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Contents.

(Illustrated articles are marked with an asterisk.)

A brave life gone out..... 64
Agricultural inventions..... 74
Art, the, to produce a cabbage..... 71
Balloon crosses the Channel..... 68
Bathing and cramps..... 66
Blinder for bridles*..... 73
Brass and its uses..... 68
Business and personal..... 75
Can opener*..... 73
Canine intelligence..... 67
Caterpillar, the, and its enemy..... 65
Centrifugal strain in cylinders..... 69
Chinch bugs and kerosene..... 73
Cleanliness of sinks..... 69
Common sense in summer..... 69
Copper for roofing..... 65
Cost of live and dressed beef..... 69
Cotton on conductors, mach. for. 66
Cotton seed oil manufactory..... 66
Decrease of immigration..... 68
Dental drill hand piece*..... 73
Electrical conductors, manuf. of* 63
Electric cable machine*..... 63
Elect. on vegetation, influence of. 71
Engineer and fireman both asleep 70
Engineering inventions..... 74
English parcels post..... 72
English torpedo experiments..... 67
Fern, new North American..... 71
Flowering plants of the world..... 71
Fruit drier, new*..... 73
Gates, improvement in*..... 73
Honors to an American engineer. 70
How to raise big crops..... 65
How to remove a tight ring..... 73
Increased speed of machinery..... 72
Inventions, miscellaneous..... 74
Lighting the Suez Canal..... 70
Lyman-Haskell gun, completion. 64
Machine for whipping silk*..... 66
Magnetic iron sand, process..... 72
Man-eating mollusk..... 73
Mechanical inventions..... 74
Natural history notes..... 71
New books and publications..... 75
Notes and queries..... 75
Novel bicycle*..... 73
Old building material..... 64
Paints and varnishes, waterproof. 70
Parallels for balancing pulleys*... 67
Photo-positives on paper..... 68
Picker fires..... 65
Relation of pat. experts to courts. 64
Reversing rail mill engines*..... 70
Salmon disease, the..... 68
Sense of direction in animals..... 71
Shad tree, a large..... 71
Sketching for mechanics..... 65
Standards for freight car building 69
Station indicator, new*..... 73
Steam navigation, development of 68
Sun dial, improved*..... 73
Telephone interference case, the. 64
Telescope, the, at the Trocadero* 67
Tests of coals..... 69
Trace eye guard, improved*..... 73
Tread power, improved*..... 72
Turbot, goldbutt, and sole*..... 71
Vent lation of public buildings..... 72
Watch movement box*..... 73
Water jet, the..... 65
Waterproof and fireproof fabrics. 70
Waltzer machine, electrical*..... 66
Zinc blende at Niagara Falls..... 67

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 396,

For the Week ending August 4, 1883.

Price 10 cents. For sale by all newsdealers

PAGE

I. CHEMISTRY AND METALLURGY.—Crucibles of Nickel..... 6320
Synthesis of Organic Compounds.—Experiment by A. Bartoli and G. Papasogli..... 6320
Detection of Urea. By C. L. BLOXAM..... 6321
Preparation of Phenetol. By H. KOLBE..... 6321
Hair Restorers.—Lead the active ingredient of the "restorer."—Susceptibility of hair to dyes.—Effect of perchloride of mercury, hyposulphite of soda, silica salts, etc. Similarity of lead restorers. 6321
Progress of Nickel Metallurgy By WM. P. BLAKE.—Nickel heretofore known commercially only as an alloy.—Nickel ore in the United States.—Wrought and cast nickel..... 6636

II. ENGINEERING AND MECHANICS.—The McDonald Stone Cutting Machine.—1 figure..... 6311
Loads and Strains on Hoisting Ropes..... 6311
Steam and Pneumatic Hammers.—2 figures..... 6312
Improved Ruling Machines.—1 figure..... 6312
Waste Cleaning Machine.—1 figure..... 6312
Speed Regulators for Turbines and Steam Motors.—7 figures..... 6313
Hugo Belgram's Gearing for Metal Planers.—2 figures..... 6313
New Method of Distributing Flames in Gas Furnaces.—Numerous figures..... 6314
Steam Trawlers.—6 figures..... 6315
Twin Screw Tug Boat for the Rhine.—Several figures..... 6316
Hydraulic Fan Brake.—3 figures..... 6316

III. TECHNOLOGY.—Brick Manufacture..... 6311
Vinegar Making.—1 figure..... 6320

IV. ARCHITECTURE.—Old House, Hereford..... 6318

V. GEOLOGY AND MINERALOGY.—See Salt. By WM. JAGO.—Manner of formation.—Ingredients of sea water.—Salt in granite.—Bay salt.—Halogens..... 6320
Asphalt.—Its origin, preparation, and uses.—Where it is found.—Separation from rock.—Asphalt mastic and its uses.—Pipes and tubing.—In photography.—Under machinery.—Evils and advantages of asphalt pavements.—Asphalt in New York..... 6317
Asbestos and its applications.—Where it is found.—Varieties of asbestos.—Manufacture of yarn.—Packing and rope.—Asbestos cloth for curtains, shields, etc.—Asbestos millboard.—As an insulator..... 6319

VI. NATURAL HISTORY.—Algin; a New Substance Obtained from some of the Commoner Species of Marine Algæ..... 6323

VII. HORTICULTURE.—Transplanting Trees in Japan..... 6324
Curious Abyssinian Trees.—2 illustrations..... 6324
Edwardsia grandiflora.—1 illustration..... 6325
Matte or Paraguay Tea in Brazil..... 6325

VIII. MEDICINE AND HYGIENE.—Uncommon Diseases in Peru and Bolivia.—By EDWIN R. HEATH, M.D.—Varruga de sangre (bloody wart), seven days' sickness, air, etc..... 6322
Peptone in the Gastric Mucous Membrane.—By F. HOFMEISTER. 6322

IX. MISCELLANEOUS.—Dictionary of Carriage Terms..... 6320
Pollution of the Wells of Mill Cottages..... 6322

X. BIOGRAPHY.—Robert Griffiths, the Father of Screw Propellers... 6317

A BRAVE LIFE GONE OUT.

Captain Matthew Webb, the famous English swimmer, was drowned in the Niagara Rapids, July 25, in an attempt to float "the angriest bit of water in the world," as he styled it. His attempt was not made wholly for notoriety, for no extensive advertising was done, and no means taken to secure a large number of spectators. It was not made for money. Probably less than 200 persons saw this brave man go to his death. But he had great confidence in his powers of endurance, for he had swum the English Channel from Dover to Calais, a swim of nearly twenty-two hours; he saved a sailor by jumping overboard in the mid-Atlantic in a storm, and was the recipient of a gold medal from the Royal Humane Society, and of other testimonials, for his skill and bravery. He came to this country in 1879, and besides giving exhibitions of his own skill, gave lessons in swimming. He was only 45 years old when the remorseless waters drew him out of mortal sight.

Some time before the fatal attempt he stated that he felt himself strong enough and skilled enough to swim the Niagara Rapids and get through alive, in defiance of the stories told by the inhabitants of the adjacent localities as to the danger of these turbulent waters. He even described in detail his plan of avoiding the Scylla and Charybdis of rocks, and the dress he would wear. He had calculated on the methods he would adopt in buoying himself, the use of "breast strokes" and "overhand strokes," all his plans being well thought out beforehand, and his failure should be attributed to his lack of knowledge of the awful hell of waters into which he ventured, which outvie even Poe's horrible description of the "Descent into the Maelström."

Only three persons can boast of having shot the rapids, and they did it in a steam vessel, the Maid of the Mist, in 1861, under circumstances of such extreme peril as may best be understood by the fact that she came out of the ordeal with loss of smokestack and with such other injuries as made her appear like a wreck when she landed on the other shore, miles below her starting point. And this success was made by a boat built to withstand the surges below the falls, and specially lightened for the shoot, with a one hundred horse power engine to propel her. If she barely came out of the test, battered and abused by the terrible waters, it is no wonder that a brave man lost his life with only his own unaided physical stamina and mental courage to back him.

COMPLETION OF THE GREAT LYMAN-HASKELL GUN.

The twenty-five ton gun, twenty-five feet long, which has been in process of manufacture during the year past by the Reading, Pa., Iron Company, is at last completed, and is a splendid piece of workmanship. This remarkable weapon has the following peculiarities of construction:

Hanging from the under after part of the gun are four large protuberances arranged in a line, each something like a cow's bag. These protuberances contain pockets for holding powder, and they communicate with the bore of the gun. The latter is charged at the breech with eighteen pounds of powder, against which the projectile rests in the ordinary manner; each of the pockets is intended to contain twenty-eight pounds of powder.

The firing of the breech charge starts the projectile, which is successively accelerated, on passing the several pockets, by the firing of the powder charges contained in them, which are set off by the flame within the cannon. In this way five successive charges are made to act against the projectile, which leaves the gun with a tremendous velocity. It is expected that this cannon will revolutionize the art of gunnery; it is believed that it will carry its ball twelve or fifteen miles, and go through iron plates two feet in thickness. The new gun is now on its way to Sandy Hook, N.Y., where it is soon to be tested before a board of army and navy officers, under a special Congressional appropriation. A full, illustrated account of this novel invention was published in the SCIENTIFIC AMERICAN of January 28, 1882.

THE TELEPHONE INTERFERENCE CASE DECIDED.

The Examiner of Interferences at the Patent Office, Mr. J. B. Church, has lately rendered a decision in the long contested telephone case, in which the parties interested were Bell, Gray, Edison, McDonough, Dolbear, Boelker, Blake, Irwin, and Richmond. We understand that this decision disposes of some eleven cases in all, in which the above parties were represented. These cases have been pending before the Patent Office since 1878, and were argued before the Examiner about a year and half ago.

It has been necessary for the Examiner to go over a vast amount of testimony, and it is understood that he has performed the duty with greatest care; his decision is stated to cover nearly seven hundred pages of manuscript.

Priority of invention is awarded to Bell for the art by which oral conversation or sounds of any description can be telegraphically transmitted; also for the improvement in the art of transmitting vocal sounds or spoken words telegraphically; also for the acoustic telegraph, including sound producers as well as reproducers on armature plate, the electro-magnet for the same, and a closed circuit passing from the helix of such electro-magnet to the source of undulatory electric energy; also for the telephonic transmitters and the combination in one circuit of two or more disks or diapbragms; also for the combination for rendering audible acoustic vibrations: also for the combination in an acoustic telegraph of an electro-magnet and a polarized armature, and the combination in an acoustic telegraph of an armature plate polarized by induction, a resonant tube, and an electro-magnet and circuit connections.

Priority of invention is awarded to Edison, although he did not claim it, for the transmitter, consisting of the combination in an electric circuit of a diaphragm and a liquid or equivalent substance of high resistance, whereby the vibrations of the diaphragm cause variations in the resistance of the electric current; also for the combination in a telegraph instrument operated by sound of two or more electrodes placed in an electrolytic liquid, and operating to increase and decrease the resistance of the electric circuit by the movement derived from the diaphragm; also for a spring forming or carrying one electrode, and constantly pressing against the other electrode and the diaphragm to maintain the required initial pressure between the electrodes and yield to the movements of the diaphragm.

Priority of invention for "a telephone receiver, consisting of the combination in an electric circuit of a magnet and a diaphragm supported and arranged in close proximity thereto, whereby sounds thrown upon the line may be reproduced accurately as to pitch and quality," is awarded to McDonough.

OLD BUILDING MATERIAL.

An extensive trade in second hand building material has been carried on uninterruptedly in this city for fifty years, and is largely supported by builders and joiners. The stone and brick of an old building is used in the construction of a new one, the lime-whitened bricks making the inside of the outer walls and the partitions, and the stone going into the foundations. But it is not generally known that the inside woodwork is used again, frequently without radical alteration. Many builders prefer this old timber because it is thoroughly seasoned, having been defended from the weather and been subjected to the influences of a measurably even temperature for years. The richer woods which are admired for their color acquire mellower tones by age and become more valuable as the years pass. Everybody knows that furniture of mahogany and rosewood that has outlived several generations is much handsomer than that made from new wood. But it has an added value as mere material. An article made from the old wood will retain its integrity in all its joints; its shrinking days are over. For the same reason the timbering, waiuscoting. and flooring of old buildings has an added value, although its selling price is less than that of new material.

THE RELATIONS OF PATENT EXPERTS TO THE COURTS.

When a case involving scientific principles comes up in the courts the custom is for each side to call to their assistance scientific experts. These are men who, on account of education and profession, are admitted to possess a peculiarly full knowledge of the scientific points involved in the issue.

They occupy an anomalous position. They are summoned nominally as *amici curiæ*, or friends of the court, to assist in its deliberations, and give it information in the special knowledge required to dispose of the questions that come before it. This assumes that they are quite disinterested and indifferent to the ultimate issue. Yet each side engages its own expert, and each of these experts takes as favorable a view as possible of his own side and runs down the other as much as possible. Although their compensation does not depend on the final decision that is reached, if they were to act as judges and not give their own side the benefit of all doubts, their occupation would soon be gone. The fact that they are in some sense advocates is recognized by the court. The fact that they are retained by one or the other side to testify in its favor is admitted.

Because it is always possible in this special class of suit to engage experts to testify on either side, a certain degree of distrust for their opinions is often expressed. The great truth is overlooked, that in not one case out of a hundred are the principles so clear that something is not to be said on both sides. Yet the complaint is continually made that the expert is too much the advocate.

Among lawyers who practice in patent suits different views of this subject obtain. Some say that they do not believe in experts. They would prefer to conduct their suits without them. The general custom is all that makes them retain them. These lawyers will often be found to be among the best of their class. They will have so good a knowledge of the principles of science, as to quickly grasp the mechanical points of a case. They could act as experts themselves, but custom requires that they should have some witness, one obliged to tell the whole truth, as a supporter of their views. Such a supporter has been found to have great weight with the court, and to be of much influence in controlling its decision.

Some lawyers propose another system. They say that the expert should be engaged to present the views of the counsel to the court. They should not be witnesses. Their statements should be an exposition in understandable and correct form of the views of the counsel. This statement should be given as a one-sided view, and should not profess to be disinterested. Finally, it should not be given under oath. This certainly is meeting the difficulty, and justifies the expert in the most advanced position of advocate which he may be inclined to assume. Were his position recognized as this one he would still remain to a certain extent an *amicus curiæ*, while the fact of his being an advocate would be recognized as proper and right. At present this is practically

his position. except that his testimony is given under oath. This places a great restraint on his direct testimony, and enables the opposing counsel to test the validity of his views by cross-examination.

There is yet another way of disposing of the difficulties of the case. It is to have experts called by the court directly, and paid by it to assist it in its deliberations. At present experts are to all intents and purposes assisting counsel. This would make them assisting judges. The idea of thus using them is quite a popular one. Many of our best lawyers advocate it. The expert would occupy a wholly disinterested position, and the decisions he reached would have every chance of being equitable and just. In this suggestion there is much that is attractive, and in a more advanced state of society it would seem worthy of being carried out.

But the same necessity which calls for advocates and lawyers to argue separately each his own side of a case calls also for experts on the separate parts of complainant and defendant. When two people come to an issue they do not go before a court and accept its unaided judgment as infallible. Each side engages its own counsel. These are officers of the court, yet are not prohibited by that fact from taking one side or the other of a case. Their duty is to do so, and be as one-sided as possible, and to carry every possible point in their client's favor. No matter how able the judge may be, his time is too important to be devoted to looking up authorities and to studying each from the books. He sits in judgment upon the views presented him by counsel. If they are properly put forward, he in many cases can decide the case without leaving his seat. Thus business is expedited, and the main expenses of a suit are borne by the interested parties and not by the government.

Were the court to call an expert for its guidance in special suits, and were the parties in the suit to have none, the position would be analogous to that of a court sitting in direct judgment or arbitration, with no lawyers to advocate the causes of those appearing before it. There would be no summary of the scientific questions presented. This work would fall upon the court and its expert. Business would be delayed, and a very considerable expense be placed upon the court. It would not be much better to dispense with experts than to dispense with counsel.

At present the scientific views are well presented. The experts give them in detail. They are formulated after discussion with their counsel. The counsels in their briefs and arguments summarize them, and present to the court their most salient and applicable points. The expert has been debarred by his position of witness from arguing the case. Any tendency he may exhibit in his testimony toward such a course is met by objection from the opposing counsel. All he has been able to do is to give his views as a specially qualified witness. The counsel completes the work the expert has begun. He can give the fullest license to his reasoning powers in proving his case. The argument is the supplement of the expert's testimony, and has therefore to follow it very closely. A departure from any of the views brought forward by the expert will be made to tell forcibly against the same side.

Thus it will be seen that the lawyer and expert must work hand in hand. One cannot go ahead without the other, the witness being the most restricted on account of his position. While his testimony must bear the stamp of independence, it will necessarily be partial. As this partiality is known and recognized as an attribute of expert testimony, it gives the professors of it a known standing. They are considered with justness as specially educated witnesses retained for the purpose of presenting the views of one side to the court. They should not be considered as sailing under the false colors of a pretended disinterestedness.

THE CATERPILLAR AND ITS ENEMY.

The ordinary caterpillar is covered with bright yellow hair, has a deep brown stripe down the back, has four tussocks, or tufts, of hair in a row back of its head, and has two small red warts on the two segments next the last. From the extremity projects a single pencil of hairs, and from the head radiate two pencils having the appearance of horns. The eggs from which the caterpillar, or grub, is hatched are small, white, and hard.

When the grub emerges it commences to feed, bending all its energies toward gorging itself. It grows rapidly, shedding its skin several times, and when full sized, or full fed, as it is termed, is ready to spin its cocoon and enter the pupa or chrysalis state. The hairs of the body are woven in the cocoon in addition to the thread spun. The female case is longer and thicker than that of the male. From the cocoon emerges the moth known as the *Orgyia leucostigma*. The females are wingless, having only rudimentary wings, and do not travel any distance. The males are smoke colored with spotted wings. The female lays about 230 eggs, covering them with gluten and a silk which she spins, so that the nest has the appearance of a little tuft of white cotton. She sometimes draws leaves around the nest so as to completely close it, excluding the rain and deceiving the eyes of the birds.

The ichneumon fly is a parasite, its prey being the caterpillar above described. The female deposits its eggs on the back of the pupa in the cocoon of the caterpillar. When the egg is hatched the grub works its way down into the pupa, on which it feeds. When full fed it spins its cocoon in which it completes its transformation, coming forth as a fly. The fly is slim bodied, about one-half an inch long, and of a black color. In some species the antennæ and legs are red, but in the one under consideration the antennæ are black with the exception of the center, which is white.

There is no way by which the worm-pest can be got rid of, and although this fly aids in the work of destruction, his numbers are too small to make his efforts appreciable. Undoubtedly the best way yet devised is to brush off and destroy the nests of the moth. Generally they are easily seen, and when it is remembered that each one contains more than two hundred eggs, it is easy to conjecture what an inroad one man could make in the ranks of the caterpillar.

SKETCHING FOR MECHANICS.

While the value of a knowledge of mechanical draughting to a mechanic is indisputable, there is a sort of free hand drawing, or sketching, that is also useful. The faculty for its practice may be innate, and in that case but slight instruction is necessary to enable its possessor to illustrate his thought far better than he could impart it verbally. But even those whose natural tendency does not impel them to sketching as explanation can get enough facility by practice to make themselves understood readily.

Probably nothing is more difficult to explain and exhibit by words alone than mechanical construction and mechanical movement. It is not only difficult for the narrator, but also for the listener. The memory must hold all the points of the information in contact ready to make a completed idea at the climax. But an appeal to the eye, however crudely made, presents the entire image at one view without any laborious action of the mind. And it is a noticeable fact that those mechanics who are of an inventive, improving, and originating turn of mind are most apt with pencil and paper, or chalk and slab. To them the mechanical idea has received a form in their own mind, and by a partial representation they seek to impart their knowledge to others.

The practice of sketching as illustrative of verbal statement is an excellent one for mechanics generally to acquire. If one has not the natural impulse in this direction, a few lessons in free hand drawing will not be amiss. Some of the best of James Watt's improvements derive their historical and mechanical value from his rough sketches, which told much more plainly than his equally crude English the operations and conclusions of his constructive mind. In the annual meetings of mechanical engineers there is seldom a paper read that is not illustrated by the author, at the time of reading, by the blackboard and chalk, or else it had been made visible by prepared cartoons, or possibly lithographed charts. Shop work also demands the ready hand at sketching. There are many jobs which do not require the preliminary preparation of the draughting room, that are greatly expedited if the foreman has a facility with pencil, crayon, or chalk.

PICKER FIRES

A writer in the *Textile Record* for July asserts that a fire cannot be started in a picker house by sparks of fire from the picker igniting the cotton; "no spark from a picker ever fired a mill or ever can be made to set fire to anything." As the writer well says, "these are tolerably broad assertions." Nevertheless, he offers as evidence in favor of their truth the result of experiments which he made, such as producing a shower of sparks from a brick held against the beater, into which was thrust successively shoddy, cotton fiber saturated with benzine, and even lucifer matches. The open hand held against the stream of sparks felt no pain.

The sparks from an emery wheel do not burn the hand, nor ignite the workman's apron or overalls, but each particle is a minute coal of fire, and under favoring circumstances will ignite inflammable and explosive materials. Sparks from a flint and old file will ignite tinder, charred rags, and punk. But to do so the sparks must be protected from the wind. Possibly the experiments made by the correspondent were made with the beater box uncovered, and the lint and other materials and the shower of sparks were exposed to the blast from the revolving beater. It is probable that particles of grit, nails, bits of wire, and similar materials do run the gauntlet of the picker beaters frequently without inciting a blaze, as the condition of the waste proves; but there may come a time when, all the conditions being favorable, the destructive spark will do the work.

The writer attributes fires to the spontaneous combustion of oily waste which is put into the picker house. If such a reprehensible practice is followed, or allowed by a mill superintendent, he is certainly an unfit man for his place.

It is not always possible to ascertain the cause of a fire that starts in the picker room, but that mills are burned by fires started there is unquestionable. Mill owners show their belief in the danger from this source in erecting detached fire proof buildings for picker houses, and it is doubtful if a single mill owner could be found so confident in this correspondent's belief as to allow experiments be made in his picker house by passing through the rolls to the beater nails, wire, or grit with the cotton. At all events, no degree of the vigilant caution now practiced to prevent these foreign substances from reaching the picker should be relaxed because cotton lint once did not take fire from a shower of sparks.

AN artesian well sunk by the Pierce Well Excavator Company for the Manhattan Elevated Railway Company, at 128th Street corner 2d Avenue, in this city, has a depth of 250 feet, and yields 250 gallons of water per minute.

How to Raise Big Crops.

It has often been asserted by advanced agriculturists that if wheat, either spring or winter, is sown in drills, far enough apart to admit of using a horse hoe between the rows, both to keep down weeds and loosen and aerate the soil, the yield might be increased to a marvelous extent more than it now is in this country.

In proof of this, a recent observing and intelligent traveler in Belgium gives the mode of culture there and the yield, which sometimes, with very favorable weather for harvest, reaches as high as 160 bushels per acre. This is one of the most fertile, prosperous, and most populous countries in the world, supporting 481·71 persons to the square mile, against 13·92 in the United States and 216·62 in Germany. Winter wheat is a staple crop there on their high priced small farms of only an acre or two. The land is highly manured in Autumn, well harrowed several times, and got into the best possible condition. The grain is sown in the fall in seed beds, very thickly on the highest and best location, where it is not likely to be winter-killed, or injured by any casualty, such as overflowing or drowning out, or smothering under the snow.

In the spring the main fields are again dressed up and marked out in drills the proper distance. When the wheat has grown sufficiently to be moved, it is thinned out by being taken up, separated from the thick stools, and planted in the drills with a tool called a dibble, which makes a hole the proper depth, into which the wheat roots are inserted, pressing the earth tight against them with the foot. This work is usually intrusted to half grown boys and girls, a man sorting out the wheat plants in order that those of the same size may be placed together, that the field may grow even and regular.

When the plants have commenced growing, the soil is thoroughly and constantly stirred, either by means of hand or horse power. Every weed and all foreign plants are destroyed, and nothing but what is wanted, the article itself, is allowed to grow. There are very seldom any extensive failures of crops thus carefully and scientifically grown. The yield is a quantity never imagined or heard of in this country, and the crop always and surely pays the cultivator.

It is asserted that such pains would not pay to apply to crops in this country. But do we not go to the opposite extreme? Has it ever been tried here? It certainly would pay satisfactorily if applied to choice varieties in small quantities, about to be used for seed. It is certainly better to till one acre and get a crop now raised on four acres, than to try the four and only raise half a crop, which is now so often the case here.—*Milling World.*

The Water Jet.

The *Annales des Travaux Publics* describes the method used in sinking the piles for the foundation of the Palais de Justice at Brunswick (Prussia).

A framework with hoisting fall somewhat similar to the ordinary pile driver was used in placing the pile in position ready for sinking; two tubes, each 2 inches in diameter, with the lower ends bent inward toward the point of the piles, were attached to the piles by iron staples; at the upper end each pipe was connected by a short section of rubber hose to other pipes connected with the city water main, which water supply was in this case under a pressure of four atmospheres. The piles usually sunk by their own weight into the hole formed by the water jet, as soon as the valve was opened, making connection between the tubes on the pile and the water main. To hasten the rate of settlement, a vertical iron bar 3 feet long was set into a hole bored in the head of the pile, and upon this were placed iron weights of 200 pounds each, as the resistance might require.

Piles 12 inches in diameter were sunk in this way to a depth of fifteen feet in 10 minutes' time. The least time required for a depth of 15 feet was 2 minutes, the longest time for the same depth was 30 minutes. As long as the water jet was in operation at the foot of the pile it was possible to give the pile rotary motion, and thus facilitate the descent; but as soon as the jet was stopped the pile became immovable. As a proof of their stability a dead weight of 50 tons was applied to some of them, and it was found that their resistance was entirely independent of the time consumed in sinking them.

To sink 20 piles by this method required the use of about 2,000 gallons of water; 7 or 8 laborers were employed, and one gang put down from 6 to 14 piles per day.

Copper for Roofing.

In speaking of the cost of building materials an architect recently suggested the use of copper instead of galvanized iron or "terne" sheets for roofing purposes. He said that copper costs only about double the price of tin, or iron, for the same area of roof, that it is practically indestructible by time, and that even if the building it covers is pulled down the roofing material possesses an absolute value. The price of copper has seriously declined within the past year, and if the supply continues to augment much more, the metal will soon be as cheap as tin.

COTTONWOOD lumber seems to be coming into large use, and for dry goods cases, starch boxes, and similar purposes it is said to be well adapted. One establishment in Ohio, it is said, works into boxes as many as two million feet of lumber annually. For building purposes it is not well adapted, as it is apt to swell and shrink with the condition of the atmosphere.