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HOW DEEP WELLS ARE MADE.

In sinking deep wells, whether for water, oil, or gas, American mechanics and engineers are easily a long way in advance of those of the rest of the world, and we export annually considerable of the "plant" required for such work abroad, as well as, in many cases, the expert workmen to conduct the operations. It was, of course, the "striking of oil" in a little town of Western Pennsylvania, in 1859, giving rise to our great petroleum industry, and leading to the subsequent wonderful utilization of natural gas, which caused our rapid progress in improving the machinery for and perfecting the methods of well drilling.

There had long previously been, as there are to-day, in many other parts of the world, equally promising indications of a rich reward for enterprise and skill in this direction, but the discovery of Pennsylvania's hidden resources found men with the genius to make the most of it in a way which has not only added greatly to the national wealth, but has inspired explorers to an activity in similar work that now takes the whole surface of the globe within the sphere of possible operations.

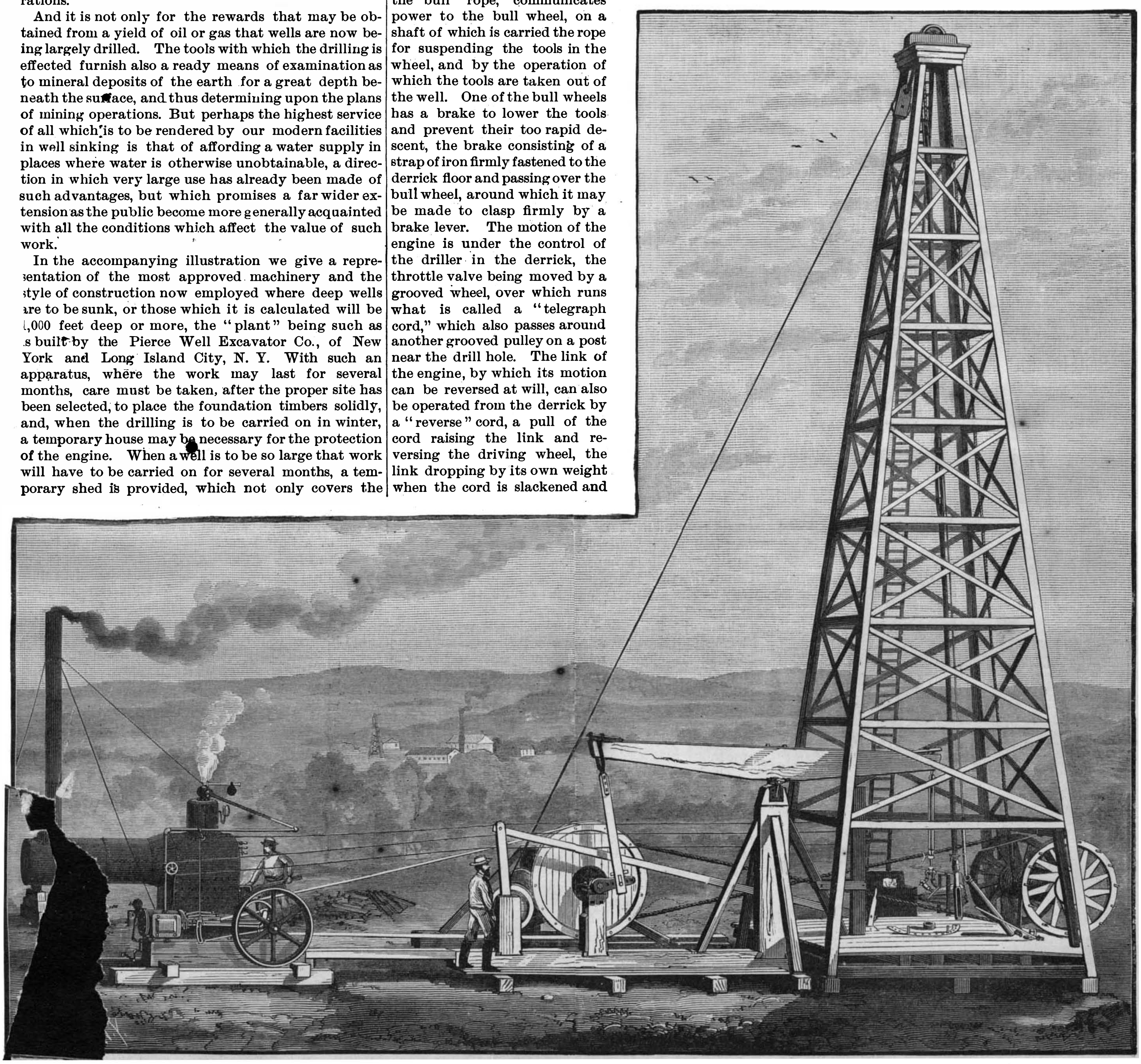
And it is not only for the rewards that may be obtained from a yield of oil or gas that wells are now being largely drilled. The tools with which the drilling is effected furnish also a ready means of examination as to mineral deposits of the earth for a great depth beneath the surface, and thus determining upon the plans of mining operations. But perhaps the highest service of all which is to be rendered by our modern facilities in well sinking is that of affording a water supply in places where water is otherwise unobtainable, a direction in which very large use has already been made of such advantages, but which promises a far wider extension as the public become more generally acquainted with all the conditions which affect the value of such work.

In the accompanying illustration we give a representation of the most approved machinery and the style of construction now employed where deep wells are to be sunk, or those which it is calculated will be 1,000 feet deep or more, the "plant" being such as is built by the Pierce Well Excavator Co., of New York and Long Island City, N. Y. With such an apparatus, where the work may last for several months, care must be taken, after the proper site has been selected, to place the foundation timbers solidly, and, when the drilling is to be carried on in winter, a temporary house may be necessary for the protection of the engine. When a well is to be so large that work will have to be carried on for several months, a temporary shed is provided, which not only covers the engine and belt connections, but also incloses and protects the machinery and workmen in the lower part of the derrick.

The diameter of the well is generally 6 or 8 inches, but may be either smaller or greater, as desired, though seldom less than 5⅝ inches, all the tools and appliances for wells of several different diameters being regularly manufactured. The principle upon which the well is drilled is that with free falling tools, suspended by a cable and worked by steam power, the weight of the tools shall be so great as to give blows of sufficient force to pierce the hardest rock.

The power from the engine is taken by a large band wheel, on one side of which is a crank that gives the up and down motion to the pitman working the walking beam that raises and drops the tools in the well in the operation of drilling, the crank having, as will be seen, several holes for connecting it with the pitman at different distances from its axis, to vary the length of stroke given by the walking beam. On the opposite side of this band wheel is what is called a tug pulley, which, by means of a crossed rope, styled the bull rope, communicates power to the bull wheel, on a shaft of which is carried the rope for suspending the tools in the wheel, and by the operation of which the tools are taken out of the well. One of the bull wheels has a brake to lower the tools and prevent their too rapid descent, the brake consisting of a strap of iron firmly fastened to the derrick floor and passing over the bull wheel, around which it may be made to clasp firmly by a brake lever. The motion of the engine is under the control of the driller in the derrick, the throttle valve being moved by a grooved wheel, over which runs what is called a "telegraph cord," which also passes around another grooved pulley on a post near the drill hole. The link of the engine, by which its motion can be reversed at will, can also be operated from the derrick by a "reverse" cord, a pull of the cord raising the link and reversing the driving wheel, the link dropping by its own weight when the cord is slackened and the ordinary motion of the engine is restored. The sand pump, which, as well as the regular drilling tools, is shown just touching the derrick floor, is made with a valve in the bottom, and a suction valve on the end of the plunger; and when the pump stops at the bottom of the well, the plunger descends to the bottom of the pump, the leather valve being so constructed as to go down in the pump readily, while on pulling back it flattens and becomes a tight piston. The sand pump line is fastened in an eye at the top of the plunger, from which a rope runs over a pulley block at the top of the derrick, thence down to the sand reel. The sand reel shaft has also a brake, and the reel is so hung that the bearing of the friction wheel is even with the face of the band wheel. The sand pump runs down in the well by its own weight, but is withdrawn by pulling upon a lever which holds the friction pulley against the face of the band wheel, its rate of ascent or descent being always readily controllable. There are several varieties of sand pumps, one having a common leather flap valve, the other a ball and dart valve; the

(*Continued on page* 116.)



APPLIANCES FOR DRILLING DEEP WELLS FOR WATER. OIL OR GAS.

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Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 555.

For the Week Ending August 21, 1886.

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THE CHANNELWAYS OF NEW YORK.

Now that Congress appears to be ready to set aside a large sum of money for the improvement of the approaches to the port of New York, it seems a fitting time to inquire with something like particularity into the needs of the harbor, and whether or no the plan of operations determined upon is likely to result in permanent advantage. The deep-draught steamers that ply to and from the port stir up the bottom of the channelways, so near do they approach it, as they pass in and out, and sometimes they fetch up hard and fast, and are compelled to seek assistance to get off. This usually occurs during the neap tides, or when the attraction of the sun and moon are exerted in directions perpendicular to each other, or about four or five days before the new and full moons.

There is an inclination in certain quarters to build even deeper ships than those now employed, in the belief that greater steadiness besides enlarged carrying capacity would result; and the ship builder, it is said, is only dissuaded because of the shallowness of the channels in the port of New York.

It is the commendable design of the friends of the measures now before Congress to so deepen these channelways, on the one hand by the construction of a sea wall or dike and on the other by dredging, that a ship can carry in thirty feet at mean low water without the risk of grounding.

Just how it is proposed to carry out this scheme of improvement may be gathered from the recommendation of the Board of Engineers for River and Harbor Improvements. Here it is:

"If a dike, rising to half tide, were built running from Coney Island about S.S.E. toward Gedney's Channel, for a length of five miles, the water cross section at Sandy Hook would be reduced to about 470,000 square feet, and the mean velocities during a tide would be nearly doubled. These figures give a general idea of the forces now acting, and which would act after such a contraction. Since the existing velocities maintain a depth over the bar of 24 feet, this considerable increase in velocity would maintain a considerably increased depth. . . .

"As the increase of current would cut away the head of Sandy Hook, it would have to be protected. . . .

"The total cost of the improvement, giving 30 feet from New York to the ocean, would be about $5,000,000 to $6,000,000. . . .

"To recapitulate: The board recommends as a general plan for improving the entrance to New York Harbor, so as to give 30 feet from New York to the ocean, the construction of a stone dike running about S.S.E. from Coney Island to such distance as shall be found necessary, and probably not less than four miles; the protection of the head of Sandy Hook, and the dredging of a 30 foot channel from deeper water near Sandy Hook to deep water below the Narrows; also, the immediate dredging of a channel 1,000 feet wide and 28 feet deep through the shoal west of Flynn's Knoll as soon as Congress shall furnish the funds; also that the existing appropriation be applied to dredging Gedney's Channel to a depth of 28 feet."

That such dikes have been built in the Old World, and that they realized the hopes of their constructors, there is no doubt; but whether the conditions were the same as those which obtain here there would seem to be a serious, and perhaps it is not too much to say a fatal, doubt. Who is able to guarantee that the construction of this costly dike, even if it should prove capable of withstanding the assault of the sea, would not lead to the filling up of the channelways, the destruction of the harbor, and to the making of New York what, practically speaking, might be called an inland city?—What New Orleans was until the arrival of Eads.

That this Board of Engineers is not infallible, we have a fairly good illustration in their condemnation of and hostility to the scheme whose successful development opened a deep channel way through the passes of the Mississippi below New Orleans. The army engineers believed the only hope for New Orleans lay in dredging, notwithstanding that millions had already been expended in this manner with nothing to show for it.

The idea of dredging out a channelway is an attractive one. Given a modern dredge with a capacity for scooping out hundreds of cubic yards of soft material every working day, and it is easy to calculate the number of weeks or months it will take to replace a shoal with deep water. But, unhappily, it is scarcely more difficult to estimate, the dredging having ceased, when the hole will be again filled up by the same forces which first formed and afterward maintained it.

So far as the port of New York is concerned, it may be stated as a fact that there is as much water in the channelways to-day as there was a century ago. If any one doubts this, let him call at the Harbor Commission office, where he will be shown the proof in the form of a hydrographic chart made by the English during the Revolutionary War. All the dredging that has been done since that time has not availed to permanently deepen the channels. Of late years, since the coming of the great fleet of steamships and steamboats into the harbor, there has been much dumping of ashes and clinkers into the waters of the bay, which has, at times, threatened the channels. But the continual churning up of the bottoms of these by the revolving screws of the big steamers has kept them clear, and the pilots, who make daily examinations with the lead-line, say that these whirling screws do their work more thoroughly than the dredge, because they do not have to await an appropriation to go on and continue it.

A writer to a daily paper, who has confidence in the dredging machine, says of the work now being done in Gedney's Channel: "An increased depth of more than two feet has been gained for a width of 800 feet, thus giving 26 feet at mean low water, where only 23½ feet was previously found. The indications now are that the improvement will be of a more enduring nature than was at first anticipated, *if the dredged channel shall remain open during the next winter.* That fact will furnish conclusive evidence that jetties and dikes will not be needed for the conservation of the channel."

The *italics* are ours.

But the experience with dredging in these channelways within the memory of men now living shows that the advantages gained by dredging have never been of a permanent nature, and hence dredging seems "not to be needed for the conservation of the channel."

Tyrotoxicon: a Poison Developed in Milk.

About a year ago, Dr. Victor C. Vaughan, of the University of Michigan, succeeded in isolating from some samples of cheese that had produced alarming symptoms in many persons, a highly poisonous ptomaine, which he named tyrotoxicon (cheese poison).

His knowledge has been gained largely through experiments upon himself and some of his more enthusiastic students. He found that the same symptoms were produced by the isolated poison as had been observed in those who had partaken of the affected cheese. They consisted principally of dryness and constriction of the fauces, nausea, retching, vomiting, and purging. Although in several cases the illness was very severe, all finally recovered.

Further investigations have led to the discovery that tyrotoxicon may be developed in milk, and is probably responsible for the several cases of poisonous ice cream that have recently puzzled the medical authorities. It is also believed to have an intimate connection with cholera infantum and kindred diseases, a view that is sustained by the severity of its effects upon young animals.

It was found by Dr. Vaughan that milk which was presumably normal when first obtained, yielded crystals of the poison after long standing in a tightly closed bottle.

A sample of ice cream which had made eighteen persons quite ill was also examined by the same method, and the aqueous solution of the tyrotoxicon was given to a cat. The effect was distinctly noticeable in ten minutes, when the animal began to vomit and show other characteristic symptoms. There seems little doubt that the poisonous element in the cream was due to the presence of the alkaloid.

Dr. Vaughan is of the opinion that the production of the poison is due directly or indirectly to the growth of some micro-organism.

The presence of butyric acid has been demonstrated in the specimens of cheese, milk, and cream from which the poison was obtained, and it has been suggested that the generation of the tyrotoxicon was the result of a butyric acid fermentation. It is known that the action of the butyric acid on ammonia produces an alkaloid known as coniine, and it is quite possible that tyrotoxicon may be formed by the action of decomposing nitrogenous substances on butyric or other fatty acid. From its phosiological effects, it has been inferred that the alkaloid contains two poisons.

Heating Water Rapidly.

Mr. Thomas Fletcher, whose various forms of apparatus for gas heating of all kinds are known in almost every civilized country, read, at a meeting of the Gas Institute on June 9, a paper which was pregnant with matter of high importance to all who take an interest in the heating of water, either for domestic or manufacturing purposes. The various forms of water-heating apparatus that have been advertised [illegible]ur columns evidence the importance of the subj[illegible] to photographers, and we have little doubt tha[illegible] before long, others still, founded upon the investi[illegible]ons described in Mr. Fletcher's paper, will be br[illegible]t before them. The lecturer at the outset showe[illegible] taking a copper kettle full of water as an exam[illegible] metal never attained a high degree of heat, as [illegible]ed by pasting upon it a paper label, which rem[illegible]hout discoloration, although played upon by [illegible] the whole of the time the kettle was boiling[illegible]ter, therefore, was not acted upon by any hea[illegible]an 400° Fahr. (that being the charring po[illegible]r). Taking as a guiding principle the th[illegible]e speed with which convected or conducte[illegible] sorbed by any body is in direct ratio to[illegible] between its own temperature and that o[illegible] heat in absolute contact with it, he devised the plan of studding the bottom of the metallic vessel with a number of copper rods, each passing through into the water space, and being there flattened to a broad head, which gives its heat up rapidly to the water. The proof of the value of this novel invention was shown before the audience by Mr. Fletcher boiling a quantity of water in a new form kettle in little more than the half of the time needed by one of the old form, while at the conclusion of the lecture he in a strong four-quart kettle, weighing over six pounds, boiled a pint of water in fifty seconds. This was a very marvelous achievement, and renders it probable that, as we say, photographers may hope soon to be provided with an apparatus for quickly heating water for the many purposes for which it is needed by them—carbon printing, for example, with numerous other processes—that will perform its work in less time and with greater economy of fuel than is possible with any apparatus yet introduced.—*Br. Jour. of Photo.*

PHOTOGRAPHIC NOTES.

How to Change Blue Prints to Dark Brown.—Dissolve a piece of caustic potash about the size of an ordinary soup bean in five ounces of water. It will dissolve in a few minutes. Place your blue prints in this solution, and in a short time they will fade to a pale orange-yellow color. When all the blue tints have disappeared, wash in clean water. Now dissolve a partly heaped up teaspoonful of tannic acid in about half a pint of water. Put your yellow prints into this bath, and they will immediately begin to assume a brown tone. Permit them to remain in the tannic bath until they are as dark as you desire. Then take them out, wash well, and dry. F. S.

Sensitizing Albumenized Paper—Precautions to be Observed in Hot Weather.—There are always some troubles in connection with printing on albumenized paper, but during very hot weather these difficulties are increased in various ways. We are assuming just now that the printer sensitizes his own paper. Using ready sensitized paper, there is certainly no great difference in the ease with which results can be got at different temperatures.

The modern tendency to use very highly albumenized paper makes the difficulties, perhaps, somewhat greater than they used to be. The sensitizing solution is liable to run into tears on such papers at all times, but particularly when the temperature is very high. The bath appears to have more tendency to get out of order in hot weather than in cold, and certainly the evil results when it is out of order are more noticeable. We have known cases in which, when the temperature was very high, the air somewhat damp, and the bath only a little out, the paper could not be dried before it commenced to turn brown.

We believe that there is no better way of keeping a bath in order than to keep a little carbonate of silver in the bottom of the stock bottle, frequently to stir this up, and to keep the bottle in bright light for as long as possible. The carbonate of silver is insoluble in water or in nitrate of silver solution, but it decomposes any acid which may form in the baths, thus keeping the solution neutral. At the same time, being in a fine state of division, it serves as well as kaolin to carry down organic matters.

The carbonate of silver is, of course, produced by pouring a little solution of carbonate of soda into the bath. So much should be added that the resulting precipitate is sufficient to make the solution quite opaque when it is shaken up.

When the solution is in use for the greater part of the day, far the best course is to have two baths mixed up, one in use and one in the sun continually, the two being changed daily, and that in the sun being shaken up twice or thrice during the day. We have known of cases in which many reams of paper have been sensitized with a total amount of solution equal to only two gallons, without any treatment of the solution beyond that just described, and, of course, the addition of silver as it was used up, and in which the bath was as clear at the end of working as at the beginning, and even giving as good results.

It is probable that a good deal of harm is done in very hot weather by floating for too long a time, or we should, perhaps, say for an unnecessarily long time. It is not generally appreciated how great an accelerating influence rise of temperature has in the sensitizing process; that only about one-half the time is, on an average, required in very hot summer weather that is required in winter, even in rooms heated up as rooms commonly are in winter.

We advise all to follow the plan of brushing a little solution of chromate of potash on to the back of the first sheet sensitized on any day, and of observing how long it takes for the wetted part to turn orange in color. It may be taken for granted that any sensitizing after this change has taken place is of no use, and probably does harm both to the paper and to the bath. Of course, the amount of time required to sensitize the first sheet may be taken as a guide to the time that should be allowed for others; although we have known some who rejected all measurement of time, and simply put a minute drop of the chromate solution on one corner of the back of each sheet, removing the sheet when the spot changed color.

It is a common practice to allow the bath to get weaker in hot weather, and no doubt something is to be said for the custom. It has the effect, if nothing else, of making it less likely that tears will form on the paper while it is drying, and it has a slight influence in the direction of causing the paper to keep well. It may probably be taken for granted that so long as the sensitizing solution dries in tears, it may safely be reduced in strength without any danger of injuring the surface. We have not known a case in which, if a solution as weak as 10 per cent, or say 45 grains to the ounce, be used, the running of the solution in tears, even with paper of the very highest surface, has occurred.

Next to attention to the condition of the bath, there is, perhaps, nothing which adds so much to facility in printing in hot weather—or, indeed, in every weather—as the free use of blotting paper that has been steeped in a solution of carbonate of soda.

Probably most readers know more or less definitely that soda paper has a preserving influence with sensitized paper; yet, in our experience, few use it as freely as they should, or appear thoroughly to appreciate the benefits to be derived from it.

We will describe the use of it, especially as there is a little manipulative difficulty in preparing the paper, on account of its extreme softness when washed in water. This softness makes it by no means a very easy thing to handle a sheet without tearing it.

The precise strength of the solution does not appear to be of much moment. We generally take about a pound of washing soda, and pour about a gallon of water over it in a dish large enough to sensitize half a sheet of paper on. We then take the sheets of blotting paper, folded in two, and lay them on the liquid until they are saturated, which, of course, takes only a very few seconds. They are then hung over a string to dry, no attempt being made to open them up, otherwise they are almost certain to be torn.

To secure the best results in the matter of preserving the sensitized paper, each sheet should have a sheet of soda paper on each side of it—that is to say, sensitized paper and soda paper should be piled alternately. If this be done, and the whole be surmounted with a flat weight, there appears to be scarcely a limit to the length of time that the paper can be kept—certainly for many weeks. If this paper requires to be kept for only a few days—or, say, even for a week—it is sufficient to roll it up tightly, and to inclose the roll in soda paper.

The precise action of the soda we will not attempt to explain, but it is probable that it acts as a *sulphur trap*, preventing the access of any sulphur in the air to the paper. A piece of the soda paper should always be kept be kept behind the sensitized paper in the printing frame.—*Photo. News.*

Natural Gas Belt.

Professor J. P. Lesley, in a recent report of the Pennsylvania Geological Survey, has the following:

Shall I bore for gas at my works? is a question so often asked, and so seldom answered with intelligence, that a short statement of the principles involved in a correct answer to it will probably be of use to more than one reader of this report.

First of all, there can be no gas stored up in the oldest rocks. This at once settles the question in the negative for the whole southeastern third of the State. To bore for gas in Bucks, Montgomery, Philadelphia, Delaware, Chester, Lancaster, York, or Adams counties would be simply absurd.

Secondly, there can be no gas left underground where the old rocks have been turned up on edge and overturned, fractured and recemented, faulted, and disturbed in a thousand ways. If there ever was any, it has long since found innumerable ways of escape into the atmosphere. This settles the question in the negative for all the counties of the great valley—Northampton, Lehigh, Berks, Lebanon, Dauphin, Cumberland, and Franklin; as any one can see by looking at the present condition of their limestone, slate, and sandstone formations.

Thirdly, there is not the least chance that any gas is left underground in the greatly folded, faulted, crushed, and hardened formations of the middle belt of the State—Carbon, Schuylkill, Lehigh, Luzerne, Columbia, Montour, Northumberland, Union, Snyder, Lycoming, Perry, Juniata, Mifflin, Center, Clinton, Huntingdon, Blair, Bedford, and Fulton counties. Where the oil and gas rocks rise to the surface in these counties, as they do in a thousand places, they show that all their oil and gas have escaped long ago.

Fourthly, where the rock formations lie pretty flat, and have remained nearly undisturbed over extensive areas—as in Wayne and Susquehanna, parts of Pike and Lackawanna, Wyoming, Bradford, Tioga, Potter, and all the counties west of the Allegheny Mountains—there is always a chance of finding gas (if not oil) at some depth beneath the surface determined by the particular formation which appears at the surface; but as yet we have no satisfactory evidence of the existence of quantities of rock gas in any of these counties east of Potter.

Fifthly, wherever the bituminous coal beds have been changed into anthracite or semi-bituminous coal, it is reasonable to suppose that the same agency which produced the change, whatever it was, must have acted upon the whole column of formations, including any possible gas rock at any depth.

Sixthly, wherever rock oil has been found, there and in the surrounding region rock gas is sure to exist.

Natural Gas in New York.

The striking of a heavy gas well recently at Knowersville, near Albany, New York, brings the supply of this valuable fuel within measurable distance of a number of our great industries situated along the Hudson River. Each succeeding month brings new discoveries of gas nearer to New York, and recalls the prediction of Mr. Henry Wurtz, the eminent chemist, made seventeen years ago, that nautral gas will be found in a belt following the outcrop of the great gas-bearing beds (the principal of which is the Marcellus shale), at such a distance from their outcrops as will give a depth of about 400 feet to the bed. Professor Wurtz, as long ago as 1869, urged the use of natural gas in the region of which the great gas well at West Bloomfield, Ontario County, New York, was the center.

In a discussion before the Lyceum of Natural History of New York, October, 1871, he gave the quantity of gas sent out by this well as 5 cubic feet per second, and the composition 82½ volumes per cent marsh gas, 10 per cent carbonic acid, 3 per cent illuminating gases of the olefine group; estimated its heating power equal to 14 tons of anthracite a day; and discussed at length the question of carrying the gas under heavy pressure to great distances for use as a heating and lighting agent. Professor Wurtz indicated five or six beds running across New York State, "lying deep enough, and thick and porous enough," to pour out combustible gas when tapped. And he repeated a statement he made long before editorially in the columns of the American *Gas-Light Journal*, that "It may be accepted with implicit confidence as a fact that there are vast districts of country throughout the United States in which, by judicious exploration, and immense number of such fountains of natural gas may be developed; furnishing a fuel which raises itself out of the mine, and which may be made to transport itself, up hill and down dale, to any point required, independently of seasons and circumstances, miners' strikes and railroad monopolists to the contrary notwithstanding. A future lies before this new art of developing the gifts of Mother Nature, big with a promise for which even the wondrous history of American petroleum production has furnished no parallel."

In conclusion, Professor Wurtz said: "I will venture to enounce as my own conviction, which, however visionary it may be deemed by many, I claim to be strictly founded on induction from known facts, that, (throughout large sections of the United States throughout the middle tier of counties in Western New York for example), every town, nay, every house in the land ought to be both warmed and lighted by gas drawn from the bountiful bosom of Mother Earth, without money and without price."

Undoubtedly to this clear minded and able chemist are due the first suggestions of the possibility of finding natural gas over great areas and of carrying it to great distances for general manufacturing purposes.

Many theories of the formation of natural gas have since been proposed; but it is none the less interesting to quote here that suggested by Professor Wurtz nearly seventeen years ago in these words: "As to my views of the mode of formation of the gas that exists now in such enormous compression in these different strata, I ask first, What is this gas chemically? Always essentially, from whatever horizon obtained, it is marsh gas, that hydrocarbon of all others which contains the most hydrogen and the least carbon: the compound which naturally and necessarily forms the final residue of the abstraction of carbon from organic matter by a powerful oxidizing agent, since in nature we scarce find elementary hydrogen as such a residue. Now, what oxidizing agents are there, or, rather, what have there been in all these rocks that could effect such a combustion? I reply, oxides of iron, now represented in these rocks by iron sulphides, showing the iron oxides to have passed through the forms of sulphates;" an action similar to that "evolution of marsh gas going on in every stagnant pool, loaded with vegetable matter, and blackened by sulphide of iron, which is occupied in conveying the oxygen of the water to the carbon of the mud."

The development of the natural gas industry during the past two years has been marvelous; yet it is almost as extraordinary that it required fifteen years after Professor Wurtz's prediction to awaken even enterprising men to what they all now know to be so incalculably important.—*Engineering and Mining Journal.*

LEE BOARD FOR SMALL VESSELS.

The lee board herewith illustrated is designed as a substitute for the center boards, lee boards, and movable keels heretofore used. It is of suitable length and depth, and may be placed at either or both sides of the boat. The board may be held to the boat by two arms, whose outer ends are bent down and inserted in tubes secured in the upper edge of the board, and whose inner ends are suitably attached to the boat. If desired, a single arm, forked at its outer end, so that the board will always be held parallel

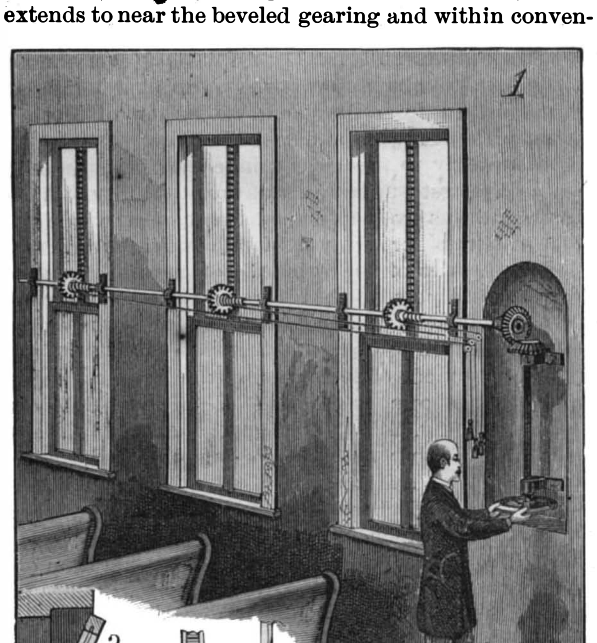
CLAPHAM'S LEE BOARD FOR SMALL VESSELS.

with the keel of the boat, can be used, as shown in the engraving. Guys hold the arms at right angle to the boat. This construction allows a free up-and-down movement of the board, which will be unaffected by the rocking of the boat, and will remain vertical, whether the boat be heeling to the force of the wind or be standing plumb, so that it will always be in the best position to secure a lateral grip or hold on the water to prevent leeway.

This invention has been patented by Mr. Thomas Clapham, of Roslyn, N. Y.

DEVICE FOR OPENING WINDOW SASHES.

This device is for raising and lowering a number of windows simultaneously and for locking them in any desired position. To the center stile of each window sash is secured a rack, engaging with which is a pinion, carried by a shaft journaled in suitable supports, and extending along the entire series of windows. The pinions are prevented from turning on the shaft, but are capable of sliding longitudinally. Each pinion, when in its normal position, is held against a stop pin by a spiral spring. To one end of the shaft is secured a bevel wheel, which engages a wheel on a vertical shaft, provided at its lower end with a hand wheel. To each pinion is secured a cord, which extends to near the beveled gearing and within conven-



PAINE'S DEVICE FOR OPENING WINDOW SASHES.

ient reach, so that, by drawing any one of the cords, the pinion with which it is connected may be moved out of engagement with its rack, so that that particular sash will not be moved when the shaft is turned. In case of a large or heavy window, or one having but a single glass, two racks are applied to the stiles on opposite sides, and two pinions used. In the case of a pivoted transom, the rack and pinion are arranged as shown in Fig. 2, the rack being held in engagement with the pinion by a spiral spring. In the construction shown in Fig. 3, the pinion is provided with a boss having clutch teeth formed on its end, and is capable of being turned independently of the shaft or of remaining stationary and allowing the shaft to be turned when disengaged from the clutch. The clutch is pressed into engagement with the boss by a spring, but may be drawn back by means of a properly arranged cord, as indicated in the drawing. Where the windows are deep, an intermediate or idle wheel connects the shaft pinion with the rack.

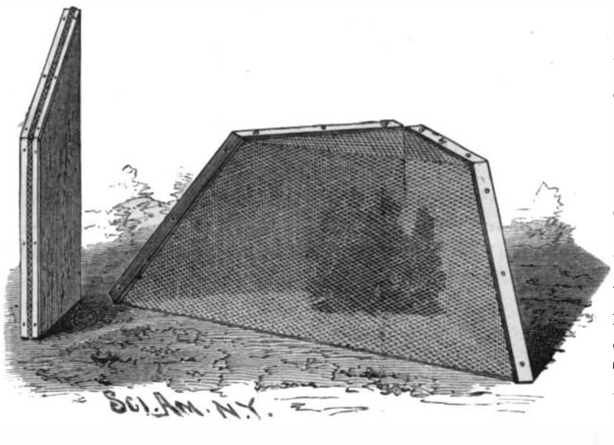
This device, which is the invention of Mr. George W. Paine, of Sullivan, Ill., is especially applicable to large factories, churches, halls, and railway cars, where it is desirable to have all the windows under one control and to secure uniformity in ventilation, and in all cases where it is desirable to do away with the annoyance arising from the usual manner of opening and closing windows.

A Whistling Barometer.

In the village of Meyrin (Canton of Geneva), Switzerland, some disused wells, it is said, have been hermetically sealed to serve as barometers to the people. An orifice about an inch in diameter is made in the cover of the well, by which the internal air is put in communication with the external. When the air pressure outside diminishes on the approach of a storm, the air in the well escapes and blows a whistle in connection with the orifice, and in this way notice of a storm's approach is given to the inhabitants. If, on the contrary, the pressure increases, a different sound is produced by the entry of the air into the well, and the probability of fine weather is announced.

PLANT PROTECTOR.

The device is designed to protect young plants from injury by frost, or insects, or fowls. It can be readily folded for transportation or storage, and easily un-



ZIMMER'S PLANT PROTECTOR.

folded and placed in position for use. A pair of trapezoidal boards are hinged together at their right angled ends, and connected by netting or oiled muslin, of sufficient size to permit them to be opened to approximately a right angle. The free edge of the netting is strengthened by a suitable binding. To use the device, the boards are opened until the netting is strained, when the protector is placed over the plant with the netting facing the south, to allow the sun to shine on the plant; but when the plant is to be shielded from the sun, the position is reversed. The protector may be folded compactly, as shown in the cut.

This invention has been patented by Mr. Eugene Zimmer, of Mobile, Ala.

The American Association for the Advancement of Science.

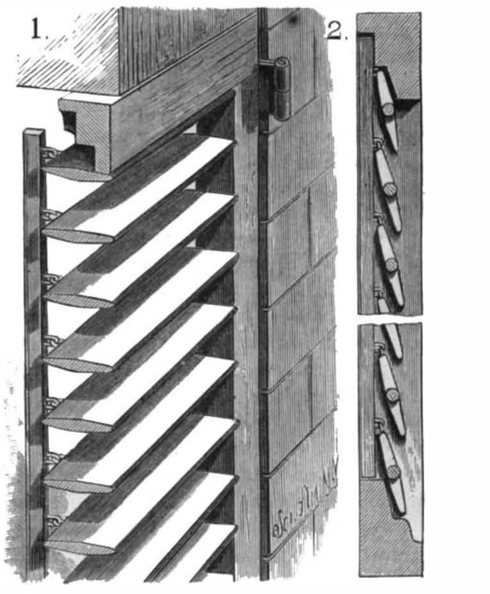
The thirty-fifth annual meeting of this large and influential society will be held at Buffalo, N. Y., where it has already met twice before. The date will be from August 18 to August 24. The daily sessions will be in the ample rooms of the High School, where the offices of the secretaries and committees will also be located. Reduced rates on the railroads will facilitate attendance, and arrangements have also been made for reduced rates at the principal hotels. Among special features already announced are the following:

The presidential address on Wednesday evening by Prof. H. A. Newton, of New Haven, who will resign the chair to Prof. E. S. Morse, of Salem. An illustrated lecture on Friday evening, by Prof. C. A. Ashburner, of Pennsylvania, on "The Geology of Oil and Gas." Special preparations have been made by the sections of mechanical science and anthropology; and delightful excursions are planned for the departments in botany and entomology.

The local committee has promised for Thursday afternoon an excursion down Niagara River to Grand Island; and for Saturday, one to Niagara Falls and another to Chautauqua Lake. In the section of geology, special attention will be given to the various problems connected with Niagara Falls and its gorge.

WINDOW BLIND.

As ordinarily constructed, the slats in blinds are held in a horizontal position by the friction of the slats in their bearings; but when the blind becomes worn, the slats are no longer retained in this position. A recent invention by Mr. Charles W. Radford, of Oshkosh, Wis., obviates this difficulty in a very simple manner. The upper and lower rails of the blind are each provided with a rabbet, having a tongue which, in the case of the lower rail (Fig. 2), projects upward on the

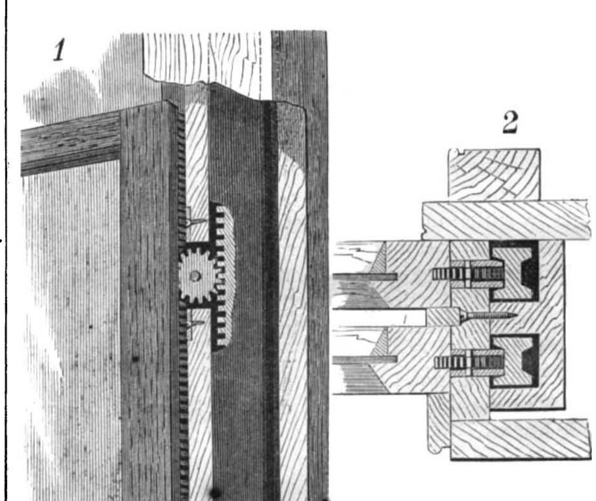


RADFORD'S WINDOW BLIND.

inner side of the frame to a point near the pivot of the lowest slat, which, when the slats are open, will rest upon the upper edge of the tongue; but the tongue formed on the upper rail extends along the outer side of the frame, so that the outer half of the top slat will rest against it (Fig. 1) when the slats are open. When the slats are closed, the rabbets receive the top and bottom slats, and the rod passes over the edge of the lower tongue, and prevents the slats from being accidentally turned.

SASH BALANCE.

The invention herewith illustrated relates to that class of sash weights in which each weight is formed with a rack, and is connected with a rack on the sash by an intermediate pinion. To the inner surface of the stile of the window casing is secured a false stile, formed with a central strip that separates the window weights, as shown in the sectional plan view. The inner stile is formed with two grooves, which, together with the main stile and the outside facing piece, form the weight channels. The weights are of metal, are about equal in length to the sash, and each is formed with a rack. In the back of each weight is a channel to receive lead or other heavy material to suit the weight to that of the window. The side edges of each sash are provided with racks. In openings formed in the stile are fitted boxes, in each of which is journaled a small pinion which meshes with the racks on the sash and weight, so that the movement of the sash up or down will communicate a re-



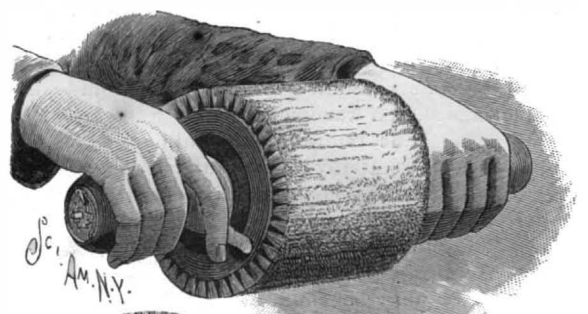
LENNON'S SASH BALANCE.

verse motion to the weights, which thus balance the sash. Guides on the weights prevent their lateral displacement. Weights constructed in this manner are not liable to get out of order, and by using the false stile no back lining is required in the frame, and the ordinary inside casing is dispensed with. When the fittings are all in place, they are invisible, nothing being seen to disfigure the window.

This invention has been patented by Mr. William F. Lennon, of 124 East 84th Street, New York city.

ROTARY BRUSH.

Upon the rod forming the axis of the machine are mounted two sleeves, between which is a rectangular frame rigidly secured to the rod. To one sleeve is secured one end of a volute spring, whose other end is secured to a drum revolving loosely on the sleeve, and carrying an arm attached to a spur wheel revolving upon the shaft. This wheel connects by suitable gearing supported by the rectangular frame with a wheel secured to the other sleeve. On the first sleeve is loosely



McCONNAUGHAY'S ROTARY BRUSH.

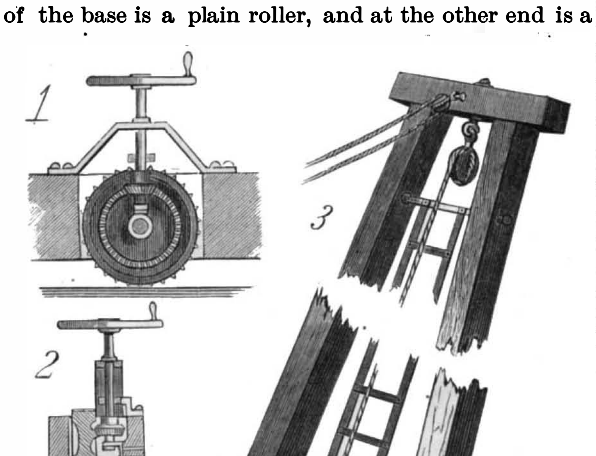
placed a head, and upon the second sleeve a head is rigidly secured. Fitting over the heads is a sheet metal cylinder which supports the brush.

One handle is rigidly secured to the sleeve carrying the spring, while the other is fastened to the rod. The spring is wound up by turning the first handle, and is held under tension by a pawl and ratchet wheel. The brush is then revolved, the power of the spring being transmitted by the gearing to the second sleeve, to which one head of the cylinder is secured. The velocity depends upon the tension of the spring, and, should the speed of the cylinder become too great, it may be reduced by pressing a brake spring against one of the heads. The many uses to which a brush of this description may be put are evident.

This invention has been patented by Mr. T. J. McConnaughay, of Harrisonville, Mo.

IMPROVED DERRICK.

Rising from the platform or base of the derrick are the two main uprights, which are connected by cross rods and a top cross bar in the usual way. At one end of the base is a plain roller, and at the other end is a



BLUNDELL'S IMPROVED DERRICK.

roller formed with cogs, by which it may be revolved, for shifting the derrick. The periphery of the latter wheel is provided with ribs that prevent slipping. This wheel is revolved by means of a beveled cog wheel attached to an upright shaft and meshing with the cogs of the wheel. Upon the upper end of the shaft is a crank or crank wheel, by turning which the derrick may be moved. The arrangement of the wheel and gears is shown in the sectional views, Figs. 1 and 2.

The hoisting rope passes over a pulley attached to the top cross bar, and thence over a hoisting drum, which is revolved by the main crank shaft and cog wheels in the ordinary manner. The bearings of the shafts of the crank and drum are made in two parts, so that the shafts may be removed, thereby permitting the easy transportation of the derrick. The cap piece of each bearing is hinged to the pillow block, and the latter is provided with a stud to which the cap plate may be locked by a pin or key passed through a hole in the stud. To one of the uprights is pivoted a pawl to engage with the cog wheel on the crank shaft, and thereby lock the drum, so that the load being hoisted may be held at any desired point. A ladder, by which a person can easily ascend or descend the derrick, is constructed as shown in the engraving.

This invention has been patented by Mr. William J. Blundell, of 221 E. 125th St., New York city.

New Method for Protecting Iron.

A new method, which promises to be easier of application than any previous, has been lately brought out by M. A. De Meritens, the well-known electrician, and if it succeeds as well in the hands of the public as it does with the inventor, should find a very extended application. The article to be protected is placed in a bath of ordinary or distilled water, at a temperature of from 70° to 80° Centigrade (158° to 176° Fah.), and an electric current is sent through. The water is decomposed into its elements, oxygen and hydrogen, and the oxygen is deposited on the metal, while the hydrogen appears at the other pole, which may either be the tank in which the operation is conducted or a plate of carbon or metal. The current has only sufficient electromotive force to overcome the resistance of the circuit and to decompose the water, for if it be stronger than this, the oxygen combines with the iron to produce a pulverulent oxide which has no adherence. If the conditions are as they should be, it is only a few minutes after the oxygen appears at the metal before the darkening of the surface shows that the gas has united with the iron to form the magnetic oxide Fe_3O_4, which it is well known will resist the action of the air, and protect the metal beneath it. After the action has continued an hour or two the coating is sufficiently solid to resist the scratch brush, and it will then take a brilliant polish.

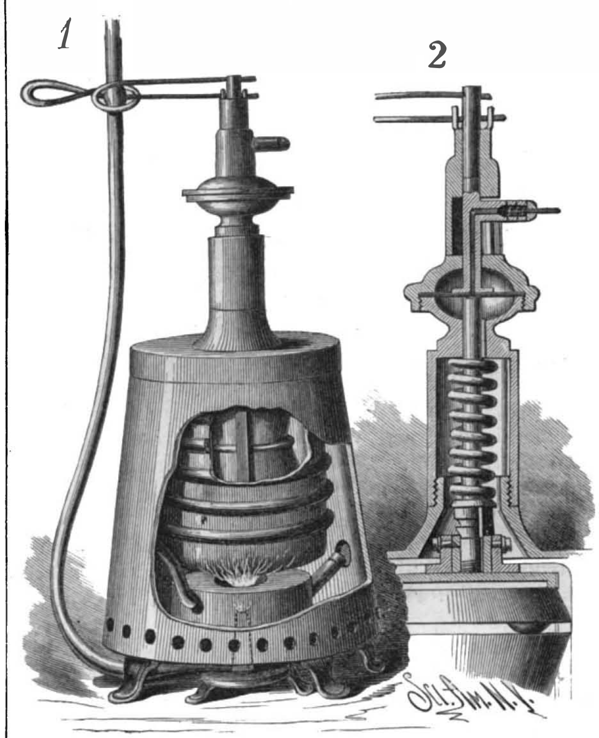
The process is simple, and demands but little skill in its execution. Now that dynamo machines have superseded batteries as sources of electricity, all that is required is a tank, a quantity of distilled water, and a little power to drive the machine.

An Artesian Hot Well.

A remarkable example of the increase of temperature in the earth toward the center has been presented at Pesth, where the deepest artesian well in the world is that now being bored for the purpose of supplying the public baths and other establishments with hot water. A depth of 951 meters—3,120 feet—has already been reached, and it furnishes 800 cubic meters—176,000 gallons—daily, at a temperature of 70 degrees C.—158 degrees Fah. The municipality have recently voted a large subvention, in order that the boring may be continued to a greater depth, not only to obtain a larger volume of water, but at a temperature of 80 degrees C.—176 degrees Fah. It is suggested that it is thus within the bounds of probability that the time may come when a brewer will obtain his water supply from a well of sufficient depth to yield "liquor" at the mashing temperature.

IMPROVED VULCANIZER.

The annexed engraving represents a vulcanizer in which dry steam is supplied to the vulcanizing oven, and in which the moulds containing the work are closed by spring pressure, after the rubber or other plastic material has been softened by the heat of the steam. Below the oven is located an annular steam generator, which surrounds the upper portion of the burner, and is connected with the top and bottom of the oven by a spiral tube, shown in Fig. 1, which opens into the oven near the top. The screw cap of the oven has a hollow cylinder surmounted by a casing containing a diaphragm, as shown in the enlarged sectional view, Fig. 2. Connected with the upper side of the diaphragm is a rod having a lateral branch near the top, which contains a safety valve in communication, by a passage through the rod, with the space below the diaphragm. The safety valve is arranged to blow off at the pressure required for vulcanization in the oven. The flexible tube supplying the burner with gas passes through a wire nipper tap, which is arranged, in connection with the diaphragm rod, to regulate and finally shut off the gas flowing to the burner. The flasks containing the work to be vulcanized are received by a three-armed yoke, having in its top a follower secured to the end of a rod provided with a collar, for taking the pressure of a spring arranged as shown. At the beginning of the moulding operation, the rod is in contact with the under surface of the diaphragm. When starting the oven, the collar of the rod is held in an elevated position by a block of fusible metal, placed between the collar and top of the three-armed yoke. The gas tube is not then pressed by the nipper tap, which is raised by the pressure of the rod upon the under side of the diaphragm, so that gas will be supplied to the burner. When the temperature in the oven reaches about 220°, the fusible block will melt, permitting the spring to exert its force upon the flasks and their contents, and the rubber,



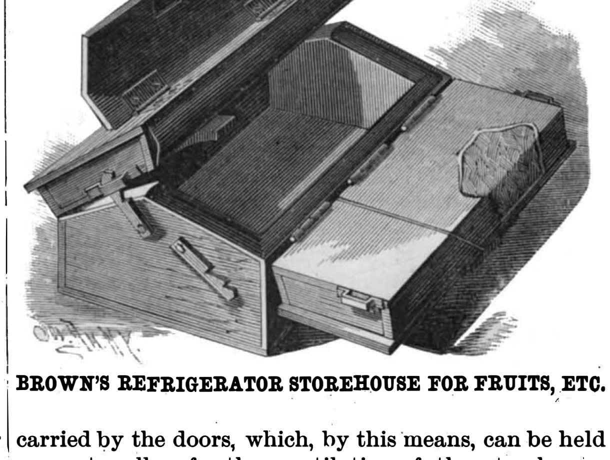
CARLL'S IMPROVED VULCANIZER.

having been softened by the heat, will be pressed into all parts of the mould. At the same time the temperature and pressure continue to rise until the upward movement of the diaphragm shuts off the gas. The safety valve begins to blow off steam, and continues to do so until the water is entirely exhausted, when the pressure falls and the elasticity of the wire nipper tap causes it to close down upon the tube and shut the gas off entirely from the burner.

This invention has been patented by Mr. Maskell F. Carll, of 134 Oxford St., Providence, R. I.

REFRIGERATOR STOREHOUSE FOR FRUITS, ETC.

This refrigerator is designed especially as a receptacle for potatoes, but may be used for other kinds of vegetables or fruits. The space between the outer and inner walls of the storehouse is packed with sawdust, hay, or some other non-conducting material. This packing is held in place by strips nailed to the upper edges of the walls, so as to form a continuous line of cushions, upon which the upwardly opening doors rest. The doors are hinged to the upper side walls, and consist of box-like structures filled with packing. The free edge of one door is provided with a cushion, so as to effectually close the storehouse when the doors are shut. One door is formed in sections as shown; and in order that the meeting edges of the sections may be properly supported, the opposite door is provided with a projecting arm upon which the edges rest when the divided door is closed. Upon each end of the storehouse are arms formed with teeth which may be brought into engagement with brackets



BROWN'S REFRIGERATOR STOREHOUSE FOR FRUITS, ETC.

carried by the doors, which, by this means, can be held open, to allow for the ventilation of the storehouse. After the doors have been closed, the opening between their meeting edges is protected from the weather by a hinged saddle or weather cap, shaped to conform to the pitch of the roof. It will be readily seen that this storehouse, which is the invention of Mr. Samuel Brown, of Russellville, Ark., protects the contents from injury by excessive cold or excessive heat, and provides for proper ventilation.

HOW DEEP WELLS ARE MADE.

(Continued from first page.)

latter will discharge its contents at the surface by resting the dart on the derrick floor.

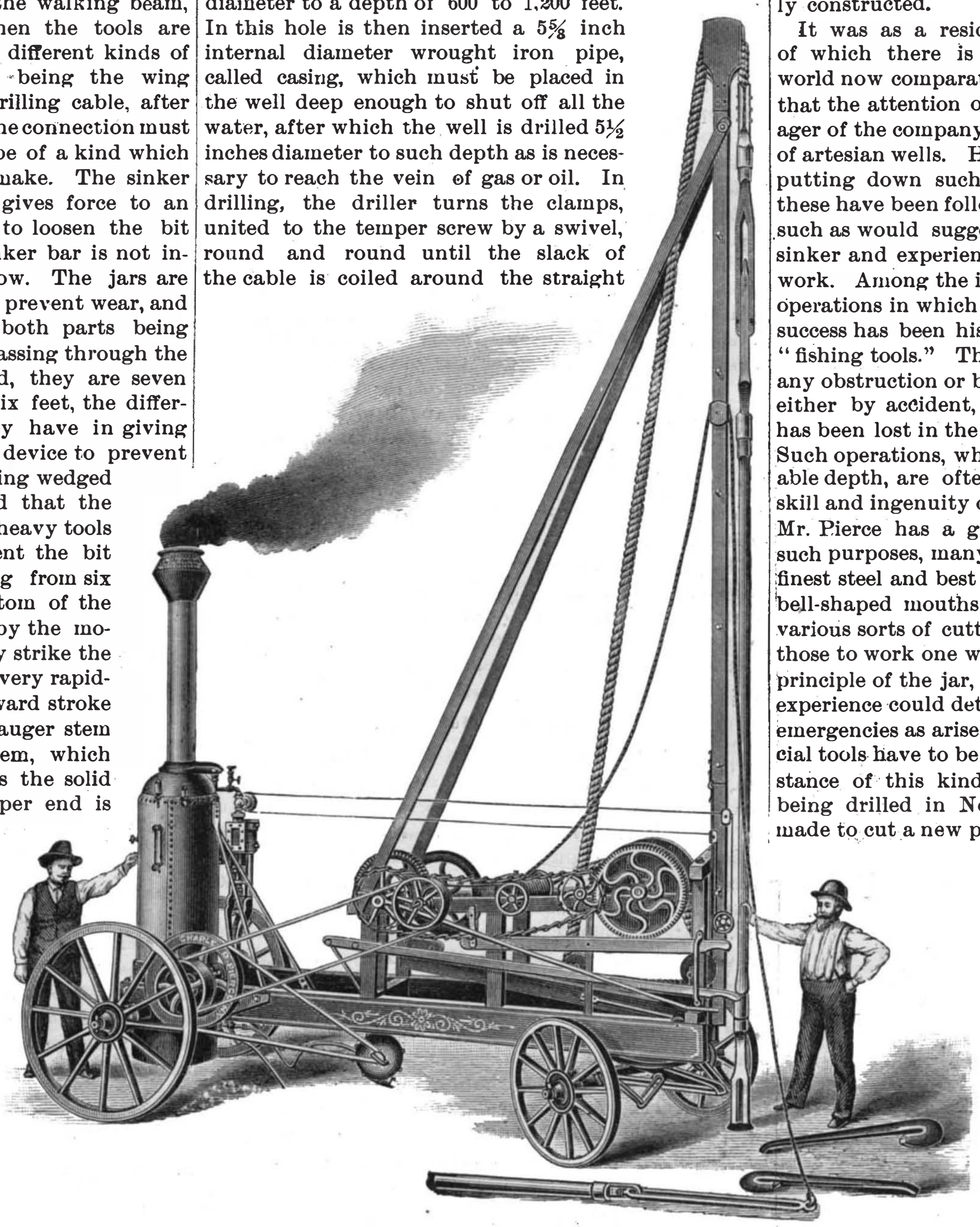
The weight of the tools hung from the rope in the center of the derrick varies considerably, according to the material to be passed through. In the oil regions, for drilling a 5½ inch hole, generally through slate and sand rock, the weight of the tools will be about 2,200 pounds. For a hole of 6 inches in diameter, 1,000 feet and more in depth, and through granite, flint, and other hard formations, as is often necessary in drilling deep wells for water, the weight of the tools will be 3,000 pounds or more. In some of the hard formations found around New York, when deep wells were to be made of six to eight inches in diameter, the Pierce Well Company have used the heaviest tools ever yet employed in such work, the weight of the string suspended from the derrick equaling 4,000 to 4,500 pounds.

The measurement of these tools would be about as follows: Rope socket, 3 feet long; sinker bar, 14 feet long; jars, 7 feet long; auger stem, 35 feet long; bit, 4 to 5 feet long. These are screwed together, forming the string of tools, and there is, in addition, the temper screw, hung by a hook from the walking beam, and made to grasp the cable when the tools are down in the well. There are two different kinds of rope sockets, the more common being the wing socket, in which the end of the drilling cable, after being wrapped, is firmly riveted. The connection must be strong and reliable, and should be of a kind which does not call for especial skill to make. The sinker bar, just above the auger stem, gives force to an upward blow made by the "jar" to loosen the bit after the regular stroke. The sinker bar is not intended to strike a downward blow. The jars are made in two parts, are steel lined to prevent wear, and are like two long links of a chain, both parts being slotted, and the cross-head of one passing through the slot of the other. When extended, they are seven feet long, and when closed about six feet, the difference in length being the play they have in giving an upward stroke. The jar is a device to prevent the bit from getting fast or becoming wedged in the rock. Ordinarily, it is found that the spring of the long cable, with the heavy tools attached, will be sufficient to prevent the bit from becoming fast. The tools hang from six inches to two feet above the bottom of the hole, and when they rise and fall by the motion given to the walking beam, they strike the bottom in a way that cuts the rock very rapidly. The action of the jar on the upward stroke is felt through its lower link on the auger stem to loosen the bit. The auger stem, which comes next above the bit, furnishes the solid weight in giving the blow; its upper end is either screwed or welded into the lower part of the jars, and on the lower end of the auger stem is a box into which the drill is screwed.

In the manufacture of all these tools, it is of the utmost importance that only the best quality of metal should be used. The resharpening and tempering of the drills is a work that has to be frequently repeated, and for this purpose a forge is provided in one side of the derrick.

On the end of the walking beam in the derrick is a hook on which is placed what is called a temper screw. This screw is 5½ feet long; it is carried between two wrought iron reins, at the bottom of which is a split nut around which is a clamp and set screw. The split nut is to facilitate raising the screw after it has been paid out while drilling. At the lower end of this screw the cable is solidly clamped, and this clamping need not be disturbed only at such intervals in the drilling as a depth is made equal to the length of the temper screw. When the screw is all out, it must be disconnected from the cable and reset at the top. But when this amount of solid material has been cut out and pulverized in the bottom of the well, it is so churned up with the water as to fill up the well for a good many more feet than the length of the temper screw, and the tools have to be taken out for clearing the well. As the tools are drawn from the well, when the top of the bit appears, the engine is stopped, a wrench is put on the squared portion of the bit just below the collar, and another wrench on the squared part of the auger stem just above the box, when a bar is inserted in one of the arc of holes in the wrench circle fastened to the derrick floor, and with this lever the joint is unscrewed. The joints are always set up by the same leverage, that no risk may be run of their unscrewing in the well.

After the derrick has been erected, the boiler and engine placed in position, the steam and water pipe connections made, the tools hung in the derrick, and everything made ready to commence work, the drilling of the well is commenced as follows: If there is a depth of say 20 feet of earth above the solid rock, a 12 inch hole is usually drilled or spudded down to the rock, in which can be inserted a wood conductor pipe, which can be made of octagon shape, 10 inches diameter inside, or can be made in the shape of a square box of 2 inch plank spiked together. If there is a depth of earth of over 75 feet, in which are bowlders, loose stones, or caving sand, a heavy wrought iron pipe, 8 inches internal diameter, is driven to the rock, and on the bottom of the pipe is placed a steel shoe, which will cut off the loose stones that may lie in the path of the pipe, and to prevent jamming the pipe. On top of the pipe is placed an iron driving cap. This pipe is driven through the earth with a heavy wooden maul, about 18 in. diameter and 15 feet long. This maul is attached to the drilling cable, and is raised and dropped on the pipe to drive it to the bed rock, the drilling and driving being done inside of the pipe alternately every eight feet. In drilling a well for water, the hole in the rock may be drilled 6 or 8 inches diameter, it not being necessary to exclude the water from the well. In drilling an oil or gas well, a hole is drilled 8 inches diameter to a depth of 600 to 1,200 feet. In this hole is then inserted a 5⅝ inch internal diameter wrought iron pipe, called casing, which must be placed in the well deep enough to shut off all the water, after which the well is drilled 5½ inches diameter to such depth as is necessary to reach the vein of gas or oil. In drilling, the driller turns the clamps, united to the temper screw by a swivel, round and round until the slack of the cable is coiled around the straight



PORTABLE APPARATUS FOR DRILLING WELLS 100 TO 600 FEET DEEP.

cable below the temper screw. He then reverses the motion, uncoils it, and recoils it up the other way, and repeats this constantly while the drilling is going on, thus constantly rotating the drill. While the driller is thus at work, his assistant dresses the worn bit previously employed, the forge at the side where this is done having its bellows operated by the motion of the walking beam.

The Pierce Well Excavator Company has been particularly successful in the drilling of large and deep wells in the exceptionally hard rock and difficult strata to work found in New York city and vicinity, its angle of inclination and the crevices and small caves met with making such work very difficult. They have drilled several wells for the Manhattan Elevated Railway Company, some of them over 1,500 feet deep. The bit in this case weighed over 500 lb., and had a cutting edge of eight inches. The string of tools was all of the heaviest description, which is an indispensable condition for work of this character; but the task proceeded with as much celerity and regularity as though it had been a job of much smaller dimensions, although several previous attempts of other contractors in the same neighborhood had failed after the drilling had been carried down about 600 feet. Another well recently completed for a New York brewer, drilled to a depth of 685 feet, and 9 inches in diameter, has proved a remarkable success. The rock was the hardest kind to drill in, but the work was done in five weeks. The temperature of the water is 50° F., and, after a thorough pumping test, night and day, for a week, it was found that the well would supply over 300 gallons of water a minute without apparently diminishing the supply. The company has put down many such wells for brewers and others in Newark, Paterson, Westchester County, and other places in the vicinity of New York. One well was also put down for the Anglo-Swiss Condensed Milk Co., at Middletown, N. Y., that was over 2,000 feet deep. It is an 8 inch flowing well, and the machinery used is that from which our first page sketch was made.

Besides the plant required for making deep wells, the Pierce Well Company are manufacturers of appliances which will more economically serve for making smaller wells. They make three sizes of such machines, the first being for wells from 50 to 200 feet deep, to be operated by horse power or a small portable engine; the second size may be similarly operated for depths up to 350 feet; but beyond this depth steam power is necessarily applied, and for such wells the machinery shown in the illustration on this page has been specially constructed.

It was as a resident of Kansas, in many sections of which there is some of the richest soil in the world now comparatively worthless for want of water, that the attention of Mr. Charles D. Pierce, the manager of the company, was first directed to the subject of artesian wells. His first patents for machines for putting down such wells were granted in 1873, and these have been followed by numerous improvements, such as would suggest themselves to a practical well sinker and experienced mechanic in a wide variety of work. Among the important features of well-drilling operations in which Mr. Pierce has met with marked success has been his construction of what are called "fishing tools." These are for removing from a well any obstruction or broken tool, or other article, which, either by accident, carelessness, or malicious design, has been lost in the well or intentionally placed there. Such operations, when the well has attained considerable depth, are often extremely difficult, and tax the skill and ingenuity of the operator to the last degree. Mr. Pierce has a great variety of forms of tools for such purposes, many of them very heavy, and of the finest steel and best workmanship, some of them with bell-shaped mouths and openings above, others with various sorts of cutting and binding edges, as well as those to work one within another, something after the principle of the jar, but all such as only an extended experience could determine the form of to meet such emergencies as arise in drilling wells. Very often special tools have to be made for such cases, and an instance of this kind occurred in one well which was being drilled in New York city. A tool had to be made to cut a new pin, 3 inches diameter and 4 inches long, on the end of a 5 inch bar of iron that was several hundred feet below the surface. Another tool was made to fit the pin thus cut on this bar of iron, and grasp it firmly; then, with the auger stem on top of the jars to which this tool was attached, a force was exerted equal to over 150 tons, which jarred the iron loose from the hole. This class of tools is but seldom used except for the deepest wells, the lighter tools used with the portable rigs seldom breaking, even when the same apparatus is used for putting down hundreds of wells.

The Pierce Iron Works are at the foot of Sixth Street, Long Island City, just opposite Thirty-fourth Street, New York. Here they have extensive and complete appointments for the manufacture of all the machinery, tools, and appliances necessary for sinking oil and artesian wells, and for making the work throughout of that thoroughly good quality which is so indispensable a requisite of success in this branch of business.

Blindness due to Decayed Teeth.

Dr. Widmark, a Swedish surgeon, having as a patient a young girl in whom he was unable to detect the slightest pathological changes in the right eye, but who was yet completely blind on that side, observing considerable defects in the teeth, sent her to M. Skogsborg, a dental surgeon, who found that all the upper and lower molars were completely decayed, and that in many of them the roots were inflamed. He extracted the remains of the molars on the right side, and in four days' time the sight of the right eye began to return, and on the eleventh day after the extraction of the teeth it had become quite normal. The diseased fangs on the other side were subsequently removed, lest they should cause a return of the ophthalmic affection.

Correspondence.

Drainage Schemes in Southern Florida.

To the Editor of the Scientific American:

I have just read an article on the drainage schemes of the Disston Company in Florida, published in your issue of April 17, and credited to the Atlanta *Constitution.*

It was my good fortune to traverse the lower canals connecting Lake Okeechobee with the head waters of the Caloosahatchie River during the past winter, and to make a complete circuit of Lake Okeechobee. A desire that the truth should be known would lead me to correct some of the rather glowing statements in the article referred to.

In the first place, the statement that a canal has been opened to the Atlantic is totally erroneous. Such a canal exists only on the maps of the Disston Company. The canal is designed to lead from the lake at Chaney's Bay on the northeastern shore. Having explored this locality in a small boat on the morning of Feb. 18 last, I can say with reasonable confidence that no such canal has been begun.

Neither is the waterway through the canals such a one as the article would lead one to suppose. The upper canal connecting Lake Okeechobee with Lake Hickpochee, about three miles and a half long, is only about twenty feet wide. It is absurd to suppose that such a ditch can have affected the depth of water in Lake Okeechobee to any extent. In fact, the most claimed for it is that it has lowered the lake about one foot. Where the canal enters Lake Hickpochee, mud deposits have been formed, so that we found great difficulty in getting through with a yacht drawing two and a half feet.

At the upper end of Lake Flirt also we found insufficient water to float our boat, and were obliged to drag her through the mud.

There is a general sentiment along the Caloosahatchie River that the whole undertaking is a well-masked land steal.

A map showing the lands of the company will lead any intelligent observer to wonder what claim it can have on thousands of acres of land apparently so situated as to receive no possible benefit from the drainage improvement.

As to the Kissimmee valley, I can say nothing from actual observation. Most astounding stories are told of its productiveness and of the fortunes realized from single crops on the reclaimed land; but in the background of these stories one can generally distinguish an interested "promoter."

To learn facts about Florida, one must visit it as a pleasure tourist only, apparently at least with no intention of buying land. Nor can he learn much of value in the big hotels of the St. John's Valley. Let him visit the Gulf coast and spend months drinking in its delicious air, and he will surely learn to love this much-abused and over-lauded land, and long to return to it before another winter. F. L. BLISS.

The Atlantic Right Whale.

To the Editor of the Scientific American:

In your issue of February 20, Mr. Holder takes me to task for inaccuracy. He says: "His statements (October 17, 1885) would not readily have met with question twenty years since, but in the light of present knowledge he is questioning true record."

Will Mr. Holder be kind enough to specify where my lack of "present knowledge" crops out, even if I might have been right twenty years ago? My article referred to the "American Whale Fishery," and was simply giving its present status, and what I wrote will bear the closet scrutiny. Mr. Holder says frankly, "I have not statistics at hand." Unfortunately, I have, and every item given by me was taken from published documents, which cannot be questioned.

The point as to whether I was right, or he, as to the species of whale represented in your paper of August 8, 1885, is not of much consequence. The figure is not a good one, and must be taken at random; but it seemed to me more like *mysticetus* than *cisarctica*, and I think so still. It has not enough "steeple top" for an Arctic right whale, but it has altogether more of it than I have ever seen on the *cisarctica*. Their heads are not shaped like that. If Mr. Holder will look into Harper's *Young People* for April 18, 1882, he will find a drawing made by Dan. Beard, which shows the true shape of the top of the head of *cisarctica* better than any other that I know, excepting, of course, Mr. Holder's own accurate figure. I had examined that specimen very carefully before Mr. Beard made his drawing, and I have seen too many of them, both in the water and dead on the beach, not to speak with some degree of confidence.

But the remarkable feature in this paper by Mr. Holder has no reference to my evil doings. He tells us that the *cisarctica* is a new comer, for the present time, on our coast! He says that they disappeared in the latter part of the eighteenth century; that the "North Atlantic right whale remained extinct, as was supposed, till 1854," and then was detected only in the Bay of Biscay.

"In 1865, Prof. Cope brought the subject into shape, etc. . . It was in the spring of 1882 that the first opportunity occurred to examine a full grown Atlantic right whale, the species having been nearly extinct during the period commencing about the year 1770." And then he specifies six being seen off Amagansett in 1884, and two or three more in 1885, and concludes: "From a long period of supposed extinction, this whale is now evidently becoming more numerous." All that I can remark as to this is that such statements as these would be exceedingly apt to cause any inhabitant of the east end of Long Island to "smile out loud." The idea that whales were a new thing in their experience!

The fact is that whaling stations have existed at each of the four villages of the South Side—Southampton, Bridgehampton, Easthampton, and Amagansett—during all the time of my knowledge of that region, which reaches back more than forty years. The first whale I ever saw killed was in 1846, and the habit of watching for them and killing them was then so old that no one thought anything of it. That was a *cisarctica*, as I now know, but I was then too young and inexperienced to detect the difference, and I supposed it to be what it was called, a "right whale," that is, the *mysticetus*. I examined it sharply and made my drawings, but attempted no publication, which would have been at the time, and in the circumstances, premature and foolish.

That the species was the same one which Cope nearly twenty years later named *cisarctica*, I think I can say that I know. That any other species of right whale comes along our coast does not seem probable; at least, I have never seen any other. They do not apparently strike in shore near enough to be seen from the beach more than about thirty-five miles westward from Montauk; and as Amagansett is the village furthest eastward, it is quite natural that they should get more whales than "the Hamptons," though captures at all the points have occurred at intervals. One whaleman, specially, at Amagansett, for the last twelve or fifteen years, has attained much distinction from his success. "Capt. Josh." wears the champion belt of the East End, and Amagansett has come to the front in notoriety by this means.

I do not know that the whales of late are any more abundant than they were fifty years ago, though it is by no means impossible; but that they are no new arrival is certain. That they did not become "known to science" until 1865 was not the fault of the whales. Mr. Holder's admirable and enthusiastic account of the *cisarctica*, published in the *Bulletin* of Museum of Natural History of Central Park, with its full and accurate drawings, leaves little to be desired; but it is right that the life history of South Side whale fishing should be set forth correctly. W. O. AYRES.

Compressed Air for Small Motors.

To the Editor of the Scientific American:

It seems to me quite manifest that so much interest has already shown itself in relation to this topic, and is cropping up in various directions, that it is quite reasonable to hope for practical results at no distant period. The article written by me on compressed air for lifeboats, printed in your number of July 3, and again in the SUPPLEMENT of July 17, evidently struck the right point, as clearly shown in the comments on it which appear in the issue of July 24.

Those made by Captain Forbes are specially noteworthy, and, coming from a man of his standing and great practical knowledge, deserve every attention. His suggestions on direct propulsion by a pneumatic current may perhaps make it advisable for us to look at it again more closely.

I first brought the subject forward in your columns, January 5, 1884, basing my preliminary propositions on the well-known modes of motion and rapidity of swimming of our common squids or cuttlefish. That article attracted little attention at the time, but perhaps it is coming to the surface now. The mechanical principles involved seem to be correct, and without a flaw. The *entire amount* of the force at command is expended in the effort to send the boat ahead, on the calculation that, as action and reaction are equal, the current which acts *directly backward* must react *directly forward*, and the movable body, the boat, must be driven ahead with the absolute force employed. Nothing is lost by indirect action, by friction, by weight of machinery, etc. This is the theory, simple enough in itself, but it involves a great number of details. Among the several patents which have been taken out to cover this idea, the position of the jet or jets to be employed has varied not a little, and I regard it by no means impossible that this point has had more or less to do with the fact that the plans have not been successful. At least, as no tangible and current results from them are known, I infer that practically they have thus far failed. Mr. Forbes himself puts forward a suggestion as to situation, which with all proper respect I would like to amend. And perhaps I can meet the different objections, and put the subject in what I believe to be its best light, by sketching rapidly the plan as it is in my own mind.

The air, retained in any suitable reservoir (perhaps coiled steel pipes, as suggested, may be the most suitable), is used always at a very high pressure. All my calculations are based on the assumption that the initial pressure is 3,000 pounds, and that at the close of working it has not run below 1,000. It is a very simple matter to calculate the capacity of reservoir required for the size of our boat and the length of service needed. The air thus retained, and always ready for service, is conducted in the most simple manner possible, by a pipe with stop cock, to the place of exit. This place of exit and the environment of the discharge are, in my judgment, among the most potential factors of success.

The place is to be, not at the stern, as set in several of the patents, nor "on the quarter well aft," as mentioned by Captain Forbes, but as nearly in the median line as possible, and *well forward* instead of aft. Let us confine our estimates to an ordinary sixteen foot Whitehall boat, for it will give us figures with which to work. Directly by the side of the keel, the planking being suitably strengthened, six feet from the stern, the exit pipe goes straight down through to a length of five inches. Of this five inches, the terminal three is bent up, but not quite to a right angle. It cannot be done with an elbow, for the object is to drive the jet of air slightly downward and directly backward. Of course, this torrent of air is limited in its lateral expansion on the one side by the keel. It is equally limited on the other side by a projection solidly attached to the boat's bottom, commencing a foot in front of the place of pipe exit, and continuing aft as far as needed, five or six feet at least. The current of air thus used in propelling the boat is expending its energy on a body of water six inches wide, which is open freely at each end. The water actuated by the jet, and displaced, is instantly and constantly replaced from forward, and as the boat rushes rapidly forward, no power is lost.

The slight downward direction is given to the jet because of the difference in the gravity of the water and the air. The length of space through which the lateral limitation should extend can be determined doubtless only by trial. As for backing the boat, another pipe is too easy of arrangement to need a word. As for steering the boats by means of two jets, it is doubtless practicable, but I prefer decidedly to make use of our present means, a rudder. W. O. AYRES.

Making and Manufacturing.

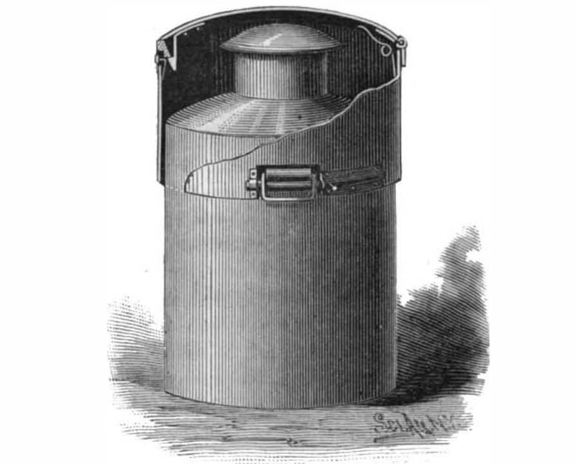
There is little doubt that the changes which have taken place in the mechanic arts, the change from *making* to *manufacturing*, as technically understood, has much to do with the aggregation of working people into trades unions. In shoemaking, for instance, every journeyman shoemaker, every 'prentice, expected some day to have a shop of his own. He learned to *make shoes*, not just *part of a shoe*, and the goal he aimed at did not seem difficult of attainment, because it only implied the possession of small capital. The ambition of a workingman was easily fostered, because it did not seem impossible of attainment. Such men had in them the making of better citizens perhaps than the piece workers of the present day. Strikes were almost unknown, and there was no special identification of the interests of all. Under the new *regime* things are different. Every individual knows his services are worthless without those of the others, he is identified with them in interest, and naturally they unite in associations. The mere union makes strikes possible. The question arises, because we always think of *progress* as beneficial, Wherein lies the advantage of the present system over the old? In the first place, in the cheapening of the product. Shoes cannot be made and sold as cheap and good in the old way as the new. So far as the working people are concerned, there must be some compensating good even to them. While the unions have up to this time been of questionable benefit, it is seldom there is an evil without its compensating good. And if the unions have not yet fallen into the line of accomplishing solid good to their members, it is because they are yet new, and to a great extent have been controlled by those who lacked judgment or had ulterior purposes to serve.

We believe the time will come when the existence of unions will be obviously beneficial to both employers and employes.—*Leather Gazette.*

LET those who think they know, without ever having looked to see, review their supposed knowledge and cast their thoughts over again; and if, in the particulars, they find they have mistaken words and fancies for realities, and accepted the dicta of pretenders instead of the evidence of observed facts, let them correct the record and acknowledge the truth as it is in nature. Moreover, let them remember that he who propagates a delusion, and he who connives at one when already existing, both alike tamper with the truth, and that we must neither lead nor leave men to mistake falsehood for truth. Not to undeceive is to deceive.—*Dr. T. Wharton Jones.*

DETACHABLE MILK CAN REFRIGERATOR.

On the upper part of the milk can fits a case, the lower edge of which is recessed to receive the handles. Hinged to the top of the case is a cover, which is raised by a spring and held closed by a spring catch, as shown in the engraving. By pressing upon a properly arranged knob the catch may be disengaged, when the cover will be instantly raised by the spring. The case is held in place by bolts, which may be placed across the recesses, so as to be below the handles on



DOUGLAS' DETACHABLE MILK CAN REFRIGERATOR.

the can. When in use, the case is filled with ice, which keeps the upper part of the can cold. As the ice melts the water escapes through the loose joint between the case and can, and runs down the can body, which is thereby kept cool. When not in use, the case can be detached and laid aside.

This invention has been patented by Mr. James Douglas, of Cornwall-on-the-Hudson, N. Y.

Examination of Mixed Tissues and Yarns.

The author determines actual solids on 2·5 grms. by drying at 100° in a special apparatus. The fat is obtained by extracting 15–20 grms. of the sample, gently dried, with the purest petroleum ether, evaporating, and weighing the residual fat. Soaps, resin, alkali, pigments, etc., are obtained by extracting the sample freed from fat, first with boiling water and then with a mixture of two parts absolute alcohol and one part ethylic ether. The residue is dried at 100° and weighed. To determine wool, this residue is steeped for 12 hours in a cold acid containing 60 per cent of sulphuric anhydride, carefully transferred to three times the volume of cold water, filtered, perfectly washed with hot water, and weighed as wool. The difference is cotton, linen, hemp, or silk waste.—*A. Gawalowski.*

WRITING TABLET.

The engraving represents a tablet for receiving and holding paper for writing purposes, which is the invention of Mr. Clarence Selah, of Ewing, Neb. The two side edges of the metallic back are folded, as shown in Fig. 2, to form a recess to hold a lining of paper or other flexible material suitable for a pad to write upon when a single sheet of paper is used, and upon which to place a quantity of paper. One end of the back is folded over and inward to receive a wire which stiffens it, and serves as a journal to receive the spring hinge clamps which hold the blotting cover. The action of the hinges is such as to adjust the blotter to the various thicknesses of paper, from one to a number of sheets. One construction of the spring hinge is clearly shown in Fig. 3; in this the blotting cover is firmly

SELAH'S WRITING TABLET.

held in position, and is not liable to injury, as the entire edge is clamped.

How to Remove Rusty Screws.

A Russian plan is to heat a flat iron bar to a cherry red and press it in the head of the screw for a couple of minutes, after which the screw becomes loosened, and is easily extracted with a screw driver.

Oleomargarine.

As noted in our last issue, Congress passed, and the President has signed, the bill aimed to cripple the oleomargarine industry by imposing a special tax of two cents a pound on the article, while all other food products go free. Says the American *Analyst:* In 1884, when the oleomargarine bill "to prevent deception in the sale of dairy products" was pending in the New York Legislature, the opinion of the Hon. William M. Evarts was sought as to the constitutionality of the proposed law. He declared unequivocally that it was not constitutional. The following is an extract from his opinion rendered two years ago:

"If this act shall be construed, not as protecting the public against 'deception in sales of dairy products,' but as protecting dairy producers in a monopoly of human food, against the manufacture and sale of the genuine products of other oleaginous substances suited as wholesome human food, in greater or less degree, to compete with or take the place of dairy products, I am of opinion that such legislation is repugnant with our Constitution. Legislation in this sense no longer adheres to the protection of guaranteeing a lawful product against simulation and deception, or protecting the public against fraud and imposition, but stands upon the avowed and unlimited discrimination in favor of monopoly, to the injury of other honest and useful producers and the oppression of the public. It is quite plain that the moment this legislation departs from the theory and justification of this act as limited, to 'prevent deception in sales of dairy products,' no proscription, on the mere ground of protective monopoly, of one industry can be limited by any rule of discretion in this line and style of discrimination. Hitherto, until recently, the maxims and instincts of public liberty have discountenanced all such methods of legislation. I am unwilling to tolerate the pretension that the provisions of our constitution offer no barrier to such an innovation upon freedom and equality as the creation of monopolies at the discretion of the Legislature."

Forgetful, apparently, of his strong language of 1884, Mr. Evarts, a few days ago, in the United States Senate, made a strong speech in favor of a bill, not framed merely to protect the public from deception, but imposing a restrictive tax upon oleomargarine, intended to protect dairy producers in a monopoly of human food such as he denounced so vigorously in the extract above quoted. To show the inconsistency of Mr. Evarts' attitude in the premises, we give the following brief extract from his recent senatorial speech:

Mr. Evarts described the condition of alarm into which the dairy interests of the country had been thrown by the introduction of oleomargarine, and said he would have supposed that, on the mere statement of that existence of things, everybody would have sympathized with this interest, so vast, so simple, so necessary, and so historical. The question was whether one good and honest product, one good and honest trade, one good and important element of foreign commerce, was—in its body and substance—to be attacked by fraud, and reduced, not only in its gain, but threatened in its existence. He argued that, within the eye of the law, the bill was constitutional. The Senate was now to confront the question whether this mischief, this injury, this stigma, this danger to trade abroad and at home, should be suffered to exist because of a difference between the two houses as to the amount of the tax. He himself should forego his own judgment as to what the tax should be, and would accept the bill as passed by the House. In conclusion, he made a strong appeal for sympathy in behalf of the great class of dairy farmers.

The "attack by fraud" upon the dairy interest is a gratuitous assumption by Mr. Evarts. The oleomargarine interest, sustained by Professor Atwater and the entire scientific skill of the land, is strongly in favor of the adoption of the severest measures, if needful, for protecting the public against fraud and deception; but they maintain, as Mr. Evarts also did so earnestly in 1884, that the legislation now sought for stands—to use his own words—"upon avowed and unlimited discrimination in favor of monopoly, to the injury of other and honest producers, and the oppression of the public."

The Attractiveness of M. Eiffel's Proposed Tower.

The iron tower which is to form the chief attraction of the Paris Exhibition of 1889 is already beginning to fill the Parisian mind with apprehension; and a savant explains in the *Moniteur* the curious phenomena which will be produced by this immense mass of iron rising to a height of 300 meters. He says that the enormous blocks of iron running north and south will become polarized, and that this polarization will soon invade the whole column. Then who knows whether the four lifts with their continual friction will not increase the magnetic influence a hundred fold? In this case, all articles for a mile around will be attracted to the tower, and will adhere to it as a needle does to a magnet. If the troops quartered in the Ecole Militaire, hard by, be called out to drill, it will be all in vain for the commanding officer to shout "*En avant,*" if they are paraded with the column behind them; they will irresistibly be drawn to the rear, with exception of the drummer, who does not carry a rifle. All the houses in Paris will suffer from a St. Vitus's dance, and, gradually attracted toward the Champ de Mars, will finally find themselves stuck to the tower. As for locomotives entering Paris, it will be found impossible to stop them at the various termini; they will rush through Paris, and dash themselves to pieces against the center of attraction. These and other evils, we are told, will follow the erection of the great Eiffel tower; but then the *Moniteur* is opposed to the anniversary of the capture of the Bastile being observed, and may have exaggerated the consequences.—*St. James' Gazette.*

PROTECTIVE GARMENT.

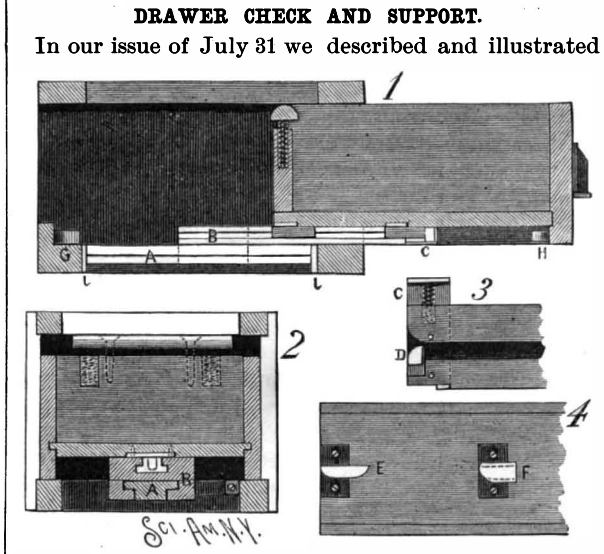
This garment, the invention of Mr. G. W. Hill, of 388 Pearl Street, New York city, is designed to protect parts of the body from the influences of cold and moisture. It consists of one or more pockets, B, open along one edge, D. In these, waterproof paper, E, is placed. As shown in the engraving, the pockets are to be worn for the protection of the chest and back, and are connected by shoulder straps. The paper is of approximately the same form as the pocket, and being rendered waterproof in any suitable way, will be unaffected by perspiration and will not be permeated by water from without. It also effectually excludes cold, and protects the body from sudden changes of temperature.

A Bee in a Telephone.

The experience of telegraph operators, inspectors, and linemen brings them into close acquaintance with all sorts and conditions of faults in connection with their work; the variety of these faults is wonderful, many stranger than fiction. One of the most curious in connection with telephony which we (*Mechanical World*) have ever known has just happened within the last few days at a place called Moss Bay. The lineman's attention was called to the circuit in question, as hearing was difficult; on listening at the telephone, he heard a "sort of booming which came on intermittently, very much resembling the distant roll of the tide, and which rendered speaking and transmission of work almost impracticable." Having satisfied himself by the usual methods that the instrument was right and the line free from induction, and that it was not picking up vibrations, the conclusion was arrived at that the fault must be in the general office, Moss Bay. An examination of the telephone apparatus disclosed a novelty. A huge bee was inside the telephone, and in trying to make good its escape, it had become fixed between the sounding board and the microphone, and it had hummed to the extent of interfering with the human organs on that circuit. How the bee came there the lineman cannot say, whether by accident or design he knows not, but the bee was the cause of the fault. In concluding his report, the lineman candidly states: "I have met some very tedious and technical faults in connection with various telephone apparatus, but I never was done with a bee before."

DRAWER CHECK AND SUPPORT.

In our issue of July 31 we described and illustrated



FRAZER'S DRAWER CHECK AND SUPPORT.

a drawer check and support, the invention of Mr. S. J. Frazer, of 69 Worthen Street, Lowell, Mass. In Fig. 3 of the engraving there was an error, which, although apparently slight, most materially affected the operation of the drawer. The stop, D, was there shown square, but one corner should have been well rounded, as here drawn, so as to admit of the drawer going in in the usual way.

The Treatment of Pneumonia.

About a half a century ago, Mr. Samuel McEvatt, now of Paterson, N. J., was cured of pneumonia by a very simple course of treatment, which not only restored him to health, but left him with unimpaired lungs. He has since made use of the same treatment in a number of cases, several of which were unusually severe and had been given up as hopeless. In all of them, however, he met with entire success, and consequently desires to publish the remedy, in the hope that it will be a benefit to others.

Leeches, fomentation, and linseed poultices are the three necessary elements in this course of treatment. If the case is severe, and great difficulty in breathing is experienced, six leeches are used, but ordinarily four will be found sufficient. These are applied on the back, as close as possible to the shoulder blade. The patient should be sitting up and leaning slightly forward, in order to support the leeches. The skin under the shoulder blade is first washed with a little sweetened milk. The leeches are then placed in a glass about two and a half inches wide, which is carefully turned upside down over the spot indicated. It is well to have the glass touch the shoulder blade, and be held a little toward the spine. It may be removed when the leeches have once taken hold. As soon as they drop off, flannel cloths dipped into boiling water are applied to the wounds, and this process of fomentation kept up for half an hour. During this time the water from which the cloths are taken must be maintained at almost a boiling heat. This part of the treatment removes more blood than the leeches. Two or three linseed poultices are then applied to the wounds in quick succession.

The patient will be extremely weak from the loss of blood, and some simple and easily digested nourishment should be administered. The impeded respiration, Mr. McEvatt states, will soon give place to an easy breathing. He has had an opportunity of treating a number of cases, and has met with such constant success that he believes himself justified in saying that if these simple directions are faithfully carried out, the patient will be quite safe. We feel obliged, however, to add a word of caution. Pneumonia is a disease of so serious a nature that wherever possible it would be much wiser to consult a physician, and permit him to decide whether the patient could safely be subjected to this course of treatment. It is one of the recognized modes for strong, healthy persons to give them a single full bleeding; but where the patients are feeble or well advanced in years, the loss of any considerable amount of blood would not be admissible. In case of emergency, when no physician is available, or where he has made a careful examination of the patient, and decides that the system can stand the strain of losing so much blood without injury, we have reason to believe, from the evidence submitted, that the method of treatment here recommended would prove very beneficial, but like all other treatments it must be employed with discretion.

Papaine.

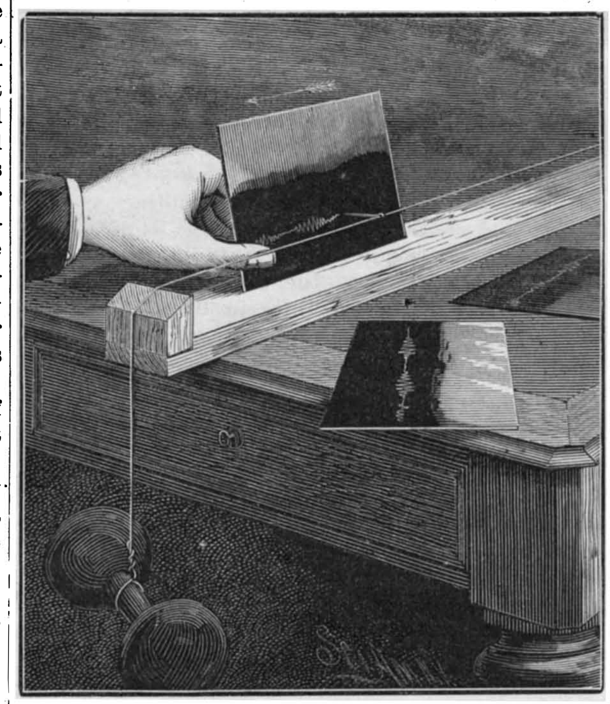
Papaine, obtained both in the form of a white powder and of a dried juice from the fresh milk of the fruit of *Carica Papaya*, is known in this country commercially as *Papaine-Christy*. Under the name of *Papaine-Finkler* also two preparations are known in commerce, and there is one by Merck, of Darmstadt (*J. Soc. Chem. Ind.*, 1885, 571, and 1886, 390). A chemist residing on the Papaw plantations prepares the article from the milk for Mr. Thos. Christy, of London.

Papaine, which, from its chemical nature, is considered to belong to the peptones, is capable, according to Professor Finkler, of Bonn, of dissolving in pure water 1,000 times its weight of fibrin. Experiments show that the papaine preparations are ferments which dissolve albumen; that this solvent action occurs under very different conditions; that it is possible with a very small quantity of the ferment to dissolve a large quantity of albumen. The action is not one of simple solution, but the albumen is changed into peptone. Papaine dissolves albumen best in water, but almost equally well in a slightly alkaline solution, but less readily in dilute HCl. Experiments were made in these three directions with 30 grm. fresh fibrin, 0·03 grm. papaine, and 100 c. c. water, 100 c. c. of 0·1 per cent HCl or 50 c. c. of 0·1 per cent KOH. After 72 hours the fibrin in all cases was completely dissolved. This action goes on between wide ranges of temperature. A higher temperature, 40° to 50°, has an accelerating influence. The author finds from experiment that 1 part of *Papaine-Finkler* dissolves 1,000 parts of fibrin. It has been repeatedly observed that 8 grm. hard boiled albumen were dissolved by 0·01 grm., and even by 0·001 grm. of papaine. Finkler states that it dissolves very rapidly the membranes of diphtheria and croup, and that not a single patient he has treated in the University Hospital or in private practice has died, but that all recovered. In each case the membrane was dissolved by painting it with papaine about five times per diem. He further adds that since papaine can be applied with salicylic acid, which increases its action, there is no other drug known equally powerful for the purpose named. Finkler found that when the membrane was dissolved, the fever disappeared. In the *Berliner Klinische Wochenschrift* (1885) it is stated that Dr. Schoffer, who had tried most of the remedies recommended for diphtheria, obtained the best results with papaine. In the summer of 1884 he treated forty-seven cases of this deadly complaint with a 5 per cent solution of it. The treatment was commenced as soon as possible, and the patches were to be painted every five or ten minutes; in a few hours the membranes are said to be removed, and the fever meanwhile disappears.—*Chem. Zeit. and Christy's New Commercial Plants and Drugs.*

EXPERIMENTS IN SOUND.

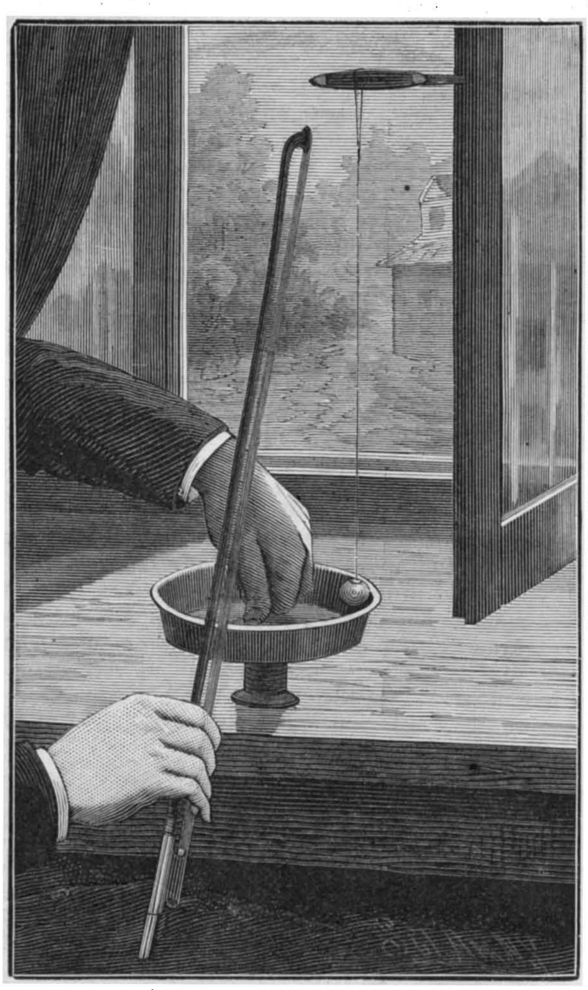
T. O'CONOR SLOANE, PH.D.

By means described in the last number of this journal, we have seen some of the laws that govern the vibrations of strings experimentally examined. Loops and nodes were produced, and their existence proved by the use of riders. Next, by Melde's experiment, they were made visible to the eye. So far, one thing will have been noticed: that all sounding bodies so far experimented with are in actual physical motion. In the experiments to be now spoken of, this motion is to be still further studied.



GRAPHIC SOUND WAVES.

It has been found that sound is always produced by a body in actual motion. This motion must be rapidly repeated. It is doubtful if one motion could produce sound, properly so called. If the motion is rapid enough in actual rate to affect the air, and is repeated rapidly enough, and not too much so, then sound is produced. The range of repetition that can be thus defined extends at the utmost from nine vibrations to forty-one thousand per second, or over twelve octaves. But these are extreme limits, and for ordinary ears and ordinary types of sounds they must be curtailed about one octave at the base and one at the highest range. As soon as sixteen thousand vibrations per second is passed, the ear can no longer place the notes musically. The next fact to be observed in this connection is that by delicate enough means the air can always be proved to be in corresponding motion when sound is transmitted. When a body is made to vibrate in a vacuum, no sound is produced. Hence the conclusion is reached that air is the bearer of sound through space.



VIBRATIONS OF SOUNDING VESSEL.

Very extraordinary results of calculations founded on this principle may be deduced. A sphere of air, one mile in diameter, contains seventy-seven French billions of cubic feet of air, weighing five billions of pounds, or three millions of tons. Yet a slight sound may be heard at a distance of half a mile, and therefore has possessed power enough to throw this vast weight of air into motion. The vocal organs of a bird or even insect may do this. This calculation, or parallel ones, has been used to throw discredit on the air theory of the transmission of sound, but we cannot refuse to believe it under our present limitation of knowledge.

To find the character of vibrations producing sound, the first experiment may be carried out. A pin is secured to the tightly stretched wire of the monochord. To do this, the head and upper end of the pin is bent around the wire, and the pin sustained in a horizontal position until a drop of sealing wax is melted on the pin and wire, and has cooled. Then the support may be withdrawn, and the wire be left free.

Some pieces of glass are next to be provided. They are smoked on one side over a candle or a partly full gas flame. A full flame does not deposit lampblack so freely, and is more apt to crack the glass. The string is set in very strong vibration, and one of the slips of glass is rapidly drawn past the vibrating pin, and barely in contact with it. The wave motion of the cord is delicately developed on the glass as an elegant wave line, diminishing rapidly in altitude of its sines. This forms a very pretty lantern slide. If it were possible to move the glass at the rate of one thousand feet a second (more accurately 1,093), a correct graphic representation of the phases of the air wave would be reproduced. If it were known just how long the glass was in contact with the pin point, the number of vibrations per second would be known. This under the circumstances is impossible, of course. But an accurate ear could place the note given by the string, and the number of its vibrations per second could be ascertained from the text-books, and then, by counting the number of waves marked on the glass, we could determine the period of contact. This last principle is often of great use. A tuning fork can be, and frequently is, used as one of the most delicate and accurate measurers of time, by precisely such a method. The oscillations may run up to 1,100 per second, and, marked on a slip of smoked glass, divide a second to this extent. These three illustrations show what value may attach to this line of work in physics. It may be recurred to in future articles of this series.

The line drawn by the pin point being a true wave line, without angles above or below, shows that the wire is at rest at the beginning and end of its beat, and that from this rest it gradually attains its quickest transverse motion, and loses it in the same way.

Knowing the velocity of sound and the number of waves per second, we may by simple division ascertain their length. It varies from seventy feet to a fraction of an inch.

Other bodies than strings may be made to vibrate, to produce sound, and the vibrations made to produce visible effects. A violoncello bow can be made to draw musical notes from the most unpromising objects. A common stamped metal pan is shown in the cut, held firmly upon the upper end of a spool. From it pure notes can be drawn by a bow manipulated as shown. To prove that it vibrates, a marble is suspended in contact with one of its sides. The thread is attached to a piece of leather cemented to the marble by gum tragacanth. As soon as the true note is struck, the marble starts into motion, being repelled from the side of the pan over and over again as long as the sound continues. The marble must be so placed as to rest in good contact with the metal; the thread should not be in a vertical line, but should be inclined slightly away from the dish.

By using thin wineglasses or goblets containing a little water, very beautiful waves may be produced on sounding them with a violoncello bow or with the wet finger drawn around their upper edge. By using a spool and bow as shown, dinner plates, small tea trays, and other objects may be made to yield notes of great purity.

It is most interesting in thus experimenting to find from how many objects notes can be drawn. By similar manipulation, Chladni's plates may be simply experimented with, which will be more fully explained hereafter.

CHICAGO.

When one visits New York, he thinks that the bustle in the streets and the activity that every one displays in business during the day cannot be surpassed; yet Chicago offers a still more extraordinary spectacle. In the principal streets, State Street among others, the number of vehicles of all kinds is wonderful. The tramway cars, always filled with people, follow each other in close file. To one observing them, it seems as if they were attached to an endless chain, that was taking up and throwing out a crowd of busy passengers at every moment. Pedestrians move about amid all this, and complete the interesting spectacle of a city that appears to exist for work only. On going toward Chicago River, on whose banks stand the grain elevators, the spectacle becomes still more remarkable. The steamboats mingling their smoke with that of the gigantic establishments, the number of small boats crossing the river at every moment among the merchant ships, and the crowd walking over the bridges give one a sort of vertigo.

After seeing the streets, the most interesting visits to make in the city are to the stock yards or cattle markets and the abattoirs annexed to them. A few figures will give a real idea of this immense market. In the different pens of which it is composed, there is room for 25,000 beeves, 100,000 hogs, and 22,000 sheep. There are special compartments, besides, capable of holding 500 horses. To form the sides of these wooden pens, it took 29,520 feet of joists and boards. The total area occupied is one square mile. Each pen is separated by avenues designed for the traffic of the public and the owners of the cattle. Numerous inclined planes are raised on all sides, in order to allow of the easy descent of the animals from the cars to the pens, or to give them access to the abattoirs where they are to be killed. The animals are brought by rail from Texas, Pennsylvania, Ohio, and other States. The spectacle offered by this host of nearly 150,000 animals, bellowing and lowing in all keys, and the moving about of the people, who seem lost in the numerous detours formed by the sides of the pens, is one that can be found only in a city of the United States.

It cost $3,000,000 to erect the stock yards buildings, and new additions are being made to them every day. It takes 300 watchmen to look after this truly prodigious establishment. Of the abattoirs, the most extensive is that of Armour & Co. The size of this establishment can scarcely be realized at first. Built entirely of wood, and doubtless gradually, no one has ever thought of making a general plan of it. All has been constructed in haste, and according to the needs of the moment. It is a true labyrinth of sheds and enormous halls that communicate in various ways by passages, staircases, elevators, and suspension bridges, over which pass the workmen and over which runs the railway. Without a guide, one could never find his way in these immense structures. Mr. Cudahy, the superintendent, was good enough to give me the necessary permission, and have me accompanied by a young employe into every recess of his wonderful establishment. It would have been impossible to be more agreeable and obliging to a stranger than he was.

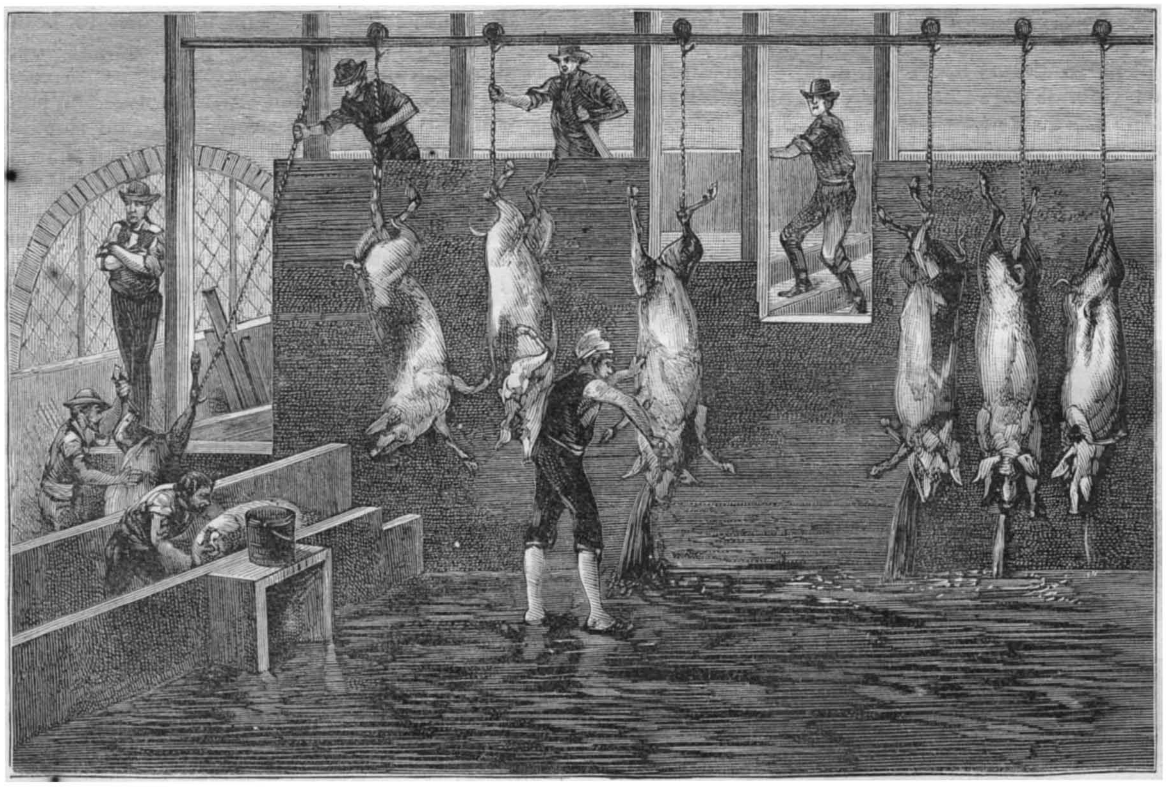


Fig. 1.—SLAUGHTERING HOGS IN CHICAGO.

On entering the abattoirs, one goes first to visit the hall where the hogs are slaughtered. The animals, one by one, enter the compartments shown in Fig. 1, through passageways made of planks. One man seizes them by the hind legs, and fastens to one of the latter a hook attached to a chain, and another man standing in a gallery above draws the chain and hog toward him. The animal is thus suspended by one leg, and utters frightful cries. His companions answer with genuine howls, but the business proceeds none the less rapidly. The chain from which the victim is suspended rolls along a horizontal rail through the intermedium of a pulley. The hog thus slides into the hands of his butcher, who, almost naked, and covered with blood, plunges a large knife into his throat. The blood flows in a long stream, and the animal no longer cries, but one sees the last convulsions of his agony. The butcher, with a slight motion, then slides the slaughtered hog along the rail and seizes another beast, and so on. He can kill about seven a minute, or five hundred an hour. One cannot gaze upon this scene of butchery without a certain feeling of horror. The cries of the animals and the streams of blood make one experience a sensation of disgust and an undefinable uncomfortableness. Yet, when I returned the next day to sketch at leisure, I was surprised to find that this feeling had already diminished. The butcher came to talk with me during a resting spell, and I was astonished to see this man, still covered with the blood of his victims, and with scarcely any clothing on, had a genteel and mild face. He reservedly asked me a few questions, and when he found that my sketches were for a French scientific journal, he spoke to me absolutely as would have done a well-informed and intelligent gentleman. His assistants appeared to be like him; they surrounded me, and asked for some details concerning the abattoirs of Paris, and then concerning our great city itself. These American workmen are decidedly not like ours; their education is superior, and they made me forget that I was in blood and in the midst of unfortunate victims.

The hogs, with cut throats, and suspended as I have just described, afterward disappear under a wooden compartment and enter a trough of boiling water (Fig. 2). Here, men provided with long pikes submit them to a preliminary washing. A sort of curved grating of the width of the trough next receives each animal, and, making a half-revolution, deposits it upon a marble slab. The hog is now again hooked to a chain, which carries him to the machine for scraping his skin (Fig. 3). Here, wheels placed in every direction scrape and scratch the animal's hide until all the bristles are removed. After this operation, the absolutely naked hog is carried by the chain to other marble slabs, where workmen wash him a second time under a heavy stream of water.

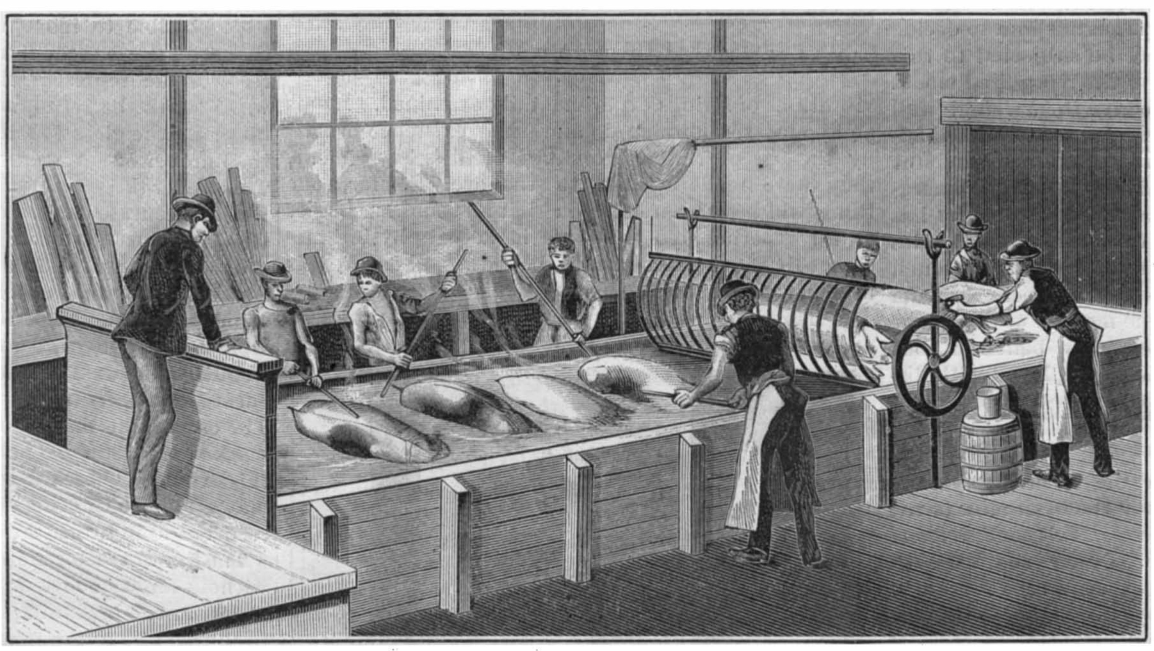


Fig. 2.—HOGS UNDER TREATMENT IN A TROUGH OF BOILING WATER.

After undergoing these different operations, the hog is hung again by one foot and run along a rail to a hall where his head is cut off, and the entrails, tripe, etc., are removed. These parts of the animal's body are carried to rooms set apart for pork-butcher's meat. Next, the hog is washed for a third time, and is finally carried into an enormous hall, where he is suspended from the ceiling. In this vast depot there is room for 10,000 animals. The hogs are finally placed in refrigerators, where they remain for two or three days without corrupting, being under the action of a constant temperature of 38 degrees Fahrenheit. The hogs are next taken from the refrigerators in order to be cut up by the butchers. The work done by these men is interesting, and in the hall in which they operate wonderful activity reigns. These men cut the animal up into parts with unequaled skill and celerity. Other workmen carry the cut meat to the different parts of the establishment where it is to be prepared for sale;

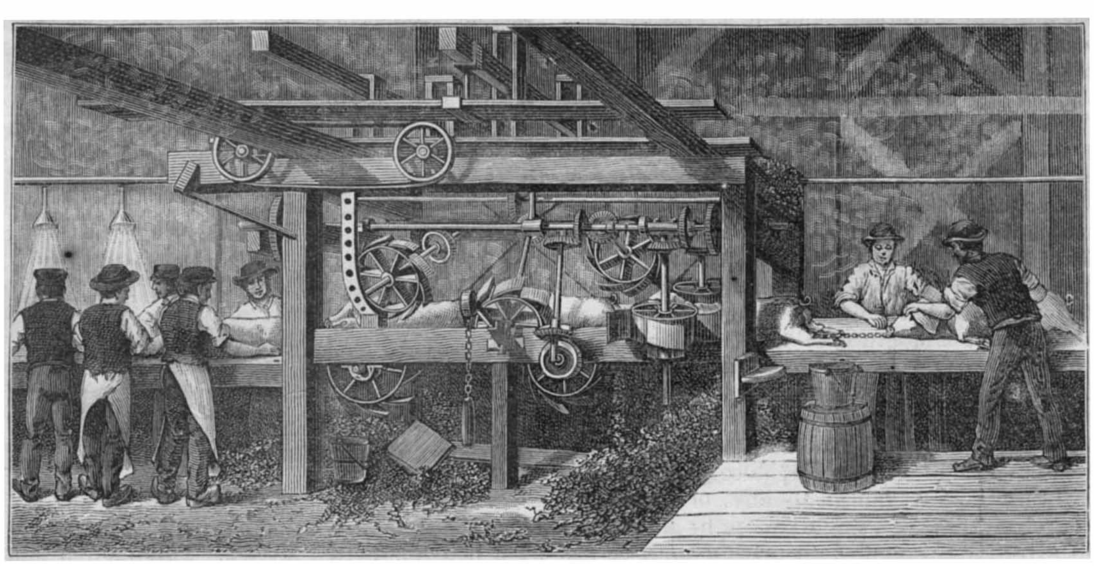


Fig. 3.—MACHINE FOR SCRAPING THE SKIN OF HOGS.

the hams to immense smokehouses, other meats to the cellars where they are to be salted, and others to a place where they are to be cooked and packed in tin cans.

My guide afterward took me into all the different shops of the establishment. I thus saw the pork-butcher's hall, wherein steam machines were hashing meat for the manufacture of sausages. The daily production of this sausage meat is 52,000 pounds. Farther along are manufactured the packages into which lard is put. Here thirty young people were sewing bags, and their duty was so pressing that they scarcely had time to see me pass. They make 8,000 packages per day. Then came the shops where the casks are made for packing salt meats. Then there are the kitchens, which are admirable for their cleanness. Here the pots are full of beef, mutton, and pork, which is afterward canned. Small, revolving, ingenious, and delicate machines close the cans and do the hermetical soldering that permits of the preservation of the meat indefinitely after the expulsion of the air. In the rooms, too, where the cans are painted and varnished, the women have to work with activity, and they finish from 35,000 to 40,000 per day.

The beeves do not have their throats cut as do the hogs and sheep. From the provisional pen in which they are placed they are made to walk one by one through a narrow plank passageway. A trap opens, and the animal, goaded by a man standing on a stage outside, enters a compartment in which there is room for but himself.

A skillful marksman, standing upon a stage, aims at the forehead, between the eyes, and with the muzzle pretty close. The animal drops down dead; a second trap is opened, and the victim is dragged to the butchery. From 800 to 900 beeves are killed thus during the day. As for sheep, only about two hundred per day are slaughtered, and these undergo the same treatment as the hogs. Annexed to the establishment there are large structures wherein the skins of these animals are dressed.

In these remarkable abattoirs 3,200 men are employed in summer, and 4,500 in winter; and more than a hundred horses are constantly at work in the various departments. The Armour establishment occupies an area of twenty-four acres. In addition to the large shipments of preserved meats that are daily made to all the States of the Union, meat is sold at retail in a store on the ground floor, organized for the convenience of the inhabitants of the city, who come hither to make their purchases. The establishment sells more than 600,000 hams per year, in addition to the canned meats. From the information that I received, it would appear that the Chicago abattoirs, collectively, export more than 2,500,000 per annum.

It will be seen that the meat trade of this city is immense. The trade in lumber is just as extensive. There are immense yards situated on the shores of Lake Michigan, near the mouth of the Chicago River. There are more than three hundred houses engaged in this business, and these own 150 yards, in which a large force of lumbermen is employed. The fire that destroyed a portion of the city in 1871 ruined many capitalists, but none of them became discouraged.

The sawmills of the neighboring cities of Michigan and Illinois received orders for the material necessary for the rebuilding of the destroyed city, and worked day and night. The ruined individuals set themselves to work again, Chicago rose from her ashes as if by enchantment, and the lumber trade for this reason received an extraordinary impetus. In 1877 there were delivered to the yards more than 1,180,000,000 feet of planks and other timber, and more than 650,000,000 feet were shipped by rail or boat. This trade is increasing in extent, and the circulation of the capital employed exceeds that of all the banks of Chicago, and even that created by the traffic of the grain elevators.

A walk in the lumber yards is very interesting. Here, one finds himself in long streets skirted by planks piled one upon another, and forming walls 30 or 50 feet in height. Instead of placing the planks in such a way as to form vertical walls, the lumbermen lay them in overhanging courses. Owing to this, the rain can wet only the top planks, which are quickly dried by the wind, and the water drips into the middle of the avenues instead of running down along the wood. On this account, dampness has less action upon the planks located near the earth. The avenues multiply in all directions, and one loses his way between all these walls. One seems to be in a fantastic city, whose houses have neither doors nor windows; while the agreeable odor of the pine wood revivifies him.

From an artistic point of view, Chicago offers really nothing of interest. It has a few monuments, but the only merit of these is their size, and one could not gaze upon them long. The parks around the city are pleasing, and are very gay on Sunday, when the inhabitants come to pass a portion of the day in them. In the artificial rivers and lakes there is a continuous moving about of boats of all sorts. One often sees a frail rowboat filled with young girls of from twelve to fifteen years, who are alone, and who sing as they row.

A taste prevails for ornamental designs in flowers in the gardens, and is much more in fashion here than in France.

Gardeners indulge in the most whimsical eccentricities. The people flocked to South Park, among others, to see a large elephant, a camel, a butterfly, and the American flag formed of matted plants and flowers of various colors planted upon the greensward. The great attraction was a large sun dial made entirely of plants, the hours being formed on the grass with plants having red leaves. This dial had been well oriented by the gardener, and the shadow given indicated the hour of the day quite accurately.

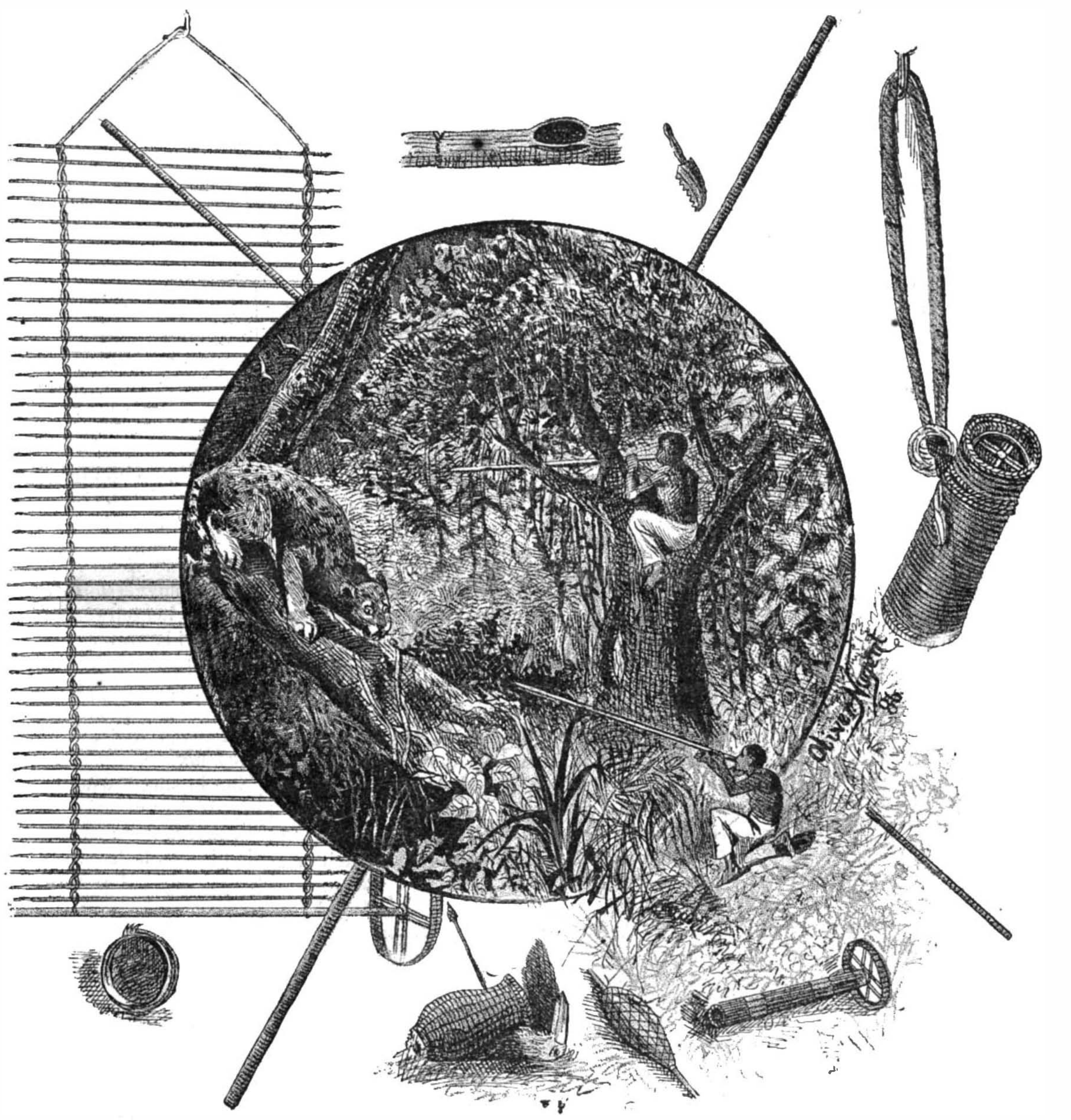
These public gardens of Chicago would somewhat resemble our Bois du Boulogne, as they are laid out in the same way, were it not that South Park and Lincoln Park, ornamented with artificial lakes and rivers, are upon the banks of Lake Michigan. Hence a comparison becomes impossible. Lake Michigan is immense; its opposite shores cannot be seen, so great is its width. Numerous steam and pleasure boats ply upon it, and one might imagine himself at the seaside. Through the instrumentality of the Floating Hospital Society, there has been constructed in the lake, at Lincoln Park, a jetty two or three hundred yards in length, provided with porticoes, where sick children may indulge in various gymnastic amusements. Here, accompanied by their mothers, they can breathe the pure air from the waters of Lake Michigan, and regain their lost strength by exercising in any way that they prefer. The idea of this aquatic structure appeared to me to be an original one. It was a great success last year, and the pale faces of the babies seemed to be regaining their fresh colors on this promenade.—*A. Tissandier, in La Nature.*

THE ZARABATANA OF THE MACOUSHIES.

JOHN R. CORYELL.

Almost the first exercise of ingenuity and skill by the savage is in the formation of a missile weapon suitable to his peculiar needs. Hence it is we see such a variety of bizarre yet effective weapons in use among the savage tribes of the world. Where the conditions are right, a smooth stone projected from the hand may suffice; but the places are very few where the kind of stones, game, and surroundings harmonize so well that no further effort of ingenuity is needed. The rule is that many difficulties must be overcome before a weapon is produced which fits the needs of the man whose very life is at stake.

It has been said that the boomerang is the most remarkable result of savage ingenuity and skill in the making of a missile weapon; but it seems to me that even that singular instrument must yield first place to the zarabatana, or blow gun, of the Macoushie Indians of Guiana. The zarabatana and its several accompaniments make a series absolutely unique, in that they so clearly portray the efforts successfully made to overcome a number of seemingly insurmountable obstacles.



THE ZARABATANA, OR GUIANA BLOW GUN.

Being at once the wettest and warmest portion of the globe, Guiana is characterized by a vegetation so rank as to defy the utmost efforts even of civilized man to control it. Ordinary missiles are of little use in its tangled forests, for scarcely an animal fit for food lives elsewhere than among the branches of the lofty trees. Even the large animals, as the jaguar and puma, lurk in the trees, and are not only wounded with difficulty, but if wounded can easily drag themselves away to some leafy covert, there to die or, perhaps, recover undiscovered. The missile needed is one that is silent and instantly fatal, no matter what the animal or where it is struck. A vital part can seldom be chosen by the marksman, owing to the opportunities for hiding afforded by the dense foliage, consequently the missile must be fatal though it only puncture the flesh. This, of course, involves the use of poison, but of such a poison as will be harmless when eaten.

The steps by which the Macoushie accomplished his blow gun, with its instantly fatal poison, are, of course, unknown, but it is safe to say that in all their elaborateness they are the work of years.

The blow gun itself is a tube about three-quarters of an inch in diameter and eleven feet long. It weighs a trifle more than a pound and a half. The tube is made up of two tubes, one within the other, the object of the inner tube being to supply as nearly perfect a cylinder as may be, and that is found in a comparatively frail aquatic reed called *ourah.* The outer tube is made of the stem of a young palm tree of the genus *Ireartea,* and known as samourah. The only purpose of the outer tube is to act as a guard for the inner tube, and wonderful skill is displayed in the adjustment of these, one within the other. The mouth end of the outer tube is bound with thread made from the agave, and the outer end is secured by means of a seed of the aquiro palm, through which a hole is bored. The seed acts also as a back sight. The fore sight is made of the two upper incisor teeth of the acouchi. The arrows are made from the midribs of the leaves of the coucourite palm, and are peculiar from their hardness and weight. They are not larger than a knitting needle, and are bound at the base with a tuft of cotton procured from the tree *Bombax ceiba.* This makes the missile fit the gun snugly, a prime necessity for correctness and strength of flight. The arrow is pointed by drawing it between the teeth of the pirai fish, one half of whose lower jaw forms a necessary part of the Macoushie's outfit.

The weapon is now complete, but would be almost harmless without the famous poison, the manufacture of which is held a secret among the conjurors of the Macoushie Indians. The chief characteristic of this wourali poison is its instantaneous action. It does not kill instantly, but it seems to paralyze first, and then cause death slowly and painlessly. The consequence is that a creature smitten by it is unable to move even an inch, but falls to the ground from the very spot on which it was struck. The composition of the poison as given by Waterton is peculiar. Some of the ingredients he could not learn, but the most important is the wourali vine (*Strychnos toxifera*). Two or three other plants are used, among them red pepper and hyarri, the latter belonging to the genus Lonchocarpus, and being used to kill fish by throwing into the water. Besides these vegetable ingredients, the fangs of two kinds of serpents are used, and also the bodies of two kinds of ants. The probabilities are, however, that the animal ingredients are unimportant. The materials are all boiled together over a slow fire until the poison in the form of a thick sirup is produced. Dampness is fatal to the poison, so that the utmost care is taken to keep it dry. The wourali is so precious that with it the Macoushie can purchase anything, and among all the neighboring tribes it is used as money.

The arrows, after being sharpened and dipped in the poison, would be extremely dangerous if not carried with peculiar care, and the Macoushie, therefore, has contrived a way at once simple and safe. The arrows are woven into a sort of ribbon on two sets of parallel cords, the points all directed one way. A wheel is then fastened to the end of a shaft tied to the ends of the cords, and the whole ribbon of about five hundred arrows is rolled up, the poisoned tips being kept harmless by resting against the wheel. The whole is then placed in a water-tight quiver, made of reeds lined with a delicately woven matting and covered with kurumanni wax. The cover is made from the hide of the tapir or peccary.

The whole outfit of the Macoushie is so light that when he goes on an expedition he can literally take up his bed and accouterments, and go about as untrammeled as any savage could wish. His hammock he folds around his body, clothing by day, bed by night. Quiver and cotton basket slung over the shoulder, and zarabatana in hand, he is ready for whatever may come.

DECISIONS RELATING TO PATENTS.

U. S. Circuit Court.—Southern District of New York.

LA RUE *v.* WESTERN ELECTRIC COMPANY.

PATENT TELEGRAPH INSTRUMENT.

Brown, J.

Letters patent No. 270,767, granted to Edgar A. Edwards, January 16, 1883, for an improvement in telegraph transmitters, adjudged valid, and the third claim thereof to have been infringed by defendant.

The invention in controversy consisted in substituting for the trunnions or pivots of the lever of telegraph transmitters a torsional spring or strip of metal. The defendant used this torsional spring upon a "sounder." A transmitter is operated by the finger at one end of the line, and a "sounder" is operated by electricity at the other end of the line. The third claim covered the combination, in a telegraph key, of the lever, its torsional spring, and adjusting screws. It was stated in the specification, immediately before the claims, that the invention was not limited to the application of torsional springs to telegraph keys, but they might replace the trunnions of the relay and sounder.

The third claim covers the operative combination, whether in a telegraph key or in a sounder, and the language in the claim, "in a telegraph key," must be taken in connection with the statement in the specification that the invention is not limited to the use of torsional springs in telegraph keys.

The statute requirement as to claims in a patent is complied with when the specification shows clearly what the inventor intended to cover in language found in immediate connection with the claims proper.

Where the combination patented is only a part of the machine, it is infringed by the use of the same combination in a different machine.

The statute (Rev. St., sec. 4,888) requires that the inventor "shall particularly point out and distinctly claim the part, improvement, or combination which he claims as his invention or discovery."

Whatever the inventor does clearly point out as his invention, and whatever the application does clearly show that the inventor intends to claim as his, should, as it seems to me, be deemed a part of his "claim," when found in immediate connection with the specifications of his claim. There is no arbitrary and formal division of the application into different sections that requires language naturally indicative of the inventor's claim and intention to be excluded from consideration as a part of the claim under the statute, simply because it is not found in a particular part of the application, or because it does not follow the words "I claim," nor is it necessary to use the word "claim." Any language that does clearly and unmistakably indicate that the inventor intends to secure to himself the benefit of a certain use of his invention, though the expression immediately precedes the words "I claim," ought, as it seems to me, to be as much regarded as a part of his "claim," in the statutory sense, as the words that follow, because otherwise the intent both of the statute and of the inventor would be thwarted. Any perfectly clear expression of what the inventor intends to secure to himself is virtually a part of the "claim." The reasons for confining the patent to the "claim," viz., because the inventor is presumed to intend to dedicate to the public so much of his invention as he does not claim, and because the Patent Office is presumed to intend to grant the patent for only what is claimed, have no application to such a case.

U. S. Circuit Court.—Northern District of Illinois.

BUTLER *et al.* *v.* STECKEL *et al.*

PATENT BRETZEL CUTTER.

Blodgett, J.

The Butler, Earhart, and Crawford bretzel cutter patent of March 20, 1883, No. 274,264, held void for want of patentable novelty.

It being old to cut crackers, cookies, and cakes of various sorts into different shapes—as, for instance, in the shape of animals or of capital B or character &—only mechanical skill was required to change the die so as to make it cut dough in the shape of bretzel, and this, too, notwithstanding the bretzel is somewhat clumsily shaped, the parts being bent, twisted, and laid upon each other, so as to require some study, effort, and experiment to make the shape of the die correspond to its external formation. The fact that the mechanic might be compelled to experiment somewhat—that is, cut several dies—does not show invention.

The mere fact that others were long wandering by the wrong path is not evidence that it required invention to accomplish what has been done by taking the direct path pursued by these patentees, whose merit was in overcoming the fixed prejudice in favor of hand made goods, rather than in inventing any radically new process for making the same goods by machinery.

U. S. Circuit Court.—Eastern District of Missouri.

DEDERICK *v.* WHITMAN AGRICULTURAL COMPANY.

BALING PRESS PATENT.

Treat, J.

A certified copy of a recorded but unacknowledged instrument purporting to be the assignment of a patent is admissible in evidence to prove the execution of such assignment, and is sufficient proof thereof in the absence of countervailing testimony.

The first claim of letters patent No. 126,394, granted May 7, 1872, to Frank A. Huntington and John F. Carter for an improvement in baling presses, is for the combination therein named, involving as essential thereto the peculiar construction of the press box, and is not infringed by a combination into which such press box does not enter.

First claim of letters patent No. 199,052, granted Jan. 8, 1878, to Albert A. Gehrt for an improvement in portable hay and cotton presses, is valid.

A substitution of an equivalent for an ingredient of a combination covered by a patent cannot avert a charge of infringement.

Suit for infringement of the first claim of letters patent No. 126,394, for an improvement in baling presses, and the first claim of letters patent No. 199,052, for an improvement in portable hay and cotton presses. The complainant sues as assignee. The only evidence offered of the execution of an assignment to him is a certified copy of an unacknowledged instrument on record in the Patent Office, which purports to be a duly executed assignment. The admission of the copy was objected to by the defendant. The first claim of letters patent No. 126,394 is as follows:

1. The combination of the lever or sweep, H, with the lever, G, follower, F, and box, A of a baling press, when constructed to operate substantially as herein described.

The first claim of letters patent No. 199,052 is as follows:

1. In a portable press, the combination of a horizontal guide frame with a reciprocating follower, pitman, and pivoted double cam at the end of tongue or sweep lever of press, substantially as and for the purpose set forth.

DEDERICK *v.* WHITMAN AGRICULTURAL COMPANY.

BALING PRESS PATENT.

Treat, J.

The first claim of letters patent No. 170,998, granted to P. K. Dederick December 14, 1875, for an improvement in baling presses, is void for want of invention.

The first claim of letters patent No. 224,281, granted to P. K. Dederick February 10, 1880, for an improvement in baling presses, is, in view of the previous state of the art, void, unless restricted to the peculiar devices named in the combination therein described.

The mere change of position of an old mechanical device from one part of a machine to another to effect the same result involves no patentable invention.

Suit for the infringement of the first claim of letters patent No. 170,998 and the first claim of letters patent No. 224,281, both for improvements in baling presses. Said claims are respectively as follows:

1. In a press having the bale chamber smaller than the press box, beveling the mouth of the bale chamber substantially as described.

2. The combination of a press box, a bale chamber, and a reciprocating traverser, and means for increasing or diminishing at will the area of the passage between the press box and the bale chamber, whereby to render the sections or charges of material larger or smaller and produce bales of greater or less density, substantially as described.

U. S. Circuit Court.—District of Massachusetts.

LIBBEY *v.* MOUNT WASHINGTON GLASS COMPANY *et al.*

GLASSWARE PATENT.

Colt, J.

On motion for preliminary injunction, letters patent No. 282,002, granted to Joseph Locke, July 24, 1883, for an improved article of glassware, and the process of making the same, sustained.

This patent was for an article of glassware of ruby and amber colors made from a gold-ruby compound, which was a well-known glass mixture containing gold. Patentee discovered that by reheating only a portion of the article the ruby color was developed in the reheated portions, while the other portions remained amber color, producing an article known as "amberina." This process of obtaining party-colored glassware had been before practiced, but not with gold-ruby compound—the amber color had not been obtained, except by accident, and then with no thought of utilizing the product; and, although this fact undoubtedly led patentee to make the discovery, the patent was sustained. The specification of this patent sufficiently describes the invention to enable persons skilled in the art to which it relates to produce the patented article.

A disclaimer can be made after the suit is commenced; and the defendants in this case having knowledge of the scope of the patent, and sufficient time to prepare their defense to a motion for an injunction, *held* that their rights had not been prejudiced in any degree by the disclaimer.

Care of Animals in Summer.

The American Humane Association presents the following suggestions relative to the care of animals during the heated term:

Provide water—fresh, pure water. Think, reader, how you are refreshed by a drink of cool water on a hot day. The lower animals are equally in need of the means of quenching thirst.

The active dog requires drink frequently during the hot day, as does also the cat; and a dish of fresh water should stand where they can have access to it. Undoubtedly many a dog is driven to madness through lack of water; and the testimony is that hydrophobia is almost unknown in those localities where dogs can drink when they wish.

Every city, village, and country town should be liberally supplied with drinking fountains for animals, and they should be so constructed that even the smallest dogs can drink from them. No gift to a people confers a greater pleasure than a fountain, and that person who turns aside a stream from the field and gives a watering trough to the roadside, or provides a fountain at which man and beast can drink pure water, is truly a public benefactor.

Give the horse frequent opportunity to quench thirst at times when not too much overheated, and before eating. To drink freely immediately after eating prevents a favorable digestion of food.

Provide shade. How instinctively we seek the shadow when the sun is pouring its hot rays on the dry and parching earth! If the pasture is not provided with shade trees, in a convenient locality set four, six, or eight supports, across which place straw or grass, and thus, in a brief time and with little labor, make a shade in which animals can rest from the heat of the sun, to the great comfort of themselves and benefit to their owners.

Remove the harness from the horses in the hot day whenever you desire to give them a full, free rest, and once during the day, preferably at night, a thorough currying and grooming will not only give rest, but will do about as much toward improving the animal's condition as will the oats.

Examine the harness on your working team, and you will discover that blinds, check reins, and cruppers are simply torturing contrivances, serving no useful purpose. Take them all off for the convenience of yourselves and the comfort of the horses. Keep the stable well ventilated and free from the strong ammonia, which is injurious to the eyes. Assist the animals to protect themselves against flies, feed regularly, hitch in the shade, and remember that the care which will give comfort to the lower animals will make them doubly profitable to their owners, aside from the humane bearing upon the subject.

ENGINEERING INVENTION.

A flue cleaner has been patented by Mr. William E. Sidney, of Frankfort, Ind. It has bell-shaped attachments so placed that their inwardly flaring ends will enter the exposed open ends of a flue, a box nut striking against the boiler head and opening a valve which allows steam to enter the flue to an extent which can be regulated as desired.

MECHANICAL INVENTION.

A nail plate feeder has been patented by Mr. George T. Harden, of Middleport, O. It is for attachment to nail making machines, to act as a part thereof, to intermittently seize upon the nail rod or plate and feed it to the machine, providing also means whereby nail rods varying slightly in thickness may be fed with certainty and without danger of breaking the feed works.

MISCELLANEOUS INVENTIONS.

A harness saddle has been patented by Mr. Jabob Hess, of Muscatine, Iowa. The tree is of metal, having openings through which a nut may be placed, and ribs or guides, bulged or arched to direct the nut, and so they may be placed after the pad is built up, the tree being padded only on opposite sides of its center part.

A bedstead has been patented by Mr. Jacob L. Stair, of Altamont, Ill. It is for use with a flexible bottom of webbing or woven wire, and has simple, inexpensive irons or fastenings to support the roller and opposite cross bar of the flexible bed bottom, while being designed for quick and easy connection to the side rails and corner posts of the bedstead.

A method of constructing buildings has been patented by Mr. Samuel C. Burris, of Victoria, British Columbia. It consists in the wall, ceiling, floor, and roofs being built solidly of longitudinally grooved timbers, studs, rafters, etc., with curved grooves or coves formed in their faces to receive and retain mortar or cement, with which the timbers are coated.

A flat-iron heater has been patented by Ellen Dillon, of Sioux City, Iowa. It consists of a horizontal base and a hollow pyramidal portion, both made of perforated sheet metal, to cover both of which and the irons, when placed on a stove, is a conical slotted cover, the slots to accommodate the handles of the irons, so that the heat will be well confined.

A bedstead fastener has been patented by Messrs. John S. Dickey and William P. McKinney, of Payne, Texas. It consists of a system of wires connected together and with the posts and side rails in such way that by turning a nut upon a bolt in the center the tension upon the connecting wires will be controlled and other fastenings dispensed with.

A photographic paper box has been patented by Mr. Washington Boyce, of Danville, Ill. It is designed to hold and protect sensitized paper from the light, and by means of a false bottom, beneath which are springs, all the paper in the box may be constantly pressed toward the top, whereby the paper may be retained in the box when the latter is opened, with other novel features.

A door check has been patented by Mr. Joseph A. Coultaus, of Brooklyn, N. Y. Combined with an arm arranged to be pivotally connected to the casing of a door is a socket connected to the door, a slotted cylinder within the socket, and a slotted block arranged within the cylinder and acted on by a spring, the device being for holding doors opened at any desired angle, or completely closing them.

A galvanic belt has been patented by Mr. James H. Murray, of Hopkins, Mo. It consists of a series of metal plates that will produce a current when acted on by an exciting liquid, the plates being in pairs and separated by a cotton or woolen fabric, the pairs being connected in series, the ends of the chain formed by the connected plates being in electric communication with two body contact points.

A wheeled scraper has been patented by Mr. Patrick Deevy, of Dudley, Iowa. The scraper bowl is pivotally connected with a crank axle by suspending arms, with a mechanism to prevent accidental dumping and a manipulating lever supported by a frame within which the bowl swings, with other novel features, whereby the load may be raised from the ground and transported from place to place.

A pressure regulating valve has been patented by Mr. Parker F. Morey, of Portland, Oregon. It is a kind of differential valve to be placed in water service pipes, the valve presenting different areas on its opposite sides or ends, such areas being proportionate to the difference there is to be made in the pressure from receiving mains and delivery pipes, and the device being intended to work automatically.

A shutter worker has been patented by Mr. Charley Cramer, of Clarington, O. Combined with a hinged shutter is a shaft in the window frame, a spring being connected with the shutter and with mechanism operated by the shaft, to the inner end of which is secured a crank and handle lever, whereby the shutter may be easily locked in any desired position when open.

A grain huller has been patented by Messrs. Alvah Dewey and Job Short, of Cannelton, Ind. It consists of a perforated box or casing in which are made to revolve cylinders having roughened surfaces, with disks secured between the meeting ends of the adjacent cylinders having roughened surfaces and saw-like edges, the machine being especially intended for corn or whole hominy.

A stove pipe collar and clamp has been patented by Messrs. Emmett H. Brower and John J. Travis, of Carson City, Mich. This invention covers novel features of construction intended to prevent forcing the pipe back too far into the flue, and to prevent the pipe slipping forward out of the collar, holding the latter securely to the chimney wall, and so as not to soil the wall finish by soot or dust when the pipe is removed.

NEW BOOKS AND PUBLICATIONS.

ELECTRIC TRANSMISSION OF ENERGY. Gisbert Kapp, C.E. London, 1886. Pp. 331, with cuts.

In this work by the well known electrical engineer, the subject of the title is treated systematically, beginning with the rudimentary principles and going through to the latest economical developments. His statement of the laws regulating the field of force of induced magnetic effects is one of the clearest and most accurately reasoned that we have met with. Mathematical formulæ are used sparingly in this section. Further on, the mathematics of the subject are further developed. In the illustrations, clearness and applicability are aimed at rather than picturesqueness, which is a most commendable feature. The work has an index. It bears the imprint of the famous Chiswick Press, and is characterized by the extreme neatness common to the work of Whittingham & Co.

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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) S. S. asks how many days during the summer of 1885 the thermometer reached 98° or over in this city. A. On no day during the summer of 1885 did the temperature reach 98° Fah. at the U. S. Signal Service station, where the official records are made for New York city. This station is on the top of the Equitable building, about 100 feet above the street, and the temperature there has been generally three or four degrees lower than that on the street during all the hottest days. The record of a standard thermometer five feet above the sidewalk showed one day 98° and another 99° Fah. during 1885.

(2) E. L. K.—The articles you refer to are known as Rupert's drops. They are made by dropping melted glass into cold water, leaving the glass balls in a high state of tension, so they go to fine pieces, with a report, from a slight blow. A description of their manufacture will be found in chemistry under "Glass."

(3) C. H. P. says: A discussion has arisen here between a number of baseball players over the following question, which it has been agreed to leave to you to decide, through the Notes and Queries column of the SCIENTIFIC AMERICAN: At a game, recently, a "fly" was struck, and the first baseman attempted to catch it, but the ball bounded from his hand and a fielder near by caught it, before the ball reached the ground. Was it out, or not? We fail to find it in the book of rules, for 1886. A. It was out.

(4) W. H. K. asks how coniferin is prepared. A. Coniferin is found in the cambium of coniferous woods, and separates on concentration to one fifth of its volume. It forms glittering efflorescent needles fusing at 185°, difficultly soluble in cold water, more easily in hot water and alcohol.

(5) Edw. asks the process of silvering glass with a liquid, so as to produce a reflecting surface. A. Take of lead and tin, of each 2 oz., bismuth 2 oz., mercury 4 oz. Add the mercury to the rest in a melted state, and remove from the fire; mix well with an iron rod. This amalgam melts at a low heat, and is employed for silvering the insides of hollow glass vessels, globes, convex mirrors, etc. The glass being well cleaned, is carefully warmed, and the amalgam rendered fluid by heat is then poured in, and the vessel turned round and round, so that the metal may be brought in contact with every part of the glass which it is desired to cover. At a certain temperature this amalgam readily adheres to glass.

(6) W. G. A. desires some cheap chemical solution that would render a small piece of wood non-inflammable. A. The timber is inclosed in a close iron vessel in which a vacuum is formed. A solution of sulphate of iron is then admitted into the vessel, which instantly insinuates itself into all the pores of the wood, previously freed from air by the vacuum, and, after about a minute's exposure, impregnates its entire substance. The sulphate of iron is then withdrawn, and another solution of muriate of lime thrown in. The two salts then react upon each other, and form two combinations within the substance of the wood—muriate of iron and sulphate of lime. Timber thus treated is preserved both from rot and from the attack of worms, and is incombustible.

(7) H. M. P. asks: 1. Have any particulars of the experiments of Meyer on the decomposition of chlorine, in 1879, been announced? A. See a "Contribution to the Knowledge of Chlorine," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 229. The chemical journals during 1879 and 1880 contain numerous papers on the subject. 2. Has the decomposition of chlorine been proved? A. It has not. Chlorine is still an element. 3. Has any other supposed element been decomposed? A. Many of the recently announced elements have been shown by spectroscopic examination to be of a compound nature. 4. Are Mr. Lockyer's views of the non-elementary character of so-called elements generally believed? A. Mr. Lockyer's views in a general way are generally believed in.

(8) C. R. H. asks the cause of the phosphorescence of white sugar. A. Ganot describes the phenomenon referred to as "phosphorescence by mechanical effects," such as friction, percussion, cleavage, etc.

(9) E. C. T., of Mo., sends an insect which is attracting attention at Stockton, and asks what it is, if poisonous, etc. Professor Howard, of the Entomological Division, U. S. Department of Agriculture, to whom we referred the specimen, says: The insect is the common Northern mole cricket (*Gryllotalpa borealis, Burm*). This insect is quite common all through the Northern States, and in the extreme South its place is taken by an allied species. In some parts of the country, it is so abundant as to be reckoned as an injurious insect, but ordinarily it is rare, and is seldom noticed. It works at night, and burrows under the surface of the ground, and avoids the light of day as much as possible. Its fore legs are curiously modified, and admirably adapted for digging. They are exceedingly strong, and many times the size of the middle and hind legs. It feeds upon the tender roots of plants, and in Europe it frequently does great damage by undermining whole beds of cabbages and beans. In the West Indies an allied species feeds upon sugar cane. The common remedy is use in Europe consists in placing grated carrot or potato mixed with poison in their haunts. Swine eat them greedily, and easily root them out from their burrows.

(10) R. R. S.—Absolute zero, according to C. A. Young, is −459° Fah. It has been only mathematically computed, the lowest artificial temperature yet produced being about −220° Fah.

MINERALS, ETC.—Specimens have been received from the following correspondents and examined with the results stated.

O. & B.—The specimen is ordinary clay, containing a certain amount of iron oxide. It has no value as a pigment in New York. If burnt, it can be used locally as a cheap paint when mixed with oil.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted,

August 3, 1886

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

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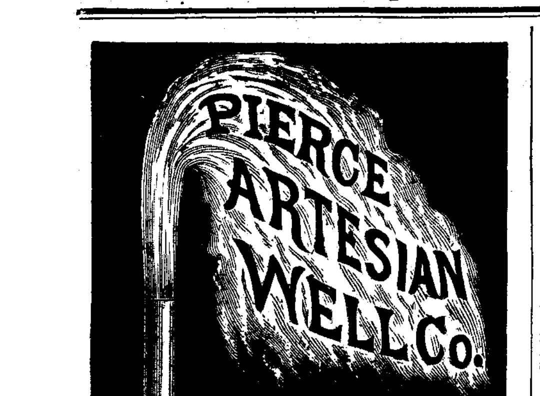

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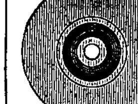

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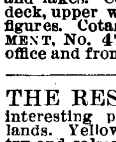

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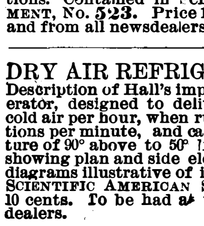

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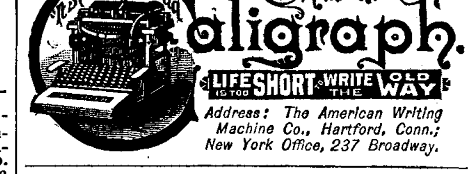

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