

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, postage included... \$3 20
One copy, six months, postage included... 1 60
Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at \$3.20 each; additional copies at same proportionate rate. Postage prepaid.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly; every number contains 16 octavo pages, with handsome cover, 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 news dealers 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, or registered letter. Address MUNN & CO., 37 Park Row, N. Y.

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 foreign trade, may have large 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., 37 Park Row, New York.

VOL. XXXVIII., No. 22. [NEW SERIES.] Thirty-third Year.

NEW YORK, SATURDAY, JUNE 1, 1878.

Contents.

(Illustrated articles are marked with an asterisk.)

Accidents, two remarkable... 341
American commerce, extending... 347
Am. vs. English manufactures... 811
Ant bear... 343
Arsenic... 346
Ash sifter, dustless... 346
Astronomical notes... 338
Beet sugar [S]... 343
Boat, collapsible... 343
British commerce and manuf's... 345
Business and personal... 348
Cattle, Texan... 345
Chinese labor... 340
Clearance machine... 344
Clearance and compression... 337
Communications received... 348
Correspondence... 340
Cutler competition... 340
Ear, effect of water on... 342
Earthquakes of Japan... 343
Egg within an egg... 340
Electrotype, largest... 338
Engine, Roberts... 342
Fire engines... 345
Fish commission... 345
Gyroscopes, electrical... 343
Heating through teeth... 342
Hecla, eruption of... 346
Henry, Prof. Joseph, obituary... 336
Horizontal engines, wear of... 335
Internal commerce, American... 333
Inventions, agricultural... 333
Inventions, mechanical... 341
Inventions, new... 347
Kaga ware... 339
Knit goods, American... 340
Laryngostroboscopy... 339
Lead poison... 346
Meddlers, unskilled... 337
Mercury, transit of... 347
Minerals... 348
Mint for Honduras... 339
Mississippi J. ties... 347
Mossito net frame... 339
Muscadin... 348
Notes and queries... 348
Opium... 346
Patent Office, large business... 340
Patrol for tramps... 340
Perpetual motion... 346
Piles in sand, driving... 340
Planetary population... 346
Poisons... 346
Railroad, narrow gauge... 340
Respiration at high altitudes... 342
Salt mining, hydraulic... 346
Silk industry... 340
Silk worms for distribution... 340
Sperm whale... 344
Sponge trade of Bahamas... 344
Steel exhibits... 346
Steel steamer... 344
Stove draught apparatus... 346
Stuttering, cure of... 346
Tea in South Carolina... 340
Telegraph, mouth... 346
Telephone, new details... 341
Telephone in dry weather [S]... 348
Theaker, natural... 343
Torpedo boat, Russian... 338
Typemetal [S]... 348
Vise, Stevens... 342
Warfare, new phase... 343
Washington correspondence... 340
Wool, Californian... 339
Yankee notions... 340

TABLE OF CONTENTS OF THE SCIENTIFIC AMERICAN SUPPLEMENT No. 126, For the Week ending June 1, 1878.

I. ENGINEERING AND MECHANICS.—Steel Casting Apparatus. By MICHAEL SCOTT. Read before the Iron and Steel Institute. A cheap and convenient arrangement successfully applied to the Siemens open hearth steel melting furnace. Application of the Revolving Spout to Bessemer Pits, 5 figures.—A Peculiar Case of Failure in a Water Main. Paper read by D. McN. Stauffer, member of the American Society of Civil Engineers, 1 figure.—Improvements in Bicycles, 1 figure. New Designs for War and Merchant Vessels. By EDMOND THOMPSON. The Cellular Principle. Protection of Vessels from Torpedoes. Water Ballast. Docking without Docks. Reduction of Vibration and Stiffness and Prevention of Racing in Screw Propellers, 6 illustrations. The Preservation of Iron Surfaces. Galvanizing, Tinning, Painting. Barr's Hot Steam and Bower's Hot Air Processes, and their success.—Locomotives vs. Horses.—Mechanical Aids to Human Locomotion. Velocipedes, etc.
II. ARCHITECTURE AND BUILDING.—Obelisks. By Professor T. L. DONALDSON. Paper read at the Royal Institute of British Architects. The Antiquity and Value of Obelisks as Records. Obelisks capped with Gold. Obelisks of the Pyramids. Translations of Inscriptions. The Architectural Magnificence of the Ancient Egyptians. Egyptian Chronology. Transporting Monoliths.
III. TECHNOLOGY.—New Warming, Scouring, Sizing, Drying, and Beaming Machine, illustration.—Carding Machine Fires.—Bleaching Shellac. By JOSEF MARIA EDER.—Dry-Plate Prize.—New Photo-Plate Process.—Plaster Casts of Fish.
IV. CHEMISTRY AND METALLURGY.—Ammonia.—New Method for the Estimation of Sulphur in Organic Compounds. By M. W. ILES and C. FAHLBERG.—Separation of Crystalline Silicic Acid.—Detection of Butter Adulterations.—Benzerythren.
V. ELECTRICITY, LIGHT, HEAT, ETC.—Convenient arrangement of the Mirror Galvanometer. By A. FLOYD DELAFIELD. 1 figure.—The Telephone.—Hertz's Telephone. 1 figure.—The Zodiacal Light. By Prof. W. PRITCHETT. 1 figure.—Study of Crystals. By J. H. COLLINS, F.G.S. 19 figures. Instructions for determining the true Crystal system, etc.
VI. NATURAL HISTORY, GEOLOGY, ETC.—A New Field for the Microscopist. By W. SAVILLE KENT, F.R.S. The Flagellate Monads. The Salpingoeca, the Codopsis pulcherrima, and other sponges. Numerous species minutely described, with 56 figures, and valuable hints for their study.—The Synthesis of the Lichens. Their organization and fructification. Curious anomaly. M. Schwendener's theory and its verification, etc. 3 figures.—Lac and the Lac Insect.
VII. MEDICINE AND HYGIENE.—Suggestions in the Treatment of Spinal Diseases and Curvature. By E. H. COOVER, M.D. Dr. Sayre's suspension principle. Treatment and results in several cases. 3 illustrations.—Albuminuria in Health.—Action of Remedies.—Trichina Spiralis.
VIII. AGRICULTURE, HORTICULTURE, ETC.—Cranberries in Maine. Missouri Apples. Thinning Fruit. Liquid Grafting Wax. Profits of Fruit Growing. Far Walks. Enriching Orchards. Apples for Wisconsin. Blackberries.—Managing a Lawn.—The Value of Hen Manure.—White and Yellow Corn.
IX. CHESS RECORD.—Biographical Sketch of Kling and Horwitz, with Portrait.—Problems by W. Meredith and J. B. Cherriman.—Problem from Association Letter Tourney.—Brownson's Dubuque Tourney No. 3.—The New Automaton Chess Player.—Solutions to Problems.—En Route.
Single copies of any desired number of the SUPPLEMENT sent to one address on receipt of 10 cents. Remit by postal order. Address MUNN & CO., 37 Park Row, New York. Price 10 cents. To be had at this office and of all newsdealers.

DO INVENTIONS INJURE THE LABORER?

One of the arguments made use of by many against the patent law is the old fallacy that improvements in machinery take the bread out of the mouth of the laborer, and the great number of unemployed people at the present time is cited as an example of the effect of the use of machinery enabling one man to do the work of several, who must, it is stated, be thrown out of employment because the one man on the machine does all the work that the others did before. From this it is argued that a patent law for encouraging inventions is a bad law, and should be abolished.

This is one of the old ideas that are continually cropping up, and its fallacy has been so thoroughly exposed by the logic of events that it seems to many as hardly worth considering. We certainly thought so until lately, but it has made its appearance quite often of late in places where we would hardly have thought to have seen it. Petitions have been sent to Congress for the abolition of the patent law; various newspapers have been publishing articles condemning the introduction of new machinery, and seriously proposing a return to the old methods of hand labor, so as to give employment to the thousands who cannot now get it, and it appears from various questions asked by some of the members of the Congressional Committees on patents, in the recent discussion on the amendments to the patent law, that they are, or rather were, believers in this doctrine. We say "were," because we believe that since the discussion before these committees the members thereof have become so well posted on the good effected by patent laws that some of them, who were originally inimical to the law and seriously desired to repeal it or suspend its operation, are now in its favor. The fact, however, that men having sufficient general intelligence to edit a newspaper or to reach the position of members of Congress believe in the theory that machinery is hurtful to the laborer, seems to call for some effort on our part, as the special champion of the inventor and the patent law, to show how erroneous is this idea, and we therefore propose to cite a few instances that occur to us where it would appear that if there were any chances of machinery throwing people permanently out of employment, it certainly would be in the examples mentioned.

As one of the prominent and most familiar examples, let us consider the sewing machine. When Walter Hunt invented his machine in 1838, his wife objected to his introducing it, as she thought, like many others, "that it would throw all the sewing women out of employment." Hunt appeared to think the same himself, and on his wife's entreaties abandoned his invention, thus losing a fortune and leaving the field open to Howe, who was either wiser than Hunt on this point or had less scruples. Now what has been the result of the introduction of sewing machines in lessening the demand for labor? Are there fewer people now employed at sewing than there were formerly? Is it not a fact that the thousands of operators earn much more than they formerly could by hand; that where one stitch was put in a dress when made by hand there are ten now; that the miserable "three-stitches-to-the-inch" style of clothing has disappeared from the market since sewing machines have been introduced; that tens of thousands of women who formerly made the underclothing of their families, now buy it ready-made, because it is made so cheap by sewing machines; and that sewing machine made goods are exported in large quantities to countries that would otherwise supply us, because with their underpaid laborers they could compete with and undersell our manufacturers, and thus throw thousands of our people out of employment?

These statements may, however, be said to be mere assertions, not borne out by facts. Let us see, therefore, what the figures of the census say on this question. In 1850 there were 52,069 tailors employed in the United States, which then had a population of 23,191,876, or one tailor to 445 inhabitants. In 1870, notwithstanding the introduction and use of thousands of sewing machines, there were 106,679 tailors in a population of 38,558,371, or one to 361 inhabitants. So that although the population had not doubled by nearly eight millions, the number of tailors employed had more than doubled. The statistics relating to women's clothing are not so readily obtained, or we have no doubt but that they would show equally as well.

There is, however, another point to be considered. The introduction of the sewing machine has not been made without labor, for according to the census there were 17,372 hands employed in sewing machine factories in 1870, and there were 3,152 dealers in machines in the same year, besides the almost countless hosts of canvassers or "agents" who were perambulating the country, all of whom got their living directly from the sewing machine industry, to say nothing of the numbers of people who were employed in mining and manufacturing iron and steel for the machines and lumber for the tables, and the thousands of others indirectly supported by the sewing machine business.

In our remarks so far we have only cited such points as appeared to have a bearing on the question of the effect on labor of the employment of sewing machines, but have said nothing as to the gain of the people generally by their use. We do not have by us any reliable statistics on the prices of clothing, but if any one doubts the fact that sewing machines have reduced the price of wearing apparel, let him go to a shirt maker and ask the difference in the price that would be charged for making two shirts of the same materials, one to be made entirely by hand and the other by machine.

With regard to the effect of sewing machines on the shoe manufacture we have some interesting statistics that we be-

lieve may be relied on. The sewed shoes which are made in the greatest numbers are the ordinary gaiter shoes (women's). These shoes before machines were introduced for sewing them sold at about \$2.00 per pair, but now shoes of the same quality can be bought for \$1.50, notwithstanding that the materials in them have gone up from 40 to 70 per cent, and that wages have more than doubled. The women who formerly sewed the uppers got 50 cents per day; they now get \$1.33 on the machine. Men got on an average \$1.25 per day, varying according to their skill; now they get about \$2.50—some rather less, many a great deal more.

If we consider the textile industries of cotton goods, woolens, worsted goods, carpets, hosiery, etc., we find that notwithstanding the great advance in the number of labor-saving inventions, the hands employed have increased faster than our population, and that the wages paid have more than doubled, as will be seen by the following figures, taken from page 596 of the Industry Volume of the Census of 1870:

Table with 3 columns: Item, 1860, 1870. Rows: Hands, Wages, Product.

The last line shows the advantage of the use of the improved machinery now employed, as, notwithstanding there was only an advance of less than one half of the number of hands employed, the value of the product was increased about 150 per cent, although the hours of labor in many factories were largely reduced between 1860 and 1870.

As another instance, take the use of the reaping and mowing machine. In the twelve States where these machines are used most we find that farmers and agricultural laborers have increased from 1,301,863 in 1850 to 2,024,399 in 1860, and 2,641,830 in 1870.

It may be objected, however, that most of the States where mowers and reapers are used are the rapidly growing Western States, and that this is therefore hardly a fair argument to use. We will therefore give the following table, compiled from the census, showing the hands employed in the various manufactories of all kinds all over the United States:

Table with 4 columns: Year, Hands, Wages, Population. Rows: 1850, 1860, 1870.

From a comparison of these tables it will be seen that, notwithstanding the immense number of labor saving machines introduced in the twenty years embraced in the above figures, the hands employed have more than doubled, and the wages nearly quadrupled, although the population had only increased from a little over twenty-three to thirty-eight and a half millions, or about 67 per cent.

In considering the effect of inventions on the laboring interests of the country we must not forget that many inventions actually increase the amount of labor to be performed, as, for instance, the telegraph and photograph. The census of 1870 gives nearly 17,000 as the number employed in different capacities in the telegraphic offices of the country, to say nothing of those indirectly connected with it in building the lines, drawing the wire, making the instruments, etc. The photographers are also a large class entirely dependent on a modern invention, without which their occupation could never have existed, and they in their turn keep a large number of people employed in preparing chemicals, paper, plates, mats, frames, etc., for their use. The rubber business also employs tens of thousands of operatives directly in the manipulation of the rubber, leaving out of consideration those engaged in other countries in the collection and shipping of the raw gum, and the thousands employed here in the sale of the manufactured articles. If to these we add the immense number of people employed in connection with the railroad and steamboat interests of the country, which are wholly dependent upon the inventions of the steam engine, locomotive, and steamboat, it will appear plain to the meanest capacity that inventions, so far from throwing people out of employment, have rather increased the demand for their services.

PROFESSOR JOSEPH HENRY.

The death of Professor Joseph Henry, which occurred on May 13, has not been unexpected, for he had attained the ripe age of eighty years, and the signs of failing health for some time past have indicated the near termination of a life fruitful in great works. During last winter he contracted a kidney malady which severely prostrated him, so that at the recent meeting of the Academy of Sciences, in Washington, he was barely able to leave his room and preside for a very brief period over the deliberations of that body. His address as president was read by Secretary Hilgard, and the tendering of his resignation therein, together with the many suggestions he offered for enhancing the welfare of the Academy, bore the impress of his evident foreboding that those were his parting words.

Professor Henry was born in Albany, N. Y., on December 17, 1797. His education was such as could be obtained at the ordinary common school, and he developed in his early years no especial aptitude for study. Entering the Albany Academy he acquired enough knowledge to fill the post of district school teacher, but this he did not retain long, returning to the academy to resume his studies, and finally becoming an assistant of Dr. Beck in the chemical researches of the latter, and also professor of mathematics in the above named institution. In 1826, while holding this position, he began his magnificent original investigations on electricity