

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

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 the 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.

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 cast-iron, steel, and concrete 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, SCIENTIFIC AMERICAN and SUPPLEMENT, \$3.00 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. Readers are especially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, MAY 7, 1892.

Contents.

(Illustrated articles are marked with an asterisk.)

Table listing various articles such as 'Air ship, Riddle's', 'Musical appliances, patented', 'Aluminum, present output of', 'Naval gun factory, Washington', etc.

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 853

For the Week Ending May 7, 1892.

Price 10 cents. For sale by all newsdealers.

Table listing articles in the supplement such as 'I. AGRICULTURE.—Spraying for the Prevention of Plant Diseases', 'II. ASTRONOMY.—Variable Latitude', etc.

STEADYING VESSELS AT SEA.

At the recent meeting of the Institute of Naval Architects, in London, Mr. J. I. Thornycroft read a paper on the steadying of vessels at sea. He gave an account of some experiments recently made on the yacht Cecile. The vessel was provided with a shifting weight which was arranged under the floor of the cabin and connected with a pendulum and a hydraulic apparatus, in such a manner that when the vessel rolled, the weight was shifted so as to counteract the rise of the vessel.

The use of shifting weights for the trimming of vessels is in common use in this country, and has been for many years. It is chiefly employed on our river and sound steamers. In some cases the weight is shifted by mechanism, but a more common method is to make use of boxes containing iron weights, such as chain cables. The boxes are mounted on wheels, and when the boat begins to roll, the seamen, on signal from the pilot, move the weight as required to bring the boat back to even keel.

Quite a number of patents have been granted in this country for self-acting ballast-shifting devices, with pendulums to trim or prevent vessels from rolling. Among the earliest of these patents was that of Purse and Staley, number 1,460, granted in 1839—more than half a century ago. In this invention a weighted pendulum was used, which, by swinging when the vessel rolled, set gearing into motion that instantly moved a heavy weight athwart the vessel so as to counteract the rolling. This apparatus was arranged below decks and motive power from the main engine or from a special engine operated the mechanism.

Mr. Thornycroft is of the opinion that a contrivance on the principle described might be advantageously applied to sea-going vessels. The success of his recent experiment and the long use of analogous apparatus in this country support his views. The application of anti-rolling devices to Atlantic passenger steamers certainly would render the sea passage much more comfortable than it often is at the present time.

CALIFORNIA WINES.

An excellent quality of table wine, red or white, can be had of the wholesale dealers in California for from 50 to 60 cents per gallon. Each gallon fills from five to six bottles, making the cost to the venter but about ten cents a bottle, although he sells it at from 50 to 60 cents a bottle to the consumer. Very little native wine goes to the saloons, because the demand is small, the patrons usually preferring beer or stronger liquors. The hotels and restaurants are the channels through which the wines chiefly go to the tables, and the reason why there is not greater use of native wines is on account of the exorbitant prices charged, under the guise of foreign labels. A correspondent says he has seen casks of as fine claret as the world can produce made in Los Angeles; but the wine merchant sorrowfully said, "Every bottle of that splendid wine will be sold in New York under French labels."

The result of such frauds is not merely to impose on the purchaser, but also to diminish the inducement to make really choice native wines, because there is no market for them as such.

Large cargoes of California wines go abroad, to be reshipped to this country as foreign goods. The French manipulate them, put in a fancy bouquet, and sell them back to us at an enormous profit. Patriotism should lead us to patronize our own productions, which with a fair degree of caution we may know to be pure and wholesome.

The question is asked, however, if California wines are not adulterated. It is asked in reply, what they can be adulterated with that is cheaper than \$10 a ton—the price of the native grapes to the manufacturer. There is no question about imitations and frauds; but this is not done in California, for the simple reason that honesty is cheaper there.

Electrical Ribbon Machines.

The City Council of St. Etienne have resolved to apply electric motive power to all the hand looms in the city, and contracts have been made with an electric company for the necessary plant and currents. The electric dynamos are to be driven by water from the city reservoirs. There is practically an unlimited supply of water in the reservoirs, with a fall of upward of 100 feet. To grasp the importance and far-reaching results of this innovation, it is necessary to understand that the bulk of the enormous output of ribbons (\$22,000,000 a year) is the product of house industry. The weavers for the most part own their own looms, and operate them by hand in their own houses. There are 18,000 looms which are thus distributed among the homes of the weavers, while the number of looms driven by steam in the few ribbon factories of the town is only 5,000. The 18,000 looms of the independent weavers are valued in the aggregate at \$4,500,000. What the city of St. Etienne proposes to do is to convert each one of the 18,000 hand looms into a power

loom driven by electricity, the innovation being coupled with the adoption of electric light. The result of this change from slow, laborious, uncertain hand power to the swift, regular, unflinching power furnished by electric motors will be an increase in the productive capacities of the looms and a considerable reduction in the general expenses of fabrication. In other words, art will be wedded to modern machinery. The weavers of St. Etienne have always been the most artistic ribbon makers in the world, but they have enjoyed few mechanical advantages. Now the old order of things is to be changed, and the products of the St. Etienne ribbon looms, which have been a trifle more costly than similar products in some other countries, notably in Switzerland, will be turned out at the lowest possible prices. The weavers employed in the ribbon trade number 70,000.

Origin of the Term "Grippe."

La Medecine Moderne gives an extract from a meteorological journal kept at Versailles in the eighteenth century, and in which the meteorological variations are carefully noted day by day, with a few reflections upon remarkable atmospheric occurrences—storms, hail, thaw, etc.

Commenting upon the months of February and March, 1743, the journal says, "There was a prevalence of colds and inflammations of the chest at Versailles and Paris. The king named this malady 'la grippe.' It was observed that bleeding was wholly contra-indicated. Such persons as had not been bled, and who drank much, were the most quickly cured."

It results, then, from this document, that it was King Louis XV. who gave the name of grippe to the influenza that then prevailed under a meteorological state, as the journal shows, analogous to that of recent years and of the present year.

Wooden Pavements in Paris.

In an article on wood pavement in Paris, contributed to the Revue Pratique des Travaux Publics by Mr. Brown Vibert, the author remarks that, to insure durability, this class of pavement must be laid with considerable care. The concrete foundation should be 6 in. thick, and made with 300 lb. to 440 lb. of Portland cement to a mixture of 9 cubic feet of sand and 27 cubic feet of gravel. As soon as it has set, the concrete should be covered with a 1/2 in. layer of mortar consisting of 660 lb. of Portland cement to every 35 cubic feet of sand, and left to harden two or three days. The blocks should then be set in rows separated from each other by a space 3/8 in. wide. These cracks are filled with cement mortar, and a layer of broken porphyritic stone 1 1/2 in. thick spread over the pavement. This layer is soon driven into the wood by the action of the wheels. Provision must be made for the expansion of the wood, and for this reason in wide roadways a space about 2 in. wide is left open along the sidewalk and afterward filled with sand. In a roadway 131 ft. wide an expansion of no less than 16 in. was observed to take place in fifteen days, the blocks being very dry. In Paris these blocks are 6 in. high, 3 in. thick, and 8 1/2 in. long. The cost as laid is about 9s. 6d. per square yard for Landes pine and 14s. 3d. per square yard for northern spruce blocks. The duration is said to be about seven or eight years under heavy traffic and about fifteen under moderate.

The Best Stone for Roads.

In a paper read before the Boston Society of Civil Engineers, Mr. W. E. McClintock remarks that the specific gravity of a rock is no indication whatever of its fitness for road metal. Thus slate weighs 175 lb. per cubic foot and pure mica about 183 lb., but no one would think of using either of these for road metal. The best material for this purpose was, he considered, trap rock, after which he would place felsite, and then came granite. As regards the latter, however, it differs in quality, that containing hornblende being preferable to those with mica. The latter was soft and should not be used unless it was very difficult to get better material. In cases where the traffic is light and the stones previously mentioned difficult to procure, sandstone may be economically used for metal, in spite of its inferior wearing powers. Of two sandstones, he held that the coarser-grained was to be preferred. Gneiss he held to be of about the same value as a good sandstone.

Use of Carrier Pigeons at Sea.

According to the Revue Maritime et Coloniale, some important experiments have been recently made at Portsmouth relative to the use of carrier pigeons at sea. A depot of these birds having been established at the Eastney barracks, some of the pigeons belonging thereto were taken to sea by a torpedo boat, from which they were set free in series at a distance nearly equal to that of the coast of France. These birds almost invariably returned to their home, and on one occasion there was a thick fog on the other side of the channel; the pigeons set free circled for a few minutes around the boat, and then, getting their bearing, returned to Eastney without delay.

The Manchester Merchants on the Chicago Exhibition.

A meeting of manufacturers, merchants, and others interested in this exhibition was held at the Town Hall, Manchester, Eng., on the 8th ult., with a view of affording manufacturers information upon the conditions under which exhibits might be made and space obtained. The *Chemical Trade Journal* gives the following report of the proceedings:

The mayor (Mr. Alderman Leech), presiding, stated that the Society of Arts had been appointed commissioners for the exhibition on behalf of the government, and introduced Sir Douglas Galton, Sir Cunliffe Owen, and Sir Henry Trueman Wood, as the representatives of the commissioners, who had also brought with them Mr. M'Cormick, the commissioner from Chicago, to lay this matter before the manufacturers and merchants of the district.

Sir Douglas Galton said the government had ultimately voted £60,000 (\$300,000) for the purpose of representing England at Chicago, this grant enabling them to offer exhibitors space free of cost. He pointed out that other countries were making extensive preparations to be fully represented, and it was desirable that the manufacturers of the Manchester district should be also to the fore.

Mr. M'Cormick then pointed out that the United States were the best customer: England had, despite the McKinley tariff. Moreover, Chicago was in the center of a large district where there had been a great deal of opposition to the tariff. By sending to the exhibition, manufacturers at home would be able to show the merchants of the great West how much cheaper they could sell their goods without the tariff, as exhibitors would be allowed to mark on their goods the cost to the buyer at Chicago, with the tariff and without the tariff, thus demonstrating what benefits the abolition of the tariff would carry with it.

Sir Philip Cunliffe Owen said that the Chicago World's Fair would be different to the ordinary run of exhibitions, as it would be essentially a business exhibition, and was intended for business purposes and not pleasure, as was the case with the Paris Exhibition. As to the objection that by sending our goods we only enabled the Americans to copy from us, he said, we and the Americans were brothers, and why should we not steal from each other. (Laughter.) He thought that in the face of the efforts that France and Germany are making, the manufacturers of Manchester would never cease to regret it if they did not go handsomely into this exhibition.

Sir H. Trueman Wood said that already much of the available space had been taken, and as yet barely any of the industries of Manchester were represented; he hoped those who wanted space would apply before it was too late.

Mr. Alderman Bailey then spoke strongly, deprecating the idea of exhibiting machinery at Chicago. If anybody in the United States desired to copy our machines, let them come over here and do it. (Applause.)

Mr. M'Cormick, in replying, pointed out that English manufacturers would best please the Americans by stopping away, especially in the case of the iron industry, in which they were developing an export trade. In answer to a question, he also stated that an article patented in England, and not in America, would during the exhibition be protected as if it were patented in both countries, and also that goods for the exhibition would be entered duty free.

The only point raised practically was whether it was advisable to send machinery to Chicago or not. Nothing was said about other industries, more particularly the chemical and allied industries, which are centered in the Manchester district. The information given, however, will no doubt be of interest to those who have any intentions of exhibiting, and, as was pointed out by Mr. G. Helm, though the opinion expressed by Mr. Bailey did exist to a large extent in Manchester, there was also a broader spirit, which, instead of evincing any jealousy, rather courted competition, believing that mutual benefits would result. The mayor of Oldham (Mr. Alderman Emmott), in moving a vote of thanks to Mr. M'Cormick, said that as makers of machinery in England often complained of their goods not being known abroad, he thought they would appreciate the opportunities afforded them by the Chicago exhibition when looked at from an advertising point of view. After passing a vote of thanks to the Royal Commissioners, the meeting terminated.

Ventilation of Underground Railways.

Those who are accustomed to travel much on the underground railways of London are aware, says the *London Practical Engineer*, from painful experience, the ventilation is utterly inadequate, while the quantity of smoke and other deleterious products of combustion with which the air in these tunnels is laden is a serious trial to the health of those passengers who happen to be afflicted with delicate lungs. With a view to improving the ventilation of these underground railways, an invention has been patented by Mr. Christopher Anderson, of Leeds, and an inter-

esting trial of his system was made on a half mile length of the Metropolitan Railway, at Neasden, a few days ago. Mr. Anderson's invention consists of a long rectangular tube laid between the rails, the tube having valves opening downward at intervals on its upper side. This tube or flue is connected with an exhausting apparatus, while underneath the locomotive is a slider, which communicates with a down chimney connected to the smoke box. As the locomotive passes along, the slider presses open the valves in succession, and the products of combustion are drawn into the tube by an exhaust fan at the station, from whence they are delivered into an ordinary chimney stack, and so discharged into the air. The locomotive is so fitted that the gases and products of combustion can be delivered into the air through the ordinary funnel when the train is running in an open cutting, while during its passage through the tunnel the upper funnel is closed, and the down chimney from the smoke box connected to the exhausting trough or pipe between the rails in the manner described. At the trial to which we have referred the arrangement was found to work very efficiently, and complimentary opinions were expressed by a large number of influential engineers and railway managers who were present, respecting the value and practicability of the invention.

Kansas Salt.

BY H. C. HOVEY.

Anciently there were extensive lagoons and land-locked lakes in the region now occupied by the State of Kansas. These shallow waters held various mineral substances in solution, that would necessarily be precipitated in the course of evaporation. One of these substances was the sulphate of lime, which, being heavier than the rest, fell in the form of gypsum. First there were crystals of selenite scattered through the crevices of the underlying limestone. Then came thin crusts, and finally massive beds from five to twenty feet in thickness. Plaster factories have been successfully established at points where the gypsum can be worked to advantage. Occasionally, as in the bed near Geuda, the rock is hard as marble and is quarried as a fine building stone. Dental plaster and kinds of cement heretofore only had from Europe are now made in quantities. According to Professor Hay, this gypsum horizon was "the premonition of the great salt age," and is possibly related in order of time to the broad salt marshes described by Professor Mudge and other explorers.* Twelve such marshes have been found within the limits of the State, besides salt springs and saline streams. To these resorted formerly great herds of bison, as well as deer, antelope, elk, and other creatures, whose bones have been abundantly found along their margins. The density of the brine, tested by the salometer, varies from 13 to 45 degrees. Some of the marshes are small, while others are very large. One covers 1,000 acres, another 3,000 acres, and still another is described as seven miles long and one mile wide. In Meade County is a circular sink 150 feet in diameter, containing a black pool 50 feet deep, whose surface is twenty feet below the prairie level. This was formed by the sudden sinking of the ground in 1878. The efflorescence along the margin of many an ugly bog resembles newly fallen snow, and over the bog itself are scattered small oval domes of indurated mud crowned by sparkling saline crusts.

Further examination shows that these marshes and springs ooze from beds of gray shales, probably themselves formerly marshes. Below the saliferous shales, and resting on the permo-carboniferous rocks, are remarkable beds of pure rock salt, varying in thickness from a few inches to several hundred feet. Their contents seem to have been protected by strata locally known as "red beds," but which, being barren of fossils, the geologists have hesitated to classify. In Bulletin 57 of the United States Geological Survey, Prof. Hay gives his reasons for regarding them as triassic. Above the salt and below the red beds are non-saline shales. The region in southern-central Kansas overlying the beds of rock salt is about 130 miles in diameter, extending from Kanopolis to the Indian Territory. At Kingman, and perhaps elsewhere, shafts are sunk from which the solid rock salt is obtained that has found a ready market; but exact statistics are not at hand.

Aside from the mines, and from the solar works at Solomon, that have existed for a quarter of a century, there are about twenty salt plants in the Kansas field. As fourteen of these are owned by the three companies operating at Hutchinson, I decided to visit that place in order to inspect their methods and results. The city itself is highly attractive. It was laid out in 1871 by Mr. C. C. Hutchinson, whose name it bears. It has gained celebrity from its packing house, and is also a commercial center for a wide region. Like other Western cities it has suffered from overbooming, but is now recovering from the consequent reaction. It has an actual population of about 10,000, and is steadily growing.

The vein of salt was discovered here in 1887, and the

* See 6th and 7th Reports State Board of Agriculture, on the "Geology of Kansas Salt."

first block was worked for two years by a New York firm that afterward sold out to the parties now operating on a far larger scale. Some 400 men, besides a few women and girls, are now employed in the various plants. The wells are driven in triple tubes. The outer, or jacket, tube goes down 80 feet through the soil and gravel to the red rock, its object being to exclude all surface water. The other tubes go down 775 feet, completely through the red rock and the salt bed, which is here 300 feet thick. Through the inner tube fresh water is forced, which is driven up again to the surface through the middle tubing, charged with a solution of salt. This is at first quite weak. The custom is to pump for only half an hour to begin with, and to increase the time as the subterranean reservoir is enlarged by solution. It takes a month for a well to get into thorough working order, *i. e.*, for the reservoir below to become sufficiently large to hold brine enough to fill a receiving tank. The aim is to obtain a saturated solution, having a strength of from 97 to 100 degrees by the salometer. When by too rapid pumping it gets down to 80 degrees, the brine is too weak for profitable working, and the well rests till it gathers strength again. The life of a well is usually three years; the cause of failure being the breaking of the pipes by the overlying shale. It is cheaper to drive a new well than to repair the old one. The brine, having stood in the receiving tanks 24 hours, is run into pans for boiling down. These pans are 26 feet wide, 115 feet long, and 14 inches deep; and are fired at the end of the pan into three large arches. Each pan consumes from 10 to 15 tons of coal daily, and yields from 100 to 125 barrels of salt. The pans are "raked for dripping" every two hours. The salt is then wheeled into the store room, where for thirty days it is allowed to drain through a perforated floor; after which it is ready for packing and transportation. According to Messrs. Mulkey and Vincent, to whom I am indebted for attentions, the output from all the Hutchinson plants is about 700,000 barrels annually. The entire output from the State is about 1,250,000, which supplies the present demand in the territory reached; but it could readily be increased to 2,000,000 annual output if necessary. It should be added that the Hutchinson Salt Company has one of the largest and most complete dairy and table salt refineries west of New York, supplying the creamery trade of Iowa, Missouri, Nebraska, and Kansas, entirely displacing imported brands in those States. We regret not being able to furnish other than approximate estimates, but they seem to be all that can be had at present. It is but fair to this new and growing industry to say that, in the opinion of the State geologist, the actual aggregate of products exceeds the figures now given. He recommends that a State salt inspector should be appointed, by whose authority more complete returns may be obtained.

Turrets of the Monitor Monterey.

The building of these turrets, recently completed at Bethlehem, Pa., marks the attainment in this country of a high state of excellence in the most difficult class of work required for the modern battle ship. The turrets are made of five armor plates each, every plate so curved that when the five plates are set together they form a perfect circle. One of the turrets is composed of plates 11½ inches thick and 4 feet 6 inches wide, or so high when set on edge. The other turret is heavier, and composed of 13 inch plates, 4 feet 4 inches high. All the plates were forged on the big hammer and bent to the required curve on the hydraulic bending press, next to the hammer.

The quality of each set of plates was tested by the process. Six plates were made for each turret, one of which was chosen to stand the test for the group. The plates were sawed and finished on the big saws and planers in the armor plate finishing shop. Where the ends of the plates touch they are joined by heavy steel keys. The keys are each four feet long and four inches square.

On the Monterey's decks the turrets will be pinned by the keys and fastened to a strong frame, to which they are clamped by enormous bolts, three inches in diameter. The 13 inch turret is fastened by 104 bolts, the other by 72 bolts. The 11½ inch turret set up in a perfect circle in the machine shop is large enough to contain an ordinary workman's cottage. It is 24 feet 5 inches in diameter, or about 80 feet in circumference. The larger is almost 29 feet in diameter, or over 90 feet around the outside.

Testing a Horse for Lameness.

When examining a horse with a view to purchasing, says a contemporary, always have him led down a steep or stony descent at the end of a halter and with no whip near him. Many horses when brought out of the stable are excited by the presence of strangers, and become still more so at the sight of a whip. A slight lameness may therefore be momentarily overlooked by the horse himself, just as a man, under strong excitement, will sometimes forget a sore foot. Leading the horse down a slope will show any defect in his fore-quarters, and running him back will develop any weakness that may exist in his hind legs.