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CANADIAN MECHANIC'S MAGAZINE AND PATENT OFFICE RECORD

Vol. 5. APRIL, 1877. No. 4.

THE WASTE LUMBER OF CANADA.

THE great importance of the subject to which we so forcibly alluded in our leading article in the last number of this Magazine, relating to Canadian Inventions, and, also, how the perfecting of the Machinery of our workshops is the only way to enable us to compete with other countries (particularly in the manufacturing of such staple articles of trade, of which we possess in abundance the raw material), induces us now to bring to the notice of manufacturers and importers of lumber another important matter of not less advantage to a numerous class of the community, and which might be called the *minor lumber trade* of the Dominion. A commercial business of this description, if once inaugurated, would undoubtedly grow into large dimensions: we mean the utilizing of the immense quantity of short-cuttings from logs, planks and boards which is, annually, wasted, or burnt up as firewood. If this waste lumber consisted of inferior wood, the question of using it for trade purposes would not be worth a thought; but on the contrary, some of it consists of the very best description of pine, of little value to our own manufacturers in a country where wood is plentiful, but of great value to manufacturers in Great Britain and foreign countries, who would pay a fair price for this sort of timber, if sawn up into the sizes required, as it would be to them just as good and as valuable as first-class lumber.

The Dominion of Canada exports the largest quantity of pine lumber of any country in the world; not only supplying England, Ireland and Scotland, but, to a great extent, the United States, West India Islands, South America, Australia, and now, also, some portions of Europe.

It is well known that to make this trade profitable, only lumber of first, second and third quality can be shipped. Upon its arrival in Great Britain, it is stored in the yards of the importer, who sells it to dealers in the interior of the country, and they again retail it to builders and manufacturers. Consequently, as there is always more or less waste in the cutting of it up, the freight alone on the waste pieces is no small item of extra cost.

First quality pine deals which are worth at the present moment about $40 per 1000 feet board measure, at the port of Quebec, will probably be worth double that amount when they reach the final purchaser who may require them for building or manufacturing purposes. Now any person who has travelled through this country and visited its Lumber regions, and the large mills on the Ottawa and its tributaries, Saguenay and other places where extensive lumber operations are carried on, cannot but have been struck with the amount of small sized lumber allowed to go absolutely to waste.

In the forests we have frequently seen the butt of a large pine tree (which although it may be partially hollow, is generally of the very best quality of wood) hewn off and cast away. The quantity of short lengths of square logs that we have seen in the Coves of Quebec cut off to make merchantable timber for shipping, is enormous; these pieces are split up and sold for firewood.

There is not a mill in the country but makes a similar waste. The mills of Ottawa supply that city with a large portion of its firewood, being a collection of the ends cut off planks and boards, which, if not collected by the employés, who sell them at a trifling sum per cart-load, would be cast into the river. Many of the large mills on the outskirts of the forest have had to construct tramways in order to carry off their waste lumber to a sufficient distance to burn it with safety; and at one time, to such an extent was this waste carried, that many fine houses were built with the ends of planks laid in grout, and then clapboarded. The demand, of late years, in the American market for Canada lumber, caused from the exhaustion of pine in the forests of the New England States and the enormous increase of their manufactories in woodwork and for building, has caused a very sensible diminution of this wholesale waste of lumber, but the quantity that is still cast away is very great, to say nothing of the small sized lumber destroyed or burnt in the forests. There is no reason, therefore, why this wood should not be utilized, and cut up into sizes suitable for a foreign market; there is not only every probability of its proving, as a mercantile speculation, a success, but of its adding materially to the welfare of a numerous class of people, who would obtain employment therefrom.

Although a glance at a map of the Dominion exhibits vast tracts of land, which extend north and west of the present limits of colonization, and those who have not traversed these forests might suppose them to be an exhaustless region of marketable timber, such is not the case.

We can assure our readers, from our personal experience, and the lumber merchants of the country know it full well to be a fact, that but a small portion of it contains merchantable lumber, such as is fit for exportation to a foreign market; that the pine tree has to be sought, year after year, farther and farther up rivers and streams, and that a hundred years hence—but a short period in the history of a country—will find these immense forests denuded as completely of their pine as are now the woods of Vermont, New Hampshire and Maine. When the population of Canada, which now amounts to about four millions, shall have increased in a hundred years to sixty millions, the old decayed stumps will be all that remain to mark the place where grew a giant race of trees that, at one period, towered their lofty heads over the once mighty forests of Canada. Vast tracts of our forests consist of swamp and burnt land, or mountainous regions timbered with a dwarf growth of stunted spruce, white birch and other inferior timber.

In making these remarks of course we feel it incumbent upon us to point out how this waste of lumber can profitably be disposed of. We can state our experience in this matter from a tour we made a few years since through the manufacturing districts of the New England States; we then noted the rigid economy practised in cutting up lumber for manufacturing purposes.

Scarcely a piece of any medium size but was utilized; pieces that would be discarded in Canada, on account of a knot, would be neatly bored out and plugged, and made as perfect, for work to be painted, as first quality pine.

But without going too lengthily into this subject, as to the economy of our neighbours across the line, we will point out to the English manufacturer, how he could obtain first-class pine for his purposes, at one half the price he is now paying.

We will take for instance, as an example, the wood required in the construction of a house. Setting aside all the large timbers necessary, although, even in this item, we could point out a saving, let us first consider the timber required for doors.

There are panels, cross bars, mouldings, &c., which could be supplied, of the sizes required, at probably one half the cost now paid for the same by English manufacturers.

Of doors, of a standard size, several thousand must be manufactured yearly in Great Britain, therefore window blinds, slats and cross bars, being all short pieces, could be cut up into sizes and packed for the English market. The same with slats for making Venetian blinds.

Sashes, shutters, and window casings also could be made up of short lumber.

Brackets and scrolls of every description could be sawn to any pattern, and sent to their destination in cases.

Flooring of short narrow battens could easily be obtained of perfectly clear pine, cedar, and other woods—such lumber can be obtained in large quantities and supplied to builders—in fact, there is no reason why a very large quantity of lumber required for house building in Great Britain could not furnished in this way considerably under its present cost to consumers.

Of other articles connected with house building, such as light fancy fencing for cottage fronts, ornamental and rustic decorative work for gardens and villa grounds, we could send abroad a great variety.

Then we have our black and yellow birch for furniture, oak, ash and elm for machinery, carriages, and agricultural purposes; in fact, so numerous are the different branches of manufactures in wood work, which, with great profit, might take advantage of the idea we put forth, that any Company, under proper management, and with a limited capital, could easily obtain orders from various parties in Great Britain, so as to load several vessels before the close of another season.

Why we do not make use, ourselves, of the waste cuttings from the mills, is simply because the price of lumber in our own market has not yet reached so high a figure as to make it pay. If we were importers, instead of exporters, we would exercise more economy.

We are probably the first to bring forward this project in a public journal, for utilizing the waste lumber of this country, and, by so doing, creating a new branch of trade. It rest with the English consumer now to give it serious consideration, and if he can obtain lumber, cut up into certain sizes, to suit his work, at probably one half the cost he now pays, it is assuredly worth his while to make about it further enquiries. We shall be happy, since we have broached the subject, to afford full information as to the cost of supplying lumber sawn into short lengths, and we have no doubt that it will prove satisfactory.

LITERARY.

THE STEREOMETRICON.—We have just received the KEY TO BAILLARGÉ'S STEREOMETRICAL TABLEAU, or New System of measuring all BODIES, SEGMENTS, FRUSTRA and UNGOLI of such bodies, by one and the same rule.

For this very ingenious and valuable work the author, Chas. Baillargé, Architect and Civil Engineer, of Quebec, has been the recipient of seven medals awarded to him in Europe for his discovery and invention, and has been further awarded a medal by the Commission for the late Centennial Exhibition, as well as a Diploma strongly recommending the invention as one of high merit and especially adapted to Education.

For a work that has received such high recommendation it would be superfluous for us to make any comment, but we have much pleasure in bringing it to the notice of our readers.

Published by C. Darveau, 82 Mountain Hill, Quebec.

GLYCERINE AND ITS USES.

This substance, says the *Polytechnic Review*, which has of late years attained a position of considerable technical importance, exists in the form of glycerines—in combination with the solid and liquid fatty acids, in most of the fats, to the extent of eight or nine per cent. From these combinations the glycerine may be separated by treating them with certain bases (such as potassa, soda, lime, or oxide of lead), or with acids (sulphuric acid), and certain metallic chlorides (chloride of zinc); or finally by the action of superheated water. Glycerine is likewise one of the products of the alcoholic fermentation of the several fermentable varieties of sugar, forming, according to the researches of Pasteur, above three per cent. of the weight of the sugar.

We append in what follows, a list of the more important uses of this substance. It is employed to keep modeling clay in properly moist condition. It is excellently adapted for the preservation of articles of food, and especially of fruits which require to be kept in a moist condition. It is used in the manufacture of liquors, essences, and the like, as a sweetener; and its sweetening

and preservative properties have caused it to be largely employed as an addition to wines and beer. As a lubricant, especially for fine machine work, such as the working parts of clocks, watches, chronometors, sewing machines, glycerine has been found well adapted, in virtue of its non-liability to decompose or freeze, and its indifference to metals. It has been found to make an excellent copying ink, when added in small quantity to such writing fluids; letters written with the ink to which glycerine has been added do not require the wetting of the copying paper, but may be copied dry even for some time after writing. In virtue of its property of keeping the skin soft and moist, glycerine is employed pure, and in a number of preparations (glycerine soap, pomatum, etc.), and medicinal mixtures, as a cosmetic, in cases of burns, catarrhal affections, etc.; and from the same property of this substance—its avidity for moisture—it has found application in several industries, such as paper making, weaving, dressing of leather, etc., where it is found desirable to give to fabrics great softness and flexibility, and do away with the subsequent tendency of such articles (as leather belts and the like) to dry and crack It is extensively used as ingredient of printer's rollers.

As a solvent, glycerine occupies an important place in medicine and the arts; it is particularly valuable as a solvent for gum arabic, as also in paste. Glue, by continued heat and stirring, is soluble in glycerine, gelatinizing on cooling. Glycerine dissolves anniline violet, alizerin and alcoholic madder. A solution of anniline colors in glycerine is often used for stamping with rubber hand stamps. Glycerine is employed to extract the perfume from flowers, and the aromatic principle of red peppers. Sulphate of quinine dissolves in ten parts of glycerine when hot, but when cold, separates in clots, which, when triturated with the supernatant liquid, gives it the consistency of a cerate, very useful for frictions snd embrocations. Fifty parts of warm glycerine will hold in solution, when cold, one part of salicylic acid. Three hundred parts of water may be added without causing precipitation. A mixture of carbolic acid and glycerine has been suggested as a preservative agent for green skins, as a substitute for the salting generally practised. The carbboic acid increases the preservative effect of the glycerine, while the action of the latter keeps the skins perfectly soft and fresh, just as they were directly after the slaughtering.

One of the most important applications of glycerine is its use in wet gas-meters. Water possesses the disadvantages of freezing in winter and of evaporating in the warm seasons, while a mixture of equal parts of glycerine and water is free from both of these evils.

A few drops of glycerine in mercurial gauges, etc., have been found to prevent the formation of the objectional slimy film that shortly makes its appearance on the surface of the quicksilver column. It has been recommended for keeping guns and pistols clean and free from rust. It is found well adapted for the preservation of anatomical preparations and for the saturation of barrels intended to contain petroleum, etc.

Lastly, it is employed in great quantities for the production of that most powerful and valuable of all known explosives, nitoglycerine, made by a treatment of glycerine with a mixture of sulphuric and nitric acids. We have no figures at hand from which to estimate the total magnitude of the glycerine industry of the world, but its extent may be imagined from the statement that in the United States alone there is annually produced not less than 2,000,000 lbs.

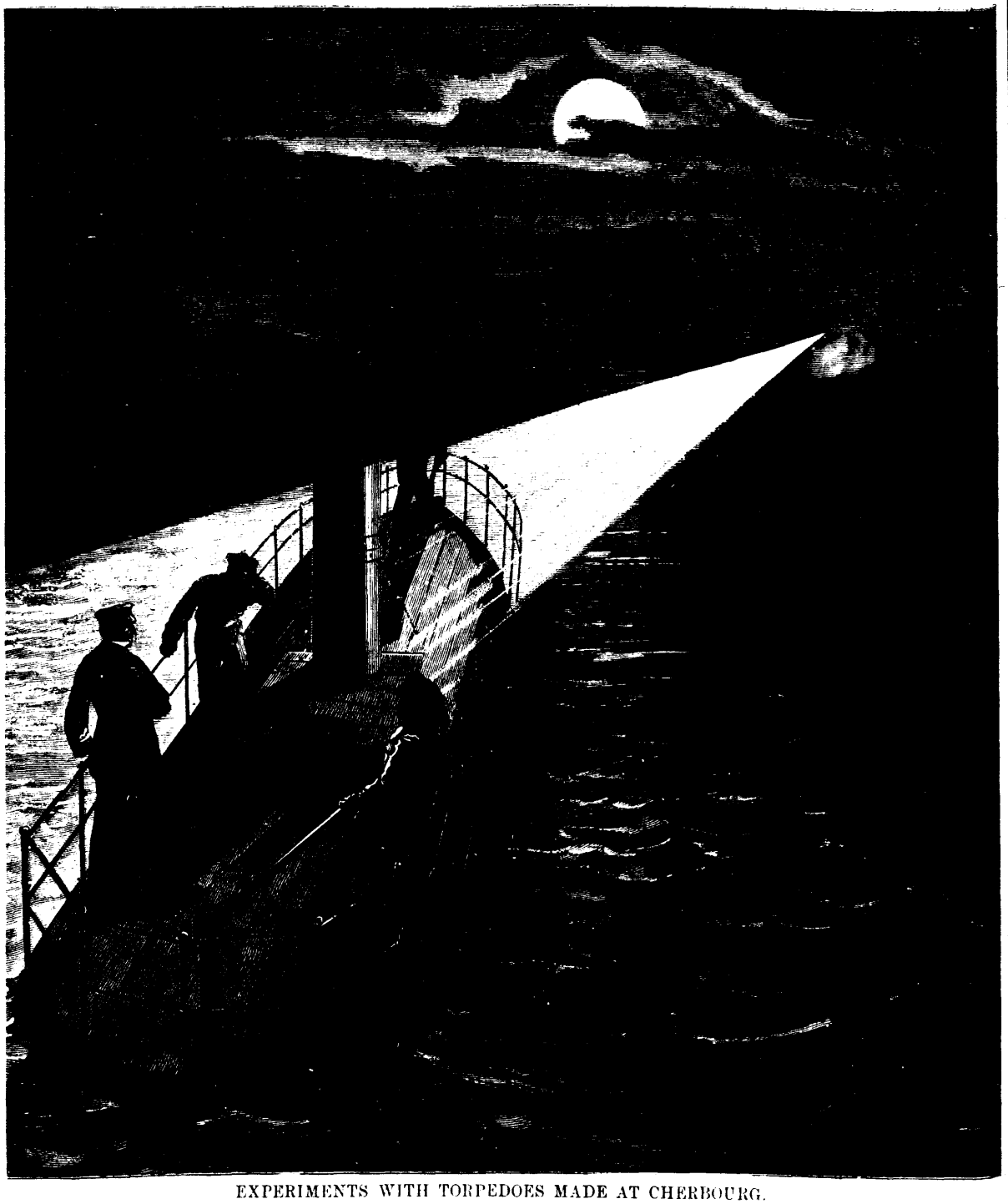
New German Patent Law.—The *American Manufacturer* says: "The German patent law has long been a source of complaint on the part of inventors, and the aptitude of German manufacturers for appropriating to their use the creation of others' brains has become notorious. We are glad to learn, however, from our foreign exchanges, that a bill has been introduced into the Reichstag which promises a great improvement in the patent law of that country. The new bill provides that patents may be granted for a term of 15 years. For every patent thirty marks ($7.14) are to be paid as soon as it is granted, but poor inventors are allowed a delay not exceeding two years. At the beginning of the second year fifty marks must be paid, and fifty marks more every succeeding year. Any person having used an invention before it was patented, may continue to use it without making any payment to the patentee. The latter is, however, bound to permit its use to any one that will pay for it. If this be refused the patent privileges are lost. The patent office is to have the right of publishing all descriptions and drawings in print, and any person may search the specifications, drawings and other documents in the office."

TEN THOUSAND AMERICAN PLOWS FOR RUSSIA.

The *American Agriculturist* for March 1st says: "One of the most noticeable of recent occurrences is the purchase of ten thousand American plows by the Russian Government, for distribution among the farmers of Russia. There is more in this than would seem to be at first sight. It is certainly a great compliment as well as a valuable acknowledgment of merit to American agricultural implement makers, but it implies that the competition of American farmers in the European grain trade has touched what has been considered an invulnerable spot. The wheat growers of Southern Russia supply what is known as the Black Sea trade, and being much nearer to the market than we are, their wheat has had a great advantage over ours. But American wheat had displaced the Russian wheat, to a considerable extent, in the market, and the Russian farmers have now to exert themselves to hold even a portion of that trade. Hence it is determined to try the plows that we are using, with a view to produce wheat more cheaply than hitherto. But there is something else needed. The man that holds the plow is of more account than the plow, and there are no farmers in the world who are more intelligent or more skillful than American farmers. But we cannot afford to rest upon what we have gained. The important fact here noticed shows that our competitors are by no means idle, and intend to improve their methods of work as far as possible. We must meet their improvements by others of our own."

The English Patent-office.—A correspondent of the *Daily News* writes: "Some of the recent arrangements at this office have given great dissatisfaction to those of the public who are concerned with it. An attempt at economy in printing the specifications and drawings of patents has caused a good deal of complaint, which culminated the other day in an appeal from Mr. Aston, Q.C., to the Master of the Rolls, the learned gentleman stating that by the new method of printing the drawings were rendered almost unintelligible. Still graver fault is likely to be found when it is known that the authorities at the office are now busy destroying the old stock of printed specifications; these are being carried away by the ton from the Patent-office stores to be 'pulped,' it being found easier to do this than to provide storage room for them. The loss that these documents will be to patentees, patent agents, and patent lawyers is most serious, and the public inconvenience will be considerable. A few years ago the Patent-office obtained and deserved great credit for the rapidity with which it printed and published all its documents, but it is evident that its present administration is of a very different character to that which then was in power. I understand that attention will be drawn to these matters when Parliament meets, and it is intended to make an effort to obtain a select committee to inquire into the Patent-office administration."

Albertite, a very light mineral, resembling fine pitch in appearance, is largely found in New Brunswick. It occurs in connection with calcareo-bituminous shales, and has been by some regarded as true coal, by others as a variety of jet, and by others again as more nearly related to asphaltum. The true nature of the mineral was made the basis of a law suit in Scotland a few years ago, in which the amount involved was something more than a million pounds sterling; as the decision settled the question of the liability to pay a royalty. It resembles asphaltum very closely, being very black, brittle and lustrous, and like asphaltum, is destitute of structure, but differs from it in fusibility and in its relation to various solvents. It differs from true coal in being of one quality throughout, in containing no traces of vegetable tissues, and in its mode of occurrence as a vein and not as a bed. The vein occupies an irregular and nearly vertical fissure, and varies from 1 in. to 17 ft. in thickness. It has been mined to the depth of 1162 ft. The accompanying shales are abundantly filled with the remains of fossil fishes, and it is not improbable that from these, in part at least, the mineral was derived, existing at first in a fluid or semi-fluid state. Vegetable remains are almost entirely wanting in the shales. During twelve years since the discovery, there have been shipped 154,800 tons of albertite, chiefly to the United States, where is has been used for the manufacture of oil, and for the admixture with bituminous coal in the manufacture of illuminating gas. It is admirably adapted for either of these purposes, yielding 100 gallons of crude oil, or 14,500 cubic feet of gas of superior illuminating power per ton. The price varies from $15 to $30, gold, per ton.



EXPERIMENTS WITH TORPEDOES MADE AT CHERBOURG.

A "TORPEDO-STEAMER" DISCOVERED BY AN ENEMY'S SHIP BY MEANS OF AN ELECTRIC LIGHT.

A TORPEDO BOAT

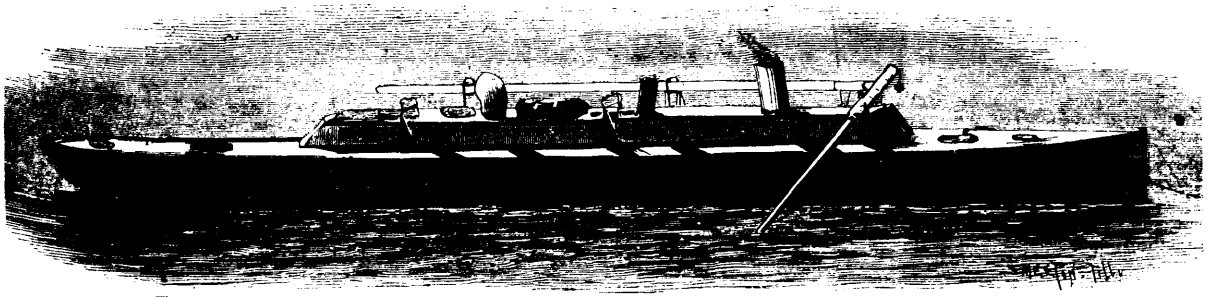
DISCOVERED BY AN ENEMY'S SHIP, BY AID OF AN ELECTRIC LIGHT.

Results from experiments with Torpedos at Cherbourg.

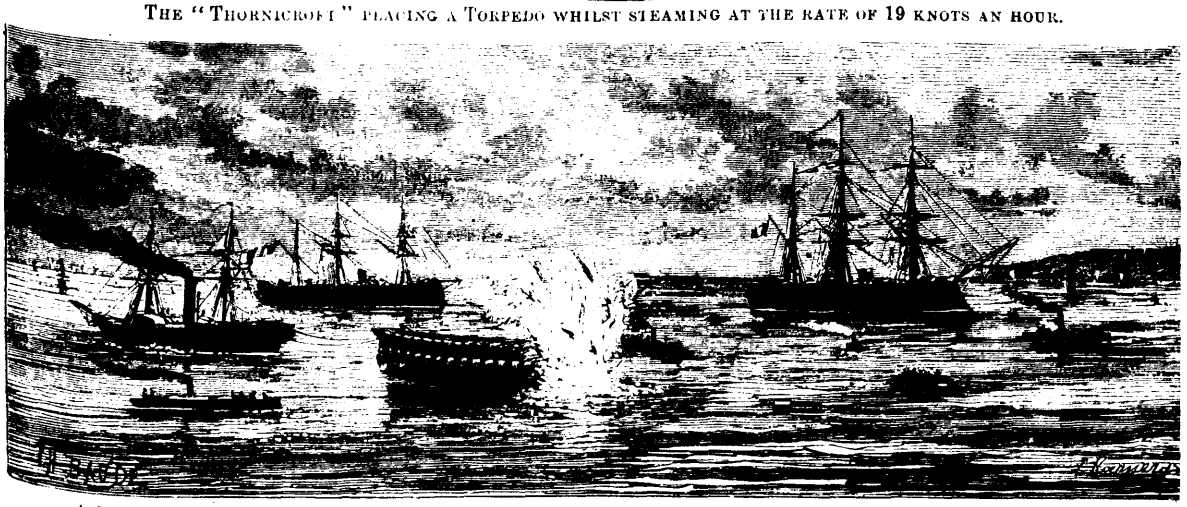
Some very interesting experiments with Torpedos have recently been made at Cherbourg—of which we give some striking illustrations—in which it was attempted to put into practice the new naval tactics inaugurated for the use of these destructive instruments of war.

We regret that our space will not allow us to give a full account of these experiments, as published in the French paper, *L'Illustration*. The drawings are so well executed that the result of the experiment is more clearly shown than words can express. The object of this experiment was to put to the test the effect of casting overboard a torpedo, under the stern of vessel, from the deck of a low craft like the *Thorncroft*, steaming at the rate of nineteen knots an hour, the great speed of the torpedo boat carrying her out of harm's way before the explosion occurred. Of course this attack upon an enemy's vessel is supposed to take place under cover of night, and hence the object of the electric light to discover if any of these destructive engines of war are on the waves around. The result of the explosion seems to have been the complete blowing in of the stern of *La Bayonnaise*.

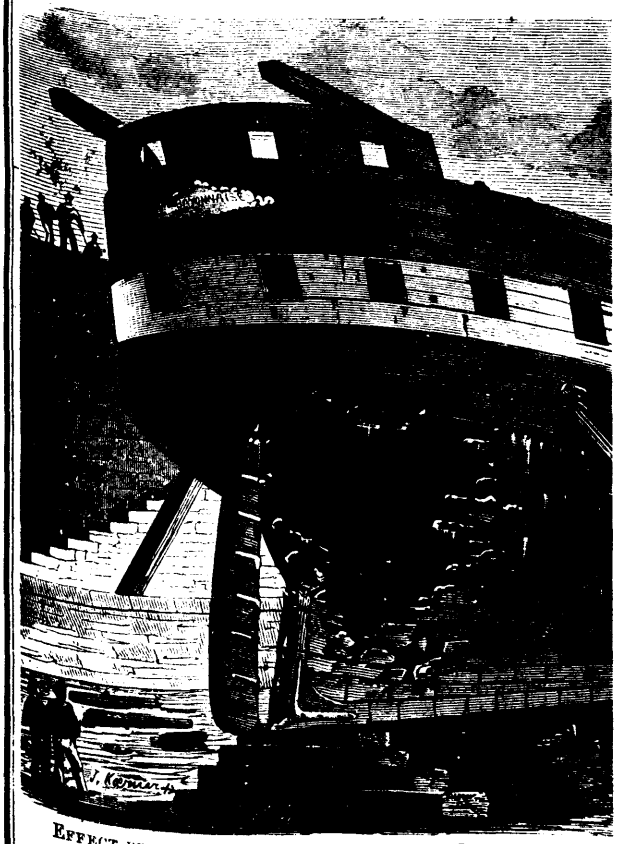
EXPERIMENTS WITH TORPEDOES MADE AT CHERBOURG.



THE "THORNICROFT" PLACING A TORPEDO WHILST STEAMING AT THE RATE OF 19 KNOTS AN HOUR.



A VESSEL CARRYING A TORPEDO ATTACKING THE "BAYONNAISE" BY MEANS OF A TORPEDO TOWED AFTER HER.



EFFECT PRODUCED ON THE STERN OF THE "BAYONNAISE" BY THE EXPLOSION OF A TORPEDO.

PINFOLD'S BRICK-MAKING MACHINERY.

(See page 104.)

It may at first sight be thought that brick manufacture is one of the most simple and easy matters for successful mechanical manipulation. But, in fact, it is very far from being so simple a matter, and we can well recollect that after the first mechanical essays it was decided by builders and users of bricks that the quality of machine-made bricks was so inferior as to practically keep machines out of the market; since then, however, they have once more come successfully to the front for brick manufacture. Opinions, nevertheless, still are very diverse on what might appear so simple a matter, as to the relative advantages of the wet and dry systems of treating the clay from the very commencement of its manipulation. And there is much to be said on both sides.

We illustrate this week a very strong and well made combined crushing, pugging and brickmaking machine, made and patented by Mr. J. D. Pinfold, the well-known brick-making machinist of Rugby. From its combined title, it will be seen that this machine unites in one compact and simple construction a variety of methods of treatment of the clay usually done by two or more separate machines, and thus capable of dealing with the roughest and most intractable material from first to last.

Mr. Pinfold adopts the moderately plastic method of manufacture, thereby most nearly adhering to the original method of treatment under the hand system. He advances, with justice, many claims for advantage both over the dry processes and over other forms of plastic brick machines.

In the case of dry-working machines, one great disadvantage exists in the unpliability and resistance to working offered by dry clay. This necessitates the expenditure of great power to drive the machine, and subjects it to great wear and tear and liability of breakage. Further, this class of machinery is totally unsuited to natural plastic clay, even in its dry state; also as the dry clay could not possibly be worked in lumps, it must be reduced very small, or powdered, at considerable cost, and then

again compressed. But dry powdered clay in this form has little adhesion when burnt, except in the case of such clays as vitrify or partially melt when burning; so that the bricks, when made of this dry powdered clay, even where the material is most suitable for this class of machinery, are especially brittle and liable to breakage in transport, and, at least, the fracture and destruction of their arises and edges, spoiling the neat appearance or finish of the bricks. It is noteworthy here that in a large number of other brick-making machines the brick is finally formed by a blow or pressure, or both combined, given by a piston-head upon the clay lying in a die. One possible evil of this form of pressure is the forcing and compression of air in the brick rather than its extraction under pressure. In the case of plastic machinery, one great difficulty has been to produce a machine that would use the clay in a sufficiently stiff condition so as to produce a good well-formed brick. The treatment, however, of a stiff clay which is sufficiently moist to mold properly, and yet not be injuriously yielding, requires a construction of machine as little as possible liable to shock or breakage. This principle is well carried out in Pinfold's machine. His mode of operating is as follows:—

The clay in its rough state having been drawn up by the hoisting gear (used in connection with the machine), or otherwise brought to the machine, is fed into a massive pair of grinding rolls, which thoroughly crushes the clay and all it contains. The arrangement for adjustment is very simple, and at the same time very effective, inasmuch as the contrivance for setting the distance of the rolls apart also answers the purpose of a safety apparatus, so that in the event of a piece of iron or other foreign substance harder than ordinary pebbles or small stones getting between the crushing rolls, no harm can result to the machinery. This is a great improvement over the majority of crushing mills at present in use. The ground clay then falls from the crushing rolls into the pugmill, which is fitted with a very strong wrought-iron shaft, to which is attached a series of strong wrought-iron blades and driven by correspondingly strong wheels, so as to enable the use of the clay in the stiff condition necessary for making good, sound, well-shaped bricks. After having been thoroughly mixed in the pugmill the clay is fed by it into the compressing rolls; the action of these rolls is such that while they push the clay towards the die they expel every particle of air, and thereby prevent the loss of bricks from the expansion of air during burning (a very common occurrence with bricks made by the dry processes or the piston or pug propelling plastic machinery). The easy issue of the clay is provided for by a suitable steam or water lubrication, which gives also the issuing stream a most effective surface polish. The clay is now a rectangular block only requiring to be cut into the required thickness.

The cutting table is very ingenious. In most other cutting tables in use, either the travel of the clay has to be stopped, or a piece of it has to be cut off from the travelling stream by a preliminary cutting wire, and afterwards operated upon; but in this machine the bricks are cut with perfect accuracy (while travelling) from the continously advancing stream of clay without the use of any preliminary cutting wire, thereby doing twice the amount of work at half the usual cost. The bricks, after they are cut off, are delivered either on to a special bearing-off barrow, ready for wheeling away, or are put on to the inventor's patent separators, so that the bricks may be carried to the drying stoves and mechanically separated without any separate handling.

The machine we illustrate will make from 20,000 to 30,000 first-class solid bricks per day of ten hours, the quantity, in a measure, being regulated by the industry of the men employed; the labour required to make the former quantity is three men in the mine, one at the top of the incline, one to work the cutter and load the barrows, and three men and three boys to wheel away and wall.

These machines will produce either solid or perforated brick-moulds, or drain tiles, or anything, in fact that can be expressed from a die. We may mention that the clay used is so stiff in this machine that the bricks may be stacked at once for drying six or eight high without injury to their shape.—*Iron*.

MOTHER OF PEARL WORK.—This delicate substance requires great care in its workmanship, but it may be cut with the aid of saws, files and drills, with the aid of muriatic or sulphuric acid, and it is polished by colcothar, or the brown red oxide of iron, left after the distillation of the acid from sulphate of iron. In all ornamental work, where pearl is said to be used, for flat surfaces, such as inlaying, mosaic work, &c., it is not real pearl, but mother of pearl that is used.

DANN'S BOOT AND SHOE TOE-PROTECTOR.

We have pleasure in noticing another useful Canadian invention in the shoe trade, recently patented through this office, by Thomas Dann, of Montreal. It is an invention which is likely to entirely supersede the objectional copper-tip which has so long offended the pride of our youngsters, who have been obliged, on the score of economy, to wear them, and without some such protection the toes of shoes on boys' feet become kicked out in a fortnight. The superiority of this invention is that the tip is made of strong sole leather, and attached to the sole in such a way that it will last longer than the sole itself. It is also elastic and cannot be disfigured by indentation or scratching as metal is, and, in point of neatness, cannot be detected from any plain soft leather toe-tip. It is applicable to single sole turned boots or shoes to which copper tips cannot be applied, which is another object to those who wish for strong but light shoes for children in summer. The invention, to those having large families and small means, will prove of much service.

IMPORTANCE OF GOOD WATER.

No question can be of more importance, from a sanitary point of view, than that of the supply of wholesome water. It is known that water does not in itself change in character, but it becomes noxious as it is made the vehicle for conveying injurious matter. Hippocrates appears to have been aware of the importance of pure water, and moreover of the places for its selection, or as it has been stated, "upon the aspect of its sources as well as upon its elevation." Mr. Simon, of the medical department of the Privy Council, in his last report of 1869, stated that "the doctrine in general terms, that a vast influence is exercised over the health of the communities by the quality of the water which they consume, is one which, as far back in literature as any reference to such questions could be expected to exist, may be seen to have universal medical consent in its favor; and during long ages of history the common instincts of humanity were even purer and stronger than undeveloped science. Of the many invaluable additions and improvements which medical knowledge has received within the past quarter of a century, scarcely any can, in my opinion, be compared for present practical importance to the discoveries which have given scientific exactitude to parts of the above stated doctrine, and have enabled us definitely to connect the epidemic spread of bowel infections in this country with the existence of certain faults of water supply. Not only is it now certain that faulty public water supply of a town may be the cause of the most terrible epidemic outbreaks of cholera, typhoid fever, dysentery and other allied disorders, but even doubts are widely entertained whether these diseases, or some of them, can possibly attain prevalence in a town except where the faulty water supply developes them." Such may be said to be the testimony of one of the highest medical authorities in England. Authorities in other countries have likewise drawn attention to the importance of the purity of water supplies, and moreover, Professor Pettenkofer has shown that there are in some cases certain definite relations between epidemics of entric fever and cholera and the state of the level of the ground water.

A CORRESPONDENT of the *English Mechanic*, in answer to a question as to the best means of keeping the feet dry in winter, says: "A simple plan would be, on having a pair of shoes made, to order the maker to put between the soles a piece of gutta percha as thick as a sixpence. No wet or damp will ever get through. I have adopted this plan for some years. Formerly I had both wet and cold feet continually, which even worsted stockings failed to keep warm; now I wear cotton all the winter, and never have cold feet."

THE ALLIGATOR BUSINESS.—Between 17,000 and 20,000 alligator skins are tanned yearly, which are consumed by boot and shoe manufacturers in every portion of the United States, as well as exported to London and Hamburg. The alligators formerly came most entirely from Louisiana, and New Orleans was the great center of the business. The Florida swamps and morasses are now the harvest fields, and Jacksonville, in that State, the great depot. The alligators often attain a length of 18 to 20 feet, and frequently live to an old age. The hides are stripped off, and the belly and sides, the only portions fit for use, are packed in barrels, in strong brine and shipped to the Northern tanner, who keeps them under treatment from six to eight months, when they are ready to be cut up. So far the leather has been mainly used in the manufacture of boots and shoes, but handsome slippers are also made of it.

SPENCE'S PATENT HOT-WATER AND STEAM BOILER.

(See page 112.)

We furnish a perspective and a sectional view of this boiler—which is an admirable one for heating large houses, churches, public buildings, green-houses, &c., as it is not only low priced, but is a great economist, thoroughly utilizing the heat of the fuel consumed, owing to the very large amount of surface presented to the action of the fire.

Fig. 1 is a perspective view of the boiler set up and ready for use.

Fig. 2 is a sectional view of the same, showing the manner in which the water spaces are arranged, and also, the large amount of surface over which the heat from the fire must pass before it reaches the chimney.

It is suitable for either coal, wood, or peat.

This boiler is manufactured by Messrs. Rogers and King, 645 Craig Street, Montreal.

STEAM EXCAVATING MACHINE.

We illustrate, at page 108, a "steam navy"—as it is called by the makers—constructed by Messrs. Ruston, Proctor and Company, of Lincoln. The engraving shows the construction of the machine so clearly that little or no description is required. The mode of operation is nearly identical with that of all machines of this class, the bucket scraping its way along the face of the cutting. When full, the jib is swung round, and the bucket emptied by striking a patch. It will be seen that wrought iron has been freely used in this machine, which is of unusual strength.

We understand that this firm have made these machines regularly for some years, introducing improvements from time to time as experience pointed out. Their excavator is, as it stands, one of the most perfect and handy machines of its type; and we need hardly add that its workmanship quite maintains the reputation of the firm.—*The Engineer.*

NEPTUNE THE MOST DISTANT PLANET.—After a long-continued labor, M. Leverrier has at length, with the theory of Neptune and Uranus, completed the study of all members of the solar system. The author's chief object was to decide the question whether there is an ultra-Neptunian planet, which might be detected, as Neptune was, by the perturbations produced by it on planets already known. The conclusion is negative; there is nothing indicating the existence of a body outside of Neptune.

THE MAGNET IN SURGERY.—A curious experiment was tried recently on the son of Sir Benjamin Brodie. The lad had contrived to break a needle in the calf of his leg. He was taken to the Royal Institution, in London, and a powerful electro-magnet was used to detect the position of the needle, and the possibility of moving it. The exact position was indicated by the disturbance of a magnetized needle, but no change could be produced in its position. After the experiment, however, the limb could be moved about, the pain having shifted to the other side of the leg, as was shown by the index attached to the magnet, it came sufficiently near to the surface to be extracted. The experiment, though giving a negative result so far as "drawing" the needle was concerned, was so far satisfactory that it enabled the lad to use his leg without pain.

HYDROFLUORIC acid is now very largely employed in New York in making the ornamental glass signs, usually supposed to be made by the sand blast. This involves its preparation on a large scale, as some establishments consume 100 lb. per month. Iron retorts are employed, and are found to be better than lead, and last much longer than the leaden pipes which are attached to the retorts for condensing the acid. In regard to the physiological effects of the acid, Professor Seely, of New York, in a recent communication on the subject, states that the text books exaggerate its dangers. On dipping the hand into hydrofluoric acid, no immediate effect is produced; but if not washed off at once, in the course of half an hour the fingers begin to ache worse than the teeth with toothache; they swell up, and in a day or two the true skin begins to separate and crack open. These sores do not heal for two or three weeks. If, however, the hand is washed immediately in water or dilute alkali, no more inconvenience is suffered than from sulphuric acid. Lead bottles are used to transport it; and although gutta-percha will last three times as long, its cost is much greater in proportion. Hydrofluoric acid can be made very cheaply, and sells in quantities at eighteen cents per lb.

WEARING AND WASHING FLANNELS.

We read in *Hall's Journal of Health* that the very best thing that can be worn next the skin, in summer as well as winter, is common woolen flannel. One color has no advantage over another, except that white is more agreeable to the sight. Recent scientific experiments, carefully conducted, prove the truth of the popular sentiment, that woolen flannel is the best fabric to be worn next the skin, as it absorbs more moisture from the body than any other material, and by so doing, keeps the body more perfectly dry. Cotton absorbs the least, hence the perspiration remains more on the skin, and being damp, the heat of the body is rapidly carried off by evaporation and suddenly cools when exercise ceases, the ill effects of which no intelligent mind needs to be reminded of. Hence it is that the common observation of all nations leads them to give their sailors woolen flannel shirts for all seasons and for all latitudes, as the best equalizers of the heat of the body.

We believe it to be one of the most difficult things about the house to properly wash flannels so that they will neither shrink nor full up and become hard. Mrs. Beecher has a talk in the *Christian Union* about this, as follows:

Cut up what soap may be needed, and dissolve in a gill of boiling water. Let it stand on the stove and simmer till every particle is dissolved. Never rub soap on the flannels or allow a bit to settle on them. Nothing "fulls" flannel so badly as rubbing soap on it or letting bits of it settle on the cloth. A place on which a bit of soap has lodged or been rubbed will have a different shade from the rest when dried, making the whole garment look spotted.

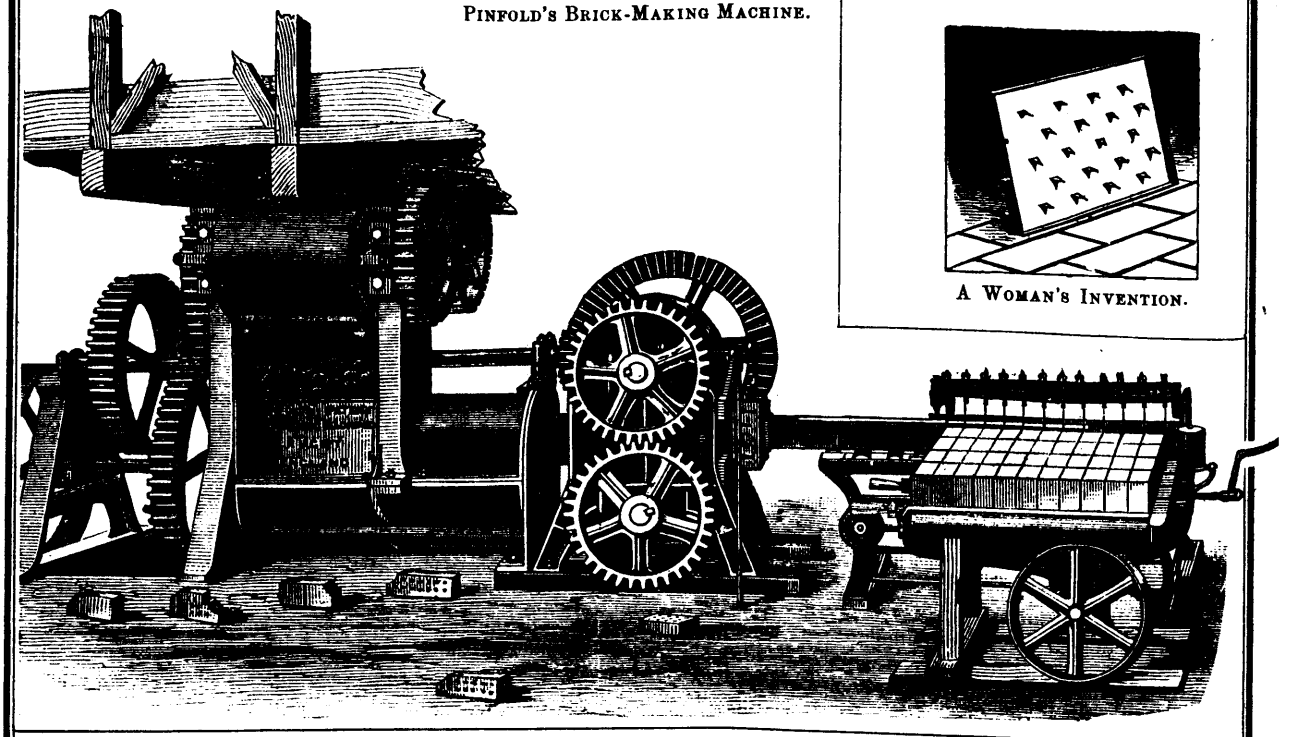
Take a small tub, not quite half full of scalding hot or boiling water. Into this pour enough of the dissolved soap to make a rich suds, pour to this some ammonia, prepared from "concentrated ammonia"—a table spoonful and a half to 10 or 12 quarts of suds is a fair proportion. Stir this and the soap into the hot water till it is all thoroughly incorporated. Then put in the flannels. Two or three articles are quite enough to soak at one time. Press them well under the water, but turn them over in the water occasionally while they are soaking. Let them remain in the water till it is cool enough to put the hands in without discomfort. While washing keep a good quantity of water at boiling heat on the range for rinsing purposes and to keep the suds as hot as it can be used. Before one piece is washed and ready to be wrung out, fill a small tub half full of clear hot water. Into this stir a little more "blueing" than would be used for cotton or linen. Shake out each piece as soon as washed quickly, and throw at once into the hot rinsing water.

Rub the flannel as little as possible, but draw it repeatedly through the hands, squeezing rather than rubbing. Harsh rubbing thickens and injures the fabric. Never wring with a wringer, as the pressure mats the nap down so closely as to destroy all the soft fleecy look of good flannel. Wring with the hands as dry as possible, then rinse and wring out again; and when as dry as it can be made by hand, snap out, stretch and pull out into the true shape; dry in the open air, if possible. Bring in when while still a little damp, so that each part can be more readily brought into shape. Pressing when ironing is better for the flannel than rubbing. It does not make the fabrie feel so hard and wiry.

Scarlet flannel is poisonous to some skins if used before washing, and as one is not always sure how one may be affected by it, it is safer to give it a scald in hot water with a little soap—not enough to make a strong suds. Let it stand and soak a few minutes, then wring out and treat like other flannels. The smell of new red flannel is not agreeable to many, and for this reason it is desirable to wash it before using. But no washing that we have any knowledge of can keep red flannel looking nice if used for underwear for any length of time, unless worn by people who do not perspire freely. It becomes badly discolored and spotted in most cases. Washing red flannel before making up will "shrink" it as much as is desirable.

INCREASE OF PATENTS.—For some time previous to January 1st, the number of weekly issues of United States patents rof inventions was unusually low. From that date there has been a rapid increase, as the following figures, obtained by us during a recent visit to the Pattent Office, show: There were issued January 2d, 199; 9th, 227; 16th, 264; 23d, 277; 30th, 303; February 6th, 352. We observed, in our brief visit, substantial improvements made in the workings of the Patent Office during the past few days.

PINFOLD'S BRICK-MAKING MACHINE.



A WOMAN'S INVENTION.

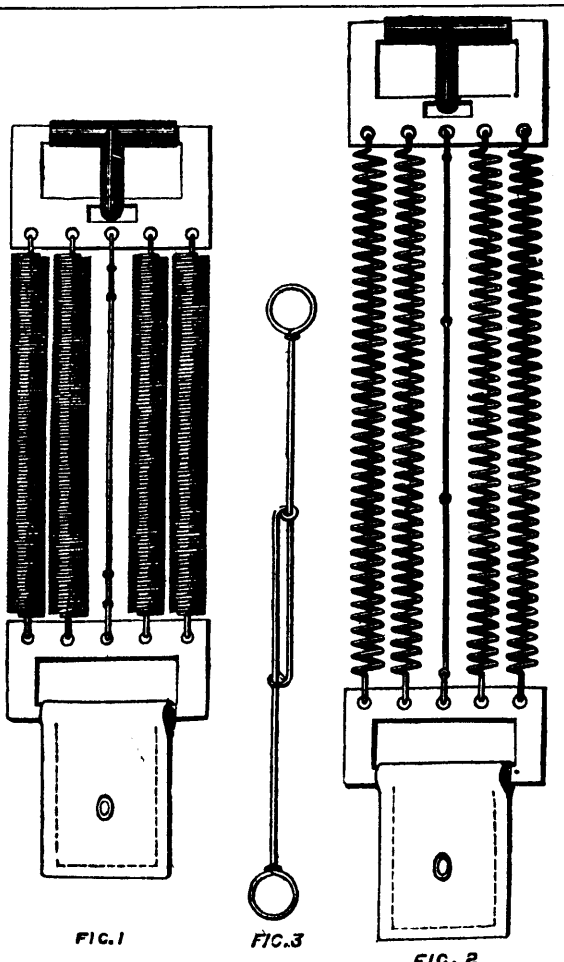
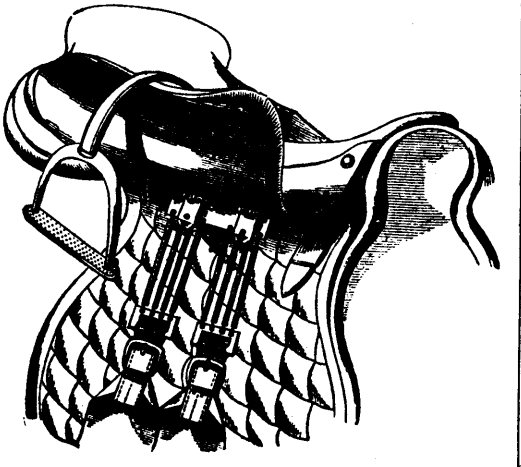
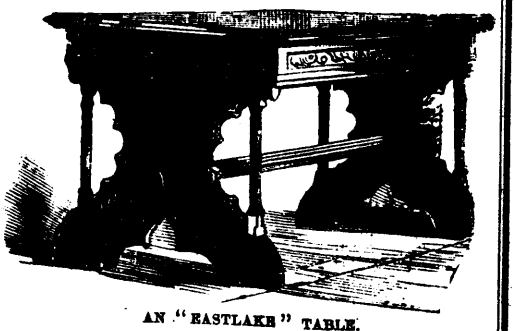


FIG. 1 FIG. 3 FIG. 2

AUTOMATIC GIRTH.

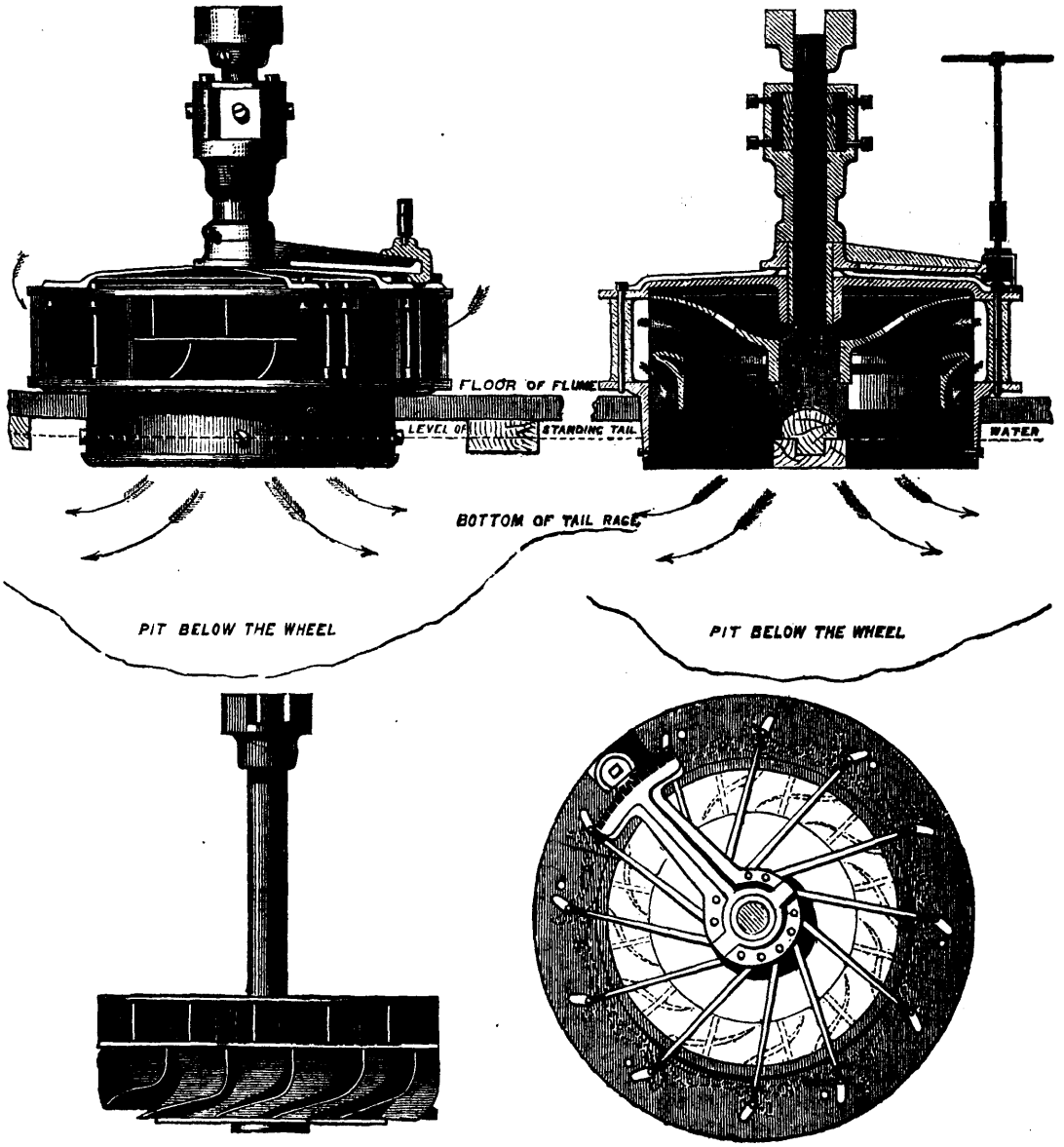


AUTOMATIC GIRTH.



AN "EASTLAKE" TABLE.

WATER POWER IN INDIA.—LEFFEL'S TURBINE.



WATER POWER IN INDIA.

The following letter and illustrations will be of interest to those of our readers connected with mills. We are indebted to the *Engineer* for the information and illustrations:

SIR,—In reply to "Aquarius'" letter in your issue of Jan. 5th, I beg to say that I am using a 15¼in. Leffel doule turbine, driving my saw mills on a 22ft. fall. I have had it constantly at work for nearly four years. It is driving one of Messrs. T. Robinson and Son's large size rack travelling saw benches, with a 6ft. circular saw, cutting 32in. deep; also two other benches, with saws 30in. diameter; band saw, an American handle turning machine, and turning lathe. The speed of the turbine is 480 revolutions per minute; consumption of water at full gate, 407 cubic feet per minute. It is represented and sold as a 15-horse power turbine, and I am satisfied it gives the full power stated in catalogue if not more, and has the very important property of maintaining uniform speed working or idle.

I am about to increase my fall to 44ft., which will then equal 42-horse power, consuming 600 cubic feet of water, and making 578 revolutions per minute with same wheel, driving my corn mills in addition with wire rope. I expect it will be the most powerful piece of machinery in this country, and the first driving wire rope.

Messrs. T. McKenzie and Sons, Limited, Dublin, are the engineers. My saw mill is employed on both hard and soft timber, such as oak, ash, elm, beech, elder, deal, &c., so you may judge this little wheel is fully tried. I am satisfied as far as I can ascertain, my brother having travelled through the greater part of the States in America, that Leffel's are the best turbines at present in use, being thoroughly effective and not liable to get out of repair, mine not having cost me a single halfpenny since it was erected.

As far as my experience goes I think "Aquarius" would be right in adapting four wheels instead of one large one, especially as he has such a large body of water to deal with and a variable supply. Had he a regular supply I would advise either one or two wheels, but I think with large power it is better to divide. I am fully satisfied the shareholders' capital could not be expended or invested in a better class of wheel. The toe in this wheel gives no trouble, same as in other turbines, the wheel being so evenly balanced when at work, owing to the double construction of the wheel. After the water passes through the gates to the wheel it divides, one-half passing to the centre, the remainder to the lower half or the buckets' circumference, and thence out underneath to the race. WENTWORTH TAILAR.

Tinahely, Ireland, January 15th.

THE ALPHA GAS APPARATUS.

(See page 109.)

Of the numerous arrangements which have been brought forward for manufacturing what is known as air gas, the most recent that has come under our notice is the Alpha gasmaking apparatus. We examined one of these contrivances on a recent occasion when it was working satisfactorily, and which it appears to have also done elsewhere for some time, as testimonials from the proprietors of various establishments show. It is being introduced by Mr. H. L. Müller, of 35 Hatton Garden. The gas produced by this apparatus is atmospheric air charged with the vapour of gasoline, which is a light hydro-carbon spirit evaporating at ordinary temperatures. The apparatus consists of four main parts performing distinct co-ordinate duties. There is first an arrangement for producing a constant and uniform current of air of the required pressure and volume. Secondly, there is a chamber in which the current of air becomes uniformly carburetted. Thirdly, an elevator for supplying the carburettor with a uniform supply of hydro-carbon to replace that consumed in the course of manufacture, and fourthly, a governor for regulating the supply and pressure of the gas in the pipes. Fig. 1 in our engraving shows a general view of the apparatus. Fig. 2 is a longtitudinal section showing the arrangement for the admission of air, Fig. 3 being a front view of the annular opening. Fig. 4 is a section of the governor.

The air inforcing arrangement consists of a drum of the ordinary wet-meter construction working in water. The drum is contained in the chamber A, into which water is poured at *a*, the seal or water lever is indicated by the overflow plug *b*; *c* is a tap for emptying the compartment. The shaft on which the drum is fixed passes out of A through a stuffing-box and rests on a bearing in the cast-iron framework N, a toothed-wheeled *y* gears into a multiplying wheel *x* carried on the supplemental shaft *s*, which supports the spool B. A wire rope attached to this spool passes over pulley blocks and supports a weight, which by descending when the cocks are open causes the drum to revolve and force a current of air into the pipe *y*. The speed of the descent of the weight is proportioned to the possibility of the escape of the air, that is, to the gas consumed. When the cocks are turned off equilibrium ensues and the weight remains suspended. The pulley-blocks having each four sheaves, and the wheels *x y* multiplying, admit of the machine working for a long time without rewinding and without raising the upper pulley to an inconvenient height. The spool works on the shaft *s*, with a pawl and ratchet, arrangement, so that the rope can be wound on it without the drum being forced in a reverse direction through the water in the drum. The air enters the drum through an annular opening round the snuffing-box, to the top of which the inlet pipe is attached. The air ascends the pipe *r*, and is discharged into the head of the drum above the water line *v*. As the lips *t* of the compartments of the drum successively leave the water, the air rushes in to be discharged at the other end under pressure. The air emerging by the pipe *g* is carried by one or other of the branch pipes into the carburettor E. The pipe on the right conducts the air to the bottom of the carburettor, so that the air has to pass over the whole of the evaporating surface before entering the governor K. The pipe to the left conducts the air directly to the governor, so that by regulating the opening of the cocks on the pipes the gas can be diluted with air as required. This arrangement is of importance in a machine designed for use in different climates, as the same quality of gas can always be secured at a high and low temperature, the spirit evaporating much more rapidly in the former, and therefore more readily impregnating the air, which can by this arrangement be diluted.

It is important that the carburettor should be constantly and uniformly supplied with spirit to compensate for loss during the manufacture. The manner in which this is effected is ingenious but simple, and by the same mechanism the spirit is kept continually agitated, so that its density is uniform, and no heavy residue remains to be drawn off. The carburettor E rests on, and communicates with the reservoir F. The spirit poured in at *d* passes through the carburettor and fills the reservoir, of which *e* is the overflow and draw-off cock. The reservoir communicates with the elevator G, at the top and bottom of which are two wheels, the teeth of which catch the link of an endless chain passing over them. The upper wheel carries on its spindle a pulley at the back of the elevator, round which passes the band *w*, set in motion by the wheel *z*, fixed on the drum shaft. To the endless chains are attached buckets which draw up the spirit from the reservoir and discharge it into a trough in the top of the case. Spirit is conveyed by a pipe to the top of the carburettor through which it falls, the portion unused falling back into the reservoir.

The governor K, which is seen in section at Fig. 4, is in effect a small and very sensitive gasometer floating in water and fitted with a valve V suspended from *l* and working in the inlet *q*. Made so as to act with a very low pressure, the governors will give any ordinary required pressure, by slipping small weights over *l*. The valve not only insures perfect steadiness of the flame, but proportions the supply of gas to the number of lights burning, so that whether the machine be supplying its full number of lights, or only one, the magnitude and quality of the flame is the same. The speed of descent of the weight, the supply of of spirit from elevator, and the size of the gas-way leading from the carburettor to the governor are all increased or diminished in the same ratios. The gas leaves the governor by the pipe *q* through the main cock *m* to the main pipe M, and thence through the building in the ordinary manner. Any condensation that may form in the main pipe is drawn off by the cock *p*. The governor holds a sufficient reserve of gas to supply the burners while the weight with the aid of the pawl and rachet arrangement is being wound up. All the main working parts are outside the machine, so that any wear or derangement can at once be detected and easily put right without opening the machine. The only regular labour connected with the machine is to pour in spirit every fortnight or three weeks as required, and to wind up the weight daily; thus the labour is nominal. This apparatus appears to be in use both at home and abroad, and to find favour with those who are using it.—*Engineering.*

A WOMAN'S INVENTION.

(See page 104.)

All lovers of good toast will be interested in the following useful bread toaster, the invention of Mrs. A. C. Harris, of Granville county, N. C. It is not patented, and can be made by all who wish to use it. It is made by taking a piece of sheet iron or heavy tin, about 18 inches square, and turning up the edges so as to form a shallow tray, to give sufficient stiffness to the sheet. A number of V-shaped openings are now made in regular order across the bottom; and the tongues of the V's are turned up at right angles to the sheet. These sharp points are to hold slices of bread pressed upon them. A short piece of stout wire hinged to the back serves as a prop to hold it at any angle to the fire. After placing the slice of bread in position, by pressing them on the points, the toaster is set up on the hearth before an open fire, where the bread soon assumes a rich brown color, and then the slices should be reversed. If the lower part should brown before the upper, the toaster can be turned upside down, and so bring the underdone bread nearest the fire. This useful invention costs only a few cents; and when once used, it becomes a household necessity.—*Scientific American.*

THE LIBRARY OF PARLIAMENT.

(See page 124.)

This magnificent building is perhaps unrivalled in any country, and if it has a fault, that is to be found in the exiguity of its accommodation. The pity is that more ample room was not provided. The building is full to overflowing, and yet fully 20,000 volumes are left in the Supreme Court.—*Canadian Illust. News.*

T. A. Edison, in an article in the *American Chemist*, has the following laboratory notes, which are of much interest, and may be found valuable:

Hard rubber or volcanite, placed for several weeks in nitro-benzol, becomes soft and pliable like leather, and easily broken.

The vapor of chloral hydrate is a solvent of cellulose. I have found the corks of bottles containing the crystals eaten away to the depth of a quarter of an inch, the cork being resolved into a black semi-liquid. Certain kinds of tissue paper are partially dissolved in time, if thrown in a bottle containing the crystals.

A very difficult substance to dissolve is gum copal. I have found that analine oil dissolves it with great facility.

Hyposulphite of soda is apparently soluble to a considerable extent in spirits of turpentine. Large crystals of "hypo" melt down to a liquid after several weeks, and if the bottle be shaken, partially disappear. The turpentine smell nearly disappears.

The vapors of iodine, in the course of several months, will penetrate deeply into lumps of beeswax.

If to a solution of bisulphide of carbon there be added twice its bulk of potassic hydrate in sticks, and the bottle be well sealed, the whole will, in two months, become an intense reddish, syrupy liquid, with scarcely any free bisulphide of carbon.

ON THE CHIEF SYSTEM OF SEWAGE DISPOSAL NOW IN OPERATION.

(*Continued from page 43, February number.*)

DETAILS OF THE MODES OF DEALING WITH SEWAGE.—The application of town sewage to land is shown in this report to be the cheapest mode of disposing of it. The first cost of purchasing land for a sewage farm, of preparing this land to receive and filter sewage, and of constructing the necessary works and machinery, may require a rate in aid during the term allowed for repayment of the capital; but in most cases, where the sewage can be applied at a reasonable cost, by gravitation, so far as our investigations have been extended, there will be an available income from the farm at the termination of the temporary debt. Sewage irrigation should in all cases be practised where there is land to be obtained, and the prospect of a balance of income in its favour, as sewage-grown grass is wholesome, and when used for dairy-cow feeding produces good milk, and affords employment to a large number of labourers. The application of sewage to land need not in any case produce a swamp, nor generate malaria, as the volume of sewage applied at any period should be delivered in a thin film, such as the land can absorb at once; that is, within a few hours of its delivery. Sewage should not in any case drench the land to which it is applied, as is usual with water irrigations, where extensive areas are laid under water for several days at a time. The volume of sewage from any town being known, the sewage-farm should be from 10 to 15 per cent. greater than the area required for one week, and no more than one-tenth of the area of a sewage-farm should ever be under sewage at one time.

RENT OF LAND USED FOR SEWAGE IRRIGATION EXCESSIVE.—At Croydon some 515 acres of land are under irrigation, the population being about 56,000. This at a rate of nearly 10 acres for each 1,000, or about one acre to 100. The land in use had an average rental of 26s. to 30s. ($6.22 to $8.30) before the Croydon Local Board of Health required it; the rent now paid averages 10*l.* ($49) per acre per annum. (1)

SEWAGE FARMS.—A sewage-farm should be so laid out and managed that a sufficient area of land shall be under sewage every day in the year, winter and summer; and as town-sewage is seldom below 40 degrees in temperature, irrigation can be carried on. And if sewage should freeze on the surface of land which is without crop no injury is done, and when thaw sets in absorption takes place. The mode of laying out a sewage-farm cannot be fully described in this report, but see the maps and diagrams for partial elucidation. As a rule it may be stated that the works should be simple in character, that they may be cheap in construction. Good examples may be seen at Doncaster, at Bedford, at Leamington, and at Aldershott. Permanent sewage-carriers should contain the land and be laid so as to be level, the grade of the land being provided for by vertical steps, regulated by stops, overflows, and wash-outs; side-junctions to be provided on the lower sides of the carriers to draw off sewage for distribution over the land. If a permanent sewage-carrier is laid with a fall, it will be impracticable to block the flow at any point and preserve an even surface, as sewage blocked in a sloping channel would flood over the point of stoppage; hence the necessity for level lines at the surface. Tributary-carriers may be made by a plough, the cross-sectional form and the gradient being suited to the character of the soil; the larger carriers may have a grade of 1 in 400; the smaller, or "herring-bone lines," may have a grade of 1 in 300. These temporary carriers will be broken up with the plough at intervals, and be renewed as required.

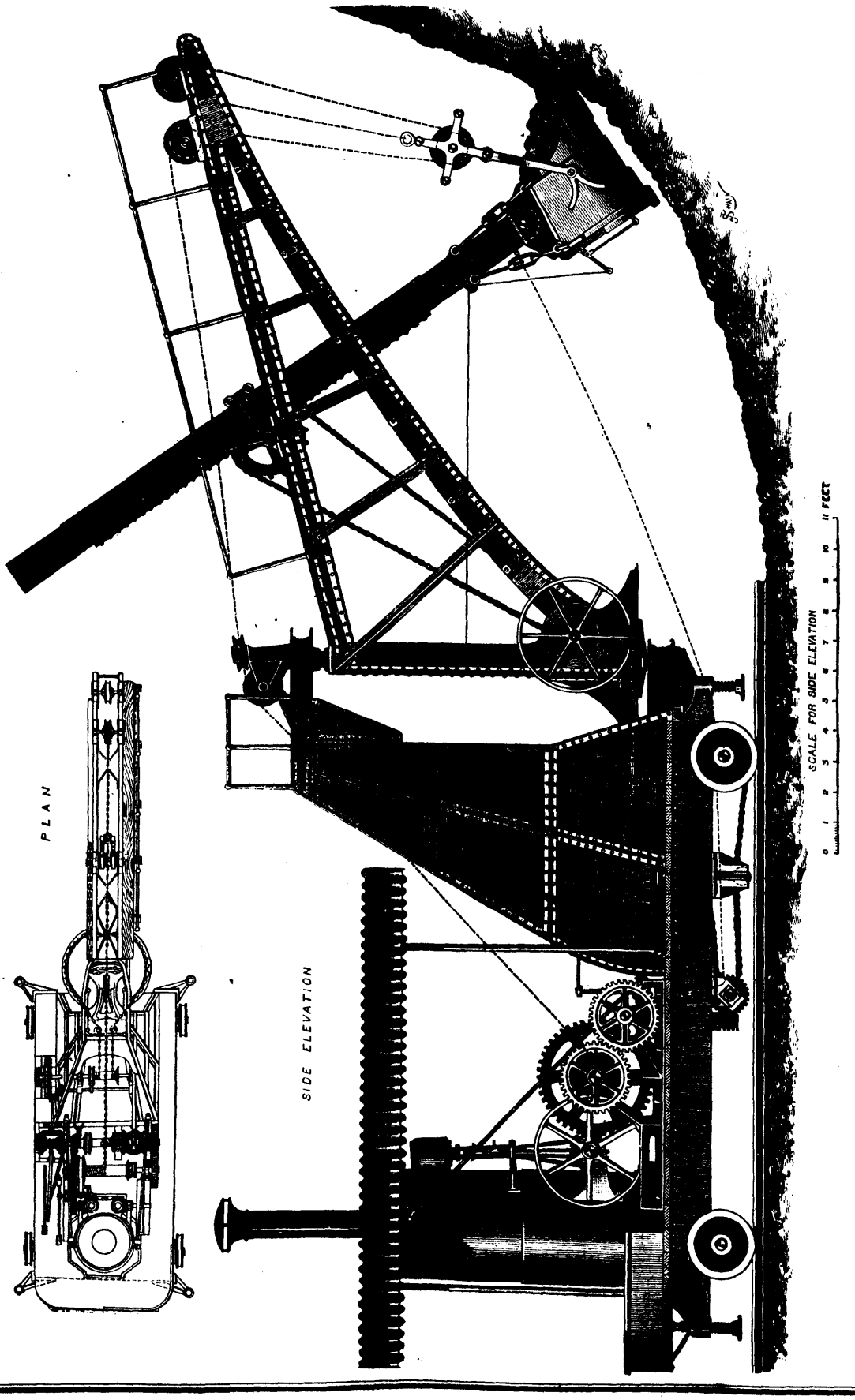
AREA OF LAND REQUIRED FOR A SEWAGE-FARM WILL DEPEND ON LOCAL CONDITIONS.—The area of land required for a sewage-farm will be governed in a great measure by the character of the subsoil, and if it is very porous or otherwise; as also by the volume of sewage and subsoil-water in proportion to the population. At Doncaster, with a sewage-farm of 264 acres, and a population of 20,000, the average daily flow of sewage being about 600,000 gallons, 120 acres of land of a light sandy and even character have for three years absorbed the entire sewage, only about five acres at any one time being under sewage, and one acre has occasionally absorbed the entire volume of one day. At Croydon about one acre to each 100 of population has been provided. For a population of 60,000 there are about 15,000 water-closets in use; or one to four of the inhabitants. There are the contents of 25 water-closets in 20 tons of sewage each day; or, about 7,000 tons of sewage per acre per annum. Small fields enclosed by large fences will be detrimental to sewage farming; land which is open and without inner fences, having a uniform surface and gentle slope to the south, will be most advantageous. Italian rye-grass is probably in all respects the most advantageous crop to be grown under sewage, as it absorbs the largest volume of sewage, occupies the soil so as to choke down weeds, comes early into the market in spring, continues through the summer and autumn, bearing from five to as many as seven cuttings in the year, and producing from thirty to fifty tons of wholesome grass upon each acre. It is most profitable for feeding milch cows. A dairy and a sewage-farm should, therefore, wherever practicable, be associated. A portion of each farm should be specially deep-drained and prepared for land-filtering the sewage during winter or wet weather.

DRAINS AND WATER-CLOSETS.—Drains must not traverse the basements of houses, but must commence at an outside wall and be fully ventilated. Water-closets must not be within the body of a house, but against an external wall, the soil-pipe being ventilated above the roof, with an open top, so as to ventilate fully, the water-closet room having full and free ventilation at the ceiling. The main sewers must be true in line, having smooth and even gradients, and be fully ventilated. The water supply must be constant and abundant, laid on to each house and to each water-closet; contamination by sewage-gas within dwelling-houses will then be practically impossible. Sewage is the waste water from towns, and the polluted water and liquids from manufactures. Where the privy, cesspit, and cesspool are retained, the corrupted fluids from these pass into the sewers. Sewage is injurious in proportion to its age and putridity. Fresh sewage, if removed day by day, does not, in that time, become putrid; and, consequently, is not so injurious to health as putrid sewage is. Where water-closets are in full use, as in London (about 700,000), in Croydon (15,000), in Leamington (about 8,370), in Harrogate (about 1,620), in Cheltenham (about 8,560) and in like proportion in some other towns, the entire of the polluted fluids, with the effete matter of the water-closet, passes at once to the common outlet. The London sewage is at present wasted into the river Thames; but at Croydon, Leamington, Harrogate, and Cheltenham the sewage is purified by irrigation, in each case producing useful crops of grass and vegetables. Where towns are situated on the sea, or on the estuaries of tidal rivers, sewage is wasted,—as at Brighton, at Liverpool, at Sunderland, and even at Edinburgh, where the Water of Leith intercepting sewer discharges the sewage from a population of about 100,000 by a cast-iron outlet direct into the Frith of Forth. When sewage shall be wasted in preference to utilising it, must depend upon local conditions. The waste of sewage must not, however, produce a nuisance injurious to health, and this wasting of it certainly ought to be cheaper than using it under any of the precipitating and chemical or irrigating processes at present known.

CLARIFICATION OF SEWAGE.—Clarification by deposition in tanks and treatment by chemicals remove *detritus* and suspended matters from sewage, but, as explained, will not fully purify the fluid. This removal of the solids will, however, be an advantage, as a vast mass of matter liable to choke the bed and banks of a stream or river will be removed, which, when allowed to accumulate, becomes putrid and offensive. The gross cost of purifying sewage by irrigation is, per ton, at Doncaster $\frac{28}{64}$ of a penny, at Bedford $\frac{51}{64}$ of a penny, at Leamington $\frac{38}{64}$ of a penny, at Chelteham $\frac{19}{64}$ of a penny, and at Banbury $\frac{48}{64}$ of a penny. These farms may be accepted as fair samples of thus utilising sewage. The use of sewage in agriculture is comparatively new, and the best mode has not in all cases been practised. They, however, indicate Aldershott, Bedford, Doncaster, Leamington, Wolverhampton, and Wrexham as good examples. At Leamington, Lord Warwick leases the sewage to be used upon a portion of his estate, and at Aldershott, Wrexham, and at Doncaster the sewage and the land are leased, and are worked independently by gentlemen of intelligence, who make such experiments as they think proper, and vary their modes of culture as best suits the sewage, the land, and the crops to be grown. The attempts to economise in town scavenging and sewering by removing human excreta separately has been a failure; by the dry-earth system, the Goux system, the Rochdale pail system, or by any other of the patented systems, so far as are known to them; the local costs have been largely increased, and the local nuisances also, in proportion to the time of retention of the excreta before removal; there is also the inconvenience suffered by trespass on the privacy of the household.

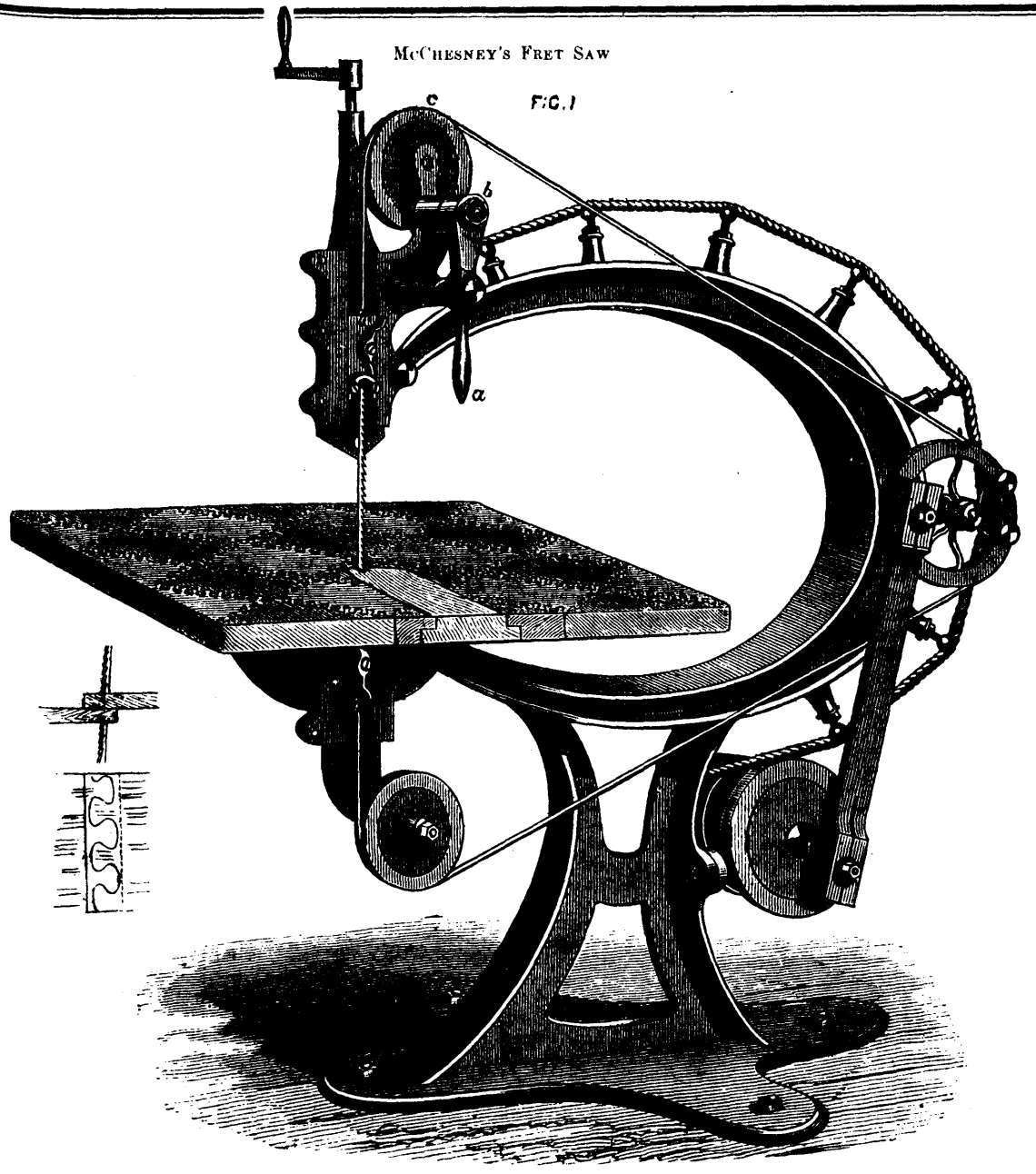
(1) A sewage-farm will not bear a rent of 10*l.* per acre. About half this sum is as much as should be paid if the income is to cover the expenditure

IMPROVED STEAM EXCAVATING MACHINE.



McCHESNEY'S FRET SAW

FIG. 1



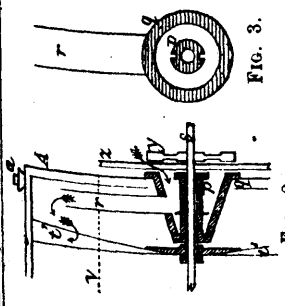


FIG. 3.

FIG. 2.

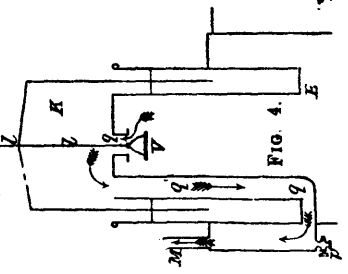


FIG. 4.

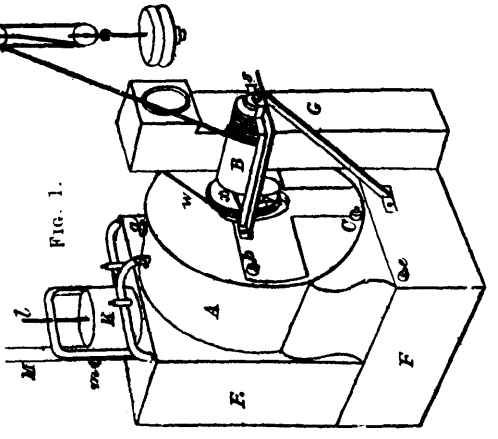


FIG. 1.

THE ALPHA GAS APPARATUS.

DETAILS AS TO IRRIGATION BY TOWN SEWAGE.—As they recommend the application of town sewage to land, they at the same time wish to guard against some extravagant expectations of the agricultural benefits it will confer, which are held and advocated by a few zealous and enthusiastic theorists. The continuous application of town sewage to all soils is by no means an unalloyed benefit; as in some cases and seasons, and especially upon clay land, it may be rather injurious than otherwise. Very few crops are actually benefited by the direct application of sewage upon a stiff and retentive soil; indeed, Italian rye-grass, cabbage, and mangold-wurtzel seem to be the only farm crops that persistently flourish upon any soils, heavy, or light, under continual doses of town sewage. No growing crop, save natural grass, should be sewaged during the depth of winter; and for potatoes, turnips, most vegetables, and certainly for all pulse and cereals, the land ought rather to be enriched by frequent irrigation in the preceding season, than treated with sewage when these crops are growing; except in times of great drought, and even then care is requisite. A very limited experience soon teaches us that the purification of a constant flow of sewage, and which is frequently greatest when least wanted on the farm, must bring certain difficulties in its train. The cultivation of sewaged land, for instance, requires more than double the amount of manual labour which is usually employed upon arable land, and more horses must be kept than upon an ordinary farm. The amount of capital, even where the produce is sold off as soon as grown, must be greatly in excess of that required for the general ordinary cultivation of the soil; while to properly stock and work a sewage-farm upon which the main produce is consumed, quite five times the usual amount of money will be needed. One of the greatest difficulties is to keep the sewaged land clean, as not only does every seed and the minutest portion of a root-weed grow, but sewage itself often contains the seeds of numerous weeds which have been washed down from the fodder and straw of stables and cow-houses in towns. There can be no doubt now, after the experience of some years, that the land best adapted for sewage irrigation is a warm friable loam. The only instance in which town sewage irrigation is a decided financial success is that of the Craigentinny Meadows, at Edinburgh. These meadows are, however, in reality for the most part only a deposit of sea sand, washed and blown from the adjoining estuary, and the main produce grown is nothing more nor less than luxuriant couch-grass. The enormous amount of coarse forage which is produced from such a naturally sterile soil shows the fertilising properties of town-sewage, and also points still more distinctly to the fact that a sewage-farm should consist of land through which the sewage can readily filter. It is strange that although deluges of crude town-sewage have been poured upon portions of these Craigentigny Meadows for 200 years, the discolouration of the sandy soil only extends a few inches below the surface, and that at the depth of a foot the sand appears as bright and clean as that upon the adjoining sea-shore. There seems no doubt that even the lightest soils should have a few deep under-drains, as at Doncaster, and Heathcote Farm, Warwick, so as to prevent the sewage-water from lodging in the subsoil. All land of medium staple should be thoroughly underdrained, and clays require the drains to be multiplied, so that the interval between them shall not be more than 15 ft.; and care should be taken that the drains are so formed that no sewage-water can flow vertically into them. To prevent this, upon the top of the drain-pipes, a foot of the most retentive portion of the soil should be damped or puddled, and tightly rammed down, so that the sewage-water after percolating through the subsoil shall flow horizontally into the drains, and not rush into the drain-pipes through the loose mould or cracked clay directly from the surface. As most sewage-farms are at present under the control of ever-changing town councils and local boards whose members must, as a rule, be ignorant of practical agriculture,—and whose theories upon the subject may be wild and visionary,—is it surprising, the Commissioners ask, that such poor returns have hitherto resulted from the application of town-sewage to the growth of crops? Disappointment has been expressed at the poor financial results of sewage-farms. Agriculture is never a specially lucrative business, and during the last few years it is probable that strictly accurate accounts would prove that very little profit has been derived from the ordinary cultivation of arable land. Farms to which town-sewage is applied have invariably many unfavourable circumstances to contend with. The rent, except where the local authority has land of its own, is certain to be extravagant; the application of sewage is often too costly; the management is frequently changeable and faulty, and the prejudice against the produce of the farm is, in some districts, obstinate and wide-spread. But they, nevertheless, arrive at the satisfactory conclusion that where a fair rent is charged for suitable land, the sewage cheaply and regularly delivered, and a good market is close at hand, there is no reason to doubt that the return for capital, judiciously expended upon sewage-farms, will produce a higher rate of interest than the money invested by the majority of the tillage farmers throughout the country.

GRINDING TOOLS.

(See page 125.)

In order to secure good and accurate work, and as much as possible in the least time, it is of the first necessity that your tools should be in good condition: but to secure this it is necessary to grind them—which process is oftentimes both difficult and unpleasant. For grinding chisels, plane-irons, and other broad tools this is especially so. A very simple plan is proposed by the *English Mechanic*, by which tools can be ground in less than half the time it formerly occupied, and so perfectly true are they that a cutlery grinder might envy their accuracy. In the first place, the tool-holder consists of a simple strip of wood about 15 in. long by 2½ in. wide and ¾ in. thick. To one end of this, on the underside, is secured whatever you require to grind. A chisel, no matter what width, is held firmly by simply sliding an iron link over the chisel and short distance down to the tool-holder. Plane-irons are secured by a small ⅜ in. bolt, or the screw which binds the plane-irons together will answer very well; and irregular tools may be secured in a variety of ways. To the bottom of the grindstone trough is fastened a strip of timber—say, about 18in. long and 3in. wide—to act as a base or rest; on a center line near the end are bored several holes about ⅜ in. apart, into which is fitted a small peg for the bottom of the tool-holder to rest against. The angle at which you want to grind the tool is determined by the peg being nearer or further from the stone. With the tool fixed to the holder at one end, and resting against the peg at the other, you can now grind away with pleasure and satisfaction by moving the tool backwards and forwards, the pin acting as a center pivot. Both the drills can be ground in this way by making a round tool-holder about half an inch apart, the drill being fixed at the other end. The rough sketch of the grindstone is herewith presented which is made to fit in the lathe-bed to the exact height of the lathe center, the lathe being used to turn it. But the arrangement described can be applied with a little variation to any good stone, whether on the bench, and turned by hand, or on the ordinary grindstone and trough with treadle on the floor.

FRET SAW AT THE PHILADELPHIA EXHIBITION.

(See page 109.)

The engraving on page 109 illustrates a very neat arrangement of fret saw designed more especially for dovetail work. The table may be shifted in a vertical plane to any desired angle, so that the two pieces of wood to be united by dovetailing may lay at the requisite angle to give the necessary taper to the toothing of the wood, as shown in Fig. 2. The saw is thrown in or out of gear by moving to the left the handle *a* pivoted as *b* and carrying the sheve *c*. When in the position shown, the cord, by which the saw is driven, is tight, but when the handle is moved to the left the cord drops into a festoon and the saw is free to stop. The sheave *c* and the similar one beneath the table are carried by adjustable supports, the upper one being adjusted by the screw-handle shown, so that the cord running over the three sheaves may be adjusted as to tension. In order to prevent oscillation or vibration of the frame, a wire rope is stretched from the lower to the upper exterior portions, and by means of the adjusting screws and nuts shown, the light frame is converted into a very rigid one. The frame, it will be noticed, is capable of admitting a large piece of work under the saw. The table as exhibited by Mr. McChesney at the Centennial was, as shown, of wood, dovetailed together in a manner similar to that shown at Fig. 2. Our engraving is from the *Moniteur Industriel*.

THERE is a rumor from the English coal regions which is calculated to alarm English miners. It is to the effect that the proprietors of the mines have resolved to import cheap labor from China, and have already consulted the Chinese Ambassador on the subject. That official replied that he would undertake the management of the immigration, provided the immigrants were protected from insult and injury.

THE AUTOMATIC GIRTH.

(See page 103.)

In the annexed engraving we illustrate a new form of saddle girth, or rather of girth attachment. It is claimed for the automatic girth that, once fixed, it acts of itself, without aid from the rider, and adapts itself to all muscular action of the horse; that it can be used for every kind of saddle, and will be found especially useful in the case of rollers for horse clothing, whilst for cavalry troops, in those manœuvres which require frequent mounting or dismounting, its advantages are obvious.

Each of the two buckles is fitted with four springs, having a power of tension of 66 lb., say together 132 lb.; so that in saddling the horse the pressure is divided, each girth having four springs, whereas formerly the eight springs were attached to a single girth, and consequently had to be stretched simultaneously. This improvement has had the effect of rendering the pressure more easy and natural. The horse being saddled, the eight springs act together; their pressure is evenly distributed upon the body, to the conformation of which they adapt themselves with the greatest facility. The spring, 3in. long, can be stretched to double length, 6in., without any loss of power. The construction of the apparatus is so simple and obvious that no detailed description is necessary. It is being introduced into this country by the Automatic Girth Company, Milk-street, Boston.

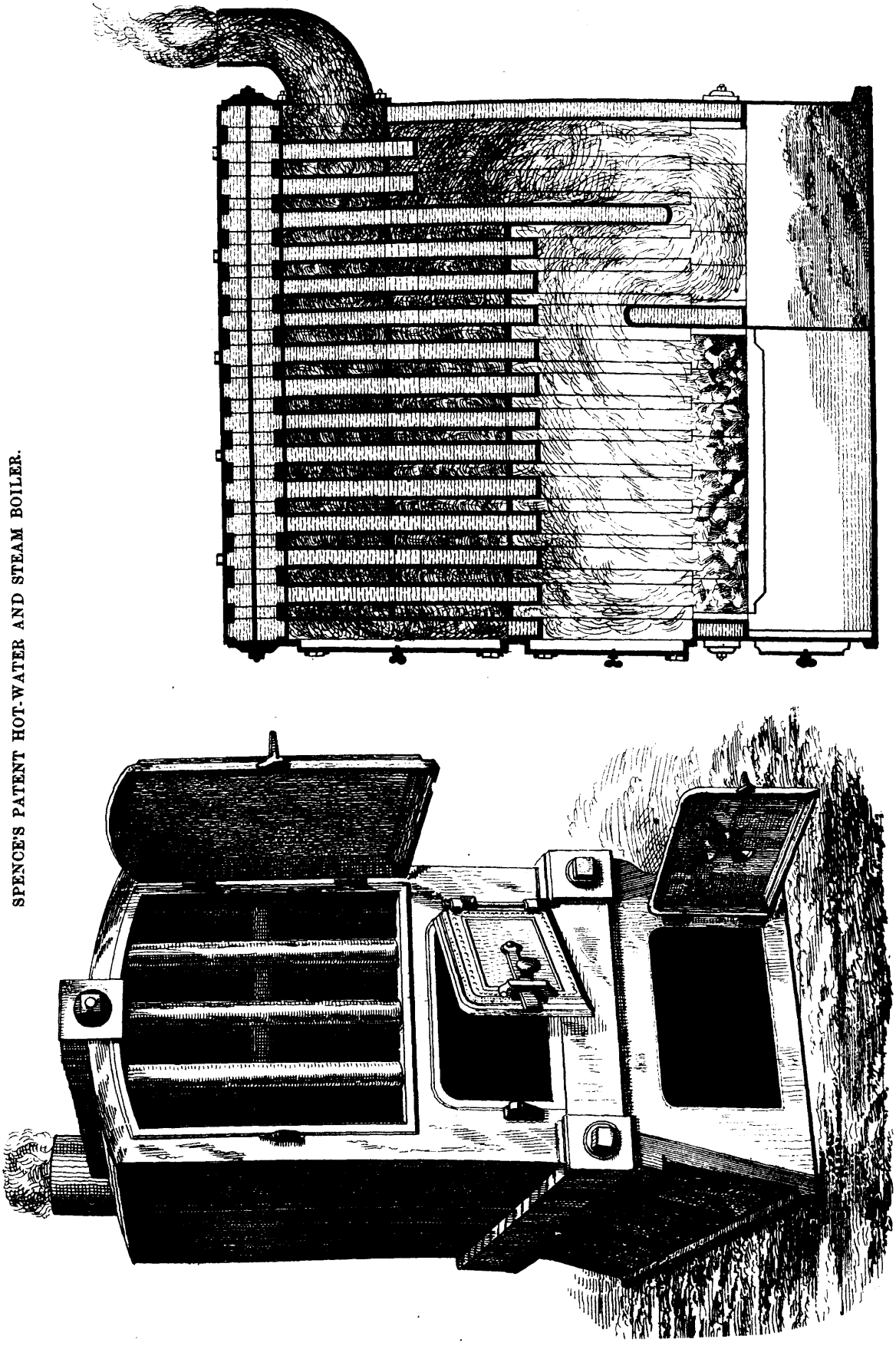
On Needle Manufacture, Tempering, &c.—This small but important implement has to go through the hands of about 120 workmen during the process of manufacture. The steel wire, being drawn to the proper size, is submitted to various tests to ascertain its quality, and is then cut into proper lengths by shears, which, by striking 21 blows in a minute, cut in 10 hours fully 400,000 ends of steel wire, which produce about 800,000 needles. These are passed on for further manipulation to other workmen, who straighten and point the pieces of wire. After pointing they are cut in two, so as to form two separate needles of equal length and quality. For each different size a small copper plate is employed. It is nearly square, and has a turned-up edge on two of its sides, the one is intended to receive all the points, while the other resists the pressure of the shears. On this plate a certain number of wire are put with their points in contact with the border, and they are cut together flush with the workman. These even wires are now taken to the *head flattener*. This workman, seated over a table with a block of steel before him about 3 inches cube, take up from 20 to 25 needles between his finger and thumb, spreading them out like a fan, with the points under the thumb, he lays the heads on the steel block, and, with a small flat-faced hammer srikes a few successive blows upon them so as to flatten them in an instant. The herds, having become hardened by hammering, are now annealed by heating and slow cooling, and are handed to the *piercer*, generally a child, who forms the eye in a second by laying the head upon a block of steel, and by driving a small punch through one side with a smart tap of the hammer, and then exactly opposite on the other. The eyes are then trimmed by driving the punch through them again on a lump of lead and after laying the needle with the punch sticking through it, upon the block of steel, hammering the head on the sides, which causes it to take the form of the punch. The next operator makes the groove at the eye and rounds the head, which he does with a small file. The needles being thus prepared are thrown by the workman pell-mell into a sort of drum or box, in which they are made to arrange themselves in parallel lines by means of a few dexterous shakes of the workman's arm. They are now ready to be tempered, for which they are ranged on sheet-iron plates, about 130 lbs. weight at a time, containing from 250,000 to 500,000 needles, and are placed in a proper furnace, when they are heated to a bright redness for the larger needles, and to a less intense degree for the smaller; they are then removed and inverted suddenly over a bath of cold water in such a way that all the needles may be immersed at the same time, yet separate from each other. This has the effect of making them very hard and brittle. The water being run off, the needles are removed for further operations. Some manufacturers heat the needles by means of immersion in melted lead, others throw them into a pan along with a quantity of grease, which, being placed on the fire, the oily matter soon ignites, and after it burns out, the needles are found to be in the proper temper; those which are twisted in the tempering being afterwards straightened by the hammer on the anvil.

Polishing is the next and most expensive and prolonged operation. This is effected on bundles containing 500,000 needles intermixed with quartz or sand, and a little rape-seed oil. Thirty of those bundles are exposed to the vibratory pressure of wooden tables, which make about 20 horizontal double movements per minute, causing the bundles to run over 2 feet each time, or 800 feet per hour. This agitation is kept up about 18 or 20 hours, causing such a movement and attrition as to polish the needles in the bag or bundles. They are then removed from the packets into wooden bowls and mixed with sawdust to remove the grease and other impurities, placed in a cask, which is turned by a winch; more sawdust is introduced as required, an the turning is continued until the needles become clean and bright. They are then winnowed by a fan to clean them from the sawdust and refuse matter, and are subsequently arranged in regular order on a small somewhat concave iron tray. The operation of making up the rolls or bags, polishing, winnowing and arranging them, has to be repeated ten times on the best needles. It is found that emery powder mixed with quartz and mica or pounded granite is preferable to anything else for polishing needles by friction in the bags at the first, emery mixed with olive oil, from the second to the seventh operation, putty, or oxide of tin for the eighth and ninth, putty with very little oil for the tenth, and lastly bran to give a finish. In this mode of operating, the needles are scoured in a copper cask studded in the interior with raised points to increase the friction, and a quantity of hot soap suds is introduced occasionally to keep them clean. The cask must be slowly turned upon its axis for fear of injuring the mass of needles it contains. They are finally dried in the wooden cask by attrition with saw dust, then wiped with a linen rag or soft leather—the damaged ones being thrown aside. The *sorting* is performed in dry apartments, where all the points are first laid the same way, and the needles arranged in the order of their polish with great rapidity. The workman places 2000 or 3000 needles in an iron ring two inches in diameter, and sets all their heads in one plane, then, on looking carefully at their points, he easily recognizes the broken ones and removes them with an instrument adapted for the purpose. These defective needles pass into the hand of the *pointer* in order to be ground again, when they form articles of inferior value. Those needles bent in the polishing must now be straightened, and the whole are finally arranged by the tact of the finger and thumb of the sorter, and weighed out into quantities for packing into blue papers. The *bluer* puts the final touch to them by taking 25 needles at a time between his fore-finger and thumb and pressing their points against a small hone-stone of compact micaceous schist, quadrangular in form, mounted in a small lathe, turning them briskly round, giving the points a bluish cast, while he polishes and improves them.

M. J. Manne, the manager of the Phosphor Bronze Works, at Val-Benoit, Liége, has made pit ropes entirely of this alloy. Phosphore bronze ropes are said to have the advantages of offering great resistance to strains of traction, of being very pliable and inoxidisable, and of resisting any attack of corrosive water, while the wear due to the contact of the wires is less than in any other metallic ropes; they also preserve their pliability after wear. These phosphor bronze ropes are used in Belgium, at the Bois-du-Luc, Horloz and Courcelles-Nord collieries among other.

Making Monkeys Useful.—It will amuse and surprise our little folks to be told that these mischievous creatures can be taught to work; and yet they are tamed and made to work in two remarkable ways, in the East. First, in the tea-gardens of China, just as an experienced Chinaman works, picking the suitable leaves and letting the others be. In the second place, he has been taught, by the natives of Molocca and the Golden Chersonese, as far as Formosa to the East, to ascend trees, gather the fruit which is ripe, and either give them or throw them down to his master. It may be confidently asserted that in each of these cases the trained ape performs an office requiring more intelligence than that of a chimney sweeper or a crossing sweeper.

Preservation of Belting.—In order that belting of cotton or linen should have both strength and flexibility, together with increased adhesive power, they should be thoroughly soaked in linseed oil varnish. If the belting be new, the varnish may be applied with a brush until no more will be taken up, whereupon it may immediately be used without any preparatory drying. After having been in use for some weeks, a second application of the varnish should be put on. Cotton or linen belting thus prepared will neither contract nor stretch, and will always be pliable and unaffected by change of temperature. The adhesion of the belt to the pulley is likewise increased by the varnish, while steam and acid fumes have no effect upon the belting at all.—*Maschinen-Constructeur.*



SPENCE'S PATENT HOT-WATER AND STEAM BOILER.

THE FAMILY FRIEND.

This part of the MAGAZINE, for the future, will be devoted to instructive domestic reading for the *Home Circle*, such as SHORT PLEASING STORIES, DRAWING, MUSIC, BOTANY, NATURAL HISTORY, POPULAR GAMES, and amusements for the boys and girls, NEEDLE WORK, AMATEUR MECHANICAL PURSUITS, and all the elements of a *practical domestic education*; also GARDENING and ARCHITECTURAL NOTES.

FLORAL CULTURE.

SANVITALIA.—Nat. Ord. Compositæ. *Linn.* — *Syngenesia Polygamia Frustranea*:—Pretty, dwarf-growing, free-flowering plants rich *brown* and *yellow* suitable for small beds, rock-work, or edgings, continuing in bloom during the Summer and Autumn months, thriving best in a light, rich soil. *Hardy annuals.*

SAPONARIA.—Nat. Ord. Caryophyllaceæ. *Linn.*—*Decandria Digynia.*—Of these charming little plants it is impossible to speak too highly; they carpet the ground with their pretty little star-shaped flowers during the Summer and Autumn months; for edgings they are unequaled, bearing cutting back if necessary for a late Autumn bloom; in beds they produce a fine effect, while in ribbons the *pink*, *rose* and *white* make a striking combination.

SEDUM (Stonecrop).—Nat. Ord. Crassulaceæ. *Linn.*—*Decandria Tetragynia.*—A useful and exceedingly interesting genus of pretty little plants, growing freely on rock or rustic work, also on ornamental mounds, old walls, etc., where, during Summer, they expand their brilliant *blue* star-shaped flowers in great profusion. *Hardy perennials.*

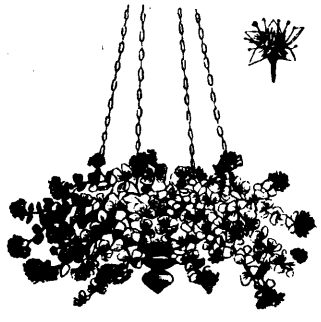
SILENE OR CATCHFLY.—Nat. Ord. Caryophyllaceæ. *Linn.*—*Decandria Trigynia.*—Highly ornamental, free-flowering plants, with bright and beautifully colored flowers of various tints, admirably adapted for Spring and Summer, blooming in beds, rock-work, etc.

STEVIA. — Nat. Ord. Compositæ. *Linn.* — *Syngenesia Polygamia Æqualis.*—A very useful plant either for pot culture or the border. Colors, *white* and *purple*.

SAPONARIA.

SANVITALIA.

GERMAN TEN WEEK STOCK.



SEDUM.

SILENE.

BROMPTON STOCK.

STEVIA.

GERMAN TEN WEEK STOCK.

TRICOSANTHES.

STOCKS (Mythiola Annua.)—Nat. Ord. Cruciferæ. *Linn.*—*Tetradynamia Siliquosa.*—The Stock Gillyflower is one of the most popular, beautiful and important of our garden favorites; and whether for bedding, massing, edging, ribboning, or pot culture it is unsurpassed either for brilliancy and diversity of color, or profusion and duration of bloom.

The imported German ten-week stocks on account of the very great proportion (viz., two-thirds) which may be depended upon flowering double, are now extensively used for bedding, massing, grouping and edging; and few plants, indeed in such positions, produce so brilliant a display, and are so universally admired. They may be classed under five heads, viz: Dwarf, Miniature, Large-flowered, Pyramidal and Wall-flower-leaved. *Half-Hardy annuals.*

SCIENTIFIC NEWS.

A VERY difficult substance to dissolve is gum opal. It has been found that annaline oil dissolves it with great facility.

TWO hundred and eighty-seven thousand three hundred barrels of oil were destroyed by fire in the oil regions last year.

HARD rubber or vulcanite, placed for several weeks in nitro-benzol, becomes soft and pliable like leather, and easily broken.

P. THÆNARD considers ozone an energetic poison for animal organisms. He states that instead of being a remedy, ozone is active poison. Even when very dilute, it causes the blood corpuscles to contract rapidly and even change their form, and accelerates the pulse. It is dangerous to disseminate ozone in dwellings in the false hope of destroying miasm.

A VERY brilliant, perfectly white, and very actinic light, which may be used for taking photographs, is produced as follows: Place some perfectly dry powdered nitre in a suitable clay vessel, and in a cavity made in the middle of the powder place a piece of phosphorus and ignite it. While it burns the mitre melts, and a quantity of oxygen gas is given off, producing an intense light.

MM. TREVES and Durassier have recently shown that the distribution of magnetism in a magnet is strongly influenced by the proportion of carbon in the steel. On comparing steels containing 1 per cent., ½ per cent., and ¼ per cent. of carbon, it was noted that, the less the percentage, the more uniform the distribution. Carbonisation tends to concentrate magnetism toward the poles.

AT the Centennial Exhibition the French books exhibit ed proved much more successful shan either the English or German. The catalogue of the French collection gives some interesting facts about the great French houses, as "that the famous establishment of Mame, at Tours, can turn out 20,000 volumes a day or 6,000,000 a year, and that the equally famous house of Firmin Didot, which dates back into the seventeenth century, has had its collection of Greek classics set up entirely by female compositors, of whom it employs 250."

AN alloy as beautifully white as electro-plate, and at the same time free from expensive nickel, is produced by strongly heating (two to two and a-half hours at brightest rod heat) a mixture of one part of best manganese ore in powder, one part of powdered copper scales, with two parts of bone-black. After the lapse of that time, the crucible—a graphite crucible to be preferred—is left to cool, and turned over, when a beautifully white button falls out, along with the unburnt bone-black. This metal may be filled, rolled, and drawn, has a beautiful sound, and seems destined to compete with nickel and German silver.

IN Sweden the manufacture of illuminating oil from wood has become a large and successful industry. The roots and stumps of trees are employed for the purpose. The wood is subjected to dry distillation, with exclusion of air, and a variety of products are formed which are of value in the arts. Among these may be mentioned turpentine, creosote, tar, acetic acid, charcoal, oil of tar, and oil of wood. The wood oil cannot be burned in an ordinary lamp, but a camphene lamp can easily be adapted for the purpose. It is not explosive and is remarkably cheap. The pine tree is best adapted for distillation, and there are fifteen establishments in operation in Sweden, three of which produce 15,000 litres—3300 gallons—of oil annually.

Note—We alluded to this process of manufacturing oil from wood in the last Feburary number, and again say, why not give it a trial in Canada where pine is so abundant?—Ed. C. M. MAGAZINE.

ASPHALT TILES.—At the Bavarian Industrial Museum there has recently been exhibited a new kind of flooring tiles made from asphalt, in a very simple way. The drawing of the intended design is first made on coarse heavy paper. Then it is covered with bits of china and glass, so as to form a mosaic. Lastly, a border is made to the sheet, and liquid asphalt is poured upon it. After the whole has been covered, the paper is taken away with cold water, and the tile is finished. This flooring is said to be handsome in appearance, and to resist damp for an indefinate period of time.

WITH reference to the method of improving impure or suspected water by boiling, Professor Ernst Brüke suggests the addition, before boiling, of a little acid, tartaric, citric, or hydrochloric, to water, and afterwards neutralizing with hydro-sodic carbonate, thus restoring the carbonic acid which is expelled by boiling, and preventing flatness. When the vegetable acids are employed, only enough soda is added to form the acid salt, thus leaving a pleasant acid taste; but with hydrochloric acid some substance must be employed to indicate the neutrality. For this purpose he employs the highly tinctorial and very sensitive salicylate of iron first used by Weiske.

LIGNOSE, invented by M. Falkenstein, is the name of a new blasting agent, and is made of woody fibre prepared with nitroglycerine. It is stated to have about three times the force of block blasting powder, but is very irregular in its action and is very sensitive to moisture. Pantopollet is produced at a dynamite manufactory at Opladen, on the Rhine, and consists of naphthaline dissolved in nitroglycerine. The blasting action is quite good, and the force equal to about three times that of ordinary blasting powder. It yielded, however, during the experiments a very unpleasant smoke and odour, and produced severe pains in the heads and chests of the workmen.

THE Castalia has recently been fitted with new paddle-wheels, the invention of Mr. Ashton, Q. C., London. The paddles are straight, flat, narrow metal blades, only 7 in. wide, so that the paddle-boxes are only about 1 ft. wide, whereas the old floats were 54in. wide, and the box wider still. The wheels are distant about 4 ft. from the sides of the vessel. The trial trip took place on Tuesday week. The vessel left the end of the Admiralty Pier, Dover, at 11.45 a.m., and steamed against the tide as near as possible in a straight line in the direction of Folkstone, arriving opposite that town an hour afterwards. The average speed obtained was about eight knots, but no accurate observations were taken. The revolutions were on an average twenty-six a minute, though sometimes they were not more than twenty. At a trial this week, however, a speed of about twelve knots was obtained.

LETTERS from Malta describe the experiences of Her Majesty's ironclad low freeboard turret-ship Devastation while voyaging to Malta, doubts as to her sea-going capabilities having been set at rest by her behaviour during a fierce storm and tremendous sea. It is true that her crew had to be battened down below, with the exception of a few men on the flying deck, as heavy seas incessantly broke over her, one of which carried away an unfortunate seaman. Commander Cole and a few gallant volunteers with great daring got out a boat and attempted a rescue, but in vain, and with great difficulty they regained the ship. With that exception Commander Cole did not leave the bridge throughout the storm. All on board were greatly relieved when shelter was reached, but they are now convinced that the Devastation will stand anything.

FROM America, says the *Medical Examiner*, comes the news of the discovery of a mine of mineral soap, which can be used for all the purposes to which our manufactured soaps are applicable. The discoverer found it when prospecting for coal, and used it in his family for a year before announcing it. It is now, however, taken up by a company, and will be brought into commerce. It is situated in a rather inaccessible part of the Californian coast. A stage road passes three miles below. From this a little stream leads towards the mine, which can be reached by mules. It is said that the pieces that are detached and fall into the stream dissolve, and that this fact has led to the discovery. The soap is described as marbled or partly-colored, like Castile soap, and the extent of the mine is said to be very great. The "soap" is in the neighbourhood of slatestone and sandstone, and near it is a mountain of gypsum, which appears to have been turned upon its edge. The whole country round bears evidence of volcanic action, and the mountains near appear to have been once under the sea, as shells and other marine products abound on the highest points.

Newspapers of Pesth, Hungary, tell of a generous nobleman in a district near that city who, finding an old, dusty, and blackened painting of the holy Veronica, serving as an altar piece in a village church, rewarded the piety of the villagers by removing it and giving in its stead a new and gorgeous representation of the saint. It afterwards turned out that the old and black painting was an original and rare work by Domenichino.

The Affectionate Card.—This trick, if properly managed, will appear marvelous. Having forced a card upon one of the company, after shuffling it up with one of the pack, you will know the card by feeling. You then take a small piece of wax and place it under the thumb nail of your right hand, and by this wax you fasten one end of a hair to your thumb, and the other to the chosen card. By this means, when you spread your cards on the table, by drawing about your right hand, the chosen card will follow you all round the table as though attracted by some magic sympathy.

A Parisian dealer in curiosities felt himself obliged, during the seige of Paris, to seek refuge in his native mountains of Auvergne. While in an old farm house one evening he remarked a Limoges enamel of wondrous coloring and brilliancy. Through a friend he succeeded in buying the dish and returned with it to Paris at the end of the war. It had cost him in all $800, and he offered it to the Parisian museum for $4,000; they could not buy it, however, and he eventually sold it for $7,000, to Sir Richard Wallace, who considered it worth at least $10,000, and has lent it to the Kensington Museum, where it is now on exhibition.

Find Fault in Private.—Find fault, when you must find fault, in private, if possible, and some time after the offence, rather than at the time. The blamed are less inclined to resist when they are blamed without witnesses. Both parties are calmer, and the accused may be struck with the forbearance of the accuser, who has seen the fault, and watched for a private and proper time for mentioning it. Never be harsh or unjust with your children or servants. Firmness, with gentleness of demeanour and a regard to the feelings, constitutes that authority, which is always respected and valued. If you have any cause to complain of a servant, never speak hastily; wait at all events, until you have had time to reflect on the nature of the offence.

Too Many Swallows.—Eating, like all other things, can be carried to excess. The requisite amount swallowed goes to build up the person; all other food eaten is superabundant, and goes to swell out the stomach. It is fallacious reasoning to say that a fine physique can be produced by gormandizing. The physique of the Scotch Highlanders is immeasurably better than that of the German, and yet the Highlanders are exceedingly abstemious. Heavy eaters are apt to be exceedingly dull people. They clog the brain in catering to the wants of the stomach. They are like a boa constrictor; they eat until they can hardly see or move, and are compelled to loll about after a dinner, closely resembling a pig. It is impossible for such people to be possessed of acute reasoning powers.

Livingstone Anticipated.—In a lecture on Rome, delivered lately in Walthamstow, by the Rev. G. Gurnock, of Spitalfields, the lecturer said: "On one of the walls of one of the corridors of the Vatican, I saw painted the two hemispheres, and there was depicted Africa, with Zambesi, and the lakes and rivers supposed to have been discovered by Dr. Livingstone. Now, seeing that these pictures were painted about 200 years ago, it is clear that these places were known before they were visited by Livingstone. It appears that some Portuguese gentlemen explored Africa some centuries ago, and presented the then Pope with a map which he had painted, as I saw it. There is no doubt it is genuine." Can any of our readers furnish the name of this early African explorer?—*English Mechanic.*

Friendship.—Friendship is the solder of hearts, the bond of spirits, the jewel of life, the charm of social intercourse, the mystic chain of sympathy, whose links, like the sweet influence which binds the stars, unites us at once to things the meanest and the most remote. How exquisite is the pleasure springing from virtuous friendship with kindred souls; from the delights bestowed by an interchange of sentiment, by the flash of wit, the flow of reason, and the flights of imagination. At these delightful moments it is—when mind, communicating with kindred mind, unfolds its hidden treasures of intellect, unlocks the sealed fountain of passion, breathes out at ease its warmest aspirations, expands its noblest sympathy, and spreads around, with lavish hand, the hoard of mental wealth and sensibility, which it reveals to no other earthly being—that man may truly be said to enjoy the most refined and elevated pleasure which his nature is at present susceptible of.

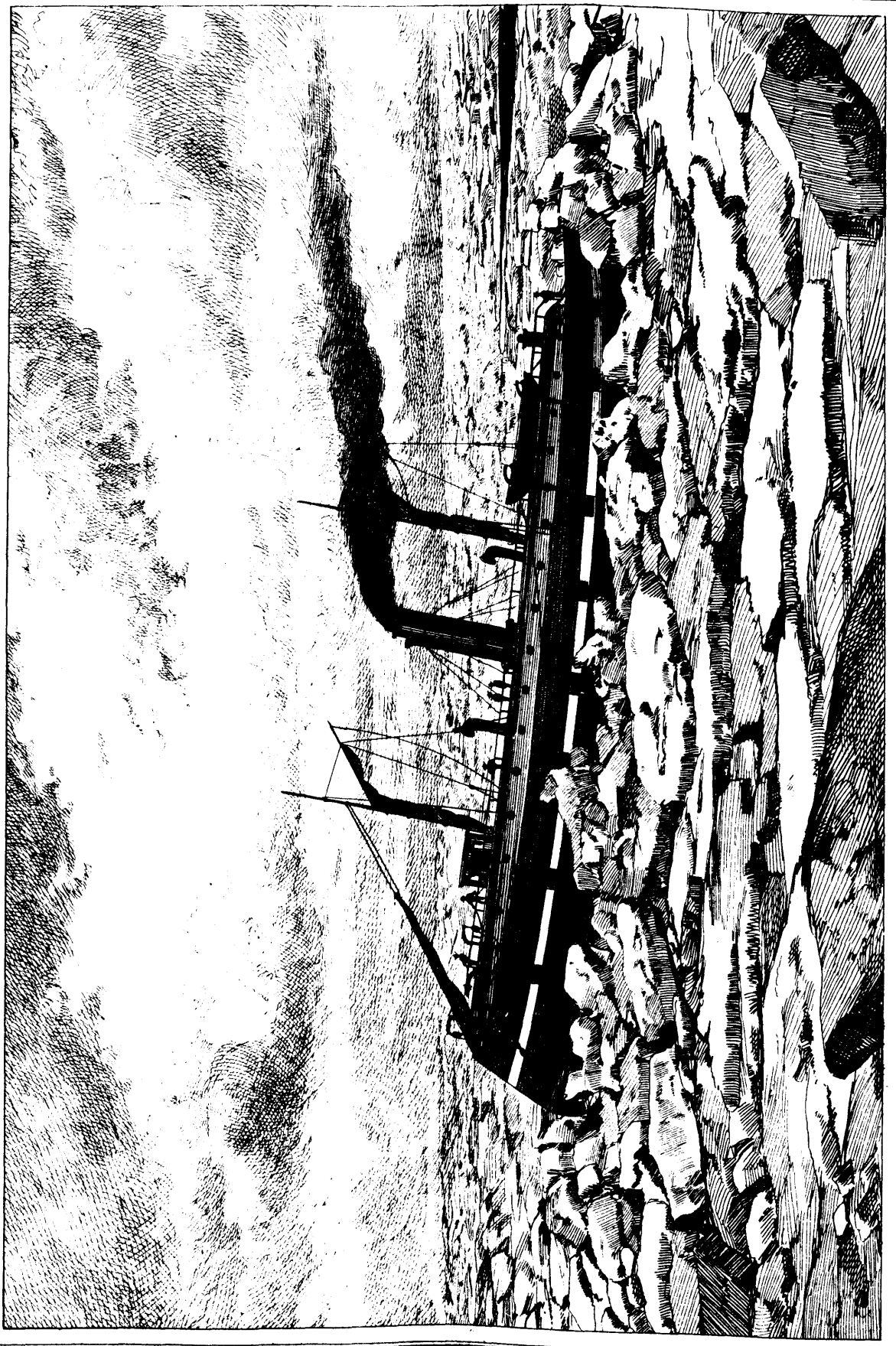
Legal Brevities.—A note dated on Sunday is void. A note obtained by fraud, or from one intoxicated, is void. If a note be lost or stolen, it does not release the maker, he must pay it. An endorser of a note is exempt from liability, if not served with notice of its dishonor within 24 hours of its non payment. A note by a minor is void. Notes bear interest only when so stated. Principals are responsible for their agents. Each individual in partnership is responsible for the whole amount of the debts of the firm. Ignorance of the law excuses no one. It is a fraud to conceal a fraud. It is illegal to compound a felony. The law compels no one to do impossibilities. An agreement without a consideration is void. Signatures in lead pencil are good in law. A receipt for money is not legally conclusive. The acts of one partner bind all the others. Contracts made on Sunday cannot be enforced. A contract with a minor is void. A contract made with a lunatic is void. Written contracts concerning land must be under seal.

Fish Culture Profitable.—In the Report, Jan. 1. 1877, of the Connecticut Fish Commissioners (Messrs. Hudson, Pike, and Bill), we read: "There are few enterprises enjoying public attention at the present time that promise more profitable results than the multiplying of food fishes in fresh water ponds . . . . It is the belief of all who have studied the subject, that fresh water fishes of all kinds can be multiplied almost indefinitely, and so cultivated as to be improved not only in quantity but in quality, and made to be the *cheapest of cheap food.* This fact should be repeated over and over again, until every one who has a patch of water on his premises large enough for tadpoles and shiners, can make it yield an abundance of wholesome fish food, at not half the trouble and expense with which he cultivates a like patch of ground. The food thus produced is too much neglected by the farming community; it affords elements of nourishment necessary to a healthy condition of the body, for which no cheaper available substitute can be found."—The report describes 256 ponds of 5 to 2,000 acres each, aggregates 31,604 acres in Conn. alone.—"These contain a considerable number and variety of food-fishes—although probably not a thousandth part of what this may be made to produce at a little expense of time and money. Besides these (256) large ponds, there are a greater number of ponds of less than 5 acres each, that are in like manner capable of development."—We would like to see a similar report of the capabilities of other States. The subject is one of great interest and importance to every State. Those not abounding in lakes and ponds, have rivers which may be easily stocked with food-fishes, doubtless at a great profit.—(From the *American Agriculturist* for March 1.)

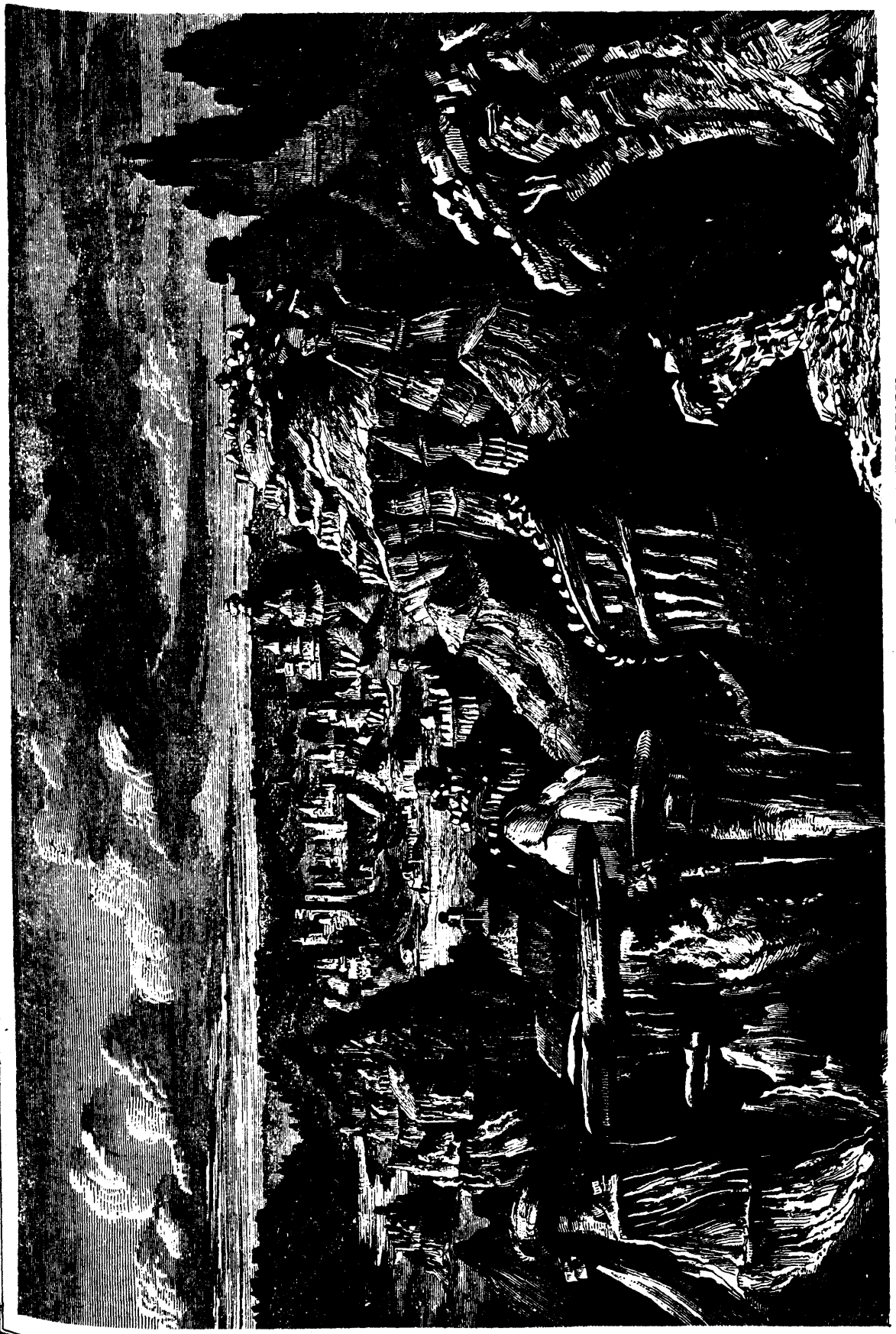
Imitation of Inlaid Wood.—Take a thin veneer of light or white wood, and fix on one side of it, by a paste or cement, a backing of paper. Previously subject the wooden veneer to the action of an acid solution (which may be composed of one part oxalic acid to nine parts water, or thereabout) by dipping the wood therein or thoroughly washing its surface therewith, after which the wood should be slowly dried. Next, wash with a solution of glycerine (which may consist of one part glycerine to four parts water), that surface of the veneer which is to be printed or to receive the design in imitation of marqueterie or inlaid work, which having been done, subject the veneer to a process of slow desiccation. Now rub the surface down with sand-paper or pumice-stone to smooth it or remove from it all extraneous fibers or matters, and print or paint upon it a black or colored background, and the figure or figures to represent inlaid work, in accordance with any suitable design. After the ink color or colors so applied to the wood have become dry, cover the surface with a weak alcoholic solution of shellac, or thin varnish, to prevent the colors from being rubbed off in the process of gluing the sheet to a piece of furniture.

With the veneer so treated an excellent and remarkably close imitation of marqueterie or inlaid wood, especially of wood, ivory, or bone, may be accomplished at a trifling expense in comparison to that required to produce the real work.

In making veneering, the wood being damp when cut, is very liable to become soiled and usually is more or less stained, particularly by the knife. By employing an acid solution, as before set forth, the natural as well as the artificial stains are mostly if not entirely removed. When the wood has to be rendered whiter, a bleaching material, such as chloride of lime, may be applied to it, but generally speaking the acid solution will suffice. The wood after, as well as before, such treatment, is more or less wrinkled or cockled. In order to remove the wrinkles or cockles, or unevenness, and prepare the surface for receiving the imprint or colors, make use of glycerine as before mentioned.



THE *NORTHERN-LIGHT* CUTTING HER WAY THROUGH THE ICE.



VIEW IN THE BAD LANDS, WHITE RIVER, DAKOTA TERRITORY.

THE BAD LANDS OF WHITE RIVER.

(See page 117.)

To the south-east of the Black Hills in Dakota Territory, and stretching nearly to the great sand hills of Nebraska, lies a sterile region, the soil of which is broken up by projecting rocks, which give the whole district a remarkably uninviting appearance. So unsuited is it for habitation that the Indians, ages ago, gave it the name of the Bad Lands, which has belonged to it ever since.

It is a work of immense difficulty to travel through this region, the ravines and valleys into which the rocks are worn being defiant obstacles in themselves and rendering it easy to lose one's way.

It is to Dr. F. V. Hayden, now United States Geologist, whose researches in the Upper Missouri country extended from 1853 to 1866, that we are indebted for our most definite scientific knowledge of this region.

The surrounding country is prairie, and the Bad Lands occupy a valley about 100 miles long by 30 broad, which seems to have sunk away from the surface of the earth. We publish herewith an engraving, for which we are indebted to the *Christian Weekly*, which well represents the general aspect of this valley, and the remarkable formations which characterise it. The rocks are fragments of what were once continuous strata, but which are now broken into tower-like columns; and it needs, as Dr. A. C. Peale remarks, but little exercise of the imagination to fancy oneself in the streets of an ancient city, whose inhabitants left behind them spires, buttresses, and shafts as monuments of their labor and genius.

M. De Girardin, a French traveler, gives the following account of a visit to the Bad Lands: "Accompanying one of the geologists, I ascended a hill and enjoyed one of the most wonderful of sights. At the extremity of an immense plain, rose-tinted by the reflection of the setting sun, there appeared to us an immense city in ruins—a city surrounded by walls and bastions, filled with palaces, gigantic domes, and monuments of most striking and fantastic architecture. At intervals, upon a soil white as snow, rose crumbling castles of a brick-red colour, and pyramids with sharp summits, capped with shapeless masses, which seem to tremble in the wind. In the centre of this chaos stood a gigantic spectre-like column. Descending into the valley, and passing between two columns of antediluvian architecture, we discover a vast amphitheatre, surrounded by crumbling and indented hills of a rich yellow colour, and a confused mass of miniature mountains, of red and yellow clay, thrown without order on a soil so that the horses' feet make no impression upon it."

This desert, says Dr. Peale, is destitute of vegetation and the scanty supply of water is strongly alkaline, coating the rocks with a white crust, where it evaporates. There are no signs of life, not a bird, nor even an insect. The geologist pursues his investigations surrounded by bleak and barren desolation. If he is there in midsummer, the scorching sun, pouring down in the hundred defiles that spread this pathless waste, is reflected back to him from the white or colored walls, unmitigated by a breath of air, or the shelter of a solitary shrub.

This extraordinary region is a vast city of the dead; and its spires and towers are the monuments of most remarkable extinct races of animals, whose remains are strewn through the *débris* in the greatest confusion. Thick layers of rock are composed of petrified bones, sometimes perfectly preserved, and again reduced to powder. Vast numbers of turtles are found.

Some of the animals combined the peculiarities of the bear, hog, and cat. Others, 18 feet in length, had points of resemblance to the tapia, rhinoceros, hog, and horse, and still others represented a race that lived on both flesh and vegetables, and yet chewed the cud like our cloven-footed grazers. These curious animals became extinct before the mammoth and mastodon lived. When they roamed over the country, Europe and Asia were represented by islands, scattered over a wide expanse of ocean, and our Atlantic seacoast extended back to the mountains, and far up the Mississippi valley. The region between the Rocky Mountains and the Mississippi was covered with great lakes, whose waters were at first salt, but gradually became fresh. Between these lakes were areas of land covered with a vegetation tropical in its luxuriance and profusion. Through its forests roamed herds of singular animals. In the bitter struggle of life, many species and genera were blotted out, and their remains washed into the lakes, to be imbedded in the then forming rocks. One of our most eminent geologists thus beautifully gives the picture of tertiary times:

"Most of the continent exhibited an undulating surface, rounded hills, and broad valleys, covered with forests grander than any of the present day, or wide expanses of rich savannah, over which roamed countless herds of animals, many of gigantic size, of which our present fauna retain but a few dwarfed representatives. Noble rivers flowed through plains and valleys, and sealike lakes, broader and more numerous than those the continent now bears, diversified the scenery.

"Through unnumbered ages the seasons ran their ceaseless course, the sun rose and set, moons waxed and waned over this fair land, but no human eye was there to mark its beauty, nor human intellect to control and use its exuberant fertility. Flowers opened their many-colored petals on meadow and hillside, and filled the air with perfumes, but only for the delectation of the wandering bee. Fruits ripened in the sun, but there was no hand there to pluck, nor any speaking tongue to taste. Birds sang in the trees, but for no ears but their own. The surface of lake or river was whitened by no sail, nor furrowed by any prow but the breast of the water-fowl; and the far-reaching shores echoed no sound but the dash of the waves, and the lowing of the herds that slaked their thirst in the crystal waters."

Gradually the lakes became filled with sediment, and the barriers over which their outlets flowed were slowly broken down and they were drained. Great climatic changes ensued. Subsequently the country was elevated, and the process of erosion began. Rain channels cut deeper and deeper into the soft rocks, forming gorges which communicate in every direction, leaving monuments between giving the characteristic peculiarities of the Bad Lands.

Yielding to the forces of nature, and crowded to the southward, during the glacial period, by the mantle of ice that covered the country, the inhabitants of this region disappeared, until now the only living representative of them is the rhinoceros. Such changes are almost incomprehensible; but we should remember that the time in which they were effected is, to us, simply infinite.

Changes are going on at present, which will eventually result in the draining of our great lakes, as were those of the Bad Lands. "The cities that stand upon their banks will, ere that time, have grown colossal in size, then gray with age, then have fallen into decadence, and their sites be long forgotten; but in the sediments that are now accumulating in these lake basins will lie many a wreck and skeleton, tree trunk, and floated leaf. Near the city sites and old river mouths, these sediments will be full of relics that will illustrate and explain the mingled comedy and tragedy of human life. These relics, the geologists of the future will doubtless gather, and study and moralize over, as we do the records of the tertiary age. Doubtless he will be taught the same lesson we are, that human life is infinitely short, and human achievements utterly insignificant."

To Polish Plaster of Paris work.—The addition of 1 or 2 per cent. of many salts, such as alum, sulphate of potash, or borax, confers upon gypsum the property of setting slowly in a mass capable of receiving a very high polish.

To Polish Pearl.—Take finely pulverized rotten stone and make into a thick paste by adding olive oil; then add sulphuric acid, a sufficient quantity to make into a thin paste, apply on a velvet cork; rub quickly and, as soon as the pearl takes the polish, wash it.

To Polish Ivory.—Remove any scratches or file marks that may be present with finely pulverized pumice stone, moistened with water. Then wash the ivory and polish with prepared chalk, applied moist upon a piece of chamois leather, rubbing quickly.

Re-colouring Gold Chains.—Several methods are employed, according to colour required and goodness of alloy. In all cases preliminary cleaning with aquafortis and subsequent rinsing will be necessary. For yellow gold take 6 parts saltpetre, 2 copperas, 1 white vitriol, and one alum. Powder finely, mix, and add water previous to application. For green gold, 12·2 parts saltpetre, 11·2 sal-ammoniac, 11·4 Roman aloes, and 11·2 verdigris, well mixed, and moistened with water for use. For red gold, sal-ammoniac, blue vitriol, alum, and borax, equal parts. Powder, mix, and moisten with water. For general work use common salt 1 part, alum 1 part, saltpetre 2 parts, the whole well powered and mixed. To use these, place them in a plumbago crucible (not metal), with a small quantity of water. Heat until the composition begins to boil. Having suspended the work by a horsehair, place it in the crucible, and allow it to remain there, moving it about, for seven minutes. Withdraw, and rinse well in a pipkin of boiling water. The colour will now be dark—nearly black; again dip and rinse, and until the work acquires the desired rich tint. Finish with scratch-brush or burnisher, and dry in boxwood dust.

WINTER NAVIGATION.

THE "NORTHERN LIGHT."

(See page 116)

The difficulties which this vessel had to contend with, and the dangers attending the winter navigation of the Northumberland Straits are not generally known, and as the success of the enterprise is looked upon with a great deal of interest, we propose now and then to give such information concerning the ups and downs as may be interesting. On the 27th of January last, while attempting to pass between two floes, they suddenly closed, and seizing the ship with inexorable grasp, first wheeled her round like a feather, when the battle began, the ice endeavouring to crush the ship to atoms, and the ship thwarting the ice by lifting as the pressure increased, till the forefoot was lifted clean out of the water, and huge masses of ice in blocks of from four feet to six feet square were piled up to above the taffrail. The ice now began to scream, and sometimes roar, as broke alongside of the ship, with the report of a cannon, as it bent under the ship's bilge and passed down completely under her, hugging the vessel as tight as if she had been in a vice, and jamming all round the propeller and rudder, so that neither could be moved. On this and several other occasions it was only the sharp floor and high bilge of the *Northern Light* that saved her from immediate destruction. All the fastening and resistance that could be secured by wood and iron would have been of no avail here. Science alone prevailed. She has fought it out once more with nature in this instance, and nature has had to succomb. The ice flowing through the Straits this year has been pronounced the heaviest and greatest in quantity that has been seen for many years, and of the large fleet of vessels caught in its inexorable grip, *every one has been crushed to atoms, and sunk, while the Northern Light crosses these terrible waters every day defying the ice king. As no such difficulties are to be met with in the St. Lawrence, there is now every reason to look more fully and with more sanguine hope into Mr. Sewell's project for the winter navigation of the St. Lawrence.*

NERVOUSNESS AND HOW TO OVERCOME IT.

From an article on this subject in the *Herald af Health*, we make the following extracts :

The symptoms of nervousness are too many to mention, and vary in different subjects. The patient knows and feels he is ill, but cannot tell where or how. He becomes fretful and peevish and angry without a cause. He is easily startled, complains of irregular action of the heart, sleeps badly, and this loss of sleep spoils the next day's happiness. Resolution and courage fail, memory is impaired, he becomes tired and easily confused. He is subject to fits of melancholy, continually makes himself unhappy, looks on the dark side, and seems to have no silver ray to line the clouds of life. If the nerves of motion become weakened the sufferer has little pleasure in either bodily or mental exertion. The appetite fails, becomes capricious, and inconstant; the patient complains of a bad feeling, a pain in the head, flatulence, and irregularity of bowels. Woe be to him now if he flies to alcohol to stimulate his failing powers.

We shall not here enter into the symptoms of hysteria so often the result of nervousness in both men and women.

Now, from what ever cause, or combination of causes, nervousness has been produced, if happiness and health are to be restored, the causes must be removed, and the injury they have caused be repaired; for in proportion to the weakness of a man's system and the enfeeblement of his nerves, will be the liability of his falling a victim to other and more fatal maladies; and thus it is that every day we find such diseases as bronchitis, consumption, Bright's disease, brain disease, and insanity following at the heels of nervousness.

The indications for treatment are fourfold. First we must remove the cause, restore the tone of the heart and improve the blood. All injurious habits must be given up, late hours and intemperance in eating abandoned; smoking, if practiced, must be stopped. This done, the patient is on the road to a cure, for nature is very kind when she has a chance, though she is dreadfully cruel when abused.

The food is most important. It must be abundant and wholesome—neither too much nor too little. It should not be sloppy, and soups had better be avoided so long at solid food can be taken. Rise from the table feeling you have had enough, but not oppressed with what you have eaten. Many a man has lived to as old age by following this rule. The bread should be stale, and no very heating food taken.

Eight heurs' sleep should be taken every night if possible. This alone will nearly cure—"early to bed and early to rise," should be the motto. Sleep is the salvation of the nervous system. When there is strength, a cool bath, short and quickly over, with much friction under a sheet, should be taken every morning, and a reaction secured. Without a reaction much harm results.

The exercise should be moderate and pleasant. Riding, driving, rowing, light physical labor, are all good. Breakfast early, dine at one or two, and sup two hours before going to bed; drink no tea.

Take no narcotics to make you sleep. A few raw oysters before bedtime are worth all the narcotics in the world, are easily digested, and furnish material for restoring nervous tissue and blood. If you wake up in the middle of the night, sometimes a mall stale biscuit eaten will send you off to sleep again.

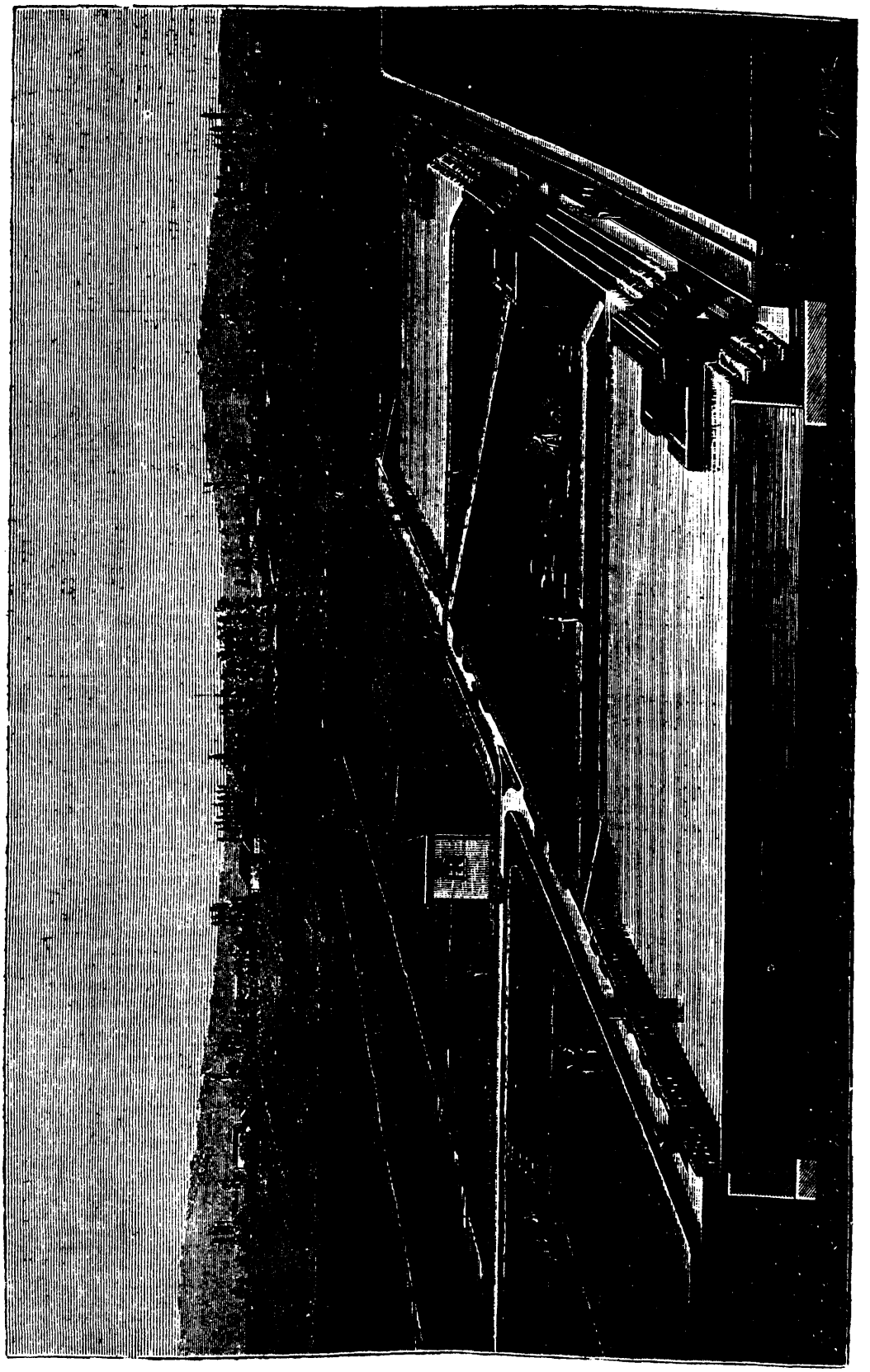
A change of scene, air, and cheerful society, with sea-bathing, are excellent agents for curing nervousness.

Avoid physic—it exhausts the tone of the system, the very thing you would restore. Above all, keep up a good heart, and a firm reliance on the healing powers of nature.

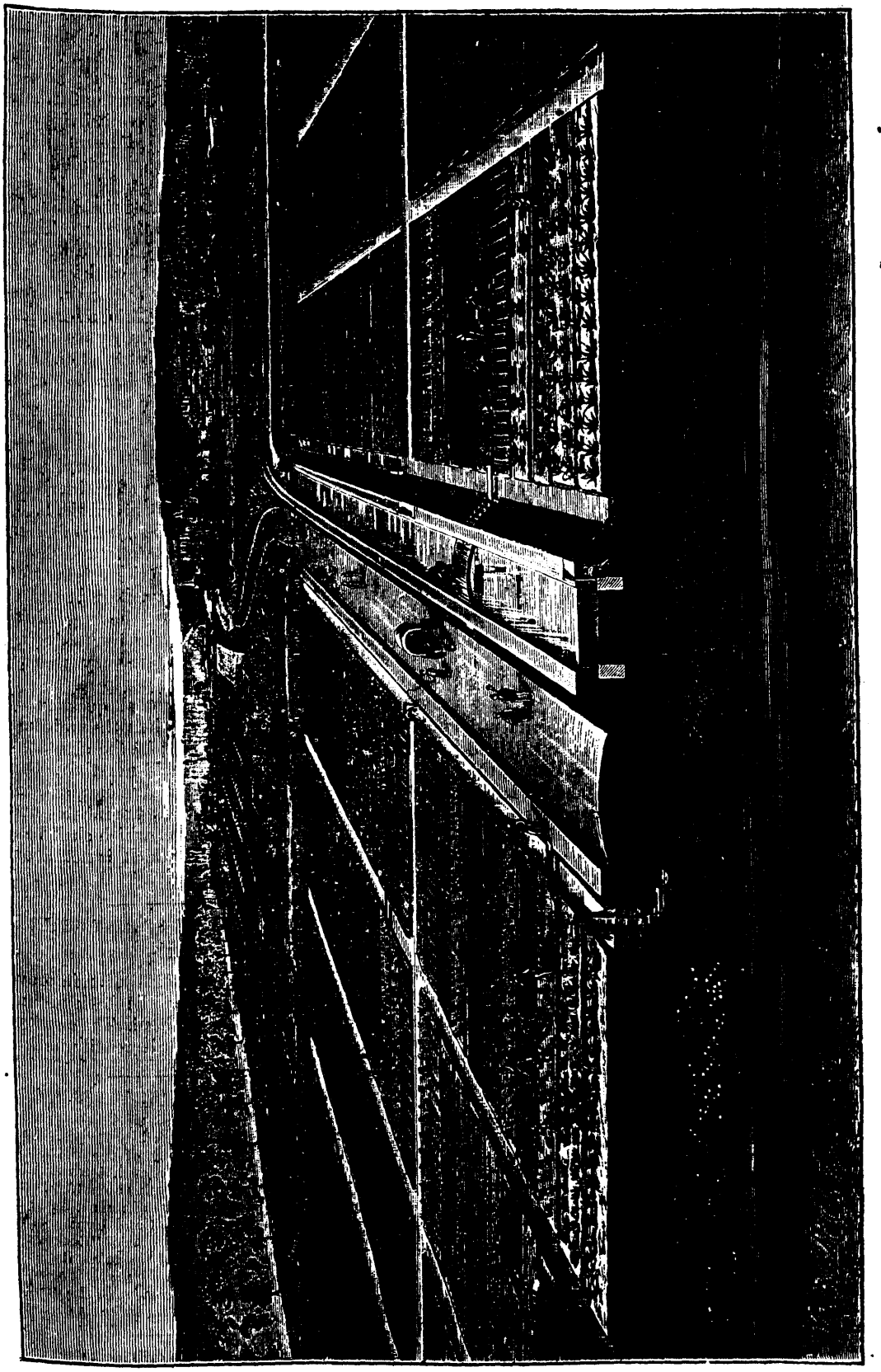
THE MICROSCOPE IN GOOD HANDS.—A competent judge declares that Professor Pasteur has saved enough to France by his discoveries to pay the entire indemnity to Germany. He is a great chemist, and one of the most skillful experimenters in the world. For many years he has been subjecting the theory of spontaneous generation to the most severe scientific tests, and is positive in his conviction that all life, so far as we know it, springs from living seed or germ. The experience of the best dealers in wine has been baffled in seeking a remedy for a difficulty. Professor Pasteur put some of the spoilt wine under the microscope and soon discovered the cause of the trouble. Minute organism were found in the wine in every instance, and the change of quality was due to their presence and growth. Of course they grew from germs, and if the germs could be destroyed the mischief would be averted. Judging from experiments in other liquids that heat would be fatal to the germs, he subjected the wines to a degree of heat which they could bear without injury, and found that all the germs were destroyed. The wine makers profit by the science of the chemist, and save millions of dollars formerly lost by the spoiling of the wines. Having been successful in making wines unalterable, he turned his attention to vinegar. This was subject to changes, which made it putrid and worthless. He detected another kind of organism in vinegar, and taught the dealers how to destroy it in germ and keep the vinegar unharmed.

LADY'S NEWSPAPER.

Within a few years there has been a tendency to reform the style of house-furnishing in England, to substitute solidity for sham, and real excellence for show. Fortunately this reform has extended to this country, and nowhere it is more needed, as nothing can be in worse taste and more unhome-like than the gaudy fittings and furnishings of the homes of some of our wealthy people. As Mr. Charles Eastlake is one of the prominent advocates of this sensible movement, and has writen a book on the subject, his name has become intimately associated with it, and the makers of furniture, etc., commend their wares by calling them in "Eastlake style," or "Eastlake patterns." In our modern furniture, a table for example, we have a foundation of pine, put together mostly with glue; this is covered with a thin veneer of mahogany, walnut, or other wood, and ornamented with carvings, which may mean something or nothing, and which are glued to the work. In a few years the pine framework warps and shrinks out of shape, the veneer peels, the carving gets chipped, and the whole becomes "shabby genteel." Eastlake and his associates would have the table *honest*, and be throughout what it appears to be on the surface, hence the table is made solid; if a costly wood can be afforded—well; if not, take a cheaper wood, but let the table be just what it pretends to be; if braces or bars are needed for strength, let these show, and indicate why they are used; and if ornament is desirable, let it be worked in the material, and not glued on. A table of this kind will *last*, and may serve for several generations. Finding that our ancestors, of a few centuries ago, understood the matter of furniture better than our cabinet makers of the present, Eastlake and the others reproduce many of the styles of by-gone times, and with some dealers "Eastlake" is used for antique. But the matter does not depend so much upon antiquity of style, as solidity, honesty, and appropriateness. To illustrate the matter, which we can not treat more in full at present, though heartily in favor of the reform, we give an engraving of the table which a furniture dealer would call an "Eastlake pattern."—*American Agriculturist.*



PLAIN OF GENNEVILLIERS.—BASINS IN WHICH THE OPERATION OF PURIFYING, BY CHEMICALS, THE DRAINS OF PARIS IS PERFORMED.



PLAIN OF GENNEVILLIERS.—RESERVOIR AND CANALS ESTABLISHED FOR UTILISING, BY WATERING LAND WITH, THE SEWAGE FROM THE DRAINS OF PARIS.

PURIFICATION OF THE RIVER SEINE.

(See pages 120 and 121.)

Of such vital importance is the "Sanitary Question" that we cannot refrain from taking advantage of every opportunity of affording to the public any information we can glean connected therewith. We have made this a special subject in the columns of this Magazine, and are pleased to find that our efforts to remedy the great sanitary evil of the day, are not altogether thrown away. We have, therefore, much pleasure in affording two illustrations of experiments that have been tried for purifying the sewage of Paris.

L'Illustration, a Parisian paper, to which we are indebted for the drawings, gives the following short account of the method of utilizing the sewage of that City :

"Everyone knows that a portion of the drains of Paris, which formerly discharged their contents direct into the Seine, are to-day received into an under-ground canal, through which they are conducted to the town of Asnière. By this disposition of the sewage, the waters of the river, above Asnières, are maintained in a state of sufficient purity for the use of the Parisians ; but they form, of themselves alone, from Asnières to St Denis, and to St Germain, a stream of fœtid and fatty water causing the waters of the Seine to be absolutely improper for domestic, and industrial uses. The inhabitants along the river side complain, not without reason, that the city of Paris confiscates the rest of the river to its own profit.

"Such is the situation from which that City now seeks a remedy.

"Two systems have presented themselves : one to dispose of the sewage for the purposes of agriculture ; the other, for their clarification before being thrown back into the river.

"Both of these systems are under an experimental trial. They were commenced in 1866, in a small field situated at Clichy, and have been continued during the following years on a reclaimed piece of land, of larger dimensions, on the plain of *Génevilliers*, between this village and Asnières on the Seine. Illustration fig. 1 shows the experiments in the field ; fig. 2, the purification in the basins.

"Drawn up by a steam-pump, the impure water is forced into pipes which cross the Seine under the footways of the bridge of Clichy, and then are thrown into a reservoir. From thence they go to fill a canal, walled in with stone, a little higher than the general elevation of the field under the experiment. The water which is conveyed over the field in small canals, forms the arteries of the system ; that conveyed by gutters constitutes the veins, which spread themselves over the large beds set aside for culture on the marshy land. In the same way the water is carried or brought by hand to the gardens. The distribution of the sewage is performed much in the same way as in ordinary irrigation, by partial obstruction of the gutters when necessary, or, by a complete inundation when it is desired to make a general deposit of the slime ; in the latter case the water flows gently over the field to give time for the settlement of the materials in suspension.

"The excess of waters for irrigation flow into three vast basins built with stone, in which is thrown a chemical salt, the sulphate of *alum*, in quantity sufficient to purify the volume of water received during a month. By the contact of the salt, the water is purified, and runs nearly clear and pure into the Seine.

"Every month the basins are emptied and dried, and the slime taken out on wheelbarrows.

"The privileges of the Sanitary Commission do not restrict to the experiments to the cultivation of the fields of Génevilliers, but lay down gutters to distribute the waters of the *canals* over the flat land of the farmers who express a desire to have it irrigated.

"It is in consequence of these different trials that a Commission has been formed in order to take into consideration the possibility of extending the system to utilising the whole of the waters of the drains of Paris, in place of discharging them into the Seine. This project has been brought before the public in a work of three volumes published by the Prefect of the Seine, under the title of the "*Purification of the Seine*," proposing to divert the sewage of the city into a district much larger than the plain of *Génevilliers*, by means of canals. "Before this commission every information connected with the subject has been laid and deposited in the office of the Prefect, and it has revealed a number of curious facts, and permitted the complaints of the inhabitants to be received in a satisfactory manner.

"The result of the experiments, in effect, has been as follows:—The enormous body of water absorbed by the soil of the fields experimented upon, and the land which has received it, has formed a sub-stratum of water under ground which percolates into the wells, and has caused inundations to cellars, from the fact that this layer of water is on a higher level, and that, at certain points, cases of typhoid fever have occurred, also the vegetables produced by an excess of watering, however seducing their appearance and weight may be, are very watery, contain but little nutrition, and will not keep.

"We enter now then into the vital question—bound down by certain restrictions which fix the problem before us to-day in the following manner; *i*, *e* the absolute necessity that the City of Paris should not throw back into the Seine the waters collected at Asnières, and to avoid the necessity, also, of not sacrificing the inhabitants of the suburbs. We must adopt a system which shall be a safeguard to every interest, and which is not above the financial means of the municipality."

IMPROVEMENT TO BACKS OF EASY CHAIRS.

(See page 125.)

We afford illustrations on page 125 of an improvement in the method of constructing the back of an easy chair so as to form a rest for the head. The construction, by reference to the diagrams, will be readily understood.

ROCK-CONCRETE SEWER TUBES.

An article that promises to be of great use in the construction of main sewers has lately been introduced by Messrs. Hy. Sharp & Jones, of Poole, Dorset, proprietors of the old-established Bourne-valley Stoneware Pipe works, near that town. The firm, not content with producing a stoneware pipe up to 18 in. diameter, are now also making large sewer tubes of almost any size, the material being a certain mixture of portland cement and other material, to which they have given the name of "Rock-concrete." The joint is formed in the thickness of the tubes itself without any projecting flange, and the spigot and rocket are so fitted as to allow space for a thin packing of cement in the joint, which once made becomes homogeneous with the tubes themselves.

DRILLING CHINA, GLASS, &c.—To drill china use a copper drill and emery, moistened with spirits of turpentine. To drill glass, use a steel drill tempered as hard as possible, and camphor and water as a lubricant.

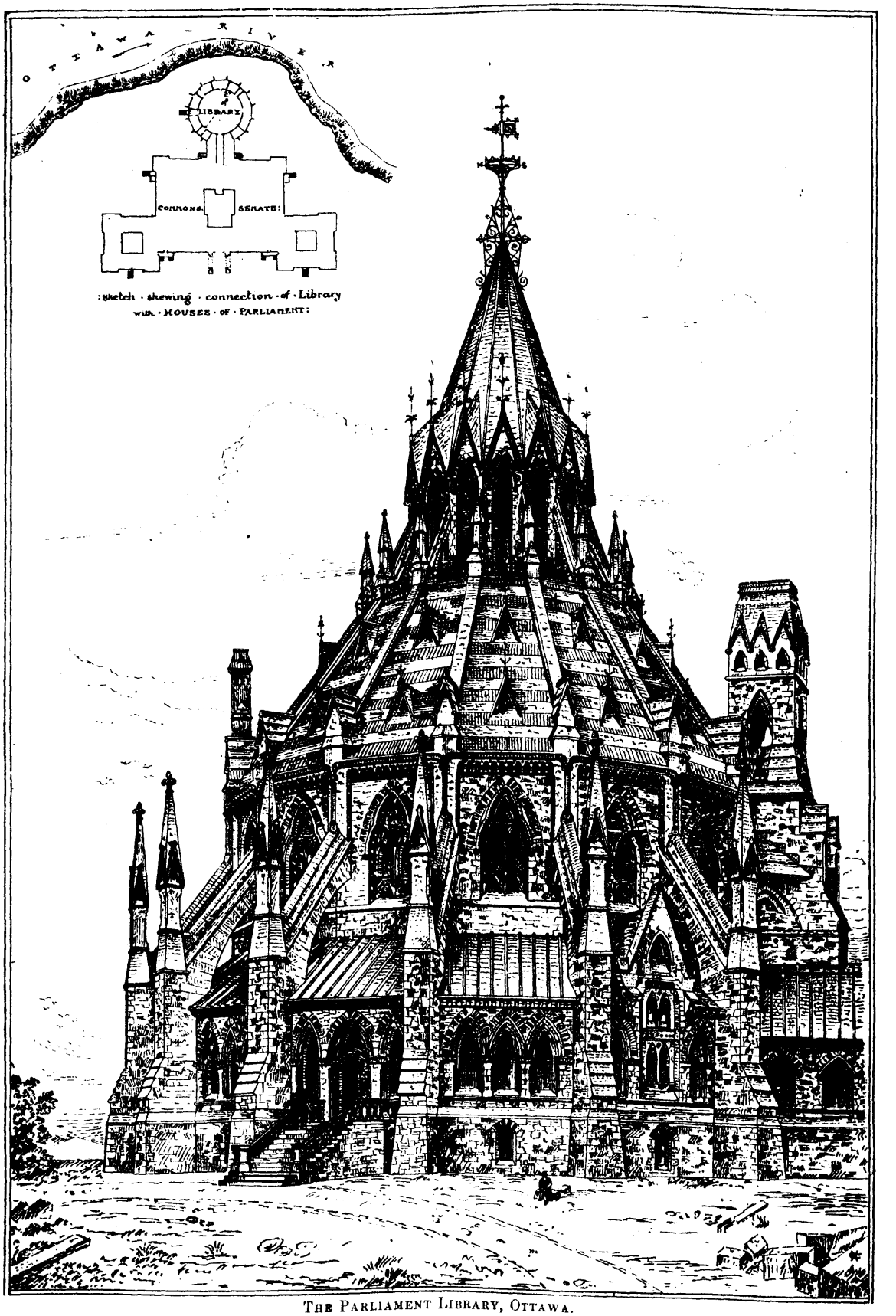
THE HISTORY OF THE PIANO-FORTE.

The history of the popular, and we may say favourite, instrument of the British public is not to be written in a book of seventy pages; that is to say, when its history is discovered, for the author of the brochure before us throws no new light on the subject. The history of the invention of the piano-forte, like that of the steam-engine, is buried in obscurity. We know the names of the persons who assisted in bringing the piano-forte into existence, but none of them appears to have indisputable claims to the credit of being the inventor. It is, in fact, probable that the piano-forte, such as we see it in instruments of a century ago, was developed by several individuals, some of them, doubtless, unacquainted with the doings of others, from the spinet and harpsichord with which they were all familiar. Although there are four names put forward as the inventors of the piano, by almost common consent we believe the merit has been awarded to Bartolomeo Cristofali, of Padua, who, so far as authentic records show, was the first to apply hammers to the strings instead of the plectra of the harpsichord. That was in 1710; but in 1711, Father Wood, an English monk resident in Rome, had not only made a piano-forte, but sold it to one Samuel Crisp, an English gentleman, who brought it to this country, where it produced an immense sensation amongst musicians. It sounds strange to be told of this instrument that rapid music could not be played upon it with good effect, but that when such slow pieces as the "Dead March" in "Saul" were performed, it was considered a marvel. Marius, a French manufacturer, in 1716, submitted to the Academy of Sciences of Paris two instruments which he called "clavecins à maillet;" but from the crudeness of the mechanism which Marius adopted it is tolerably clear that if he had heard of the invention of Cristofali he could never have seen it. The German C. G. Schröter may be dismissed from consideration; for, whatever improvements he may have introduced, he can scarcely be supposed to have invented the piano, being only about 11 years of age when Christofali undoubtedly introduced the hammer. The probability seems to be, as in so many other great inventions, that the crude idea had been floating about in men's minds for some time, and that simultaneously, or at about the same time, several persons hit upon different methods of striking the strings with hammers. The results produced are expressed by the name, which has been almost universally adopted: the hammers gave the performer the power of playing either loudly or softly, according to the force with which he struck the keys. Called at first forte-piano, the name has settled down to piano-forte, which is known throughout the civilised world. So far, then, the invention of the piano-forte is buried in obscurity; and although Mr. Brinsmead has had ample time to "re-write" this edition of his well-known book, he has not been able to throw any further light on the subject. In fact, the records bearing on the history of the instrument which Mr. Brinsmead has been able to study afford so little of information, that about one-half of his book has nothing to do with the "history" of the piano-forte. His first chapter is a sketch of the history of music, the second treats of "stringed musical instruments of the ancients," and the third of instruments with the key-board, in which he still retains the obviously incorrect assertion that Plenius, who, in 1741, invented the lyrichord, to imitate stringed bowed instruments, employed a *circular bow* to vibrate strings which were pressed near to it by the keys' mechanism. Without dwelling on the hypercriticism which would object to the phrase circular *bow*, we may point out that if Plenius really used a wheel as a "bow," it must have been a very large one, or the strings must have been arranged around it; for it is obvious that if the "circular bow" was of a reasonable size, the strings must have been taken to the different parts of his periphery, or the bow itself must have been movable. The information on the subject is meagre in the extreme, and it seems almost useless to hope for any real history of the instrument nowadays, seeing that the makers who lived about 1800, or were acquainted with the "secrets of the trade" about that time, are dead, without leaving a sign. Much confusion appears to exist between the names harpsichord and piano-forte, and we suspect that many of the so-called piano-fortes were, in reality, hammer harpsichords—that is, harpsichords to which a set of hammers had been applied; for although the hammer had been introduced by Cristofali in 1710, the piano-fortes which were made for some years subsequently must necessarily have been weak in tone. Hence there is but little doubt that even Cristofali himself never attempted to manufacture real piano-fortes, but rather sought to combine the effects of the pleetrum and the hammer in one instrument, which is known as the hammer harpsichord. For some years before 1760, many real pianos had been constructed in England, but it seems tolerably clear that, from their inferiority in tone, they had done little or nothing to supplant the harpsichord. About 1760, Zumpé, a German, commenced the manufacture of pianos, and he seems to have succeeded so well in catching the public taste that in 1774, Merlin took out a patent for an improved method of doing what had evidently been done before — viz., adding hammers to the harpsichord action. We suspect, however, that Mr. Brinsmead has fallen into an error when he says that Merlin "tried to effect a compromise between the harpsichord and the piano, which had nearly superseded it." So far from trying to "effect a compromise," Merlin merely improved certain details which were well known to makers 50 years before, and so far from the piano having superseded the harpsichord, there is little doubt that its manufacture was only just beginning to induce the harpsichord-makers to look around them. However, compromise or not, Robert Stodart patented a combined harpsichord and piano in 1777, and in 1792, James Davis patented a harpsichord piano with two rows of keys, the lower for the harpsichord, and the upper for the piano-forte. The piano was, however, slowly but surely being brought towards its present state, and when in 1821, Sebastian Erard patented his repetition action he practically perfected the key mechanism of the instrument. Meantime the playing of Clementi had produced so great an impression in favour of the piano-forte that the harpsichord soon went out of favour, and 20 years afterwards (1840) scarcely one was to be found. The harpsichord-makers naturally turned their attention to the construction of the piano-forte, and improvements were speedily made, which at the present time, have led to the production of a useful and unquestionably favourite instrument, which can be made in a cheap form as well as in a costly and elaborate one.

We shall say nothing here of the rival makers: suffice it to say that one cannot expect "all the improvements" for the minimum price. "Pianos," says Mr. Brinsmead, "now seem almost to have reached perfection. What will the next great invention be? Perhaps the sustaining power will be obtained without the aid of such subterfuges as the current of air to keep the string in vibration, the resined barrels and bow in imitation of the violin, or the second hammer producing the disagreeable tremolo by its repeated blows: indeed, Mustel, of Paris, has already introduced a small piano in which tuning-forks are struck instead of strings, and this gives greatly-increased vibration of tone." What Mr. Brinsmead means by "increased vibration of tone" we are at a loss to conceive, and we presume that if Mustel has divised such an instrument it is nothing more than the bell-piano. There are many persons, however, who will demur to the term subterfuge as applied to the method of "bowiiig" the strings of a piano-forte, and there are certainly not a few who think that if as much attention had been devoted to bowing the strings as to plucking or striking them, the "piano-forte" would have become, by this time, a more perfect instrument.

Mr. Brinsmead's notes on the construction of the piano-forte, on choosing an instrument, on tuning and remedying small defects, will be found of use to many readers. There are few persons, and, indeed, very few purchasers of pianos who would suspect the strain upon the framing of a piano varies from 10 to 16 tons, according to its design, the large grands, of course, having the greatest tension on their strings. This fact renders plausible the usual answer that is made to the question—"Where do all the pianos go?" seeing that considerably more than 100,000 are made annually in London alone. The answer is suggestive, especially to a purchaser, when he hears that it is "to pieces," which is literally true probably of half the instruments made. Mr. Brinsmead supplies a list of the patents in connection with the instrument, which he has brought down to November 15, 1875—a list which will be of use to those who desire to trace the history of the instrument.—*English Mechanic.*

FLANNEL.—There is much diversity of opinion among medical men as to the propriety of wearing flannel next the skin. The arguments appear to be in favour of the practice, provided that the thickness of the flannel be proportioned to the seasons of the year. In winter it should be thick, in summer it can scarcely be too thin. Flannel is preferable to linen or calico, because, although it may be saturated with perspiration, it never strikes cold to the skin; whereas linen under similar circumstances, always does; and the sudden application of cold to the skin, when warmed by exercise, checks the circulation, and causes illness.

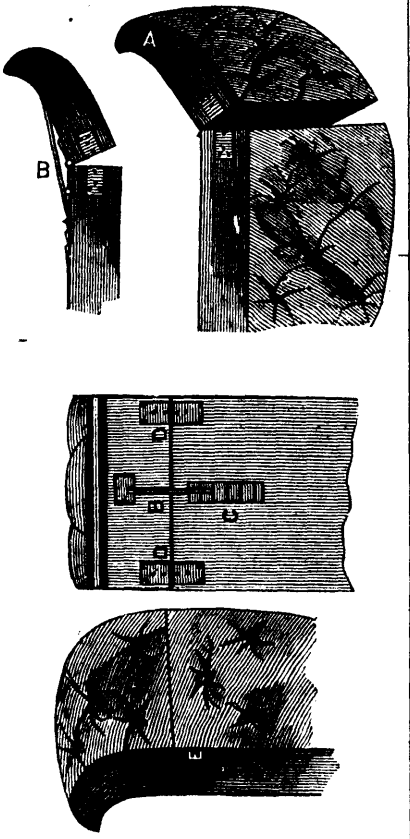


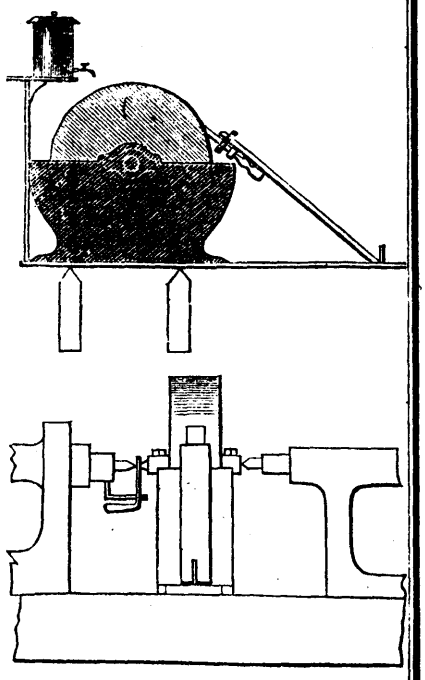
THE PARLIAMENT LIBRARY, OTTAWA.
From the "American Architect and Builder."

Natural History.

The Reed-Bird, or Bob-o-link.

Improvement to the Backs of Chairs.





Easy Method of Grinding.

CARE OF THE SICK.

TEA AND A COATED TONGUE—LEMONADE, BARLEY-WATER, ETC.

The only patients known to refuse tea, have been typhus cases, and the first sign of their getting better was their craving for tea. In general, the dry and coated tongue always prefers tea to coffee, and will quite decline milk, unless with tea. Coffee is a better restorative than tea, but a greater impairer of the *digestion*. Let the patient's taste decide. You will say that, in cases of great thirst, the patient's craving decides that it will drink *a great deal* of tea, and that you cannot help it. But in these cases, be sure that the patient requires diluents for other purposes then quenching the thirst; he wants a great deal of some drink, not only of tea, and the physician will order what he is to have, barley-water or lemonade, or soda-water and milk, as the case may be.

COFFEE SAID TO PREVENT "WASTE."

Lechman, quoted by Dr. Christison, says that, among the well and active, "the infusion of one ounce of roasted coffee daily will diminish the waste" going on in the body "by one fourth," and Dr. Christison adds that tea has the same property. Now this is the result of actual experiment. Lechman weighs the man, and finds the fact from his weight. It is not deduced from "analysis" of food. Experience among the sick shows the same thing.*

COCOA.

Cocoa is often recommended to the sick in lieu of tea or coffee. But independently of the fact that sick people very generally dislike cocoa, it has quite a different effect from tea or coffee. It is an oily, starchy nut, having but little restorative power, but simply increasing fat. It is like mockery of the sick, therefore, to call it a *substitute* for tea. For any renovating *stimulus* it has you might just as well offer them chesnuts instead of tea.

BED AND BEDDING.

FEVER A SYMTOM.

A few words in relation to bedding and bedsteads; and principally regarding patients who are entirely or almost entirely confined to their beds.

Feverishness is generally supposed to be a symptom of fever. Sometimes it is, but usually it is a symptom of *bedding*. The patient has had re-introduced into the body the emanations from himself which day after day and week after week have saturated his unaired bedding.

UNCLEANLINESS OF ORDINARY BEDDING.

In looking out for an example in order to show what *not* to do, we should take the specimen of an ordinary bed in a private house; a wooden bedstead, two or even three mattresses piled up above the height of a table, with a valance attached to the frame. Nothing but a miracle could ever thoroughly dry or air such a bed and bedding. The patient must certainly alternate between cold damp after his bed is made, and warm damp before, both saturated with organic matter,‡ and this from the time the mattresses are put under him until the time they are picked to pieces, if this is ever done.

SOILED SHEETS.

If you consider that an adult in health exhales by the lungs and skin, in the twenty-four hours, three pints at least of moisture, loaded with organic matter ready to enter into putrefaction, that the quantity in sickness is often greatly increased, the quality is always more noxious, just ask yourself next where does all this moisture go to? Chiefly into the bedding, because it can not go *anywhere else*. It *stays* there, because with the exception of a weekly change of sheets, scarcely any other airing is attempted. A nurse will be careful to fidgetiness about airing the *clean* sheets from clean *damp*, but airing the *used* sheets from *noxious* damp will ever occur to her. Besides this, the most dangerous effluvia we know of are from the excreta of the sick. These are placed, at least temporarily, where they must throw their effluvia into the under side of the bed, and the space under the bed is never aired; it can not be, with our arrangements. Must not such a bed be *always* saturated, and be always the means of *introducing again* into the body of the unfortunate patient who lies in it that poisonous matter which nature is trying to *get out* of the system?

LOW BEDSTEADS BETTER THAN HIGH ONES.

If a bed is higher than a sofa, the patient often prefers not to get out at all, rather than undergo the fatigue of getting out. If the bed were a low one, he might often feel like taking a few minutes' exercise every day in another room, or even in the open air. It is so very odd that people never think of this, or of how many *more* times a patient who is in bed for twenty-four hours is obliged to get in and out of bed than they are who only get into bed and out of bed, perhaps, once during the twenty-four hours.

BED IN A LIGHT SPOT.

A patient's bed should always be in the lightest spot in the room; and he should be able to see out of a window.

NO BED WITH CURTAINS.

It is scarcely necessary to say that the old four-post bed with curtains is utterly inadmissable, whether for sick or for well. Hospital bedsteads are in many respects very much better than private ones.

SCROFULOUS DISEASES, ETC., OFTEN A RESULT OF DISPOSITION OF BED-CLOTHING.

There is reason to believe that not a few of the cases apparently resembling scrofula, among children, proceed from the habit of sleeping with the head under the bed-clothing, and so inhaling air already breathed, which is further contaminated by exhalations from the skin. Patients are sometimes given to a similar habit, and it often happens that the bed-clothes are so disposed that the patient must necessarily breathe air more or less poisoned by exhalations from his skin. A good nurse will be careful to attend to this. It is an important part, so as to speak, of ventilation.

BED-SORES.

It may be worth while to remark, that when there is any danger of bed-sores, a blanket should never be placed *under* the patient. It retains damp, and acts like a poultice.

HEAVY AND IMPERVIOUS BED-COVERINGS.

Never use anything but light blankets as bed-covering for the sick. The heavy cotton impervious counterpane is bad, for the very reason that it keeps *in* the emanations from the sick person, while the blanket allows them to pass through. Weak patients are invariably distressed by a great *weight* of bed- clothes, which often prevents their getting any sound sleep whatever.

PILLOWS.

One word about pillows. Every weak patient, be his illness what it may, suffers more or less from difficulty in *breathing*. To take the weight *off* the poor chest, which at best is hardly up to its work, ought, therefore, to be the object of the nurse in arranging his pillows. Now, what does she do, and what are the consequences? She piles the pillows one upon the other like a wall of bricks; the head is thrown on the chest, and the shoulders are pushed forward, so as not to allow room to *expand*. The pillows, in fact, lean the patient, not the patient upon the pillows.

BED FOR THE SICK.

It is impossible to give a rule for this, because it must vary with the figure of the patient. Tall patients suffer much more than short ones, because of the drag of the long limbs upon the waist. But the object is to *support*, with the pillows, the back below the breathing apparatus, and above the hips, so as to allow the shoulders room to fall back, and to support the head without throwing it *forward*. The suffering of exhausted patients is greatly increased by neglect of these points. And many an invalid, too weak to drag about his pillows himself, slips his book or any thing at hand behind the lower part of his back, to support it.

CLOTHING FOR THE SICK.

As a rule, it is too heavy in weight—that is, it weighs more in pounds than it ought, to give the warmth it might. Fabrics looser in texture contain more air between the fibres, and as a general thing, they are much warmer than the more closely woven materials.

The head weighs several pounds, the arms with the shoulders several more, and all must be supported on the upper part of the chest by a few muscles. In ordinary health, these muscles have strength to do it, but with the weak or sick, they have less than enough. Each piece of clothing is an additional burden, and unless chosen with proper thought, it is more than the wearer can wear, unless he can get a pillow or bed to help. Sometimes the sick person will be seen to get up and walk about, wearing a garment suitable in weight; when before, with something else, there was a complaint of constant weariness.

* In making coffee, it is absolutely necessary to buy it in the berry and grind it at home. Otherwise you may reckon upon its containing a certain amount of chickory, *at least*. This is not a question of the taste, or of the wholesomeness of chicory. It is that chicory has nothing of the properties for which you give coffee. And therefore you may as well not give it.

‡ For the same reason, if, after washing a patient, you must put the same night-dress on him again, always give it a preliminary warming at the fire. The night-gown he has worn must be, to a certain extent, damp. It has now got cold from being off him for a few minutes. The fire will dry and at the same time air it. This is much more important than with clean things.

MEDICAL PROGRESS.

It is true, says the *Manufacturer*, that medical practice is still, in many respects, defective, empirical, tentative and even sometimes mere guess-work; hence the carefulness of those who know the deficiencies of the healing arts, while boldness in prescribing belongs especially to quacks, who act after the maxim, "kill or cure," and mostly kill; but, luckily for the quacks, the surviving relations of a diseased patient usually think that he would have died, notwithstanding the medicines he took, while, in fact, the patient who did not die, recovered, notwithstanding the drugs he swallowed.

In the meantime, with all the deficiencies of the medical art, and the little benefit enjoyed often by single individuals, the good done by the clearer insight of the causes of diseases, the study of preventatives and of the correct principles of hygiene has been an immense blessing to mankind in general.

In order to realize this fully, we have only to look at the death lists of large European cities two centuries ago, and we find that a large portion of the then mortal diseases have been deprived of their dangerous tendency, and several other diseases have become extinct. Many people then died of fever and ague. Cromwell died of it. At present it is no longer mortal in the temperate zone, and the reason is that improved drainage and cleanliness on the part of the people in general have caused the disappearance of the moist, foggy and unhealty atmosphere which surrounded then the dwellings in every densely populated district. Dysentery, or bloody flux, formerly caused many deaths; now it is seldom fatal. Small-pox was the most terrible of all diseases, carrying off victims by the hundreds, and scarring or blinding others by the thousand. Spotted fever, scurvy and the plague prevailed every year somewhere, but now they all are diseases of the past, and this by reason of the more correct knowledge of their nature and the means applied, resulting either in a total prevention, or at least in giving the disease a more mild form and favorable result. Even cholera, which first appeared in Europe 45 years ago, has, by a better knowledge of its nature, lost some of its former infallible malignity. It is the same with scarlatina; and we enter upon the threshold of so much knowledge respecting the nature of phthisis, that we may justly hope to see this scourge of families become more and more rare, and this by preventative measures, to be applied when there is a tendency in that direction.

Preventative medicine is slowly attaining such a degree of perfection, that the time is not very distant when the occurrence of an epidemic will be a reproach to city governments, while the chief functions of the foremost physicians will be the preservation of the public health. This assuredly will be a most noble calling, and the present boards of health, established in our large cities, is a move in the right direction, and has already been a benefit to the inhabitants which they cannot value at too high a price.

DOMESTIC RECEIPTS.

How to Curl Feathers.—Heat them gently before the fire; then with the back of a knife applied to the feather and drawn smartly along the fibres, each separately, they will curl well and quickly.

Tartaric Acid in Cookery.—This acid is put up under the false name of fruitina, and is largely used to make tarts, pies, &c. It is not a rank poison, but cannot be used very extensively without harm, and is no substitute for fruit.

Ink stains may be removed from coloured fabrics which would not bear the application of acids, chloride of lime or other strong agents, by a concentrated solution of sodium pyrophosphate (R. Bottger); old stains do not yield at once, but require a prolonged application.

An Apple Meringue.—This is a delicate, quite showy dish, easy to make, and good when it is done. It needs good apples, that is, those with a sprightly flavor; pare, quarter, and remove the cores; stew in a bright tin or enameled sauce-pan, with sugar to taste, and a little cinnamon; as soon as the apples are done through, having kept the quarters as whole as possible, turn them into a pudding dish, be careful not to break them up. While the apples are cooking, get the meringue (pronounce it always *mee-rang*) ready. For a moderate sized dish, use the whites of four eggs, beaten to a firm froth, four ounces of sugar, and flavor with lemon; spread this over the apples in the dish, set the dish in the oven, and bake until the surface is well and evenly browned. Serve hot for dessert, but some prefer to let it get cold and eat it with cream.—*American Agriculturist.*

Moiré Metallique is a beautiful crystalline appearance given to tin plate by brushing over the heated metal a mixture of two parts of nitric acid, 2 of hydrochloric acid, and 4 of water; as soon as the crystals appear, the plate is quickly washed, dried and varnished.

To Make Plaster of Paris as hard as Marble.—The plaster is put in a drum, turning horizontally on its axis, and steam admitted from a steam boiler; by this means the plaster is made to absord in a short space of time the desired quantity of moisture which can be regulated with great precision. The plaster thus prepared is filled into suitable moulds; and the whole submitted to the action of an hydraulic press; when taken out of the moulds, the articles are ready for use, and will be found as hard as marble, and will take a polish like it.

How to Write on Glass in the Sun.—Dissolve chalk in aquafortis to the consistency of milk, and add to that a strong dissolution silver. Keep this in a glass decanter well stopped. Then cut out from a paper the letters you would have appear, and paste the paper on the decanter or jar, which you are to place in the sun in such a manner that its rays may pass through the spaces cut out of the paper, and fall on the surface of the liquor. The part of the glass through which the rays pass will turn black, whilst that under the paper will remain white. Do not shake the bottle during the operation. Used for lettering jars.

Painting Floors. — There is but one paint suitable for the purpose—*French Ochre*. First if the boards have shrunk, clean out the joints well, and with a small brush give them a heavy coat of boiled linseed oil, then putty up solid. Now paint the whole floor with a mixture of much oil and little ochre, for the first coat, then, after it is well dried, give two more coats of much ochre and little oil, finally finish with a coat of first rate copal varnish. This is an extremely durable paint for floors, indoors or out, such as verandas, porticoes, and the like. A floor stain is best mixed with *oil*, and finally varnished.

Avoid Chills.—It is one of the facts best known to science that when a part of the outer surface of the body has been exposed long to cold the greater risk is run in trying suddenly to re-induce warmth. To become thoroughly chilled and then to pass into a very warm atmosphere, such as is found near a fire, results in a dangerous reaction which, a few hours later, may cause pneumonia, or bronchitis, or both diseases. The capillaries of the lungs become engorged, and the circulation becomes static, so that there must be a reaction of heat inflamation before recovery can occur. Common colds, says a contemporary, are taken in the same way; the exposed mucous surfaces of the nose and throat are subjected to a chill, then they are subjected to heat; then there follows congestion, recreation of heat, pouring out of fluid matter, and other local phenomena of catarrh.

Burns and Scalds.—The recent fearful explosion on board the British ironclad *Thunderer*, has called out the publication of many recipes and remedies. Among them all, the following, contributed by an old and experienced physician, has the merit of convenience and readiness. The remedy is simply this: The common whiting of commerce (found in nearly every kitchen) reduced by cold water to the consistence of thick cream, is to be spread on a light linen rag, and the whole burned surface instantly covered, and thus excluded from the action of the air. The ease it affords is instantaneous, and it only requires to be kept moist by subsequent occasional sprinklings of cold water. Painting the surface with ink soon relieves the pain of a small superficial burn.

To Prepare Squash for Pies.—[The following comes from "B. L. J.," Burlington Co. The method is well suited to the Hubbard and other hard-shelled, long keeping squashes, and is equally useful for preparing squash for the table. Ed.] My plan is to saw a squash in half, clean out the seeds, etc., Then place open end down in a pan containing an inch or so of boiling water, placing small slips of wood or thick wire underneath them, so that the edge will not burn on the pan. Let it steam until thoroughly tender. The flesh of the squash is then easily scraped out with a spoon, and run through a colander, if thought desirable, though it is not necessary, there being no hard lumps in it. By this plan none of the aroma of the squash is lost, while it greatly reduces the labor of preparation. Another plan is to take the two halves after cleaning from seeds, etc., join them together, and bind firmly with twine, and place in the oven to bake until tender. There is little, if any difference in the result, but I give the preference to the first method as being much the easiest. *American Agriculturist.*

No. 3. Nothing but Leaves.