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. or Canada.............................$3 00
One copy, six months, for the U. S. or Canada.............................1 50
One copy, one year, to any foreign country belonging to Postal Union, 4 00
Remit by postal or express money order.

Australia and New Zealand.—Those who desire to receive the SCIENTIFIC AMERICAN, for a little over one year, may remit £1 in current Colonial bank notes. Address

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. and Canada. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S. or Canada, on receipt of *seven dollars*.

The safest way to remit is by draft, postal order, express money order, or registered letter.

Australia and New Zealand.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for a little over one year on receipt of £2 current Colonial bank notes.

Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

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.

Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

NEW YORK, SATURDAY, SEPTEMBER 17, 1887.

Contents.

(Illustrated articles are marked with an asterisk.)

American Institute Exhibition.. 178
Bell cord coupling, improved*... 179
Bit for horses, improved*........ 179
Blinder attachment for bridles*. 179
Boat, surf, Ceylon*.............. 183
Books and publications, new..... 186
Bridge, Manhattan, New York... 177
Car coupling, improved*......... 178
Car, dumping, improved*........ 178
Comet, Olbers-Brooks*........... 181
Commissioner of Patents, annual report of........................ 179
Correspondence.................. 181
Cruiser Chicago, the*.........175, 180
Electro-motor batteries.......... 176
Exhibition, International, of Glasgow, in 1888............... 182
Fish, freezing, for market. 177
Fish, losses of, great............. 181
Fishes, poisonous................. 180
Fishing by the electric light...... 182
Gate, railway crossing, automatic*......................... 178
Gate, railway, elevated*.......... 178
Glue, moisture-proof.............. 179
Honey in Tasmania............... 181
Index plate, inexpensive*....184, 185
Invention wanted................ 176
Inventions, agricultural 186
Inventions, engineering 186
Inventions, index of............. 187
Inventions, miscellaneous....... 186
Laboratory, Edison's. new....... 184
Lightning, curious effects of..... 181
Locomotive, mining, fireless*.... 182
Metals in plants.................. 177
Mines, safety in.................. 181
Morse. birthplace of............. 176
Natural history notes............ 180
Naval dangers, English.......... 181
Navy, our new*.............175, 180
Notes and queries................ 187
Pails, wood pulp................. 177
Patents, decrying, folly of....... 181
Pattern tracing and cutting device*............................ 179
Pipe tongs or wrench, improved* 179
Plumbing leakages............... 180
Potato planter eloquence........ 181
Printing, auto-stereotypic....... 181
Roofs, gravel, to make........... 178
Saw filing machine, improved*.. 179
Shaft coupling, improved*....... 178
Sprinklers, automatic, for theaters.................................. 184
Steam launches, light draught*.. 182
Truth, solid...................... 181
Water, soft, for domestic purposes, importance of........... 182
Yacht, Singhalese*............... 183

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 611.

For the Week Ending September 17, 1887.

Price 10 cents. For sale by all newsdealers.

PAGE

I. BIOGRAPHY.—The New Statue of Philip Lebon.—Biography of the French pioneer inventor of gas lighting, with notes on the recent inauguration of his statue.—1 illustration.................... 9757

II. CHEMISTRY.—The Analysis of Urine.—An elaborate investigation of the method of analyzing chemically and microscopically this fluid, with illustrations of the apparatus employed.—4 illustrations 9758

III. ELECTRICITY.—Electrical Alarm for Pharmacists.—An apparatus for indicating to the pharmacist when he removes from the shelf a bottle containing poison.—2 illustrations.................. 9753
ElectricSteel Railways.—By GEORGE W. MANSFIELD.—A full discussion of the problem of electric railways; comparison with horse and cable traction.................................... 9752

IV. ENGINEERING.—Improved Oscillating Hydraulic Motor.—A small motor for household use, as for driving sewing machines and other domestic machinery.—8 illustrations..................... 9751
The Ceara Harbor Works.—A remarkable engineering work now in progress in Brazil; the formation of an artificial harbor.—4 illustrations.................................... 9752

V. GEOLOGY.—Notes of a Recent Visit to Some of the Petroleum-Producing Territories of the United States and Canada.—By BOVERTON REDWOOD, F.I.C., F.C.S.—The second portion of this valuable paper, treating more particularly of Canadian petroleum.. 9765

VI. METEOROLOGY.—The "Meteorologiske Institut" at Upsala, and Cloud Measurements.—The methods used and results attained in the famous Upsala observatory under Profs. Ekholm and Hagstrom; the measurement of clouds.—1 illustration................ 9764

VII. MISCELLANEOUS.—Drawing Instrument for Accurate Work.—By J. LEHRKE.—A magnifying instrument for fine work and measurements.—2 illustrations.................................. 9754
Liquid and Gaseous Rings.—Notes on the production of vortex rings.—The different aspects and breaking up of smoke rings.—6 illustrations.................................... 9760
Scenes among the Extinct Volcanoes of Rhineland.—The picturesque features of the geological formations of this region described.—10 illustrations.................................... 9762
Shall We Have a National Horse?—An eloquent plea by RANDOLPH HUNTINGTON for the production of a good type of animal.—Use of the Arabian horse as an improver of the breed........... 9760

VIII. NAVAL ENGINEERING.—Trial Trip of the Ohio.—The remarkable results attained by the introduction of new boilers and machinery in an American steamship.............................. 9751

IX. PHYSIOLOGY.—Apparatus for Determining Mechanically the Reaction Period of Hearing.—An interesting study of the time of transmission of an impulse through the sensor and motor nerves.—1 illustration.................................... 9753

X. SANITATION.—A New Disinfector.—Description of a new apparatus for disinfecting by superheated steam and air, with tabular statement of elaborate tests made with it.—2 illustrations 9754
Trees from a Sanitary Aspect.—By CHARLES ROBERTS, F.R.C.S., etc.—The sanitary value of trees considered by this eminent sanitarian.—The uses and abuses of shade near houses.............. 9765

XI. TECHNOLOGY.—A New Alkali Process.—The Parnell & Simpson process of making carbonate of soda, combining the features of the Leblanc and ammonia methods.................................. 9755
A New Process for the Distillation and Concentration of Chemical Liquids.—By GEORGE ANDERSON, of London.—An apparatus and process especially adapted to the manufacture of sulphate of ammonia.—The invention of Alex. Angus Croll described.—1 illustration.................................... 9757
Barlow's Machine for Moulding Candles.—A new apparatus for candle manufacture, fully described and illustrated.—5 illustrations.................................... 9754
Temperature of Gas Distillation.—The mooted question discussed by Mr. WM. FOULIS, the eminent gas engineer.................. 9756
The Largest Black Ash Furnace in the World.—Note of a recent furnace for use in the Leblanc process of soda manufacture 9756

ELECTRO-MOTOR BATTERIES.

Prof. Reckenzaun's paper on storage batteries for locomotion was the most important of those read before the recent meeting of the National Electric Light Association. Reckenzaun has, perhaps, had more practical experience with the electro-motor on land and sea than any other man on either side the water. This alone would have drawn attention to his paper, but the fact that he is carefully accurate in statement, a characteristic unhappily rare in some departments of science, lent to it additional importance. We are often told that figures don't lie, yet those who have had frequent recourse to figures will recall how often they have been deceived by them. Once you start with a false premise, and figures will lead you whithersoever you list; just as if we let $a=1$ and $x=1$, it may be shown that $1=2$ and $2=0$. The tendency of most experimenters with commercial leanings is to exaggerate, and it is not easy to recall any department of applied science where there has been more exaggeration than in motors. More than one projector has declared that the cost of running a motor is as the cost of maintaining a single horse per diem. Their figures invariably sustained the assertion, and it must have seemed strange to many, this being the case, that the surface street car companies, at least, did not adopt them. The fact is, practical experiment, so far, has scarcely warranted the claims set up by the promoters, and while all admit the peculiar adaptability of electricity to motors, a belief prevails that still more experimentation is required to make the motor altogether reliable.

Prof. Reckenzaun's figures, based upon actual experiment, show that cars may be run by storage battery cheaper than by horses, but that the equation of uncertainty of action is, at present, larger in any consideration of electric transit than in that of horse transit. Already, he thinks, electricity furnishes an economical and practical means of street locomotion, and he adds the opinion that, because of the interest taken in the matter here, we are likely, a twelvemonth hence, to be far in advance of the old world, both in point of perfection and use of electro-motors.

An interesting portion of the paper is where its author points out the fact that because it requires only one or two horse power to propel a loaded car on a plane surface, it is not an indication of the presence of sufficient power. It may take from twelve to sixteen horse power to pull that same car up an incline, and two average car horses are capable, on demand, of exerting that power for short periods. In other words, the batteries used should be equal in strength to the maximum power required, just as the service required of a chain should not call for a strain greater than its weakest link is capable of withstanding. The reader must not conclude from this that batteries far more powerful than what is required to draw a loaded car along a plane surface are necessitated on grade. This, fortunately, is not the case, because the storage battery may be discharged in any quantity up to its whole capacity, whether this be one ampere or one hundred; and it is, therefore, as easy to get twenty horse power as to get one, remembering, of course, that the battery, like a pitcher of water, has less remaining the more is taken out. We are told that the electrical apparatus required to run a car is one-fifth the weight of car and passengers, the current needed being in the neighborhood of thirty amperes and E.M.F. of 180 volts.

Reckenzaun once placed a dynamo between a loaded car and the two horses drawing it, so as to ascertain with exactness the amount of pull, measured in pounds measured by the distance traversed in a minute. At the easiest work the horses exerted from two to three H. P. Experimenting in Philadelphia, he found that an ordinary horse was capable of exerting eight H. P. for a few moments. It is because of their being called upon to withstand these sudden strains that car horses can be used only from three to four hours a day. A few weeks of longer hours would, he thinks, kill them; whereas, if run two hours a day, they would last three or four years. He computes this to be 33,000 foot pounds per minute per H. P. The question between cable and electrical traction is an interesting one, the more so because of the many conjectures recently indulged in, some of them, based on fact, having differed widely. Reckenzaun says he has found the waste of power on a cable road to be quite 80 per cent. He refers in this principally to the power required to work the cable itself, independently of the additional power required to haul the cars. The cable road construction in Philadelphia cost, he says, $100,000, and that in San Francisco still more. He admits that there is also a waste, and a large one, in the storage battery motor system; a waste of energy in the dynamo, again in the accumulator charged by the dynamo; in the motor driven by the accumulator, and finally in the gearing for reducing the speed of the motor to the speed required by the car axles. Regardless of some of the wild assertions that have been made as to the accuracy of the apparatus, Reckenzaun says that in the present condition of the storage system not more than forty per cent of the power collected from the steam engine and applied to the dynamo can be recovered in work. But this, he says, makes the storage battery system cheaper than horse traction.

Prof. Reckenzaun, like many others, is a believer in the future of the so-called storage battery. It is yet in the state of experimentation, and there are those who believe that the present compares with that of the future scarcely more favorably than did Watt's kettle with the steam engine of fifty years later.

An Invention Wanted.

A very interesting exhibition is now in progress in Madrid, being a display of the products and industries of the Philippine Islands, which are among the largest and richest of the colonial possessions of Spain. Our correspondent in Madrid writes as follows:

An opening offers just at present to inventors, as a machine is wanted by the planters of the Philippine Islands for preparing the abaca flax for market and exportation. This is the plant from which the fiber known as Manila hemp, and used in making Manila rope, is obtained.

On the 18th day of August, a trial was made at the exhibition, in the presence of one of the ministers of the crown, of a machine sent here from Manila by the society styled "Sociedad Economica de Manila." The machine was tried in competition with one of the Indian native workmen. It did not give satisfaction, as the man got through his work faster and produced more flax, with less waste, than the machine did. It must be stated, however, that the inventor of the machine was not present, and that the native workmen who tried to work the machine did not know how to manage it properly. Some of the Philippine planters and estate owners present stated, however, that the machine did not fulfill their requirements, and they were still anxiously waiting for a better one.

The Madrid daily paper *El Imparcial*, in its number of August 17, stated that the aforesaid society—"Sociedad Economica de Manila"—had decided to offer a prize of two or three thousand dollars (the *Imparcial* understood) to the inventor of the best machine for preparing the abaca for market. Speaking recently to some of the said planters on this subject, they informed me that the person who should present to them a good machine, suitable to their wants, would make a fortune out of it in the Philippines, as they, the estate owners, are at present entirely at the mercy of the coolies, and they are only able to utilize 25 per cent of the plant, the other 75 per cent being wasted.

The operation which the machine is required to do is that which the coolies perform by hand in the field, just as they cut down the plant. The coolie, having cut down the plant at the root, lops off the top and proceeds to strip the trunk. He takes out a series of strips about 2 inches wide and some 5, 6, or 7 feet long, according to the length of the trunk. He then takes these strips or ribbons to a rude wooden frame, and placing one between a pair of knives or shears, held down by a treadle, he pulls the ribbon, by main force, through the knives, and the part which has thus passed through the knives is converted into threads. He then turns the ribbon end for end, and passes the unscraped portion through the knives as before, and this portion is also converted into threads He then hangs the handful of thread on a pole to dry.

The above is what the machine is required to do. As I do not know what attention may have been given to this subject by American inventors, I merely mention this matter to you as a preliminary step.

I inclose you a bit of the fibrous material (the strip or ribbon alluded to) and a sample of the flax taken from it. Both the ribbon and the flax threads were recently forming part of a plant growing in a tub in the park here, the plant having, with many others, been brought from Manila for the purpose of exhibition and trial.

Now there is evidently a fine chance for an inventor here.

I will keep you advised of what takes place here in this connection, as it is expected that the government will probably offer a prize too. The sale, however, which a good machine would meet with among the estate owners in the Philippines would be the best prize for its inventor. JOHN SHAW.

[We may add for the information of our readers that the Philippine Islands have an area of about 100,000 square miles, or twice the dimensions of the State of New York. A Spanish patent, costing $100, covers Spain, Cuba, Philippine Islands, and all the other possessions of Spain.—EDS.]

Birthplace of Morse.

The birthplace of Prof. Morse, the inventor of telegraphy, is still standing in Charlestown, Mass. It is on the corner of Main Street and Hathon Square, and is occupied by two families. On the street floor are two stores, one occupied as a grocery and the other as a shoe store. This house was one of the two that remained unharmed when Charlestown was destroyed by fire by the British in 1775. Prof. Morse was an artist of some merit, and on the walls of several of the rooms are to be seen sketches in oil from his brush.

© 1887 SCIENTIFIC AMERICAN, INC.

The Manhattan Bridge, New York.

If work on the Manhattan Bridge, as the new stone and steel structure over the Harlem River at One Hundred and Eighty-first Street, New York, has been officially named, continues to be pushed as has been done thus far, there is little doubt that the bridge will be open for traffic within the time specified, that is, by June 20, 1888. It is a year since the project was started, but already the work is more than half done. The three main piers are ready for the metal superstructure; in fact, the massive steel pedestals which distribute the thrust of the arches upon the piers are now being placed in position. Of the 7,000 tons of steel and iron that the bridge will require, considerably more than half has been already cast, and last week the erection of the timber staging for carrying the arches during construction was begun.

The energy displayed by the contractor, Miles Tierney, who does the masonry, and the Passaic Rolling Mill Company, of Paterson, whose contract includes all the metal work, will be better appreciated by a brief examination of the labor involved in the undertaking, and especially in the portion of it accomplished. The bridge is 2,375 feet in length and 151 above the water, or over a third longer and about 50 feet higher than High Bridge. It will consist of two steel arches of 508 feet span each in the clear; three granite piers, each 40 feet thick at the springing line of the arches, and two abutments of masonry. The abutment on the east side of the river is 342 feet long, that on the west side 277 feet. Through each of these three arched masonry passages, 60 feet in width, will run. These land arches were not contemplated in the original plan, which had instead solid blocks of masonry. The change certainly makes a marked improvement in the architectural appearance of the structure.

The masonry, as stated, is already far advanced. The most difficult portions of the work are finished. Of these, perhaps the most important, and that which deserves special notice, is the great pneumatic caisson upon which pier No. 2, on the east bank, right at the water's edge, is founded. In its general dimensions this ranks third among the American bridge caissons, the one on which was built the New York pier of the East River bridge being the largest—172 by 102 feet. From out to out of sheeting the Manhattan caisson measures 104 feet in length, 54 feet in width, and is 13 feet in height from the bottom of the shoe to the top of the deck. It is built entirely of yellow pine timber, 12 by 12 inches, squared and tarred timber, and contains 520,000 feet of wood and 50,000 pounds of metal work. The shoe of the caisson stops at a point 40 feet below mean high tide, resting directly upon solid rock. After the point was reached at which it was decided to stop the caisson, the rock surface was carefully cleared of all debris and the entire working chamber and shafts filled with concrete. This was completed about May 1. Since then the mason work has progressed so rapidly that now enough is finished for one to get a fair idea of the appearance of this part of the bridge. The stone used is Maine granite, massive in size and remarkably well laid.

While Mr. Tierney has been pushing his part of the undertaking, the contractors for the metal superstructure have been equally active. An entire new plant of machinery had to be constructed for handling the immense segments of which the steel arches are composed. There are thirty-four of these segments in each rib or arch and six ribs in each span, making 408 segments in all. Each of them weighs about 10 tons and is composed of steel plates, curved to give the arch the form of a parabola. Upon these arches will rest wrought iron columns, thoroughly braced together and supporting the roadway above. The floor system of the roadway consists of transverse iron floor beams, resting on these columns and carrying the longitudinal iron stringers, which are entirely covered with wrought iron buckle plates. This gives the structure a solid iron floor, upon which will be laid the sand, concrete and granite blocks of the roadway. The roadway proper will be 50 feet wide, with sidewalks on both sides 15 feet in width. Within a few weeks the rolling mill company will have two or three hundred hands at work stringing the arches. This will take up most of the winter.

Mr. Tierney is to receive $1,210,000 for the stonework. The rolling mill company's bid was $845,000, thus making the total cost of the bridge $2,055,000, and there is little reason to think that it will exceed this sum. As is generally known, the work is in the hands of a commission consisting of Jacob Lorillard, Vernon H. Brown, and David J. King. William R. Hutton is their principal engineer. The resident engineer is John Bogart. Mr. Tierney superintends his portion of the work personally, though he has two or three assistants. The engineers of the rolling mill company are F. H. Leers, Thomas C. Spence, and St. John Clark. James Yeardley is the superintendent of construction.

Steel arch bridges are still a novelty in this country, although the one at St. Louis has been opened several years. Hence, it is not surprising to find that the Manhattan is attracting considerable attention on the part of engineers. There were a number of them looking at it the other day, when Mr. Fteley, the consulting engineer of the new aqueduct, called attention to a somewhat remarkable fact. "Did you ever notice," he said, "how many important pieces of engineering are to be found within a radius of half a mile from High Bridge? First, High Bridge itself, a model work of its kind, with the old aqueduct running over it. Then there is the siphon of the new aqueduct under the river, which will soon be completed. Besides may be named the New York City & Northern Railroad, the elevated road and drawbridge just below here, the cable road just over the hill, and lastly the Manhattan Bridge itself, a conspicuous example of modern engineering skill."—*New York Tribune.*

Wood Pulp Pails.

The pail is entirely in one piece and without hoops, so it never leaks or falls to pieces, besides being lighter by far than any other material from which such vessels could be made.

The process of their manufacture is thus described in the *Railway Review:* The wood, preferably spruce, although any soft, fibrous wood will answer, is first cleared of its bark and cut to a length uniform with the grindstone to be used, generally 16 to 24 in. It is then placed against the face of a rapidly revolving grindstone, the grain of the wood being in a line with or parallel with the axis of the stone, and a hydraulic or worm screw piston keeping the wood constantly pressed against the stone. The result, which is washed off the stone by a shower of water, after being screened of slivers and sawdust, is a milky white liquid. With the water sufficiently extracted this is the wood pulp used in the manufacture of paper and indurated fiber ware. The process of manufacture of ware from the pulp is exceedingly simple, and is similar in all the lines made by the company. In making a pail, for instance, the machine for first moulding the pail from the pulp is provided with a hollow perforated form of cast iron, shaped like the inside of a pail, and covered first with perforated brass and then with fine wire cloth. This form, worked by a hydraulic piston, is pushed up into a large cast iron "hat," which fits over it very tightly. Within this hat is placed a flexible rubber bag, and between this and the inner form first mentioned is admitted the pulp, still in a liquid state. The pulp being pumped in under pressure, the water immediately begins to drain off through the wire cloth and perforations, and the rubber bag swells until it fills the hat. The supply of pulp is then shut off, and water under high pressure is admitted within the hat and outside the rubber bag, thus squeezing much of the water from the pulp. After standing some eight to ten minutes the pressure is shut off, the inner form lowered, and the pulp pail removed. At this stage the pail is still nearly fifty per cent water, but is sufficiently strong to allow handling. This water is first all dried out in dry kilns, and then the pail is turned off on the outside with a gang of saws. After sandpapering inside and out the pail is ready for the treatment house, where it is charged with a waterproofing compound which permeates thoroughly the material of which the pail is made. Baking in ovens at a high temperature succeeds each dip or treatment. The polish which the goods present is described as being the result of the final treatment. After this the handles are riveted on the goods, which are then ready for the market.

Freezing Fish for Market.

For very many years in Russia and in other cold countries fish and meats have been frozen for market by exposure in the open air or by freezing them *en masse* in ice. In Thibet, as early as 1806, the flesh of animals was preserved frost dried—not frozen—and in that condition would keep, without salt, for several months.

In the United States ice was first used for the preservation of fish about the year 1842, and in 1845 fishing vessels began to take ice to preserve their catch. At first they were careful to keep the ice separate from the fish, piling it in a corner of the hold, but they soon began packing the fish in broken ice. The inland trade in fresh fish had, up to that time, been very limited, but soon increased, and it was not many years before boxes of fish packed in ice were shipped far inland.

The trade in fish frozen by artificial means began about the year 1861, when Enoch Piper, of Camden, Me., obtained a patent (No. 31,736) for a method of preserving fish or other articles in a close chamber by means of a freezing mixture having no contact with the atmosphere of the preserving chamber. The patent was issued in March, 1861. Mr. Piper states that the most important application of his invention is for the preservation of salmon, which had heretofore been preserved in a fresh state only by being packed in barrels with crushed ice, which on melting had moistened and injured the fish. The ice, it was said, could not keep the fish more than a month, whereas by the new method they could be kept for years if need be. The apparatus used is described as a box in which the fish are placed in small quantities on a rack. The box has double sides filled in between the sides with charcoal or other non-conducting material. Metallic pans filled with ice and salt are set over the fish and a cover set over the box. About twenty-four hours were required to complete the freezing, the freezing mixture being renewed once in twelve hours. "The fish may afterward be coated with ice by immersing them in iced water or by applying the water with a brush. They may then be wrapped in cloth and a second coating of ice applied, or they may be coated with gum arabic, gutta percha, or other material to exclude the air and to prevent the juices from escaping by evaporation." The fish are then packed closely in a preserving box, which is without a cover, but within a covered box, the space between the boxes being filled with charcoal or other non-conductor. Metallic tubes pass through the inner box for the introduction of the freezing mixture, a small pipe connecting with the lower end of the tubes to carry off the brine. The combined area of the tubes is required to be one fifth the area of the inner box in order to keep the temperature below the freezing point.

Numerous and complex methods of fish freezing have been invented and more or less practiced since Mr. Piper obtained his patent. The latest improvements are the simplest and perhaps the most effective.

In 1869 Mr. William Davis, of Detroit, patented a freezing pan for fish, which he describes as a thin sheet metal pan or box, in two sections, one made to slide over the other, the object being to place the fish or meat in one section or part and to slide the other part over it and in close contact with the articles to be frozen. The boxes are then to be piled in a large, close wooden box, the double sides of which are filled in with charcoal or other non-conducting material. Ice and salt is packed over and about the metal pans. In from thirty to fifty minutes the contents are frozen solid and may be taken from the pans and packed in the keeping chamber, where the temperature is constant at 6° to 10° below the freezing point.

Mr. Davis in the same year obtained another patent for a preserving chamber, which he says may be a room or box of any desired form. It has double walls, with the intervening space filled with a non-conducting substance. Within this are metal walls of less length than the outside walls, so that between the two a freezing mixture may be placed. Entrance is obtained through the top or side by closely fitting doors or hatches.

Other methods have been practiced, such as putting the fish in rubber bags or in other waterproof material and packing them in ice and salt. One method is described as a series of circular pans, seven in number, of such dimensions as to fit in a barrel, and in these pans the fish are frozen. In 1880 Mr. D. W. Davis obtained a patent (226,390) for packing fish and finely crushed ice in a barrel and freezing the same solid, the fish being so stowed as not to come in contact with one another.

In Boston, New York, and other cities entire buildings of three to five stories or floors are now made into fish freezers and cold storage for fish. The most common method of producing the cold air requisite for freezing is by the use of ice and salt in metallic chambers or large tubes, which pass perpendicularly through the freezing room. The freezing room is provided with double walls interlined with some non-conductor. The fish are either hung on hooks or spread on shelves until frozen, when they are removed to the cold storage rooms and kept for months, if need be, before marketing.—*A. Howard Clark, Bulletin U. S. Fish Commission.*

Metals in Plants.

Prof. R. W. Raymond gave to Mrs. Ellen Richards, of the Massachusetts Institute of Technology, some somewhat broken specimens of *Eriogonum ovalifolium* which he had exhibited to the institute, as a plant growing in silver ore localities. Most of them had rose colored blossoms. On one or two the blossoms were yellow. Mrs. Richards has since reported to me the following interesting results of chemical analysis. In consequence of the views above suggested as to the possible significance of color, the pink flowered plants were treated separately. The specimens were cleaned as completely as possible from earth; but this separation could not be made perfect, because the earth adhered in particles to the woolly leaves, as was proved by the subsequent detection in the ash of scales of bronze mica. The plants lost 6 per cent of moisture on drying at 100° C., and yielded 12 per cent of ash, of which 4·8 per cent was soluble in acid. This soluble portion contained in 100 parts, SiO_2, 2; Al_2O_3 (Fe_2O_3), 24; CaO, 26; MgO, 1·5; alkalies, as chlorides and sulphates (mostly K_2O), 27·8 parts. *The presence of arsenic was qualitatively proved in the plants*, and the earth was found to contain a considerable proportion of it, but silver could not be found. *In the plants with yellow flowers arsenic was not found.*

These results need to be confirmed by further experiment upon larger quantities and under more favorable conditions, but they are certainly striking and suggestive.

© 1887 SCIENTIFIC AMERICAN, INC.