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. for the U. S., Canada or Mexico.................. $3 00
One copy, six months, for the U. S., Canada or Mexico.................. 1 50
One copy, one year. to any foreign country belonging to Postal Union. 4 00

Remit by postal or express money order, or by bank draft or check.
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, for U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union, *nine dollars a year*.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico. $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, $5.00 a year; combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign countries, $11.50 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number of *La America* is profusely illustrated. It is the finest scientific, industrial trade paper printed in the Spanish language. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. $3.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

MUNN & CO., Publishers,
361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

NEW YORK, SATURDAY, MAY 31, 1890.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 752.

For the Week Ending May 31, 1890.

Price 10 cents. For sale by all newsdealers.

A WEEKLY PAYMENT LAW IN NEW YORK.

Complaints have often been made of the inconvenience to which employes in manufacturing establishments are subjected by the irregularity and delays in the payment of wages earned. To correct abuses in this direction, a new law has been passed by the legislature of the State of New York.

The provisions of the law are very sweeping. Every manufacturing, mining or quarrying, lumbering or mercantile, railroad (surface, street, electric, and elevated), except steam surface railroads, steamboat, telegraph, telephone, and municipal coporation, and every incorporated express and water company, must, after July 1 next, pay weekly each of its employes. If any employe shall be absent on the regular pay day, he shall be entitled to the money due him upon demand. The penalty for failure to comply with this law is fixed at not more than $50 nor less than $10 for each violation. Actions for violations must be begun within thirty days.

The factory inspectors are empowered to begin suit against any corporation which fails to observe the law two weeks after notification. On the trial of the action the defendant shall not be allowed to set up as a defense other than a valid assignment of wages, the absence of an employe on pay day, an actual tender of payment to an employe, a breach of contract, or a denial of employment. No assignment of future wages shall be valid if made to the employing corporation or its agents, and corporations are forbidden to require any agreement from any employe to accept wages at other periods than this law contemplates.

RICE CULTURE.

It is said that rice furnishes the principal food of three-quarters of the human race. Originally a native of the East Indies, it is now cultivated in all quarters of the globe where the conditions of warmth and moisture are suitable. Governor Alston, of South Carolina, stated in an agricultural address delivered in 1854 that a ship from Madagascar came into Charleston harbor about the close of the 17th century, and left rice seed there which was planted and prospered. Another account of the origin of rice culture in this country states that it was first grown by Sir William Berkeley, in Virginia, as early as 1647.

In 1666 the advantages offered by the lowlands of South Carolina for the cultivation of this grain were noted by agents of the English interested in the settlement and improvement of the new world, and they stated in their report that "the meadows are very proper for rice, rapeseed, linseed, and many of them be made to overflow at pleasure with a small charge."

Following the introduction of rice in this country its cultivation extended throughout most of the southern States of America, and it has also been successfully grown in Tennessee and Missouri.

The Carolina rice fields are subjected to extreme irrigation, and in fact swamp lands were considered the best for the cultivation of the cereal, but lands which are subject to tidal overflow of fresh water have latterly been found to give the best results.

In Louisiana the method pursued is very similar. The planter locates on ground having an inclination backward from the river. In the case of the Mississippi, the water rises above the level of the rice fields, from which it is protected by the levees. The planter is allowed to cut openings in the levee, which are called flumes, through which the water passes to the rice fields. The flumes are arranged with gates which can be opened or closed at will, and thus the discharge of the water is regulated. The water after passing through the flumes flows into ditches which are supplied with laterals, which divide the field into sections and are supplied with dams, and these secure the distribution of the water as it is needed. Methods of irrigation vary in different localities, but the ditches are usually five feet deep and of about the same width, while the principal canal is sometimes wide enough to be used for transportation between the fields and the barns.

Very serious objections are made to the practice of piercing the levees for the purpose of irrigating the rice fields, as it has been shown that the aperture made for the location of a flume frequently causes a serious break in the bank, which results in flooding the neighboring country. The difficulty could be overcome by dispensing with the use of flumes and employing pumps for taking the water from the river and placing it in the ditches.

The ground is plowed or dug over with a hoe early in the winter, and at certain times when the weather is favorable it is covered with water. During March the land is kept dry, the clods are broken up, and the surface is smoothed off with harrow or hoe. The manner of planting the seed varies according to locality. In some cases seed drills are used, and in others trenches of from 3 to 5 inches in width are prepared with a hoe made for the purpose, and these trenches, in which the seed is placed, will be from 13 to 15 inches apart from the center. In still other cases the seed is sown broadcast, and the larger part of the planting is done during March and until the middle of May. The amount of seed required is 2 to 2½ bushels to the acre. The drills cover the seed as it is dropped into the earth, a hoe is used to cover it lightly with earth when it is sown by hand in the trenches, and it is harrowed in when sown broadcast. After the seed is thus planted the water is let in through the gates and remains upon the land from four to six days or until the grain swells and commences to sprout. Sometimes the seed is not covered with earth when sown, and it is then prepared by stirring it in clayey water and drying it when enough clay adheres to keep it from floating off when the water is let on. Where the seed is covered with soil, two floodings at sprouting time are required; but where the process of mixing the grains with clayey water is pursued, but one flooding is necessary.

Seed prepared in the manner just stated has been sown upon the surface of the water, the clay adhering to it, sinking it to the bottom, where it took root and grew.

The water, after standing from four to six days on the sprouting rice, is drained off, and when it is five or six weeks old, where the grain has been sown in trenches, the earth is stirred with hoe. This is repeated ten days later, and then what is called the "long water" is put on for about two weeks, which is kept at a considerable depth for four days, and then is made to diminish gradually. After the water has been drawn off about eight days and the field has become dry, it is hoed to a considerable depth. When a joint appears on the plant the land is lightly hoed again, and then what is known as the "joint water" is put on, which remains until the grain matures, which requires about two months. During the time that the water is upon the crop it has to be frequently renewed, as the evaporation is very great. Much care has to be taken that no salt or even brackish water reaches the growing crop, as it is fatal to it. In localities where the water used in irrigation is likely to be impregnated with salt by the incoming tide from the ocean, men are stationed at the flumes, who taste the water as it flows through, and the moment salt is discovered the gates are closed. While the water is upon the crop the hands are obliged to wade about in it and pull up or destroy the weeds or grapes, which grow luxuriantly in the rich soil. The maturity of the grain is indicated by its turning yellow, and a few days before the harvesting commences the water is drained off.

Rice grows to a height of from four to five feet, and it is cut about eighteen inches above the ground, and is spread upon the stubble to cure, which generally takes about twenty-four hours. In cutting the grain, the sickle is used, also the cradle, and the attempt has been made to employ reaping machines, but they have been found to be too heavy to run upon soil made soft by irrigation. It is thought, however, that a lighter machine with a broad-tired wheel might do the work successfully.

Rice is also grown on uplands and without irrigation, and the grain thus obtained is in some respects superior to the lowland product, although the upland and lowland rice are of the same species, the differences being but modifications of the varied cultures, which differ with the soil and the localities. In cultivating upland rice, the best results are obtained where it is sown in rows like fodder corn, where it can be hoed and kept free from weeds. It is also sown broadcast like wheat, oats, and other grains, and in loosening the soil and freeing it from weeds, an implement about half the size of a scythe is used, and which is called a grasping knife. The method of reaping the upland rice is similar to that which has already been described. Upland rice yields from twenty-five to forty bushels to the acre, and lowland, where irrigation is used, fifty to seventy-five bushels to the acre. One great advantage of lowland culture is that the lands thus used would not yield any other crop, and the area of land in the South which might be devoted to the culture of rice is almost unlimited in extent. When fully cured, rice may be said to occupy in appearance a position intermediate between barley and oats.

The grain is thrashed by machines usually run by horse power, the old-fashioned flail being now but little used. When it comes from the thrasher it is known as rough rice or paddy, and requires grinding to free it from the hulls, according to the following method. After the rice is screened from sand, it is passed through buhr stones about five feet in diameter, to grind off the husks. These stones are not grooved like ordinary mill stones, but have level faces, set as far apart as the length of the grain, with concave depressions in the center where the grain is fed, the stones revolving at a speed of about two hundred.

When the grain is fed in, the centrifugal force sends it circling to the periphery, and each grain, revolving on its shortest axis, in accordance with a well-tested principle of philosophy, travels upright between the stones, the mass moving like battalions of Lilliputians on the march, and the stones strip off the husks of all the grains touched, the short grains escaping unhulled. The grain is next fanned to drive off the separated husks and then taken to the mortars, where it is heavily beaten to remove the husks from the shorter grains and such others as have not been completely cleaned by the stones. These mortars are either of wood or iron. The pestles weigh from 250 to 350 pounds each, and are of iron or wood shod with iron, and are moved as in the common stamp mill by cams or levers passing through slots in handles. The grain is there pounded from 40 to 70 minutes, a more protracted pounding being fatal to the integrity of the unbroken kernels. The last named process is extremely primitive, and it has even been called barbarous, for it does not differ essentially from that in use by cannibal tribes. Dr. Schneider, in his "Life among the Battas of Sumatra," says: "The rice which is the principal food of the people is always kept in the hull and thrashed out day by day as it is needed. The thrashing is done with hard wood pestles eight or ten feet long in wooden mortars made from a stump or log." The process most used in this country is the same as was introduced by Dr. Calvin Emmons in 1812, having the pestles shod with sheet iron and serrated by iron wires, which break more or less of the grain, rendering it unfit for market as first-class rice.

After the rice is hulled it is passed through an inclined revolving cylindrical wire screen, the gratings of which grow coarser toward the lower end. It is thus assorted into a number of products. At the upper end of the screen the flour passes through, next the eyes and small pieces of broken rice, then the "middling rice," which consists of larger fragments of the smaller grains, and lastly the prime rice, or best and mostly unbroken grains. The prime rice as it falls through the screen descends to the "polishing" or "brushing screen," which is a vertical cylinder laid up and down with shreds of sheep skin, and made to revolve rapidly within a wire screen. The rice falling down in the space between these is swept free of the flour which adheres to it, and is discharged below in a perfectly clean and polished condition.

The hulling of the rice, including that which requires the use of the stones, the pestles, and mortars, as well as the polishing, is all done at the rice mills, which are run by steam or water power, and of which there are only about twenty-five in the United States. These are located at Charleston, Savannah, New Orleans, and at other centers of rice culture. All the rice which is produced must be sent to the mill to be hulled, polished, and thus made ready for the market, though the product is sometimes shipped to New York, as well as to Europe, in the hull, and is subjected to the process of separation at the place of destination.

A small rice mill has been invented by a Brazilian, which is now being manufactured and introduced in this country. It is three feet square and five feet high, and has a capacity of 80 to 150 bushels a day. This machine will take the rice in the hull, or rough rice, as it is called, and prepare it for market, excepting that it cannot polish it. It leaves upon the grain the outer skin, which, as it contains gluten, adds materially to the nutritive qualities of the rice. Usage, however, demands that the rice should be polished, which makes the grain more attractive to the eye, but really renders it less nutritious.

Were it not for the polishing requirement, which can only be done at the large mills, which are often located many miles from the plantation, each farmer could hull his own rice with one of the small machines, and thus much time and expense of transportation would be saved.

Improvements in the methods of rice culture have not kept pace with those in other departments of agriculture; in fact, the course generally pursued is of the most primitive character. The crop, however, is more profitable than wheat, and vast tracts of cheap land in parts of Louisiana, Texas, Alabama, and Mississippi could be utilized in the cultivation of this cereal. In Louisiana the cost of production per acre is from $20 to $28, and the average yield is 45 bushels. It can be sold for from 75 cents to $1.25 per bushel, according to quality and the season.

If more rice were grown the price would be lower, and it would then be more generally used for food. Large quantities of it are imported every year, as the home product is not sufficient to supply the demand. The figures given below show the quantity raised in this country and that which was imported since 1881:

	Foreign.		Domestic.
1882	351,100 bags.		390,000 bbls.
1883	378,300 "		325,000 "
1884	333,600 "		410 000 "
1885	246,400 "		600,000 "
1886	208,000 "		615,000 "
1887	410,000 "		448,000 "
1888	491,000 "		
1889 to June 1, 1890	Not complete.	Estimated	515,000 "

With the invention of better machinery for cultivating rice and preparing it for market, and the exhibition of more energy and enterprise by the planters, a department of agriculture will be developed which will be very profitable to those engaging in it, and which will add greatly to the wealth of the country, and at the same time cheapen a nutritious and healthy food.

OXALIC acid dissolved in water and mixed, if desired, with a little tartaric acid will remove ink stains from white paper.

POSITION OF THE PLANETS FOR JUNE.

MARS

is evening star. The radiant planet, under his present conditions, has a majestic bearing as he treads his starry path over the celestial highway, rising, on the 1st, before the sun sets, and reaching the meridian at 11 h. 26 m. P. M. A glance at the southeast in the early evening will reveal his presence, his ruddy color distinguishing him from the other planets. Mars is nearest to the earth on the 5th, continues to retrograde during the month, and is in conjunction with Beta Scorpii on the 7th, being about 2½° south.

Mars sets on the 1st at 3 h. 56 m. A. M. On the 30th he sets at 1 h. 34 m. A. M. His diameter on the 1st is 20".8, and he is in the constellation Scorpio.

VENUS

is evening star. She increases in size and brilliancy as she approaches the earth, and charms every observer who beholds her as she makes her way westward, being visible for two hours after sunset. The evening star and the crescent moon will form a lovely celestial picture on the evening of the 19th.

Venus sets on the 1st at 9 h. 21 m. P. M. On the 30th she sets at 9 h. 30 m. P. M. Her diameter on the 1st is 11".6, and she is in the constellation Gemini.

JUPITER.

is morning star. He is finely situated for observation, as he rises soon after 11 o'clock in the southeast, on the first of the month, and soon after 9 o'clock at its close. Jupiter and Venus are both above the horizon for a short time on the last few evenings of the month, the one rising a few minutes before the other sets.

Jupiter rises on the 1st at 11 h. 16 m. P. M. On the 30th he rises at 9 h. 18 m. P. M. His diameter on the 1st is 41".4, and he is in the constellation Capricornus

SATURN

is evening star. He is now moving easterly or in direct motion, and when the month closes it will be easy to see that he is receding from Regulus. He is on the meridian, on the 1st, at 5 h. 22 m. P. M., so that he must be looked for in the west.

Saturn sets on the 1st at 0 h. 8 m. A. M. On the 30th he sets at 10 h. 19 m. P. M. His diameter on the 1st is 16".6, and he is in the constellation Leo.

MERCURY

is morning star. He reaches his greatest western elongation on the 24th, at 1 h. A. M., when he is 22° 21′ west of the sun, and visible to the unaided eye as morning star. He is in conjunction with Neptune on the 10th, being 2° 38′ south.

Mercury rises on the 1st at 4 h. 27 m. A. M. On the 30th he rises at 3 h. 14 m. A. M. His diameter on the 1st is 12".0, and he is in the constellation Taurus.

URANUS

is evening star, holds nearly the same position northeast of Spica, and is visible to sharpsighted observers. He is one of the six planets visible to the naked eye during the month, the others being Mars, Venus, Jupiter, Saturn, and Mercury.

Uranus sets on the 1st at 2 h. 10 m. A. M. On the 30th he sets at 0 h. 15 m. A. M. His diameter on the 1st is 3".8, and he is in the constellation Virgo.

NEPTUNE

is morning star. He rises on the 1st at 4 h. 12 m. A. M. On the 30th he rises at 2 h. 22 m. A. M. His diameter on the 1st is 2".5, and he is in the constellation Taurus.

Venus, Saturn, Uranus, and Mars are evening stars at the close of the month. Jupiter, Neptune, and Mercury are morning stars.

History at the University of Pennsylvania.

The University of Pennsylvania is almost the only institution of learning in the world which has a professorship and a course devoted to the history of the United States. When the Wharton School of Finance and Economy was established, American history was expressly laid out as a branch of the instruction. Some years later, with the advent of Professor John Bach McMaster, whose "History of the People of the United States" has given him a national reputation, a new impetus was given to the course in American history at the university, until now it stands high in value and in popular favor.

The theory of Professor McMaster's instruction is perhaps as unique as the college's stand with regard to this special branch of general history. Text books are eschewed altogether, lectures and a printed syllabus taking their place. Students are referred, wherever it is possible, to original documents for their information, and maps and diagrams are always required to accompany the theses which are from time to time prepared by the members of the classes, the professor holding that historical knowledge which cannot be illustrated by means of a map or diagram is not knowledge at all. It is hoped that before long the Wharton School can be equipped with a lantern and complete set of historical slides, thus doing away with the use in lectures of ponderous and time-worn maps. The earliest contributions from those interested in the university's departure in the branch of history will probably be applied for this purpose.

PHOTOGRAPHIC NOTES.

Water-Developing Plates.—The following is the formula used by Dr. Backelandt for coating the backs of his water-developing plates:

Pryogallic acid	154 grains.
Salicylic acid	15 "
Gum or dextrine	154 "
Alcohol	1 fl. dr. 21 minims.
Water	5 fl. drs. 25

This is allowed to dry at the ordinary temperature. Development takes place by immersion in water with the addition of a very small quantity of ammonia.—*Photo. News.*

The Acid Eikonogen Developer.—It has been found by some experimentalists that the keeping qualities of the eikonogen developer are much improved if it is made acid, or nearly so. With regard to this, the following formula is recommended by Mr. T. H. Voigt, chairman of the Photographic Society of Frankfort-on-Main:

Solution No. 1.

Water	500 c.c.
Sodium sulphite	25 grammes.
Eikonogen (previously pulverized)	5 to 6 "

As soon as the eikonogen has completely dissolved, 20 c.c. of a mixture of 500 c.c. of a saturated solution of sodium sulphite and 40 c.c. of hydrochloric acid are added to the above (Solution No. 1).

Solution No. 2.

Water	500 c.c.
Carbonate of soda	20 grammes.
Carbonate of potash	5 "

To develop a cabinet plate, 30 c.c. of solution No. 1 are poured over the plate in the dish, and the latter is well rocked, so that the plate is entirely covered by the solution. Previously, 10 c.c. of solution No. 2 have been poured into a measure; if it is probable that the plate has been over-exposed, at first 5 c.c. of solution No. 2 are added to the developer in the dish; if, however, it is found that the plate has been correctly exposed, the remaining 5 c.c. of the alkali solution are also added. It will be noticed that with this method of development only about one-third the quantity of the alkali which is usually taken is used. It seems that the minute quantities of the chloride of soda and chloride of potash which are formed by the addition of the hydrochloric acid increase the energy of the developer.—*H. E. Gunther, in Photo. News.*

Monument to Marshall, the Finder of Gold in California.

On Saturday, May 3, the statue of James W. Marshall, the discoverer of gold in California, was unveiled at Colomo, El Dorado County, near the spot where the first gold was found. The Legislature provided the funds for this monument, which was designed by F. Marion Wells, the accomplished sculptor, who has executed his task with skill.

The statue represents Marshall in the dress of the period. He is facing the river. In his right hand he holds a golden nugget, while with his left index finger extended he points to the exact spot where the ever memorable discovery was made. The statue is grand in proportions and workmanship, and the design is quite historical.

The monument is 39 feet 6 inches in height, and is of admirable proportions. The cap of the pedestal is 5 feet square, on which the statue of Marshall is placed. The statue is heroic in size, being 9½ feet in height, representing Marshall dressed in miner's garb.

On the west side of the monument are the words: "Erected by the State of California, in memory of James W. Marshall, the discoverer of gold. Born October 10, 1810. Died August 10, 1888. The first nugget was found in the race of Sutter's mill, in Coloma, January 19, 1848."

MIXTURE FOR TOYS.—Fine ground argillaceous slate 50 per cent, rag paper paste 20 per cent, and 30 per cent of burnt plaster are mixed with the necessary volume of water to form a paste, which is then cast in moulds, the moulds having been previously daubed with finely ground slate, powdered plaster, or fat. A sufficiently thick crust will form in a few minutes, when the residuum of the mixture must be poured out of the mould. The mixture, which is unbreakable, hardens very rapidly. The castings thus produced may be immersed in paraffin or stearine, or they can be japanned. In the latter case it is desirable, so as not to consume too much paint, to first apply a coat of quick-drying boiled oil, and when the oil has become hard the article is to be painted.

Vaseline Harness Composition.

Prussian blue, in fine powder	¾ oz.
Lampblack	4 "
Treacle	2 "
Soft soap	2 "

Mix together in a large Wedgwood mortar, previously warmed, and add—

Vaseline	6 oz.
Cerasin	5 "
Yellow resin	½ "

Melted together; then sufficient turpentine to give the composition the proper consistency. Mix thoroughly.—*Chem. and Drug.*