

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors. PUBLISHED WEEKLY AT No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, postage included. \$3 00 One copy, six months, postage included. 1 50

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at \$3.00 each; additional copies at same proportionate rate. Postage prepaid. Remit by postal or express money order. Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all newsdealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of seven dollars. Both papers to one address or different addresses as desired.

The safest way to remit is by draft, postal order, express money order, or registered letter. Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, \$5.00 a year, sent prepaid to any part of the world. Single copies, 50 cents. Manufacturers and others who desire to secure for their goods the largest and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

NEW YORK, SATURDAY, AUGUST 14, 1886.

Contents.

(Illustrated articles are marked with an asterisk.)

Table listing various articles such as 'Baseball, the art of pitching', 'Length of life, as to our', 'Breech-loading gun, a hammerless', etc., with corresponding page numbers.

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 554.

For the Week Ending August 14, 1886.

Price 10 cents. For sale by all newsdealers.

Table listing detailed contents of the supplement, including sections like 'I. ARCHAEOLOGY', 'II. ASTRONOMY', 'III. CHEMISTRY', etc., with page numbers.

PRODUCTION OF IRON AND STEEL IN AMERICA.

The semi-annual statistical statement of the American Iron and Steel Association is of particular interest, as it shows an unprecedented activity in both of these industries. During the first six months of the year, the product of pig iron amounted to 2,954,209 tons of 2,000 pounds. In a similar period of time, the country has never before produced such a large amount of pig iron. Prior to 1879, indeed, the output for the whole year never reached these figures.

The most noticeable feature of this half year's increase in Pennsylvania is the lead taken by the Lehigh Valley district. For some time this has been second only to Allegheny County in its pig iron production, but this year it has exceeded it, having produced 320,568 net tons in six months, against 301,014 tons in Allegheny County. The output of pig iron in either of these districts is greater than in any State in the Union except Ohio.

On the 30th of June, 1886, there were 470,421 net tons of iron remaining unsold in the hands of the iron masters or their agents, a slight increase over the stock in hand at the first of the year.

The statistics of steel production show a similar activity. During the six months just past, the production of Bessemer ingots reached 1,073,663 net tons, against 938,418 tons in the second half of 1885 and 763,344 tons in the first half of that year. These figures include also the Clapp-Griffiths metal, of which 24,810 net tons have been produced during the present half year.

The report concludes with the very gratifying statement that this country will produce more Bessemer steel, more Bessemer steel rails, and more open hearth steel in 1886 than in any previous year of our history.

HEAVY ORDNANCE FOR COAST DEFENSE.

The Senate Committee on Appropriations has given much consideration during the present session of Congress to the question of our coast defense and the proper method of securing the requisite armament. The report of the board appointed to examine the national resources in the matter of the production of steel guns made it very plain that the fortification of even two or three of the more important seaports could not be accomplished in less than from one and a half to three years' time.

An appreciation of the difficulties of obtaining suitable arms has aroused the Committee on Coast Defenses to the necessity of prompt action. They have now secured, if not all possible, at least all requisite information, and are in a position to act advisedly in urging Congress to appropriate an adequate amount, and provide for its judicious expenditure. The propositions and amendments offered for the consideration of the Committee and the Senate have been very numerous. Many of these have naturally been ill advised. The fault in most cases has been a failure to recognize the importance of the subject and a disposition to put it off with very inadequate legislation.

determined to contract with private firms for the manufacture of the rough steel, and provide for the assembling and finishing of the parts at the Frankford Arsenal, Philadelphia, and at the Washington Navy Yard.

It is now provided that the Secretary of War and the Secretary of the Navy are to be authorized jointly to make contracts with responsible steel manufacturers, after suitable advertising, for the supply of rough bored, rough turned, and tempered steel in forms suitable for heavy ordnance for army and navy purposes. Its quantity is not to exceed 10,000 gross tons. In quality and dimensions, it must conform to specifications, and be subject to inspections and tests at each stage of manufacture. It is provided that no money shall be expended, except for steel accepted and delivered, and that each bidder shall contract to erect a suitable plant in the United States. Such establishments must be equipped with the best modern appliances, and capable of making all the steel required, and of finishing it in accordance with the contract.

Four hundred thousand has been apportioned for the thorough equipment of the Frankford Arsenal, and two hundred thousand for additional tools and machinery for the Washington Navy Yard. Minor sums were also appropriated for the construction of cast iron mortars and other purposes.

The full discussion which this question received in Congress has shown that under the most favorable conditions it will take several years to provide for the adequate protection of our seaport cities. In the interval, they are left at the mercy of circumstances. It is true that we are now so fortunate as to be at peace with all the world, but it is impossible to have any guarantee that this condition of affairs will continue for any length of time. It is at such a period that defensive preparations should be made, and not when war is actually at hand. In urging an extensive and complete system of fortification, we have that a higher civilization will prevent the necessity of ever testing its efficiency in battle. It is, however, quite well recognized in international history that an improved armament is fully as valuable in preventing war as in gaining victories when hostilities have once been declared.

DISEASE GERMS IN MILK.

It is a well recognized fact that the mother who is nursing her child is obliged to be very careful about her diet, for whatever she eats or drinks has its effect upon her milk, and consequently upon the health of her child. The most acute symptoms, and even death, may be produced by dietary indiscretion. But it is less appreciated that similarly alarming results may be produced in both children and adults by the use of milk taken from improperly fed cattle. There have recently been a number of mysterious poisoning cases, that after a great deal of random speculation have finally been traced to diseased milk. In spite, however, of these warnings, the subject has not yet received the sanitary attention to which it is entitled. Particularly is the danger of such contamination great in the neighborhood of large cities, where the absence of wholesome pasturage is a temptation to the less scrupulous to substitute all grades of organic refuse, the most of which should properly be consigned to the garbage crematory.

In other places the case is even worse, for the cattle have been observed to feed with evident relish upon unadulterated animal excreta and other highly pernicious food. Aside from the disgust which the practice excites, it is a source of actual and grave danger. When it is remembered that the fatal plague at Plymouth, Pa., was directly traceable to the careless disposal of the excreta of a single typhoid fever patient, it can readily be seen that milk may become in this manner a vehicle for the distribution of the most malignant disease germs.

So large are the possibilities for evil which may result

from the use of milk taken from animals improperly fed, either through design or carelessness, that it is not too much to ask that all public dairy farms should be placed under sanitary supervision, and that the food and quarters of all cattle whose milk is offered for sale should be regularly inspected by officials appointed for the purpose.

As to Our Length of Life.

BY THOS. S. SOZINKSEY, M.D., PH.D., OF PHILADELPHIA.

One meets frequently in the course of his general reading, and even in scientific publications, declarations to the effect that of late the length of human life, as well as the vital stamina of the race, has markedly increased. Some assert that the average age has been run up ten, fifteen, even twenty years, but a doctor of hygiene puts the case moderately thus: "The average duration of human life has increased, and all the evidence, I think, is in favor of the view that we are a better stock or race than we were a few years ago." "A few years" are sufficient to work material changes in the "stock or race"! Let the disciples of Darwin take notice.

The asserted increase in the length of life and vital force is attributed to more hygienic living, due in great part to the growth and diffusion of sanitary knowledge, which is said, of course, by the enthusiastic doctor of hygiene, to be a span-new science. Our forefathers were an ill-conditioned and ignorant set—they did not know anything about right living. Shades of Hippocrates and other great lights of the past, take no offense at modern presumption!

Macaulay spoke with great force, as was his wont, of the improved condition of the English people in his day. "The term of human life," said he, "has been lengthened over the whole kingdom, and especially in the towns;" but it is nearly forty years since the historian wrote, and, of course, the hygiene of forty years ago, according to the modern doctor, being of little account in comparison with what it is to-day, there must have been considerable addition since to "the term of human life;" for be it known that an increase of "the term of human life" goes *pari passu* with the modern "strides" in sanitary science. The day dawns, to be sure, in which men will live as long as the antediluvians!

Such statements are apt to be very agreeable to *amour propre*, but are they really true? Is the vital condition of the race improving?

The volume of the United States Census Reports of 1880, which has been issued recently, furnishes an interesting mass of plain, unvarnished facts bearing on the subject in question. During the census year it appears that of a hundred deaths reported, forty were of persons under five years of age, fifty-two were of persons under twenty, and only twenty-two were of persons over fifty. Only about ten per cent survive their threescore years and ten. Twenty-four per cent, or nearly a quarter, of the deaths are of persons between twenty and fifty years. Here is the table in detail:

AGE.	DEATHS IN 100.
Under 1.....	23.24
1 to 5.....	16.90
5 to 10.....	5.71
10 to 15.....	3.04
15 to 20.....	3.89
20 to 30.....	9.61
30 to 40.....	7.60
40 to 50.....	6.49
50 to 60.....	6.22
60 to 70.....	6.88
70 to 80.....	6.38
80 to 90.....	3.28
90 to 95.....	0.43
95 to 100.....	0.26
Unknown.....	0.42

These astounding figures represent the mortality according to age, as already intimated, for the entire United States. For the thirty-one cities in which the deaths were registered during the census the showing is far worse. "Under five years of age the proportion of deaths (reported) in the country at large was forty-three and seven-tenths per thousand of living population, while in the registration cities it was eighty-eight and four-tenths per thousand. In other words, the mortality of children under five years of age . . . was about twice as great in the cities as in the average of the whole country." So it is said in the Census Report. Of course, if a far greater proportion of the deaths in the whole country of persons under five years than of those older were not reported, which was certainly the case, the percentages given in the table of deaths of those dying at different ages of over five years are much greater than they really ought to appear; for *il va sans dire* that the greater number of deaths of very young people, the lower is the average age at death. Even as the table stands, the average age is not far up in the twenties.

In France forty-eight per cent of the deaths are of persons over fifty years of age; and what is more remarkable, twenty-five per cent are of persons over seventy years of age. The French present the best showing, except, perhaps, the Irish, of any nation as regards long life. Only about twenty-six per cent of their deaths are of children under five years. About six per cent only are of persons from five to twenty years.

For the purpose of comparison the following table of percentages of mortality at different ages in England and Wales in 1880 may be given:

AGE.	DEATHS IN 100.
Under 1.....	25.48
1 to 5.....	16.98
5 to 10.....	3.66
10 to 15.....	1.73
15 to 20.....	2.23
20 to 25.....	2.61
25 to 35.....	3.51
35 to 45.....	6.36
45 to 55.....	6.88
55 to 65.....	8.75
65 to 75.....	10.06
75 to 85.....	7.66
85 and over.....	2.09

According to this table, the deaths of persons from five to twenty years of age were less than eight per cent of the whole; while in the United States they were over twelve. The deaths of persons from twenty to fifty-five years of age were twenty-one per cent of the whole; while in the United States the deaths of persons from twenty to fifty were more—twenty-four per cent. The deaths of persons over seventy-five years of age were about equal to the deaths of persons over seventy in the United States.

As serving to show how much other things than the advancement of practical hygiene have to do with the length of human life, the following table of the percentages of deaths at different ages in Ireland, in 1880, is highly interesting:

AGE.	DEATHS IN 100.
Under 1.....	13.98
1 to 5.....	11.60
5 to 10.....	4.00
10 to 15.....	2.53
15 to 20.....	3.41
20 to 25.....	3.85
25 to 35.....	5.62
35 to 45.....	5.78
45 to 55.....	6.54
55 to 65.....	10.77
65 to 75.....	14.05
75 to 85.....	13.30
85 to 95.....	3.72
95 and over.....	0.80
Unknown.....	0.05

Let the modern doctor of hygiene look critically at these figures. No nation of Europe is supposed to be more oblivious of sanitary science than the Irish, and yet a far greater percentage of the people of Ireland than of any other people, except the French, live to and beyond the age of seventy years. Nearly five in a hundred of the deaths are of persons over eighty-five years of age! Only about thirty-five per cent of the deaths are of persons under twenty years of age. About forty-two per cent of the deaths are of persons over fifty years. One-half almost of the deaths are of persons over forty-five years. In England and Wales only thirty-three per cent of the deaths are of persons over forty-five years, while in the United States only thirty per cent are of persons over forty years of age.

Let the boastful doctor of hygiene say what he will, the vital condition of the people of neither England nor the United States is satisfactory; it is lamentably unsatisfactory. I know of no sound evidence pointing the other way. Appealing to the experience of life insurance companies does not meet the case at all, for the simple reason that the very young, the frail, and the diseased are very carefully excluded from regular insurance. Then, if the physical condition of the people of Ireland, a people poor and comparatively ignorant of sanitary science, is immensely superior to that of either, there must be influences at play in both England and the United States which much more than counterbalance all the beneficial effects of the sanitary science in practice in either country. Climate has something to do in the case, but the mode of living of the people far more. There is only too much reason for the belief that the very artificial mode of existence general in civilized countries is harmful. In other words, the less natural one's mode of living is, the more likely are his vital powers to become impaired.

The multiplied appliances and complex ways of highly civilized life do not make for health and long life. The comparatively uncivilized do not suffer much from disease, or at least non-contagious disease, and their offspring are not doomed to die in great part in their infancy. The simple habits of those who live close to nature are most favorable to real human welfare. To live close to nature, which in general means in accord with nature—that is the cardinal axiom which the doctor of hygiene would do well to specially inculcate. To this I may add, by way of conclusion, that Mephistopheles, who, unlike the modern doctor of hygiene, was wont to say, "*allwissend bin ich nicht*," gave Faust passing advice as to how to preserve his youthful health and vigor:

"Betake thyself to yonder field;
There hoe and dig as thy condition;
Restrain thyself, thy sense and will
Within a narrow sphere to flourish;
With unmix'd food thy body nourish;
Live with the ox as ox, and think it not a theft
That thou manur'st the acre which thou reapest;
That, trust me, is the best mode left
Whereby for eighty years thy youth thou keepest."

—*Med. and Surg. Reporter.*

The Adjournment of Congress.—No Changes in the Patent Laws.

Congress adjourned August 5. Among the notable bills passed was one for the protection of public lands. The failure of Western railroads to fulfill the conditions stipulated in their grants has led to the reannexation of 190,625 square miles to the public domain. The lawless cattle syndicates, which were fencing off millions of acres to which they had no possible claim, have also been brought under the dominion of the law. The oleomargarine industry received a severe blow by the passage of a bill imposing a tax of two cents a pound on the article, and requiring both stamp and brand. The naval bill provides for the addition of two sea-going armored vessels, one protected cruiser, and one first-class torpedo boat, while the four double-turreted monitors now in course of construction are to be completed. The river and harbor bill, appropriating \$14,473,900 for national works, has been approved.

None of the various bills for the curtailment of the rights of patentees was passed. The copyright bill for foreigners to register copyrights also failed to pass.

New Canals in Russia.

A new canal, improving the water communication between the Caspian and the Baltic, was opened by the Minister of Ways of Communication, Gen. Possiet, recently. The canal, which has cost 300,000*l.* to construct, joins the rivers Wyhegra and Kovja, and forms a fresh link in the chain of waterways known as the Maryinsky system, connecting the Neva with the Volga. Its length is 22 versts, or 15 miles, width 70 feet, and depth 7 feet. Some of the cuttings through which it runs had to be excavated to the depth of 30 feet. Most of the work has been done by hand, upward of 20,000 laborers having been employed in the undertaking, together with three dredging machines, nine stationary engines, and two locomotives.

Upward of 270,000 Russian cubic fathoms of earth had to be removed in making the canal, and two sluices constructed. Compared with the rest of the vast canal system between the Neva and the Volga, the new link was neither an extensive nor a formidable undertaking, but it has relieved the pressure of traffic on the other canals, and shortened the distance from Rybinsk to St. Petersburg. It is noteworthy, says *Engineering*, that in spite of the development of the Russian railway system the traffic on the canals shows no sign of diminution, a phenomenon quite the reverse of what has occurred in England. This is to be explained, perhaps, by the fact that distances are greater in Russia, while the canals are more like rivers than the narrow waterways common to England.

Barges on Russian rivers and canals range in length from 100 feet to 300 feet. The cargoes a large proportion of them carry, consequently, are as large as many an ocean cargo; and instead of being mere lighters, carrying only portions of cargoes, they are to all intents and purposes the counterparts of ocean-going ships. Thanks to the wide reaching ramifications of the River Volga, the largest in Europe, barges of 500 or 1,000 tons can start in the spring from the floods from some tiny stream in the Ural Mountains, and arrive in the autumn on the River Neva. On the other hand, it is possible for English steamers to make their way from the Neva through the canal system to the Volga, and thence descend to the Caspian Sea. The Neva-Volga canal system thus possesses an importance which no English canal could claim, although we think that water carriage in this country deserves to be rescued from its present neglected and decaying condition, into which it has lapsed through the instrumentality of ambitious and over-grasping railways.

The Planet Mars.

Mr. W. F. Denning has made a series of careful drawings of the appearance of the planet Mars this year, and finds the edges of the seas very brilliant and well defined. The surface markings of the planet are very varied, and in some places distinctly mottled; and during the past few months the north polar cap has been very bright, and in startling contrast to the less luminous regions. Mr. Denning thinks that the atmosphere of Mars, instead of being dense and cloud laden, is extremely attenuated; and that most of the supposed changes in the latter are really due to changes in the earth's atmosphere.

A Liniment for Earache.

According to the *Canada Medical Record*, Pavési recommends a liniment composed of camphorated chloral 2½ parts, pure glycerine 16½ parts, and oil of sweet almonds 10 parts. This is to be well mixed, and preserved in a hermetically closed bottle. A pledget of very soft cotton is to be soaked in the liniment, and then introduced as far as possible into the affected ear, two applications being made daily. Frictions may also be made each day with the preparation behind the ear. It is claimed that the pain is almost immediately relieved, and even in many cases the inflammation is subdued.