SCIENTIFIC AMERICAN

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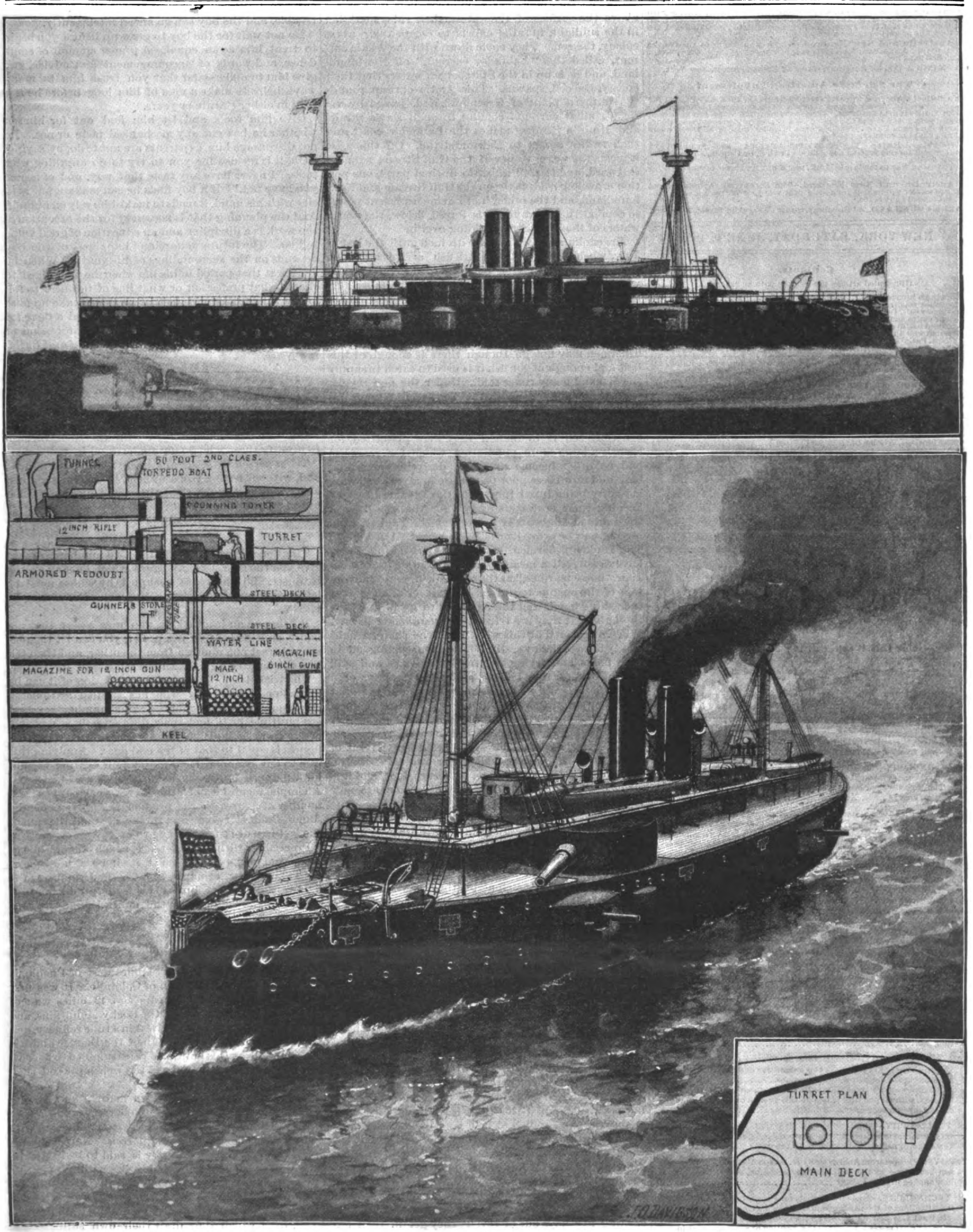

THE U. S. ARMORED BATTLE SHIP TEXAS.—[See page 357.]

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Contents.

(Illustrated articles are marked with an asterisk.)

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For the Week Ending June 9, 1888.

Price 10 cents. For sale by all newsdealers.

THE COD HAVE "STRUCK IN."

A dispatch from Newfoundland says that the caplin have "struck in." This means that the cod, the most famous of all commercial fish, has arrived on the banks. From now until November the cod will "run," and the great fleet of fishermen, hailing from our own eastern coast and from New Brunswick, Nova Scotia, Prince Edward's Island, and Newfoundland, consisting of nearly 1,000 vessels, not including the French fleet, will be kept busy.

Those who have been on the Newfoundland coast when the caplin "strikes in" will not forget the excitement that ensued; the beautiful little fish, about seven inches long, filling all the bays and bights of the shore line, tumbling over each other, and darting up above the surface of the waters, their sides sparkling in the sunlight, in futile efforts to escape their worst enemy, the cod. They come down with the Arctic current, called the "Labrador current," off Newfoundland, and it is up in the Spitzbergen waters that their enemy, the cod, spawns. This Arctic current rounds the southern point of Greenland, and, joined by various similar currents coming through Davis Straits and Hudson Straits, makes the Labrador coast and then rushes across to Newfoundland. Off this coast it meets the warm waters of the Gulf Stream running eastward, and is split into two distinct parts, one portion crowding itself between the Gulf Stream and Newfoundland, and the other, not having sufficient power to combat this great force, is forced below, the warm waters of the Gulf Stream riding over it.

The caplin supply the cod with food until the last of July, when the squid or cuttlefish arrive and take their place; these giving place in turn to the herring, which "strike in" about the middle of September. As if they know all about the fisheries treaty, and were in favor of its continuance, these little fish almost always keep strictly within the "three mile limit" line, that is to say, within Canadian waters, where the Yankee fishermen may not go, though there is enough of this bait and enough of the fish it is used to catch to supply the demand many times told. Under the new regulations adopted by Canada, the Yankee fishermen are not permitted even to buy bait, and willing enough they are to do so, and gladly would the Canadian fishermen sell it to them if they were permitted, for there is a large shore population which for years has had no other income save that derived from selling bait, and now these poor people are in a very bad way, in reality being taxed to pay the Canadian cruisers for keeping their customers away; for the sole duty of these armed tugboats is to prevent the Yankees from buying bait or provisions or ice to keep their fish fresh. The Yankee fishermen, with characteristic ingenuity, have discovered a means of circumventing the Canadian "horse marines," as they are called, taking advantage of the opaque fog which seems ever to hang over the fishing banks and their vicinity to go in and take the bait that they are refused the permission to buy. When discovered at this work from the shore, a fight nearly always follows, the shore men coming off in their boats and trying to "trip" the seines and spill out the bait, for they believe, and with reason it would seem, that, should their neighbors be able to get what bait they want, there would not be any excuse for a fishing treaty with them at all, and hence no further market for the bait they are wont to catch.

Last week, a part of our fleet started for the Gut of Canso, between Nova Scotia proper and Cape Breton Island, a district of the same, to secure bait, and it is said that some of the Canadian fishermen are now making a business of supplying them at sea. The French fleet consists of about 400 sail; and though now the French possessions in North America are restricted to a small group of islands on the western coast of Newfoundland, these Frenchmen catch and cure a very large amount of fish, being expert and industrious and sending the catch across the ocean to their own country, where it easily competes with the catch taken in the North Sea. Miquelon, the principal of the French group, the others being St. Pierre and Isle Aux Chiehs, though one of the most dangerous parts of the coast to approach in a southeaster or southwester, is the chief headquarters of the Gaul. The shores of this island are always strewn with wreckage, mostly of French craft too, but the Frenchman has great endurance, if not so much skill as his Anglo-Saxon brother fishers, and, having a ready market for hake and haddock and turbot and alewives, as well as for cod and halibut, there is great incentive to fish. The treaty made with the English, when they ceded these islands to the French, permits them to take bait and dry their fish and nets along the Newfoundland coast, but notwithstanding this there is continual dissension among the two peoples. The Grand Banks, the principal fishing grounds, are 600 miles long and about 200 wide, with a bottom of shifting sands, "no holding ground," as the sailors say; and while in ordinary weather the schooners—they are from 80 to 125 tons—ride to their anchors with a long cable out, as soon as it comes on to blow, and the sea rises—conditions existing five days out of seven—they get in their anchors and heave to under close-reefed foresails.

Don't Undervalue the Boy.

Too many men make their boys feel that they are of little or no account while they are boys. Lay a responsibility on a boy, and he will meet it in a manful spirit. On no account ignore their disposition to investigate. Help them to understand things. Encourage them to understand what they are about. We are too apt to treat a boy's seeking after knowledge as mere idle curiosity. "Don't ask questions" is poor advice to boys. If you do not explain puzzling things to them, you oblige them to make many experiments before they find out; and though experimental knowledge is best in one sense, in another it is not, for that which can be explained clearly does not need experimenting with. If the principle involved is understood, there is no further trouble, and the boy can go ahead intelligently.

Do not wait for the boy to grow up before you begin to treat him as an equal. A proper amount of confidence, and words of encouragement and advice, and give him to understand that you trust him in many ways, helps to make a man of him long before he is a man in either stature or years.

Give him tools, and let him find out for himself whether he has got any mechanical taste or not. Do not discourage him, as parents are apt to do, by saying, "Oh, it is no use for you to try to do anything with tools. I never have any taste that way, and of course you have not." If a boy finds he can make a few articles with his hand, it tends to make him rely on himself. And the planning that is necessary for the execution of the work is a discipline and an education of great value to him. The future welfare and happiness of the boy depends on the surroundings of his youth. When he arrives at that period in his life when he is obliged to choose what profession or what line of business to follow, it is highly important that he should take no false step. And if in his youth he has cultivated a taste for any particular branch, the choice of a profession or business will be made more easy.—*Architect and Building News.*

A Trick with Figures.

The following mathematical trick, from *La Nature*, although not new, may be revived for the benefit of those who are unacquainted with it. It never fails to mystify those who do not understand it.

Tell a person to select any even number of figures, and, without letting you see them, to write them *down* and then place under them the same figures *in reverse* order. Thus, for example:

943518
815349

This done, ask him to add the two numbers, and to give you the sum, less any figure which he may choose to reject, and the space occupied by which must be left blank or shown by a hyphen. For example, 17588-7.

Putting on an inspired air, you now assert that the figure omitted is 6. If you prefer, you can let the person subtract one number from the other, and then tell him the omitted figure with the same ease.

The trick is simple, and the explanation of it can be understood by any boy who has studied arithmetic. The sum of a number and the same number reversed is a multiple of 11, and their difference is a multiple of 9. Now, in multiples of 11, the sum of the even figures is equal to that of the odd ones. Applying this rule to our example, 17588-7, and representing the unknown figure by x, we have $x+8+7=1+7+5+8=21$. A simple mental calculation gives $x=6$. Where the number of figures in the product is an even one, the sum of the first two or first three will equal the sum of the last two or last three, and so on.

Proceeding with the difference, which is a multiple of 9, the sum of the figures must itself be a multiple of 9. Taking our example, 1-8169, and adding the figures, we obtain 25, but as this is not a multiple of 9, we have to add 2 to obtain the multiple, and this was the figure rejected.

The Oil Wells of Florence, Colorado.

This town, situated about 30 miles west of Pueblo, is the center of the oil region of Colorado. It was first discovered about twenty years ago, 12 miles west of the town, in the foothills of the Rocky Mountains, and was pumped up by hand, refined in a rude refinery, and sold for $1.50 per gallon. When the Denver and Rio Grande Railway was built, the price tumbled to 50 cents per gallon, and the owners of the well supposed their business ruined.

There are now within the town limits about twenty paying wells, yielding about 1,000 barrels crude oil, or 450 barrels refined oil, daily; also two oil refineries, with a total daily capacity of 1,000 barrels. New wells are being bored, and the industry is said to be in its infancy. The town has doubled in size within a year.

The Denver and Rio Grande and the Atchison, Topeka and Santa Fe Railroad companies have extensive coal mines of excellent quality within three miles of the town, from which they draw their own supplies and furnish the towns throughout this part of the State.

Wages Here and in Great Britain.

In the sixteenth annual report of labor, by Mr. Carroll D. Wright, of Boston, at page 107 he says: In the fall of 1883, we started upon an original investigation through personal agents of the bureau, in Massachusetts and Great Britain, and through these agents we have gathered from original sources (meaning by original sources the pay rolls of great manufacturing establishments, the official wage lists agreed upon in England, so far as England is concerned, between trade societies and employers, and from other reliable sources) the rate of wages paid in the following twenty-four industries, which are common to Massachusetts and Great Britain:

Industries, 1884.	General Average Weekly Wages paid to All Employes.	
	Massachusetts.	Great Britain.
Agricultural implements	$10.25	$8.85
Artisans' tools	11.80	4.89
Boots and shoes	11.63	4.37
Brick	8.63	4.16
Building trades	14.99	7.21
Carpetings	6.08	4.11
Carriages and wagons	13.80	4.89
Clothing	10.01	6.71
Cotton goods	6.45	4.66
Flax and jute goods	6.46	2.84
Food preparations	9.81	2.72
Furniture	11.04	7.96
Glass	12.28	6.94
Hats—fur, wool, and silk	11.01	5.51
Hosiery	6.49	4.67
Liquors, malt and distilled	12.87	12.66
Machines and machinery	11.75	6.98
Metals and metallic goods	11.25	7.40
Printing and publishing	11.37	5.52
Printing, dyeing, bleaching, and finishing cotton textiles	8.67	4.94
Stone	14.39	8.58
Wooden goods	12.19	5.67
Woolen goods	6.90	4.86
Worsted goods	7.32	3.60
All industries	$10.31	$5.86

The Gamboa Dam on the Panama Canal.

Mr. Jacobson, an engineer from the Panama Canal, is staying at the New York Hotel. He arrived on the steamer Colon, from Aspinwall, and is on his way to France. Mr. Jacobson is a graduate of the Polytechnicon of Zurich, and has a fair knowledge of English. His position on the canal works was a very responsible one—that of chief executive officer for the Societe des Travaux Publics, contractor for that part of the line between Obispo and Emperador, including the celebrated Gamboa dam. Mr. Jacobson has been in the employ of the Societe for a year and a half, during which time he has resided on the canal line, giving the work his personal supervision. He returns to France at this time for needed rest and to arrange personal affairs.

In reply to inquiries about the condition and prospects of the Panama enterprise, Mr. Jacobson expressed his entire willingness to give any information in his power, and to pronounce an opinion upon any matter that fell within the range of his observation. He said work had commenced on the Gamboa dam, which, after long hesitation, was at last decided to be necessary for the control of the Chagres River.

Of the 3,000,000 cubic meters of material that the dam is to contain, about 30,000 have been deposited on the opposite ends of the works, at the bases and sides of the two large hills Obispo and Santa Cruz, between which the dam is to be situated. These deposits are far enough from the bed of the Chagres to be safe from the current, even during a freshet.

When, however, the work is further advanced, and the center of the dam is reached, which is to oppose the flow of the current, it is feared that the floods of the rainy season will carry away all the material within their reach. It is Mr. Jacobson's opinion that unless this central part of the dam can be completely finished in a single dry season, it will be found very difficult and perhaps impossible to construct it at all. Mr. Jacobson says, with reference to operations during the rainy season (which has now set in), that little more can be done while the rain lasts than to take care of the yards and material and preserve the work already accomplished.

Representatives of M. Eiffel, under the new contracts for locks, have begun work at several points, but the plans, Mr. Jacobson says, are still inchoate, and the number of locks and their final location not yet determined. In the excavation of the locks there will doubtless be obstacles to overcome. Already at points between the forty-fourth and forty-eighth kilometers the excavations made are actually too deep for the lock canal on the proposed level, which will necessitate the construction of dikes on one side to raise the water of the canal above that of the river. In this section the canal is in a plane with the Chagres and Obispo at their junction. That part of the Chagres will be suppressed by the Gamboa dam, and its flow diverted into an artificial channel on the south side of the canal, but a dike of about four kilometers in length and nine meters high must be raised between the canal and the Obispo.

M. Eiffel will have no part in any of the canal work, except the preparation for and construction of the locks. The other contractors continue the dredging and excavation as heretofore, except for such modifications as the new project necessitates. The completion of the canal does not, therefore, depend upon M. Eiffel any more than upon any other of the contractors. When asked whether he thought the canal could be completed and open for traffic in 1890, Mr. Jacobson smiled broadly, and said that if the work on the Isthmus could be completed in five years, it would be a great achievement.—*N. Y. Evening Post.*

Filtration of Water.

At a recent meeting of the Society of Engineers, London, a paper was read on "Filtration by Machinery," by Edward Perrett, A.M.Inst.C.E.

The paper first compared the processes of straining and filtering, and pointed out that in the latter process the mutual attraction of particles of matter, in addition to the straining action, causes the retention of the suspended material in a liquid passing through the filtering medium. After describing the early experiments made by the author in filtering Thames water through filter bags, such as are used for the filtration of sugar, the paper pointed out the danger of using animal charcoal for the filtration of drinking water. This material has the power of taking out matter in an infinitely fine state of division, and even in solution, the charcoal becoming so charged with such matter that nothing short of subjecting the charcoal to a red heat is sufficient to thoroughly clean it. An animal charcoal filter with any system of washing will gradually accumulate the very fine matter, which may germinate, and at length be carried through with the filtered water. A filter with a granular medium—such as crushed retort coke—designed by the author, is effectually cleaned by an upward stream of compressed air occasionally applied. This causes an agitation of the material, and the attrition loosens the dirt, which a small current of water washes away. At a waterworks in South America, where these filters are used, 20,000 gallons of river water are filtered per hour, the floor space covered being 37 feet by 7 feet 6 inches, or an average rate of nearly 100 gallons per square foot of filtering surface per hour.

The purification of water containing organic matter by contact with iron was mentioned. The original method of using Professor Bischoff's "spongy iron" on a large scale was to mix the spongy iron with gravel, and to use this mixture as a filter bed; but it was found that the top surface became hard and impervious after a short time, and Mr. Wm. Anderson introduced a machine to supersede these spongy iron filter beds. His "revolving purifier" causes ordinary iron borings to be mixed with the water as it passes through the machine. The water is afterward filtered through ordinary sand beds.

For the filtration of very muddy water for manufacturing purposes, sponge is used by the author. The machine consists of a cylindrical casing, in which sponge is compressed between two diaphragms; the lower diaphragm is movable and attached to a piston rod, which passes through the top cover. To clean the sponge, an up and down motion is given to the lower diaphragm or piston, thus alternately compressing and releasing the sponge. These filters will render Thames water at London clean enough for boiler feeding or other manufacturing purposes at the rate of about 100 gallons per square foot of surface per hour. The precipitate resulting from the processes known as "softening" water is now generally extracted by filtration. The material used for this purpose is the filter cloth referred to at the commencement of the paper, as the chalk deposit may accumulate to a considerable thickness before it becomes impervious. In this case the deposit is easily removed. The author finds that simple external jets of water are sufficient for the purpose.

House Moths.

"Have you anything that is sure death to moths?" asked an anxious-looking housekeeper of a druggist the other day.

The druggist smiled, looked as though he would like to say "chestnuts," but answered: "So you belong to the moth-persecuted multitude of housekeepers? Well, for articles to be packed away in boxes or drawers, there are several things I can recommend. Some people prefer one remedy, some another. You will find some families putting their faith and their winter clothes in snuff or tobacco; others favor red pepper; but for many years I have used camphor, and consider that the best of anything. There is nothing disagreeable about it, and moths don't seek it as a regular diet; in fact, will never come where there is the camphor odor."

"Doesn't it evaporate too quickly?"

"No. Put in good sized pieces, and there is no danger from that source. A piece as large as your fist in six months or a year will be the size of a hickory nut, and the odor will penetrate every part of the box or drawer where the clothing is packed.

"Cedar chips are also a preventive," he continued. "Sprinkle them in among goods packed away, and you will have no moths. But they are not very easily obtained. Sometimes they can be found at a cigar box factory, but there are not enough to make their use very general.

"The best way of all," he added, "is to have a large cedar chest and pack everything in that. But such chests are expensive, and common mortals must content themselves with other methods."

"Can moths be kept out of things that are in every-day use, like carpets, furniture, curtains, etc.?"

"A good housekeeper should never be troubled with moths in a carpet, for if it is swept thoroughly, especially the edges and corners, moths will not make it their abiding place. Newspapers laid under a carpet are said to be an effective aid in driving away these troublesome pests, but hard sweepings are more reliable. If a room is to be shut up for any length of time, something should be sprinkled over the floor.

"Portieres and all curtains must have frequent shakings, or the moth millers will be sure to lodge in their folds. The great object is to keep them out of a house, for when they once locate and take up a claim they have the 'squatter's right,' and only force can drive them out."

"But how are the unfortunates who already have them in their houses to get rid of them?"

"For such cases I know of nothing better than some of the moth powders. The other things I have mentioned are preventives against moths, but these powders kill the moths themselves."

"Are they poisonous?"

"No. They are perfectly harmless. The moths don't eat the powder, but are suffocated by it. The powders are made from a tree that grows in Persia, and will kill anything that hasn't lungs. I sprinkle it plentifully around a room where there are moths, shut up the room for a while, and what moth-heaven gains we lose. The powders are good to put under carpets, and if a house is to be closed, should be liberally used in every room. A carbolic acid dilution is also very good for anything that can be dampened without injury."—*Chicago News.*

Pyrogravure.

At one of the recent sessions of the Societe d'Encouragement, Mr. Perier presented a communication upon the application of burning to the decoration of wood, leather, glass, etc.

This new process of engraving is not mechanical, and has nothing in common with branding boxes, corks, etc., with a hot iron.

Pyrogravure is a new method of engraving in black, reddish brown, bister, etc., by the use of a red hot metallic point. The engraving is done as easily as is drawing with a pen or pencil. A scraper and some gum serve to suppress or lighten the lines upon wood, just as upon paper.

Mr. Perier obtained his first pyro-engraved drawings with red hot pokers and the conical cauteries used in surgery. These burners, which it was necessary to keep continually heating, were replaced by platinum burners heated by an electric current, and then by instruments based upon the principle of gas soldering irons.

The invention of the Paquelin cautery has certainly given the best instrument of the kind to surgery and the best burner to pyrogravure. It is by the aid of one of these wonderful instruments that Mr. Perier produced the specimens that he exhibited at the above mentioned session. It is also with this instrument, the point of which is bent for its new application, that he demonstrated his new process, by making an engraving in the presence of the assembly.

The rubber bulb that serves to send carbureted air to the cautery has been replaced, for photogravure, by an organ bellows, an air bag, or a charged gasometer. The draughtsman, after regulating the pressure, has nothing to think of but his work, the burning tool remaining incandescent an hour or more if necessary.

Art decoration on a large scale, and industrial ornamentation, have in pyrogravure a new means of utilizing the talent of the artist and the skill of the workman. By means of it, we can just as well draw a portrait or a landscape as decorate a room, piece of furniture, or any other object, or mark the handle of a tool. The lines made by pyrogravure have not the sharpness of those given on wood by the graver or gouge. It increases the decorative effect of marqueterie and of objects of wood or leather inlaid with metals, ivory, mother of pearl, etc.

Binders, cabinet makers, toy manufacturers, etc., will be able to employ it with advantage for cheaply ornamenting their products. In a word, any object capable of being carbonized, or modified by the action of burning, can be ornamented or marked by this process. The process therefore interests the industries in general by its numerous applications.—*Annales Industrielles.*

Safety Envelopes.

Schlumberger's safety envelopes are tinted in such a manner as to turn black, blue, and red if an attempt is made to open them by wetting or by exposure to steam, while moist air or fog does not affect them.

An Old Chinese Printing Establishment.

A correspondent of the North China *Daily News*, of Shanghai, describes a printing establishment which he found in a village in the interior, about 150 miles from Shanghai. The printing was being temporarily carried on in the village temple, and movable type only was used. In the large central hall of the temple were placed about 20 ordinary square tables, on which the cases of type were spread out, very much after the English method, only taking up much more room.

At the time of the visit one man was engaged in setting up type, another was printing. The former stood before a table, on which was what may be called the Chinese "case." It was a solid block of hard wood, about 22 inches long by 15 inches broad, and perhaps 3 inches deep. The inside was hollowed out to a depth of about ¼ inch, this depression being still further hollowed out into grooves about ¾ inch deep. The block had 29 of these grooves, each filled to the depth of ¼ inch with ordinary stiff clay. With his copy before him, armed with a small pair of iron pincers, the compositor began his work; character after character was transferred from the case and firmly pressed into the clay. When the "form" was complete, a flat board was placed on the top and the characters pressed perfectly even and level with the surface of the wooden block, the edge of which was cut to form the border generally found round every Chinese page.

The printer now received the form, and carefully brushed his ink over the type. Taking a sheet of paper, he pressed it down all over the form, so that it might be brought in contact with every character. He then removed the sheet and examined each character, carefully adjusting those which were not quite straight with the pincers, and apparently never touching the type with his fingers. After sufficient copies had been struck off, the type was distributed, each character being returned to its particular box. The type in the form was of three sizes, each character being kept in place entirely by the clay in which it stood. They were cut out of some hard wood, and were perfectly square. The writer was told that the art of printing in this way had been handed down in the same family since the Sung dynasty, more than 600 years ago.

No strangers were ever taught, apprentices being always taken from the same clan. They were open to take any work at the rate of about a shilling a day, which included the two men, type, and ink, but not paper. They were then printing family registers. The custom in that part of the country is to hire the printers, who bring their type and set up their printing establishment on the spot. In this way the same business has been carried on in one family for six centuries, and during all this time movable type only had been used in the manner here described.

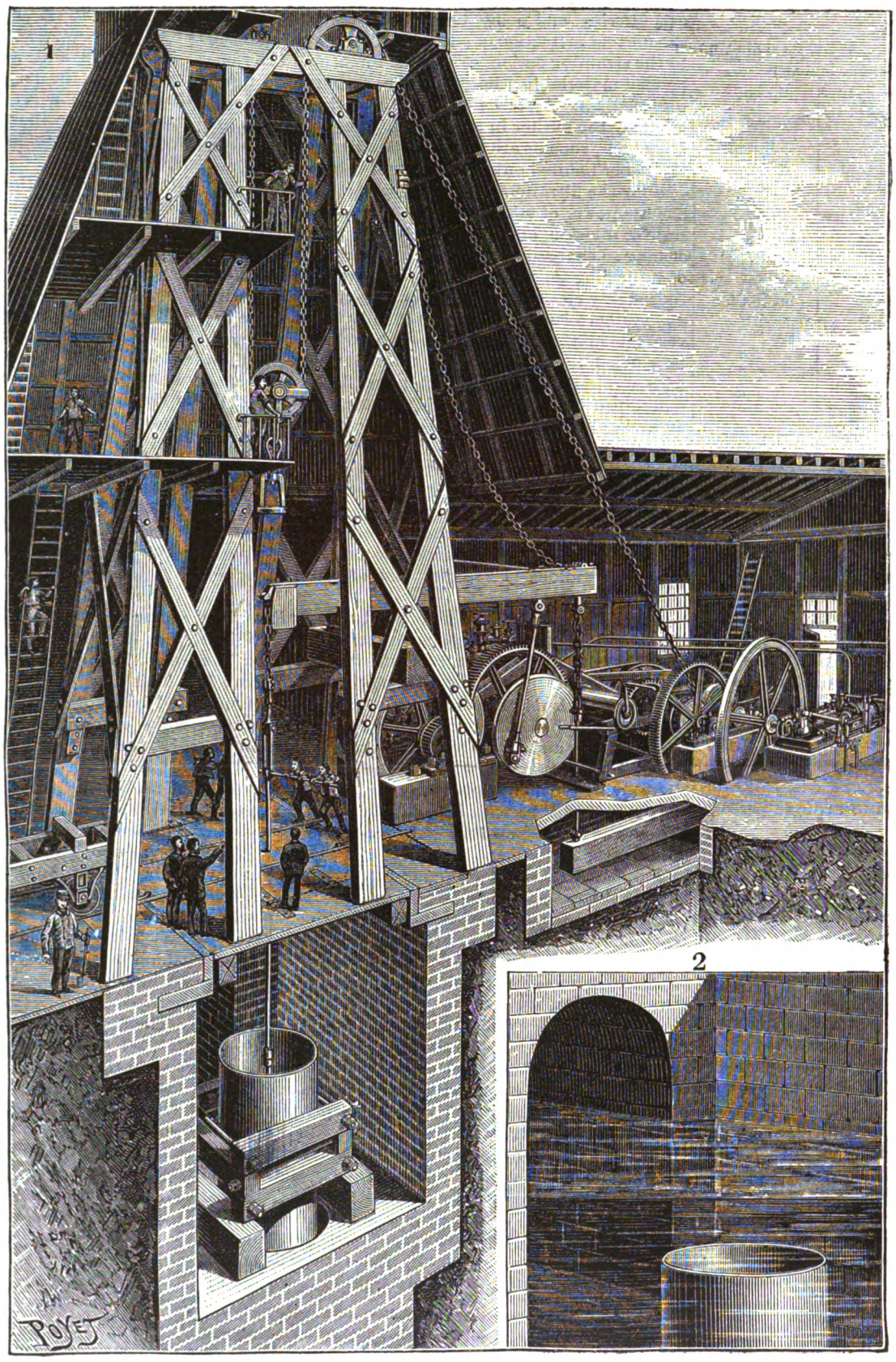
Whitening Linen with Potatoes.

According to *L'Industrie Parisienne*, a laundryman in the vicinity of Paris has discovered a very ingenious method of cleaning linen without soap. He uses no soap, nor lye, nor chlorine, but replaces these substances by boiled potatoes, with which he rubs the linen.

This curious process, it appears, is much superior to those hitherto employed, and the worst soiled cotton, linen, or silk, cleaned by this method, are made whiter than they could be by the use of an alkali. Besides, the method has the advantage that brushes can be dispensed with, and well water be used.

THE ARTESIAN WELL IN THE PLACE HEBERT, PARIS.

Well boring, in spite of the many applications which have been successfully carried out in many parts of the world, has recently attained a notable success in Paris. A new artesian well, the work on which has been in progress for a long time, has at last reached, at the depth of 2,359 feet, the water supply which it is designed to raise to the surface. The work has been watched with as much curiosity by the public as by scientists. The public sees in it the acquisition of a powerful supply of hot and pure water, which may be used for the various industrial and hygienic requirements of the city. The scientists, whether geologists or engineers, see in it a new investigation as to the constitution of terrestrial strata, the methods and systems to be employed, the composition of subterranean water, and finally the results of the various processes of boring, which specialists are constantly trying to improve.



1. General arrangement of the machinery for operating the drill. 2. General view of water flowing into subterranean conduits.

Fig. 1.—ARTESIAN WELL IN THE PLACE HEBERT, PARIS.

The work of sinking the artesian well in the Place Hebert at La Chapelle (Paris) was commenced, carried on, and successfully completed by the firm of Lippmann, of Paris. The greater part of the work is accomplished, and it simply remains to complete the final storage of the water. In the meantime the water is conducted through a subterranean gallery into the sewers of the city. After the work has been completed, Paris will possess an artesian well whose dimensions will place it in the first ranks of works of this kind, owing to its depth of 2,359 feet and its enormous diameter of 3½ feet. It may be remarked that similar wells in France and elsewhere are seldom more than from 4 to 8 inches. The enormous difference between these is noteworthy.

The soil of Paris, as in all cases where useful and interesting experiments in artesian wells have been made, contains various subterranean strata of water superposed one above the other between sedimentary formations which are alternately permeable and impermeable. The ascensional force of these different supplies depends upon the altitude of their original source.

The water supply which is reached by the boring in the Place Hebert is between 2,309 and 2,362 feet below the surface in water-bearing sand, and its origin is apparently in Champagne. It has great purity; it does not exceed 8 degrees hydrotimeter, which renders it suitable for industrial uses. It is well known that the legal requirements prescribe that it should not exceed 15 degrees hydrotimeter. Too great purity, much below 8 degrees, would be prohibitory, for water which is excessively pure, as for instance distilled water, attacks metals and corrodes them. The enormous natural filter of the strata of water-bearing sand at which the new artesian well terminates naturally determines its degree of purity.

The temperature of water at the surface is 12 degrees, that of the new artesian well is about 30 degrees, in compliance with the well known law which gives a sensible increase of temperature of one degree Centigrade for every 98 feet of increased depth. Therefore, when in an artesian well various superposed supplies are met with, the deepest is generally the most powerful, and it is best to use this, completely shutting off all the others. Experience shows, in a word, that the power of consumption of the supply is at least equal to its power of delivery. If the upper supplies remain in communication with the lowest one, the latter simply delivers what the others have left. It is better therefore to shut off all the other supplies which are traversed before the supply to be used has been reached. Remarkable work in artesian engineering executed by Mr. Lippmann at the general hospital at Tours has demonstrated this. This boring traversed three upper strata or supplies, which were completely shut off. The fourth, which was reached at a depth of 558 feet, gave a discharge at the surface of 1,056 gallons of water per minute, while another boring which had previously been made at the same establishment, having the same diameter, the same level, and the same depth, and having traversed the same strata, which, however, were left to communicate with one another, only gave a delivery of 264 gallons per minute. It is for this reason that attention is directed to the supply of a well having a depth of 2,359 feet; that is to say, that the best processes were studied to shut off the subterranean supplies met with in the tertiary formations and at the beginning of the cretaceous formations.

We will now briefly review the processes of boring which are actually used, a detailed description of which would be too extensive. These processes are known under the names of boring by the Chinese method, boring with a hollow instrument, and boring with a black diamond, which latter method was introduced by the engineer Leschot. These methods, however, were used only for making bores of small diameters; when large diameters of from one to two feet and more are required, which, according to the improved processes, are economical, the system of boring with a rigid instrument is employed, which instrument is very powerful, and the skillful use of which has given to our French scientists a well earned reputation.

The rigid shafts are made of wood or iron, and the perforation is made by means of an auger which crushes the rocks by concussion. The apparatus used by Mr. Lippmann are of this kind, but with a free fall. The shaft of the instrument is balanced, and the blow

on the bottom to be crushed is made by means of a catch which permits the drill to fall, the lower part of the instrument being provided with a heavy weight. In that manner the force which is necessary to operate the auger at a depth of 2,624 feet, 2,952 feet, or 3,280 feet is no greater than at 328 feet. It is only necessary to remove the instrument from the bottom of the hole in case of some accident.

It was Œynhausen who first conceived the idea of balancing a portion of the drill, and this was the first step in the application of the free fall, which is now in use in a great number of the systems that are constantly being improved.

The instruments to be used in driving artesian wells form almost an arsenal. Our engraving (Fig. 2) reproduces the principal types of these cyclopean instruments which are used for boring, for cleaning, for extracting the rubbish, for enlarging the bore, etc.

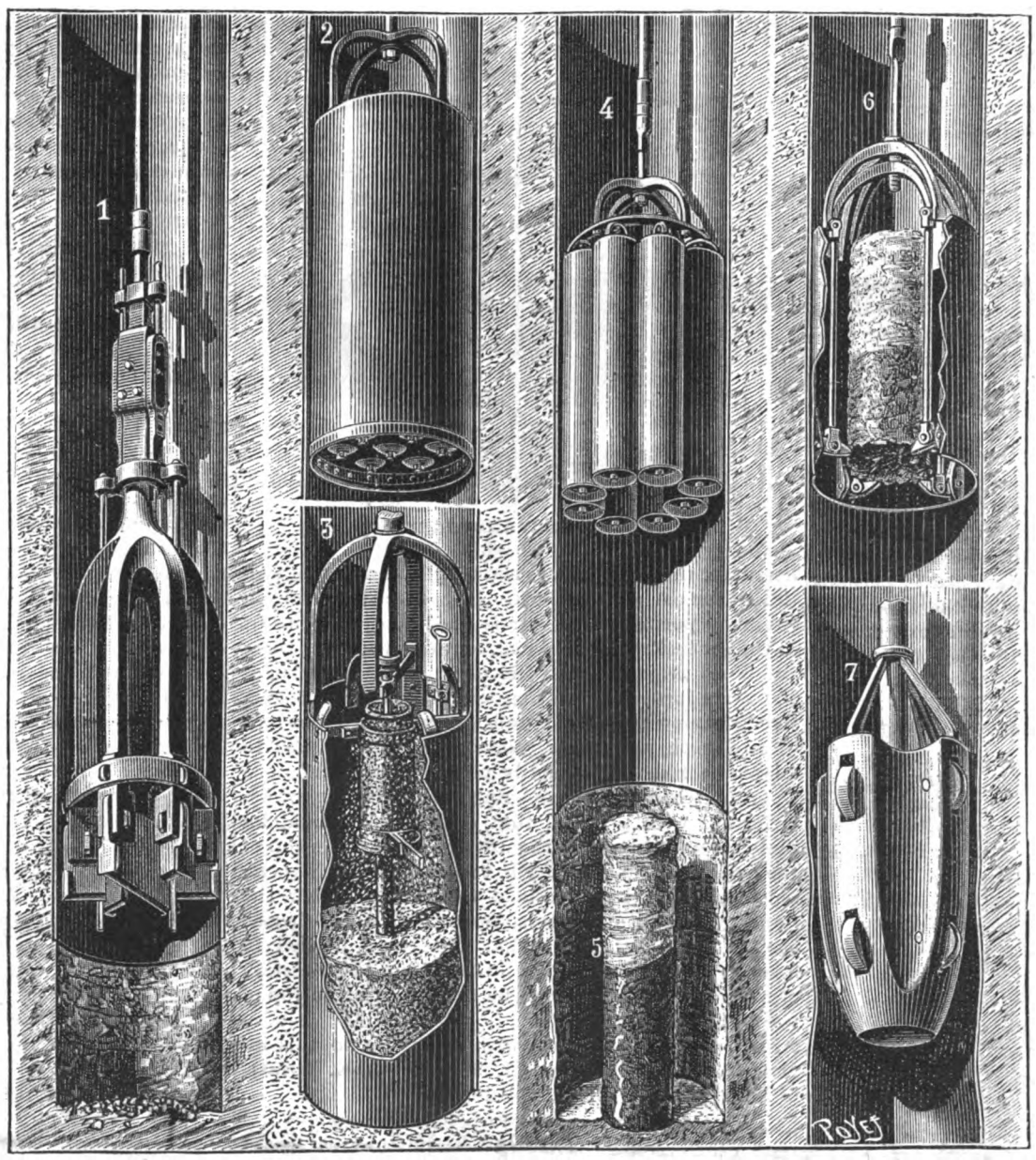
The reader will find in the description placed under the cuts the necessary explanations. By means of samples, the large cylindrical blocks of rock which are brought to the surface, it is possible, with the help of science and past researches, to form geological charts giving the exact position of the strata traversed by the boring instrument. The drill, by alternating and repeated blows, crushes and grinds the hard rock at the bottom of the boring. The rubbish is brought to the surface by a cleaning instrument. When a friable stratum is met with, it is sustained by iron tubes, and when the artesian supply is reached) the tubes which serve to conduct the water to the surface are put in place.

The tubing is run in large iron sections, 3, 9, 12, and 7 feet in length, riveted together in such a way as to form a smooth interior bore and constitute a single rigid column from the top to the bottom of the well. The thickness of the tubes varies from 0·118 to 0·787 in., according to the diameter of the bore. It is curious to see the tubes superposed one above the other with perfect precision, while in their interior the enormous drill works with regularity and almost noiselessly. The instrument employed at the Place Hebert weighs 8,000 pounds, but those used by Mr. Lippmann in the wells at Konigsborn and Gelsenkirchen weighed 50,000 pounds. The drill is lifted from 1 foot to 1 foot and 6 inches, ten or fifteen times a minute, and falls by its own weight on to the bed, which it reduces to powder.

Sometimes accidents happen, and the tubes are crushed and flattened out at enormous depths. It is then necessary to withdraw them and bring them to the surface. It required nine years to remove tubing 328 feet long and weighing 120,000 pounds, which had been placed in the well in the Place Hebert.

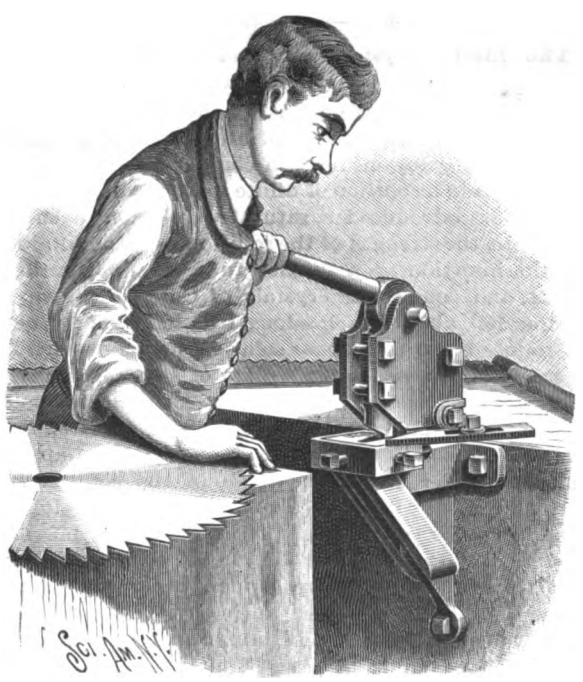
Sometimes dynamite is used for breaking the formations which have defied the powerful weight of the tools, but dynamite does not act effectually at such great depths under the enormous pressure of water. Charges of 30 pounds of dynamite simply lift the column of water, and let it fall again, without accomplishing any useful end. A pressure of 2,000 feet of water or more is so great that a wisp of straw carried to the bottom of the well by the instrument, and then brought up to the surface by the cleaning device, was found twisted and contracted in such a way that it was as heavy as metal, and fell to the bottom of a dish of water like lead, although it preserved its original appearance and form.

Our other drawing (Fig. 1) represents the position of the well at Place Hebert, the surroundings of which have not yet been completed. This abundant supply of hot water throws a spout 114 feet high. The water will be conducted to reservoirs, where it will be at the disposal of factories and, perhaps, employed for private purposes. Very little remains to be done to complete this important work and to gather in the fruit of success. Science and the arts will have learned many useful and important lessons, which will be of benefit to posterity.—*La Nature.*



1. Drill, 4 feet 6 inches in diameter, having 6 arms provided with channels, allowing a free fall. This instrument is used for sinking the well and for cutting out specimens at a depth of from 1,400 to 1,800 feet. When it is desirable to remove a sample, the large transverse blade is replaced by two small ones. 2. A drum having 7 valves serving to remove the earth which has been ground by the drill with the transverse blade. 3. Drum with an interior pump. This drum serves to remove the sand which is met with at a great depth. 4. Drum composed of 8 tubes having valves at the bottom; this is used when it is desirable to remove a specimen of a stratum. It serves to clean the annular space made by drill No. 1 without the transverse blade. 5. A specimen cut out and ready to be clamped and raised by drill No. 6. 6. This tool is used for cutting the base of the specimen and removing it from the bore. 7. Machine having 8 rollers for straightening tubes of 5 feet in diameter, and for grinding up a section of tube which has been broken.

Fig. 2.—INSTRUMENTS USED FOR BORING THE ARTESIAN WELL IN THE PLACE HEBERT, PARIS.



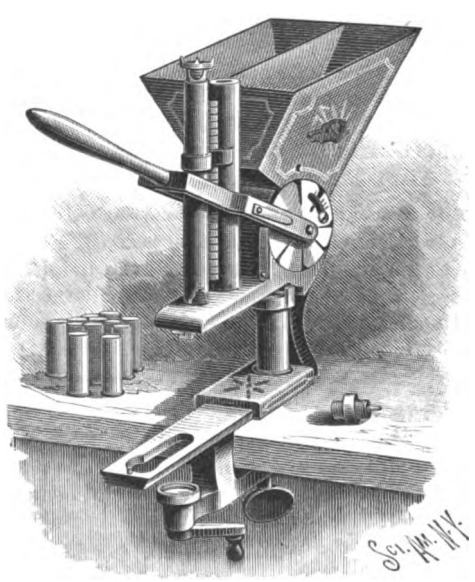
ROMER'S SAW GUMMER.

AN IMPROVED SAW GUMMER.

A saw gummer which admits of ready adaptation and quick adjustment for work on a variety of saws is illustrated herewith, and has been patented by Messrs. John P. and Nicholas Romer, of Gowanda, N. Y. To the side faces of the lower portion of the body are riveted upwardly extending diagonal plates, above which is adjustably held a die holder, the adjusting screws holding the die in any desired position, while the die rests directly on the upper ends of the diagonal braces. In the die is formed a V-shaped opening corresponding with the desired interdental spaces of the saw. Side plates are secured above the die, between which is mounted a movable bar, the lower end of which is formed to correspond with the opening in the die, the bar being normally upheld by a spring. Above the bar is a double-faced eccentric, having a rigid handle made integral therewith, the eccentric being pivotally supported by a bolt extending through the upper portions of the side plates. A bracket is adjustably connected to the right hand side of the body, so that it may be moved toward or from the front of the gummer, the bracket forming a support for a gauge, upon the point of which is a toe to enter the recesses between the saw teeth and regulate their size and slant as they are formed by the gummer. The construction is such that the gummer may be readily secured to a bench or other stationary support, and allow the saw body to be swung over the bench when the dies are used for shearing, giving a greater range of motion than would be possible if the gummer were supported at points above the die.

AN IMPROVED CARTRIDGE LOADER.

A combination tool for loading the ordinary form of paper shell cartridges, and which will load both No. 10 and No. 12 shells, is illustrated herewith, and has been patented by Mr. Francis P. Devens, of No. 1306 Forest Avenue, Kansas City, Mo., the invention covering an improvement on a cartridge loader by the same inventor described in our issue of April 21. Upon the main standard is mounted a cylinder, above which is a centrally divided hopper, with one compartment for shot and the other for powder, the internal mechanism of the cylinder being such that, by the raising of the bifurcated lever a certain distance, a regulated discharge of powder will be effected and, the lever having been lowered and again raised in like manner, a similar discharge of shot will be made. The base of the shell tube is adapted to slide on a plate extending forwardly from the clamp, and having an elongated aperture, through which the shell to be filled is passed into the shell tube, the latter being then moved to the position beneath the hopper where it is shown in the illustration. The powder having been supplied, the tube, as it is drawn forward, engages a tongue at the lower end of the wad tube, whereby a wad is placed on the powder, and the shell tube with its partially filled cartridge is moved further forward to a position just beneath the plunger, when a depression of the lever forces the wad home upon the powder. The same operation is then repeated in loading the shell with shot. A capping and decapping device, adapted to screw into the lower end of the plunger, has a convex face on one end for capping and a pin projection on the other end to remove an exploded primer. The crimper, beneath the forward end of the clamp plate, has an annular groove



DEVENS' IMPROVED CARTRIDGE LOADER.

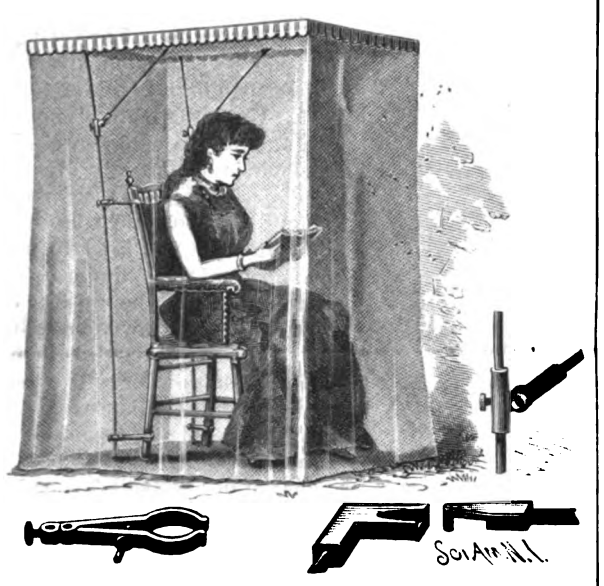
in its upper face, its lower edge being formed of cam faces, operated by a crank arm. The open end of the cartridge is first depressed by a claw or pronged piece adapted to engage with the thread of the plunger, so that it will enter the annular groove in the upper face of the crimping block, when by a slight downward pressure on the lever, at the same time rotating the crank arm, the edge of the shell will be further turned over and properly crimped.

Photography as a Detective.

Photography is gaining prominence in the criminal courts. With its help a Berlin merchant was lately convicted of crooked ways in keeping his accounts. The slightest differences in color and shade of inks are made manifest in the photographic copy. Blue inks appear nearly white; brown inks, on the contrary, almost black. A contemporary states that the books of the accused were submitted to a photographer, who took off the pages concerned and brought into court the most undoubted ocular proofs of the illegitimate after-entry of some of the accounts. A subsequent chemical test substantiated this evidence. The photographic is to be preferred to the chemical test, because it brings its proofs into the court, and submits them to inspection, at the same time leaving the document under examination unharmed; while the results of a chemical test must be taken on the evidence of the chemist alone, and the writing examined is perhaps destroyed. In another case similar to the above, the changing of the date of a note by an insignificant erasure and addition was proved by means of photography.

AN IMPROVED CANOPY DEVICE FOR CHAIRS.

A frame to support an awning, canopy, or mosquito netting, which can be quickly and easily secured to



SMITH'S CANOPY ATTACHMENT FOR CHAIRS, ETC.

and detached from a chair, settee, etc., and is especially designed for use as a screen for protection against mosquitoes, etc., at all watering places and mountain resorts, is illustrated herewith, and has been patented by Miss Almira A. Smith, of Hadley, Mass. (box 140). The frame proper is composed of two standards, two side pieces, two end pieces, and two braces, which may be made of wood, but are preferably nickel plated metallic rods.

The standards are adapted to be detachably secured to a chair or settee by means of clamps, such as shown in the small figure to the left in the illustration, the small figures to the right showing corner pieces of the top frame, and the manner of adjusting the braces on the standards. An awning cloth of waterproof material is attached to the top frame, and, when used in localities infested with mosquitoes, a suitable netting is suspended in such manner as to wholly inclose the space beneath the frame. The construction is such that the frame can be accommodated to any irregularities of the ground, and the whole can be quickly taken down and folded in compact form to be readily carried in the hand of the user.

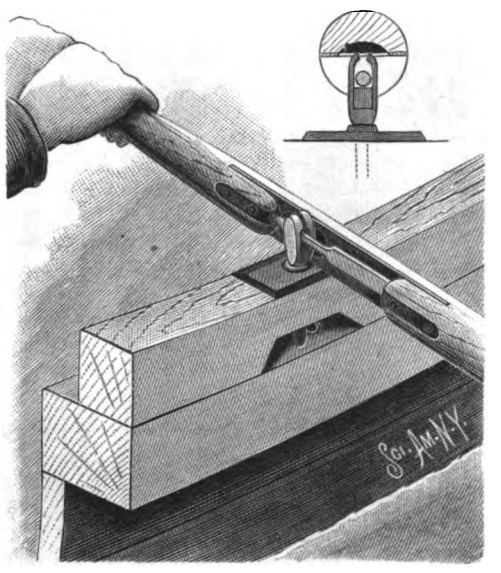
The Hoosac Tunnel, North Adams, Mass.

The total length of the tunnel is 25,031 feet, or four and three-fourths miles. It is 20 feet in height and 24 feet in width. From it was excavated 1,900,000 tons of rock. Its entire cost was $14,000,000. It is soon to be lighted by electricity.

THE SCIENTIFIC AMERICAN needs no one to "sing its praises," but, notwithstanding this fact, we feel it an absolute duty to the general public, at least that portion of it which has never seen or heard of the paper, to tell them that such a one is published at the low price of $3 a year, and that its true value cannot be overestimated. It stands at the head of all publications of its kind.—*Amer. Art Printer.*

AN IMPROVED OAR AND OAR LOCK.

A novel construction, whereby an oar will be held securely in the oar lock, while turning freely therein, forms the subject of a recent patent, and is illustrated



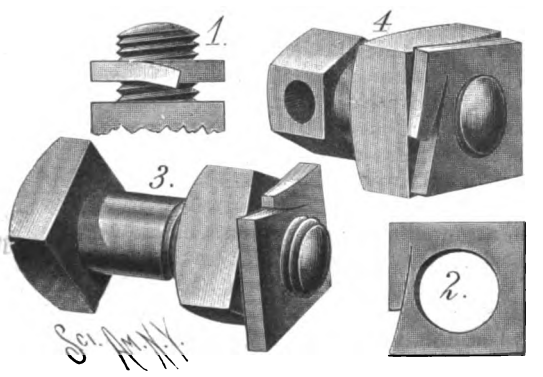
PHEATT'S OAR AND OAR LOCK.

herewith, the small figure showing a sectional elevation of the oar and oar lock. In a space formed by a cut-away portion of the oar is fixed a metal rod to fit in the oar lock, this rod being so attached that there will be no projections on the oar. At the bottom of the space formed by cutting away the oar is fitted a strengthening plate. The rod is round for about half of its length, the other portion being flattened to adapt the rod to be readily placed in and removed from the narrow slot or opening of the rowlock, which is formed with a shank that enters the rail, and a plate secured thereto in the usual manner. The top of the lock is divided to form two opposite members, between which the rod is held to fulcrum the oar, the upper ends of the members approaching each other at the top to form a narrow slot. The oar is limited in its outward movement, and in reversing the direction of rowing, it has simply to be turned over the top of the lock.

For further particulars with reference to this invention, address the inventor, Mr. Gideon K. Pheatt, of No. 120 Locust Street, Toledo, Ohio.

AN IMPROVED NUT LOCK.

A nut lock which partakes of the functions of a jam nut, and which may in some instances take the place of a nut already in use, is illustrated herewith, Fig. 2 showing a plan view, and Figs. 1, 3, and 4 illustrating different applications. The invention consists in a nut whose inner periphery is threaded, and whose body portion is cut entirely through with a slit parallel to the axis of the bolt, a portion of the body thus cut being depressed or pushed out of the normal plane of the nut, so as to act as a stout spring bearing against the other nut when screwed up. The tension of this spring, when the jam nut is screwed up, creates so much friction that neither of the nuts can turn without turning the other, while the strain is so unequal as to prevent them from acting in unison. The cut in the jam nut may also be semicircular, or nearly so, terminating at either end in the body of the nut, and not extending to the edge. This invention was patented in December, 1886, and the nut has been thoroughly tested and has given satisfaction. For



VAUGHAN'S NUT LOCK.

further information relative thereto address the Vaughan Manufacturing Co., No. 41 South Front Street, Philadelphia, Pa.

Annealing Small Tools.

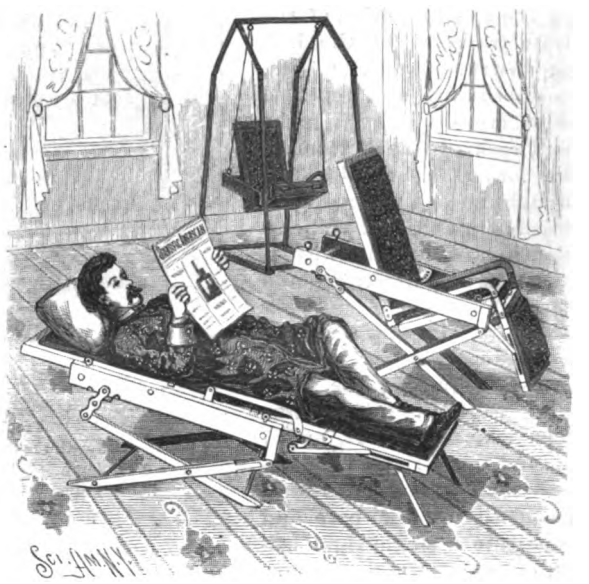
According to the *English Mechanic*, a very good way to anneal a small piece of tool steel is to heat it up in a forge as slowly as possible, and then take two fireboards and lay the hot steel between them and screw them up in a vise. As the steel is hot, it sinks into the pieces of wood, and is firmly embedded in an almost air-tight charcoal bed, and when taken out cold will be found to be nice and soft. To repeat this will make it as soft as could be wished.

Paper for Cleaning Lenses.

Prof. S. H. Gage, of Cornell University, recommends, as preferable to linen or chamois skin, the so-called Japanese filter paper, the bibulous paper often used by dentists in filling teeth. It is soft and flexible, absorbs liquids readily, is less likely to contain gritty particles that are liable to scratch the lenses, and it is so inexpensive that when a piece has once been used it may be thrown away. Every director of a microscopical laboratory appreciates the difficulty of getting students to exercise the proper care in cleaning objectives and eye pieces. Every large laboratory is sure to contain some students whose genius for scientific study is exhibited chiefly in the careless handling of delicate apparatus. Doubtless if in a microscopical laboratory each student were provided with a quantity of this paper, fewer valuable lenses would be injured.

AN IMPROVED ADJUSTABLE CHAIR AND SWING.

A chair, in which the position of the back seat and foot rest may be changed at pleasure, and the chair be readily varied in height as desired, while it may also be quickly transformed into a couch, or adapted for use as a swing, forms the subject of a recent patent, and is illustrated herewith. Besides a main frame of novel construction, three separate frames are provided, constituting respectively the back, seat, and foot rest, hinged together, the seat being adapted to fold upon the back, and the foot rest upon that side of the seat not in contact with the back. There is a crank to make continuous the reclining action of the back and seat, whereby also the foot rest may be made to work in unison with the back and seat, or be released to fold under the seat. The foot rest is also detachable, so that it can be placed out of the way without inconvenience to the user. The normal height of the chair may be lowered to that desired for a lady's sewing chair, retaining the reclining position, and, with



BASTIAN'S ADJUSTABLE CHAIR AND SWING.

the extension of the foot rest, the chair may then be made to form a couch. Discarding the legs by folding them underneath the frame, provision is made to use the contrivance, suitably hung, as a swing, which will be comfortable and secure, and peculiarly adapted for children's use. As is obvious, the construction, as a chair and chair and swing, presents facilities for a great variety of changes. Entirely folded up, it forms a rectangular package of small compass capable of easy transportation and storage.

For further particulars with reference to this invention, address the patentee, Mr. Charles Bastian, No. 36 Howard Street, New Orleans, La.

The Electro-Crystallization of Metallic Copper.

BY H. N. WARREN, RESEARCH ANALYST.

The apparatus made use of for the above mentioned substance consists entirely of an open tube, closed at one extremity by means of a bladder diaphragm, and suspended in a solution of dilute sodium chloride. Into the tube is introduced a saturated solution of cupric sulphate, the strength of the solution being maintained by the insertion of a smaller tube terminating in a point, and containing crystals of $CuSO_4$. A strip of copper foil, about 3 inches long by 1 inch wide, is next introduced into the copper solution, and connected by means of a copper wire to a plate of zinc, forming the negative electrode and in contact with the salt solution. After the lapse of a few hours small cubical crystals of metallic copper gradually begin to appear on the copper electrode, which in the course of a week or more will have arranged themselves into a compact crystalline mass, possessing a full metallic luster, and rivaling in purity and malleability the finest specimens of native copper, which they much resemble. Metallic silver, antimony, bismuth, zinc, and even aluminum, magnesium, iron, chromium, and all the more oxidizable metals, may by slight alterations be reduced to the metallic state.—*Chemical News.*

THE U. S. ARMORED BATTLE SHIP TEXAS.

The new cruiser Texas, which is now being built by the United States government at the navy yard, Norfolk Va., was designed by the Barrow Ship Building Company, and is of the belted type; that is, it has a belt of armor amidships to protect the vitals of the ship, and has an underwater armor deck extending from armor belt to the extremities of the vessel. It has twin screws. The principal dimensions are: Length between perpendiculars, 290 feet; extreme breadth, 64 feet 1 inch; depth moulded to upper deck, 39 feet 8 inches; mean draught of water, 22 feet 6 inches; displacement to this draught, 6,300 tons; displacement per inch at load line, 30 tons; complement of officers and men, 300; speed, maximum, 17 knots.

Armament.—The main battery consists of two 12 inch guns in turrets and six 6 inch guns protected by shields.

The secondary battery consists of four 6 pounders, four 3 pounders, and four 47 millimeter revolving cannon, protected by 1½ inch steel plating. Two Gatlings and two 37 millimeter revolving cannon. Two 1 pounders. Two Gatlings, with two 37 millimeter revolving cannon, are fought in the military mast tops to repel boarders and torpedo boat attacks. Two 37 millimeter rapid-fire guns are fitted in the steam cutters.

Torpedoes can be projected through six tubes, one through the bow, one through the stern, two through the side above water, and two through the side forward below water.

Machinery.—The motive power is furnished by two triple expansion engines, placed in separate watertight compartments.

The cylinders are 36, 51, and 78 inches in diameter, with a stroke of 39 inches. There are four double-ended boilers, 14 feet diametar by 17 feet long. Steam pressure, 150 pounds. Grate surface, 504 square feet. Indicated horse power, with an air pressure of 2 inches of water, equals 8,600.

Coal supply is 500 tons. With this supply the endurance for a speed of 17 knots is 1,110 knots; at 15 knots speed, 2,050 knots; and at 12 knots speed, 3,170 knots. With an increased coal supply to 850 tons and a speed of $11\frac{8}{10}$ knots, the endurance is 6,000 knots.

Quarters for Officers and Crew.—This vessel is to be fitted as a flag ship. Directly aft, on the gun deck, is the admiral's private cabin. Forward of this, his dining saloon and sleeping cabin. Next, the admiral's bath and water closet and pantry. Forward of these are similar accommodations for the captain. Forward of this is an open space extending across the ship, with two passages leading forward. These passages inclose the wardroom, and the staterooms open into them from the outer sides. There are nine staterooms opening into these passages. Beyond the wardroom bulkhead is a large open space, which can be used by the steerage officers. The crew are berthed on the gun and berth decks.

General Construction of Hull.—The ship has double bottom and transverse watertight bulkheads. Is built with vertical and flat keel plates. Longitudinal stiffeners for bottom and bilges. Above the armored deck the transverse frames are made of Z-bars.

British Cottons and Hardware in China.

The British consul at Ichang, the most western port in the Yangtsze, notices in his last report that while the import of the lighter cotton goods has increased, that of the heavy and coarse textures has decreased. In the spring of last year there were rumors among the Chinese of bodily ailments, diseases of the skin, and even death being induced by wearing garments of foreign cotton stuff. In Szechuen province the story had much currency for a short time. He suggests that those who control the cotton goods trade should take means to prevent the presence of noxious or irritant matter in their goods. "The alleged use of baryta and its possible effects might be worth inquiry." Mr. Gregory further urges that some one from Birmingham should visit the China ports with a shipload of samples and wares for sale. "Two spades were in my hands lately for transmission to a brother officer; they bore the mark of a Pittsburg manufacturer. I wrote to a house (British, I believe) at Shanghai for weighing scales, and what were sent me were American. The stove in my office bears a name which means the 'stars and stripes.' Our own people could surely have supplied these things quite as well and as cheaply." He also suggests a trial of watches of gigantic size, say three inches diameter, of sound and very strong construction, so as to bear rough usage, last long, and not give much trouble in cleaning and repairing. The cases might be of copper or one of its alloys.

An Active Centenarian.

Charles Clendenning, one of the pioneers of Allegheny County, Pa., celebrated his 100th birthday on May 24. Mr. Clendenning is in good health, and personally superintends the work on his large farm in West Deer township, and cares for thirty hives of bees. He has never worn spectacles, and still shaves himself. Upward of one hundred and fifty descendants and relatives were present at the reunion.

Correspondence.

Curiosities of Deafness.

To the Editor of the Scientific American:

In the SCIENTIFIC AMERICAN of May 26 there is an article entitled "A Curious Case of Deafness," which does not seem so very curious to me.

I am myself so deaf that common conversation is inaudible to me when in a room where there is no other noise, but when there is singing or instruments playing I can hear as well as any one; and when on board of railroad cars in motion I have frequently heard conversation from the seat behind me that those on the seat with me could not hear. I have known a number of people similarly affected.

I am seventy years of age, and have been deaf for more than fifty years. CHAS. STONE.

Brockton, Mass.

The Alleged Clay Eaters of North Carolina—A Refutation.

To the Editor of the Scientific American:

In your paper of the 19th of May, 1888, I find an article on page 311, under the head of "Carolina Clay Eaters," on the authority of Dr. Frank H. Getchell, which, in the interest of truth, deserves a brief notice.

I am a resident—a native—of Rowan County, in which Salisbury is located, and within the last sixty years have been in all parts of the county more or less, and am utterly at a loss to determine where Dr. Getchell found his community of clay eaters. If there be such a community, I ought to know of it. If there be such a place, either "back," front, or on the sides of Salisbury, some one—nay, many—in Salisbury ought to know where it is; and yet if any such place exists in this county, it is unknown to us. We have two little hills in the county, one of them 3½ miles south-southeast of Salisbury, which have been dignified by the name Dunn's "Mountain," and the other, 13 miles west, as Young's Mountain. Neither of them exceeds 300 feet above the waters at their bases. The snow and ice never lingers on them until spring, and in no particular do they answer to the description of Dr. G. In fact, the doctor's report as a whole or in detail cannot be made to apply to any part of Rowan County. Her people are prosperous farmers, and live as well and are as intelligent as those of any other part of this or other Southern State.

In conclusion, I will say that this story of Dr. Getchell has been going the rounds for two or three years, and has more than once been contradicted.

J. J. BRUNER.

Salisbury, N. C.

A Royal Society Conversazione.

At a recent conversazione of the Royal Society at Burlington House, under the presidency of Professor George Gabriel Stokes, among the exhibits of interest were samples of extremely hard carbon by the Woodhouse & Rawson Electric Supply Company, for microphonic and other purposes. It took a high polish like jet, and in pieces as thick as average metallic foil gave a metallic ring when dropped upon the table. Some samples of it, soldered into small disks of brass, were exhibited. The soldering had been effected by first depositing copper upon the carbon by electricity, then tinning the copper. This "adamantine carbon" was stated to be hard enough to scratch glass, and the exhibitors said that its mode of preparation is secret, but electrical deposition is brought into play in the process. The same firm exhibited Vernon Harcourt's new pentane standard lamp, in which part of a cylinder of flame is seen between two vertical tubes, which cut off from view the upper and lower part of the flame, gave a light in all directions equal to that of one average standard candle. Messrs. Woodhouse & Rawson also exhibited a holophotometer, for measuring the intensity of a light all round. It consisted of adjustable mirrors mounted upon a heavy kind of retort stand. The absorption of light by the mirrors themselves had been found to amount to 1·8 per cent.

Among the most interesting objects on view was a copy of M. Moissan's apparatus for the isolation of fluorine, exhibited by Professor T. E. Thorpe.

Mr. C. V. Boys, who is noted for his ability as a demonstrator, whether in drawing quartz silk by means of flying arrows or in managing straw skyrockets, performed various experiments with soap bubbles. He blew one bubble and placed it upon an iron ring, then with coal gas he blew another bubble inside the first one, which rose, carrying the outer bubble with it, also a piece of paper attached by a thread, as a sort of balloon car, to the lower part of the outer bubble. When two bubbles were blown independently of each other, and then rubbed against each other, they would not touch, but the slightest amount of electricity brought near them by means of a little electrophorus caused them to coalesce and burst. When one bubble was blown inside another, the electricity caused no coalescence, the outer bubble protecting the inner one from its action.

Mr. J. G. Symons exhibited some Casella's thermometers, made to determine the present temperature of mineral springs in the Pyrenees, in order to ascertain whether there have been any small changes in their temperature during the present generation.

Mr. Shelford Bidwell exhibited apparatus for measuring the changes produced by magnetization in the dimensions of rods and rings of iron and other metals. It has long been known that an iron rod when magnetized is at first slightly lengthened, but Mr. Bidwell has discovered that if the magnetizing force be sufficiently increased the bar again contracts, and ultimately becomes actually shorter than when unmagnetized. A cobalt rod contracts at first under magnetization, and then becomes longer; a nickel rod contracts, and the limit of its contraction has not yet been reached; bismuth is slightly elongated in intense fields. These results were rendered visible by means of lever motion applied to a little reflecting mirror; the instrument would measure changes in length amounting to the twenty-five-millionth of an inch.

Mr. A. A. Common, of Ealing, exhibited photographs of the polar axis of a 5 foot telescope. The axis of the telescope consisted simply of an ordinary iron boiler floating in water, so that it would turn easily, and loaded with pig iron.

Professor George Forbes exhibited a coulomb meter, in which an electric current passing through an iron conductor creates heat, which sets up a convection current in the air, and this causes vanes to rotate about a vertical axis and drive clockwork. The number of revolutions indicated on dials is, through a considerable range of currents, an exact indication of the number of coulombs or ampere hours which have passed through the conductor. The friction of a ruby cap on a pivot determines the smallest current which can be accurately measured, and the friction of the clockwork is barely perceptible. The resistance of a meter to read from 1 ampere upward is 0·02 ohm.

Mr. E. S. Bruce had on view a translucent captive balloon for flashing signals by night. Some glow lamps were placed inside the balloon, and flashes could be produced from the earth by means of two fine conducting wires and a commutator; some experiments with the system have been conducted in the presence of the English and Belgian military authorities.

The Great Philadelphia Sugar Refinery.

The plans for the great sugar refinery to be erected by Mr. Claus Spreckels, at Philadelphia, are rapidly assuming shape. The pile driving has been begun, and very soon the foundation walls will give the outlines of the great structure. In twelve months, it is hoped, the refinery will be in working order. It will then be started, and be able to turn out every day two million pounds of refined sugar.

The main refinery building is to be 60×160 feet in area. Its height of 132 feet will include thirteen stories. The finishing house, warehouse, boiler house, filtering works, and other structures will greatly extend the works, the entire area to be covered by buildings being in the neighborhood of 100,000 square feet.

In its effects, even upon so large a city as Philadelphia, the gigantic establishment will be impressive. With its workmen and their families, the shipping and dock employes, and the allied industries of cooperage, etc., many thousands of individuals will be supported by it.

In California Mr. Spreckels has given every evidence of his enterprise and progressive nature. He has encouraged, by free distribution of seed and otherwise, the cultivation of beets for sugar, and he may yet play in this country the same role that Napoleon filled for France. The enormous development that the beet root industry has attained in Germany and France is almost without parallel in its widespread effects. It has given the farming population a remunerative crop. The requirements of the root have been studied, and the fertilizer manufacture has been greatly increased by the demands of the beet root farms. Even on metallurgy its influence has been felt in the utilization of the phosphatic basic steel process slags as a source of plant food.

It is not easy to predict the effects upon this country of the introduction of so important an industry. If Mr. Spreckels succeeds in establishing it here, his influence on the prosperity of America may be very deep and lasting.

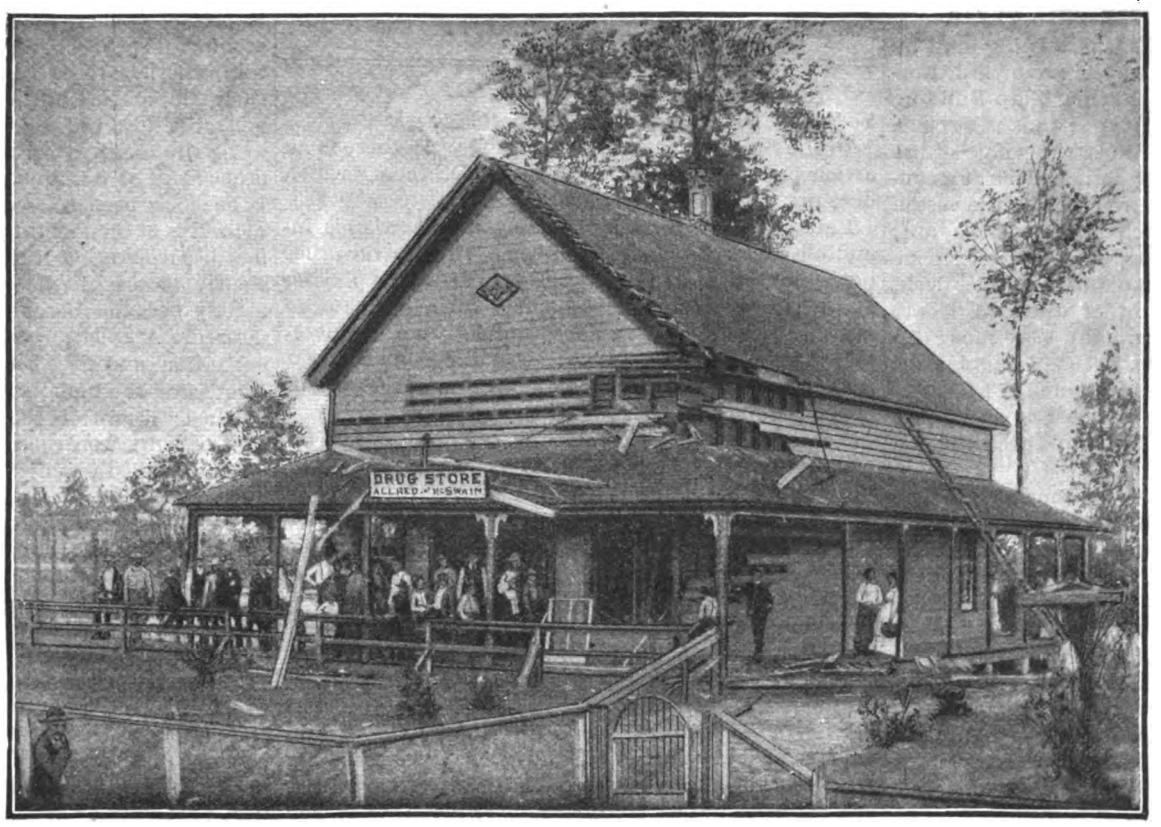
De Haen's Antimony Salt.

This salt is a combination of antimony terfluoride and ammonium sulphate readily soluble in water, containing 47 per cent antimony sesquioxide, and having a strongly acid reaction. Its solution attacks glass and metals, and should consequently be used only in wooden vats. If employed for fixing tannin, it should be neutralized with half its weight of soda crystals. The quantity to be used per liter is 4 grms. of the antimony salt and 2 grms. soda crystals, taking the pieces through the solution at 50°; 4 grms. of the antimony salt take the place of 5 grms. of the double tartrate. The shades are brighter than those obtained with tartar emetic, and the whites purer, which proves that the coloring matter is better fixed.

A REMARKABLE ESCAPE FROM LIGHTNING.

To the Editor of the Scientific American:

The narrowest escape from death by lightning of which I have ever heard came to my knowledge while lecturing a few weeks ago at the Florida Chautauqua. The drug store, which is used as a post office by the good people of De Funiak, stands between the railroad station and their beautiful little lake. At the time to which I refer it was "protected" by a common sized twisted copper band lightning rod, with iron core, fastened to the house by glass insulators in the old fashioned way. Several other houses in the town were "rodded" in the same way; but after this one was so badly shattered they were torn off by their owners, "to lessen their chances of getting struck, you know," they explained. About a hundred feet back of the post office stood two fine specimens of the tall pines which grow so abundantly in that region.



STORE STRUCK BY LIGHTNING—DE FUNIAK, FLORIDA.

On the afternoon of the 18th of last August, at about 1 o'clock, a number of boys and men had collected under the post office porch, thinking, on account of the lightning rod, that they would be safe from the lightning, which was playing rather freely from an only partially cloud-covered sky. Among them was John Chisholm, a merchant of De Funiak, who was sitting about half way between the corner post of the porch and the nearest window.

The lightning struck the two high pines, and, after shattering their tops, leaped to the rod, completely melting its points, and then running along the comb of the roof to the gable and down a corner, leaving it in the condition shown in the engraving. Mr. Chisholm's only recollection of the stroke is a sensation like that of a heavy blast of hot air striking him between the shoulders. He was thrown forward upon his face and taken up for dead. His shoes were new and his trousers nearly so, yet they were left looking very much as if they had been attacked by an army of hungry rats. The engravings, which are made from photographs which I had taken for the purpose, give a fairly good idea of their condition. How a man could have his clothes chewed off from him by lightning in that style and still live is a mystery. His shirt was torn entirely in two. His body was badly blistered, especially from the knees down. Becoming conscious, he experienced a terrible feeling of suffocation and "heartache, as though it would burst." He remained helpless for four months, suffering terribly from aching in the bones and a stinging sensation, "as though a thousand needles were being stuck all over my body."

Now, after a lapse of over nine months, Mr. Chisholm has gradually recovered the use of his limbs, only suffering from an occasional violent involuntary jerk in the back. He attends to business, and has recovered much of his former sociability. As his photograph indicates, he is altogether the best preserved specimen of a thunderbolt that I have ever seen.

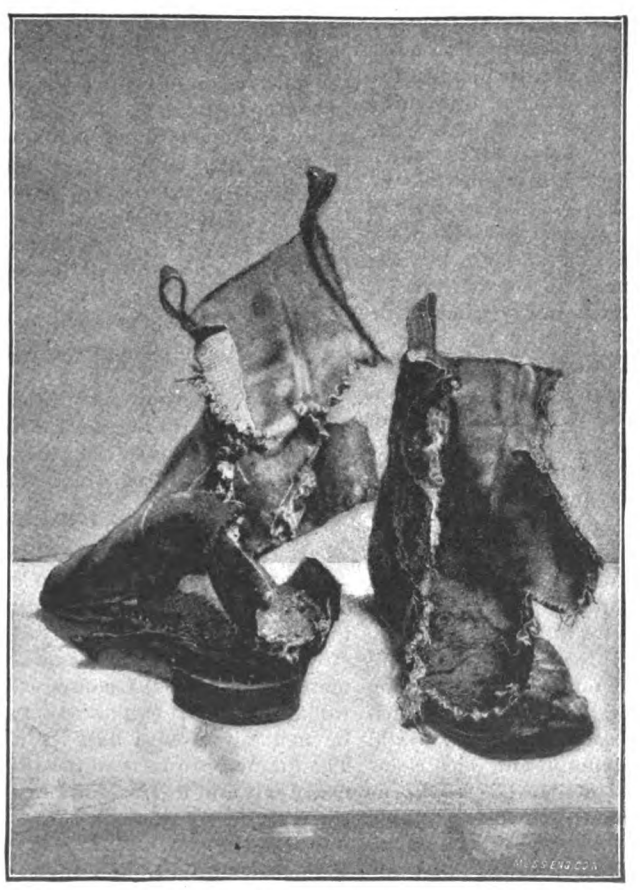
Several others sitting near were, of course, more or less shaken up.

Dr. Allred caught a part of Mr. Chisholm's charge in his foot, and went on crutches for some days.

The jeweler, Mr. Cochran, who was at work in the window nearest the corner, had his hair and breast badly singed, and the artist who took these photographs had his pipe knocked out of his mouth and broken to pieces—a calamity which I imagine cost him many a regret.

JOHN CHISHOLM.

JOHN B. DE MOTTE.
De Pauw University, Greencastle, Ind.



MR. CHISHOLM'S NEW GAITERS AND CLOTHING AFTER THE STROKE.

Armor Plates and Concrete.

A course of experiments were recently conducted at the camp of Chalons, in the presence of M. De Freycinet and the heads of the Paris military technical commission, for ascertaining the relative resisting powers of armor plate and concrete faced cupolas against melinite shells. The trials demonstrated the shelter afforded by the concrete facings of 10 feet in thickness to be much more effectual than the metal plates alone; but in justice to the latter system of protection it must be mentioned that the armored cupolas had already withstood five months' exposure to the heaviest shot and shell that could be directed, almost daily, against them. It was generally agreed that the concrete facings were superior to the plain metal shields, and conjoined the two substances were comparatively irresistible to melinite, but the metal alone showed an unexpected and extraordinary degree of resistance against the discharges from guns and mortars of the largest known caliber, sometimes at point-blank range. Some of the shells employed contained even 197 pounds of melinite, without materially impairing the offensive purposes of the cupolas, for, spite of their battered plates and other damages, the two guns within were found still serviceable and readily workable to the last.

The compound protection system was approved for future constructions of a similar kind, but it was held that the metal cupolas had maintained the continual crushing tests with so much success that it was adjudged in the end to replace the shattered surface plates, and send them to strengthen the defenses on the eastern frontier. Contrary to first reports, the gunners within the cupolas could have remained within during all the incessant pounding unharmed, and well able to serve their pieces.—*Broad Arrow.*

Natural Gas in Kentucky.

Mr. Albert W. Moreman is interested in the gas wells now in process of development at Brandenburg. His father owns salt wells there that are operated by means of natural gas, which has been used for this purpose some twelve or thirteen years. Mr. Moreman's house is also heated by natural gas.

A reporter recently called on Mr. Moreman, and asked him to give some account of the development of the gas wells of Brandenburg. He said: "Within the last few months seven or eight wells have been bored. Five of these give a flow of from 1,000,000′ to 1,500,000′ of gas a day. The well struck recently by the Doe Run Natural Gas and Manufacturing Company is the largest of the wells, giving at a depth of 437′ a flow estimated at from 8,000,000′ to 10,000,000′ per diem, and having a pressure of 225 pounds to the square inch. The estimates are made by practical gas men who have been boring about Pittsburg. This is the only well in which any shooting has been done. We put down a 12 pound cartridge, which brought the gas. Every well that has been bored gives gas in some quantity."—*Louisville Times.*

JAMES CURTIS BOOTH.

It has been pointed out by the present writer, elsewhere in these columns, that two distinct epochs can be shown in the development of science in the United States, one beginning with the teaching of chemistry by the elder Silliman at Yale College, early in the century, and the other beginning with the settlement of Louis Agassiz in Cambridge. Between these two eras there was a development of chemistry in Philadelphia, which may be traced back to the influence of Robert Hare, who was contemporaneous with Prof. Silliman, but which culminated in the opening of J. C. Booth's laboratory, in 1836, where many of our ablest chemists of a past generation received their early training. A course in this laboratory was considered necessary for the chemist of that time, and was regarded as of more value than a college diploma. Professor Booth continued long in the active practice of his profession, and his recent death, on March 21, 1888, at his residence of "Midhope," Haverford College Post Office, Pa., removes from us one of the most eminent of American chemists.

James Curtis Booth was the son of George and Ann Bolton Booth, and was born in Philadelphia on July 28, 1810. He received his early education at classical schools in Philadelphia, and then spent four years in Hartsville Seminary, in Bucks County, Pa., after which he studied at the University of Pennsylvania, where he was graduated in 1829. A year later he entered the Rensselaer Polytechnic Institute, and completed his course in 1831. He then went to Flushing, L. I., where, during the winter of 1831–32, he delivered an introductory course of lectures on chemistry. Deciding to follow that science as a profession, he went to Germany in December, 1832, and entered Friedrich Wöhler's private laboratory in Cassel, there being at that time no university laboratories arranged for the regular reception of students; and it is believed that he was the first American student to study analytical chemistry in Germany. After a year with Wöhler, he went to Berlin, and spent an equal amount of time with Gustav Magnus. The remainder of his three years abroad was devoted to the practical study of chemistry applied to the arts in the manufacturing centers of the Continent and England.

With an education probably unequaled at that time by any chemist in America, he returned to the United States, and in 1836 established in Philadelphia a laboratory for instruction in chemical analysis and applied chemistry. This institution soon acquired considerable distinction, being the first of its kind in this country, and during the course of a few years nearly fifty students availed themselves of his instruction, most of whom have since acquired distinction. The list includes John F. Frazer, professor of chemistry at the University of Pennsylvania in 1844–72; Thomas H. Garrett, his surviving partner in the analytical business; Campbell and Clarence Morfit, known by the handbook which they wrote; Richard S. McCulloh, professor of physics at Columbia College in 1857–63; Robert E. Rogers, professor of chemistry at the University of Pennsylvania in 1852–77; and Dr. William Camac of Philadelphia.

At first he was assisted by Dr. Martin H. Boyé, who remained with him until 1845, and in 1848 Thomas H. Garrett became his associate. The latter continued to manage the analytical department of the business until 1881, when Andrew A. Blair joined the firm, which, under the title of Booth, Garrett & Blair, have a high reputation as analysts, especially in the examination and determination of iron ores.

Meanwhile, in 1849, Mr. Booth received from President Zachary Taylor the appointment of melter and refiner at the U. S. mint in Philadelphia, which office he held until his death. His resignation was sent to the President on July 27, 1887, and accepted on January 7, 1888, to take effect on the qualification of his successor—an event which occurred after his death. In his official capacity, Mr. Booth was frequently consulted by the government on questions pertaining to chemistry, and his studies on the nickel ores of Pennsylvania led, in 1856, to the adoption of nickel as one of the components of the alloys used in the coinage of the cent issued in that year.

Soon after his return from Europe he was called on to take part in the geological survey of Pennsylvania, and during 1837–38 he had charge of the geological survey of the State of Delaware, in connection with which he issued the first and second "Annual Reports of the Delaware Geological Survey" (Dover, 1839) and "Memoirs of the Geological Survey of Delaware" (1841).

His partiality for applied chemistry led to his appointment as professor on that subject at the Franklin Institute, in Philadelphia, in 1836, and during the nine successive winters he continued his lectures, making three full courses of three years each, and exhaustive of the range of applied chemistry. It is much to be regretted that these full courses have not been resumed since 1845, except in single sporadic cases.

The University of Lewisburg conferred on him the degree of LL.D., 1867, and that of Ph.D. he received from the Rensselaer Polytechnic Institute in 1884. In January, 1839, he was elected a member of the American Philosophical Society, and in September, 1852, he was chosen a member of the Philadelphia Academy of Natural Sciences. He served as president of the American Chemical Society in 1884 and 1885, and was elected for a third time, but declined this honor, never before conferred on a member.

His bibliography, which is not very extensive, includes the following papers: "On the Deutarseniuret of Nickel from Reichelsdorf in Hessia" (1836); "Analysis of Various Ores of Lead, Silver, Copper, Zinc, Iron, etc., from King's Mine, Davidson County, N. C." (1841); "On Beet Root Sugar" (1842); "Chrome Iron Analysis" (1842); "Constitution of Glycerin and Oily Acids" (1848); "On Remingtonite, a New Cobalt Mineral" (1852); with Martin H. Boyé: "Analysis of Well Water in Philadelphia" (1842); "On the Extraction and Decolorization of Gelatin" (1842); "On the Preparation of Aluminous Mordants" (1842); "Conversion of Benzoic Acid in Hippuric Acid" (1843); and "Analysis of Three Kinds of Feldspar" (1844); with Thomas H. Garrett: "Experiments on Illumination with Mineral Oils" (1862); and with Campbell Morfit: "On the Analysis of Cast Iron" (1853). His larger works are: "Encyclopedia of Chemistry, Practical and Theoretical," in the preparation of which he was assisted by Martin H. Boyé, Richard S. McCulloh, and Campbell Morfit (Philadelphia, 1850), and "Recent Improvements in the Chemical Arts," issued by the Smithsonian Institution (Washington, 1852). Also he edited, with notes, a translation from the French of Regnault's "Elements of Chemistry" (two volumes, Philadelphia, 1853).

THE LATE JAMES CURTIS BOOTH.

Electrolytic Deposit of Pure Iron.

For obtaining fixed or detachable deposits of chemically pure and very homogeneous iron, Mr. Barthol employs the following process:

A bath of carbonate of iron is prepared with 18¾ ounces of sulphate of iron to 2½ gallons of water, and 4¾ pounds of carbonate of soda to 2½ gallons of water. To this is added 5 gallons of water acidulated with sulphuric acid, and there is thus obtained an electrolytic liquid in which, on the one hand, are immersed the objects to be covered, and, on the other, an iron or steel anode of the size of the object to be coated with pure iron.—*Revue Scientifique.*

THE physicians are vigorously discussing the ethics of patenting instruments invented by members of the profession, in the *Medical Journal.* They never hesitate about copyrighting a book, though, the *Sanitary News* has discovered.

Ventilation of the Beds of the Sick.

In the Cambridge (Mass.) Hospital there is an arrangement for the ventilation of the beds not generally known It is so effective that I wish to describe it. Beneath each bed is a ventilating tube of about eight inches in diameter, fifty square inches area, leading directly through the floor to a foul air tank, beneath which it communicates with the main ventilating chimney. About 2,000 cubic feet of air an hour is thus drawn from beneath each bed. This ventilating tube is connected with the bed above by a four inch pipe of tinned plate, with a proper cover and joints, which passes around the side or foot of the bed and into it beneath the clothing. This pipe is lengthened with one of the same size of pasteboard or other substance, a non-conductor of heat, reaching to any part of the bed. By this simple means foul air is removed as fast as formed, the bed kept free from odor, and the patient's body is no longer surrounded with contaminating gases. As the air presses inward through the porous bed clothing, none escapes into the ward. Further, a two inch flexible pipe is adjusted to that just described, and slipped over the hollow handle of the bed pan when in use, carrying off odor from that also. In the same hospital similar means connect the beds in the private wards with the chimney of an ordinary fireplace, up which the pipe reaches about four feet to insure a good draught with a moderate fire; the part in the chimney is of black iron. The advantages of such an arrangement in cases of sloughs, foul ulcers, cancers, and in fevers with frequent fæcal dejections, are obvious. It may be supposed that the passage of air through the bed would cool it too much. Practically it does not. Probably the quantity of air passing is about the same as in beds ordinarily at the same temperature of the room, but in a different direction.—*N. Y. Medical Journal.*

The Chemistry of Plants.

The activity characterizing many branches of scientific research has yielded wonderful results during recent years. We look upon continued developments with an indifference which but yesterday would have been wonderment. The phases of human progress follow in such rapid succession that we fail at times to note their continuity. But the momentum of research and thought is nevertheless daily demonstrated, and with each demonstration it receives a new impetus which suggests the final possibility of a solution of all mysteries.

While perhaps not in greater activity, still in apparent results the mechanical sciences lead, and from their direct appeal to the more evident interests of the people probably always will be regarded as the most important form of development. In the fields of research of more difficult conquests the results are correspondingly meager, and in no branch is this more true than in that of organic chemistry, especially that pertaining to the chemistry of plants. In referring to this subject the *Western Druggist* says there is little doubt that the organic principles existing in plants are as yet very imperfectly understood. The question of their relations to each other, the influence of variation in climate and soil, the presence and effect of ferments, which appear to be one of the most important at present, are problems which the pharmacologist is called upon to explain more clearly. Recently the active principles of several drugs have been localized in their respective parts of the plants—amygdalin and emulsin in almond, and atropine in belladonna. It is hoped that these and similar investigations will pave the way to a better understanding of the cause, origin, and chemistry of the proximate organic principles, that a systematic science may be formed from the present chaotic mass.

What a Ton of Coal Yields.

A ton of coal yields about 8,000 cubic feet of gas and 1,500 pounds of coke. The purification of the gas furnishes 45 gallons of ammonia water, from which is obtained sulphate of ammonia for agricultural purposes, and about 130 pounds of tar. It is here that the operation becomes especially interesting, for from this last named product are obtained 70 pounds of pitch, 18 of creosote, 9 of naphtha, 13 of heavy oils, 6 of naphthaline, 4 of naphthol, 2 of alizarine, about 1 each of phenol, aurine, and aniline (the substance to which we are indebted for so wonderful colors), 10 ounces of toluidine, 6 of anthracene, and 12 of toluene. Finally, it will interest photographers to know that hydroquinon, that product that has been so much spoken of recently, and which was at first obtained from cinchona, is now obtained from coal by industrial processes.—*La Science en Famille.*

Fabulous Astronomy.

(*Continued from page* 344.)

THE EARTH, SKY, AND STARS.

The first observers of the heavens had no suspicion of the true nature of the stars, nor of the great distances that separate us from them. They believed them, if not within reach of the hand, at least (and almost in a literal sense) to be within reach of the voice. Homer says that the loftiest pines of Mount Ida extended beyond the limit of the atmosphere and penetrated the ethereal region, through which the noise made by the arms of his heroes reached the sky. The latter was a solid hemisphere—a bell that rested upon the earth. According to Euripides, it was a cover put upon the works of the sublime workman. The Hebrew psalmist of the eleventh century before our era said to the Lord, "Thou spreadest the heavens like a tent." It is in this hemispherical vault that the stars of Anaximines are fixed like nails. Empedocles supposed them to be attached to a crystal vault.* The celestial bell covered a flat earth surrounded on every side by water. Every nation supposed itself to be in the center, and China is still to-day the "central empire" [and its Chinese name, Chon-Koo, means "center of the world"]. The Incas of Peru showed the center of the earth in the sanctuary of Cuzco, the name of which signifies "navel," just as the Greeks saw it in the temple of the sun at Delphi, called also the navel (*'ομφαλός*) of the habitable world, and celebrated under that title by Pindar. The Chinese locate the navel of the earth in the city of Khotan. The conception of an earth flat like a cake prevailed in European civilization up to the crusades, and the lazzaroni of Naples still have it.

The Hawaiians, Maoris, and Eskimos believe the entire sky to be supported by a column, just as classical antiquity supposed it to be upheld by Atlas. The Iroquois Indians suppose the sky to be fluid. In order to explain the circular motion of the sun, the Polynesians suppose that the great god Mani holds it by means of a cord, and this also was the idea of the Peruvians.

To the pastor of the Saptasindhu, the stars were fires lighted by Agni (elementary fire) or by Varuna (the celestial vault). A hymn that he addressed to the gods mentions the moon with icy rays only to proclaim the powerlessness of it before the divine fires of heaven.

THE MILKY WAY.

The grouping of the stars in constellations is very ancient. The Great Bear, the Little Bear, the V of Taurus, the Pleiades and Orion have been known for a very long time. The milky way, which is the "winter lane" of the Scandinavians, is the "soul's road" among the Iroquois and several other nations of America [and the *tchibekana*, or "road of the dead," of the Odjibways]. The souls enter the world through the door at the intersection of the zodiac and milky way in the constellation Gemini, and make their exit, to return to the gods, through the door of Sagittarius. French peasants still call the milky way "St. James's Road," and mythology attributes it to a drop of milk that fell from Juno's breast while she was nursing Hercules. It is the "celestial river" of the Chinese, an arm of the sea inhabited by sharks to the Tahitians, the field in which the manes of the ancestors of the Puelches hunt ostriches, and the "star dust" of the Peruvians.

THE PLEIADES.

The Pleiades are a group of stars quite close together, visible in winter in that part of the constellation which lies near Aries and Perseus. Several ancient peoples imagined that they saw male and female dancers in the group.

[Iroquois tradition originates the Pleiades in seven little Indian boys, who met for a dance. Their heads and hearts grew light as they flew around the mound about which they were dancing, until suddenly the whole party whirled off into the air. Higher and higher they rose, whirling around their singer, until, transformed into bright stars, they took their place in the firmament, where they are dancing still, the brightness of the singer, however, being dimmed on account of his desire to return to earth.]

In India, Italy, England, and France, it is rather a hen and her chickens that are seen in the group. French peasants call the group the *poussiniere* (from *poussin*, "chicken"). According to *Ciel et Terre*, observations of the Pleiades are of the highest importance to the Blackfoot Indians, whose feasts are regulated by the advent or disappearance of this group of stars. When the latter disappear from the starry vault, in autumn, the agricultural labors are begun by sowing seed. It is the *inissiman*, or feast of the men. When they reappear, the *montoka*, or women's feast, is celebrated. The first merrymaking has for signification the burial or burning of seed, and the second the return of the absent. The day before the Pleiades make their appearance (and a knowledge of this event implies an advanced state of astronomy), the women make merry by dancing around a pole. It is the *marristam*, in which the vestals of the sun take part. *Ocan* is the autumn feast, during which the dead are honored by a dance called *stapuscan*, or "dance of the dead." The women swear by the Pleiades, and the men by the sun. They are called "the seven," implying the idea of perfection and signifying the seven perfections. In every religious feast the calumet is always presented to them, and prayers are offered up to them that a happy life may be granted. To these Indians the Pleiades were formerly seven young people who guarded the sacred seed at night, and who executed a sacred dance while doing so. Epizors, the morning star, charmed with their gracefulness, took them to heaven, where the sight of their gambols delights the stars.

The sand dance of Malay warriors gives an idea of this celestial dance. The bath of purification prescribed to the Indian doctors contains a triangular aperture, in which are placed seven hot stones that are afterward covered with cold water. After the medicine men have made their invocations, they invoke the aid of the Pleiades in curing the sick in body. As a talisman, they have seven bones, balls, or buttons.

To the ancients, the Pleiades (from *πλειν*, "to navigate") were the constellation of navigators, because they were visible from May to November—the period of navigation in the Mediterranean—and served, instead of the pole star, for directing sailors at night. According to a fable, the Pleiades, or Atlantides, were the seven daughters of Atlas and Pleione, who were carried off by Busirus, king of Egypt, and rescued by Hercules. Being afterward persecuted by Orion, they were changed into stars. The most brilliant of them, Alcyone, η Tauri, is of the third magnitude; Electra and Atlas are of the fourth; Merope, Maia, and Taygates are of the fifth; and Cæleno, Pleione, and Asterope are of the sixth and eighth. The last two are invisible to the naked eye, and Cæleno can be seen only by sharp eyes. It has probably diminished in brilliancy since the time of the Trojan war, since an ancient version states that it disappeared on account of the carnage of these battles.

It is a remarkable thing that our sun and its system are drawn along to a point in space situated between μ and π Herculis, and much nearer the latter, under the influence of a central star, which is perhaps Alcyone.

THE GREAT BEAR.

In the Great Bear, the inhabitants of northern regions see a rude figure of the common bear, or that of the reindeer or dog. A chariot is likewise seen in it—the "chariot of David" of country folk.

The Iroquois have long known of the approximate immobility of the pole star, and call it *tiyunsoudagoerr*, "star that never moves." [The Cree Indians name it *atak ekawikatch ka attutet*, "star that never changes place."]

THE AZTEC FEAST OF THE CYCLE.

The period of fifty-two years appeared to the Aztecs so complete a cycle that they asked themselves whether, at the expiration of this period, the great clock of heaven (having accomplished its revolution) would not stop forever. The Aztec cycle threatened a large number of men once, sometimes twice, in their life. The fatal night on which the fifty-second year was to expire was therefore a solemn moment. On this evening the sacred fires in the temples were extinguished, as were also the fires in private houses. All vessels that had contained food were broken. The evening was passed in darkness, the population being divided between inquietude and hope. It was in the month of November. The sky, usually clear at this season, sparkled with myriads of stars. The people then betook themselves to the mountain of Huixachtecatl, near Mexico. The Pleiades were to culminate at midnight; it was the demarkation of the cycle. When they were at the highest point of the heavens, the chosen victim was brought forward, and the priests opened his breast and tore out his heart. Then laying the sticks whence the new fire was to issue upon the victim's quivering breast, they rubbed them in order to produce the flame that was to light the funeral pile. Men provided with torches at once surrounded the new flame in order to light the resinous wood that they carried in their hands. These were the couriers who were to distribute the sacred fire throughout all the provinces of the empire. At this moment, cries of joy made the mountain echo; the world had not come to an end, and man could hope for at least one more cycle before the destruction of the universe.

Those who were unable to be present at the public ceremony kneeled upon the house tops, asking themselves whether they would see a new era. At the approach of daybreak, with eyes turned toward the east, they watched for the first glimmer of the dawn, like the bird that Dante speaks of, which fixedly gazes eastward in order to see the day appear. At the first sign of light, cries of joy arose from everywhere. New fires were everywhere lighted, a magnificent feast was celebrated, and thanks were rendered to God for having prolonged his light and accorded a new cycle.

The secular feast of the Aztecs has been suppressed by the Spaniards, their conquerors. The last human victim was sacrificed upon the pyramid of Tlaloc in 1507. This solemn celebration was analogous to the secular games of the Romans, and still more closely resembled those of the feast of Isis, in Egypt.—*L. Barre, in Revue Scientifique.**

* According to Lucian, this vault is externally of brass.

Aluminum Bronze.

A writer in the *Journal* of the United States Cavalry Association points out that this alloy might with advantage be used in the construction of breast plates. There is no doubt that the days of defensive armor are by no means past. The advantage of the cuirass was shown in the cavalry combats of the Franco-German war, and the far range of the modern rifle may render it every day more desirable that some attempt should be made to counteract its deadliness. Gun shields also will sooner or later become necessary, and it may be that in this alloy will be found the solution of the question how to protect light artillery and cavalry without sacrificing mobility. Captain W. Hall, the writer above referred to, gives an interesting comparison, which was made by his government, between the average of 130 specimens of accepted gun steel and an alloy of 90 parts copper and 10 aluminum. This comparison is as follows:

	Aluminum alloy. Lb. per sq. in.	Gun steel. Lb. per sq. in.
Tensile strength	111,400	96,150
Probable elastic limit	84,000	51,611

It is considered that modern methods of working aluminum, especially by aid of the electric furnace, will so reduce the price that it will come into general use for many purposes.

THE PEARL MUCILAGE BOTTLE.

The accompanying cuts show a novel and useful mucilage bottle recently placed on the market by the Nassau Manufacturing Co., of 140 Nassau Street, New York.

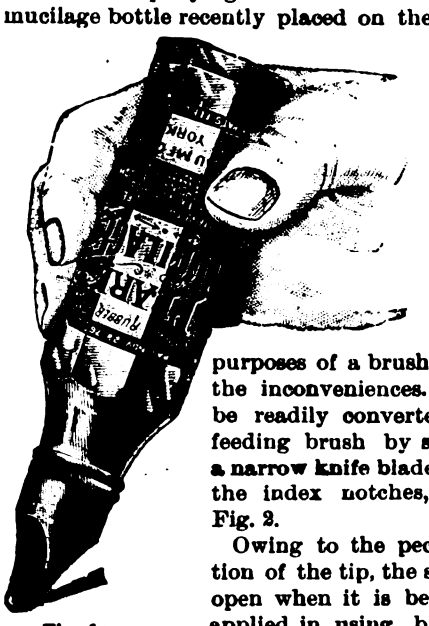


Fig. 1.

Fig. 1 shows the flexible rubber tip, which is of peculiar construction, answering the purposes of a brush, with none of the inconveniences. This tip may be readily converted into a self-feeding brush by simply sticking a narrow knife blade through it at the index notches, as shown in Fig. 2.

Owing to the peculiar construction of the tip, the slits will always open when it is bent by pressure applied in using, but if mucilage hardens around them, a pinch or tap on the end of the tip will readily loosen it. The bottle may be left on its side, or, in fact, in any position, without the slightest chance of spilling any of its contents, as the mucilage will only flow through the apertures when pressure is applied, as in use.

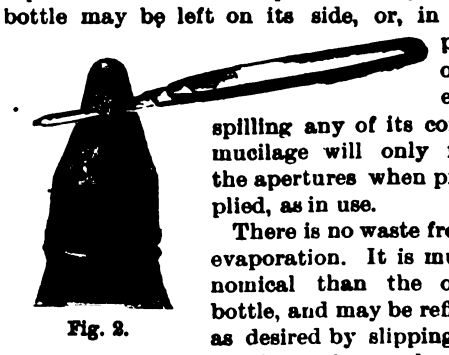


Fig. 2.

There is no waste from spilling or evaporation. It is much more economical than the old fashioned bottle, and may be refilled as often as desired by slipping off the tip. Though on the market but a few weeks, it is having a deservedly large sale.

Friction of Collar Bearings.

The third report of the friction committee of the Institution of Mechanical Engineers is on experiments on the friction of a collar bearing. The general conclusions of the committee are that this kind of bearing is inferior to a cylindrical journal in weight-carrying power. The coefficient of friction is also much higher than for a cylindrical bearing, and the friction follows the law of the friction of solids more nearly than that of liquids, due doubtless to the less perfect lubrication applicable to this form of bearing compared with a cylindrical one. The coefficient of friction appears to be independent of the speed, but to diminish somewhat as the load is increased, and may be stated approximately at one-twentieth at 15 pounds per square inch, diminishing to one-thirtieth at 75 pounds per square inch.

QUANTITIES of bears' bones and seven very well preserved skulls were recently discovered in a cave at Rubeland, in the Hartz. A set of stag antlers, fragments of skeletons of hyenas, and some slender bones, which are assigned to the ptarmigan and the lemming, were also discovered. The cave is to be lighted by electricity for the benefit of scientific visitors.

* With additions by the translator.

Own Your Homes.

Every man, says the *Building News*, whether he is a workingman in the common acceptation of the word or not, feels a deep interest in the management of the affairs of the city, county, and State in which he lives wherever he owns a home. He is more patriotic, and in many ways is a better citizen, than the man who simply rents, and who has but little, if any, assurance of how long it will be before he can be ordered to move, to which may be added in many cases the saving of more money.

Of course it requires some economy to lay up a sufficient amount of money to purchase and pay for a home, but this very fact, if properly carried out after the home is acquired, may be the instrument of furnishing the means to commence and prosecute a business upon one's own responsibility. True, in some cases it will require more economy, perhaps, than is now practiced. But the question with every man, and especially if he is the head of a family, is, can he afford it? That is, can he afford to live up his wages as fast as he earns them, without laying up anything for the future?

If he is the head of a family, he is obliged to pay rent, and it does not require very many years of rent paying to make up an amount sufficient to purchase and pay for a comfortable home. You have to pay rent. This you say you cannot avoid and be honest. Well, you cannot be honest with your family unless you make a reasonable attempt to provide them a home of their own in case anything should happen to you.

And the obligation to do this should be as strong as the one to pay rent or provide the other necessaries for the comfort of your family. When you own a home, you will feel a direct interest in public affairs that otherwise you might consider were of little interest.

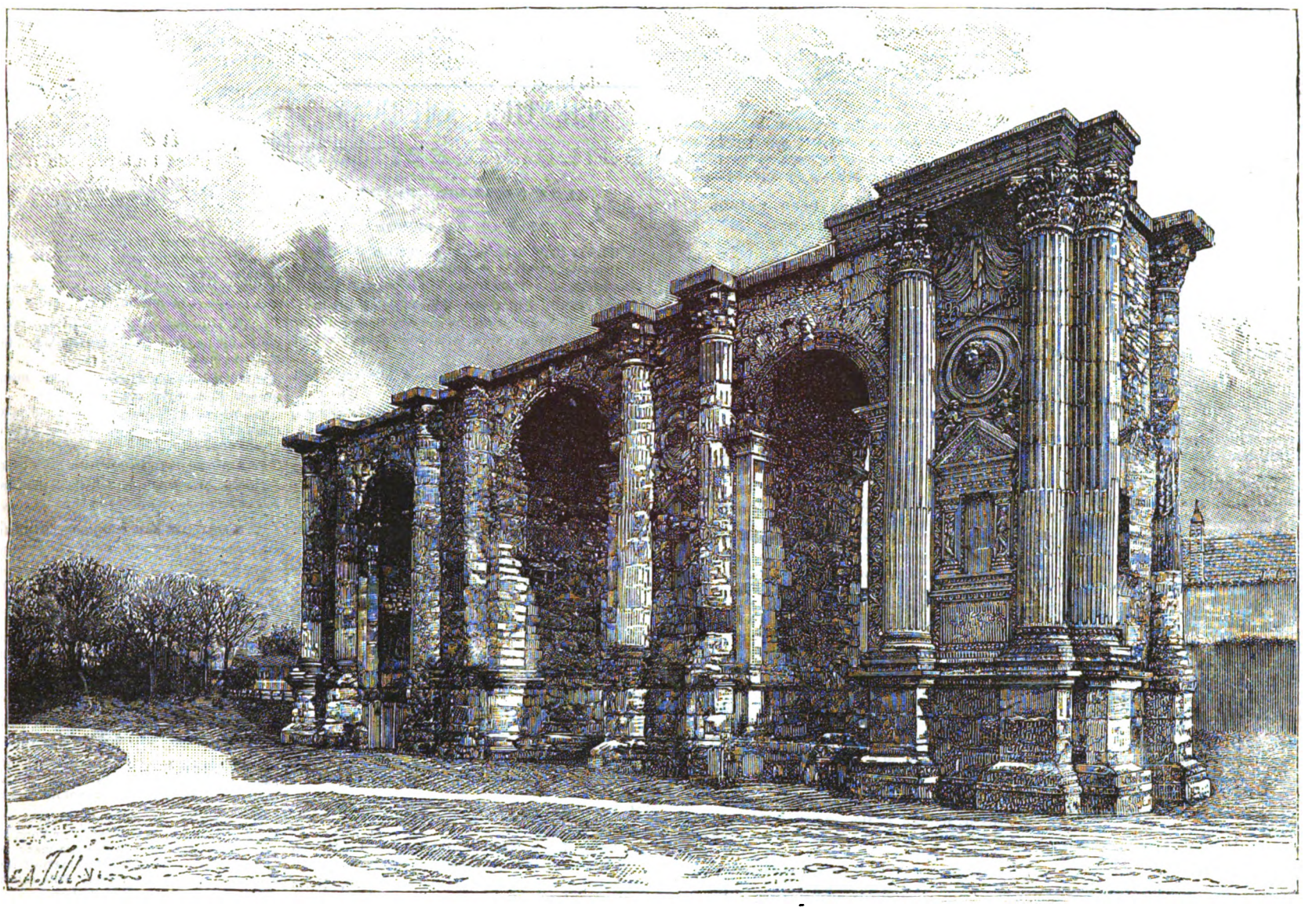
Dye Colors from Plants and Shrubs.

A variety of very useful colors and dyes may be obtained from very common plants, growing in abundance almost everywhere. The well known huckleberry or blueberry, when boiled down with an addition of a little alum and a solution of copperas, will develop an excellent blue color; treated in the same manner with solution of nut galls, they produce a clear dark brown tint, while with alum, verdigris, and sal ammoniac, various shades of purple and red can be obtained. The fruit of the elder, so frequently used for coloring spirits, will also produce a blue color when treated with alum. The privet, boiled in a solution of salt, furnishes a serviceable color, and the over-ripe berries yield a serviceable red. The seeds of the common burning bush, "euonymus," when treated with sal ammoniac, produce a beautiful purple red. The bark of the currant bush treated with a solution of alum produces a brown. Yellow is obtained from the bark of the apple tree, the box, the ash, the buckthorn, poplar, elm, etc., when boiled in water and treated with alum. A lively green is furnished by the broom corn.

RESTORATION OF ROMAN RUIN AT REIMS, FRANCE.

The gate known as the Porte de Mars at Reims, in France, one arch of which has been recently restored, a first step toward the restoration of the whole monument, is the only one remaining of four similar gates or triumphal arches which were used in the city of Reims while under the dominion of Rome. It consists of three arches and eight columns of the Corinthian order, measuring 42½ feet in height. The middle arch, which is the largest, measures 49 feet in width and 38 feet in height. It is called the Arch of the Seasons, and the sculptor had represented the twelve months of the year. Unfortunately, five of these bass-reliefs are almost entirely destroyed, and the seven others are very much damaged. The left hand arch is called the Arch of Remus, and represents Romulus and Remus under the wolf, and at the right and left of the children are standing figures of Faustulus and Acca Laurentia. The arch at the right is called that of Leda, and represents Leda and the swan, with a Cupid carrying a torch above them.

Until 1544 the Porte de Mars was actually used as the gate of Reims, but at that time, owing to the growth of the city, it became necessary to carry the gates further out, and the Porte de Mars is found buried (incredible to believe) under the rubbish brought there for leveling the new routes. Discovered and unearthed in 1812, the government has recently classed it among the monuments of historical interest, and has voted, in conjunction with the municipal government, the funds necessary for the preservation and restoration of this important ruin.—*L'Illustration.*



THE HISTORIC MONUMENTS OF FRANCE—THE ROMAN ARCH OF MARS, AT REIMS.

Danger from Electric Wires.

The number of deaths in this and other cities caused by the electric wires in our streets seems to call for a thorough investigation on the part of our city authorities and electrical engineering associations here and elsewhere.

In a paper presented by Mr. P. B. Delany before the American Institute of Electrical Engineers, a suggestion to this end was thrown out. The causes of death by electricity, its nature and limitations, as well as the probable means for its prevention, are of sufficient practical importance to warrant earnest investigation. The investigations which have thus far been undertaken in this direction have for the most part been isolated and limited in their scope, and there is thus left for the Institute a clear field for work, the result of which will redound to its credit. We hope, with the *Electric World*, that this subject will meet with the attention it merits, and that light will be shed upon a still obscure subject.

The Dynamite Gun.

At a recent meeting of the United States Military Service Institution, General H. L. Abbot, of the Corps of Engineers, criticised this weapon adversely. He did not believe in the practical value of the pneumatic gun in coast defense, because its short range restricted its fire to the area already obstructed by submarine mines, and the defenders cannot afford to make every shot that misses the enemy a countermine to destroy the mines, and thus open a route for his passage. The mines are indispensable, because steam vessels can force their way through any unobstructed channel under cover of darkness, whether the projectiles thrown at them contain gunpowder or dynamite; and it would be inadvisable to introduce a new weapon that directly antagonizes another of prime importance, which it cannot replace.

If it be suggested that the use of the "aerial torpedo" may be restricted to the period of the siege, when, the submarine mines having been destroyed by the enemy, he is ready to attempt to pass the forts, we must remember the high trajectory of the weapon. Vertical fire is not effective against a rapidly moving target, such as would be presented by the enemy's ships when once the channel is opened. For the dynamite gun was claimed the exclusive ability to throw detonating substances with safety; but it was stated on good authority that mortar shells charged with 110 lb. of wet guncotton were fired successfully in Germany, and improvements in the manufacture of such substances pointed to their early use even in guns.

The pneumatic gun was more useful in the navy than the army. As a counterminer to destroy submarine mines it might have a value, although without absolute proof he would be loth to believe that it could do more than moderately assist in the opening of any known and well defined channel from four to six miles long, without which no armored ship could safely pass the forts. Even then it would be a serious matter to maneuver an unarmed floating magazine, containing many tons of dynamite, under the fire of high power guns, mounted on land at a range of one or two miles.

Telegraph vs. Telephone.

A speed trial between the telegraph and telephone from New York to Boston was lately undertaken at the *Sun* newspaper office in this city. The contest lasted for ten minutes; 330 words were delivered in Boston, ready for the printer, by the telegraph, and 346 words by telephone. But many of the telephone words were incorrectly received. So the telegraph was the winner.

ENGINEERING INVENTION.

A boiler feeding attachment has been patented by Mr. Morris P. Janney, of Easton, Pa. Combined with the pump and a feed pipe connected with it having a cock or valve at one side of its connection with the pump, is an accumulator connected with the throttle of the pump and with the feed pipe, whereby, when the feed pipe valve is closed, the force of water in the feed pipe causes the accumulator, through its connections, to operate the pump throttle.

MISCELLANEOUS INVENTIONS.

A wagon has been patented by Mr. George S. Conwell, of Booneville, Tenn. This invention covers an improvement in wagon bodies whereby the wagon can be readily fitted with side standards for hauling wood and the like, or may be formed into a box wagon by the addition of suitable side boards.

A pocket book fastening has been patented by Mr. Robert L. Boyd, of New York City. A catch plate is attached to the flap, having a hook-shaped jaw adapted to engage a corresponding jaw on a base plate attached to the body of the pocket book, the base plate having a movable button arranged to be pushed over the engaging jaws to lock them together.

A nut lock has been patented by Messrs. Alvin B. Neiman and Lewis M. Melhorn, of York, Pa. The nut has a tapered screw hole at right angles to the bolt hole, combined with a tapered screw plug cutting the threads of the bolt at right angles until its threads are deeply embedded crosswise into the threads of the bolt.

A combined square, bevel, protractor, and level has been patented by Mr. William Palmer, Jr., of Rincon, New Mexico. It is an improved instrument for measuring the length of rafters and braces, for marking bevels at their ends, and for forming polygonal figures, the invention covering various novel details and combinations of parts.

A nut lock has been patented by Mr. Orlando L. Castle, of Upper Alton, Ill. It is for use in connection with fish plates at the abutting end portions of railroad rails, and is of that kind in which arch shaped spring plates are used to assist in keeping the nuts from working loose or turning, and to compensate for or take up any slack in the nut lock.

An inkstand and frame has been patented by Mr. Charles Vehring, of New York City. The frame is covered with leather or other suitable covering, and is beveled at its front edge, being adapted to be applied to the base of a writing pad, the casing of the ink bottle being made fast to the frame by tongues of metal, with other novel features.

A stock trap and holder has been patented by Mr. Joshua H. Gentry, of Sheldon, Mo. It is a device which can be cheaply made and set in a fence, gateway, or stock chute, and adapted to any sized opening, as a device for catching and temporarily holding a domestic animal driven into it, by means of a hand lever, ratchet and pawl, and sliding bars.

A road grader has been patented by Mr. Alberto Finks, of New Berlin, N. Y. This invention provides a novel construction and arrangement of parts in connection with a reversible scraper, with means for securing it in different positions, and applying the draught for adjusting the scraper vertically or holding it at any suitable angle.

A wagon jack has been patented by Mr. Rozell Harris, of Hackensack, N. J. Combined with the carrying bar is a curved arm attached centrally thereto, upwardly extending supporting bars integral with the extremities of the arm, and steps secured on the arm beneath the supporting bars, whereby one or both wheels of a wagon on the same axle may be raised as desired.

A theatrical appliance has been patented by Mr. Joseph Arthur, of New York City. This invention provides mechanical means for representing the interior of a city fire engine house, wherein the clothes covering the beds and the harness for the horses may be manipulated simultaneously, the former being lifted from the beds and the latter dropped in position upon the horses.

An electro-medical apparatus has been patented by Mr. Peter Horst, of Sioux City, Iowa. It has a hard rubber grooved disk with a small metallic plate on its under side and a large one on its upper side, with conductors held in the disk and connecting its under side with the metallic disk on top, in connection with a collector for frictional electricity held between the top disk and the hard rubber disk.

A gummed paper fastener forms the subject of a patent issued to Mr. Joseph M. Jones, of Paris, Ky. It consists of a strip, divided transversely at suitable distances by rows of perforations, and having gum or adhesive material applied to both of its sides, to secure, upon dampening, separate sheets or pieces of ungummed paper together, in counting houses and elsewhere.

An automatic fire extinguisher for stoves and heaters has been patented by Messrs. Frederick L. Hotchkin and Pierre A. Raby, of Brooklyn, N. Y. It is designed to be especially applicable for use with car heaters, to automatically act, in case of accident, to extinguish fire in the heater, the invention covering various novel details in construction and the combination of parts.

An embossing machine has been patented by Mr. Michael T. Durkin, of Brooklyn, N. Y. It is a lever press having a follower with variable stroke operated by a lever working on a yielding fulcrum, with an arrangement of movable dies adapted to be readily adjusted for different kinds of work, for forming sheet metal in various designs without the employment of special dies or moulds.

An electric tele-thermoscope has been patented by Mr. Harry W. Hardinge, of Leadville, Col. It has a pulsator consisting of a curved tube with a bulb at each end, additional tubes extending short distances into the bulbs, combined with an air chamber connected with one of the additional tubes, a thermostatic spring and adjusting screws, arranged in an electric circuit, for indicating changes of temperature.

A punching and shearing machine has been patented by Messrs. Claus Weber and Henry Schneider, of Parker, Dakota Ter. The invention consists of a series of different sized punches, and a shear adapted to be engaged alternately at their heads by a link, pivotally connected with a lever fulcrumed on a longitudinally sliding bar held above the punch and shear heads.

A gate has been patented by Mr. Jesse Chandler, of Red Stone, Kansas. Combined with a gate is a three-armed lever on its end bar, a sectional latch, rods pivoted to the opposite arms of the lever and loosely connected to the rear section of the latch, ropes being connected to the other arm of the lever, the object being to facilitate the opening and closing of gates and promote reliability in their action.

A secondary battery has been patented by Mr. Ludwig Epstein, of Martinkenfelde, near Berlin, Prussia, Germany. The electrode consists of a series of composite strips formed of the active material and metallic lead, the strips being arranged at a suitable distance apart, and connected by suitable means to form a grid, which is adapted to permit the free circulation of the electrolyte.

An oven attachment has been patented by Mr. Charles E. Hollingsworth, of Minneapolis, Kansas. It is for use in connection with a gas or gasoline stove, the invention covering a novel construction by which it is designed that baking may be carried on at the time when it is necessary to employ the stove for other culinary purposes, with no additional expenditure for fuel to produce the requisite heat.

A fire escape has been patented by Mr. Henry B. Calkins, of Hyndsville, N. Y. It has friction rollers pivoted near the upper end of a frame, combined with aligning curved carrying arms and angle levers, and other novel features, being adapted for use with a rope, to facilitate the safe descent of a person from any height, the rapidity of the descent being under the control of the operator.

Tubular plaited or braided bands form the subject of a patent issued to Mr. Leedham Binns, of Philadelphia, Pa. The improved band is more especially designed for driving the spindles of spinning and twisting frames, and the invention covers a novel construction, in which the tubular band is formed at its ends with disconnected loops of the same thickness at their bends as the body of the band.

A wheel for hand trucks, casters, etc., has been patented by Mr. Michael J. Cummings, of New York City. It is made of two metallic compressing disks, each having a peripheral flange and an annular shoulder, combined with a tire of rubber or similar material, having annular side grooves to receive the flanges on the disks, the construction being such that the tire cannot be slipped off the wheel by hard usage.

A fire escape has been patented by Mr. Thomas Brice, of Sandy Hill, N. Y. The case is made of two long half boxes, in which grooved pulleys are arranged, a rope passing through the case and winding around the pulleys, with means for making more or less frictional engagement, making a simple and efficient device not liable to be disarranged in the excitement of a fire.

A hay derrick has been patented by Messrs. William A. Hooper and Rodney F. Hamblen, of Maryville, Mo. The base frame has an outer guide pulley at its lower end and an inner guide pulley, in connection with a centrally journaled mast carrying a cross beam on whose ends are pulleys, the mast and its cross beam turning in any desired direction, and there being a windlass on the base frame.

A machine for planing stereotype plates has been patented by Mr. Lucius Goss, of New York City. It is for use with plates cast with several spaced columns, and has trimming knives or cutters arranged to enter the spaces between columns and trim the edges, while the bed plate or frame has a straight edge or offset to align the stereotype plate with the bed plate and its line of motion, to insure accurate trimming of the columns.

A belt punch has been patented by Mr. Hugh L. T. Overbey, of Summerville, Ga. It consists of a vertically reciprocating rod mounted in the arms of a metallic frame, the lower end of the rod being threaded to receive a tubular bit, and there being a handled lever pivoted at the top of the rod, and the rod being surrounded between the arms by a coiled spring, which acts to withdraw the punch after a hole has been made.

A moulder's draw iron has been patented by Mr. George A. White, of Sharon, Mass. It is an improved device for the ready and accurate withdrawal of a pattern from the mould, in which ordinary wood screws are employed, so that as one wears out it may be quickly replaced at slight cost, and by means of the attachment of the handle with the screw the latter may be so controlled in entering the pattern as not to depress or jar it and thereby trouble the sand.

An apparatus for detecting leakage in furnace blocks has been patented by Mr. Joseph Bird, of Saxton, Pa. Combined with the water blocks of a furnace and the discharge pipe is a detachably connected faucet, with a valve near the lower end, an upwardly extending branch above the valve, a glass tube supported by the branch and closed at its upper end, a stop cock below the tube, and a sectional collar attaching the faucet to the discharge pipe, making a simple device capable of application by any workman.

A process of reducing iron ores has been patented by Mr. Gustaf M. Westman, of Stockholm, Sweden. In addition to the reducing furnace, regenerating or carbureting furnaces are employed, with a circulating blast engine, affording means for reducing the ores by means of carbonic oxide, by passing the carbonic oxide through a charge of ore, drawing off the gases from the charge and passing them over glowing coke, cooling the gases and then superheating them, after which they are again passed over or through the ore to be reduced, thus saving fuel without injuring the quality of the product.

A process of reducing zinc ores has been patented by the same inventor. It consists in subjecting the zinc ores in mixture with coal to the action of highly heated carbonic oxide, condensing the zinc from the outgoing carbonic oxide, and subsequently reheating and returning the gas through the charge, the gases taking the oxygen from the zinc oxide and the carbon from the fuel, avoiding the admixture of air or oxygen, and constituting a process of reducing the ores at a low cost, with saving of labor and fuel.

A two-wheeled vehicle has been patented by Mr. Charles C. Spencer, of Cortland, N. Y. It is designed to obviate horse motion by the use of a novel form of springs, having a transverse front spring attached to the body and the side bars, in combination with longitudinal side springs having their forward ends attached at the front of the body and their rear ends curved upward, with a U-shaped bend, and secured to a semi-elliptic spring attached to the under side of the seat, each side spring being likewise susceptible of being made in two parts, to vary its form in front of and behind the point of its attachment to the axle.

NEW BOOKS AND PUBLICATIONS.

A TREATISE ON THE USE OF BELTING FOR THE TRANSMISSION OF POWER. By John H. Cooper. Third edition. Philadelphia: Edward Meeks. Pp. 399. Price $3.50.

This work, from the time of the appearance of the first edition, in 1877, has been looked upon with decided favor by large numbers of users of leather belting, as being eminently practical and covering a wide range of practice. It has numerous illustrations of approved and actual methods of arranging main driving and quarter-twist belts, with rules for calculating the size and driving power of belts, and directions for their care and management. The author also presents liberal quotations covering the views and experience of the best known engineers and managers of machinery, collected through a long series of years.

WOOLEN AND WORSTED CLOTH MANUFACTURE. By Roberts Beaumont. New York: John Wiley & Sons. Pp. 390. Price $2.50.

This book is designed to be a practical treatise for all persons employed in the manipulation of textile fabrics. It treats of the physical structure and clothing properties of the raw materials used in the production of woolen and worsted fabrics, the making of yarns and their preparation for weaving, the manipulation of the loom, designing and coloring, and the operations to which the cloth is submitted after weaving. The author is a lecturer and demonstrator in the textile industries department of the Yorkshire College, Leeds, England, and therefore brings to his task a knowledge of the technical details in one of the foremost manufacturing districts in this specialty in the world.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) C. H. writes: I have just completed a small motor, made after the instructions given in your valuable paper, but on a smaller scale. I made the magnets one-half the width and thickness as the one you described, put the same number of layers and convolutions, and wound the magnets with No. 20 covered wire. I applied it to the wires from a dynamo, and found it to work excellently. This is my first attempt at such work. Would you please give me the dimensions of a motor, such as the size of field magnet, length of armature core, size of wire, and the number of convolutions and layers to be wound on each, so that I could make a motor with power enough to propel a small row boat about 18 feet long? A. We are pleased that you have succeeded so well in making your motor. We shall in the near future publish a description of a larger electric motor adapted to your wants.

(2) J. J. E. writes: I have built a dynamo according to description given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 161, and it works beautifully both as a dynamo and a motor. As a motor it runs with a small current, and where I run it and magnetized the field magnets, they put the current from 4 arc lamps as used on the streets, and it ran with uncountable speed without heating at all. The first few turns of the drive wheel generates a current. I have made an arc lamp 18 inches by 6 inches, ¼ inch carbons. Can you give me an idea how I can make some electric magnet that will cause the upper carbon to be raised about ¼ inch when the current is turned on, so as to make an arc? A. An axial magnet formed of a few turns of wire heavy enough to carry the entire current, and provided with a hollow cylindrical core or armature, carrying clutch adapted to engage the carbon or the carbon supporting rod, will probably answer your purpose.

(3) W. C. S. asks: 1. Will the motor used as a dynamo, wound with 16 and 20 wire, develop as much current as the one in SUPPLEMENT, No. 161, when driven by a half horse power engine? A. Yes. 2. Can the so-called burglar alarm wire wound with two layers of cotton, costing 40 cents a pound, do in place of regular magnet wire to wind it? A. No. The insulation is too thick. 3. Would a better commutator, like that of the eight light dynamo recently described in SCIENTIFIC AMERICAN, increase its efficiency as a dynamo? A. It would undoubtedly be a better commutator to use, but it would not be in accordance with the spirit of the article, which calls for a commutator made with few tools. Such a commutator would not increase its efficiency.

(4) H. H. W. asks: Will increasing the amount of wire on the field magnet increase the lighting capacity in number of lamps from dynamo, in No. 600 of the SUPPLEMENT? A. You can increase the capacity of the machine by adding two layers of two parallel No. 18 wire each, or two layers of No. 12, which is the equivalent of two No. 18 wires, and, by increasing the size of the wire on the armature from 20 to 19, and increasing the speed about 25 per cent. This modification will enable you to run about 12 lamps, but at a corresponding increase in the expenditure of power.

(5) H. A. Z. asks: If an armature can be made to fit in the field magnets of dynamo described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 161, that will give a stronger current in volts than 6·3, can it be made on same principle as the eight light dynamo armature, and what size wire and number of coils? If soft iron wire or washers would be best for core? A. We cannot advise you to make a drum armature for your small dynamo. You can increase the voltage by reducing the size of the wire upon the armature and field magnet. The reduction of one or two sizes in the wires will make a marked difference in the results.

(6) D. T. G. writes: I anticipate using the hand power dynamo for a motor, in a canoe. If I wind it as directed in the article on making a drum armature for it, for motor, how much battery power will it take to run it? A. The hand power machine described in SUPPLEMENT, No. 161, will answer very well as a motor without any alteration, except possibly the reduction of the amount of wire upon the field magnet to about one half its present quantity. A drum armature of a diameter suitable for this machine we think would not be as efficient as an H armature.

(7) J. O'D. writes: I am trying to make the simple electric motor. I would like to know if the copper wire as used in the telephone will do? A. The wire used in the telephone is too fine for the motor. 2. I would like to know the size of the vulcanite. A. The vulcanite is 2¼ inches in diameter and ⅛ of an inch thick. It need not be exactly of this size. Consult SUPPLEMENT, No. 641.

(8) C. K. S. asks if the simple electric motor described in your issue of March 17 would be capable of running a small dynamo of same dimensions, and if this dynamo would be capable of sustaining two 16 candle power 40 volts incandescent lamps. A. The motor is incapable of running a dynamo of sufficient size to sustain two 16 candle power lamps; better use the current employed in driving your motor for running your lamp.

(9) W. T. asks: Can we decompose water by a dynamo-electric machine, and how? What quantities in cubic feet of H and O per hour can two horse power engine with a dynamo in favorable circumstances produce? A. Yes. By using iron terminals and immersing them, not touching, in a vessel of caustic soda, oxygen and hydrogen will be evolved, one gas from each pole. It is an expensive way of working. A 2 horse power engine will give about 5 cubic inches of hydrogen and half as much oxygen per second.

(10) M. F. D. asks: Is Fordham a part of New York City? A. Yes.

(11) H. M. P. writes: We have constructed the electric motor, following as near as possible the instructions given in your paper. Being unable to get 12 coils on the armature, we wound it with 8 coils No. 16. The commutator is made of a brass tube 1 inch long and 1 inch diameter, divided in 8 sections. The battery consists of eight 1 gallon earthenware jars, each jar having 1 plate of zinc and 2 plates of gas carbon cut roughly in shape, and separated from the zinc plates by vertical stripe of wood nailed to a horizontal strip that supports the zincs. This battery runs the motor for two or three hours, but does not give power enough for any work. The motor attains a high speed when in the circuit of a small dynamo. How can we increase the efficiency of the motor so that it will run a lathe? Is it necessary to make a new solution every time we use the motor? You say to connect the coils 2 inches parallel. What is meant by this? In taking twice the dimensions of motor, should there be 24 coils on the armature? Is the power of motor increased by adding to the number of coils? How can I mould plates for a battery from gas carbon? A. You would probably secure better results if you were to connect your battery for "quantity," that is, connect all the zincs together for one pole of the battery, and all the carbon plates together for the other pole. It was a mistake to reduce the number of coils—better increase the number than reduce it. To connect coils in parallel is to connect corresponding ends of the coils together, so that the current will pass through both at once, instead of passing through one after the other. If you double the diameter of your armature, you should use 24 or more coils. The power of a motor will be increased by adding to the number of coils, but there must be a corresponding increase in the current. You cannot readily make your own battery plates. You will find it far cheaper and better to purchase them. You will, however, find in recent answers to queries full directions for making battery carbons.

(12) E. C. B. asks: 1. Should the armature touch the field magnet in the electric motor described in SUPPLEMENT, No. 641? A. No. 2. How can I make the vulcanized fiber disk for the motor? A. You will have to purchase the vulcanized fiber from a dealer in electrical supplies. A disk of hard rubber will answer the same purpose. 3. Would it be practicable to use a storage battery and dynamo run by windmill to run the motor? A. The power of a windmill is too unsteady to run a dynamo direct for charging storage batteries. 4. How could I make the dynamo and storage battery? A. For information on dynamos consult SUPPLEMENT, No. 600. For information on storage batteries, consult SUPPLEMENT, Nos. 346, 416, and 342. 5. How is adhesive tape made, and where can I procure it? A. Adhesive tape is made by covering cotton tape with a varnish formed by dissolving pure rubber in benzole or turpentine, and adding a very small percentage of a fixed oil to prevent it from drying hard. 6. Where can I procure loadstone? A. From any dealer in physical machines or apparatus. 7. How can I temper a steel spring? A. Heat the spring to a cherry red, plunge it in oil; hold the spring over an open fire and heat it evenly from end to end until the oil blazes. A great deal of practice is required to properly temper a spring. In the first place, to secure a proper spring temper, good spring steel is required. The steel must be uniformly heated to a cherry red, and care must be taken to not overheat it. 8. Does an engine take any heat out of steam except what is due to expansion? A. A great deal of heat is lost by conduction through the walls of the cylinder. 9. What is the best form for an account book for a mechanic working by the day? A. Consult any work on bookkeeping. 10. Where can I get rules for figuring on a building? A. Consult "Building Table and Estimate Book," by Brown. Price $1.50. "Builders' Guide and Estimators' Price Book," by Hodgson. Price $2. Or "Architects' and Builders' Pocket Companion and Price Book," by Vodges. Price $1.50. Which we can supply.

(13) F. McF. asks: 1. Would a motor made one-half the size of one described in March 17 number be strong enough to work one sewing machine? A. If made one-half the size (linear), it would have but one-quarter the power of the machine as described. We think it advisable to adhere to the present proportions except in the matter of winding the armature. You might fill up the sections of the armature ring with No. 20 wire, about six layers deep. 2. Will four bichromate batteries be sufficient? A. Yes. 3. Is field magnet wound with same kind and size of wire as armature? A. The size of the wire on the field magnet may remain the same. 4. The brushes are connected up by means of flexible cords. Please explain. A. The connections of the brushes are clearly shown in the drawings. The flexible cords are used to permit of turning the disk which carries the brushes.

(14) G. I. K. asks for the calorific powers of natural gas and coal gas. A. Natural gas varies greatly in its composition. A fair tabulation would give per 1000 cubic feet:

Natural gas.....650,000 foot pounds.
Coal gas.....450,000 to 500,000 " "

Water gas is about the same as coal gas. 1 foot pound = 766 10/10 pounds avoirdupois of water heated 1 degree Fah.

(15) A. K. asks: What substance in the form of a varnish or paint, or similar covering material, will resist the action of hydrofluoric acid? A. Melted beeswax or paraffin may be used as a resistant varnish, or solution of gutta percha in bisulphide of carbon.

(16) J. W. I. asks for something to put on posts to keep them from rotting in the ground. We have nothing but spruce and some cottonwood, and find the spruce posts will only stand three or four years, when they rot off at the ground. A. Creosote oil is an effectual preservative. Make a small shallow tank into which pour one or two barrels. Place the ends of the posts in the tank, as many as convenient. Allow them to remain a few hours, then drain off excess of oil and lay by ready for setting. If the posts are of such size that you can burn the portion going into the ground, before creosoting, so as to make on them a coating of charcoal, that is a good protection.

(17) J. T. asks (1) how to make a fire bed in a forge that will not crack and get loose. A. Make the fire bed of your forge of pulverized fire brick, which can be done with a hammer. Mix with just enough common clay and water to make the mass stick together, ram the bed slightly with a stick or hammer, let it dry, and build a slow fire at first. 2. What is the best way to temper small flat springs, such as main springs in guns, etc.? A. Small springs as for gun locks should be dipped in salt water edgewise, so that the water will flow through the bend. Use as low a heat as will allow of hardening. Much depends upon the quality of steel used as to heat required. To draw temper, dip the spring in lard oil or linseed oil, and heat over the fire until the oil takes fire, then dip in oil.

(18) Mrs. F. P. writes, concerning how to keep jelly from moulding. Grease a soft paper with butter, and place it very carefully on the top of your jelly, buttered side up, and do not leave the least air bubble visible, placing the paper close to the side of the cup all round, then paste another good paper, not too stiff, over the top of cup; you will find your jelly afterward as good as when first put up.

(19) H. A. S.—Kerosene and petroleum are used in burners for cooking purposes, and in a small way for generating steam without the steam jet. Steam pressure of 3 or more pounds pressure is needed to make any reliable flame for steaming a boiler. It has been tried without pressure on burners to boilers for house heating, but all such devices have been failures from the fact that they cannot be trusted and are therefore a source of danger. We do not know enough of the particular burner you mention to venture an opinion.

(20) F. W. J. asks: 1. Will the lines of vision of a man standing on the equator and a man standing in the temperate zone, both looking in a westerly direction, be converging, diverging, or parallel lines? And if so, why? A. They will be parallel. All horizontal lines at right angles with a meridian are parallel for every degree of latitude. The reason is a geometrical one, derived from the axiom that a meridian of the earth is in a geometrical plane, and all lines at right angles to a plane are parallel. This has no relation to the dip of the horizon, which will make all lines converge from a meridian or other circle.

(21) L. C. N. asks how to enliven the cushions on a billiard table. A. The cushions of billiard tables are usually made of rubber, vulcanized; when they become hard by age and use, there is nothing that can be done but renewal.

(22) P. C. C. asks (1) a receipt for making chloroform liniment. A. Take 1 ounce each chloroform, ether, spirit of camphor, and laudanum, and ½ ounce tincture of Cayenne pepper. 2. How to make a blood purifier. Mix ½ ounce sulphite of manganese with 1 pint of water. Take a wineglassful three times a day.

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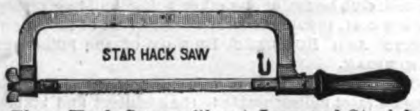

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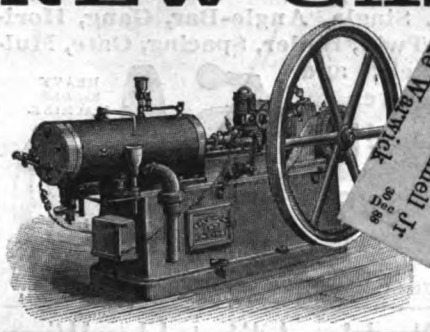

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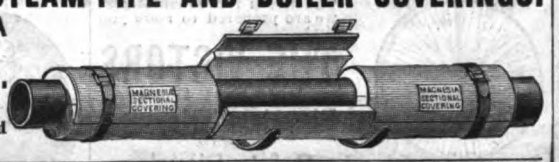

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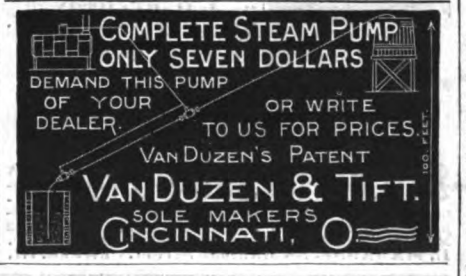

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