

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.
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.

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 11 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. (3.) 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. XL., No. 14. [NEW SERIES.] Thirty-fifth Year.

NEW YORK, SATURDAY, APRIL 5, 1879.

Contents.

(Illustrated articles are marked with an asterisk.)

Acoustic apparatus, new*	207	Mining district, Leadville.....	213
American tools, Netherlands for	214	Monkeys, working.....	215
Artisans, American and English	209	Motor, Miss Hosmer's.....	209
Astronomical notes.....	216	Neutral line, Gary's alleged.....	208
Barnum calls for a new invention	205	Neutral line, note from Mr. Gary	209
Belling, speed of (46).....	219	Notes and queries.....	218
Bobac, the.....	213	Parabola (4).....	214
Books at auction, rare old.....	211	Patents, American, recent.....	214
Bridge, East River, security of.....	219	Patents, Amer. some recent*	216
Bridge, Niagara (54).....	219	Penicils, colored, for glass.....	211
Buffalo, domestication of the.....	213	Petroleum, refined (12).....	218
Cattle, mate.....	219	Photograph (18).....	218
Cement to stick rubber to iron (49)	219	Press, improved, an*.....	214
Chloride of lime as an insecticide	213	Pumps, air, locomotive (11).....	218
Coal field, Ohio.....	213	R. R. brakemen, danger to.....	211
Coal fields, Western Iowa.....	213	Safes, fillings for (17).....	217
Copper, refined (6).....	218	Sequences, poison of.....	217
Cranberry, Wisconsin.....	211	Sinclair, Alaskan islands.....	217
Decision, Supreme Court.....	216	Siphon, advantages of.....	213
Dynamo-electric machine (5).....	218	Siphon, automatic, new*.....	216
Engine, small stationary (10).....	218	Steamship, ocean, large.....	211
Engines, yacht, prices for (32).....	219	Steel, magnetized (47).....	219
Explosion, tea (24).....	219	Surveys, National.....	217
Geological, Heinrich.....	211	Tax, shipping, new*.....	217
Gun barrels, boring (11).....	220	Telephones (13).....	218
Ink, anti-blue black (15).....	218	Tinned ware, lead poisoning.....	208
Inventions, miscellaneous.....	216	Torpedo launch, Herreshoff.....	210
Labor and the cost of living.....	208	Tortoise shell, to polish (61).....	219
Lace, to clean (63).....	219	Varnish, alcoholic shellac (50).....	219
Lawn mower, improved.....	218	Varnish, black, cheap (14).....	218
Lawn, the.....	218	Vitriol, effect of on skin (42).....	217
Meat canning by machinery.....	209	Washing machine, improved*.....	219
Millers, victory for.....	211	Why so depressing?.....	214

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 170.

For the Week ending April 5, 1879.

Price 10 cents. For sale by all newsdealers.

- I. ENGINEERING AND MECHANICS.—The Lighthouse of Chlipona, at the mouth of the Guadalquivir, Spain. With general description and one page engraving. Heavy Ordnance, a paper by J. A. Longridge, M. E. Showing the true law for the distribution of metal, with dimensions for guns according to the true law, with comparative costs of guns as now made, and the true law made. Modern musketry, showing the weights of arms adopted by different governments. The De Bay propeller, a new form of double screw, which throws the water astern in a line with the vessel's keel, and thus increases the speed of the vessel. Comparative trials of the De Bay and Griffiths screws, and tables of relative performance. Illustrations and descriptions of the apparatus for testing the effective power of these and other propellers. With interesting and valuable particulars, and 5 illustrations. Description and diagram of a durable spur wheel, that has run for 25½ years day and night.—Hahn's Iron Scaffolding for Buildings, with 1 engraving; a light, strong, durable, and effective improvement.—Zinc Dust as a Cause of Fires, curious examples.
- II. TECHNOLOGY.—The International Exhibition, Australia, to be opened in October, 1879, showing the building, description, dimensions, and other interesting particulars.
The Manufacture of Vermicelli, with description and 5 engravings of the latest and best machinery now used in this important industry.—The New Grain Separator of M. MILLOT, now extensively used in Switzerland, with description and 1 engraving, showing construction and operation.
On Theory and Practice in Bread Making. By MRS. GEO. M. WHITAKER. A plain, practical, valuable paper, with directions for the making of good bread, each step being well explained, and the science of the art clearly shown. Every lady who wishes to understand how to make good bread should read this paper.
Suggestions in Rural Architecture, with engravings of plans, elevation, and description of a handsome Dairy Cottage.—Interesting and valuable Experiments on the Porosity of Building Stone.—How Oysters are Changed with Copper in France.—Interesting Statement of the earnings of Working People in Great Britain.—Productions of the United States Mints in 1878.—A New Form of Adding Pencil, with engraving and description.
The New Lebrousse Paper Pulp Machine, with engraving and description.
Designing for Textiles, valuable suggestions, with 1 eng. aving.—Apparatus for Testing the Evenness of Yarns, with 1 engraving.
Silver Guide for Spinning Machines, with 1 engraving.—A Drag for Throble Bobbins, with 1 engraving.—Warping Bobbins with Iron Heads, with 1 engraving.—Gulcher's New Buckskin Loom, with 1 engraving.
Porcelain Painting. By V. JOULET. A valuable article, showing how to prepare and apply various fine colors to the best advantage.—On the Classification of Colors. By M. CROSS. Containing much valuable information.
Manufacture of Solid Carbonate of Ammonia from Gas Liquors. By F. W. BROTHERS. Description, and 1 engraving of the apparatus.
Prohibitions of the Government of Zurich in respect to the use of poisonous substances in the arts and in foods.
- III. ELECTRICITY, LIGHT, HEAT, ETC.—On some Improved Methods of Producing and Regulating Electric Lights. By HENRY WILDE. A valuable and interesting paper, read before the Manchester Literary and Philosophical Society.—Description of Planté's Secondary Battery.—Description of a New Device for Magnetizing Compass Needles.—Dynamo-Electric Machines. By Professor A. HOUSTON and THOMPSON. A valuable and instructive paper.—Dr. Fay's Theory of Electricity.—On a Condenser of Valuable Capacity. By C. BOYS.—Mathematical Estimate of the Pressure in the Radiometer.—Spectrometric Measurement of High Temperatures. By A. CROVA.—A New Differential Thermometer. By Dr. O. J. LODGE.—On the Influence of Different Colors of the Spectrum on the Development of Animals. By E. YOUNG.—On Tides and Tidal Currents. By Professor PURSER.
- IV. CHEMISTRY, METALLURGY, ETC.—Thallium Tetraiodate.—Anti-line Dithionate.—Hypoxanadic Dithionate.—On the Stealing of Copper Plates. By R. BOTTGER.—On the Absorbing Powers of Vegetable Charcoal. Interesting particulars.
- V. ARCHAEOLOGY.—Archaeological Explorations in Tennessee. By F. W. PUTNAM. Curator of the Peabody Museum, with 17 illustrations, showing various figures, objects, and utensils obtained from mounds in Tennessee, with interesting particulars.
- VI. ASTRONOMY.—Is the Moon Inhabited? A most interesting paper by CHARLES FLAMMARION. Describing a large number of observations by various astronomers, tending to show the probabilities of life on the surface of the moon, the existence of an atmosphere, vegetable life on the moon, probable character of animal and vegetable life on the moon, how the question of lunar inhabitants may be resolved, etc.

LABOR AND THE COST OF LIVING.

Notice was taken last summer of the encouraging results obtained by the Massachusetts Labor Bureau in the inquiry as to the numbers of employed and unemployed men and women in that State. It will be remembered that the number of people seeking work was then about 28,500. The tenth annual report of the Bureau, just published, gives the result of another canvass, made in November, from which it appears that only 23,000 people in Massachusetts were then in want of work and could not get it. If the industrial condition of Massachusetts may be taken as an index of the industrial condition of the whole country, we arrive at the encouraging conclusion that not more than one per cent of the population of the United States began the winter unemployed. This, notwithstanding the fact that the relative proportion of those seeking employment and depending on it for support was probably much greater than ever before. Multitudes who had retired from business in flush times, had been driven to seek work again in consequence of failing investments; and for similar reasons many young people and dependents upon wealthy parents and relatives had been set adrift to crowd the labor market.

That the reduction of wages consequent thereupon, and the return of prices to a gold basis, had not brought the working people of Massachusetts, as regards work and wages, relatively below their position when gold began to go up, is shown by statistics, which we believe to be worthy of the utmost confidence.

"The following is the per centum of increase of wages in 1878 over 1860 in the several trades: Agricultural laborers, per day 33 per centum, per month 15; manufacture of arms, 19; artisans' tools, 38; blacksmiths', 47; bookbinding, 14 to 17; boots and shoes, 2'6; boxes, 13 to 38; bakers, 13 to 38; brickmakers, 9; building trades, 16; cabinet making, 6 to 16; carpet making, 23; carriages, 30; clothing, 8; dress-making, 19; leather making, 28; linen and jute manufacture, 20 to 28; machinery manufacture, 27; metallic fine work and jewelry, 25; millinery, 23; musical instruments, 8; paints, 28; paper, 41; printing, 30; silk manufacture, 45; soap and candles, 13; stone working, 8; manufacture of woolen goods, 33; worsted goods, 22. The following are the occupations and the percentage of decrease of wages: Bleaching, dyeing, and printing of cloths, 3 per centum; preserving meats, pickles, etc., 2; envelope making, 11; shipbuilding, 32.

"The returns from 63,515 employees in the occupations considered, in the cities and towns visited, show that average weekly wages, on a gold basis, were twenty-four and four tenths per centum higher in 1878 than they were in 1860.

"It is found that the prices of groceries had advanced over 1860, 7 per centum; provisions, 28; fuel, 5; boots, 18; rents, 25; board, 49; while drygoods have fallen 9 per centum. On all the items entering into the cost of living the average price was 14½ per centum higher in 1878 than it was in 1860. The following figures show the per centum which the prices of the following articles in 1872 exceed the same in 1878: Groceries, 43; provisions, 17; fuel, 44; drygoods, 40; boots, 21; rents, 105; board, 37. On all of the above items the average per centum of cost in 1872 above the same in 1878 was 54 per centum.

"The results of the investigation relative to wages and prices are as follows: Wages have advanced, compared with 1860, 24·4 per centum, and the cost of living 14·5 per centum, which on its face shows a pecuniary advantage to the workmen of 9·9-10 per centum.

"Careful inquiry was made by the officers of the bureau of 345 retail dealers in ten cities and towns containing a population of 530,000, to ascertain the amount, quality of goods purchased now compared with the same several years since, together with the ability to pay for the same. From these inquiries the following conclusions are reached: That the workmen of Massachusetts, in the majority of cases, have the best quality of food, though not in so great quantity and variety as in previous years; that they are practicing a rigid economy in purchases of clothing, drygoods, boots and shoes, house-furnishing goods, and fuel; and that the majority continue to pay their bills promptly.

"Comparing this state of affairs with the previously ascertained relations of wages and prices, which shows in 1878 an advance over 1860 of 24·4-10 per centum in average weekly wages, and an average advance in cost of living of 14½ per centum, which means a pecuniary betterment of 10 per centum in the general condition of the workman in Massachusetts in 1878 as compared with 1860, no account being made of the decrease in hours of labor in many industries—it would seem almost like stating an axiom to prophesy that, with a revival in business, a gradual decline in the prices of provisions, etc., and no cut down in wages, the condition of the workman in this State, within a comparatively short period, will be better, considering all circumstances, than it ever has been since the foundation of our Commonwealth."

What is true of Massachusetts in this respect, there is ample reason for believing to be true of the whole country.

DANGERS OF LEAD POISONING FROM THE USE OF
TINNED WARE.

According to recent investigations made, both in England and this country, it seems that we would do well hereafter to examine very carefully the tin employed in coating utensils that are used for cooking or preserving food of any kind. Since tin has fallen in price it is not very uncommon to meet with samples which contain lead to a considerable amount, evidently added to the more expensive metal with a view of adulterating it and thus avoiding loss on the price at which

it is necessary to sell it. The results of this, of course, may prove serious. Dr. R. C. Kedzie, President of the State Board of Health of Michigan, in a recent report on this subject says: "I have examined a large number of specimens of tin plate, of vessels made of tinned iron, of tin spoons, and iron spoons coated with tin, both teaspoons and tablespoons, and find in almost every instance that the tin is alloyed with lead; in almost every case the lead was present in some quantity, and often in very large quantity. Nor is the lead confined to the poorer qualities of tin, but some of the highest priced and 'first quality of tin plate' contains a large quantity of lead. It is an astonishing fact that a large proportion of the tinned wares in the market are unfit to use because of the large quantity of lead with which the tin is alloyed."

The dangers that are likely to ensue from the use of articles tinned with such an alloy are these: The alloy of tin and lead will tarnish, or, more properly speaking, oxidize much more readily than pure tin; and the oxide of lead thus formed is very soluble in acetic acid or vinegar (forming "sugar of lead"), and also in lactic acid or the acid of sour milk; it will form, too, salts with malic and citric acids which exist in our common fruits, such as apples, cherries, strawberries, currants, etc. Indeed, as Dr. Kedzie very truly observes, any of our acid fruits when cooked in vessels containing any lead, or even when left in such vessels for some time, are very liable to take up some of the poisonous metal, and to become thereby unfit for food, inasmuch as all salts of lead are poisonous; and the danger is the greater because lead compounds are cumulative poisons. "A person may not be poisoned by one or two small doses, but even if a very minute dose is taken for a long time, the person may be broken in health or even lose his life."

Fortunately the test for lead is a very simple and easy one, and almost everybody has it in his power to make the application of it and determine satisfactorily whether his tinware contains any of the poisonous metal in sensible quantity. For this purpose Dr. Kedzie recommends that a drop of strong nitric acid be placed on the tinned surface by means of a glass rod or splinter of wood, and that the acid be rubbed over a space as large as a dime, warmed gently until dry, and that two drops of a solution of potassium iodide be then dropped on the spot. If the tin contains lead a bright yellow iodide of lead will form on the spot. The test is one that can be very rapidly applied, and the results are decisive.

GARY'S ALLEGED NEUTRAL LINE.

Mr. G. T. Milliken, in a letter to the Editor of the SCIENTIFIC AMERICAN, dated March 13, 1879, maintains that the explanation of the behavior of the nail, contained in the issue of the SCIENTIFIC AMERICAN, March 8, page 144, is not correct. That explanation was as follows: "At a certain point the nail leaves the sheet iron and falls to the ground, simply because, by reason of its approach to the attracting pole, it tends to fly to it, but in leaving the piece of sheet iron, the force of gravitation acts more strongly than the force of attraction, and the nail consequently falls to the ground."

Mr. Milliken's explanation is as follows: "The sheet iron armature, being polarized by the magnet, in turn polarizes the nail which is suspended from it, and this polarity (of the nail) is necessarily reversed when brought within the direct control of the magnet, or sufficiently near thereto to be more powerfully affected by it than by the sheet iron, the power of which to increase its ability to control the nail, as they both approach the magnet, depends upon its thickness and area." Mr. Milliken's explanation is essentially the same as that which he criticises. The lines of force from a magnet, it is well known, radiate from the poles and diverge as the distance from the pole increases. This can be noticed in the ordinary experiment of the action of iron filings near a magnetic pole.

The particles of the sheet iron armature of Mr. Gary are in the condition of the iron filings. Each one would separate from its neighboring particle and tend to fly to the attracting magnet if it were not held to the neighboring particles by the forces of cohesion and elasticity. The nail, however, is in the condition of a detached particle of the armature; its reversed polarity prevents its remaining attached to the last particles of the armature, and it falls, if it is not near enough to be attracted to the magnet. The lines of force of the magnet, however, act upon it just as they would upon a small iron filing and draw one end of it toward the magnet while the other end is repelled. When the armature and nail are very near the magnet, the nail is strongly attracted to the magnet, just as iron filings are strongly gathered about the pole. When the nail is at a suitable distance it is less strongly attracted to the pole, just as an iron filing is less strongly attracted to the pole at a little distance. In other words, a chain of magnetic nails, hanging together vertically by their mutual attractions end to end and suddenly submitted to the action of a strong magnetic pole placed at right angles to the chain, will separate and behave like iron filings, and also like Mr. Gary's armature and its nail. The explanation of Mr. Milliken does not differ from that given in the issue of the SCIENTIFIC AMERICAN, March 8. In short, every particle of the armature tends to fly to the magnet; the nail, which for the time being is part of the armature, also tends to fly to the magnet. This tendency necessarily implies opposite polarities in the ends of any two neighboring particles which move in converging lines of force to the magnet.