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Contents.

(Illustrated articles are marked with an asterisk.)

Table listing various articles such as 'Millionaire merchant, death of', 'Parasites, animal', 'Patent decisions, recent', etc., with corresponding page numbers.

THE SCIENTIFIC AMERICAN SUPPLEMENT.

No. 18.

For the Week ending April 29, 1876.

TABLE OF CONTENTS.

Table listing contents of the supplement, including 'MECHANICS AND ENGINEERING', 'THE INTERNATIONAL EXHIBITION OF 1876', 'TECHNOLOGY', 'CHEMISTRY', 'NATURAL HISTORY', 'MEDICAL', and 'PROCEEDINGS OF SOCIETIES'.

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Laundry Blue.

A good washing blue is made as follows: Make a solution of prussiate of potash, 2 ozs., and another of protosulphate of iron, 1 oz.; add the second gradually to the first, until the precipitate almost ceases to fall, then strain through linen, add water, add continue the washing until the blue color begins to dissolve in it, when it may be at once dissolved in distilled water and dried.

THE PRACTICAL EFFECTS OF PHYSICAL STRAIN.

Dr. B. W. Richardson, in his recent admirable work on the "Diseases of Modern Life," devotes a chapter to a subject to which we have repeatedly alluded, and to which, in view of the athletic competitions to occur during the Centennial, the attention, not only of those in training for such contests, but of those who favor athletic sports in all forms, may well be directed. We mean disease induced from physical strain, physical overwork in short, which too often reduces the fairest specimens of muscular humanity to abject wrecks. Dr. Richardson brings to the consideration of this important topic a variety of new thoughts and suggestions, and these all tend to show, first that excessive physical culture is useless, and second, that it is hurtful. The first question which he places before us is: "Do these arts contribute to the health and vitality of a race, either collectively or individually: that is to say, are they necessary in order that a race may obtain the means of subsistence, and (whether necessary or unnecessary) do they contribute to the longevity and tenacity of the life of the men or race through whom or through which they are represented? He first points out that, in a nation so uncivilized as to be obliged to trust to individual force alone for its means of life, no physical culture can be too high or too highly prized; then he shows that in a later age, when none but brute power is at man's service, the predominance of the physical over the mental faculties is still natural. But finally, removing the doctrine of necessity and separating the individual from the community, the picture is reversed. There is no evidence anywhere, he asserts, that the greater culture of the physical strength has favored the longevity of the individual or the vital tenacity of a race. All the observations handed down to us by the physicians of the Greek, Roman, Arabian, and Italian schools, reinforced by the vital statistics of modern France and Prussia, point unmistakably to the fact that in each country, within its own population, the value of life is influenced to the favorable side by the reduction of physical expenditure. A most curious instance is afforded in the history of the Jewish race, in which as a people there has never been a vestige of studied development of physical capacity. And yet the broad truth stands forth that, despite centuries of oppression and suffering, the Jewish is the first in vitality of all civilized races. Dr. Richardson gives a quantity of statistical information supporting this assertion, showing that the period of life among Jews is considerably longer than among a like number of Christians, and the causes, he says, are simply summed up in the term "sobriety of life."

It is not difficult to find answers to the question: "In what manner does overwork of a physical kind injure or kill?" During life the forces by which the life is manifested are balanced against time. The active animal machine must rest and recruit; time, an absolute immateriality, flows on unceasingly, destroying as it flows silently and surely. Again, the powers or forces of the body are limited by the size and capacity of the organism. If the force put forth in a certain period be greater than that which ought to be put forth in that period, the extra force is expended at the expense of the organism itself, and, by so much as is lost in any present effort, will be so much shortened in the future. For the body is not constituted to make up time against the slightest breath of force it has once lost. Were it so, the problem of renewal of life would be solved.

Generally speaking, physical overwork injures by the destruction of those parts of the body on which the involuntary acts of life depend, namely, the muscles and nervous structures engaged in the digestion of food, the circulation of blood, and the respiration. When these organs fail, every other portion of the system dependent on these likewise succumbs. The particular characteristics of the changes induced, and of the work itself which induces such changes, are by no means complicated; and such as are noted by Dr Richardson are well worth examination, since they are the results of his own matter-of-fact observation.

The first disease mentioned is aneurism of the aorta, the large blood vessel which rises from the left side of the heart to convey arterial blood to the body. Its cause is a simple mechanical result. The heart during violent exertion (as in rowing spurts), working at high pressure, drives ahead a current of blood which, instead of making its course in steady circuit through the aorta, is brought back by concussion, and falls like a water hammer at the place where the semi-lunar valves prevent its return to the heart. This mechanically injures the wall of the artery, which loses its elasticity; and eventually the resilient tube becomes a passive pouch, ready to give way upon some extra exertion, to let out the contained blood and so cause instant death. In four cases, the author has found life terminated in this way.

The second injury is wearing out of the heart. This is common to persons who practice physical exertions, not violently but persistently. The right ventricle of the heart, which maintains the circuit of blood through the lungs, is much thinner than the ventricle on the left side, which carries the blood over the body. If this ventricle, which drives some 18,750 lbs. of blood in twenty-four hours, be overtaxed, it must necessarily weary; and as the heart not only supplies the rest of the body but also itself with food, it follows that, if it fails to supply the body, it fails to supply itself. This enfeeblement is very gradual. It begins to show itself by slight difficulties in breathing, susceptibility to fatigue, to cold and heat, to congestion of the lungs, and finally to actual organic changes of the lungs, kidneys, or nervous centers, or congestion of the venous side of the body, leading to dropsical effusion and resulting in death.

A third disease is just the reverse of the preceding, and is due to the heart becoming too powerful. Its muscular structure is unduly developed on both sides, its stroke is too

severe, and, if the nervous power by which it is governed be not proportionately balanced, it becomes intermittent in its work. These conditions follow closely upon boat and foot races and all fierce competitive exercises. Of the undue action of the organ, the affected person is painfully conscious, the breathing is oppressed, the muscular tone decreased and the end of all is premature disorganization of remote organs and comparatively early death.

"By skillful training," says our author in conclusion, "it is quite true that men may be and are brought to a fine external standard; but the external development is so commonly the covering of an internal and fatal evil that I venture to affirm that there is not in England a trained professional athlete of the age of thirty-five who has been ten years at his calling who is not disabled. He may hold on sustained by a will which cannot bend to defeat; he may win bravely; then win, and only just win; then tie some new antagonist; then lose and, urged by friends whose ardor is damped, retire, but he will soon die. The falling-off which has been observed by patrons or admirers before actual failure means not want of skill nor stiffness of joint, but actual overworked, worn-out heart and blood vessels; it means, in fact, now a race for life rather than for fame."

THE VALIDITY OF PATENTS.

The inexperienced purchaser of a patent does not generally appreciate the importance of having its claims examined, and their validity and scope defined by some person experienced in such matters, before parting with his money. It is not unusual for the assignee, just as he is commencing the manufacture of articles under his recently purchased patent, to find that it is an infringement upon some previously issued patent, and that he has not only made a worthless investment, but that he is likely to get mulcted in damages if he proceeds with his manufacture. Cases are continually coming to our knowledge wherein parties have made purchases in good faith, and paid considerable sums of money on the assurances of the patentee and a mere glance at the patent, presuming that all that the drawing of the invention showed was protected by the claims, when, in fact, the point covered was almost infinitesimal. Another manner in which purchasers are sometimes deceived is that the claims, although broad enough and worded properly to cover the invention, contain a single element protected by some prior patent, which covers the very part in the new machine which is necessary to insure its efficiency. The Howe sewing machine patent illustrates this. It protected but little that any of the manufacturers cared to use, except the one small part essential to all sewing machines; and all manufacturers had to pay Howe a royalty, and he derived from that apparently trivial item an immense income.

We therefore recommend any person who is about to purchase a patent, or about to commence the manufacture of any article under a license, to have the patent carefully examined by a competent party, and to have a research made in the Patent Office to see what the condition of the art was when the patent was issued. He should also see that the claims are so worded as to cover all the inventor was entitled to when his patent was issued; and it is still more essential that he be informed whether it is an infringement, as above suggested, or not. Parties desiring to have such searches made can have them done through the Scientific American Patent Agency, by giving the date of the patent and stating the nature of the information desired.

WHAT THEY SAY ABOUT US.

We should be lacking in appreciation of a great deal of kindness did we not occasionally acknowledge a few at least of the good wishes and compliments which our labors call forth. It would be impossible to publish all or even a tithe of our correspondents' good opinions; but the limited number which we make room for may be taken as samples indicating the drift of all. A writer, to whom Wrinkles and Recipes has been sent as a premium, says: "I do not send you clubs to be rewarded for it, but I feel it a duty to distribute the SCIENTIFIC AMERICAN among my fellow men, because they cannot benefit themselves any better for the money, and nobody ought to be without the paper." And we, let us add, also feel it a duty, when any one kindly promotes our interests likewise, to serve his, and certainly we can do so in no better way than by presenting him with such valuable works of practical and useful information as the Science Record and the volume above named, or with so fine a work of art as "Men of Progress." Apropos of this engraving, another writer, who has received it as his premium, says: "Your beautiful engraving 'Men of Progress' came to hand: I am very grateful to you for your kindness, and I will do all in my power to promote the circulation of the SCIENTIFIC AMERICAN."

The SCIENTIFIC AMERICAN SUPPLEMENT is likewise meeting a wonderful share of public approbation. Speaking of the excellent series of illustrated articles on mechanical drawing, now in progress of publication, one writer considers them "worth much more than the subscription price of the paper;" and he adds: "While the SUPPLEMENT is so fine, it in no way lessens the value of the SCIENTIFIC AMERICAN." It enhances the worth of the older journal, we might continue, because, through the large accession of space gained by its pages, we are enabled in both journals to present not only a wider range of valuable information, but to treat the same more elaborately and completely than otherwise would be practicable. One more notice, this time from our excellent illustrated contemporary In Door and Out, and we terminate this tax on our modesty. "The SCIENTIFIC AMERICAN," says the editor, "like wine, has gradually grown better and better in its field of usefulness, and today has a circulation

probably exceeding the combined subscription lists of all mechanical journals in the country." (Let us interrupt to say that it is a fact that the circulation of the SCIENTIFIC AMERICAN and SUPPLEMENT combined is unquestionably larger than that of all other mechanical journals in the world.) "We have read its pages for years, but never with greater satisfaction than the present volume No. XXXIV. To the mechanic it is really indispensable, while it is valuable to everybody."

DEATH OF THE MILLIONAIRE MERCHANT.

The recent death of Mr. A. T. Stewart, the great dry goods merchant of New York city, on April 10, has called forth from a large number of people a variety of curious and often striking anecdotes relating to his early life and struggles, as well as to his habits after he had attained his enormous wealth. Perhaps not again in this generation will any one man accumulate by legitimate trade so immense a sum as he acquired; and it is a natural curiosity which prompts all to examine closely those traits, customs, and habits through which the great fortune was amassed. Mr. Stewart was born in Belfast, Ireland, in 1803. His parents were well-to-do people, but died while he was quite young, leaving him under the care of his grandfather. He was well educated, and had begun to prepare for the ministry, when his grandfather's death caused him to change his plans, and at the age of 20 to embark for America. Here he started as a school teacher, and was pursuing that calling when he lent a small sum to a friend who desired to open a dry goods store. The friend failed, and Mr. Stewart, partly from a desire to enter trade, and partly in order to protect his investment, took charge of the store. Soon after, he returned to Ireland to obtain his patrimony, some \$3,000, and this he laid out in cotton trimmings for dresses, which were then very fashionable in New York. In Belfast he purchased the goods at some two pence sterling a pound, and afterwards sold them in this city at two shillings a pound, and this stroke of success, he always stated, convinced him "that money could be made in the dry goods business." Of Mr. Stewart's honest and rigidly fair dealing in the little store in which he began, there are abundant stories. "What do you mean by saying what you know to be untrue?" he once angrily demanded of a clerk who was exercising all possible powers of persuasion to convince a woman that the colors in a piece of calico would not fade. "The calico won't wash; she'll demand her money back, and she'll be right. I don't want the goods represented for what they are not." It was this perfect honesty toward all his customers that was Mr. Stewart's most prominent characteristic, and it was his invariable custom, when questioned as to his explanation for his great success, to reply with great emphasis: "Truth, truth is the talismanic word; and if I have one earthly wish or desire greater than another, it is that in this respect my example may be commended and followed by young men entering into business, and especially by young merchants."

On this firm basis of truth and honesty he reared his gigantic transactions: not by bold ventures or colossal speculations, but through steady application, perfect organization, and minute attention to every detail. The discipline in his establishment was rigid. "Do you see all these people about here?" he once asked of Mr. Peter Cooper, pointing to the scores of busy salesmen and ushers in his great retail store. "Well, there isn't a man of them who is allowed the slightest discretion. Every one is taught to do precisely and simply what he has been told. He is a machine working by rote and according to rule." Hagglng over prices was to him an especial abhorrence. There was but one price for everything and everybody; but on the other hand he was no believer in holding for high prices, when by lower ones he could realize promptly. An old employee of his recently told us that Mr. Stewart seemed to watch each individual class of goods "as if his fortune depended on them only." If in making his rounds through either store, he noticed an unusual quantity of any material on hand, he would question the salesman closely about it; and if he found its sales slow, he would mark down the price to such figures that its very cheapness would attract customers. It is said, moreover, that he knew the contents of his warehouses better than those in his employ; while he watched the latter much more closely than they ever imagined. If he saw too much jewelry worn, he deemed it a suspicious sign, and placed the wearer under special surveillance. "He never spoke to me but once," says an old clerk, "and then it was when I tore a piece of wrapping paper roughly across. He came and told me that I should have folded it and made even edges. People," he said, "didn't like to get shiftless bundles." At another time, a clerk wound a package with an extra turn, of cord. Before he could cut the string, Mr. Stewart quietly took the bundle from him and unwound the extra turn, saying: "Never waste even a piece of string; waste is always wrong."

The principles illustrated by these brief anecdotes carried him from the possession of the humble little store to that of his magnificent buildings on Broadway in New York, to emporiums in Boston, Philadelphia, Paris, Lyons, Manchester, Berlin, Glasgow, Chemnitz, Belfast, and Nottingham, and to mills in various parts of the United States.

Gigantic as was the business he controlled, Mr. Stewart likewise managed real estate operations of sufficient magnitude to be a life's work for an ordinary man. In New York city alone, he was the absolute owner of over one hundred pieces of improved property, free from encumbrances and valued at about ten millions of dollars. This magnificent estate included, besides his two stores, two theaters, the Metropolitan Hotel, the Working Women's Home (an im-

mense iron building on Fourth avenue), his superb marble residence on Fifth avenue, the finest private dwelling in the country, besides dwellings and stores scattered in the most desirable quarters of the city. In Saratoga, he owned the enormous Grand Union Hotel. Probably his greatest real estate scheme was the founding of Garden City on Long Island, a work of genuine philanthropy undertaken in order to supply cheap and good homes for those unable to pay high New York rents. He bought a tract of land on Hempstead Plains, ten miles long and one mile wide, and built a city as he would a single house. Gas and water works and a railroad to New York were begun with the foundations of the houses; and when some forty fine dwellings were complete, he offered to rent, not to sell, them at prices ranging from \$1,200 to \$250 per year, and only a few weeks before his death he contracted at one time for thirty new houses.

Personally Mr. Stewart was of a retiring disposition, free from the ostentation which might legitimately follow the possession of such vast wealth; and while philanthropic and charitable, he was inclined to temper his benevolence with prudence. Miscellaneous appeals for charity he heeded little; but on the other hand, cases recommended to him by those in whom he had confidence met bountiful attention. With seven thousand employees to control, rigid impartiality and discipline was a necessity; but outside the business connection, there were many who felt his aid in time of need and suffering. The world knows nothing of such good works, for he was the last to publish them. It is reported that he was inclined to superstition, and was a firm believer in Baron Rothschild's maxim: "Never have anything to do with an unlucky man;" but the many anecdotes based on this are hardly reconcilable with his character. An educated man himself, he possessed an educated man's taste. He used to say that, if ever he retired from business, he would "go to school," for he loved study for its own sake, and in the midst of all his concerns he found time to keep up his knowledge of classics and the languages, and to read his fifty lines of Homer or Virgil in the morning before going to his office. He was a liberal patron of the arts, and some of the most celebrated of modern paintings are in his private gallery. It was he who recently paid \$60,000 for a single picture by Meissonier, and in the same apartment are works by Rosa Bonheur, Zamacois, Gérome, and other great artists, besides statuary, the whole valued at half a million dollars.

Mr. Stewart has, by his will, bequeathed the whole of his immense property to his wife, with the exception of a number of small bequests to relatives, old employees, and servants, and the magnificent legacy of \$1,000,000 to Judge Hilton, his counsel, business manager, and adviser. No reference is made in the instrument to any appropriation of money to public purposes, save a recommendation to Mrs. Stewart to carry out such charitable undertakings as the testator had begun.

Mr. Stewart's death is a public loss. Few men could have controlled his vast wealth so as to benefit the public as he did; for apart from the direct advantage occurring to all from his colossal business, there stands the grand example of honesty, industry, and perseverance, crowned with a reward gigantic beyond all precedent.

ANIMAL PARASITES.

Professor Van Beneden, of the University of Louvain, France, has recently written an interesting little work entitled "Animal Parasites and Messmates," in which he has contrived to compress a great deal of curious information regarding a subject much more extended than the reader not versed in modern progress of natural history would suppose. He divides the strange creatures of which he treats into three classes: first, messmates, or those who join others to obtain a living or a home or protection; second, mutualists, or animals which live on each other without being either parasites or messmates; and third, the parasites, whose profession it is to live at the expense of their neighbors, and whose only employment consists in taking advantage of them, but prudently, so as not to endanger their lives.

While it would be impossible here to follow the writer in the numerous distinctions which he draws among the members of these different classes, it will perhaps prove interesting to note a few of the most odd and novel peculiarities of the creatures belonging to each. There is a fish, he tells us, called the *holothuria*, which is a living boardinghouse for the *flerasfer*, an eel-like animal. The latter is lodged in the digestive tube of his companion, and, without any regard for the hospitality which he receives, seizes on his portion of all that enters. The angler or *beaudroie* of the Mediterranean often harbors, in the bronchial sac, a kind of eel, which is abundantly able to take care of itself, but prefers to live a life of idleness and share its host's spoils. The shark is accompanied by the pilot fish, which does not, as is often reported, exist on the leavings of his larger companion, but on his own industry, and doubtless finds some advantage in piloting his neighbor.

Another remarkable fish, the *remora*, literally moors itself to the body of the shark, thus converting the latter into a vehicle which carries him about without exertion on his part. When he becomes hungry, he lets go and hunts for prey wherever he may happen to be. This tenacity of the remora in attaching itself is taken advantage of by the fishermen of Mozambique Channel, in order to capture turtles and large fish. They pass through the tail of the remora a ring to which a cord is attached, and then send it in pursuit of the first passer-by which they consider worthy to be caught. The fish holds on to its prey so firmly that it only remains to haul victim and captor in by the line.

There is a crab, of the family of the *maide*, which conceals itself in the substance of a polypidom; it is common in

the Viti Islands, in company with a gasteropod mollusc, and both of them assume the exact color of the polypidom. This is a new kind of mimicry. Another crab appropriates a sea anemone to form a living cloak to hide it from view, in order that it may spring out from its ambush to attack prey. Remarkable marine creatures are the *birgi*, a kind of crustaceans which grow very large, and conceal their abdomens no longer in a shell, but in the crevices of rock. In the East Indies they remain on land, and even climb trees. They have so much strength in their pincers that it is related that one, while stretched on the branch of a tree, "raised a goat by the ears." A family of isopods are rather dangerous messmates, it would seem, for they cut into the walls of their host's stomach and live like Sybarites on its contents.

The most interesting fixed messmates are the cirripedes, which cover the skins of whales, which they never quit after once choosing their abode. Each whale lodges a peculiar species; so that the crustacean messmate is a true flag, which indicates, in some respect, the nationality. It would not be without interest for voyagers who are naturalists to study these living flags.

Among the mutualists may be mentioned the ticks, one generic division of which has twenty species, one of which lives on the dog, another on the cat, and another on the ox. Fishes harbor crustaceans instead of ticks, and these sometimes multiply so rapidly that they cover their post as though they took the place of scales. The cod gives lodging to a species of very beautiful shape, which in its turn affords a resting place for a still smaller organism. In the midst of the eggs of the lobster, there lives an animal of extreme agility, which our author considers the most extraordinary being ever subjected to the eyes of a zoölogist. "Let us," he says, "imagine a clown in a circus, with his limbs as far dislocated as possible, displaying tricks of strength and agility on a heap of monster cannon balls which he struggles to surmount: placing one foot formed like an air bubble on one ball, the other foot on another, alternately balancing and extending his body, folding his limbs on each other, or bending his body upwards like a caterpillar: and then we shall have but an imperfect idea of the attitudes which it assumes, and which it varies incessantly."

There is no organ which is sheltered from the invasion of parasites; even in man, *cysticerci* have been found in the interior of the lobes of the brain, in the eyeball, in the heart, and in the substance of the bones, as well as in the spinal marrow. Each kind of worm has also its favorite place; and if it has not the chance of getting there, in order to undergo its changes, it will perish rather than emigrate to a situation which is not suitable to it. One kind of worm inhabits the digestive passages; another occupies the *fossa* of the nose; a third, the liver or the kidneys. Each animal has its proper parasites, which can only live in animals having affinity to their peculiar host. Thus the *ascaris mystax*, the guest of the domestic cat, lives in different species of *felis*, while the fox, so nearly resembling in appearance the wolf and the dog, never entertains the *tania serrata*, so common to the latter animal. The same host does not always harbor the same worms in different regions of the globe. Thus the large tapeworm of man, called *bothriocephalus*, is found only in Russia, Poland, and Switzerland; a small tapeworm, the *tania nana*, is observed nowhere except in Abyssinia, and, strange to say, the natives consider their absence from the body a sign of ill health; the *anchylostoma* is known only in the south of Europe and the north of Africa, the *filaria* of Medina in the east and west of Africa; and the *Bilharzia*, a terrible worm, has been found only in Egypt.

SCIENTIFIC AND PRACTICAL INFORMATION.

THE STARTING OF THE GREAT ENGINE AT THE CENTENNIAL.

Pursuant to the terms of the contract between the Centennial commission and the builder of the Corliss engine which is the principal motor at the Exposition, the great machine was started running on April 10. Steam was generated in four of its twenty boilers; and when a pressure of fourteen pounds was reached, everything was in readiness to open the throttle. Director General Goshorn stationed himself between the two cylinders, gave the signal, and the immense walking beams slowly began to move. The operation is quite noiseless and easy, despite the huge dimensions of the engine; and the builder may be congratulated on the successful completion of a work creditable alike to himself and to the Exposition.

EFFECT OF THE SEASONS ON THE BODY.

The curious fact has recently been pointed out by Dr. B. W. Richardson that the changes of the seasons have a potent physical influence upon the body. Some years ago, in a convict establishment in England, a number of men were confined amid surroundings (of clothing, room, food, etc.) practically the same for each individual. The medical superintendent of the jail undertook investigations, extended over some nine years, and during which over 4,000 individuals were weighed. It was found that during the months of winter the body wastes, the loss of weight varying in increasing ratio: that during summer, the body gains, the gain varying in an increasing ratio: and that the changes from gain to loss and from loss to gain are abrupt, and take place, the first at the beginning of September, and the second at the beginning of April. This is shown in the following figures, indicating the ratio of loss or gain: Loss: January 0.14, February 0.24, March 0.95. Gain: April 0.03, May 0.01, June 0.53, July 0.08, August 0.70. Loss: September 0.21, October 0.10, November (exception) a slight gain, December 0.03.