

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 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. XXXIX, No. 8. [NEW SERIES.] Thirty-third Year.

NEW YORK, SATURDAY, AUGUST 24, 1878.

Contents.

(Illustrated articles are marked with an asterisk.)

Table listing various articles such as American Institute Exhibition, Astronomical notes, Atlantic evidence, Barometer, Boats, Boiler explosion, etc.

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 138.

For the Week ending August 24, 1878.

Table of contents for the supplement, including sections on Engineering and Mechanics, Technology, French International Exposition of 1878, Electricity, Light, Heat, etc., Natural History, and Medicine and Hygiene.

EDISON AND THE UNSEEN UNIVERSE.

Hitherto man's knowledge of the extent of the universe has been bounded by the limits of vision. During the day, when the range of sight is narrowed by the sun's excessive brightness, we see but a minute fraction even of the little world we inhabit. At night a wider reach of vision is possible, and some thousands of stellar and planetary bodies are added to the domain of positive knowledge, thus enlarging enormously man's idea of the magnitude of the universe.

That the most powerful of telescopes enables us to reach the limit of the universe no one imagines. See as much as we may, more—perhaps infinitely more—lies beyond. So, at least, all experience leads us to infer; but our positive knowledge ends with the limit of vision.

Must this always be so? Hitherto science has given no hint of the possibility of exploring the vast and mysterious beyond, from which no visible ray of light has ever been detected, or is ever likely to be detected, by the most far-reaching and sensitive of optic aids. But now there comes a promise of an extension of positive knowledge to fields of space so remote that light is tired out and lost before it can traverse the intervening distance. A new agent or organ of scientific sense for space exploration has been given to the world in the tasimeter, by which it is possible not only to measure the heat of the remotest of visible stars, out, Mr. Edison believes, to detect by their invisible radiations stars that are unseen and unseeable! Mr. Edison's plan is to adjust the tasimeter to its utmost degree of sensitiveness, then attach it to a large telescope, and so explore those parts of the heavens which appear blank when examined by telescopes of the highest penetrative power.

IMPROVEMENTS NEEDED IN SALT MAKING.

Judging from articles in some of our recent exchanges the salt manufacturers of Syracuse, who have so long enjoyed a monopoly, are beginning to recognize the fact that the methods which have so long prevailed for the manufacture of this commodity require considerable modification in order to encourage continued or further investment of capital; that the conservatism which has for so many years held fast to the old system, is beginning to find that it is too crude and expensive for these times of sharp competition in the business, and is at last not indisposed to admit that some change might be advantageous.

The salt block of to-day consists of a horizontal brick flue 90 to 110 feet long, or thereabouts, having at one end from 50 to 75 square feet of grate surface, and at the other an upright smoke stack, while arranged all along on the top of this flue are open circular iron pans for the evaporation of the salt water.

When in operation a large amount of soft coal (two or three tons) is kept burning on the grate in order to produce sufficient burning gas to fill the flue throughout its length; but of course the pans at the grate end evaporate the water four or five times more rapidly than those at the other end. The water in the pans is constantly replenished until several inches of salt are deposited, which is then removed with shovels, and the evaporation renewed.

The excessive consumption of fuel and the unequal temperature in the flue are the most immediately apparent objections to this method, but one of no less importance lies in the fact that the deposit in the pans of several inches of salt constitutes such a non-conductor of heat that a large portion of the thermal value of the fuel used is lost.

The two first objections may be overcome by improved methods of firing; one of which would be to build a cylindrical fireplace (which should be fed from the top), lined with a coil of pipe for superheating steam, then to make within it a fire of anthracite culm, and force up through the burning coals a jet of the hot steam, which, first passing through the coil, should carry with it into the mass of fuel sufficient air to maintain active combustion. The steam, taking air with it, becomes decomposed by passing through the hot coals, and creates a very high temperature and a long and full hydrogen gas flame, which, extending throughout the length of a "block," would secure a far more equable heat than is now done.

This method of firing was in successful practice and brought to our notice eighteen years ago at certain experimental works in Philadelphia, but since then we had heard nothing of it until, quite recently, we find it is strongly advocated by scientists in England.

Another method of very economical firing for salt works would, in our opinion, be found in the use of pulverized bituminous coal, by which a great saving in cost and amount of fuel, and a long, hot flame throughout the flue, could be secured; and this plan, we understand, is about to be tried by parties in Pomeroy, Ohio.

The objection to the use of pans for evaporation has been removed by substituting for them revolving cylinders, whose continual movement prevents the local deposit of the salt and thereby greatly economizes or makes of use the volume of heat now lost. The expense of the plant for this system seems to be the only bar to its general adoption.

THE NEW PATENT LAW OF SPAIN.

The splendid exhibit which Spain and the Spanish colonies displayed at Philadelphia was a surprise to many. For a century or more the curse of bad government had weighed so heavily upon the industries of that once powerful country that the recovery of its former standing among nations was regarded by most people as practically hopeless. The numerous prizes won by Spain at the Vienna Exhibition, however, had clearly indicated that the period of Spanish decadence had come to an end, and that the spirit of the nineteenth century had at last, though tardily, gained a lodgment there. The energy and industrial earnestness manifested in connection with the Centennial Exhibition proved that Spain was becoming once more a power in the world—industrially if not politically. A further and if anything more striking evidence that the country is in earnest in regard to industrial progress is seen in the patent law which has just gone into operation.

Hitherto patents have been granted in Spain only under such onerous conditions as to practically exclude the majority of inventors, foreign inventors especially, from any share in the very limited benefits offered. The new law is comparatively liberal, placing foreigners on the same footing as natives, and the interests of the inventor are well protected. The duration of patent rights has been largely extended, the fees have been greatly reduced, and a single patent now covers not only Spain, but all the Spanish colonies—the Balearic Islands, the Canaries, Cuba, Porto Rico, the Philippines, and Fernando Po.

Heretofore separate patents had to be taken out for each of these possessions, each costing several times more than is now charged for all. Certificates of additions, covering any improvement or modification of patents, are granted any time within the first year; and subsequently the inventor is given the preference for new patents on improvements. Patents may be inherited, sold, or donated, the same as other property. The time allowed for the official working of patents is extended from one year to two. Infringements are punishable by fines, confiscation of machinery and products for the benefit of the patentee, and, if repeated, by imprisonment. The life of a patent has been extended to twenty years.

Inventors and manufacturers will readily appreciate the value and importance of the field laid open to them by this law—certainly that part of it embraced in the Spanish West Indies. The commercial relations of our country with Cuba and Porto Rico are steadily increasing in scope and value, and the nearness of those islands to us must ultimately give us the command of their markets.

The protection which patented inventions now enjoy there cannot but prove of signal advantage to our manufacturers in many ways, not the least of which may be the shutting out from Spanish-American markets of British and German counterfeits of American products, by which Americans have so long suffered, in pocket as well as in credit.

As our readers are doubtless all aware, the publishers of this paper are also solicitors of American and foreign patents. Their advertisement, with special reference to Spanish patents, in another column, will be of interest to inventors and manufacturers.

LOCAL ENCOURAGEMENT OF MANUFACTURES.

A member of the Baltimore City Council proposes to that body the appointment of a permanent commission of prominent citizens, whose special duty shall be to promote the establishment of manufactures in that city. Among the means proposed for securing that end is the proffer of sites for manufacturing establishments at low rates, the exemption from municipal taxation of the buildings and machinery used, and the granting of special water rates. Speaking of this proposition the Baltimore Sun pertinently remarks that except in rare instances and under peculiar circumstances it is always by a combination of manufactures and commerce that cities grow populous and wealthy. Every new manufacturing establishment brings an accession of citizens—who require additional houses, and whose wants must be supplied by additional artisans and shopkeepers. The wealthiest States are the manufacturing States, and they are the ones which sustain a numerous population. Rhode Island, for example, depending almost entirely upon manufactures, has a larger population for its area than any other in the Union. So with cities. Philadelphia, which until recently has had no foreign commerce worth speaking of, has grown populous and wealthy within a little more than thirty years through the numerous manufactures that have been established within her limits.

The gathering of eight or ten thousand inhabitants about the mills and manufactories in the suburb of Baltimore known

as Woodberry is looked upon in that city as an earnest of what might be done on a larger scale for the city's growth and prosperity by increasing the number of its manufacturing establishments. If, as the *Sun* remarks, the hearty co-operation of every citizen will be given to whatever effort may be made to increase the manufactures of Baltimore, there can be no doubt that intending manufacturers will take the advantages offered into careful consideration

INDEPENDENT WORKERS.

As the larger industries from the pressure of the times become crippled or paralyzed, it is surprising to note how quickly our American inventors devise machines and appliances for doing in a small way what was before done on a large scale, in factories controlled by capital and employing heavy machinery and a great number of men.

When capitalists fear to invest and the whole manufacturing world is in a state of suspense, the self reliance of the mechanic or artisan is brought to the test. Then each must begin an industry for himself, choosing the particular branch of manufacture with which he is best acquainted.

In these days, for almost every branch of industry, tools and machinery that can be operated single handed are obtainable. With such tools and machinery, and with a reasonable amount of energy, skill, and good judgment, it would rarely happen that a man could not at least earn a livelihood, with the probability of doing much better, and with the satisfaction of being his own master

A thousand energetic men with a thousand light machines would, in many branches of manufacture, prove formidable competitors for a large establishment, employing the same number of men, and especially in the present state of affairs is it evident that the small manufacturers have the advantage over the larger, who now struggle against interest on investments, and are obliged to conduct their business on an unprofitable scale; if at all.

Now, when mechanics and artisans are looking for the dawn of better times, and hoping for the revival of industries, is the time for every workman to become capitalist, president, vice president, secretary, and superintendent. Instead of "waiting for something to turn up" let every workman apply himself to business. We would then have a multiplicity of industries which would increase in importance as the times grow better, and furnish employment while the times are unpropitious.

A CURIOUS INSECT.

Practical entomologists will find a very interesting and suggestive study of a singular phase of insect life in Mr. William H. Gibson's paper on the "House Builder Caterpillar," printed in the current issue of the *SCIENTIFIC AMERICAN SUPPLEMENT*. Mr. Gibson says that for a dozen successive years he has studied this insect, collecting hundreds of caterpillars and cocoons and watching their transformations. Meantime he has searched in vain for any satisfactory account of the singular features of the reproduction of the insect and the fertilization of the eggs. Harris says that the female never leaves her cocoon. Packard says the same. Gibson says there is no female!

Mr. Wood says of a West India species that the female has no external vestige of wings, and looks more like a grub than a moth, the head, thorax, and abdomen being hardly distinguishable from each other, and adds: "Love and courtship with this insect are carried on quite in an oriental fashion pushed to extremes; for whereas the oriental in many cases never sees the face of his veiled bride until after the nuptial ceremony is completed, the house builder moth never sees his mate either before or after marriage, and so is obliged to love blindly or not at all."

Mr. Packard's account is characterized as "more specific but nevertheless unsatisfactory." He describes the female as wingless, cylindrical, and in general form closely resembling its larva. The fertilization of the female he believes to take place while it is within the case, which it never leaves, and in which the eggs are deposited. This conclusion Mr. Gibson thinks to be based entirely on inference, not at all on observation

According to Mr. Gibson's observations the female larva is transformed, not into a moth, but into a bundle of eggs and a little fuzz, which, under the microscope, reveals forms of wing scales similar to those on ordinary moths. If fecundation takes place at all it occurs either during the caterpillar state, which is improbable, or the fecundative is passed down several generations after the manner of the Aphides. Mr. Gibson illustrates by numerous drawings the various stages in the development of this strange insect, as observed by him. The caterpillar inhabits the arbor-vitæ, larch, hemlock, and the like, sometimes doing much harm to these favorite hedge and shade trees.

NINE ounces—a little more than half a pint—of water may be decomposed into eight ounces of hydrogen gas and one ounce of oxygen gas.

PHOTOGRAPHIC AND OTHER VIEWS OF THE ECLIPSE.

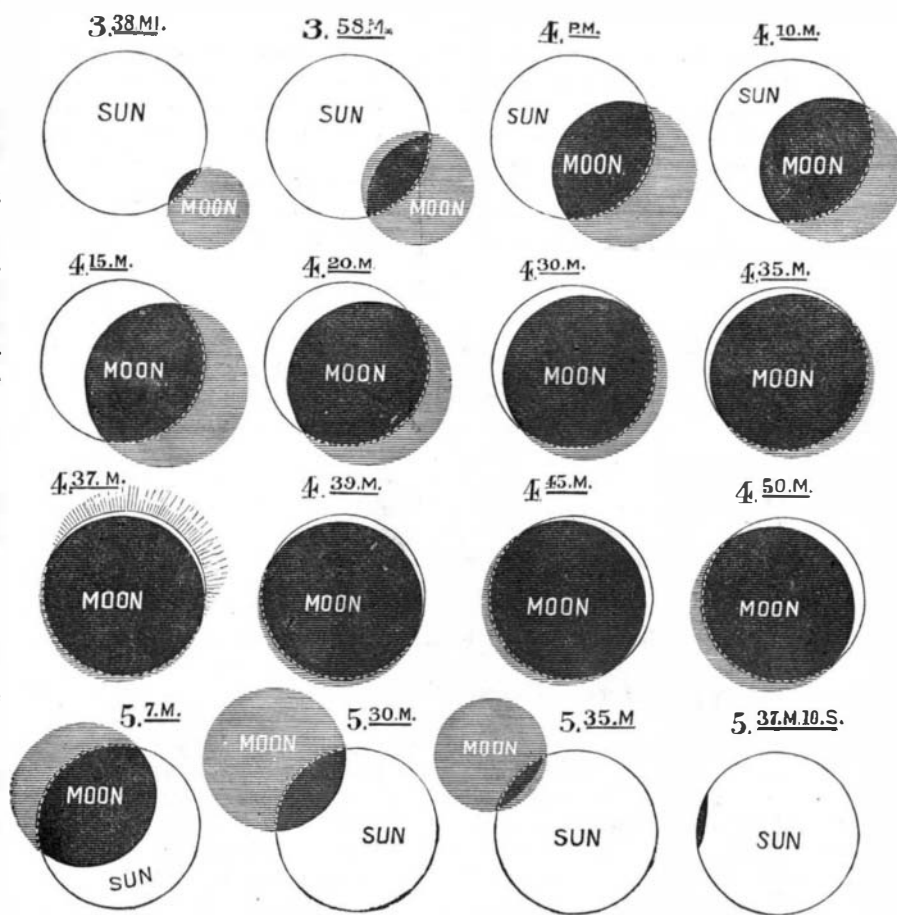
We are indebted to several amateur and professional astronomers for interesting reports of their observations, but have room for only the following:

Fig. 1, a copy of a photograph taken at Indianapolis, Ind.,



by Mr. F. M. Lacey, we owe to the courtesy of Mr. L. T. Stanley of that city. It shows the eclipse as it appeared there at 4h. 51m. P. M. The cloud effects as shown in the photograph are very fine.

Fig. 2 represents a series of diagrams sent by J. B. Jones, M. D., representing the several phases of the eclipse indicated, as observed through an ordinary field glass at Caddo C. H., Indian Territory. The time is that of Sedalia, Mo. From 4:15 to 4:35, the sun was partially obscured by the moon.



In these diagrams the observer has evidently given precisely what he thought he saw; but it is equally evident that he did not see what he represents. We reproduce his drawings as an illustration of the liability of unpracticed observers to misinterpret the testimony of their senses. Of course the observer did not see the full orb of the moon at any time, save at the moment of totality. He saw at each other instant a lenticular spot of black creeping over the face of the sun, increasing in size up to the moment of to-

talities, then regularly diminishing to the end of the eclipse. In his diagrams, however, he has completed the circle of the moon for each phase of the eclipse from the portion visible, and, misjudging the impinging curve, has drawn the curious series of expanding and diminishing moons shown in the cut.

The moral of it all is the uncertainty of individual observation, however sincere, particularly when the observer is not an expert. Had the phenomenon been one of local or unique occurrence, visible to no other observer, such a misreading of facts might have given rise to endless theorizing to account for the real or apparent increase and diminution of the moon's orb before and after totality. Indeed, in earlier times the hottest of controversies have arisen from just such mistakes.

THE ECLIPSE.—A NOTE FROM PROFESSOR MITCHELL.

[The following pleasant note from the head of the Vassar College Eclipse Expedition touches some points not noticed in the press reports.—ED. SCI. AM.]

DENVER, July 29, 1878.

The weather has been all that any one could desire, and the eclipse has been successfully observed.

The brilliancy of the corona far exceeded that of the eclipse of 1869 as observed at Burlington, Iowa, but the rosy prominences were less marked. We obtained a sketch of the corona in oil during the 2m. 40s. of totality.

Mercury, Regulus, and Mars were seen, Venus was very brilliant, Procyon and several other stars were visible. Situated as we were on a lofty plain outside of the city of Denver, the landscape (including, as it does, a long sweep of the Rocky Mountains) was wonderfully beautiful. The sweep of the black shadow was seen as it approached us from the Rocky Mountains, and its retreating darkness was seen to cross the plain to the southeast.

I have been assisted in the day's work by four of the graduates of Vassar, and every facility has been afforded us by the citizens of Denver. MARIA MITCHELL.

THE STUDY OF REAL LIFE IN SCHOOLS.

Referring to the growing custom of using newspapers in the place of reading books in schools, a teacher in the Milwaukee High School, Professor L. Burstall, writes us that for some years he has used the *SCIENTIFIC AMERICAN* in that way with the most beneficial results. His belief is that a great part of the work of schools, especially of the higher grades of schools, should be to direct the work of students to "real results," to knowledge "that may give them a lift in future years," and fit them to understand that they "ought to be greater, more practical, more decisive than their fathers." For this reason he thinks that too much time is given in the schools to the history of the past, to human conflicts and dynastic struggles, battles, mad strifes, and the victories of hypocrisy and brute force; and too little time to the history of real progress of the present age, the history of the steam engine, the telegraph, and other inventions, the influence of which would be to impel the students to emulate in their lives the men who have lived and labored for the real benefit of humanity.

As the best exponent that he knows of the realism which is the mainspring of our country's success is the *SCIENTIFIC AMERICAN*, he insists that it ought not only to be on file in all school libraries, but that it should be used as a common reader, for translation and for composition, as a leader for class work and home occupation.

We are not sure but our friend is altogether right. Certainly one great fault with current school teaching is that it gives too little attention to, and is too little in sympathy with, the real working and determining forces of the age. As our correspondent puts it, "too much time is given to the knowledge of the past, very little to the present and the future." As a natural consequence, most students leave school not much better fitted for the life of to-day than they would be had they been schooled a hundred years ago and laid away to sleep for a century. The reading of a paper like the *SCIENTIFIC AMERICAN* in school or at home must do much to correct and atone for this neglect of the scientific conditions and aspects of modern life in the routine work of the schools. While much of the information given is beyond the years of school children, enough of every-day life is covered from week to week, pictorially or otherwise, to make the paper instructive even to the youngest.

One Effect of the Chinese Famine.

The great famine in China has created a sudden and large demand for the cereals of the Pacific slope, and the farmers of that region prosper accordingly. All the steamers from San Francisco now go out fully loaded with flour. Unfortunately many California farmers were deterred from seeding largely by the drought of last year, and the wheat crop of the State is light; but the crop of Oregon is fair in quantity and quality. Already the people of this coast are beginning to feel the revival of trade, and the season promises to be a decidedly favorable one.