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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 295,

For the Week ending August 27, 1881.

Price 10 cents. For sale by all newsdealers.

"A MILITIA FOR THE SEA."

Under this title Mr. John Roach, in the August number of the *North American Review*, discusses the old but ever new subject—the weakness of our navy and the smallness of our foreign shipping trade. Probably there is no other one question in which the general public is so profoundly interested, for it combines the tariff with a leading point in governmental policy, and touches the national pride in a matter where we have especial cause to be sensitive. Every one is hoping that we shall soon have a change from the present situation, and the feeling is strong that some policy should be adopted to compass the desired end, but just how this can best be effected is by no means clear.

Mr. Roach brings forward a plan for the building of one hundred powerful iron screw steamships, with a speed of 15 and 16 knots, and of a burden of 2,500 to 4,000 tons, exclusively for the foreign trade, but of such special construction that all of them could, in thirty days' time, be armored with nine-inch steel plates. He would have the government encourage the building and running of these ships by American houses by the appropriation of three to five million dollars per annum in subsidies, and knows of one man who would then subscribe one quarter of the amount needed for the entire fleet. The vessels are to be built on plans approved by the government, but he gives drawings of a style of construction, with the vessels in sections, and the armor backed by coal bunkers, and quotes from the Chief of Naval Construction of the British Navy to show the effectiveness of coal and loose iron plates to resist the fire of heavy guns. These vessels, he claims, would be greatly superior to the best merchant ships heretofore built in their adaptability for war purposes, and quite equal to most of the modern iron-clads. The cost, also, is assumed to be less than would be that of simply taking care of an equal tonnage in time of peace, and not exceeding the annual appropriations of England and France to encourage mercantile shipping.

It is evident that this project should be looked at somewhat differently from the question of free trade *versus* protection, as they affect American ships. How far the plan suggested by Mr. Roach would be practicable only a board of naval experts can determine; but, were it feasible, it is apparent that the ends sought must be attained by having the ships built as well as owned in this country, and manned by American seamen. To this extent the appropriation therefor would be in the way of government protection and promotion of American ship manufacturing and shipping interests. On the other hand, one hundred such powerful steamships, capable of conversion into efficient iron-clads at short notice, would afford, in an emergency, a convenient naval force of considerable magnitude—a fleet by the side of which our entire navy at present would make but a poor show.

The first thing to be looked at, in any question of expending money to strengthen the navy, is the uncertainty as to what would be the best form of construction. Arms and armor have changed so radically within a few years, and the best authorities are still so widely divided in regard to most important particulars, that any large investment on this account is not to be thought of. Who knows, for instance, but that our recent splendid progress in the science of electricity may not lead to the development of such forces, heretofore unknown, as will make of little worth the best previous efforts in naval construction, and make the lightning as effectually our servant as steam and improved explosives now are? Looking at the matter in this light is the best justification of our past temporizing policy with regard to the navy, but under some such plan as that proposed by Mr. Roach the government would not have to expend much to largely supplement its naval strength, according to present standards, leaving out of view entirely the national benefit which such a fleet of American merchantmen engaged in foreign commerce would confer. It concededly costs ten to fifteen per cent more to build a first class iron ship here than it does in England; the capital to own and run the ship is also heavily taxed by our State laws, with no tax in England except upon net profits, and there are many petty charges here unknown abroad; but if it be possible to provide ourselves with a genuine "militia for the sea," a force on the water which would be a worthy counterpart of that which we always have on land, the plan would seem worthy of discussion on higher grounds than are usually considered in the questions which ordinarily make party issues.

THE COTTON MANUFACTURE.

The "cotton year," statistically, ends September 1, when the preceding year's growth is substantially all marketed, and the picking of the new crop is well under way, this part of the work extending up to the end of the year, and sometimes later. It is now certain that the crop of 1880–81 will exceed that of 1879–80, which was 5,761,252 bales, and was the largest crop ever raised in the country up to that time. The receipts reported up to August 10 were 5,735,356 bales, against 4,914,226 bales to the corresponding date last year. The quantity of cotton in a bale varies, although the improved machinery for compressing and baling has tended to make all bales heavier the last few years. The total weight of the last crop was 2,771,797,156 pounds, the lightest bales being of Sea Island, weighing 348 55 pounds, and the other descriptions varying from 460 to 509 pounds. Beside the American growth, India and Egypt together contribute about 1,500,000 bales annually to the world's supply of cotton, but of so different a quality as to affect but little the sale of the American staple with prices ruling as low as they have for a few years past.

Especial significance will be given to these figures this year, and to everything pertaining to the cultivation and manufacture of this great staple, by the exhibition to open at Atlanta in October, all the preparations for which are in a very forward state, and give promise of affording a worthy representation of the vast interests concerned. Many had wished that such an exhibition might have been held in some Northern city, near the principal centers of manufacture, but this would have reduced to a minor place what will be a leading feature of the coming show—the illustration of the conditions under which the crop is raised, and the practical working of the appliances by which it is made ready for market. The exhibition, coming as it does right in the harvesting period, and in a locality where the gathering of the crop can be personally investigated by all visitors, will present more vividly to the minds of mechanics, inventors, and business men many questions of importance which have hitherto received comparatively little notice. These include not only such as relate to the merits of different improved gins and various devices to facilitate the picking and bettering the average condition of the crop, but the larger problems connected with the possibilities of the future in the more extensive utilization of the seed and the stalk for the production of oil, feed, paper, a substitute for jute, etc.

We have had a large and healthy growth in the manufacture of cotton goods for a few years past, which has covered a substantial development in this branch of industry in the South itself, where the factories already in operation are making good dividends and many new ones are projected. But we do not as yet make up into finished goods more than about one-third of the cotton we grow. In this department of industry Great Britain has long been a great way in advance of all the rest of the world, taking about one-half of our raw cotton, and nearly all of that furnished by other cotton growing countries. For the past few years times have been "rather hard" with her in this specialty, as in many other manufactures, but the falling off in actual amount of production seems to have been due rather to a depressed state of trade generally than the competition of manufacturers elsewhere. For the four years between 1870 and 1875, her production exceeded $500,000,000 annually, the raw cotton costing from one-third to two-fifths of this amount, and the remainder going to pay for English labor and capital. About one-fifth of this great total was exported, while our own exports of cotton goods for those years averaged about $3,000,000 yearly; they have since reached $11,000,000; but our imports of cotton goods in 1880, notwithstanding a pretty stiff tariff, were but little below $30,000,000.

We come next to England in the manufacture of cotton goods, running more spindles than France and Germany together, but how far behind her we still are these figures too plainly indicate. Undoubtedly lower wages and cheaper capital give the British manufacturer his principal advantages, to which are to be added better means of communication with different markets, long established connections, etc.; but with all these in his favor he has been especially alert, within a few years past, in seeking out and originating improvements in the machinery required in the business. Marked advances in this direction have been made in the cotton industry quite recently, and there is hardly any detail of the business for which some new device or machine has not been brought forward. The value as to advancement in the product, or economical performance, of many of these supposed improvements are yet matters of debate in the trade here, but the exhibition at Atlanta, in which British manufacturers of cotton machinery are to be prominently represented, ought to be of great advantage to our manufacturers generally, on account of the comparisons they can then make of their practical working. If the exhibition can effect anything to improve our chances of successfully competing in many foreign markets now closed to us, so that we shall export more largely of finished instead of raw cotton, thus widening the field for the employment of American labor and capital, its influence upon industry, both here and in England, will be great.

IS CONSUMPTION CONTAGIOUS?

If our medical journals were to announce the steady approach to this country—say from China—of an ill-understood, painful, and usually fatal malady, which if once established among us would certainly kill half a million of our citizens every year and ultimately carry off one in every five of the entire population, it is safe to presume that the announcement would not be calmly received. As one man, physicians not less strenuously than laymen, we should demand the most rigorous quarantine against the infected country. No effort would be accounted too heroic, no precaution too costly, to shield our country from so disastrous an invasion. And if there were any doubt as to the specific nature of the threatened plague or of the mode of its transmission or inception, neither our medical and sanitary societies nor the government would rest until competent commissions were sent to investigate the matter. It would be accounted criminal indifference on the part of medical and sanitary authorities to neglect to make a concerted and persistent effort to discover the causes and conditions of the plague, and how to protect the community from its ravages or to cure its victims when attacked.

Would the urgency of the case be diminished in any

respect by the circumstance that the supposed invasion had already become a fact accomplished?

At first thought any one would reply: Not in the least; rather the contrary; for the evil in the latter case would be actual, not threatened merely, and the loss or saving of half a million lives a year is a matter of the gravest national importance. Yet it is a singular fact that while we should be thrown into a panic if half a million lives were threatened by a new disease, we accept as inevitable, almost with indifference, the certain killing of that number of people every year by an old and familiar malady. And our medical authorities tell us, without a twinge of professional pride, that they really do not know positively how consumption is induced and transmitted, or whether it is communicable from the sick to the well or not; and worse yet, they confess without blushing that they do not contemplate any special or general effort to have such momentous questions critically investigated!

When half a million of discontented natives of Europe throng to our shores in a single year we do not fail to appreciate the importance of the gain, both immediate and prospective. When a larger number of our own citizens are cut off untimely by a disease which, while it destroys them, transmits a legacy of sickness and too often early death to their descendants, we mourn our individual losses, but make no adequate effort to put an end to the national loss by urging or aiding the scientific determination of its conditions, causes, and remedies. Already one in every five of our population dies of consumption, and the indications are that the conditions of our civilization tend to increase the death rate from this cause. If the disease is infectious, as many believe, the multiplication of cases may sooner or later reach a point —if its progress is unchecked—at which a perpetuation of our race and the civilization developed by it will become impossible. Other races and civilizations have disappeared, leaving no explanation of the secret of their decline. Others, we have good reasons for believing, have been exterminated by plagues peculiar to them, developed in all probability by something peculiar to their modes of living.

That there is any imminent danger of so disastrous a result to our race and civilization from the increase of consumption no one but an alarmist would suppose; still it remains an impending possibility, more especially if there is any error in the common belief that the disease is not contagious or infectious.

In the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT a valuable summary of evidence supporting the position that the virus of consumption is specific and communicable is presented by Dr. Cogshall, of Michigan. The evidence is fuller and more cogent than is popularly believed; and while it must be admitted that many cases of supposed communication of the disease may be due not to any transmission of virus but to similarity of unsanitary surroundings and family customs on the part of related victims, there is still sufficient evidence that the direct communication of tuberculosis is followed by pulmonary consumption to justify not only exceeding care in the intercourse of the healthy with consumptive patients and rigorous sanitation in connection with all cases of the disease, but a special reinvestigation of the natural history of consumption by the medical profession.

The suggestions which Dr. Cogshall makes touching the measures best calculated to prevent the ravages of consumption, and his remarks with regard to the superior efficiency of hygienic treatment over medication, will be found worthy of thoughtful attention. The position he takes with regard to the curability of consumption, even in advanced cases, through improved nutrition and a judicious hygiene to the exclusion of all nostrums and so-called consumptive cures, is decidedly hopeful; and we believe that the most of our physicians will measurably agree with him. We wish we could be so well assured of their desire to investigate anew and thoroughly the question of the communicability of the virus of the disease.

OPENING OF THE PARIS ELECTRIC EXHIBITION.

The International Exhibition of Electricity at Paris was officially opened August 10. Much work remained to be done to put all the exhibits in proper position. The delinquents were mainly in the British and American sections. The French, German, and Belgian sections were more forward. The electric railway was not completed. The Tissandier balloon was ready and attracted much attention. President Grévy, the ministers, and a few other privileged persons were treated to a telephonic musical entertainment. Four wires had been placed in communication with the opera, and the voices of the opera chorus were heard with perfect distinctness.

SCHAEBERLE'S COMET.

The approaching comet (C 1881) discovered by Professor Schaeberle, July 13 (SCIENTIFIC AMERICAN, page 104), is more than fulfilling its early promises. Though dimmed by the light of the full moon it is already visible to the unaided eye and is rapidly increasing in apparent size and brilliancy. It is about fifteen times as bright as it was a month ago. Its bright nucleus, of an estimated diameter of from ten to twelve thousand miles, is surrounded by a hazy envelope or coma perhaps fifteen times as much in diameter. Its tail is said to surpass that of the great comet of 1858, the most conspicuous comet of the century, when that comet was as far from perihelion. The perihelion passage will be about August 20, and the comet will approach the earth most nearly a day or two after. About that time it will be at its brightest. Like comet B, now slowly going out of sight, the new comet remains above the horizon all night, but its motion is such that it will rapidly disappear after it passes the earth. The comet is to be looked for near the star Theta of the Great Bear, the tail pointing toward the north star.

A REMARKABLE INSTANCE OF RETENTION OF HEAT BY THE EARTH.

BY H. C. HOVEY.

Every one knows that heat may be retained for a long time in a bed of ashes, but it is seldon that the period has been known to be so protracted as in the case now to be described.

My attention, a year ago, was called by Mr. Hudson, the manager of the Albion Mines, in Pictou County, Nova Scotia, to a peculiar area including about two acres of ground, where the snow never lies long without melting, and the frost never penetrates far, even in severe winters. All over this space are scattered fused masses of clay and ironstone, resting on the outcrops of what are locally known as the "main" and the "deep" seams of bituminous coal, which at this point are about 450 feet apart. The outcrops of other seams are also partially affected.

On inquiring as to the probable date of the fire that had left this recrement of scoriæ and ashes, I was told that this portion of Nova Scotia was visited early in the seventeenth century by French explorers, and that an account of the harbor called Pictou was given in 1672 by the Governor of the Gulf of the St. Lawrence.

The name—Pictou—is derived from a Micmac word, signifying *fire;* and the traditions of the Indians still point to this locality as having been, a long time ago, the scene of a fierce and long-continued fire, which made them avoid the place as being visited with the anger of the gods.

The coal measures of Pictou were discovered in 1798, at the very point now described; and the discoverers represented the spot as covered with ashes over which grew large hemlock trees. Some twenty years ago, while a drain was being cut in this locality, a tree was felled that showed 230 rings of annual growth; and three feet below the root of this tree a large piece of wood was found that had been fashioned by some sort of ax.

In Mr. Harrison's opinion, at least 300 years must have passed since the fire at this point was extinguished. How it was caused and how long it burned are wholly matters of conjecture. The ignition may have been effected by chemical action, such as often causes what is called "spontaneous combustion" in heaps of slack about coal mines; or it may have followed a stroke of lightning; or the blaze of a campfire may have been communicated to one of the "springs" or "feeders" of inflammable gas that issue along the outcrops of the unusually thick seams for which the Pictou area is celebrated.

Last spring it was found necessary to sink a small pit at the outcrop of the deep seam on this area, in doing which a bed of hot ashes was reached. I am indebted to Mr. Edwin Gilpin, Government Inspector of Mines, for the facts, and, to some extent, for the terms in which those facts are presented. Mr. Gilpin prepared for me a comparative view of sections of the same strata made only a short distance apart, the design being to exhibit the changes made by igneous action.

Present Section.	ft.	in.	Original Section.	ft.	in.
Surface of burned clay.....	22	0	Black, argillaceous shale, with bands of ironstone 1 to 2 inches thick. Total thickness, 144 ft. 6 in.	2	6
Band of hard scoriæ.	4	0	Brown carbonaceous shale,	1	10
Reddish ashes.....	3	0	Bad coal	0	2
Hardened shale.	2	0	Good coal	3	7
			Black shale with ironstone bands.	1	2
Good coal etc. (being upper part of the deep seam).....	+		Good and coarse coal in alternate strata..... ..	18	+
Depth of pit.....	32	+	Total thickness of deep seam	22	10

The present section is taken at the new pit sunk by the Albion Mines Company on the burnt area; and what is termed the original section is one given by Sir William Logan ("Geological Survey of Canada," 1869, p. 69).

The surface cover consists of clay with bowlders of sandstone and layers of gravel. The small portion of the 144 feet of black argillaceous shale filled with ironstone balls passed through by the shaft has been converted into an almost continuous mass of scoriæ, very hard and compact, and difficult to drill through.

The next layer represents the upper portion of the deep seam, which has been completely burned away, leaving a *compact, laminated, reddish ash.* And it was in this ancient bank of ashes, *known to be more than* 300 *years old*, that the retention of heat was observed, which it is my object by this communication to place on record.

Immediately on opening the pit the heat of the ashes, at a point 30 feet below the surface, was tested by a reliable thermometer, and was found to be 80° Fah., at a time when the surface temperature varied from a minimum of 45° to a maximum of 65° Fah. Soon after an opening had been made through the pit to the workings in the mine the air currents caused the temperature to fall rapidly to the normal point.

The consideration of the gradual radiation of the heat of the earth suggests the idea that abnormal increases in the temperature of deep mines may be due in some cases to the presence, at comparatively short distances, of masses of heated matter, which are, geologically speaking, modern, although they may be historically ancient.

Technological Institutes in England.

The Prince of Wales has lately accepted the presidency of an institute of technology, called the City and Guilds of London Institute. It is located at South Kensington, and is intended to be the central institution of its kind for England and her provinces. The corner stone of the building was recently laid by the Prince, who in reply to the Lord Chancellor's address relating to the objects of the movement said: "Hitherto English teaching has chiefly relied on training the intellectual faculties so as to adapt men to apply their intelligence in any occupation of life to which they may be called; and this general discipline of the mind has, on the whole, been found sufficient until recent times. But during the last thirty years the competition of other nations in manufactures which once were exclusively carried on in this kingdom has become very severe. . . . Other nations which did not possess in such abundance as Great Britain, coal the source of power, and iron the essence of strength, compensated for the want of raw material by the technical education of their industrial classes; and this country has therefore seen manufactures spring up elsewhere, guided by the trained intelligence thus created. Both in America and in Europe technical colleges for teaching not the practice but the principle of science and art involved in particular industries, have been organized in all the leading centers of industry. England is now thoroughly aware of the necessity of supplementing her educational institutions by colleges of a like nature."

The Medical Congress and Sanitary Exhibition in London.

The Seventh International Medical Congress closed its sessions in London, August 9. In connection with the congress, which called together five or six hundred delegates, there was a sanitary exhibition to which nearly five hundred sanitary engineering firms and manufacturers of surgical instruments and apparatus contributed. This feature was particularly interesting and valuable. The different sections included: Surgical instruments and apparatus; appliances of the ward and sick room; electrical instruments and appliances; microscopes and optical apparatus; apparatus of other kinds used in the investigations of disease; appliances used in teaching medicine; domestic and hospital architecture; ventilation, lighting, and warming; sewerage and drainage; water supply and filtration; appliances used for the treatment of the sick and wounded during war; street ambulances, etc.; drugs, disinfectants, medical dietetic articles, and mineral waters; applications of hygienic principles to food and dietaries, clothing, etc.; school furniture; and miscellaneous articles for the promotion or maintenance of proper sanitary conditions.

Mining under Fire and Water.

In his annual report for the Eastern District of Luzerne and Carbon Counties, Pennsylvania, Mine Inspector W. S. Jones states that Butler Mine fire, which has been raging at Pittston for nearly five years, is now under control, and he anticipates no further serious consequences from it. The company surrounded the burning area with a wide ditch, varying from fifty to one hundred feet in depth, with a view to isolating the fire completely. A peculiar phase of mining is shown in the fact that while the fire raged in the upper vein the miners worked in the vein directly beneath, and at times the water dripping from above was scalding hot. This has been remedied by a costly system of ventilation. In view of the frequent fires in coal mines, Mr. Jones suggests that a strong continuous pillar of coal be left on the dividing line between collieries to prevent the spread of the flames from one mine to another. He points out a new source of danger in the fact that many collieries are now working under the beds of the Susquehanna and Lackawanna Rivers, and there is every reason to fear that sooner or later "caves" will occur, in which case the rivers would rush into the mines beneath with disastrous results, which would be multiplied by the indiscriminate system of working from one mine into another.

Recent Changes at the Patent Office.

Mr. Robert Mason, of Tennessee, promoted to be principal examiner; Marcellus Gardner, New York; John W. Babson, Maine, and Schuyler Duryee, New York, to be chief of divisions. Samuel B. Roane, New York; Reuben S. Parks, Ohio, and Louis W. Sinsabaugh, Ohio, from second assistant examiners to clerkships of class four. To be second assistant examiners—David Purman, Wisconsin; Marshall B. Cushman, Massachusetts; Edward M. Bentley, Connecticut; Albert C. Fowler, District of Columbia; and William Auginbaugh, Ohio. To be third assistant examiners—John W. Clements, District of Columbia; James B. Littlewood, Illinois; Rufus A. Morrison, Robert G. Read, and Walter F. Rogers, Pennsylvania.

First Steel Works in Colorado.

The South Pueblo Steel Works just being completed at a cost of over $1,000,000, are the first establishment of the kind in the State. The company expect to be ready to turn out steel rails in December, and have contracted to furnish the Denver and Rio Grande Railway Company with thirty thousand steel rails for their extension. This will be about the capacity of the works for the first year.

The company own several mines near Placer and South Arkansas, to which side tracks will be extended by the railroad company.