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 20
One copy, six months, postage included..... 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each; additional copies at same proportionate rate. Postage prepaid.

Remit by postal 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, 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, APRIL 11, 1885.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 484,

For the Week Ending April 11, 1885.

Price 10 cents. For sale by all newsdealers.

IMPROVED LOOSE PULLEYS.

Visiting the shop of a wideawake machinist, a short time ago, attention was attracted to a singular arrangement of pulleys. A special tool was driven by a belt from an overhead shaft on to a fast pulley of 10 inches diameter, by the side of which was a pulley of 9 inches diameter in the position of what would be the loose pulley. This smaller pulley was, indeed, the loose pulley, but it was not on the same shaft or arbor with the fast pulley. It was secured to a stud that had two bearings or journals on independent studs, so that the loose pulley and its stud had no connection with the fast pulley and its arbor. Its position in regard to the fast pulley was such that its rim and that of the fast pulley were exactly coincident at the point where the driving side of the belt "took" on the pulley face. Mechanics will readily understand the situation; of course, the opposite edge of the smaller or loose pulley's rim fell within that of the larger or fast pulley's rim by the difference in their respective diameters. Now, if the belt is shipped from the larger (fast) pulley to the smaller (loose) pulley, its tension is at once slackened, and the belt runs on the loose pulley with the least possible friction. And, when the belt is shipped from the small pulley to the larger pulley, the coincidence of the rims at the point of belt driving and the gradually increasing diameter of the running side of the pulleys induce the belt to climb up the larger diameter, just as a belt on the crowning faced pulley will seek the largest diameter.

It was surprising to notice this "encouraging" or "inviting" action when the belt was shipped from the small loose pulley to the fast larger pulley; the least impinging of the edge of the belt on the edge of the fast pulley sent it whirling across the face, so that the belt was seated apparently with a single revolution, starting the machine fully as quickly as it could have been done by a friction clutch, and without any shock or jar. The converse action of shifting to the smaller loose pulley appears to be just as easy as when the two pulleys are of the same diameter, the release or slackening of the belt being probably an inducing element.

The contriver of this arrangement claims that something of the readiness of the belt to engage the larger fast pulley is because of the higher velocity of the smaller loose pulley; but this seems hardly tenable, as the velocity of the belt is independent of the diameter of the receiving pulley. Yet there are advantages in this peculiar adaptation of the pulleys one to the other; the smaller loose pulley eases the tension on the belt, and its enforced independence of the other pulley is a good method to use in all cases where it is feasible; all loose pulleys should run on their own axes, and not loosely on a shaft, that is, loose pulleys should, when practicable, be mounted on journaled spindles—keyed on—so that the spindles turn with them. This better practice is gradually being adopted by enterprising machinists to replace the present rattling, squeaking, and oil-consuming arrangement.

RECENT EXPERIMENTS IN VIVISECTION.

Those who are familiar with the work performed by that estimable gentleman and philanthropist, Mr. Henry Bergh, cannot help listening attentively to what he has to say, and generally agreeing with him; but, at times, it seems as if his sympathy for the brute creation carried him to unwarranted excesses. To this latter category would seem to belong his action regarding the very valuable, and in no sense cruel, experiments in osteotomy recently made with an etherized sheep at the New York Post-Graduate College and Hospital. Suffering humanity has some claims that cannot be overlooked; and if investigations made by experts with living subjects will seem to lessen the pain or shorten the list of maladies that human flesh is heir to, it would appear unreasonable to demand their discontinuance.

The experiments referred to were made with a purpose of ascertaining whether or no bone may be removed in diseases of the joints without entailing permanent stiffness in the affected parts. The theory upon which Dr. Roberts' operation was based is that the first indications of disease in bone may be removed in much the same manner as that employed by dentists with decayed teeth, and that the well known property of bone to throw out new tissue would do for the part removed what the dentist's artificial filling does for the cavity that is left in the tooth.

When the sheep had been rendered insensible by the application of ether, Dr. Roberts removed the wool between the thigh and the shank, and then laid bare that portion of the bone which lies adjacent to the articulation of the joint. A small electric battery served to operate a drill and burr, and by means of these he made a small excavation in the bone, pausing from time to time to examine by the aid of a miniature incandescence electric light the progress of his work. When the operation was completed, a cavity was left in the bone large enough to admit a small thimble, but the articulation of the joint remained uninjured. After a drainage pipe was affixed to the cavity, the parts were carefully sewed together. Six weeks hence, when the cavity shall have had ample time to fill up with new bone, the animal will be killed, in order that the result of the operation may be accurately determined. Should the theory upon which this operation is based prove well founded, the most important results may be expected in the future treatment of diseases of the hip, knee, and ankle where the spongy interior of the bone is the seat of the trouble, and the slow and trying system of absorbing the diseased bone, of removing the joint and thus shortening the leg, and the other and various means employed, all of which leave a stiffened joint as a result, will be superseded.

It does not require unusual perception to distinguish between operations such as that described, related directly and specifically to the art of healing, and those with no more specific aim than the advancement of knowledge or, worse still, to illustrate the living organism or satisfy idle curiosity. Such practices as these latter have furnished good cause for complaint, and moved even those less sensitive than Mr. Bergh to protest in indignant tones against them. But there is a higher cause to which vivisection may be made to appeal—the cause of suffering humanity; and when so directed by competent hands, objections on the plea of cruelty seem to be at once unjust and illogical.

ARTISTIC MECHANICS.

A recent notice of a mechanic in Massachusetts who is an expert in that department of natural history of which the butterfly is the chief representative, suggests other and similar instances. It may be that the exactness required in mechanical work develops a taste for close study, or it may be that natural history and pure science become pleasant foils to the monotony of mechanical work; but it is the fact that some practical, day-working mechanics stand high in some scientific specialties.

There is a machinist—a fine tool maker—who is well known, and widely known, as an amateur astronomer. He has contributed importantly to the science, and is not surpassed in nicety and preciseness in designing astronomical mechanism.

Another is an expert steel engraver by choice and as a pastime, and yet, incredible as it may appear, he is a smith or forger, handling steel and iron in bars and the heavy hammer of the blacksmith all day, and doing delicate steel engraving at night or on "off hours." He has nearly finished designing and engraving a series of plates representing the childish legend of the "Death of Cock Robin," the proofs of which are really fine.

One left the machine shop three years ago, and set up as an engraver on jewelry, plate, and similar articles. He originates all his designs, and rarely makes a second drawing. He is a wonderful producer of elegant and legible monograms. A set of six silver buttons for a vest, all uniform in general design and no two alike in particulars, is very artistic, and yet he designed and engraved the six while the customer waited—perhaps an hour. These two instances show that the bent of the authors was naturally artistic rather than mechanical.

There is a young man, thirty years old, a joiner, who is better authority on the flora of New England than some of the authors of accepted text books. The fields, pastures, woods, and by-ways are his haunts when he has an hour "in the season." He is not surpassed as a herbalist, and is quoted as authority where he is known.

A surgeon was spoiled when another man, a machinist, went into the shop. He acts at call in setting bones and reducing sprains. He is so successful that he is in the confidence of the professionals, who are not ashamed to profit by his suggestions.

This mechanic, however, only carries to its ultimate a faculty and a practice that is not uncommon in the shops. It is rare, indeed, that in case of an ordinary accident in the shop there is necessity for outside aid. When the writer was a youngster, he lodged a piece of the sharp, hammer hardened head of a cold chisel in one eye. The "shop surgeon" applied a powerful magnet without avail. Then he cut out the obtrusive particle with a keen penknife blade, making an incision just as he might in a finger. A professional surgeon who afterward examined the eye said that it was a "very creditable job."

THE JACK OF ALL TRADES.

In the shop of one of these men was noticed, recently, some articles sent for repair; curiosity prompted a list of some of them. There were two parasols, the handles of which were broken, one requiring inlaying with gold and silver in plates and wires; several clocks, one an antique musical timepiece marked "Jans Heerch, Haarlaem 1692;" a musical box with a capacity of eight tunes; a seated statuette of Clio, the muse of history, one of whose legs had been broken off. This figure was made of cast zinc, externally bronzed, as most of our foreign "bronze" statuettes are made, and the shell was very thin—not more than one-sixteenth of an inch thick. For this job the mechanic scraped enough of the metal from the interior to determine its quality, and then made a solder to correspond. As

it was manifestly impossible to hand-solder inside or outside the broken limb, which was not more than half an inch diameter, the workman secured the broken parts in place by wire and twine, drilled a concealed hole on the under side, poured in the hot metal, turned the image in his hand for a moment, and the job was done. The flux and fusible metal formed a metallic coating inside the leg, and effectually repaired the damage.

The method employed in this job was only a modification of that used extensively in the manufacture of soft metal wares, as Britannia and silver plated articles. The handles of Britannia teapots, for instance, are cast hollow, but they have no removable sand and rye flour cores, as castings of iron and brass have. These and a hundred other pieces of soft and quick cooling metals are cast in brass moulds, only a sufficient amount of melted fluid metal being poured in to make a thin shell. This metal is equally distributed by turning and shaking the mould in the hand, when it chills, and the superfluous metal is poured out. The doing of this work is a trick, but this competent mechanic was equal to it in the case of a difficult job.

He had on hand, also, musical instruments, drums, cornets, a trombone, an ophicleide, an oboe, and a sewing machine, and an old fashioned spinning wheel, intended to soothe the æsthetic rage of some admirer of antiques. On particular inquiry, this mechanic served four years as a machinist, worked one year in an iron foundry where brass was also cast, became a pattern maker, a decorator, and letterer of railroad passenger cars, worked nearly a year in a gun making establishment, and taught himself engraving and the setting of precious stones, spending several months in the shop of a practical jeweler. In all, he had worked fifteen years for others, and then set up a general utility shop for himself. While he does every job that he undertakes well, he has some special gifts. He is the master model maker of his part of the country, and probably possesses a larger number of inventors' secrets than most men in his line. If there is a particularly nice job of steel tempering to be done, it generally comes to his hand, and leaves it properly completed.

WATER GAS RULED OUT OF MASSACHUSETTS.

The investigation of the illuminant known as water gas, begun some time since by the Massachusetts Board of Health, is now completed, and the report submitted to the legislature. It will not surprise those who are conversant with similar investigations made long since in Europe, to hear that in the present report the use of water gas as an illuminant is strongly condemned. The reason for this condemnation is that a large quantity of carbonic oxide—30 per cent against 7 per cent in coal gas—is left in the product of the process for converting steam into gas by its exposure to incandescent anthracite. This carbonic oxide is, as we know, a deadly poison, and has been found to kill as surely, if not as quickly, as hydrocyanic acid.

In the experiments with animals, the escape of a very small quantity in a closed chamber brought stupor and unconsciousness, and only a little more, death, whereas with coal gas a much larger percentage produced only a condition of lethargy from which the animals were readily roused.

One of the most dangerous properties of water gas is that, being odorless, it is difficult and at times impossible to detect its escape. The animals that were exposed to its influence during the recent investigations passed quickly and motionless from one stage to another until death came. This shows the painless character of the lethal process and the insidious dangers of the gas.

The use of water gas as an illuminant originated in France, but so great was the loss of life which it occasioned that the municipality of Paris, after careful investigation, forbade its use. Yet it is the same process (Tessie de Motay) which is now used here in New York, and which certain persons sought to introduce in Boston. In the report of Chairman Pelouse, of the Municipal Council of Paris, which the Massachusetts Investigating Committee will find to coincide in many details with their own, appears the following: "It was proved that a mixture of one per cent of oxide of carbon killed a strong dog in a minute and a half. It was a case of poisoning. With one per cent of oxide of carbon, all animals died at the end of a few minutes. These experiments terrified me. Since then they have been repeated many times by men of science. Carbonic acid must not be confounded with oxide of carbon. In the course of the experiments of which I have just spoken, I formed an artificial atmosphere with thirty per cent carbonic acid. A large dog, on being placed in it, almost immediately fell on his side, but recovered himself on being restored to the pure air. Thirty per cent of carbonic acid did not kill; but, on the contrary, one per cent of carbonic oxide is mortal."

But this same water gas which has been ruled out of France, and which an investigating committee, made up of scientists, boldly proclaims as too poisonous and deadly to be permitted to enter Massachusetts, is now and has for a long time been in use in portions of New York city and Brooklyn.

A London Freight Depot.

In order to provide for the reception, delivery, and warehousing of both import and export goods from and for the new docks, the London, Tilbury, and Southend Railway Company are now building, says the *London Railway News*, a goods depot and range of warehouses in Whitechapel, which, when completed, will rank among the most important of similar undertakings to be found in England. The area occupied by the goods station is about eight acres, and the cost of acquiring the property has alone amounted to the respectable sum of £420,000. As the Blackwell Railway runs on a viaduct about seventeen feet above the streets, the whole of this area has had to be covered with an arrangement of arches to bring the new depot up to the same level; the road approaches from the main entrance in Commercial Road, being made on an incline of one in thirty to the level of the station. The covered portion, or goods station proper, will be 600 feet long by 200 feet wide, and will be occupied by five lines of rails, three platforms 20 feet wide, and three cart roadways, each 30 feet wide, running the whole length of the building. Over this station, and carried by cast iron columns 2 feet 6 inches in diameter and a network of steel girders, a warehouse, four stories high, will be constructed for the exclusive use of the East and West India Dock Company. The available floor space in this warehouse will be about twelve acres. There will be twenty-five hydraulic cranes on the platforms in the station; and twenty-four hydraulic lifts, each capable of carrying two tons, will convey goods direct from the platforms to either floor of the warehouse above. By these means the unloading and warehousing of a whole train load of goods from the docks will be accomplished in a very short space of time. At the south end of the station a hydraulic crane, capable of lifting twenty tons, will be fixed for loading and unloading heavy machinery, etc., and the whole of the shunting will be done by hydraulic capstans fixed in convenient positions. The warehouses will be fireproof, the floors being carried on steel girders amounting in the aggregate to about 8,000 tons in weight. In order to insure the stability of this enormous structure, the foundations have been carried down into the London clay about 24 feet below the surface, and are constructed of Portland cement concrete, the piers carrying the main girders being built in blue Staffordshire bricks to the top of the building. On the lower or street level the arching has been so arranged that rails, platforms, etc., can be laid down, and there will consequently be two large railway depots, one above the other, over the whole area, the upper and lower stories being connected by hydraulic lifts for the lowering and raising of the railway trucks. In addition to the buildings which they are erecting for the dock company, the railway company has purchased a large range of warehouses abutting on the new works, for their general business.

Electrical Transmission of Power.

M. Cornu has reported on the experiments made on March 4, 1883, at the works of the French Northern Railway, as to the application of M. Deprez's dynamos to the transmission of power along a telegraph wire. The generating machine (a Deprez No. 20) was connected with the receiver (a D Gramme machine transformed) on one side by a short wire of but little resistance, and on the other by a 4 mm. galvanized iron telegraph wire, 17 kilometers = 10½ miles long, passing through the Bourget station. These conditions, although not identical with those which are usual in the electrical transmission of power, did not appear to the commission sufficient to detract from the value of the experiments, as continuous and not alternating currents were employed. The results of the measurements are of two kinds—dynamometric, relating to the power transmitted; and electric, relating to the electromotive force developed in the generating and receiving machines. The following are the principal conclusions deduced from the tables of dynamometric and electrical results which were obtained:

"The work absorbed by the generating and transmitted to the receiving machine increased with the speed of the generator, attaining 4½ horse power for a speed of 1,024 revolutions, against an effective resistance of 160 ohms, representing a double telegraph line 8½ kilometers, or 5 miles, long. The gross yield amounted to as much as 37½ per cent of the work expended; and, if the mechanical motor be allowed for, so as to arrive at the result produced by the successive transformations of energy, the dynamometric result even reached 48 per cent. The table of electrical results shows that the telegraph line practically offered, while the power was being transmitted, that is to say with a current of 2½ amperes, the resistance of 160 ohms, which was recorded with a current of 0·01 ampere during the former experiments. This observation appears to sufficiently establish the agreement of theory and practice so far as concerns an analysis of the phenomena of transformation of energy in the circuit."

General Anson Stager.

General Anson Stager, the well known electrician, died in Chicago, March 26, within a month of being 66 years of age. He entered the telegraph business as a young man, taking charge of the first office in Lancaster, Pa., in 1846, and being successively removed, as the most capable operator, to Pittsburg, and then to Cincinnati, as the telegraph was extended to these places. He devised several valuable improvements in the service, and, on the organization of the Western Union Telegraph Company, in 1856, became its general superintendent. When the rebellion broke out, in 1861, it became apparent that a great military telegraph system would be necessary, and Gen. Stager was appointed to organize and superintend a department for that purpose, Thomas T. Eckert and Albert J. Myer being among his assistants. A special cipher code was originated, which, it was claimed, was never deciphered or betrayed; 15,000 miles of line were built and operated, and it is estimated that over 6,000,000 messages were sent by this military telegraph. After the war General Stager became superintendent of the central division of the Western Union Telegraph Company, but he resigned in 1880, and became prominently interested in telephone systems, electric lighting, etc., having been, until the commencement of this year, the president of the Western Electric Manufacturing Company, one of the largest establishments of the kind in the country.

Why Patentees Fail to Realize.

A gentleman in Texas obtained letters patent something over three years ago for an improvement in lock nuts, his invention being peculiarly adapted to the requirements of railroads, and, further, it had the heartiest indorsement of men practical in railroad construction and operation; more than this, their indorsement took practical form, and a number of them associated together and offered to provide the necessary capital to manufacture, and introduce it, agreeing to turn over to the inventor within a period of five years the sum of fifty thousand dollars, meantime permitting him to draw against said amount in reasonable sums. The inventor, however, had made a mental calculation of the many thousands of miles of railroad in the country, figured up the number of rail joints where lock nuts might be utilized, and, determined that no one should "play him for a sucker," placed his value at one hundred thousand dollars, one half cash down. This effectually closed negotiations, and he has his letters patent still, and retains his job in a machine shop.—*The Milling World.*

The experience of the Texas gentleman is not unlike that which has ended a great many negotiations which have come to our knowledge. Inventors are too apt to overestimate the cash value of their patents and let favorable chances for disposing of them slip by, while they are stopping to calculate the profits which will accrue to them when the improved article becomes universally adopted.

It is not wise to refuse a fair offer if the patent is for sale. It is unwise to repel a purchaser by demanding unreasonable conditions, and yet the price should not be put so low as to lead the would be purchaser to undervalue the invention. As in other matters, it requires considerable business tact to manage the sale of a patent to the best advantage.—ED.

Tempering Process.

Mr. P. Gabriel gives the following new method of tempering steel, in the *Revue Chronometrique.* Cyanide of potassium is dissolved and red heated in a metallic or earthen crucible; the pieces of steel are then immersed in the liquid until red, and afterward plunged in water. This process is said to give great satisfaction, and many advantages are claimed for it. The temper is said to be harder, and if a finished piece is under treatment, the polish is not lost. It will show a grayish tint, but the original polish will reappear immediately, if a piece of polishing wood with the finest rouge is passed over it. It is also said that if the steel has been well annealed, and not put out of shape by the file or the hammer, it will come from the crucible perfectly straight; arbors 4 or 5 centimeters long are not deformed, if tempered by this method. It is recommended as particularly advantageous for tempering escapement springs.

Red Pepper and Salt for Cholera.

A Massachusetts correspondent calls our attention to the publication, about thirty years ago, of a very successful cholera cure, introduced in this way: The captain of an emigrant ship, coming from Europe, had lost many of his passengers by cholera, although freely dosing all who were sick with the remedies then usual. At last he made a prescription of his own—one teaspoonful of red pepper and a tablespoonful of salt to a half pint of boiling water; this to be given as hot as possible, to every patient when first taken. It is said that this simple remedy acted as a charm, curing all the cases on board that ship, and attaining considerable general popularity during the time of that cholera visitation.