in 1804. He was graduated at the College of Physicians and Surgeons in 1826, and shortly after began to practice his profession in this city. Subsequently he adopted homeopathy, and in 1834, in connection with his brother-in-law, Dr. Heill, he started the *Homeopathic Examiner*, the first journal of that school of medicine. The American Institute of Homeopathy was started in 1844 at his suggestion. Hamilton College made him a Doctor of Laws in 1871. He was a believer in a high standard of scholarship. The State Board of Medical Examiners was formed through him; he was its first president, and has since been one of the board.

Progress of Orange Culture in Florida.

A Florida paper says that within a radius of eight miles of Sanford, that State, there are 2,992 orange groves, containing 165,235 trees, and, although only 5 per cent of the trees are now bearing, they produce 2,500,000 oranges annually. The entire State is said to produce 50,000,000 oranges.

Curiosities of Ocean Cables.

Of the total 97,200 miles of cable in the world, some 36,420 are owned and worked by the Eastern Telegraph Company and its affiliated companies, the Eastern Extension Telegraph Company and the South African Telegraph Company. The Eastern Telegraph Company is perhaps the most enterprising of cable corporations, and makes a very fine display at the Crystal Palace, London. Cable operations have been, says *Nature*, of great assistance to the geographer, and the soundings taken in order to ascertain the nature of the sea bottom, where a cable route is projected, have enriched our charts quite as much as special voyages. There is, however, another way in which these operations could be made subservient to the cause of natural science; but it is a way which has not been sufficiently taken advantage of. Besides the specimens of stones, mud, and sand, which the sounding lead brings up from the deep, the cable itself, when hauled up for repairs, after a period of submergence, is frequently swarming with the live inhabitants of the sea floor—crabs, corals, snakes, mollusks, and fifty other species—as well as overgrown with the weeds and mosses of the bottom.

Many an unknown species has passed over the drums unnoted to rot and fester in the general mess within the cable tanks. We venture to predict a rare harvest to the first naturalist who will accompany a repairing ship, and provide himself with means to bottle up the specimens which cling to the cable as it is pulled up from the sea.

Some idea of these trophies may be gathered from the stall of the Eastern Telegraph Company, where a few of them are preserved. Two of these are a very fine gray sea snake, caught on the Saigon cable in a depth of thirty fathoms, and a black and white brindled snake, taken from the Batavian cable in twenty-five fathoms. Twisting round ropes seems to be a habit of this creature, for the writer remembers seeing one scale up a ship's side out in the River Amazon, by the "painter" hanging in the water.

A good example of a feather star is also shown; these animals being frequently found grasping the cable by their tentacles. A handsome specimen of the blanket sponge, picked up in the Bay of Biscay, is also exhibited. But the most interesting object of all is a short piece of cable so beautifully encrusted with shells, serpulæ, and corals, as to be quite invisible. It was picked up and cut out in this condition from one of the Singapore cables. The rapid growth of these corals is surprising, and some valuable information on this head might be gained if the electricians of repairing ships in these eastern waters would only make some simple observations. Curiously enough, so long as the outermost layer of oakum and tar keeps entire, very few shells collect upon the cable, but when the iron wires are laid bare, the incrustation speedily begins, perhaps because a better foothold is afforded.

A deadly enemy to the cable, in the shape of a large boring worm, exists in these Indian seas; and several of them are shown by the company. The worm is flesh colored and slender, of a length from 1½ inches to 2½ inches. The head is provided with two cutting tools, of a curving shape, and it speedily eats its way through the hemp of the sheathing, to the gutta percha of the core, into which it bores an oblong hole.

A full account of this particular worm, with anatomical illustrations, is given in the *Journal of the Royal Microscopical Society* for October, 1881, by Dr. Charles Stewart, Secretary of the Society. The bore holes, after passing through the oakum of the inner sheathing, either pursue a tortuous course along the surface of the gutta percha core, or go right into the copper wire, thereby causing a "dead earth" fault. Dr. Stewart classes the worm as one of the Eunicidæ, but proposes for it the generic name of *Lithognatha worslei*, because of its possessing a pair of calcareous mandibles or cutting jaws, and after Captain Worsley, the commander of the repairing ship which picked up the worm-eaten cable. The pair of calcareous jaws, in addition to three pairs of chitinous ones, is the most remarkable feature about the animal, and the white plates which form them make the creature look as if it were in the act of swallowing a tiny bivalve shell.

The best protection hitherto formed against it is to cover the core with a ribbon of sheet brass, laid on without a lap. First the gutta percha is covered with cloth, then the brass is overlaid. Canvas is then put over the brass, and the hemp and iron wires over all. A close layer of iron wires is not a sufficient protection, for the worm can sometimes wriggle in between the wires where they are not close enough; and, moreover, the rapid decay of iron wires in tropical seas is certain to leave the core a prey to these pests in a few years.

The Eastern Extension Telegraph Company also exhibit some interesting samples of stones picked up from the sea bottom; for example, limestone blocks and shells bored by the bivalve, *Saxicava ragosa*, the worm Sabella, and the sponge *Hymeniacidon celata*; wood honeycombed by the teredo, a red stone pitted by the bivalve shell (pholas), and a ferruginous flaky stone brought up from the bottom between Penang and Singapore. Most interesting, however, of these inanimate waifs is a flat piece of black flinty rock hollowed into cup-like pits by the sucking feet of the sea hedgehog. The pits are excavated as lairs for the animal, and some of them are nearly three inches in diameter by one inch deep. To make the rocky bed softer to the feel, the hedgehog has lined it with a calcareous enamel, probably secreted by its body, much in the same way as the pearl oyster coats its shell.

In the earlier days of submarine telegraphy, Sir William Thomson declared the life of a cable to be practically inviolable; and Robert Stephenson, on the other hand, was of opinion that no cable would last out ten years. The latter view has proved the more correct, for the average life of a cable hitherto has been about eleven years. Thanks to the improved means of repairing them, however, the outbreak of faults does not mean the loss of a cable, for these flaws can be cut out in water, however deep, and the cable put to rights again. Indeed every cable company expects a recurrence of faults, and provides a fully equipped repairing ship always on the spot.

Cattle Transportation.

A train of ten improved stock cars, containing 158 head of cattle, arrived in this city on the night of May 28. The train left Chicago on the 26th, and ran to Buffalo on slow time. From Buffalo to New York a speed of from 30 to 45 miles an hour was maintained. This is said to be the quickest trip ever made by a live stock train, and the condition of the cattle on their arrival proved the excellence of the treatment they had received on their long journey. The weight of the cattle when loaded in Chicago was 226,098 pounds, an average of 1,430 pounds a head. They arrived in New York at midnight, and early the next morning their aggregate weight was found to be 222,870 pounds, an average of 1,410 pounds each, showing a shrinkage of only 20 pounds a head. The usual shrinkage for this journey is from 70 to 100 pounds. The cattle were watered at stations along the road, and at the same time supplied with hay to be eaten while the train was running.

The improved cars are each 40 feet long, inside measurement, or 10 feet longer than the ordinary cattle car. Each car contains sixteen stalls, eight of which face to one side and eight to the other. These stalls are 2½ feet in width, 8½ feet in length, and 7½ feet high, allowing ample room for the largest steer to lie down on and rise from at will his comfortable dried sand bed of an inch and a half's thickness. They are separated by gates, which are cushioned, with spring fastenings, against which the animal can lean without being bruised by the motion of the train. For about one-sixth of the width of the car the gates are permanent, and extend from the floor to the ceiling, but for the remainder of their length fold upward into the rigid section, thus making a free passage for the cattle to pass out of or into the cars. The gates are dropped down, one at a time, as each animal is walked into its stall, while the car is being loaded. The heads of the animals are between the stationary sections, so that "hooking" or quarreling about feed is effectually prevented. In front of the beasts, along the sides of the car, are continuous troughs for feed and water. The food, which may be cut feed or dry hay, is easily introduced from the outside by raising a hinged board that is upheld by a hook while the food is being placed, and afterward dropped and fastened by another hook on the outside to prevent the feed from being thrown out. The water is received through an aperture in the top of the car, and is conveyed directly to the troughs through pipes. The train was provided with automatic brakes.

British Patents in 1881.

During 1881 the British Patent Office received 5,751 applications, the largest number recorded for any year. The number of patents granted is not reported. Of the whole number of applications 2,139, or more than 37 per cent. came from foreigners. The applications from the United States numbered 745, while those from Canada were only 34. France is second on the list, with 552 applications, and Germany third, with 464. From other nations the applications were few: 70 from Austria-Hungary; 70 from Belgium; Sweden 32; Switzerland 40; Russia 24; Italy 19; India 15; Norway 14; Denmark 12. The Australians appear to invent but little or few things likely to find a market in the mother country. The applications from Australia were 8; from New Zealand 5; from Tasmania 1. The South American applications numbered but 10 in all.

The home applications numbered 3,633, the number of applicants being a little more owing to joint inventions. The great majority of the applications came from England, 3,263; the number from Scotland was only 270; from Ireland 63; from Wales 46. In order of inventiveness the ten leading towns stand thus: London (postal district) 1,260; Manchester and Salford 240; Birmingham 220; Glasgow 130; Liverpool 109; Leeds 70; Sheffield 54; Bradford 44; Nottingham 37; Edinburgh 34. For its size the most inventive town is Birmingham.

M. DUMAS, the perpetual President of the French Academy, has been instructed by the Minister of the Interior to make a return of all persons who have been killed or maimed in pursuit of scientific research. It is the desire of the French Government to make some compensation for such casualties, which have hitherto been disregarded. Some time since, says the *Photo. News*, we remember meeting M. Henri Pellet, whose blue-lined copying process is so well known, and sympathizing with him on the loss of the fingers of one hand, which he had sustained through experiments with gun-cotton and nitro-glycerine. "I suppose you will give up explosives, now," was our remark. Our friend laughingly shook his head: "I have my other hand still," he cried, holding it up.