

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, postage included. \$3 00
One copy, six months, postage included. 1 50
Club.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at \$3.00 each; additional copies at same proportionate rate. Postage prepaid. Remit by postal or express money order. 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, postage paid, to subscribers. Single copies, 10 cents. Sold by all newsdealers 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, express money order, or registered letter. 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. The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

NEW YORK, SATURDAY, MAY 7, 1887.

Contents.

(Illustrated articles are marked with an asterisk.)

Table listing various articles such as American Association for the Advancement of Science, Apes as workers, Apples, loss of, to prevent, Book, American, English views, Brake, vehicle, improved, Business and personal, Cement, metallic, Clamp, floor, simple, Coffee pot, improved, Copper, price of, Diphtheria, treatment of, by the bichloride of mercury, Drill, bench, new, Dynamo electric machine, small, Earth, the living, Electrical experiment, novel, Escritoire bon ton, Evergreen barberries, best, Exhibition, American, in London, Fibers, finest, the, Gardening under difficulties, Glass tubes, breaking, Glass, varnishing, Hat, silk, to restore gloss to, Hygiene of occupations, Inventions, agricultural, Inventions, engineering, Inventions, index of, Inventions, mechanical, Inventions, miscellaneous, Lambrequin, curtain, and shade support, adjustable, Light, apparatus for illustrating the law of the reflection of, Lighting railroad cars, Julien system of, Link Belt Machinery Co., of Chicago, Marshes, Pinks, the, Mental faculties, deterioration of, Metals, melting points of, Microscopic notes, Microscopic objects, mounting, Quick method of, Nail making machine, Lovell's, Oil, improved, Organic matter in the soil, Panama Canal difficulties, Paper, wall, simple test for, Power, distribution of, by rarefied air, Pulley, friction clutch, Rabbit pest in Australia, Saw, drag, improved, Sea, work under the, a field for, Sheep, sleeping for five years, Statuary, paper, how to make, Steamships, ocean, size of, Sun cluster, a, life in, Things worth knowing, several, Threads, electrified, repulsion of, Wealth, what is?, Wine and brandy from raspberries and strawberries, Wine, French export.

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 592.

For the Week Ending May 7, 1887.

Price 10 cents. For sale by all newsdealers.

Table listing contents of the supplement with page numbers: I. BIOGRAPHY.—James B. Esdis.—An exhaustive biography of the great engineer lately deceased, with portrait.—1 illustration. 9448
II. CHEMISTRY.—Analysis of Shot.—By H. HARDAWAY.—Chemical composition of shot from four representative makers. 9462
III. ELECTRICITY.—Construction and Operation of Dynamo Electric Motor systems.—By STEPHEN FIELD, of New York.—A recent paper treating of proportions, amount of iron in armature, brush lead, and other items. 9457
Electric Welding.—By Prof. ELIHU THOMSON.—Elaborate account of the new electrical art; with full description of the apparatus and induction coils.—4 illustrations. 9458
IV. ENGINEERING.—Apparatus for Measuring Bridge Deflections.—A simple apparatus for determining this important factor.—1 illustration. 9451
Invention of the Turbine.—By GEORGE WALKER, M. E.—The probability of the American origin of the turbine water wheel; Fourneyron's claims called in question. 9454
Limiting Numbers of Teeth.—By GEORGE B. GRANT, Boston.—An important paper giving a mathematical treatment of the subject of gearing, one, two, and three teeth systems.—1 illustration. 9452
Management of Boilers.—Practical notes on the corrosion of boilers, its cause and prevention. 9454
V. GUNS AND ORDNANCE.—The Maxim Gun.—The construction and achievements of this remarkable arm.—3 illustrations. 9450
VI. HYGIENE.—Climate in its Relation to Health.—By G. V. POORE, M.D.—The opening of a course of three lectures on this subject.—The composition of the air.—Its moisture, and the effect on the health. 9459
VII. MILITARY ENGINEERING.—The Berthon Pontoon Bridge.—A collapsible pontoon, adapted for wagon transportation.—The capacity and length of bridges built upon it.—2 illustrations. 9451
VIII. NAVAL ENGINEERING.—The Fish Torpedo.—Elaborate account of the Whitehead torpedo.—The long kept secret of its mechanism described.—Method of launching.—1 illustration. 9449
IX. PHYSICS.—Heat Conductivity of Metals.—Two simple experiments in physics without apparatus.—2 illustrations. 9450
X. PLANT AND TREE CULTURE.—Forced Lilly of the Valley.—The results of applying heat to forcing the development of this plant.—1 illustration. 9462
Shade and Ornamental Trees.—Description of shade trees for which a prize was awarded by the Essex Agricultural Society. 9461
XI. SURGERY.—The Electro-Osteotome.—A concise description of this new application of electrical mechanics to operations involving the cutting of bones. 9457
XII. TECHNOLOGY.—A Review of Recent Bleaching Processes.—Recent processes compared and reviewed. 9456
Cotton Fiber.—Note on its microscopic appearance. 9451
Glass.—By SYDNEY LUPTON, M.A.—The history and development of the art.—New processes of hardening or toughening glass. 9455
Improved Petroleum Burner.—A burner intended for use in a blacksmith's forge, as employed in Baku and on the Volga.—2 illustrations. 9456
Slag Cement.—The manufacture of Portland cement from Cleveland blast furnace slag. 9455

FRENCH EXPORT WINE.

United States Consul Gifford, at Bordeaux, warns the American public to beware of French liquors, more especially brandy, for that no pure French brandy is sent hither. After commenting upon the methods employed in making brandy for export, he goes on to say that the labels on the bottles do not represent the quality of the liquid they contain. The dates 1863, 1870, 1875, etc., do not, he says, mean that the inclosed liquid is brandy put up in those years. It means that the liquid has been made to resemble as closely as possible that which was really made in those years. In other words, the brandy sent hither from France is spurious, a concoction put up in the laboratory, in which the taste of good brandy is counterfeited by various chemicals.

It is worthy of comment that, while the laws against selling spurious wines and liquors in France are rigid in the extreme, little or no attempt is made to prevent the chemical preparation and adulteration of these liquids for exportation. Quite recently, the proprietors of a Paris restaurant were arrested and tried for selling a wine which, by its composition, must have been intended only for export. It was colored with an extract of coal and mixed with plaster of Paris—a pretty combination truly! A man and his children who drank it testified that it had "a very pleasant taste of raspberries," which shows what imagination will do. But even so strong an imagination as this was not equal to withstanding the effects of the wine, and a doctor had to be called in. The suit was brought by the Municipal Laboratory, and the punishment inflicted a fine of 1,300 francs and one year's imprisonment.

PANAMA CANAL DIFFICULTIES.

The prospects for a canal at Panama seem more illusive as time goes on, and not even the skill and perseverance of the French engineers has, so far, sufficed to lend to the scheme the air of practicability. Indeed, the tenacity with which these engineers adhere to the work must be regarded as remarkable by those who know how formidable and disheartening have been the obstacles which came with its development. These have been pointed out and discussed in our columns in the order of their appearance—the deadliness of the climate, the necessity for a monstrous dam at Gamboa, the great difference in level between the Atlantic and Pacific Oceans, and the disappointing character of the rock to be cut into in the mountain section.

Now comes the news from Panama that fully fifty per cent of the excavated material from the sections of the canal route is washed back again by the floods, and that this has been going on year by year ever since work was begun, without any announcement of the fact in the reports. The contractors working in the various sections are paid certain rates per cubic yard for material taken out, and if any part of this is washed back again they must be paid for once more removing it at the same rates as when first handled. Thus the company has been, and is, paying over and over again for the handling of much of the excavated matter, and, because of the continual floods and freshets, is never sure of keeping it permanently out.

For four years the engineers have been studying the problem as to how the furious floods of the Chagres River can be stayed or checked—as yet, without finding a solution. A recent writer on this subject makes the following interesting quotation from page 55 of the Manchester Geographical Society's journal for the first quarter of the year 1886:

"The Chagres is a torrent on the scale of a river, which intersects the proposed bed of the canal at twenty-nine points, and, when swollen by rains, sometimes raising its level thirty or forty feet in a day, discharges upon the valley a flood volume four times that of the highest ever measured on the Thames. The proposed remedy is to dam it up in a lateral ravine, through which it leaps down at right angles to the canal trench, by an embankment, whose mass of 20,000,000 cubic meters, with a base of 960 meters, would measure nearly a mile in length and 148 feet high. This mighty barrage will hold a milliard cubic meters of water suspended on the flanks of the mountain in a colossal basin twenty miles in length, which, if filled at the rate of a cubic meter a minute since the Christian era, would only begin to overflow in 1903."

So far, out of a total of 200,000,000 cubic meters of material to be excavated (not counting back wash), 37,727,000 had been taken out up to last January, thus leaving 162,273,000 yet remaining. The amount expended is said to have been \$60,000,000 in stock and \$240,000,000 in bonds.

The Link Belt Machinery Co. of Chicago.

The United States Court has decided that the drive chain heretofore made by the Moline Malleable Iron Co. is an infringement, and they have been enjoined from the further manufacture. The company has settled all claims for damages, and no suits will be brought against their customers. The Link Belt Machinery Co. of Chicago will hereafter furnish repairs for the Moline Co.'s chains now in use.

Breaking Glass Tubes.

Small glass tubes, less than five-eighths inch in diameter, give no trouble at all in breaking to any desired length, provided there are two or three inches to be broken off. Make a deep scratch—it need not go far round—on the tube, and then, with both thumbs close together, pull strongly and bend from the scratch. Tubes from three-eighths inch to one inch in diameter may be cracked by making a scratch as before, and heating circumferentially in a blowpipe flame. The flame should be very small, and the tube turned rapidly to prevent irregular cracking. Heat as small an area as possible on each side of the crack. If the glass is not very thick, about half a dozen turns will be enough to heat it sufficiently. As soon as this is done, take it out and blow sharply with the breath just on the scratch, and a beautiful clean crack will spring partly round. The parts may then be pulled asunder. This is a very successful method with English glass, but that of German manufacture is apt to fly unless carefully done.

Perhaps the easiest way for tubes that cannot be pulled asunder cold is to make the scratch and then dab on a piece of white hot glass. The way to do this is to fuse up in the blowpipe a bead on the end of a fiber. The smaller and hotter it is, the better chance of a square crack. This is the method to use when only a ragged corner or a short end has to come off. If there is an electric current handy, the largest tubes may be cut with certainty. Just where the scratch has been made wind one turn of wire—platinum is the best—of such length and diameter as to get white hot when the current passes through it. The ends where the wire leaves the glass should be as close as possible, but must not touch so as to short circuit. The part round the glass keeps much cooler than the other, but the current may be switched on and off, so as to have it red hot without overheating the free part.

Another method for large tubes, but one not generally so successful, is this: About one-half inch on each side of the scratch wrap strips of wet blotting or filter paper, and then turn the bare part in front of a sharp pointed flame. If the crack starts well, it may be led round by the flame. One of the most important factors of success in all these methods is the scratch, which can best be done with a knife, generally a rectangular piece of good steel hardened in salt water and sharpened. It is best not to scrape the knife against the glass, but to turn the latter while resting in a notch in the tube against some ridge in the knife, which is pressed firmly against the tube.

Treatment of Diphtheria by the Bichloride of Mercury.

Dr. E. L. Oatman, of Nyack, writes that for the past two years he has treated diphtheria by the local use of a solution of the mercuric bichloride, and has been greatly pleased with the results obtained. "Iron in large doses and free stimulation certainly play an important part in the treatment; but with these alone I lost—at St. Agatha's Asylum—ten out of twenty-three cases, while since the addition of local treatment by the mercuric solution, I have lost but one out of thirty-four subsequent cases. This patient died two weeks after the subsidence of all local symptoms, from paralysis of the muscles of respiration. Seven of my cases have had more or less paralysis of the muscles of deglutition during convalescence. This appears to be a large percentage, and might direct some suspicion toward the mercury as being in a measure causative. The details of treatment in an ordinary case, and as followed in the hospital ward, are as follows: I manufacture on the spot about fifty swabs—made by twisting absorbent cotton around a stick about the size of a lead pencil. The cotton should be pulled out and twisted firmly around the tip of the stick, extending beyond it, that the end may be thoroughly protected, so that no injury be done while using it. This is dipped in a solution of the bichloride of mercury, two grains to one pint of water, and is passed into the throat until it touches the posterior wall of the pharynx. It is then instantly withdrawn and burnt. No swab should ever be used a second time. No attempts are made to rub off any of the membrane, but more or less always adheres to the swab. This procedure is repeated hourly, day and night, until the disease begins to subside—which it usually does in forty-eight hours. I follow every application by the internal administration of five to ten minims of tincture of the chloride of iron, and as much whisky and milk as the case appears to demand. If the interior or posterior nares are invaded, the nose should be syringed. The conical urethral syringe is the safest instrument to leave in the hands of a non-professional nurse. It is of the first importance that the nurse or mother be fully instructed in the method of treatment, and should make the application satisfactorily to the physician before being left in charge of the patient. In no case have I ever experienced any difficulty in getting my instructions carried out, or met with any serious resistance from the patient.

"Spraying the throat is a far more difficult procedure for the lay attendant, as the tongue obstructs the pas-