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CANADIAN MECHANICS MAGAZINE AND PATENT OFFICE RECORD

Vol. 5. AUGUST, 1877. No. 8.

TO WHAT CAUSES ARE TO BE ATTRIBUTED THE WANT OF SANITARY PROVISIONS IN THE DWELLINGS OF THE UPPER AND MIDDLE CLASSES ?

It has often been a matter of surprise to the residents of so many of the better classes of houses how they should be so very unhealthy—evidently from bad drainage—although it often is difficult to discover from whence the evil arises, when the drains are covered over with boarded floors.

We will first endeavor to point out some of the sanitary defects which exist in so many good houses, and, secondly, the best method which should be adopted to rectify the same.

In the first case, many of these buildings are erected as mere speculative investments, built to "sell," and the proprietor has curtailed his expenditure in every possible way where bad workmanship will not meet the eye. The interior and exterior may be all that could be desired, but cheapness in every form where cheapness could be hidden, is too frequently the rule in the erection of houses built simply to rent or to sell, and if there is one particular portion of a dwelling where parsimony is exercised more than in another, it generally is in the drainage, because it cannot be seen.

As a general rule, the subsoil of houses is not disturbed, beyond a depth necessary for a foundation ; but frequently, in cities like Montreal, many depressed portions of it have been brought up to a grade by the filling in of refuse of the most putrescent nature, and which lays the sure foundation for future illness ; upon these made foundations houses are frequently erected, and the basements simply floored over, and in cellars not even floored. Now, whilst the foul gases constantly arising from these undrained foundations, which are sometimes saturated with impurities, pass off into the open air without much injury to the surrounding neighbours, they become a bed of pestilence when covered over and concentrated inside the walls of a dwelling, within which in winter time the windows are nearly always closed. Here, then, from one cause arises a most insiduous enemy, and to strangers to the history of the locality a mystery how, when they have used every precaution in respect to ventilation, and even to a careful examination of the drain pipes, that low fevers and sickness so often prevail in the family. These foundations are sometimes little better than cesspools in the very centre of dwellings, filled with putrescent alvine matter.

The next defect in building, and the most common one, is from cheap drains and the defective method of laying them. It frequently happens that this matter, and which is of the utmost importance, is left to mere laborers to perform, and although the architect gives the proper gradients, he fails to see the work properly done, and as a consequence the drain pipes are scarcely ever properly laid, and the joints not completely cemented all the way round. The full gradient laid down to be followed is seldom perfectly done, and the pipes laid irregularly; the consequence is that they soon become silted up, the pressure of the sewage causes the joints to leak, and the saturation of the soil with general escape of insalubrious vapor to the interior of the house, follows as a natural consequence.

What, therefore, with impure subsoil and defective drainage, the basement of the house is totally unfit for habitation. In truth, such houses constructed for the upper and middle classes are but as receivers over a still below them, in which impurities and gases are distilled over, being collected and condensed above.

The staircases of many houses, instead of being used as ventilating shafts for carrying off the impure air and gases, have no vent, and therefore, are shafts for the collection of impure air, which is conveyed therefrom to the bed rooms. The basement, also, instead of all of its division walls being built of brick, is formed of studded partitions, up which the foul air is also drawn and distributed into every room in the house. Water-closets also are built in the middle of the house without any ventilating shafts carried to a warm flue in the chimney, and are frequently constructed with no ventilator whatever. The coal gas, which in winter is frequently escaping from the stove in the hall, is drawn up the wall of the staircase to the upper part of the house, and finding there no pipe through which to escape, becomes distributed throughout the dwelling, and if its deleterious effects upon flowers are so apparent, what must it be upon the human system? Thus, the staircase of the house, which should in fact be considered as its lung, is made the vehicle of contagion, all the impurities of the house discharging into it. Cupboards for soiled linen and other impure matter, are generally found in dark places, such as spandrels of stairs, and being unventilated contribute their quota to the infection of the air, and by their position promote its distribution. Thus, some of our greatest conveniences are rendered dangerous nuisances by position and construction.

We have so far been alluding to town houses, where water is supplied from the city reservoirs—but in country houses, the position of the cisterns next claims our attention. Generally speaking, they will be found located in the most out-of-the-way and inaccessible parts of the house, and consequently, from this cause alone, become neglected and unclean, the water being fouled by sedimentary sludge and feculent matter, which quickly accumulate therein. In the basement they are usually situated in the vaults and over the scullery sinks, the scullery itself being a narrow ill-ventilated slip, inadequately proportioned for its work. The waste-pipe from the cistern is usually carried into the drain, where it is supposed to be trapped. The result of the arrangement is this, that as regards the waste it conducts the sewer gas into the water, where it is absorbed; that the impure air proceeding from the sink, with its generally defective overflow, is also imbibed by the water in the cistern; and that a similar process goes on from the supply of the servants' water-closet, which is also generally connected therewith. When you consider that the whole of the potable water of the establishment is usually drawn from this supply, you cannot wonder at the lethal effects which are produced. In the upper portion of the house, more often than not, the cistern is placed on the roof, in connection with the ventilating pipes or closets (if any be provided), fully exposed to all the contaminating influences of the dirt and filth which congregate there; the wastes and water-closet apparatuses are connected therewith, as just mentioned, and with the same lamentable results.

The facts above enumerated are perhaps the most salient sanitary defects of the internal arrangements of the houses of the middle and upper classes, although many other imperfections might easily, if time permitted, be animadverted on, such as position and plan of landing, want of ventilation, not only of drains and conveniences, but of houses generally; method of heating, and carelessness as to disposition of aspect of rooms with regard to the purposes they are destined to fulfill.

Now, how are these defects to be remedied and prevented?

1. We require additional compulsory, not permissive, sanitary enactments. A Building Act is required so as to confer authority and large powers on the city surveyor, and local authorities should be amenable to a central board to carry out with strictness the provisions of the Acts of Parliament.

2. The clauses of the present Municipal Acts should be carefully utilized and strictly enforced, and not rendered inoperative by the prefunctory manner in which their obligations are construed, amounting to avoidance thereof.

3. It should be imperative that local authorities should appoint well-qualified and well-paid officers to interpret and to carry into effect the laws relating to the health of the people; men whose professional attainments, scientific knowledge, and social position will command respect and insure obedience; men who have the *fortiter in re* to insist, and the *suaviter in modo* to persuade. The best prevention, however, will be by educating the people to a sense of their own danger and ignorance. We shall never succeed in making them wise, cleanly, temperate, or pious by Act of Parliament; if we cannot appeal to their higher and better qualities, we must address ourselves to their lower and meaner natures,—we must indisputably prove to them how their individual interest and welfare are combined with a due regard to sanitary precautions. If once it becomes an acknowledged fact that people will not inhabit houses deficient in the essentials of life—fit air to breathe, fit water to drink, fit drainage for health—depend upon it houses will be erected with due regard to sanitary considerations, unsanitary houses will be altered and their defects rectified; the supply will soon equal the demand.

The points to be observed, and the precautions to be adopted, in building healthy urban dwellings, happily need no great amount of intelligence for their comprehension, require no scientific skill for their procuration, and involve no large expenditure in their execution; they are but few, simple in the extreme, and only accord with common-sense observation.

The foundations of drainage of old houses should be carefully examined and made perfect.

All houses built on ground made up of noxious soil should have concrete floors, and damp courses should be inserted over the footings. Earth should not rest against the wall, but be kept back by either dry areas, loose stones or coal ashes, and should be well sub-drained.

The main drains should not be carried through the centre of the house, but wherever possible through the back yards, and they together with their branches should be so constructed, that they could be easily inspected. No basement should ever be allowed to be constructed at such a level as will not permit of the pipes having good steep gradients to the sewer.

All pipes should be of glazed earthenware having joints made of Portland cement, and not of blue clay as is too frequently the case; they should rest on good solid foundations.

The connexion with the sewer should be direct. It is a most important question as to the insertion of a syphon between the house-drain and the sewer. We have very frequently found this to silt up and become a nuisance. If the ventilating pipe to the sewer works perfectly in all weathers, no syphon is necessary.

Our space will not permit of continuing to a greater length our remarks; sufficient, however, has been stated to point out the causes so often wondered at why houses for the middle and upper classes are so unhealthy, and we fear will so continue until the direction of the sanitary affairs of cities in Canada is placed in the hands of competent and well paid officials who will see that the law is carried out, not only with the utmost rigour, but with the strictest impartiality.

THE streets of London, if placed in one line, would form an avenue of 7,000 miles in length. In the daily cleansing of the streets about 14,000 men find employment, and 6,000 horses and 2,400 carts. The engineer-in-chief has a salary of £2,000. The work goes on day and night, but the actual sweeping does not commence until 8 P.M.

SIR JOSHUA REYNOLDS.

This distinguished painter having heard of a young artist who had become embarrassed by an injudicious matrimonial connection, and was on the point of being arrested, immediately hurried to his residence to inquire into the truth of it. The unfortunate man told him the particulars of his situation, adding that forty pounds would enable him to compound with his creditors. After some further conversation Sir Joshua took leave, telling the distressed painter he would do something for him, and when he was bidding him adieu at the door he took him by the hand, and after squeezing it in a friendly manner hurried off with that kind of triumph in his heart which the generous can alone experience, while the astonished artist found that he had left in his hand a check for one hundred pounds.

A Surfeit.—A surfeit in man is called founder in a horse, and is over-eating, eating more than the stomach can possibly convert into healthful blood. Wise men and careful men will sometimes inadvertently eat too much, known by a feeling of fullness, of unrest, of a discomfort which pervades the whole man. Under such circumstances, we want to do something for relief; some eat a pickle, others swallow a little vinegar, a large number drink brandy. We have swallowed too much, the system is oppressed, and nature rebels, instinct comes to the rescue and takes away all appetite, to prevent our adding to the burden by a morsel or a drop. The very safest, surest, and least hurtful remedy, is to walk briskly in the open air, rain or shine, sun, hail, or hurricane, until there is a very slight moisture on the skin, then regulate the gait, so as to keep the perspiration at that point until entire relief is afforded, indicated by a general abatement of the discomfort; but as a violence has been offered to the stomach, and it has been wearied with the extra burden imposed upon it, the next regular meal should be omitted altogether. Such a course will prevent many a sick hour, many a cramp, colic, many a fatal diarrhea.—*Hall's Journal.*

New Process for Preserving Iron from Rust.—Professor Barff, of England, has lately established the fact that if iron be subjected to the action of superheated steam, a black oxide forms on its surface which is an effectual preventive of rust, is much harder than the iron itself, and its adhesion to the iron is even greater than that of the iron particles for each other. He found that iron when placed for 5 hours in a closed space with superheated steam having a temperature of 500° Fah., a film of oxide is formed on the surface which is so hard as to withstand the action of emery paper; while with the temperature of the steam as great as 1200°, and the time of action from 6 to 7 hours, the oxide is so hard as to even withstand filing, as well as any degree of moisture without rusting. With exception of the change of color referred to, the oxide has no other effect on the iron; the character of the surface is not altered, and polish is perfectly maintained.

For the want of proper steam space, Prof. Barff has not as yet treated large surfaces, but is thoroughly convinced of success in case of experiment.

At a meeting of the Society of Arts of London, specimens treated, comprising gun barrels, pipes, bolts, pans, etc., were exhibited and experimented upon. The articles, after being exposed for 6 weeks to the action of the weather, showed no traces of rust, only in such places where either purposely or by accident the black oxide was not formed. A bolt which was covered with oxide for but one half its length had the other half entirely covered with a thick layer of rust on a similar exposure, but without the slightest encroachment on the treated half. As a further experiment, an iron spout head was treated and then crushed with a hammer; on being exposed to all changes of moisture, even to weak acids in the laboratory of the Professor, the broken edges were only attacked, the surfaces were unchanged.

It is anticipated that this process will be admirably adapted for treating steam boilers and the iron plates used in marine construction, as well as for innumerable other purposes; the copper vessels used for culinary operation can be dispensed with as well as the lead pipe for water supply.

A Greenwich society is about instituting a course of experiments in order to establish the durability of the iron prepared by Prof. Barff's process, in order to report on the advisability of its application to the iron used in architectural construction.—*Journal Officiel, per Gewerbeblatt aus Württemberg.*

The British iron trade is in a worse condition than that of the United States. There are heavy failures constantly occurring, there is a rapid decline in wages, and the works advertised for sale are found occupying considerable space in many papers of the Kingdom.—*Iron World.*

CHISEL-TOOTH SAWS.

(See page 229.)

The cut shows an improved mode of inserting saw teeth, as recently brought out by a well-known firm. *B* represents the saw plate, from which are cut circular sockets whose edges are beveled to a V form.

The teeth are composed of holders, *C*, corresponding in diameter, thickness, and bevel, with the sockets. There is on each holder a projection locking into a recess in the bit or tooth proper, *D*, the back of which is curved and beveled to correspond with the socket, and which has a shoulder to correspond with an abutment on the plate. The bit is matched with the holder and the two locked together and in the socket by wrenching the latter round until the shoulder on the bit strikes the abutment on the plate.

The tool or lever for thus inserting the teeth is shown in operation. The bits are drop-forged from best steel; each one should bear about three sharpenings. There is no necessity for swaging, as the spread is given to the bit when struck out. The advantages which should accrue from the use of such inserted teeth are the saving of time and plates, in case of accident to one tooth, over the ordinary plan of bringing the whole plate down to the longest radius permissible; and the high temper of teeth attainable.

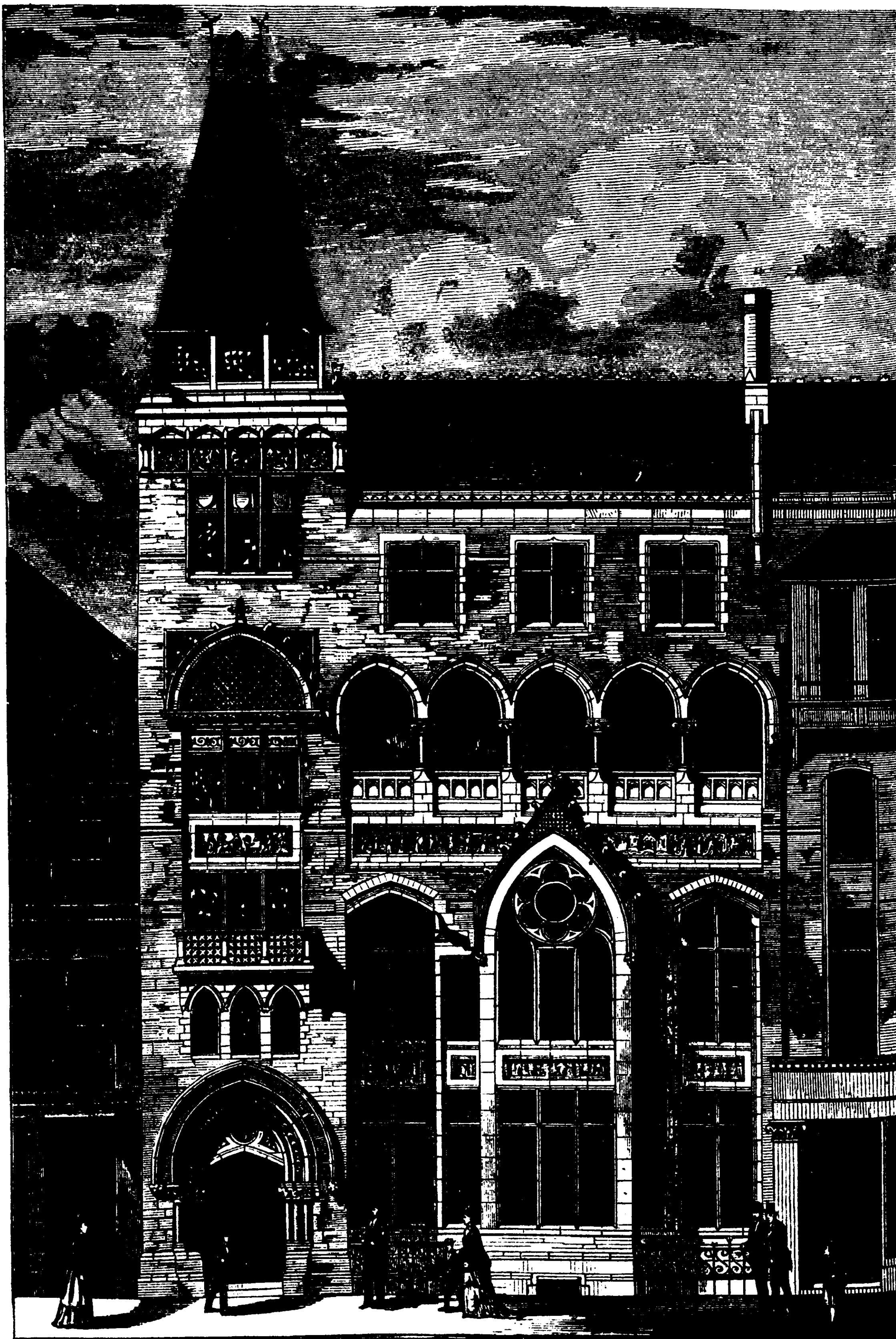
THE VAPART DISINTEGRATOR.

(See page 229.)

We annex an illustration of a disintegrating machine largely used in France. It consists of a cast-iron case provided with two doors, which can be opened as shown, for inspection or renewal of the various parts. Through the middle of the case runs a vertical shaft, with bearings at top and bottom, and carrying at the upper extremity a pulley by which the shaft is driven. Within the case, three discs are mounted on the shaft at equal intervals. On these discs are bolted a series of radial ribs as shown. Around the inner side of the case, as well as on the doors, are placed strong cast-iron toothed segments, and beneath each segment is placed an inclined and curved plate. The operation of the machine is as follows: The material to be disintegrated is fed in from the top and falls upon the upper disc, and the quick rotation of the latter drives the material forcibly against the corresponding toothed segments. From here it falls down the inclined plates, and is delivered on the middle portion of the second disc, where the same operation is repeated on it, as well as on the bottom disc, whence it is delivered into a hopper below. The disintegration can be carried to any desired extent, and judging from the samples we have seen of the work leaves nothing to be desired. The machine is now being introduced into this country by Messrs. Bird & Co. of Lawrence Pountney Lane, who have arranged for its manufacture with the Hydraulic Engineering Company, Chester.

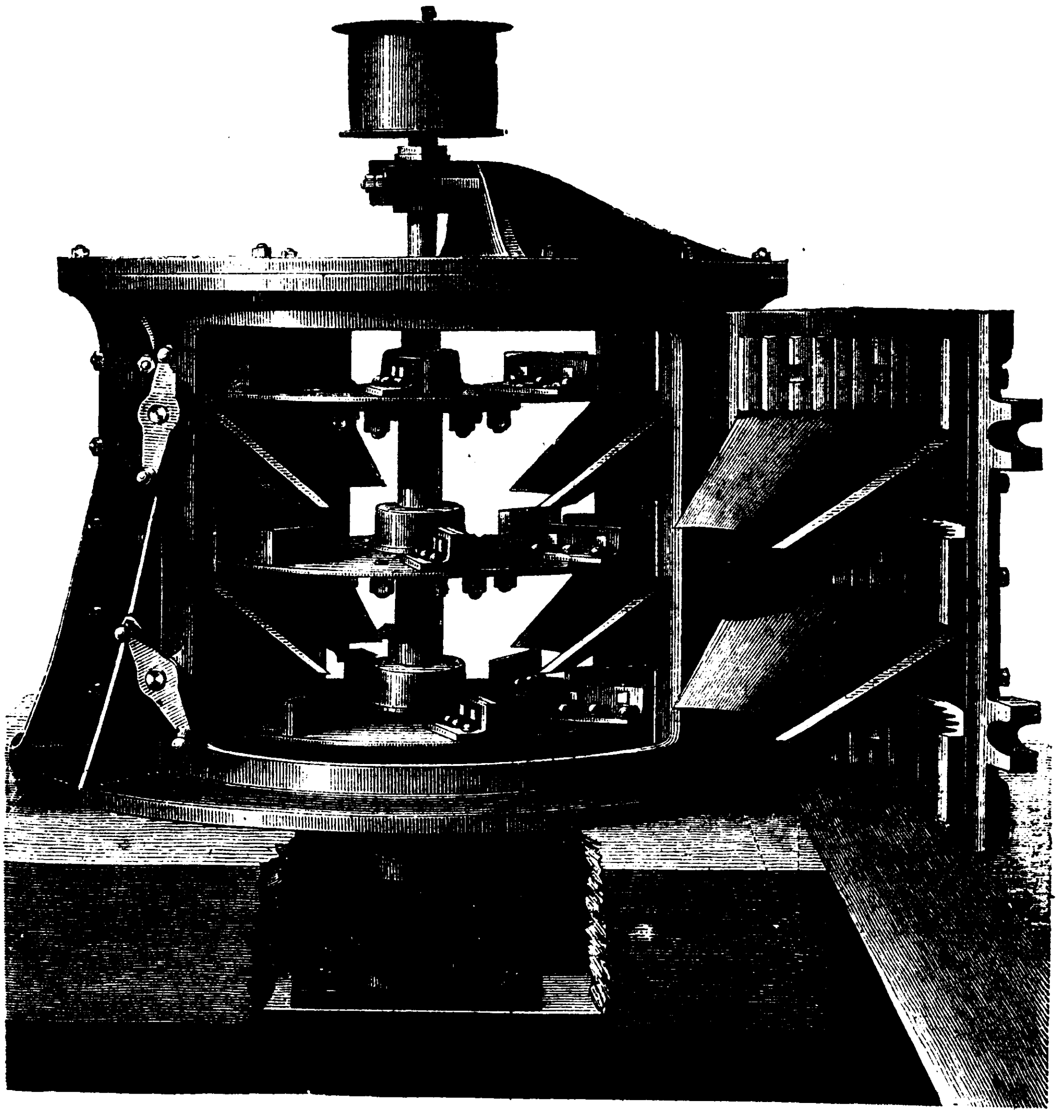
Making Marble from Slate.—A new industry that is steadily growing into importance, is the turning of slabs of slate into imitation marble. The process is thus described: The slabs of slate are first surfaced by a planer, and brought to the required thickness, and patterns are then laid upon the slabs, and mallet and chisel work out the desired forms and mouldings. The peculiar feature in the operation, however, is the marbleizing. The material for the latter is prepared in a vat, and the slate is laid down upon the composition, which adheres to the surface of the slate; the slab is next baked in an oven for one night, then coated with a varnish manufactured for this special purpose, and after six repetitions of these processes, it is finally removed and polished, the surface presenting, as is well known, a beautiful appearance; and so firmly united to the slate is this coating that it cannot be scaled or chipped off without taking the slaty particles with it.

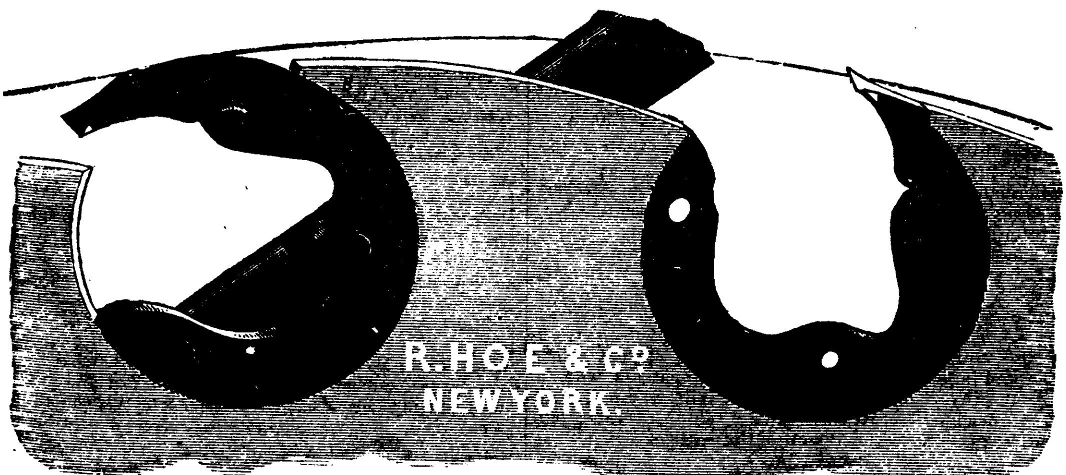
Plaster Moulds.—The moulds are first made of plaster, and allowed to get quite dry; they are then oiled till the suction is stopped; then the plaster is mixed very thin with water, and poured round the mould till it reaches about one-sixteenth of an inch in thickness; wait then until that is set hard, and repeat the operation again and again, till you have achieved the required thickness. Then when it has stood for an hour, the mould previously made in pieces may be taken apart, and the seams taken off with a steel tool called the plasterer's tool, and smoothed while soft with a piece of flannel. The joints of the mould are best made on plain parts, where it can be taken off much better. The mould must be well oiled before filling in with plaster.



HASTINGS' SCHOOL OF ART AND PUBLIC INSTITUTION.

THE VAPART DISINTEGRATOR.





CHISEL-TOOTH SAWS.

TO THE EDITOR OF THE "CANADIAN MECHANICS' MAGAZINE AND PATENT OFFICE RECORD."

Frankfort-on-Main, June 28th, 1877.

SIR,—With reference to our circular dated May 5th, informing you of the new Imperial German Patent Law, we have the pleasure of communicating to you in the following the special rules and regulations of the same:

Description and drawing are to be filed in duplicate; the measurement of the former must be 33x21 centimetres. The drawings are to be also in duplicate, one on thick stiff drawing paper, the other must be on tracing cloth. Both drawings must measure 33 centimetres high by 21 centimetres, 42 centimetres, or 63 centimetres wide. The chief drawing on paper is to be executed with the best black Indian ink, and no colouring, &c., may be used; indeed this drawing is to be worked up in the same style as those for the British and American offices. The drawing is to have one single border line drawn at two centimetres from the edge of the paper. The signature of the applicant has to be placed in the right hand bottom corner and a space left free on the top for number, date and title. The copy of the drawing may be coloured, and it is advisable to do so, if this makes the drawing more distinct. The drawings may be neither *rolled* nor *folded*. A scale in meter-measurements is to be attached to the drawing. A power is necessary, but without legalisation.

We also beg to inform you that we have appointed special representatives in Berlin, Strasburg, and Vienna; in the last named city, Max Wirth, Esq., formerly director of the Swiss Statistical Bureau; in Berlin, H. Bürgers, Esq., member of the Reichstag; in Strasburg, Mr. F. Baumam Ludwigsplatz, our former correspondent. Our representatives in foreign countries remain the same as formerly.

Yours respectfully,

WIRTH & CO.

per C. W. STOLGEL.

THE NEW GERMAN PATENT LAW.

The new law relating to patents which will come into operation on the 1st of next month throughout the whole empire of Germany, is a striking example of an entire change of policy on the part of the Government of that country. The Germans are an industrious and intelligent, not to say educated, nation, but the progress of invention amongst them has been slow, in consequence of the difficulty of obtaining a patent to protect the rights of the inventor. The best and most useful inventions made by Germans are first patented in this country and America—a proceeding which, as a rule, leads to the emigration of the inventor from his native land, to the advantage of his adopted country. The law which has tended to repress invention in Germany will shortly be repealed, and a policy of encouragement adopted which cannot fail to have an important effect on the future. The new law is not all that could be desired, and in some points, in our opinion, it is defective, and will have, in course of time, to be modified; but, compared to the old rules, it is a great and important change. In future, patents will be granted for new inventions which "admit of industrial use," unless they are incompatible with the laws or public morals; but patents will not be granted for inventions of articles of food, for nourishment or luxuries, of medicine, and of substances produced by chemical processes, except in so far as the special method of producing those articles may be an invention. An invention will not be regarded as new if it has been described in a printed publication, or publicly used in Germany. The first applicant will receive the grant, but it will be void if he has taken the essential contents of his application, without permission, from the descriptions, drawings, or models of another, or from the mode of manufacture of another, if such other raises opposition. The effect of the patent is to prevent the manufacture of the articles professionally or commercially, and their sale, except by licensees of the patentee, and, if the invention is a machine or tool, persons are prohibited from using it without permission. The patent is of no effect against a person who, at the time of the application, had already used the invention in Germany, or who "had made the necessary preparations for using the same." The Imperial Chancellor can order the use of any invention in the interest of the public welfare; but the patentee is, under those circumstances, to be entitled to compensation, the amount of which is to be fixed by a court of law if an agreement cannot be arrived at by other means. The duration of a patent is fifteen years from the date of application; but if the invention is an improvement upon another invention previously patented by the applicant, he may obtain a supplementary patent, which, however, expires with the patent for the original invention. A patent may be annulled if found to have been granted in opposition to the rules laid down as above described, and it may be revoked after three years if the patentee fails to do everything that is necessary to insure its being worked in Germany, or if he refuses to grant licenses upon adequate compensation or against sufficient security. Persons not resident in the empire can advance their claims to patents only through representatives resident in Germany. It would appear that the application for a patent can be made without fee, though, according to the rules, 20 marks must be paid at the time of application; but at the issue of the patent 30 marks (20 marks = 19s. 7d.) must be paid. If, however, the patentee proves his inability to pay, he may have a respite as to the payment of fees for the first and second years until the third, and if the patent should expire in the third year, the fees may be remitted entirely. At the commencement of the second year the fee will amount to 50 marks, and it will increase by 50 marks for each year that the patent endures, so that the fee for the third year will be 100 marks, for the fourth 150 marks, and so on. Supplementary patents (that is, improvements subsequently added to previous patents, but which expire with the originals) are not liable to these fees, but are covered by the one patent. These are the chief details of the new law, which, it will be seen, so far as the fees are concerned, removes the difficulty of the poor inventor; but the fees were always merely nominal in Prussia. The great advantage of the new law is that, practically, inventors will obtain protection, the granting of patents, their annulment and revocation, is vested in the Patent Office, which will consist of at least three permanent members, who must have the qualification for the office of a judge or superior official of the administration. The non-permanent members must be expert in some branch of technical science, and will be appointed for five years. Appeals against the decisions of the Patent Office will be heard by the Imperial Supreme Court of Commerce; but, in the first place, complaint as to a decision of one department of the Office will be heard by another department, or by several departments jointly. If an application is defective as regards the prescribed requirements, it will be referred to the applicant for amendment: but if in due form, and there is no apparent objection to the granting of a patent, the application will be provisionally protected. The application and all papers accompanying it, will be laid open at the Patent Office for public inspection and objections against the granting will be received until the expiration of eight weeks. This opposition must be based on the assumption that the invention is not new, or that it has been copied without permission, and the objection must be accompanied by a fee of 20 marks and the arguments on which it is based must be set forth in writing. The statements as to novelty and prior usage must be made on oath; but we are afraid that the publication or exposure of the documents relating to an invention will lead to many cases of opposition. In many respects, however, the authorities in this country might take a lesson from the German patent bill, and especially so in the matter of fees. A fee of 20s. will protect the office from a great number of frivolous applications and is not beyond the means of all but the very poorest of inventors. That sum is all that must be paid before a patent can be obtained, but the inventor will have to prove his inability to pay a fee of 30 marks to obtain a respite of payment. The payment of the fee by annual increments of 50 marks will commend itself to many patent-law reformers. Altogether German inventors may be congratulated on their new law, which, if worked in a liberal spirit, will be productive of much good.

THE GROOSOKAT, OR PORTABLE TRAVELLING ENGINE.

(See page 232.)

Among the novel and useful things exhibited by Ruisia, in Machinery Hall, was the "Groosokat," or portable travelling crane, illustrated herewith. This is certainly a very useful invention, and in many respects a novelty. It is designed to form a convenient and cheap means of transhipment of goods and materials in places where the distance is too short for a railroad track, and too great for unloading by means of cranes or similar mechanism, and where goods are usually transported by hand labor, or with horses. The principal localities for the successful use of this invention are wharves, quays, railroad stations, depots, warehouses, manufactories, earthworks, etc., and all places where coal, bricks, sands, wood, grain, cotton, etc., are required to be moved through a comparatively short horizontal distance. It has been in use at Cronstadt by the Artillery Department of the Government since 1872, as well as in many other places in Russia. As a fixed mechanism for the handling of weighty articles, such as is required for large machine establishments, foundries, etc., the overhead travelling crane has to a great extent superseded all former apparatus ; and so universal has its use become, that it is found in many places where a very large original outlay has been made for a comparatively temporary purpose—such, for instance, as in the erection of the public buildings in Philadelphia, where one has been erected surrounding the entire square inclosing the buildings—and such is the facility afforded the handling of materials in this way, that the first cost of such temporary structures is found to be economically invested. When the apparatus under consideration is understood to extend to this principle the very desirable property of portability, its value will be apparent. It is essentially a portable overhead travelling crane, supported at intervals upon tripods, or in some cases two-legged supports, as shown in the figures.

Fig. 1 shows the apparatus as used in unloading a vessel, conveying the merchandise to a distance, and depositing it upon a railway truck. Fig. 2 is a side view of the tramway beam, with the suspension eyes and truck. Fig. 3 is a short section in two views of the same, showing the construction of truck and beam. Fig. 4 shows a cheaper form of beam and truck, with the former made of wood, as well as the wheels of the latter. Fig. 5 shows the splice for joining two or more lengths of beam.

As shown, the beam is built of plate and angle iron, riveted, and consists of two separate stringers, held together at proper intervals by appropriate cross-webs. At intervals, governed by the strength of the beam and the intended maximum load, are placed pieces in form of a staple of plate-iron, riveted to the inside of the stringers, and to the crown of which the suspension eyes are secured. As shown in the middle cut, Fig. 3, the beam is encompassed by a yoke, the crown of which passes below it, and on the inside of the upper ends of which the wheels of the truck are pivoted, the suspension rods passing between the wheels. In this way there is free passage from end to end for the truck, and the whole may be supported at as many points as may be found necessary.

On the left, Fig. 2, is shown a stationary staple for securing the ends downward, when used with but one support, as seen in the background, Fig. 1. The beams are made in sections of about 28 feet long, as many of which may be jointed together as is necessary for the distance to be travelled, the splice being made by placing the piece (Fig. 5) inside the beam with four square-bodied bolts passing through, as shown at A, Fig. 2.

This apparatus is designed to convey loads up to about 18 cwt. In existing machinery for the hoisting and transporting of materials—aside from the permanent overhead travelling crane—the horizontal distance through which the load may be moved is quite limited, confining this species of machinery to heavy loads, if profitably done ; and with such the apparatus in question does not compete for public favor, except where such is used for comparatively light loads. The ordinary swinging crane is vastly more expensive, and very much less efficacious, where loads of a ton or less are to be moved ; while this portable crane is far superior in the distance through which loads may be conveyed, is cheaper, and above all quite portable. For the discharge of goods of uniform shape, such as bags, casks, cases, and bales, or of such material as coal, sand, stone, etc., which readily conform to some uniform kind of receptacle, it is very well adapted, as the chair as shown on the right (Fig. 1), the chime hooks as seen in the centre, or any convenient form of support for the particular load, may be attached to the truck yoke.

The tripods are generally about 20 feet high, but can, of course, be made to suit the particular work for, or locality in which it is to be used. The beam is suspended from these by means of a block and falls, in order to adjust the beam to the inclination necessary to convey the load from end to end, which in this machine is done by the action of gravitation. This feature in it will limit its length, as, if constructed for too great distance, the required elevation of the goods at the higher end will be an inconvenient amount. The work of horizontal transport in this case is of course done in the hoisting of the load to the high end of the beam ; but it is doubtless economically performed in that way, as generally the same manual labor which is required to raise the load to the required height suffices to guide it to the lower end, or place of deposit, returning the empty truck and sling by the same means.

This instrument is advantageously used for distances up to 100 feet. For the suspension of the beams from the tripods, the Weston differential block is preferably used, as it gives a convenient means of adjusting the heights, and of securing it when adjusted. A very convenient way of using it for unloading vessels is, to connect the support for the load to the truck yoke with a self-checking block and fall, or a differential block of the single sheave kind, and use the same fall for a guy to regulate the descent, and for lowering away at the discharging end of the crane. In this way light loads may be transhipped very rapidly. —*Polytechnic Review.*

THE ANDREWS SAW GUMMER AND SHARPENER.

(See page 240.)

It has been constructed with a view to combine all tools for putting and keeping saws in the best working condition. The emery wheel, when properly used, is the cheapest and quickest thing to keep saw teeth in the right shape for cutting. Objections have been raised against its use, because the points of the teeth are sometimes injured by using a stationary wheel or badly constructed machine. In this machine the workman has perfect control over the wheel ; can present it to the saw with the slightest touch or hardest pressure.

Fig. 1 illustrates the machine, with saw in position for either gumming, sharpening or jointing.

The saw is readily adjusted to grind the teeth with a bevel or straight face, or any rake or hook, and every tooth just alike. After dressing a saw with the emery wheel, it is placed in an upright position by simply raising up on one edge, one end of the saw support being hinged for that purpose. It is then in position to be swaged or secured in the adjustable vise to receive a file dressing. Every sawyer knows the importance of having circular saws perfectly round. While a saw may be jointed nearly round by the emery wheel, it cannot be done as accurately as it can with a file held permanently in position, and the saw revolved against it.

Fig. 2 shows a new arrangement for rounding with a file.

There is also an arrangement to use a burr gummer by holding it in the vise, and not securing it to the saw, as usual ; with this a saw may be more easily and accurately burred than it can be done in the old way.

This machine is a complete saw dresser. When a saw is once put on the machine, it need not be removed until it is perfectly fitted for use, as the machine is not only an emery wheel gummer and sharpener, but is also a file bench, a swager, and jointer.

Another very serious defect in emery wheel machines is removed by the use of removable collars with gum or flexible faces to secure the wheel. A great many accidents have happened owing to the breakage of emery wheels, because the mandrel collars are too small for the size of the wheel used.

Emery wheel mandrels are made with one fixed collar and one loose ; these are made small in order to allow a wheel to be worn down to a small size. The arrangement in connection with these collars is to make a number of thin collars of different sizes for each mandrel, securing a wheel when it is the largest between the largest removable collars, and changing the collars from time to time, so that there will be a sufficiency of the wheel outside of the collar to do its work. The nearer the periphery of the wheel to the collar which secures it, the stronger it will be, and can be run at a higher speed without the danger of breaking. This protection against such accidents is of great value to all users of emery wheels."

THE GROOSOKAT, OR PORTABLE TRAVELLING ENGINE

Fig. 1.

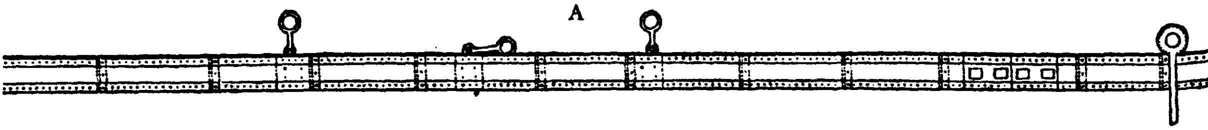


Fig. 2.

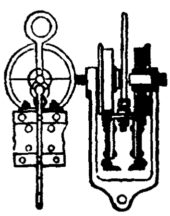


Fig. 3. C

D

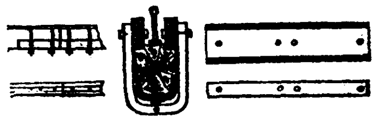
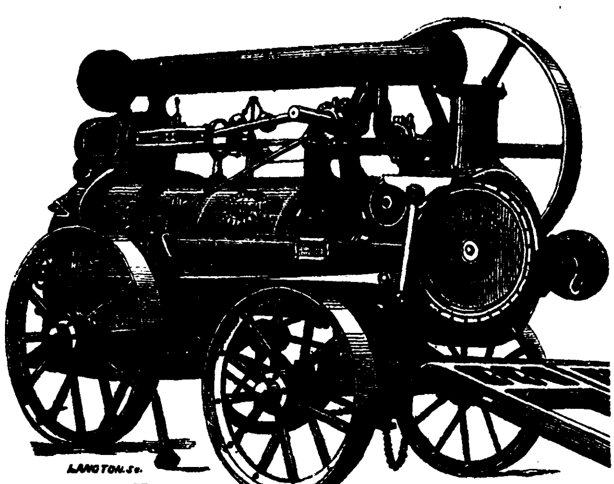


Fig. 4.

B

Fig. 5.



PORTABLE ENGINE AND HOIST.

PORTABLE ENGINE AND HOIST.

We annex an illustration showing a handy arrangement of builder's hoist combined with a portable engine, constructed by Messrs. Brown & May, of Devizes. As will be seen from the engraving the hoisting drum is placed in front of the smokebox, a position which enables the chain or rope to be led off at any desired angle. As Messrs. Brown & May fit all their portables with their powerful steam-jet arrangement for cleaning the tubes, there is no necessity to open the smoke-box door for this purpose, and hence the position of the hoisting drum involves no inconvenience. The mode of driving the hoisting gear is as follows: A pitch chain is led off from a chain wheel on the crankshaft (on the fly-wheel side) to a wheel on the first motion shaft, this latter shaft carrying at its opposite end a grooved friction wheel. Between this latter friction wheel and the large wheel on the hoisting drum shaft is a moveable wheel which can be raised or lowered by the long lever shown at the side of the engine, this lever also operating a brake fitted to the periphery of the large friction wheel. The first motion shaft being coupled to the crankshaft by the pitch chain is always revolving when the engine is running, while the hoisting gear is stopped or started by raising or lowering the intermediate wheel already mentioned, the raising of this wheel taking it out of contact with the large friction wheel and the wheel on the first motion shaft, while a further motion of the hand lever in the same direction applies the brake. The hoist is made to lift easily 10 cwt. at the rate of 50 feet per minute, and this combination of a hoist with a portable engine is one which will be of much service to builders and contractors. The arrangement is also one which can be advantageously applied to engines driving portable saw-mills, as the hoisting or winding gear can then be utilized for hauling logs to the mill.

MESSENT'S PATENT CONCRETE MIXER.

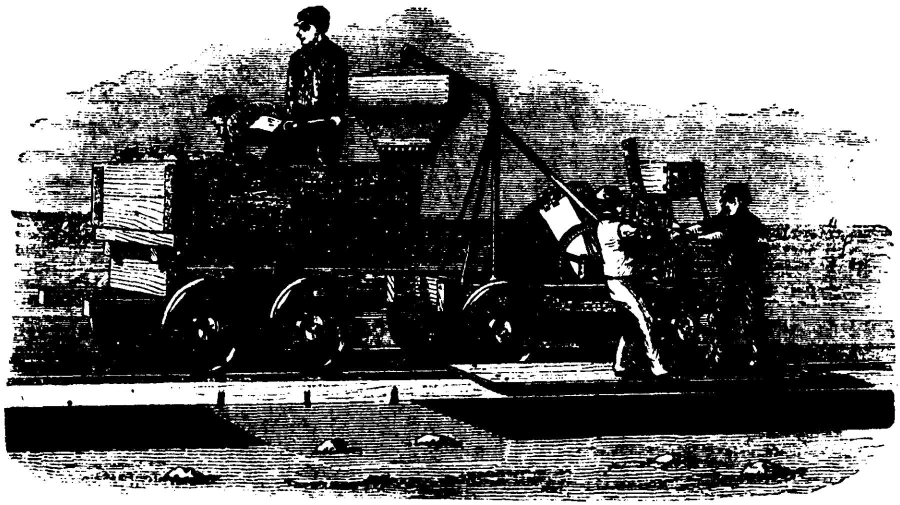


FIG. 1.

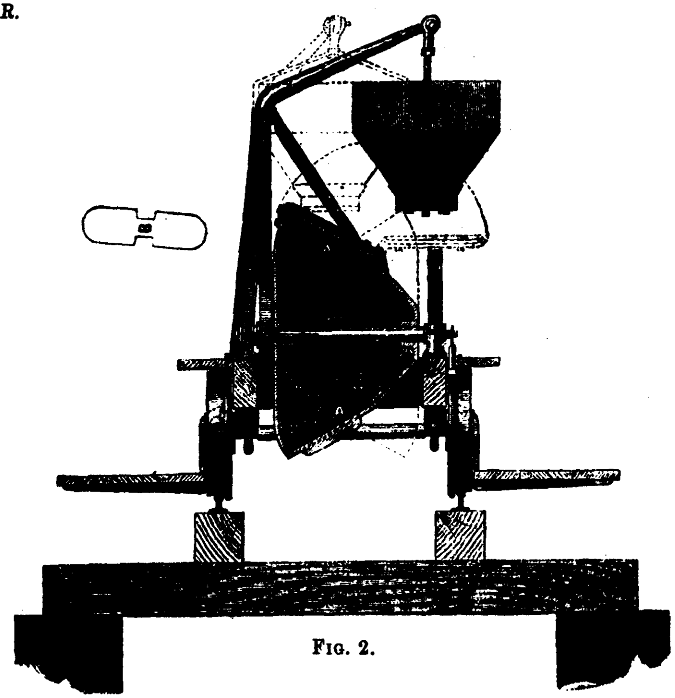


FIG. 2.

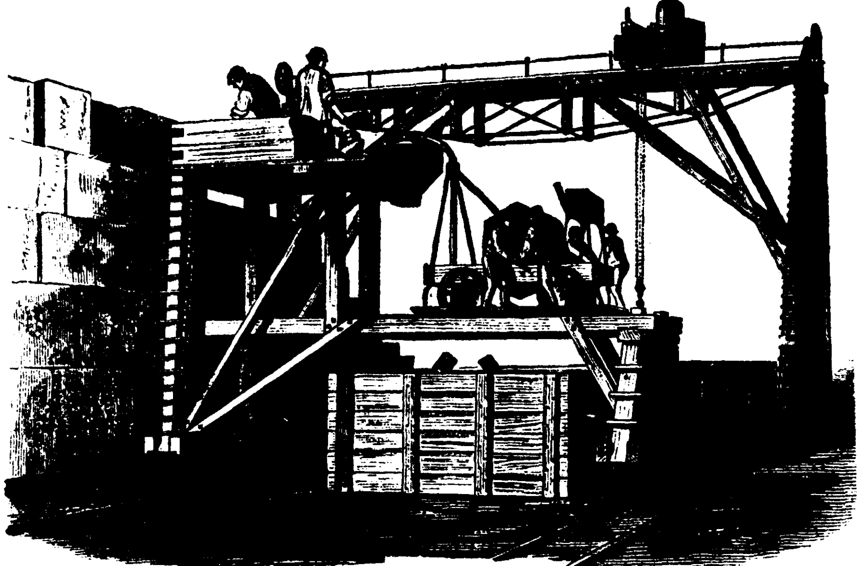


FIG. 3.

MESSENT'S PATENT CONCRETE MIXER.

The mixing chamber may be said to be of trapezoidal form, its two longest planes at right angles to each other, rotating on a horizontal axis; this arrangement is adopted in order that the stuff falling from a contracted into an enlarged space or capacity may be thoroughly rolled over, and therefore intimately incorporated. When the chamber is half filled with the materials for making concrete, the whole contents are turned over sideways, as well as endways, four times in each revolution of the chamber, so that in from six to twelve revolutions—the number necessary being varied according to the weight and nature of the materials—a more perfect mixture is effected than can be produced by hand.

Fig. 2 shows a vertical section through the mixing chamber, the dotted lines AA representing the altered view of the mixer after a quarter revolution. Fig. 1 shows the mixer mounted on a stout timber frame supported on four flanged wheels for running on rails, though plain wheels may be substituted for ordinary ground. In this arrangement it is driven by four men by means of gear, which can be adjusted to move the truck along, or can be thrown out when the truck is propelled by other means. The truck also carries, at one end, a tank holding the proper quantity of water for a charge of concrete, and at the other end a davit, from which is suspended a hopper for holding the materials, the cement being supplied in bags, ready for being run into the mixer. This arrangement is adopted for filling concrete into a trench or the heating of a pier, the mixer being supported over the opening on two balks of timber, and a waggon containing the materials following on the same line.

To receive a charge, the door of the mixer is brought uppermost, a catch in the cogs of one of the wheels holding it in that position. The door is allowed to rest on a stay provided for that purpose, as shown by dotted lines in fig. 2. The hopper containing the materials in proper proportion is swung round on the davit to the position shown in dotted lines; and while the materials fall into the mixer, the water contained in the tank is allowed to run in by a flexible hose. The hopper is then swung clear of the mixer, the door closed, and the requisite number of turns given. To save the necessity of counting or guessing, a simple tell-tale is added for giving notice when a sufficient number of revolutions (as determined by the weight and nature of the materials) has been given. A screw thread is cut on the projecting end of the mixer shaft, and an iron plate with a hole in it is hung on the screw. The rotation of the shaft causes the plate to move towards the end until it drops off, and thus indicates that the determined number of revolutions has been accomplished. For a less number of revolutions, a nut or distance-piece of the required thickness is put on the end of the shaft. When the proper number of turns has been given, the mixer is stopped with the door downwards, the door fastening is released, and the charge of concrete falls in a mass into its place, the discharge being instantaneous. The mixer is then turned, so that the door comes upwards again, and refilled as before. While the mixer is being turned, two men fill the hopper from a waggon with raised sides.

Fig. 3 shows the arrangement of the machine for making concrete blocks for pier and harbour works. The mixer is mounted on a light travelling frame, capable of being moved from one mould to another; and the materials, filled into a large tray, holding from 10 to 15 tons, are lifted on to a raised portion of the travelling frame by the steam travelling crane, which removes the concrete blocks when formed.

It is stated that, with this mixer turned by hand, a gang of six men, with a boy for attending to the water cistern, can make from 30 to 40 cubic yards of concrete blocks, or a much larger quantity of concrete in bulk, in a day, of better quality and at a cheaper rate than can be done by shovel mixing; and that when the mixers are turned by steam, twice these quantities are produced.

The great advantages of this mixer are its portability, compact shape, and self-contained arrangements, which permit of its being easily moved from place to place, and used in different parts of a work, thus dispensing with a mixing platform and measures. Another great point is that nothing is left to the judgment of the workman. The proportion of materials is predetermined, as well as the number of revolutions necessary; so that, with but little supervision, a concrete of uniform quality is produced.

Mr. Messent is engineer for the Tyne Harbour improvements, Newcastle, and joint engineer with Mr. J. F. Ure for the Whitehill Point staiths, Tyne Harbour. Besides these works, his concrete mixer has been ussd with great success on the Aberdeen, Alexandria, Madras, and Kurrachee Harbours, the Stobcross Docks, and on many other works of a similar character.

From his great experience in this class of construction, Mr. Messent may be regarded as an authority on the subject of concrete; we think well, therefore, to subjoin his notes as to proportions, strength, &c.:—"For concrete blocks or ordinary walls, 6½ parts clean gravel or shingle, 2½ parts sand, and 1 part Portland cement should be used. For the above proportions 2¼ bushels of cement will be required for a cubic yard of concrete; and for the hand concrete mixer, made to mix ½ yard charges, the cement should be measured into bags containing 1¼ bushels, one bag being required for each charge; the hopper being the proper measure for the gravel and sand. Broken slag and broken bricks or granite spawls may be used instead of granite or shingle. For large masses of concrete in foundations or quay walls, the concrete may be made with 2 bushels of cement per cube yard, or 1 bushel to each charge of hand mixer, while in cases where extra strength is required over openings, or to resist wear or abrasion, the proportion of cement may be increased to 3 bushels per cube yard. In each case the concrete may be cheapened, without deterioration, by placing large stones in the fresh mixed material, care being taken that the stones are all surrounded by and separated from each other by concrete. The Portland cement should weigh not less than 112 lb. per striked bushel, lightly filled or sifted into the measure, and, if made into test bricks, immersed in water as soon as they will hold together, should, after seven days' immersion, require at least 2½ cwt. to break by tension each square inch of the breaking section of the brick. The usual area of the breaking section (B) of test brick is 1½ inches x 1½ inches = 2¼ inches."—*Iron*.

IMPROVEMENT IN WOOD-BORING MACHINES.

(See page 237.)

The object is to construct a machine to bore at any angle, or at any depth.

A A are the supports; B B the reversible fastenings; C C the fastening screws; D trunnions connected with gear support; E the driving shaft; F the driving gear; G lifting pinion; H the auger shaft; K the angle indicator, provided with a threaded socket. The machine is fastened to the material to be bored, by passing the screws, C, through the reversible fastenings, B, into said material. A bit of the requisite size is screwed into the socket of the auger-shaft. The auger or bit is placed against the material to be bored at the angle required. The crank is then turned and the hole bored. To withdraw the auger or bit, the driving gear is thrown out of gear, which brings the lifting pinion, G, into gear with a rack upon the auger shaft. The motion of the crank is reversed, and the bit or auger is withdrawn from the hole. The auger shaft is caused to turn by a key placed in the driving gear and fitting in a slot in the shaft, permitting said shaft to slide upon it.

To bore a hole deeper than can be bored by the auger-shaft represented, attach a similar shaft to the one shown, by screwing it into the top of it.

IMPROVEMENT IN SPOKE SOCKETS.

(See page 237.)

The engraving is a side view of a part of a wheel to which this improvement has been applied. The object is to furnish a device for fastening a spoke that has broken off at the shoulder of the tenon, to prevent the spoke from wearing the felly and from rattling, and to prevent the spoke and felly from breaking, and which shall be simple in construction, easily applied to the wheel, and effective in use, holding the spoke securely and firmly in place.

The invention consists in plates provided with shanks, and so formed as to fit upon the side of a felly and spoke, to fasten said spoke when broken off at the shoulder of its tenon.

A represents the felly, and B the spoke of a vehicle wheel. C is a plate of such a shape and size as to fit upon the side of the felly, A, and which is provided with a shank, *c'*, which is so formed as to fit upon the side of the spoke B.

The device, C *c'* is cut out of sheet-iron, and is then struck up with dies to bring it to the proper shape. In using the device one of the plates C *c'* is applied to each side of the felly and spoke to be fastened, and is secured in place by screws or rivets.

The plates C *c'* are designed to be made of different sizes, so that they can be obtained to fit wheels of any size, and the owner of the vehicle can apply them for himself whenever needed.

A New Fire Extinguisher.—A new fire-extinguishing chemical compound has been lately devised, which, in its application for extinguishing fires, is quite different from the fire annihilators in general use. The new composition is a mixture of chemicals which, on being ignited, evolve sulphurous acid and carbonic-acid gases, which fill the apartment or building, producing an atmosphere which smothers combustion. A successful trial of this invention was recently had in front of the City Hall, Philadelphia. A board shanty, 13 feet square and 10 feet high, was erected to represent an apartment, and furnished with a door, window, and a stove-pipe coming through the roof. The interior was coated with tar. On a bench were placed seven basins containing benzine, coal oil, and naphtha. In one corner was a 10 lb. box of the extinguishing compound, with a fuse attached to it running round the walls, on the self-igniting plan. The combustibles were set on fire, and in an instant the interior was one sheet of flame, bursting out through the door, window, stove-pipe and every aperture. A few moments after the compound was ignited, the gases that were generated therefrom instantly subdued the flames, and in less than half a minute the fire was entirely extinguished. The new substance is called "Reec's Compound Fire Extinguisher."

EXTENSION LADDERS.

(See page 237.)

Rapid increase of population and growth of cities has rendered ground so precious that it has been considered necessary to erect buildings from three to ten stories high, to serve as homes, warehouses, factories, etc. The situation of any unfortunate being who chances to be caught in the upper stories of a burning building, in which the stairways are invaded or destroyed by the flames, is truly dangerous and pitiful. To devise means by which the rescue may be accomplished, while facility is afforded for fighting the fire at a vantage, has been a problem with many attempts and m any partial solutions. The production of a ladder to reach the windows in any of the uppermost stories at will, demands portability, lightness, strength, rapid and easy extensibility, and simplicity. The successful combination of all these elements is difficult of attainment. Extension ladders either rest upon the sill or wall which they are to reach, or are self-supporting. The former are the more simple, but dangerous in the case of walls falling; and the latter are the heaviest, but most useful.

The differences among those requiring support, are chiefly in the modes of fastening together the sections of which they are composed; nearly all of them requiring to be "up-ended" and raised, after joining, in the same manner as simple ladders. The hook and ladder trucks on which these ladders are carried differ somewhat in their construction; in some, the sections being carried on edge, and in others, on their faces or flat sides. The former mode is greatly to be preferred, as permitting the withdrawal of the longer ladders, which are generally the first needed, or of any one, without disturbing the others or removing the axle of the tiller-wheel. In some, however, of those carrying the ladders on their faces, each ladder rests upon a separate set of rollers and may be withdrawn separately; and a rigid frame is thus secured; but in most of these, the tiller shaft passes through the rungs of all the ladders, thus preventing the removal of any one until this axle is first withdrawn.

The sections, decreasing in length, weight, and strength, are generally fastened together by passing the butt of one into strong iron sockets either on the face of, or between, the ends of the other. The latter mode diminishes the width and capacity of the upper section, without materially decreasing its weight. For strength and security, the butts of each section should be banded, and shod with iron points.

When these ladders can be used as hose-elevators, and can be lengthened or shortened without taking down, their usefulness is increased.

The Scott & Branson telescopic ladder has a double set of rungs front and back in the lower section; between these the upper section slides, being moved up and down by a rope passing over a pulley on the top rung of the lower section, as in the Bangor ladder. A suitable stop-catch holds the sliding ladder at any desired point.

The remainder, or "self-supporting" extension ladders are not removed from the truck on which they are transported. In order to preserve the balance of the machine while the weighted ladder leans forward and outward, weights, guys, and braces are employed. The principal designs are those of Skinner, Porta, Pine, Watson, and Pritchard.

The Watson & Perry Ladder is shown in the accompanying cuts—one representing it as running, and the other as elevated at a fire. The truck, which runs on four wheels, consists of a frame in two parts. The front part is the hose cart and engine tender, and to the hind part is affixed the main ladder, thirty feet in length; and upon this works a slide ladder of equal length, raised and lowered by a winch at the foot; and from the slide ladder rises a socket ladder 16 feet long. To each side of the slide-ladder, and projected therewith, is affixed a pipe for the hose, with a screw top and bottom, to which the hose and branch-pipe may be readily attached. From the top of each ladder extends a forty-strand wire rope fastened at the other end to a windlass on a frame. By this the ladder is given any elevation required, and held firmly. When the machine is housed or running the triple ladder is in a horizontal position, affording room beneath for transporting a number of extra ladders, seven lengths of hose, 500 lbs. of coal, and the usual complement of hose, axes, picks, lanterns, etc., and having an extreme length, horses included, of only 32 feet, allowing it to be turned without a tiller, in a short radius. When the fire ladder is to be used, the withdrawal of the pin connecting the two parts of the truck, brings the ladder, turning on the axle of the hind-wheels, to the ground at an angle of 45 degrees.

It may thus be wheeled, by two men, upon a smooth or rough surface, into any position, and raised to any height from 30 to 70 feet, resting upon the earth for a base, and being self-supporting. "At a trial in Brooklyn it was run up, unlimbered, fixed, and a man placed by its help on the top of a high building within 90 seconds."

The Pritchard Ladder employs in its construction the principle of the jib-crane, the lower or main ladder constituting the boom, and the extensions, which slide on independent rollers below the main ladder, may be attached by any desirable method.

The main ladder or "boom," has between the butts a strong worm-wheel keyed to an immovable axle. A worm gearing on a bed plate raises and lowers the ladder in the vertical plane; while a second worm gearing revolves the bed-plate and ladder in the horizontal plane. It will be readily seen that the ladder will reach any point, at any angle in height, or in any direction; merely requiring stays or braces to afford a firm base. These last are telescopic, the sliding sections being set to any length from the top of the ladder, by means of a chain and wheel. Each motion is simple and positive. It may be operated in any alley into which the wheels will enter; extending over yards or streets, to the building. By a suitable attachment it may be used as a fire-escape, although not very rapid in the case of a rescued person to climb down the ladder.—*The Polytechnic.*

GOVERNORS.

From Knight's *American Mechanical Dictionary* we take the following illustration and description: (See page 236.)

The governor is a device which regulates the admission of steam to the engine according to the rate of motion. The intention is to maintain uniform velocity, and any acceleration of speed above a given rate causes a valve to be partially closed, diminishing the area of steam passage; contrariwise in case of flagging in the speed of motion of the engine. The favorite form of governor has a pair of balls suspended from a vertical shaft, so as to swing outward when the shaft is rotated. The greater the speed the greater the centrifugal force, and consequently the farther the balls depart from the axis of rotation. The inclination of the ball arms is made effective in working the valve.

This use of the device of the two suspended revolving balls, whose circle of revolution widens as the speed of the engine increases, is due to James Watt, who adapted it from an ancient device in windmills.

The full-page engraving shows fifteen variations in form and structure of the ball-governor, two forms in which a propellor wheel acts in a liquid, and one form in which the pressure of steam is directly upon the valve.

In *a* the balls receive their rotation from the bevel gearing above, increment of speed causing the balls to fly outward and raise the sliding sleeve on the spindle. To this sleeve is connected the end of a lever arm whose vertical oscillations are communicated to the butterfly or throttle valve, as in Figs. *k* or *l*.

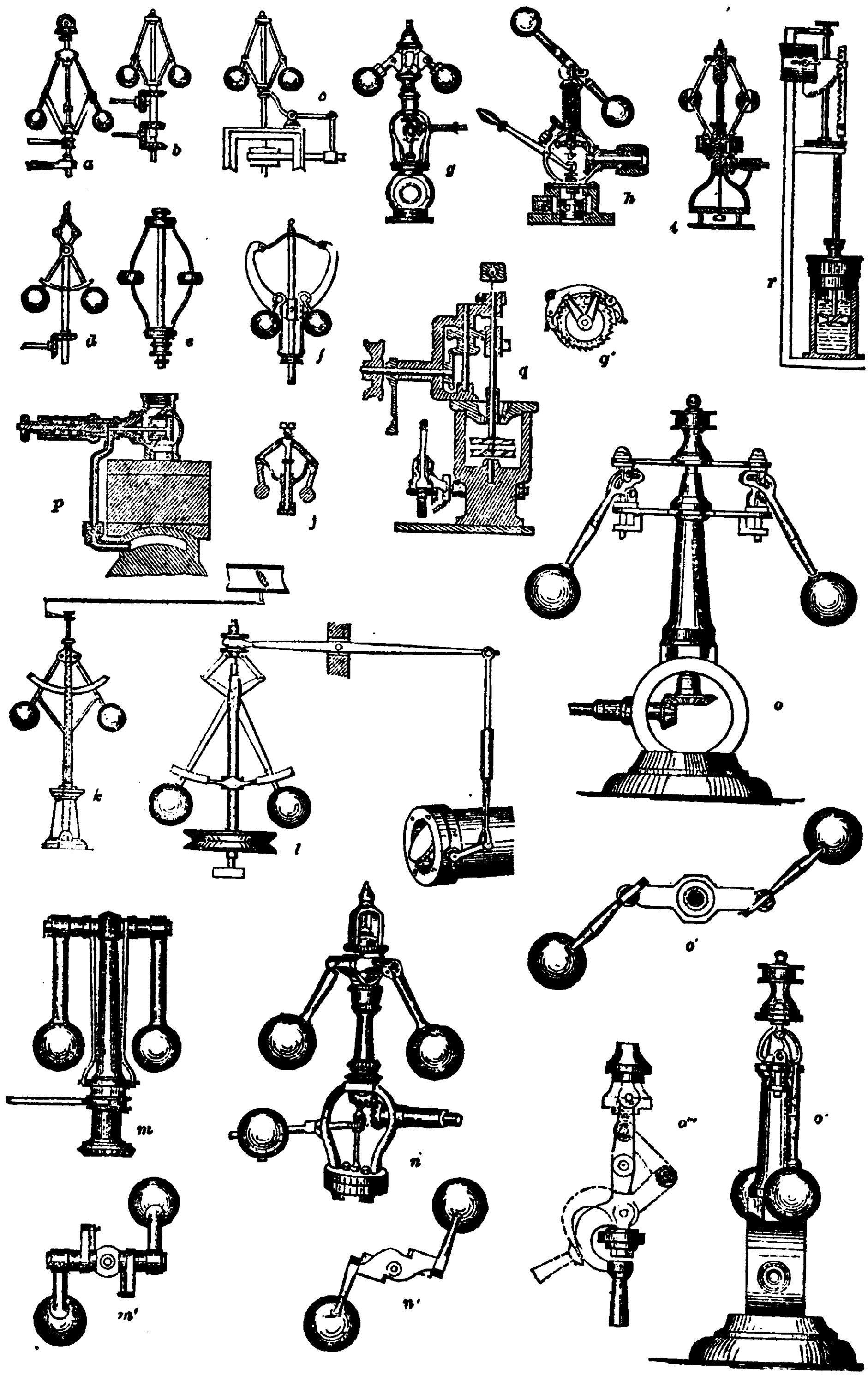
In *b* the balls receive rotation by the bevel wheels, next below the sliding collar. To the collar is attached a sleeve on which the lower bevel gears remain at rest as long as the pin on the said sleeve is not in contact with either of the studs projecting from the upper and lower surfaces of the respective bevel wheels. This is the position shown in the cut, and is that assumed when the engine is running at the required speed. Should the speed be accelerated, the raising of the balls would raise the sleeve and its pin, and thereby rotate the upper bevel wheel, turning in one direction the miter wheel with which it engages. If the speed fall below the medium, the pin on the sleeve falls and turns the other bevel wheel, moving the miter wheel in the other direction. The horizontal shaft of the miter wheel operates the throttle valve or gate of the pen stock.

c acts by substantially the same means through a system of levers upon a belt shifter. In the medium position the belt runs on a loose pulley; but when the balls rise by acceleration of speed, or falls by retardation, the belt is shifted on to the upper or the lower pulley, which pulley acts upon the valve or gate requiring adjustment.

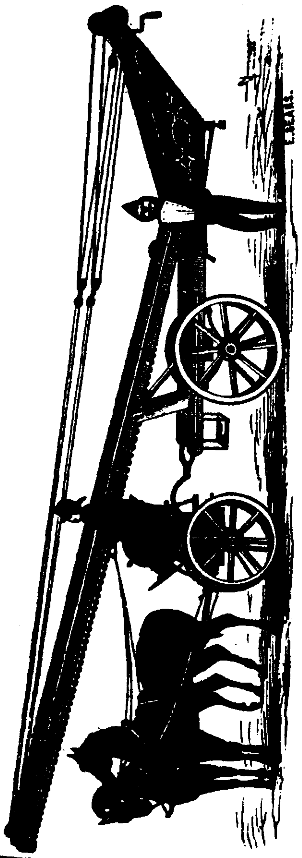
In *d*, instead of the arms being connected with a slide working on a spindle, they cross each other and are elongated upwardly, where they connect with the valve-rod by two short links.

Pickering's governor, *e*, has balls on springs, the upper ends of which are attached to a collar fixed on the spindle, and the lower end to a collar on the sliding sleeve. The springs bend outwardly proportionally to the centrifugal force of the balls, and thereby raise the sleeve, acting upon a rod which diminishes the

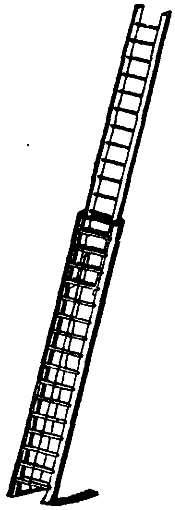
GOVERNORS.



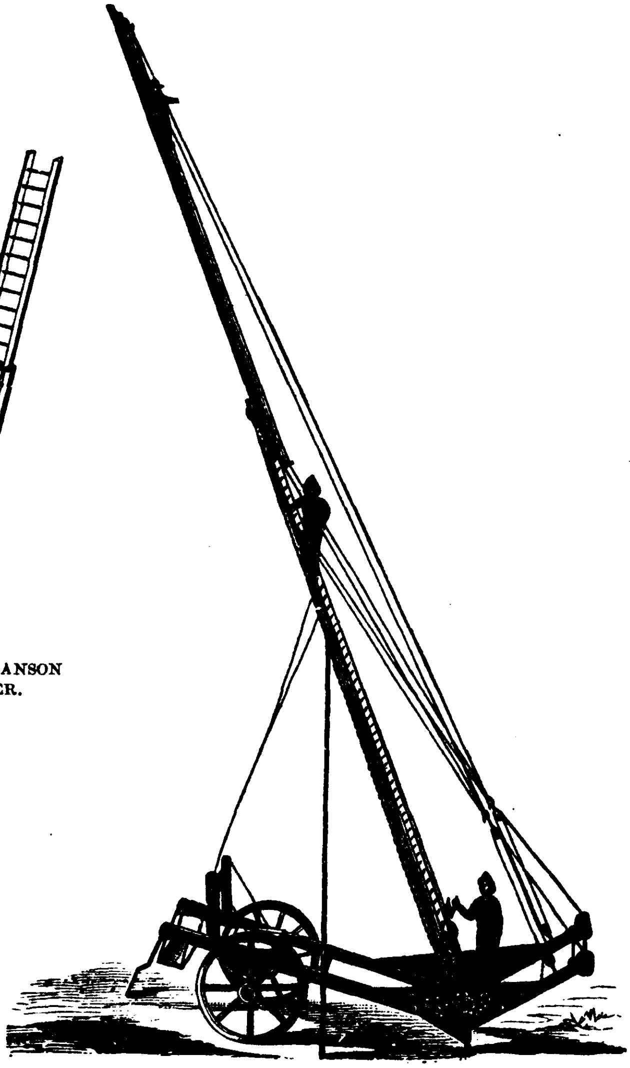
EXTENSION LADDERS.

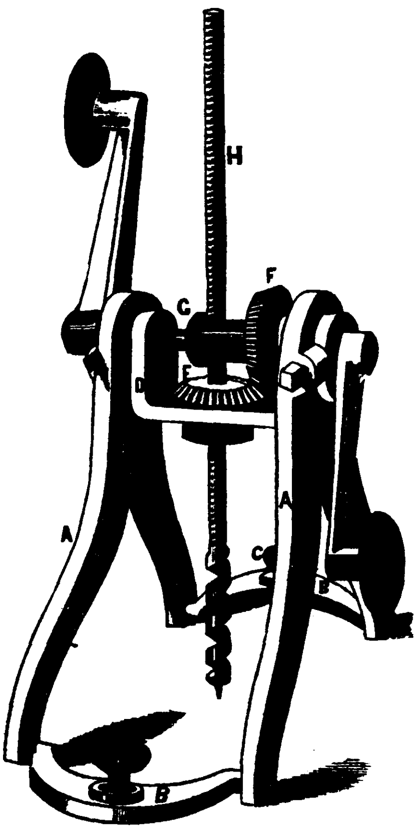


Watson and Perry Ladder.

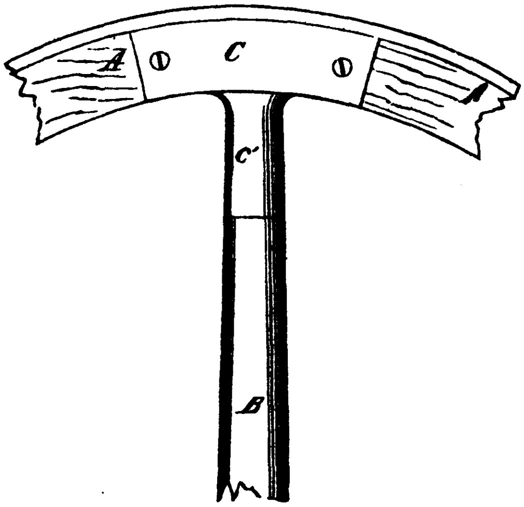


Scott & Branson Ladder.





Wood-Boring Machine.



Improvement in Spoke-Sockets.

area of induction steam opening. A diminution of speed has the contrary effect.

In *f* the balls ascend the parabolic arms as they fly outward when the motion of the engine is accelerated, and conversely. Anti-friction wheels assist the balls in the ascent. Rods from the axis of the rollers connect to a collar whose motions are communicated to a lever which acts upon the butterfly valve.

In *g* the upper ends of the ball arms have cogged sectors which act upon the racks on the axial rod to depress or raise it.

In *h* the oscillating weighted arm assumes a more horizontal position with increase of speed. Its normal or stationary position is shown in the illustration, its arms being out of poise.

i has balls upon toggle-arms, and resembles Fig. *c*, in which they are on springs.

In *j* the elbows of the arms are connected by a spring whose middle length is attached to a sleeve which slipson thespindle as the balls rise or fall.

k shows the connection of a governor similar to *a*, with the butterfly valve of a steam pipe; and *l* is an illustration of a governor similar to *d*, but driven by a band wheel below.

Tyson's governor, *m m'*, 1861, has its arms suspended from a horizontal axis which rotates with the vertical spindle. He states that his object is to avoid "the friction which resists the free movement of the weighted arms in ordinary governors, and attain the desirable sensitiveness." *m* is an elevation, and *m'* a plan view looking upon the balls in motion, showing them swinging tangentially to a circle whose radius is equal to the length of the axis of suspension. When the engine starts, their inertia first come into play, and increment of speed causes them to rise in the prescribed planes, the balls themselves describing an orbit of increasing radius. It is supposed to be more sensitive than the forms in which the balls swing radially outward, but, like them, has the disadvantge of lateral pressure in its bearings, as the balls are compelled to rise in lines which are not the natural result of the forces which actuate them. In Tyson's the line of rise and fall is tangential to a circle of given radius; in the ordinary governor it is directly radial.

In Shive's governor, *n n'*, the balls swing at an angle which is, as seen at *n'*, a compromise between the two last described. The axes of the mandrels on which the ball arms vibrate are tangential to the spindle, at a point distant about the semi-diameter of the ball from the axis of revolution of the vertical spindle. The balls thus swing outwardly and backwardly, so that the inertia as well as centrifugal action of the balls is brought into play. They are, however, compelled to rise in the prescribed direction, a compromise between the radial and the tangential.

Degener's governor, 1856, was designed to give to the pendulum balls "a motion independent of the motion of the spindle aside from their vibratory motion, by means of the diverging spiral inclines . . . . for the purpose of obtaining a more sensitive action of the pendulums." The collar from which the pendulums are swung is allowed to turn upon the spindle. The spirals are intended to "act under the pendulums and assist in throwing them upward" when the rate is increasing, or downward when the speed is checked. The diverging spiral inclines are of a shape approximating the line of ascent and descent of the ball arms under increment and decrement of speed, and can only permit freedom of motion at one ratio of increase or decrease of speed. Freedom of motion is, however, not intended, but the inclines are intended to compel quick response.

In Knight's governor, Figs. *o*, *o'*, *o''*, *o'''*, the hinging axis of each ball arm has a capacity for adjustment in a plane at right angles to the axis of revolution, so that as the hinging axis permits the vertical motion of the ball, the adjustment in a horizontal plane of the bearing of the said hinging axis shall permit the outward swing of the ball, the two, in fact, forming a universal joint permitting the ball to follow the line of motion due to the speed and the proportions of the parts. In cases where the balls are compelled to rise in a certain plane, they can only do so with perfect freedom when running at one definite speed, and their motion on their hinging axes can never be perfectly free when running above or below the said definite rate; this fact is recognized by the introduction of the usual guides, as at *a b c d k l*, which prescribe the path of motion, and which would be unnecessary were the action of the balls unconstrained. Any guide or immovable axis which tends to warp the balls from their true line of motion affects the freedom of their movements, entails additional friction, and intercepts or prevents their delicate and instant response to an acceleration or retardation of speed. If, upon an increase of speed, the arms or hinging joints of the balls have a tendency by a lateral strain or pressure to bind or rub, it is manifest that the balls cannot instantly respond, but that the cumulative force and speed will be required to obtain such a response as would more quickly result were balls perfectly free to respond in their own way; and, in fact, the motion due to the inertia of the balls developed upon an accession of speed and manifested by their tendency to lag behind, is much more immediately responsive and active than the tendency to assume a more radial relative position which presently results. In this governor the balls are free to swing in such direction as may be induced by their speed and proportions, ascending or descending under changes of speed in such curves as may result from the combined forces of gravity and centrifugal impulse, under the condition of free pivotal attachment to bearings which are permitted to rotate in a horizontal plane.

Fig. *o* is an elevation of one mode of application of this principle, the balls swinging upward.

o' is a top view of the same.

o'' shows the balls at rest. *o'''* is another form, in which a spur or finger from above the hinging joint of the governor arm projects upward, and is jointed to a link pivoted above to a spindle in the plate; the finger and link togother form a toggle, which brings the upper plate nearer to the lower one, the two ends of the toggle being hinged in bearings which are capable of horizontal rotation in the respective plates. The downward motion of the balls restores the normal position. The parts may be so arranged as to straighten the toggle by the raising of the ball, if so desired.

Modifications are shown in the patents whereby either the tangential or radial motions of the ball may be utilized, or an effect obtained from the sum of the two motions.

Some other forms than the pendulous ball may be referred to.

p is a governor in which the valve is operated by the direct pressure of steam upon a piston on its stem. The piston operates in a smaller cylinder, taking steam from the main cylinder.

q q' is Huntoon's hydraulic governor, in which a propellor wheel works in a liquid whose resistance causes a propellor shaft to rise in a degree proportioned to the rate of speed. The sectoral frame with its draw-pawls has a constant, reciprocating, rotary motion, and when either of the pawls comes in contact with the ratchet, it causes the ratchet shaft to rotate to actuate the steam valve. The rocker frame is actuated by the governor, and its cams bring one or other of the pawls in contact with the ratchet, according to the variation of the speed above or below the desired point.

r is a somewhat similar contrivance, in which the longitudinal position of the propellor in the water cylinder, due to its rate of speed, determines by the connecting rack and segment the position of the valve in the steam pipe.

Silver's momentum wheel governor has a heavy revolving wheel, whose momentum acts upon the throttle valve when any change occurs in the rate of motion of the engine.

The hydraulic governor or cataract is the invention of Smeaton. A quantity of water is pumped at each stroke, and forced by counterweights through an orifice of a certain size.

Davis's governor (English) consists of a single hollow ball with a zone round it, having an opening through the bottom to admit of an upright spindle, attached to the ball by a joint in its centre. One side of the ball and zone is much heavier than the other, and consequently, when at rest or moving slowly, it hangs down; but when driven fast, the centrifugal force of the heavy side overcomes its gravity, and the zone assumes a nearly horizontal postion. When this is the case, a small link inside the ball, jointed on one side of the axis, lowers the usual brass collar on the spindle, and shuts off part of the steam, till the diminishing speed allows the gravity of the zone to overcome the centrifugal force, and, the link being raised, the throttle valve is opened under to admit more steam.

In Mosman's chronometric governor, one of two shafts has rotation directly from the engine, its speed being relative to that of the engine. The other-shaft has motion from the engine, but its speed is regulated by a pendulum or balance wheel. A variation in speed causes a longitudinal movement in the shaft which is connected to the governor valve.

Glacial Action.—The last English Arctic expedition promises to confirm the views of glacialists respecting the origin of the Parallel Roads of Glen Ray, in Scotland. In Greenland nearly every valley shows similar terraces, which have been found in fresh-water lakes, kept in place by barriers of packed-ice. That represents perfectly the conditions of things when the Ben Nevis glacier dammed the valley of the glen, producing an extensive lake.

THE MANUFACTURE OF WALL PAPER.

(See page 240).

There is much in the manufacture of paper-hangings (so called) that differs from the ordinary idea concerning the modes employed; and feeling this to be the case, we have made special effort to present herewith in popular form a brief account of the processes involved.

In the first place, the materials employed—paper and pigments—have in themselves difficulties in working, owing to the fact that the latter are not oil paints, but water colors, and the paper has to be constructed specially "sized" in order to withstand the softening and stretching action of the water. Again, the pigments are not ground in varnish, as in the case of this and other printers' ink, which enables them to have comparatively easy "feed" and distribution, and to adhere first to the type and blocks, and then to the paper; but the colors are used as a thin mud devoid of "tack," and which would rapidly clog up blocks having only ordinary "depth" and relief. Further, the patterns must be continuous or printed in continuous rolls without a break—involving fresh questions of design to effect this continuity, and of execution to effect perfect "register," or placing, of the various colors. In fact, then, we must have different blocks, modes of applying the color to these blocks, and of printing, than for ordinary color printing from relief blocks.

A design having been chosen which is capable of being made continuously on a roll of paper, a full sized original is prepared in all the necessary colors—from one to eight, including the "ground." There must be made one block for each of the primary colors used; and nearly always one block for each color shown, whether primary or secondary. Thus there is not only a yellow and a blue block, but a green block also, where these three colors occur in one pattern. The red block contains in revel relief only those portions of the design which are to be printed in red, etc.

The cuts show photo-reductions of impressions made from four color blocks which combine to form a four-color pattern. In the example chosen, each block has sixteen squares thereon, of which we show but four, the remainder being repetitions.

According to whether the printing is to be done by hand or by machine, the blocks are made flat or cylindrical. In either case the operation is a tedious and delicate one. Having sketched all the portions of one color upon a block or roller (the material chosen is maple), there are three modes of procedure to choose from.

(1) To cut away all but the portion intended to print this given color. This is as in ordinary wood engraving, and is done by gouges, chisels, etc.; the depth cut away is about one-quarter inch.

(2) To insert thin slips of brass so as to produce the desired outlines. This requires chisels and gouges to effect a lodgment for the brass rules or slips, which are brought to the desired outline by means of pliers, files, etc., and are then driven in firmly, being left to project about one-quarter inch. This gives outlines of figures.

(3) To proceed as in the last operation, but to fill up the spaces between the brass rules with compressed felt carefully cut to fit. This gives an impressing surface of felt, held together firmly by brass, and gives better work, with the pigments employed, than the wood blocks give—showing no grained or watered appearance.

Where the printing is done (by hand) from square blocks, register or proper superposition (so as to make the impression with each color properly continuous and also in correct relative position with the others), is secured by two fine points at each end of one side of the block; these pins are in the same relative position on all the blocks.

The paper comes in rolls of about ⅜ mile each, in widths from 20 to 40 inches, and in three grades of quality. For all grades of hangings, except the very commonest, the paper is uniformly covered with a "ground"—the basis of which is clay or whiting, suitably colored. This color is licked up by a roller which transfers it to a stiff rotary brush, which revolves in contact with the paper, coloring it in spots. Five transversely reciprocating brushes, with successively increasing speed and shortness of stroke, distribute the ground color evenly over the surface. The issuing roll, or ribbon, which is quite wet, is laid in looped folds hanging from rods which are, by an ingenious machine, carried along the elevated railway to the other end of the room, there turning with the track and returning to the first end of the room. This device shortens the required length of factory one half. By a series of simple wooden friction wheels the rods on which the loops hang are turned at every few feet of the track, to prevent the roll from sticking to the rod in drying.

The ground being laid and the paper dried, it is ready for the pattern. If it is for machine work, the roll is wound over a large drum and in contact with the cylindrical blocks, which are revolving very rapidly, each being suitably supplied with its own pigment by rollers and aprons dipping in troughs containing the "color." Eight or twelve colors may be printed at once in the machine, from which the paper is taken as before upon a drying track. Accurate register of the colors necessitates (1) absolute uniformity in diameter of all the printing rollers; (2) that all shall be started right. It is evident that a difference of $\frac{1}{1000}$ inch in circumference of any two rollers would, after 1000 revolutions, show an inch out of register. A delicate adjusting screw on each roller axle enables the first register to be made in proper coincidence of parts; after which it must be maintained by absolute uniformity in circumference of the rolls, etc.

For hand printing the most primitive kind of a press is used. The flat block, say 20 to 24 inches square, is hung by a cord which permit its being swung on to the coloring pad (which is made of wet paper pulp and forms a perfectly elastic and yielding cushion). The pins on the side of the block permit the register to be kept right; and as the roll of paper is passed along from right to left, one square at a time, of each color, is printed thereon, the impression being given by a foot-lever. All the higher grades of hangings are hand-printed in this tedious manner. For gold work, the figure is first printed in size, or rather varnish, and either gold dust (ground gold leaf) made to adhere thereto by revolving brushes in a closed box, or whole gold leaf is laid on by hand—this last in the case of large surfaces. Superfluons gold is removed and saved by a boxed-in machine which *crubs* the paper with reciprocating brushes; a blower, making 4000 revolutions per minute, exhausting out the removed dust, which is collected in a proper closet.

A machine with rapidly revolving and reciprocating brushes is used to glaze the "satin-finished" papers.

To make embossed paper, the desired pattern is made upon the surface of a paper cylinder of exactly equal diameter, against which it is pressed with great force, thus making the reverse patterns; the paper is then fed through between these rollers, and thus receives the desired impressions in relief.

The measuring, cutting, and rolling into "pieces" (a piece contains eight yards in these days), is effected by a very simple machine. There is an inclined table eight yards long, with a knife hinged at each end, and a rotating spindle on the lower. The long roll of paper is fed down this table, and when the end has reached the spindle, the knives are brought down together—the upper one cuts partly through, eight yards from the lower one, which makes a clean cut; the spindle is then rotated and swings the upper partial cut under the knife; eight yards are then on the spindle; a second stroke of the knives severs the measured portion and makes a second partial cut, eight yards further on; and so on.

BRAZING BAND SAWS.—Good brass rich in copper is generally used. Bring the two ends of the saw close together and fasten, then take a small pan of charcoal, and place it under the ends and direct the flame of a blow pipe on it. As the ends will soon become red-hot, sprinkle some powdered borax upon them and add the solder with a piece of iron. The way to make the solder melt: three parts of brass filings with one part of silver; cast in ingot and file away; collect the filings, and put into solution of sal-ammoniac in water, and so keep until wanted.

BRASS LACQUERING.—If you want a good deep gold lacquer you should make up a small stock bottle, holding, say, half a pint, according to the following recipe. You can then add as much as may be required for the tint you wish to get: Alcohol, ½ pint; dragon's blood, 1 dram; seed lac, 1½ oz.; turmeric, ¼oz. Shake up well for a week, at intervals of, say, a couple of hours, then allow to settle, and decant the clear lacquer, and if at all dirty, filter through a tuft of cotton wool. Mix with the pale lacquer a day or two before you wish to use it.—*English Mechanic.*

COLORED LEAD-PENCILS.—Red, brown, green and other colored lead-pencils are made by bringing kaolin or pipe-clay to a doughy consistency with water, and then mixing the mass in a paint-mill with any earthy or metallic pigment of the color desired.—*Papier Ztg.*, 1877, 402.

THE ANDREWS SAW GUMMER AND SHARPENER.

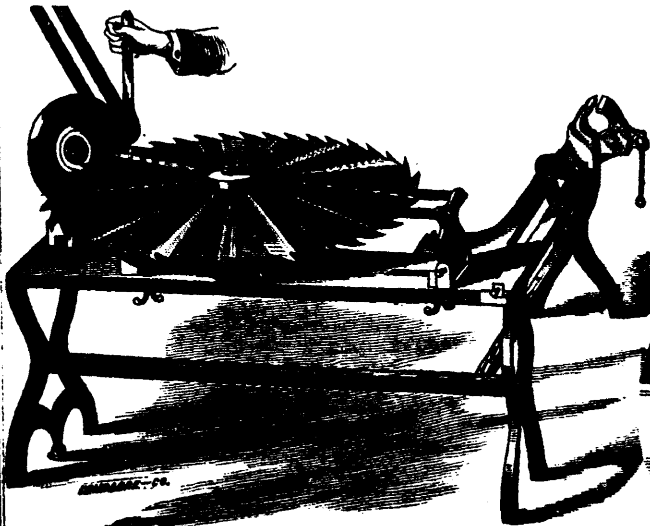


Fig. 1.

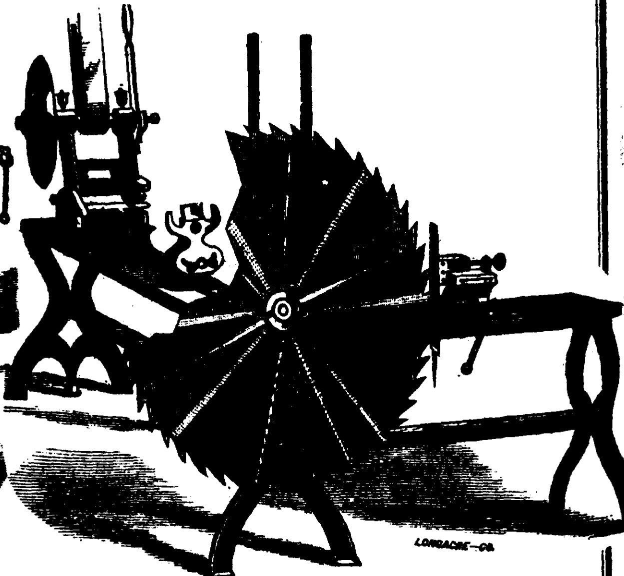
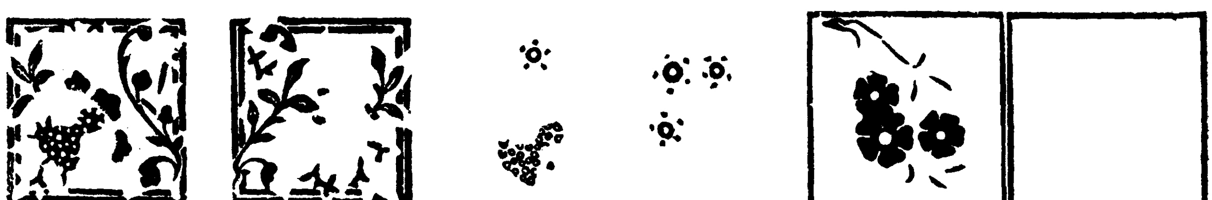
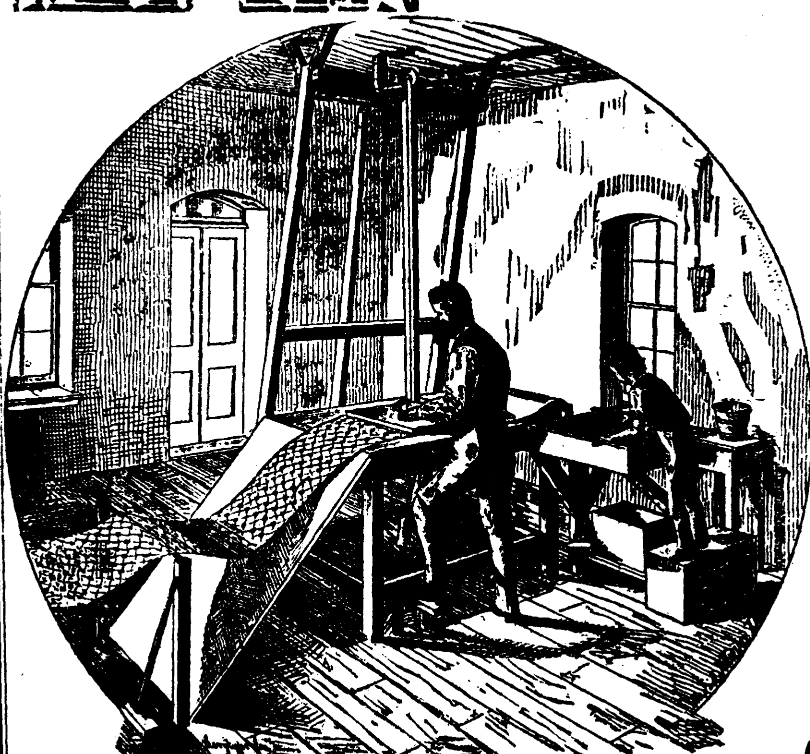
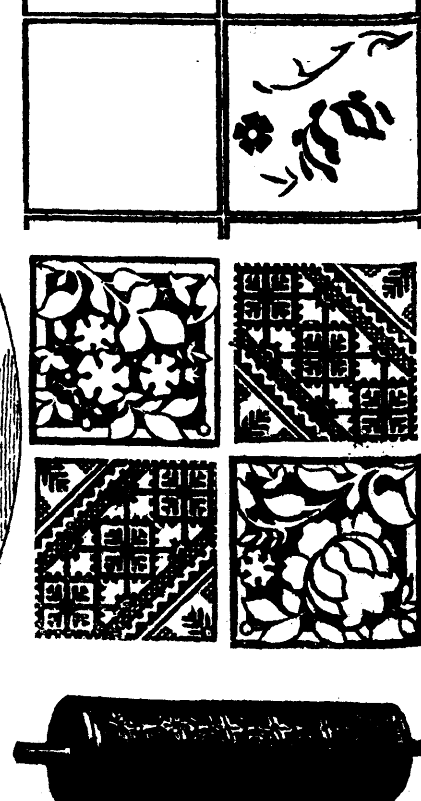


Fig. 2.



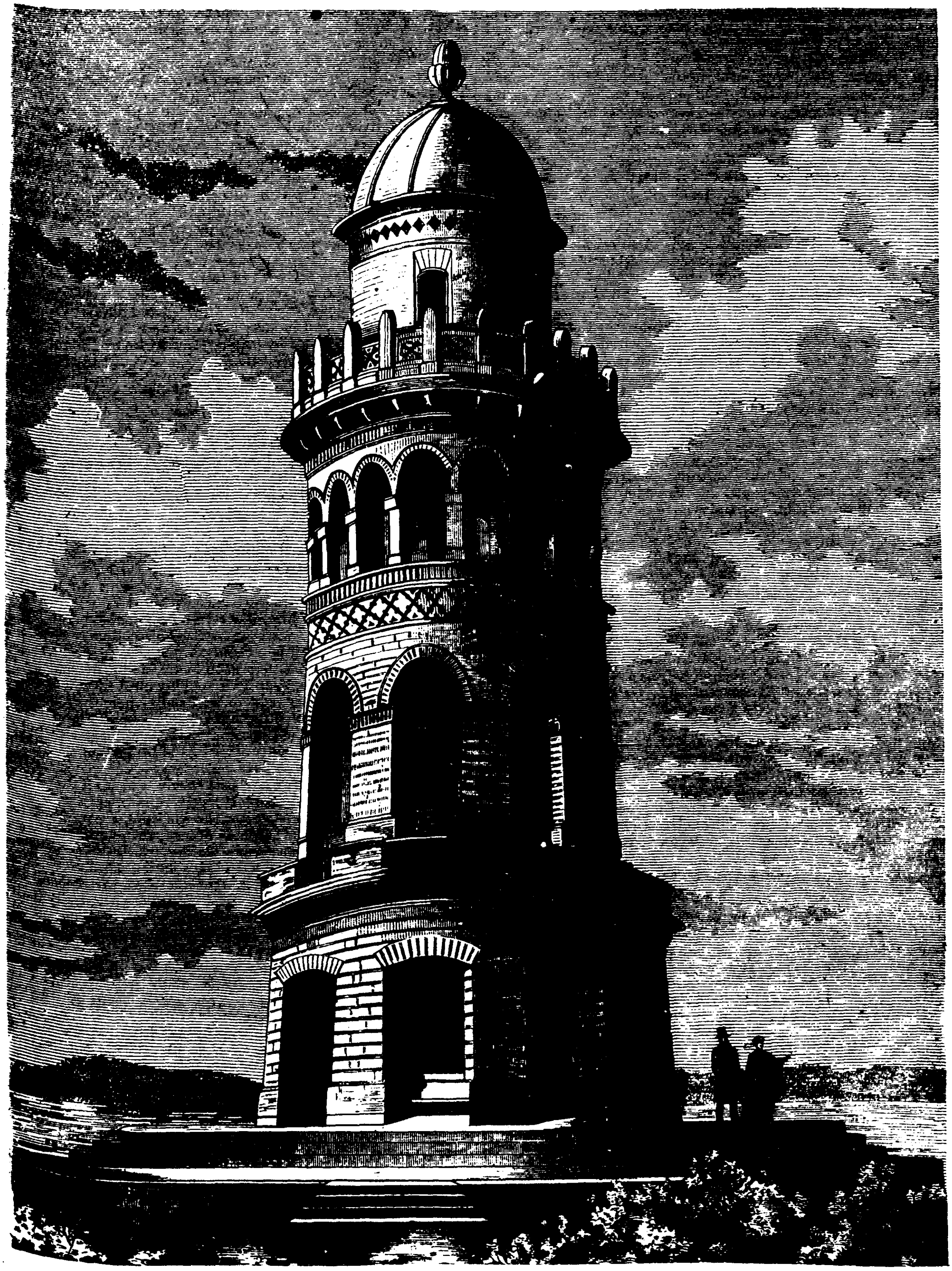


HAND PRESS, WITH PRINTER AT WORK. The boy at the right is distributing the color.



MANUFACTURE OF WALL PAPER.

THE FAMILY FRIEND.



THE ARNDT TOWER ON THE ISLAND OF RUGEN

THE ARNDT TOWER ON THE ISLAND OF RUGEN.

(See page 241.)

Like a rock from the sea, the striking figure of the noble and intrepid patriot Ernst Moritz Arndt towers above the dark and troubled period of Germany's greatest humiliation, in the time of the first Napoleon's zenith of power. Arndt was born on December 26th, 1769, at Schoritz, in the Island of Rugen, the son of simple but educated parents, and died at Bonn, on January 29th, 1860, mourned by a grateful nation. His countrymen look upon him as a hero in citizen's garb, a true German, than whom can be found none more noble and disinterested, more willing of sacrifice and devoted, more bold and persevering. By nature gifted and industrious, he studied first at the University of Greifswald, and then at Jena, theology, history, geography; wandered, impelled by an irresistible desire for roaming, nearly through the whole of Europe, in several travels, of which he afterwards published telling descriptions. He finally settled as private teacher in Greifswald, married, and was elected extraordinary professor. The sad condition of Germany weighed heavily upon him; his lucid mind foresaw the dangers threatening Germany from France, and he tried hard by his writings, especially his *Geist der Zeit* ("Spirit of the Time"), to rouse the German nation from its lethargy of indolent security, from which it was to be so soon and so terribly shaken. After the battle of Jena, this never-to-be-forgotten landmark of modern German history, Arndt was compelled to fly to Sweden to escape the persecutions of the French police. There he wrote the second part of his *Geist der Zeit*, in which he pointed out with true patriotic zeal the only ways by which Germany could be saved from her degradation. But the fall of the King of Sweden, in 1809, cost him his asylum, and either hidden or under a false name, he lived in his native home, or at Berlin, Prague, and St. Petersburg, whither Baron von Stein had called him. In the latter's service, he participated in the literary labors preparatory to the War of Liberation, and afterwards, by the side of Stein, in the struggle against the French. His patriotic and war songs especially contributed greatly towards rousing the enthusiasm of the youth of Germany for the war of liberation, and acted on the German national spirit of the people. The little gratitude shown him during the time of reaction which followed upon this period of national sacrifice and devotion, as well as his later fate and his share in the preparation for the resuscitation of the German Empire, which he was not destined to see accomplished, though he was firmly convinced of its final attainment, are well known. The German people, however, suitably honored its hero; the Arndt monument in bronze, erected at Bonn in 1865, and the imposing "Arddt-Thurm," rising to a height of 284 feet, on the Rugard, in the Island of Rugen (the subject of our illustration), prove this sufficiently. The tower was begun in 1873, and will, when completely finished, form an ornament and a beacon for the rocky cliffs of Rugen. But the noble work of the man during the time of greatest national distress will be a more secure and lasting record in the annals of German history than any perishable monument can be.—*London Builder.*

NOTES AND MEMORANDA.

The *Gewerbe Blatt* of Zurich gives a recipe for a solution said to prevent the action of moist atmosphere upon walls. A wall exposed to cold and moisture should be, it says, coated with a compound of ¾ lb. of soap dissolved in 10 lbs. of boiling water, care being taken in applying it to avoid the formation of bubbles. A little alcohol assists in dissolving the froth, and causes the solution to penetrate deeper into the wall. A second coating is added after twenty-four hours, composed of a solution of sulphate of alumina, about ½ lb. in 30 lbs. of water. The coating obtained is, it is added, impermeable. If the first coat is not dry and hard in twenty-four hours it must be left a longer time.

The New Channel Vessel.—An English paper says: "The new twin steam vessel for the channel service has been launched. She is called the Express, and differs in several respects from the Castalia. The superstructure containing the cabin is supported on an arch, which rises from the inner sides of the two hulls, about thirty feet from each end. This arch is divided in the middle, where the two paddle-wheels, each 24 feet in diameter, are supported. The length of the vessel is about 300 feet, and the width 60 feet. Each hull carries a separate engine with a cylinder 63 inches in diameter and a stroke of 6 feet. The draft of water will not exceed 7 feet, and as the number of revolutions at full speed will be 36 per minute, a high speed for such a vessel is confidently anticipated.

It is not generally known that, until the year 1840, glass mirrors were made almost exclusively by the use of mercury, the poisonous vapors of which made sad havoc among the workmen. Drayton, an English chemist, was the first to use a coating of silver, obtained by a reduction of an ammoniacal solution of the nitrate of silver with easily oxidisable oils. This process was improved upon by various chemists, but only achieved practical value by Petitjean substituting tartaric acid as the reducing agent. The glass to be silvered is placed upon an iron table heated to a temperature of 40 deg. C.; its surface is carefully cleaned and the solution of silver and tartaric acid poured thereon. In less than twenty minutes the silver begins to deposit upon the glass, and in an hour and a quarter is completed. The surplus material is poured off and the surface is washed with distilled water, dried, and then covered over with a varnish. By this means from 60 to 75 grammes silver suffice to cover an area of one square metre, while 1½ lb. tin and the same quantity of mercury would be necessitated. The former takes but a few hours for the entire process, while the latter takes more than twelve days. On the contrary, the glasses prepared in this manner have a more yellow color than those backed with mercury; the silver film often loosens from the glass, especially when placed under the direct action of the sun; and in spite of the protection afforded by the varnish, is often attacked by sulphuretted hydrogen fumes. M. Lenoir has, says the *Polytechnic Review*, succeeded in overcoming this difficulty. The glass after having the silver deposited as above described, is covered with a weak solution of the double cyanide of mercury and potassum. Some of the silver takes the place of the mercury in the cyanide and the displaced mercury forms on amalgam with the silver film on the glass, and forms a backing whiter in color and more adhesive to the glass than the silver alone. Glasses so prepared are free from the yellow hue given by silver alone, and are neither affected by the sunlight or sulphurous fumes.

Metals may be colored quickly and cheaply by forming on their surface a coating of a thin film of a sulphide. In five minutes brass articles may be coated with any color, varying from gold to copper red, then to carmine, dark red, and from light aniline blue to a blue-white, like sulphide of lead, and at last a reddish white, according to the thickness of the coat, which depends on the length of time the metal remains in the solution used. The colors possess a very good lustre, and if the articles to be colored have been previously thoroughly cleaned by means of acids and alkalies, they adhere so firmly that they may be operated upon by the polishing steel. To prepare the solution, dissolve one half ounce of hyposulphite of soda in one pound of water, and add one half ounce of acetate of lead dissolved in half pound of water. When this clear solution is heated to from 190 deg. to 200 deg. Fah., it decomposes slowly and precipitates sulphide of lead in brown flakes. If metal be now present, a part of the sulphide of lead is deposited thereon, and, according to the thickness of the deposited sulphide of lead, the above colors are produced. To produce an even coloring, the articles must be evenly heated. Iron treated with this solution takes a steel-blue color; zinc, a brown color; in the case of copper objects, the first gold color does not appear; lead and zinc are entirely indifferent. If, instead of the acetate of lead, an equal weight of sulphuric acid is added to the hyposulphite of soda, and the process carried on as before, the brass is covered with a very beautiful red, which is followed by a green (which is not in the first scale of colors mentioned above), and changes finally to a splendid brown with green and red iris glitter. This last is, according to the *American Art-Journal*, a very durable coating, and may find special attention in the manufactures, especially as some of the others are not very permanent. Very beautiful marble designs can be produced by using a lead solution, thickened with gum tragacanth on brass which has been heated to 210 deg. Fah., and is afterwards treated by the usual solution of sulphide of lead. The solution may be used several times.

To make Aniline Bronzing Fluids.—Take ten parts aniline red (fuchsine) and five of aniline purple, and dissolve in 100 parts of alcohol of 95 deg., taking care to help the solution by placing the vessel in a sand or water bath. As soon as the solution is effected, five parts of benzoic acid are added, and the whole is boiled from five to ten minutes, until the greenish color of the mixture is transformed into a fine light-colored bronze. The bronze is stated to be very brilliant, and to be applicable to all metals, as well as to other substances. It is easily laid on with a brush and dries promptly.

TESSELATED WOOD FLOORS.

(See page 244.)

Very few Americans have any idea of the chaste beauty of floors laid in with a variety of colored woods. The style of the figures in which woods may be combined for this purpose may be changed in an indefinite manner; the figures may be geometrical, from the simple straight line up to the most complex oblique and intricate linearments, polygons, circles, curves of higher degrees, etc. By the proper choice of colors perspective effects may be obtained, while if still more elaborate patterns are desired, there are the imitations of leaves, branches, flowers, etc.; in fact, the variety attainable is literally endless.

Mr. Wrigth, the head of an enterprising firm in Montreal, has undertaken to supply those who wish to avail themselves of this rich ornament, with the material required. We have before us a catalogue containing various patterns of flowers, ornamental borders, wainscotings, etc., and we represent on this page specimens of floors for a one-story dwelling-house. At the right-hand side below is a small reception room, and at the left the large parlor; the entrance hall and staircase are between. It will be seen that the hall and small reception-room are ornamented with paralellograms—the style in which marble floors are often laid, while a narrow border surrounds it. This is one of the figures which produce a kind of perspective effect, as if cubical blocks were standing on edge, and is exceedingly pretty. The parlor floor at the left has a larger and more intricate pattern, with a wider border, for the reason that here there is room for it, which is not the case in the hall and reception-room. In the rear of the hall is a room ornamented with panels of a floor made of strips of light and dark woods, set off with borders, while in the room just left of this an illustration is given of how a carpet in the centre may be set off by a border of inlaid wood.

We wish to call special attention to the advantages of the latter arrangement, in case the floor of a room is cut off on different sides by the hearth, buffet, bookcase, etc. It is not necessary to cover all the floor with a carpet of which many pieces are cut out, which is very wasteful, but the carpet may be square and have scarcely half the surface that would be required to cover all. This may appear an exaggerated statement, but it is surprising how much carpet will be saved by such a border; this is proved by the very figure here represented; the house occupies a full lot of 25 feet, and the scale is ¼ inch to the foot; the room referred to is to 11 by 17 or 187 square feet, while the inside, after taking off a border of 2 feet, is 7 by 13 or 91 square feet, less than half of 187 of the whole surface of the room.

The various woods used by this firm are walnut, ash, oak, maple, cherry, rosewood, amaranth, holly, mahogany, tulip, and ebony. They are ⅞, ½, and ¼ inch in thickness, and so set together that warping is out of the question. The ⅞ and ½ inch flooring is secured on the under side by dovetailed strips in such a manner as to hold firmly in place each separate piece. By this process a solid and durable floor is constructed at considerable less cost than by the old method of gluing a ¼ inch veneer on a base of other wood.

The ¼ inch flooring is made by an improved patented process, in sections, that can be secured to the floor in the same manner as oil-cloth, linoleum, etc., and is generally used with rugs, carpets, or as a covering for old floors where it is not desirable to change the height of one room above another.

A book of designs and price-list will be furnished on application, and we will here only mention that the prices vary from as low as 16 cents per square foot for the plainest flooring to $1.50 for elaborate figures or wainscoting. Borders vary from 15 cents to $1.75, according to elaboration of style and quality of the woods employed. Very elegant centre-pieces are also made, varying in price according to quality and size, from 75 cents to $9.

We ought to mention one kind of flooring of which the back is covered with asphaltum, and intended to be laid on stone floors or cement, by which any access of moisture from below, and consequent rotting of the floor or the evaporation of unwholesome vapors from the ground is prevented.

FILLING-UP.—This can be made in several ways. Noble & Orse's patent filling is in a powder, which you can make by mixing. Filling, 2 lb., wet; white lead, ½ lb.; varnish, ¾ lb.; gold size, 6 oz.; turpentine, ½ pint. If you cannot get the filling, get brown ochre, 2 lb.; dry white lead, ½ lb.; varnish, ¾ lb.; gold size, ¼ lb.; turpentine, ½ pint. Let there elapse at least twelve hours between each coating, of which four will be sufficient—if you can allow longer it will be all the better.

THE PAPYRUS OR PAPER REED.

(See page 245.)

The papyrus plant or paper reed, an engraving of which (taken from Knight's *New Mechanical Dictionary*) is herewith presented, belongs to the family of *cyperaceæ* or sedges, nearly related to the grasses, and as remarkable for the small number of its useful plants as the grasses are for their many valuable species. It was called *papu* by the Egyptians, whence the Greek *papuros*, the Latin *papyrus*, and our word *paper*. It grows on the marshy banks of rivers in Abyssinia, Syria, and Sicily, and formerly abounded on the banks of the Nile; but at present it has nearly disappeared from Egypt. The plant has large and abundant root stocks, which spread in the mud and throw up numerous stems from five to ten feet in height, the lower portion being submerged; the stem is triangular and smooth. The leaves all spring from near the base, the upper part of the stem being quite naked and bearing its inflorescence at the apex in the form of a large compound umbel. This consists of numerous slender branching peduncles, bearing at their extremities the flowers in small heads or spikes, and forming a graceful, drooping tuft, which has at its base numerous long narrow leaves.

In making paper the upper cuticle of the stalk was separated into thin *laminæ* by a sharp point. The finest were those next the pith; and the layer, of which there were about twenty, decreased in quality as they approached the outer integument, which was coarse and fit only for making cordage, mats, etc. The slips were laid side by side on a smooth flat surface, and covered with a second layer placed at right angles to them, after which they were pressed so as to cause the different *laminæ* to adhere to each other and form a single sheet, which was then dried in the sun. It is said that the layers were made adhesive by wetting them with Nile water, to which Pliny ascribes a glutinous quality. The sheets were finally beaten smooth with a mallet and polished with a piece of ivory. When finished, the papyrus was rolled upon a wooden cylinder, the ends of which, projecting beyond the edges of the sheet, were neatly finished and ornamented.

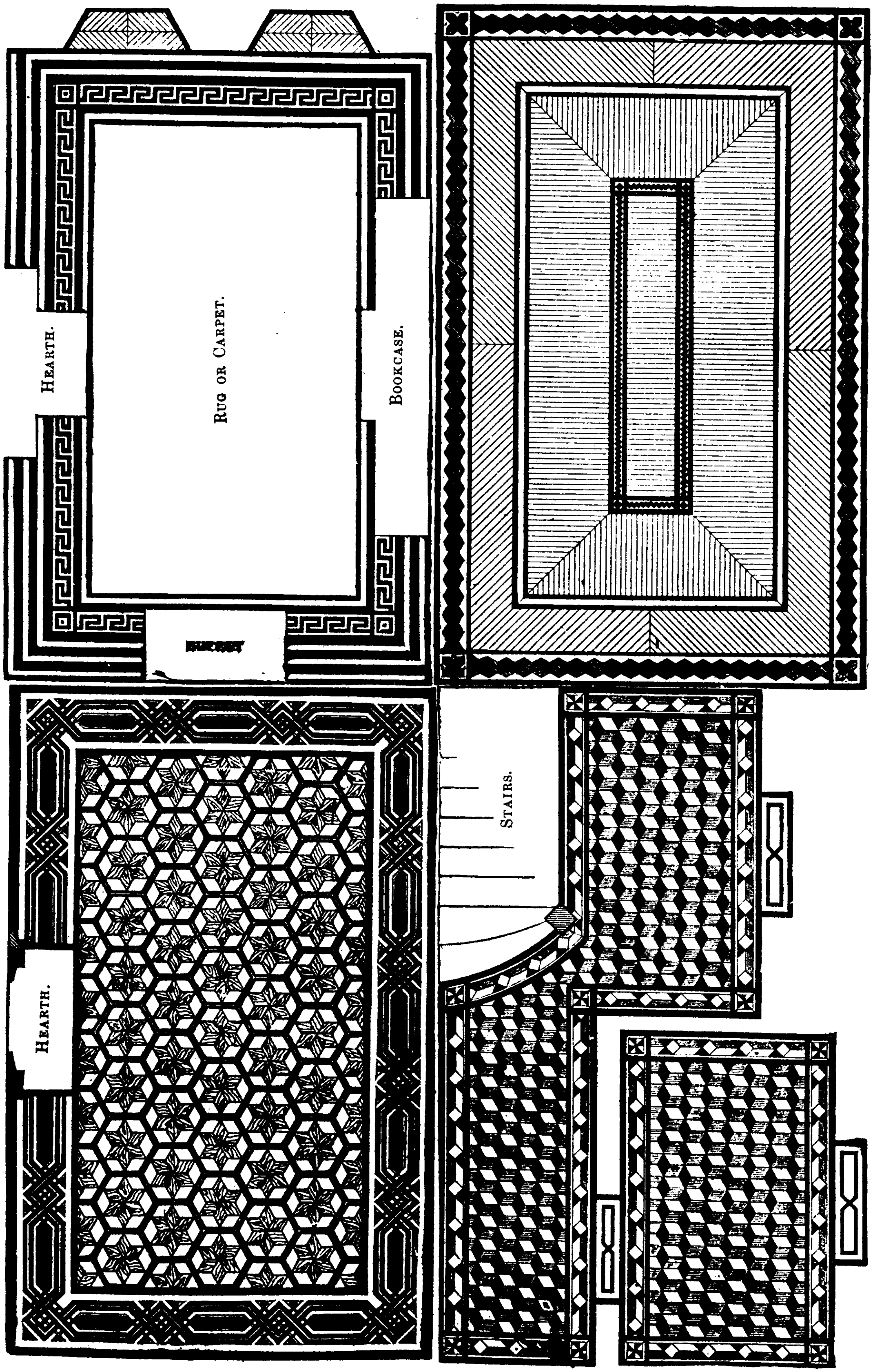
The papyrus plant was used for a great variety of purposes besides paper. Its graceful plumes crowned the statutes of the gods, and decorated their temples: its pith was eaten as food: wickerwork boats, boxes and baskets were woven of its stalk; and of its bark were made sails, cordage, cloth, mats, and sandals for the priests. It was applied as medicine to the cure of fistulas and ulcers; it furnished material for torches and candles, and its roots were used for fuel and manufactured into furniture and household utensils.

THE TEA PLANT.

(See page 245.)

The culture of the tea plant and the production of first-class sewing circle material may be said to be one of the California problems. We have credit in all the encyclopedias with the ability to produce good plants, but putting the production upon a practical and profitable basis is another question and is, we believe, as far from satisfactory demonstration as it was when our first experiments were made. We chose the tea plant for illustration this week because its cultivation may still be considered as among our far-off possibilities, and because as the illustration is a good one, the publishing of it may be of interest to our amateur students of botany, and for the information of readers generally. So far as the introduction of the plant as an element of agricultural production is concerned, we have again the oft repeated assertion that the Asiatic fields are showing signs of decadence. Whether the report be true or not we have no present means of judging, but it may serve as a stimulus toward the determination of our latent resources. We have no reason to believe, from the present quality and price of labor in this State, that we can produce tea profitably, and yet why is there not the same field for the introduction of labor-saving machinery in production of tea as in other complex operations which have already yielded to the achievements of inventors? It is, however, chiefly with the intention of interesting readers who are not familiar with the appearance of the tea plant that we use it as an illustration.

Our engraving gives an excellent exhibition of the analysis of the plant botanically. As we read the studies of the botanist, it is now generally agreed that there is not sufficient reason to give the tea plant a genus of its own, but it must be classified as a



TESSELATED WOOD FLOORS.

THE CHINESE TEA PLANT.

THE PAPYRUS.

species of the genus *Camellia*, and its name is *Camellia thea*. The tea plant differs from the other species of *Camellia* grown in this country, according to one authority, by having "longer, narrower, thinner, more serrate and less shiny leaves. Its flowers are axiliary and nodding, and though only about an inch across, closely resemble those of a single *Camellia*. The sepals and petals are usually five, the stamens numerous, a portion forming by their united bases a cup, within which are numerous separate stamens. The fruit or pod is usually three-celled, with a single large seed in each cell." These points are all well shown in the engraving. At the lower left hand corner are shown the tripatite pistil, the cross section of the three-celled ovary, and the three-celled seed-pod, when fully grown. At the right lower corner are sections of the seed, with and without its covering, and one seed split to show the position of the germ.

Such, in brief, is the plant which has given China a name throughout the world. Of the growth of it in China we have the following interesting description in the words of a traveller:

In the black tea districts of China, as in the green, large quantities of young plants are yearly raised from seeds. These seeds are gathered at maturity, in October, mixed immediately after and packed in sand and earth, in which they are kept during the winter months. In this manner they are preserved fresh until spring, when they are thickly sown in some corner of the farm, whence they are afterwards transplanted. Sometimes they are sown in rows where they are destined to grow, and consequently do not require to be removed. When about a year old the plants are usually from nine inches to a foot in height and are ready for transplanting. They are set in rows about four feet apart, in bunches or hills, three or four feet asunder along the rows, with five or six plants to each bunch. In some cases, however, when the soil is poor, as in many parts of Woo-e-shan, they are planted very close in the rows and appear like hedges when fully grown.

The young plantations are always made in the spring and are well watered by the rains which fall at the change of the monsoon in April and May. The damp, moist weather at this season enables the plants to establish themselves in their new quarters, and they afterwards require but little care, except in keeping the ground free from weeds.

When the winters are very severe, the natives tie straw bands round the young tender shrubs to protect them from the cold, and to prevent them from cracking or bursting from frost or snow.

A tea plantation, when seen at a distance, looks like a little shrubbery of evergreens. As the traveller threads his way among the rocky scenery of Woo-e-shan, these plantations, which are constantly seen dotting the hillsides, afford a pleasing contrast to the strange and often barren surface by their rich dark-green leaves. When young, they are allowed to grow unmolested for two or three years, or until they are well established and producing strong and vigorous shoots. The practice of plucking the leaves is very prejudicial to this shrub, and the natives always take care that the plant shall be in a vigorous and healthy condition before this operation is commenced. Even when the plantations are in full bearing they never take many leaves from the weaker plants, in order that their growth may not be checked. For, under the best mode of treatment and on the most congenial soil, they ultimately become stinted and unhealthy, and are never profitable when old. Hence, in well managed tea districts, the natives annually remove old plantations and supply their places with fresh ones.

INDIAN INK.—The *Papier Zeitung* gives the following recipe for making a deep black Indian ink which will also give neutral tints in its half shades:—Rub thoroughly together eight parts of lamp-black, sixty-four parts of water, and four parts of finely pulverized indigo. Boil the mixture until most of the water has evaporated, then add five parts of gum arabic, two parts of glue, and one part of extract of chicory. Boil the mixture again, till it has thickened to a paste; then shape it in wooden moulds, which have been rubbed with olive or almond oil.

COPPERING IRON AND STEEL, DRY WAY.—In cases where it is desired to give a stout coating of copper, brass or bronze to wrought or cast-iron goods, and a uniform thickness is not essential, a sufficient quantity of the metal is set to melt in a crucible. Its upper surface receives a layer of Gaudoin's flux, a mixture of cryolite and phospheric acid, and the article, heated to the temperature of the bath, is placed in it. If the article is heavy, it will be well to heat it gradually and thoroughly, both to avoid unequal expansion and to obviate the danger of the coating peeling off in consequence of unequal contraction.

DURABILITY OF TIMBER.

The durability of timber is almost incredible. The following are a few examples for illustration, selected for the *Railway Age*, from various sources, and vouched for by scientific men.

The piles of a bridge built by Trajan, after having been driven more than 1,600 years, were found to be petrified four inches, the rest of the wood being in its ordinary condition.

The elm piles under the piers of London bridge have been in use more than 700 years, and are not yet materially decayed.

Beneath the foundation of Savory place, London, oak, elm, beech and chestnut piles and planks were found in a state of perfect preservation, after having been there for 650 years.

While taking down the old walls of Tunbridge castle, Kent, there was found in the middle of a thick stone wall a timber curb which had been enclosed for 700 years.

Some timber of an old bridge was discovered while digging for the foundations of a house at Ditton park, Windsor, which ancient records incline us to believe were placed there prior to the year 1396.

The durability of timber out of ground is even greater still. The roof of the basilica of St. Paul, at Rome, was framed in the year 816, and now, after more than 1,000 years, it is still sound, and the original cypress-wood doors of the same building, after being in use more than 600 years, were, when replaced by others of brass, perfectly free from rot or decay, the wood retaining its original odor. The timber dome of St. Mark, at Venice, is still good, though more than 850 years old. The roof of the Jacobin convent, at Paris, which is of fir, was executed more than 450 years ago.

The age of our country's settlement does not enable us to refer to examples of like antiquity; but no good reason appears to exist why timber may not be as durable in America as in Europe. Many old white-pine cornices here exist, which, having been kept properly painted, have been exposed to the storms of more than 150 years. The wood is still sound, and the arrises are as good as when they were made; while freestone, in the same neighborhood, has decayed badly in less than 50 years.

THE COST OF FEEDING PARIS.—The cost of the daily dinner of the Parisians has been calculated by one of the French papers as follows: Bread, about 275,000 francs; wine, 250,000 francs; beer and cider, 15,000 francs; water, for cooking and drinking purposes, 6,500 francs; sausages, pig's feet, etc., 8,000 francs, pates and crabs, 5,000 francs; oysters, 4,500 francs; eggs, 17,500 francs; butter, 11,000 francs; beef, 230,000 francs; veal, 20,000 francs; mutton, 35,000 francs; pork, 33,000 francs; poultry, 24,000 francs; fresh water fish, 2,000 francs; sea fish, 16,000 francs; vegetables, 200,000 francs; entremets, fine and ordinary pastry, 50,000 francs; cheese, 4,000 francs; fruit, and preserves, 12,000 francs; brandy, liqueurs, etc., 50,000 francs. This gives a total of 1,268,500 francs, or about $255,000, with the addition of 5,000 francs, estimated cost of toothpicks, making altogether an average cost of 25 cents per head as the daily cost of the nourishment imbibed by the Parisians.

CAR HEATING.—A new French combustible compound has a base of carbonized tan or wood bark, and this mixed with a small quantity of nitrate of lead or spirits of niter, slacked lime or loam being added as agglutinative matter. It ignites easily, burns gradually and continuously in this state, and still slower by adding a small quantity of wood charcoal dust. Neither smoke or odor are perceptible. A small quantity burned in a foot-warmer or chafing-pan, with a limited supply of air, will not be entirely consumed for about 16 hours, and during that time will develop heat enough to warm a compartment of an ordinary carriage. The dangerous railroad stove may be succeeded by an improvement on some such mode of heating as this. It may be that steam pipes, supplied with either live or exhaust steam, and connected with flexible gutta perch pipes, might be much better, but it is certain that some general provision of safety from this source of danger to life and property is needed.

NEW HORSE-SHOE.—Mr. Yates, of Manchester, England, has invented a horse-shoe composed of three thicknesses of cow-hide, compressed into a steel mould and then subjected to a chemical preparation. It lasts longer and weighs only one-fourth as much as the common shoe; it never splits the hoof and has no injurious influence on the foot. It requires no calks; even on asphalt the horse never slips. It is so elastic that the horse's step is lighter and surer. It adheres so closely to the foot that neither dust or water can penetrate between the shoe and the hoof.

SCIENTIFIC AND MECHANICAL.

A WRITER in the *Country Gentleman* says that coal tar is often named as a preservative of wood, and the comment is correct if those who advise would add that, in using, it must have the acid in it destroyed by mingling fresh quicklime with it. Half a bushel of lime, freshly dissolved and mingled with a barrel of tar, has kept posts, saturated with it and planted in clay ground, perfect over 20 years.

ARTIFICIAL IVORY.—French journals announce two new processes for the manufacture of artificial ivory. The first consists in dissolving two parts of pure india-rubber, in thirty-six parts of chloroform, and saturating the solution with pure ammoniacal gas. The chloroform is then distilled at a temperature of 160 deg. Fah.: and the residue, mixed with phosphate of lime or carbonate of zinc, is pressed into moulds and dried. When phosphate of lime is used, the product is said to possess in a remarkable degree the peculiar composition of natural ivory. The second process involves the use of papier maché and gelatine combined. Billiard balls of this substance cost about one-third of the price of genuine ivory balls, and are claimed to be quite as hard and elastic as the latter. They may be thrown from high elevations upon pavements without injury, and will withstand heavy blows with the hammer. The composition is known as Paris marble, and may be used for raised ornamentation of ceilings, or prepared so as to imitate fine varieties of marble.

OIL GOLD SIZE.—Take of gum animi and asphaltum each 1 oz., of red lead, litharge of gold, and umber each 1½ oz. Reduce the coarser of these to a powder, mix, and put them with a pound of linseed oil into a pipkin; boil, gently stirring with a stick till about as thick as tar, strain through flannel, put in a closely stoppered bottle ready for use.

Another.—This made by grinding stone ochre with a drying oil (linseed). It may be made by pouring oil from dryers, and may be hastened or retarded in drying to suit the gilder.

Another is made by grinding good stone or Oxford ochre very fine in old flat linseed oil; when ground as stiff as possible, it ought to be kept for several years before it is used. The longer it is kept the better it becomes, as it requires a rich mellow fatness. When about to use it mix it up with a little good fat boiled oil to a proper consistence, neither too stiff or too fluid.

FRAME GILDING.—Get a smooth surface by rubbing with pumice stone and sand-paper. Lay upon this a few coats of parchment or isinglass size (letting one dry before the other is put on), mixing with the last coat some gilders' whiting and yellow ochre. When this is dry, and has been rubbed smooth, a small piece of the frame is to be moist, and the gold leaf laid on directly. Proceed in this manner until the frame is covered.

DRILLING BAND SAW.—Heat a pair of tongs till almost red hot, and put the saw between till the steel turns blue; then punch a hole through with a punch the required size.

Another.—Soften it by making it red hot and letting it cool, and drill with an ordinary drill in the usual way, then harden it by making it red hot and dip it in cold water, then rub it with a piece of pumice stone; watch it till it burns a light blue, then cool it.

TO STAIN WOOD TO REPRESENT EBONY.—Boil ½ lb. of logwood chips in 2 quarts of water, add 1 oz. of pearlash, and use hot with a brush. Afterwards take 2 quarts of the logwood decoction, ½ oz. of verdigris, ½ oz. of copperas; strain, and add ½ lb. of iron rust. Brush the work well with this, and go over it afterwards with oil.

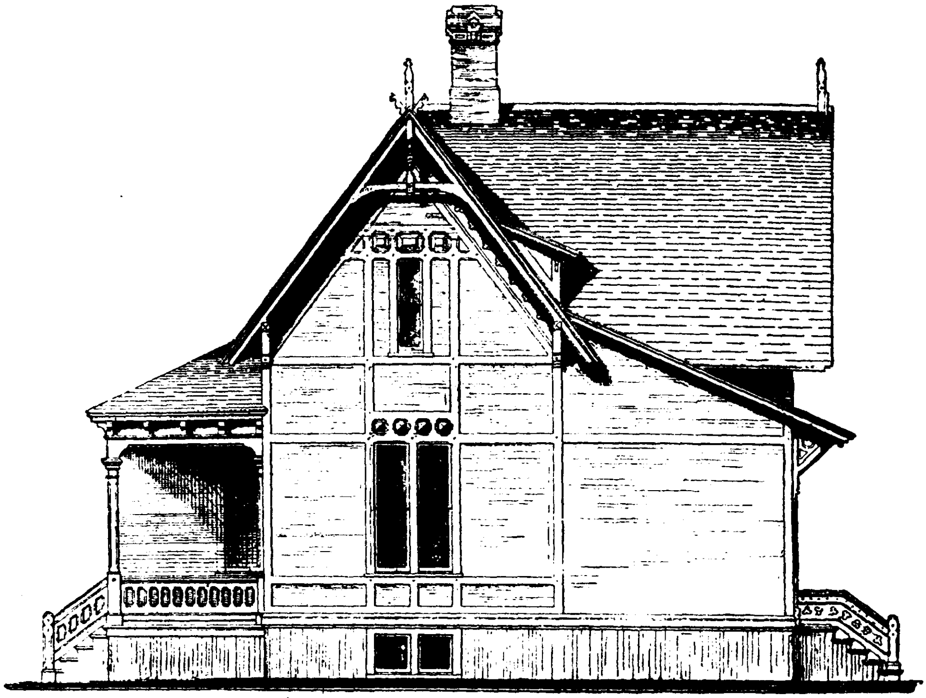
A NEW SAFETY LAMP.—A paper on "Landau's new Safety-lamp for Use in Mines" was lately read at a meeting of the North Staffordshire Mining Institute. The chief peculiarity of the invention resides in the feature that the admission of gas extinguishes the flame, so that it cannot under any circumstances be exploded by the lamp. The whole of the air supply that feeds the flame must pass through an air-chamber in a limited space at the bottom of the lamp, and as soon as the impure air, such as hydrogen, carburetted hydrogen, &c., fills up to that limited space, the passage of the needful supply of oxygen to feed the flame is choked thereby, and the flame is necessarily extinguished for want of air. Experiments made to demonstrate this claim were quite successful. It was further claimed that the lamp could not be affected by the strongest current of pure air, but were less successful. But while the latter experiment did not show the Landau lamp to be inferior to others, the former were regarded as decided points of superiority in construction.

LIQUID WATERPROOF SHOE POLISH.—The following is said to be a good formula for the purpose: Dissolve 1 oz. of india rubber in 1 pint of oil of turpentine by the aid of a water bath, preventing loss; dissolve 15 ozs. of pure bees-wax, 2 ozs. of Burgundy pitch, and 1 oz. of gum olibanum in 4 pints of oil of turpentine; then rub 2 ozs. of the finest lamp-black with 1 pint of oil of turpentine, to a smooth mixture, and mix the three solutions. Add now ½ pint of copal varnish and afterwards 5 pints of lime water in quantities of 4 ozs. at a time, stirring after each addition, and continuing the stirring after the whole of it is added for sometime aftewards. The mixture must always be well stirred up before any is taken out for use.

THE President, Mr. R. M. Bancroft, and members of the Civil and Mechanical Engineers' Society, when visiting Kirkaldy's testing and experimental works the other day, were shown a cast iron bar which had been sent to him to test, as a sample that had been treated with mysterious chemical mixtures, which were said to increase its tensile strength over fifty per cent. But as Mr. Kirkaldy's rule is always to break the specimen, or else his machine, he found it contained, upon being fractured, a centre core of wrought iron about two inches in diameter, and six small ones of the same metal spaced around it. He thus exposed the secret.

A NEW GUNPOWDER.—When a grain of gunpowder is fired in the gun, the first gas that is evolved starts the projectile; and as the latter travels, the combustion area of the powder is constantly augmented until, by the time the flame reaches the interior of the grain, the small remainder of the same is incompetent to evolve by its combustion gas enough to compensate for the increased area over which it must act. Hence that nucleus of the grain serves no useful purpose, and certainly affords no acceleration to the shot: but in the new "compensating" powder, which Captain Charles A. L. Totten, U.S.A., has devised, this nucleus is made to render an accelerating force through being formed of gun-cotton, which, exploding in an increased area, exerts little strain on the gun, and checks the tendency of the gas to lose its tension, thus compensating for the increasing space in rear of the projectile. Not only does the inventor claim for this compound explosive high impulsive power, but he states that the waste of large grained powder, which is blown out of the gun with the grain still burning, often reaches 60 per cent. of the charge, and that this is saved by the addition of the gun-cotton nucleus. In general, he affirms that the combined gun-cotton and powder is lighter, and four and a-half times more effective, charge for charge, than gunpowder. If this can be substantiated by experiment, there can be little question but that the new explosive will be of the greatest value in modern large artillery, in which gunpowder has been proved too weak to project the immense shot and shell with proper effective velocity. Captain Totten finds, by test, that no chemical change attributable to the mutual action of gunpowder and gun-cotton occurs in his powder. The gun-cotton nucleus is spherical, and half an inch in diameter, the powder envelope raising the diameter to one inch. No special machinery has yet been invented for its manufacture. —*Scientific American.*

A NEW ELECTRIC FIRE-ALARM.—A new electric fire-alarm, devised by M. Gaulne, of Paris, was described at a recent session of the Belgian Society of Civil Engineers. A metal box, fixed to the wall or ceiling of the room, has two metal columns which receive the conducting wires from below, and to which are attached two sensitive plates, the upper ends of which meet near the summit of the box at an acute angle when brought together. Each plate is made partly of steel and partly of an expansible metal, the steel being on the inside and extending to the end of the plate, the expansible metal being the shorter. The effect of heat on these plates is to cause the outer metal to expand; and the steel ends being brought in contact, connection is established between the wires, and a bell is sounded. Besides serving as a fire-alarm, the invention is intended to act as an ordinary call-bell, and to this end a vertical rod, spring supported, has at its upper extremity an index which, when the rod is drawn down by a cord similar to a bell-pull on its lower ends, rubs against the sensitive plates, and thus establishes the current. The degree of expansion of the outer metal of the plates being known, it is only necessary to approximate the ends more or less closely to cause contact to occur at any thermometric point and the bell to sound. A needle attached to one plate moves over a dial marked with degrees and fractions. This plate is moved toward, or allowed to spring from, the other by means of a regulation screw, and thus the needle may be adjusted at any degree.



SUBURBAN COTTAGE—SIDE ELEVATION.

SUBURBAN COTTAGE—FRONT ELEVATION.

DESIGN FOR A SUBURBAN COTTAGE.

We represent on this page the front and side elevations of a suburban cottage, designed by Mr. A. J. Smith, Architect, of 77 South Clark street, Chicago, Ill. This design is so attractive in all its details that we think it cannot fail to be admired, both as regards its exterior and interior arrangements. On the first floor (the plans of which will be found on the opposite page) are four good sized rooms—a parlor, 12 feet by 15 feet 4 inches; a sitting and dining room, 12 feet by 15 feet 4 inches; a kitchen, 12 by 12 feet; and a bedroom, 8 feet by 9 feet 8 inches; besides which there is a pantry 4 by 5 feet, and four good sized closets. On the second floor are three large chambers—two 12 by 12 feet, and one 12 feet by 15 feet 4 inches.

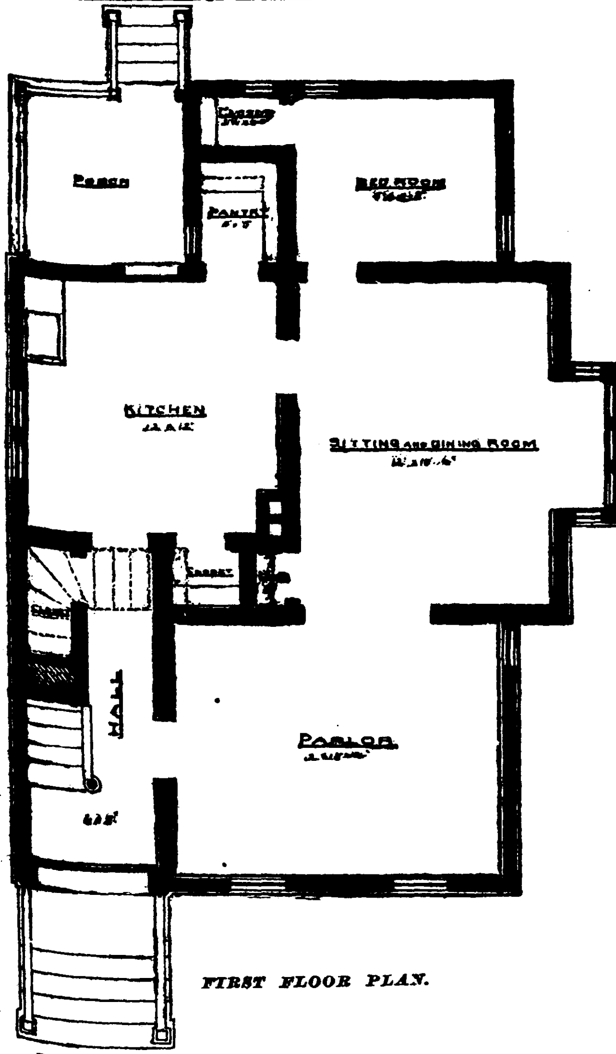
The bedroom on the first floor will be found a good feature of this design, and one that we have been asked to present by many of our readers.

The estimated cost of this house, complete, is from $2,000 to $2,500, depending on locality, price of material and finish, but in the vicinity of Montreal it can be executed probably for $2,000, if the specifications given below are closely followed. The following are the complete specifications:

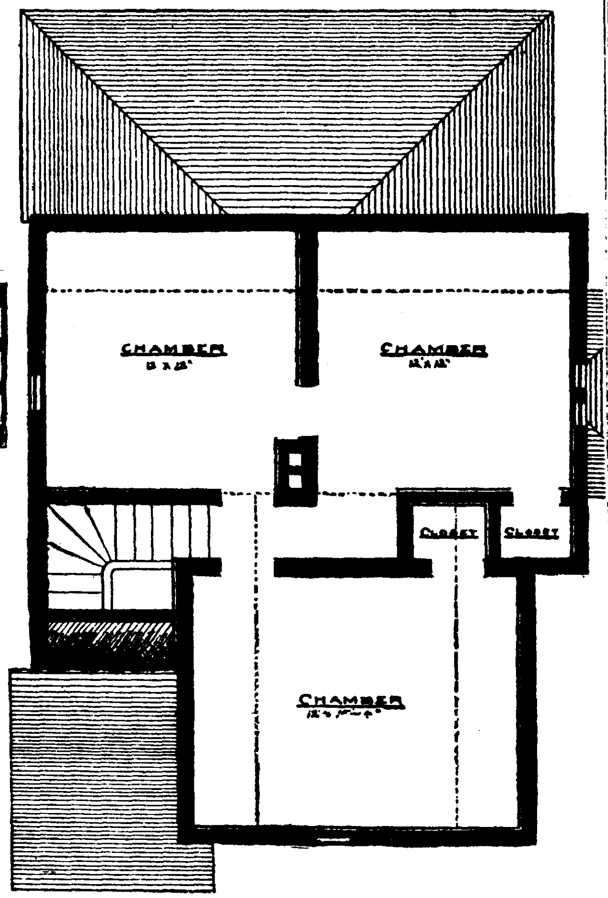
The plans are drawn to a scale of 8 feet to the inch.

Height of Stories.—Cellar 8 feet; main story, 10 feet 6 inches; second story, 9 feet 6 inches. These measurements are in the clear between floors and ceilings.

Mason Work.—The ground to be excavated for cellar under kitchen and parlor on a line with the inner wall of kitchen, and under rear bedroom, pantry, etc., in rear of the house; cellar walls to be laid up to grade with flat bedded rubble stone, laid in cement and in courses, to be topped to required height with good hard-burned brick, laid in lime mortar. Build piers under balance of house and to porches; to be of stone 16x16 inches up to grade, and sunk to a depth of 4 feet below natural surface of ground; to be topped out with brick 12x12 inches. Chimneys to be built where shown of good hard-burned brick, to be laid with close solid joints, and well plastered on the inside. Build 6-inch thimbles in chimneys to all rooms, to be set 2 feet from ceiling, and built in as the work progresses; chimneys to be topped out above roof, as shown. Basement windows and door sills to be of cut stone, also all caps for veranda piers. To have concrete floor of cement and slag in the basement.



FIRST FLOOR PLAN.



SECOND FLOOR PLAN.

Plastering.—Plaster the main and second stories with two coats of plaster, the first coat to be of strong brown mortar, well mixed with Canada hair; the second coat to be a good hard plaster of Paris finish, to be well trowelled, and to be straight and true to a straight-edge on the surface. The cellar to have one strong coat of brown mortar, well mixed with hair, and floated over with good brown finish.

All lath used throughout must be dry and well seasoned, and put on with a ⅜-inch joint; all angles must be solid. Do all patching on completion of the work.

Cornices, Etc.—Cornices to be of 15-inch girth in dining-room, parlor, and main hall; to be neat center-pieces in same.

Drain.—To be 6-inch tile drain from cellar to cess-pool; to have 4-inch branch connecting the same with sink. To have tile conductor pipes to carry water from down spouts to cistern. The cess-pool to be located at least 40 feet from the house; to be 12 feet deep and 4½ feet in diameter, and bricked well round with 8 inches of sound porous brick laid in sand.

The cistern to be of 2-*inch* hard pine, to have a capacity of 40 barrels, to be made *in* best manner, and well bound with eight wrought-iron hoops 1¼x3-16 inch; to be tarred on the outside, and sunk in the ground so that the top of the cistern will be 6 inches above the grade; to have cover of 2-inch matched pine, with trap door in the same, hung with strap-hinges, and furnished with ring and staple.

Down Spouts.—To have two down-spouts of I. C. tin, 4 inches in diameter, connecting gutters with drain tile conductors; and to be secured to the building in best manner.

Gutters on roof to be of I. C. charcoal tin, put on as the shingles are laid, to have a gradual fall to conductor pipe.

The roof of bay-window and dormers to be covered with I. C. roofing tin, with the joints well soldered.

Carpenter's Work.—The whole of the timber throughout must be dry, well seasoned, and clear of large or unsound knots or knot-holes, sap or dry-rot, and to sizes as follows: Sills, 8x8 inches, joints scarfed with 2-foot scarfings; girders, 6x8 inches, joints scarfed with 2-foot scarfings; braces, 1¼x6 inches, housed into studs; floor joists, 2x10 inches, placed 16 inches from centers; ceiling joists, 2x6 inches, placed 16 inches from centers; rafter joists, 2x6 inches, placed 16 inches from centers; hip rafters, 2x8 inches; valley rafters, 2x8 inches; ridge pieces, 2x8 inches; studding, 2x4 inches, placed 16 inches from centers, set double at all angles and openings, and openings trussed overhead. The frame to be a balloon frame, of 6x6 inch white pine, surfaced on face and two edges, to be tenoned and mortised together, and pinned with ⅝-inch oak pins, draw-bored. To have fillets nailed on sides of said framing to secure filling-in studs. The framing to be chamfered with a 1⅝-inch stop chamfer where required. The framing to be grooved with a ⅝x⅝-inch groove to receive raised panels where shown in plans. Siding to be of 1-inch common pine, tongued and grooved; clapboards of clear pine, 4½ inches wide. Frieze to be of 1¼-inch clear pine, with raised diamond headed studs as shown. Finials to be 6x6 inch pine, framed into verge-boards and collar beam as shown, the verge-boards to extend out beyond roof on each side as shown. The porch to be fitted up with clear pine, to have 6-inch box, clear pine posts with molds, etc., as detailed, to have brackets to same, also over main entrance. Cover the roofs with 1-inch common pine boards, surfaced on the top side, and best quality star brand shingles, laid 4½ inches to the weather. Lay in all necessary flashing of I. C. tin for chimneys, etc., as the work progresses.

Lay the main floor double, the first thickness to be of common pine boards, surfaced, over which lay second common pine dressed and matched flooring, 4½ inches wide, to be well blind-nailed.

The second-story floor to be as top thickness of main floor: all uneven joints to be smoothed off.

The stairs to be made of clear, well-seasoned pine, to have 1½-inch treads, with Scotia return nosings, ⅞-inch risers, 1½-inch strings and carriage pieces, 4-inch black walnut molded hand-rail, 8-inch black walnut turned newel, 1¾-inch turned black walnut balusters, dovetailed into ends of treads and also into rail. To be steps to front and rear entrances where shown on plans; to have 1¾-inch pine Scotia nosed treads, ⅞-inch risers, 1½-inch strings; the under side of steps to be sheathed with narrow beaded pine wainscoting; to have 8-inch newel posts of 1½-inch clear pine, put together with white lead, and nailed; to be chamfered, to carry out design as shown; the buttresses rails, etc., to be of pine, and made in best manner.

To be porches where shown; to have carriage pieces of 4x6 inches; joists, 2x8 inches, placed 16 inches from centers; rafters, 2x6 inches, placed 16 inches from centers; ceilings to have 2x4-inch joists, covered on under side with narrow beaded and matched wainscotting; roofs covered with common boards, surfaced, and star brand shingles, laid 4½ inches to the weather; to have tin shingle gutters and down-spouts connecting with main down-spouts. The space between floors of porches and ground to be boxed off with narrow beaded pine, dressed and matched; to have 2-4 rails and 6-inch cedar posts.

The bay-window to be framed together in best manner, to carry out the design as shown. The foundation up to sill plate to be of good hard-burned brick, laid in strong lime mortar. To have box frames with pulleys of good manufacture, 1¾-inch check-rail lip, sash hung with cords and weights, and secured with imitation bronze sash locks; to have inside blinds, 4-fold, and shutter boxes for same, with panelled backs and elbows. Remainder of windows throughout the house to have box frames, with good manufacture of pulleys, 1¾-inch check-rail lip-sash, hung with cords and weights, and secured with sash locks of imitation bronze. All windows to have inside blinds, to be 4-fold, the center fold to have rolling slats, and cut in two at meeting rail; all to be hung with wrought butts.

The front and rear entrance doors to have 1¾-inch clear pine frames, rebated ⅝-inch and to suit doors; the doors to be of 1¾-inch clear pine, tenoned and mortised, and glued and wedged together; to be stop-chamfered as shown, and to have sheathing on inside of ⅞-inch clear pine, dressed and matched; to be 3 inches wide, with a V-joint, and put on diagonally for upper panels. To have outside door locks of good manufacture, with night-latch attachment, with three keys to each one; to have ornamental trimmings, and to be hung with 4½x4½-inch acorn tipped japanned butts, three to each door. All doors to rooms on main and second floors throughout to be of 1½-inch clear pine, stop chamfered, and to have ⅞-inch grooves to receive panels; to be mortised and tenoned and glued and wedged together; to have good mortised locks, lava trimmings, and hung with 4x4-inch loose common butts. All doors to closets to be of 1¼-inch clear pine; in other respects to be similar to doors to rooms. All doorways to have black walnut saddles. To be transoms over all doorways on second floor, except closet doors. Casing to all doorways to be of 1⅛-inch pine; ⅞-inch pine to all windows—all to be to required widths. To have an 8-inch molded base throughout the main floor, with ¼-inch round at bottom; 8-inch o. g. base in second story, ¼-inch round at bottom, and 6-inch o. g. base in all closets. Wainscot around kitchen, 5 feet high behind sink, remaining 3 feet high, with narrow beaded dressed and matched; ⅞-inch pine wainscoting, to have neat cap on top and ¼-inch round at the bottom. To have sink in kitchen, 4 feet by 21 inches by 8 inches deep, made of 1½-inch clear pine, put together with white lead and well nailed; to be boxed in with narrow beaded wainscoting, with door in same, hung with suitable hinges and secured with spring catch. Pantry to have three rows of drawers, with necessary framing, runners, and pulls, and each drawer furnished with a good lock; to have four rows of shelves 12 inches wide on all sides of pantry where practicable. China closet to be filled up similar to pantry. Remainder of closets throughout to have a strip of pine 3x1-inch, extending on all sides where practicable, to be beaded on both edges, and to have hat and cloak hooks secured to same. To have three rows of shelves on all sides where practicable.

The trimming throughout main floor to be a 6-inch chamfered casing and band, and plaster mold, making 8¼ inches altogether. To have plinth blocks of necessary size and design to receive molds. Trimming throughout second floor to 5-inch chamfered casing and band mold, making 9 inches altogether. The face of all trimming must be smoothed over with a sharp smooth-plane before fixing.

Painting and Glazing.—Paint the wood, tin, and iron work, inside and outside, with three coats best white lead and oil paint, the two last coats to be tinted as desired. Putty up all nail holes or other imperfections. Shellac all knots and stains in woodwork. All black walnut throughout to be oil finished. The exterior of house should be painted in French greys, of shades to suit owner, the framing to be distinct from body of house and valleys; the sashes should be black. Glaze all windows with double thick American glass; all glass to be well bedded, pointed, and backed puttied, and secured with glazier's points; all sash to be primed before glazing.

Good pump to suit locality, to be set on sink, and to have all necessary supply and pipes, also all necessary faucets, etc.

Should there be anything necessary to complete the building not mentioned in these specifications, the same must be done at the cost of the contractors, notwithstanding such may have been omitted.

Salisbury Cathedral.—This cathedral, with the main part of Westminster Abbey, belonging to the same period, may be considered (says the *Illustrated London News*) among the finest examples of the early-English Pointed Architecture. It was built in the reign of Henry III., from A.D. 1220 to A.D. 1258, while the choir of Westminster was begun in 1245 and completed in 1269. Though much smaller than the Cathedral of Amiens, it is more beautiful. The height of the spire, 400 feet above the ground, is surpassed by Amiens as well as by Strasburg, the spire of the latter rising to 468 feet. The west front, a work of the fourteenth century, is inferior to those of Wells and Lincoln Cathedrals. But the whole effect of the exterior view, in spite of a low and flat situation, has the grandeur of unity, harmony, and consistency, in great perfection. The interior of the nave and choir, though without much ornamentation, has the severe grace of the purest gothic style. Its aspect was formerly regarded as somewhat cold and bare. This reproach is now taken away, in some measure, by the beautiful reredos, a gift of Earl Beauchamp, the carved oaken screen, the decorated floor and ceiling, the canopied stalls, throne, and pulpit: but stained-glass windows may yet be added. Salisbury Cathedral was built when the diocese of Salisbury was occupied by Bishop Richard Le Poer, or Poore, a remarkably able Churchman. It was he, in fact, who created the existing town of Salisbury, by removing the ecclesiastical establishment from the neighbouring hill of Old Sarum; which took place about 650 years ago. William Longespee, Earl of Salisbury, a son of King Henry II. by "Fair Rosamond," was the patron and helper of that great work, aided by his countess Ela; and their tomb is shown in the Cathedral to this day.

A Perilous Feat.—To the westward from John o'Groat's is seen the Hoy Head, which is one of the highest cliffs in Scotland. It is said to be 1,100 feet high. St. Paul's is 404 feet high, the height of this fearful cliff is nearly three times higher than St. Paul's. A story is told of an eagle's nest having been discovered far down a cliff somewhere in this neighbourhood. A sum of a guinea each was offered for the eggs; an Orkney man, determined to gain the prize, made a rope of heather, fastened his wife to the end, and let her down to rob the eagle's nest of the eggs. The young woman, when at the nest, was no less than forty fathoms down, or thirty-eight feet higher than the Monument from the top of the cliff. The rope was made of heather; as the clever wife suggested that if made of ordinary hemp it might chafe or even catch fire with the weight by the friction against the projections against the rock. This young woman performed her perilous feat of bird-nesting with success, and sold her eggs at the price offered. This adventurous pair are said to have collected, with their heather rope, a dozen eagle's eggs in one season.

MM. Daudier & Son thus describe a new process for bleaching wool. It consists in plunging the wool or vegetable matters into a concentrated bath of chloride of calcium, and submitting them to prolonged boiling; to the bath may be added some hydrochloric acid, or compounds of that acid with metallic bases, such as aluminum, iron, zinc, copper, or tin, which will then act energetically on vegetable matters, while it will produce no alteration on the wool.

An Ink Recipe.—Prof. Böttger informs us, through the *Jhrsbcht des Physik, Vrns. zu Frankfurt a. M.*, that a very excellent black ink, flowing easily from the pen, is furnished by making a solution of aniline-black in water. [Nigrosin or aniline-black is largely used for blacking leather.]—*D. Ind. Ztg.*

TORPEDO BALLOONS.

A correspondent suggests that torpedo balloons might prove a formidable means of offence, and proposes a plan of sending up a balloon, with a torpedo attached, to windward of an enemy, and then dropping the torpedo by bursting the balloon. It seems to us that this is a good idea, and one which might find useful application in the bombardment of cities, camps, and fortified places. It is of course not practicable against an enemy capable of moving about quickly. It is not a difficult matter to construct a balloon capable of lifting sufficient nitroglycerin for the purpose. This might be enclosed in a shell and suspended as a car under the air ship. A simple mechanical device could easily be provided for dropping the load; and this device might be controlled by a light wire through which an electric current could be sent. The besiegers have only to wait for a fair wind, and then start their balloon from a point far beyond the range of the most powerful guns. It would be easy by the aid of instruments to tell just when the balloon had arrived over the desired point, and the pressure of the key would transmit the current and drop the mass of explosive. The effect of a quantity of nitroglycerin blowing up in a city or fort would be terrific. The balloon could be permitted to rise to a height beyond the reach of artillery, so that the besieged would be totally destitute of any means of directly preventing the dropping of the unwelcome visitor in their midst.

Some well meaning philanthropists in England are just now protesting against the use of the torpedo in modern warfare, as being too cruel a resort, and one which should be classed with poisoned wells and explosive bullets, which are proscribed among civilized belligerents. Probably the torpedo balloon will to them seem exceptionally barbarous. The fact is, however, that such philanthropy is a mistaken sentiment. War itself is a frightful calamity; and it is for the benefit of all that it should be as quickly ended as possible. This result can only be reached by making weapons so effective either that people will not face them, and thus fighting may be stopped in that way, or else that they will produce such wholesale destruction as to secure victory for one side or the other in the quickest possible period. The most destructive weapons are therefore the most merciful; and in this light the torpedo should be regarded.

DANGER IN VINEGAR.

There are more kinds of so-called vinegar in the market than brands of family flour. The New York *Tribune* thus alludes to one of them: The Board of Health of the District of Columbia has condemned five car loads of vinegar sent there from Chicago, on the ground that it is not a genuine article, and is injurious to health. An analysis of the so-called vinegar has been made. It appears, according to the report of the Board of Health, that the vinegar contains 54 54-100 grains per gallon of anhydrous sulphuric acid, combined with lime to form a sulphate of lime equivalent to 117 26-100 grains of gypsum per gallon, and besides that, five grains of free sulphuric acid per gallon. The Board also report that this sample was taken from an invoice of more than 1,000 barrels brought there to be sold as vinegar, and that it is likely to find a ready sale on account of its low price. The report concludes as follows: "When we think that oil of vitrol (sulphuric acid) can be bought at five cents per pound; and that a pound of said acid would render a barrel of fluid as acid as the strongest vinegar, the wonder will cease that it is sold cheap. This, therefore, is a fraud upon commerce, and a dangerous substitute for vinegar." The fraud and danger are more general than the great mass of people will readily believe. It is asserted that probably one-half the vinegar sold at city groceries is a rank poison, with either sulphuric or other objectionable acids for its base, from which the acetic principle is evolved, the same as in the manufacture of aromatic vinegar or the acetates used in calico printing. Acetic acid is present in all vinegars, although they seldom contain more than five per cent, of the absolute acid. Their color, flavor and value depend materially upon the ingredients from which they are made. In England, honest vinegars are usually made of malt; in France, of grapes; in Germany, of grapes, beetroot or potatoes; in this country, of apples and grapes.

Priming for Varnish.—Mr. W. R. Lake has patented, in England, an invention for preparing wood for varnishing, which consists of a mixture of "finely powdered flint, qnartz or felspar, which are non-absorbents of moisture, is mixed with a suitable liquid, as oil or varnish, colored and applied to the wood by rubbing into its pores with a cloth pad."

AN ELECTRICAL PLANT.

In a recent number of the *Hamburger Garten-und Blumen zeitung*, Levy describes a plant, which, if the statements of this traveller are true, must be a remarkable wonder. It is one of the *phytolacca* which seems to be new, and has received the name of *phytolacca electrica*. The curious fact about this plant is its strongly-marked electro-magnetic properties. On breaking off a twig a sensation is produced in the hand like that given by a Ruhmkorff induction coil. This sensation was so marked that he began to experiment with a small compass. The compass began to be affected by it at a distance of seven or eight paces. The needle vibrated on approaching nearer to it, and finally began to revolve rapidly. On receding, the phenomena were repeated in reversed order. In the soil where this plant grew, there was not a trace of iron or other magnetic metal, like nickel or cobalt, and there is no doubt that the plant itself possesses these peculiar properties. The strength of the phenomena varied with the time of day. During the night it is almost nothing, and reaches its maximum about two o'clock in the afternoon. When he weather is stormy the energy increases still more, and when it rains the plant appears withered.

HOW TO PREPARE BOTANICAL SPECIMENS.

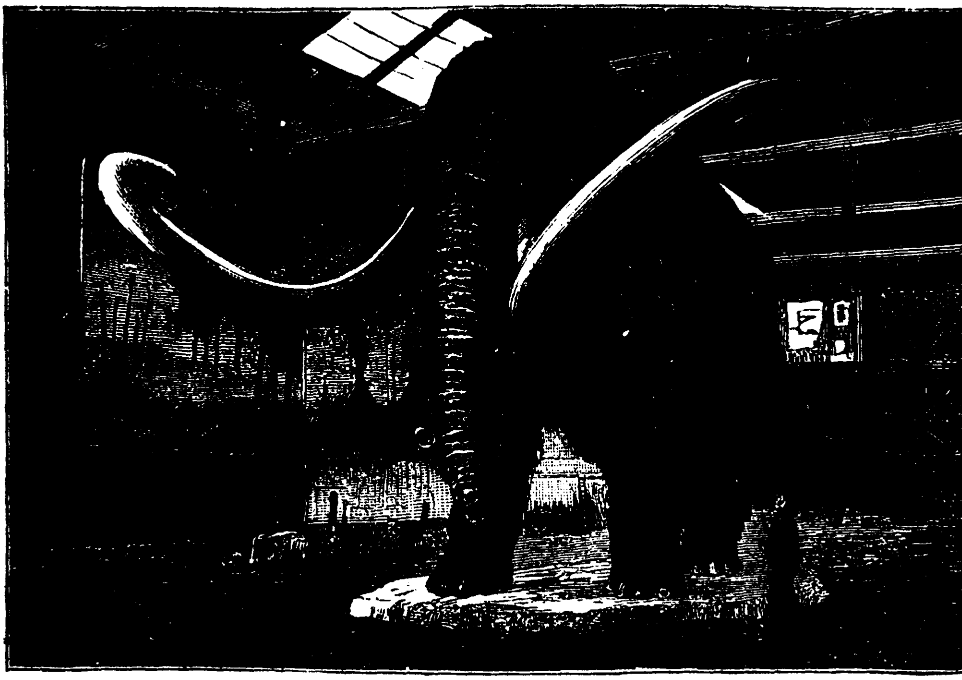
The following hints on this subject in the *English Mechanic* are clear and practical, and on some points the best we remember to have seen:

Small plants should have the roots; and, if possible, obtain a specimen of each at different seasons—the young plant, in flower, and when the seed or fruit is nearly ripe. Get a quire of good thick blotting-paper and a couple of large boards and paper on which to mount your specimens. Let the boards be about the same size as the blotting-paper. Demy paper of good quality is the best size for mounting. Arrange your plants between the sheets of blotting paper—some plants require several thicknesses—and see that the leaves, etc., are properly disposed on the paper, as you will not be able to alter them when they are dry. It is a good plan to interpose a few sheets of card-board, as it prevents plant from spoiling another. When your drying-paper is filled, put the whole between your boards and subject to pressure; take them out every 24 hours, and dry the paper, correcting any displacement as you go on; when dry they are ready for mounting. Take a piece of paper, as broad as the slit is long, fold the paper, and pass it over the stalk and through the hole at the back, and gum the ends on the back. I have seen every (I think), method of mounting, and this is certainly the neatest and cleanest. After this they must be painted with the following preservative solution: Corrosive sublimate, 20 grains; camphor, 20 grains; rectified spirit of wine, one ounce. This is a deadly poison, and should be handled very cautiously. Each sheet should have a neat label in the corner stating date and place of collection, and name of collector, also general habitat, specific and generic names, with natural order, etc. Without these particulars they will (as a collection) be perfectly valueless.

Mutual Help.—The race of mankind would perish, did they cease to aid each other. From the time that the mother binds the child's head, till the moment that some kind assistant wipes the death-damp from the brow of the dying, we cannot exist without mutual help. All, therefore, that need aid, have a right to ask it of their fellow-mortals; no one who holds the power of granting can refuse it without guilt.—*Sir Walter Scott.*

Paper Varnish.—All varnished gums composing the same-and dissolved in turpentine, have a greasy nature. Paper must be first sized, or, if dissolved by any other spirit, 8 oz. of gum sandarach, 2 oz. of Venice turpentine, 32 oz. of alcohol. Dissolve by gentle heat. Or a harder varnish, reddish cast, 5 oz. of shellac, and 1 oz. of turpentine, 32 oz. of alcohol, or Canada balsam dissolved in turps.

The Preservation of Flowers.—A new method of preserving flowers, successfully adopted by Dr. Miergues, is reported in the *Gardener's Magazine*. Each flower held by the extremity of the stalk, is plunged into a vessel of paraffin, quickly withdrawn, and twirled rapidly between the finger and thumb, so as to shake off the superfluous oil. Bouquets of flowers thus treated have been kept upwards of a twelvemonth without losing their shape or colors. Whether the smell of paraffin be equally persistent, the doctor has forgotten to inform us.



M. MARTIN'S ARTIFICIAL MAMMOTH.

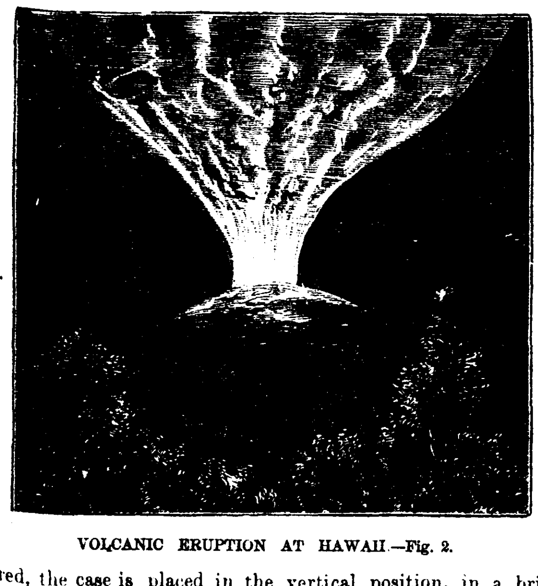
AN ARTIFICIAL MAMMOTH.

M. Martin, a German naturalist, has recently constructed artificially a mammoth (*elephas primigenius*) of the quarternary epoch, after the many fine fossils of that extinct animal now existing in the Natural History Museum of Stuttgardt. The form of the body of the gigantic creature, its trunk, tusks, and hair (the latter a close imitation of that of the real animal found in the Seberian ice) have been wonderfully counterfeited, so that the resemblance is as accurate as if the mammoth's skin had been stuffed. The animal, a representation of which is given in the annexed engraving from *La Nature*, measures 16 feet in height by nearly 26 feet in length. It is made upon a wooden framework, covered with wire cloth, the latter being coated with *papier maché*. The hair is reproduced from the fiber of an Indian palm, the tusks are of wood, and the trunk is ingeniously made of paper.

PEN MAKING.—Pens should be made of the best steel that can be got, as peculiar elasticity is required in them, which could not be obtained if poor steel were used. The steel is cut into slips some 3 feet long and 4 inches broad ; these slips are then plunged into a pickle of diluted sulphuric acid so as to remove the scales from the surface ; next it is passed between heavy rollers by which it is reduced to the thickness required, and made fit to undergo the first process in pen making. This is performed by a girl, who, seated at a stamping-press provided with a bed and corresponding punch, speedily cuts out the blank, which is perfectly flat. The next step is to perforate the hole which terminates the slit, and to remove any superfluous steel which might interfere with the elasticity ef the pen. The embryo pens are thus annealed in a muffle, and the maker's name stamped upon them. The pens are next transferred to another class of workmen, who, by means of a press, either make the pens concave, if they are merely to be nibs, or, if they are to be barrel pens, they roll the barrel together. The next process is termed the *hardening*, and consists in placing a number of pens in an iron box which is introduced into a muffle. After they become of a deep red heat they are plunged into a tank of oil, and, when they get cool, the adhering oil is removed by agitation in circular tin barrels ; *tempering* is the next step, by heating to the necessary elasticity in a warm bath of oil ; and, finally, the whole number of pens are placed in a revolving cylinder along with sand, ground crucible, and other cutting substances, which tends to brighten them up to the natural color of the steel ; next the nib is ground down finely, with great rapidity, by a girl, who picks it up with a pair of pliers, and, with a single touch on an emery revolving wheel, perfects it at once. The slit is now made by means of a press. A chisel, or wedge, with a flat side, is affixed to the bed of the press, and the descending screw has a corresponding chisel-cutter, which is passing down with the greatest accuracy on the pen, which had been placed on the chisel affixed to the bed, and the slit is made and the pen complete. They are next colored brown or blue, by placing them in a revolving metal cylinder, under which is a charcoal stove, and, by watching narrowly the different gradation of color, the requisite tint is speedily attained; a brilliant polish is subsequently imparted by immersing the pens in lac dissolved in naptha ; they are then dried, counted, selected and placed in boxes for sale.

STEELPLATE ENGRAVING.—As regards steelplate engraving it has proved immensely superior to the old copperplate system. A soft steelplate is first engraved with the required subject in the most finished style of art, either by hand or machanically, or the two combined, and the plate is then hardened ; a softened steel cylinder is then rolled over the hardened plate, with great pressure by powerful machinery, until the engraved impression appears in relief,—the hollow lines of the original becoming ridges upon the cylinder, the roller is re-converted to the condition of ordinary steel, and hardened, after which it serves for returning the impression to any number of decarbonized plates, every one of which becomes absolutely a *counterpart* of the original, and every plate, when hardened, would yield the enormous number of 150,000 impressions, without any perceptible difference between the first and the last. In one instance, from one engraving of the Queen's head on the postage stamp, over 6000 plates were produced from the original, and plates for bank-note printing are multiplied in the same way. Great caution must be used in the various processes of annealing and hardening, as only slight carelessness would result in ruining the most costly plates. The method in use in the Bank of England is as follows : the work to be hardened is enclosed in a wrought-iron box with a loose cover, a false bottom, and with three ears projecting from its surface about midway ; the steel is surrounded on all sides with carbon from leather, driven in hard, and the cover and bottom are carefully luted with moist clay ; thus pre-

THE GREAT ERUPTION AT HAWAII.



VOLCANIC ERUPTION AT HAWAII.—Fig. 2.

pared, the case is placed in the vertical position, in a bridge fixed across a great tub, which is then filled with water almost to touch the flat bottom of the case ; the latter is now heated in the furnace as quickly as will allow the uniform penetration of the heat. When sufficiently hot, it is removed to its place in the hardening tub, the cover of the iron box is removed, and the neck or gudgeon of the cylinder is grasped, *beneath the surface of the carbon*, with a long pair of tongs, upon which a couplet is dropped to secure the grasp. It only remains for the individual to hold the tongs with a glove whilst a smart tap of the hammer is given to their extremity ; this knocks out the false bottom of the case and the cylinder, and the tongs prevent the cylinder from falling on its side, and thus injuring its delicate but still hot surface. For square plates, a suitable frame is attached by four slight claws, and it is the frame which is seized by the tongs; the latter are sometimes held by a chain which removes the risk of accident to the individual. The steel comes out of the water as smooth to the touch as at first, and mottled with all the beautiful tints of case-hardened gun-locks.

THE GREAT ERUPTION AT HAWAII.

M. Baillieu, Consul of France at Honolulu, has sent to his government a detailed account of the great volcanic eruption which occurred at Hawaii on February 14 last. The phenomenon took place on Mauna Loa, at about nine o'clock in the evening. Nine great jets of flame and smoke burst from the crater of Mokuaweoweo, and united in an immense column which rose to a height of 16,000 feet. The nine fires appeared to form two groups—one of four and the other of five columns, the latter being the more brilliant. The scene is depicted in the engravings herewith given, which we extract from *La Nature*. Fig. 1 also conveys an excellent idea of the location of the volcano. N and S respectively indicate the north and south points, + is the crater of Mokuaweoweo, + + is Mauna Loa, + + + the central plateau, + + + + is the town of Kaw ; A represents Kawaihe, and B Hualailai. Viewed from Hilo the jets all seemed joined in one vast spout of fire, as represented in Fig. 2.

The eruption, a full description of which we published some time ago, lasted but six hours, and was followed nine days afterwards by earthquakes and a submarine eruption near Heei Point.

Wax Polish for Furniture.—Pure beeswax, 1¼lb.; linseed oil, ¼lb. Melt together and remove from the fire, and when the mixture has cooled a little, add one quart of turpentine and mix well.

Some Russians lately found in Siberia another elephant perfectly preserved in ice ; they were able to eat its flesh. Mr. Bayle, in announcing this fact to the Zoological Society of France, said it did not prove that elephants has lived in the country, but that, in a time of great cataclysm, there bodies may have been transported by a very strong current from the Himalayas on to Siberia, where they were stopped by the ice ; the time necessary for such transport is much than would be generally supposed. The elephant, very numerous at that epoch, had not been all carried to Siberia, many had been stopped *en route*, and nothing had been left of them but their bones and tusks ; it was the latter that had been long since used by the Chinese for their works of cut ivory. With regard to the cataclysm carrying elephants to northern regions Count Hugo has pointed out that every year English and American fishermen have brought up elephant tusk in their nets. The number of these got annually may be estimated, without exaggeration, at about a thousand.

SINGULAR BALLOON ACCIDENT.

A singular accident lately occurred at Hull, Eng., by which a large number of persons were seriously injured.

It appears that for several years a gala has been held every Whit Monday, in a large field in the Beverley road, and this year one of the attractions advertised was the ascent of a balloon. Arrangements were made with the British Gas Company for a supply of gas, it being estimated the balloon would require for its inflation about 18,000 cubic feet. There being a strong wind at the time it was filled, the balloon, although securely fixed to the ground with ropes, swayed vigorously from side to side. We learn from the local papers that close to the ring in which the filling took place there was a "striking machine," against which, just as the ascent was about to take place, the balloon was driven, and a long slit was made in the silk, through which the gas began to escape rapidly. Close to the striking machine which had caused so much damage there was a stall for the sale of hot peas, a kind of refreshment greatly in demand at entertainments of this kind. Very shortly before the balloon drove upon this stall a naptha lamp had been suspended thereon, and the escaping stream of gas coming in contact with this naked light, a fearful explosion followed.

Spectators of the scene state that what they saw was a vivid flash, as of lightning, followed by a dense white smoke, this in turn being followed by a blaze which lasted so long as there was any of the varnished silk of which the balloon was composed remaining to be consumed. From the midst of this mass of smoke and flame there arose a mighty cry of anguish, and the excitement amongst the spectators was most intense. The policemen on duty at the gala, with many others who were not too much excited to act, at once rushed to the rescue, and soon one and another were hauled out from amongst the burning mass. When the balloon collapsed, owing to the escape and ignition of the gas, it fell upon quite a crowd of persons, who were completely covered by the silk and the netting in which it was inclosed, and these people, mostly young men and women and children, were rendered powerless to help themselves. Their position was, besides, rendered the more awful by the fact that the varnish with which the silk composing the balloon was covered, when it became heated, caused the material to stick to the hands and faces of the sufferers, and in numberless instances the skin was torn away from hands and faces as the unconsumed material was removed. Amongst the injured was a little girl, who was so frightfully burned that she expired next day.

INDUSTRIAL SECRETS.—A century ago what a man discovered in the arts he concealed. Workmen were put upon oath never to reveal the process used by their employers. Doors were kept closed, artisans going out were searched, visitors were rigorously excluded from admission, and false operations blinded the workmen themselves. The mysteries of every craft were hedged in by thickset fences of empirical pretensions and judicial affirmation. The royal manufactories of porcelain, for example, were carried on in Europe with a spirit of jealous exclusiveness. His Majesty of Saxony was especially circumspect. Not content with the oath of secresy imposed upon his work people, he would not abate his kingly suspicion in favor of a brother monarch. Neither king nor king's delegate might enter the tabooed walls of Meissen. What is erroneously called the Dresden porcelain—that exquisite pottery of which the world has never seen the like—was produced for 200 years by a process so secret that neither the bribery of princes nor the garrulity of operatives ever revealed it. Other discoveries have been less successfully guarded, fortunately for the world. The manufacture of tinware in England originated in a stolen secret. Few readers need be informed that tinware is simply thin iron plated with tin, by being dipped into the molten metal. In theory it is an easy matter to clean the surface of iron, dip it into a bath of the boiling tin, and remove it enveloped with the silvery metal to a place for cooling. In practice, however, the process is one of the most difficult in the arts. It was discovered in Holland, and guarded from publicity with the utmost vigilance for nearly half a century. England tried in vain to discover the secret, until James Sherman, a Cornish miner, crossed the Channel, insinuated himself master of the secret, and brought it home. The secret of manufacturing cast steel was also stealthily obtained, and is now within the reach of all artisans.—*Metal Worker.*

SUPERSTITIOUS CUSTOM.—The custom of paring nails at certain times is a relic of ancient superstition, derived from the Romans, who would never pare their nails upon the Nundinæ, observed every ninth day, and other certain days of the week.

WEDDING JOURNEYS.

When a young man and woman marry, they generally think they must take a wedding trip, of greater or less extent, according as their purses are long or short. The idea is well enough in its place, if carried out in accordance with the laws of hygiene; but this is not always the case. We have just received a notice of the death of a friend, a beautiful and noble young lady. The cause was a cold caught on her wedding tour. Such cases are not rare; but even when death does not result, injuries which last for life may be received. It would be far better to give up the wedding trip than to injure the constitution by it. There is never a time more unsuited to journeys than just after marriage. The feelings are then at their highest pitch, and they advertise the fact by every look and movement, so that they are recognized wherever they go as a newly married couple. There ought to be a reform in this matter of wedding tours. Physiologists and hygienists should set the example. Let them be conducted strictly in accordance with the laws of hygiene, or given up altogether. It is said that the daughter of Dr. Hammond, recently married to an Italian marquis, has set a good example in this respect. The father, an eminent physician, stamped the idea of a wedding journey as something barbarous and unphysiological, and so, after the marriage, by his advice, the couple were left in quiet at their own home. If this is so it is an example well worth imitating. At any rate, let no newly married couple violate every physiological law by a wedding journey that may injure the health past all recovery.—*Herald of Health.*

TO CLEANSE WOODWORK.—Take a pail of hot water; throw in two tablespoonfuls of pulverized borax; use a good coarse housecloth—an old coarse towel does splendidly—and wash the painting; do not use a brush; when washing places that are extra yellow, or stained, soap the cloth; then sprinkle it with the dry powdered borax, and rub the places well, using plenty of rinsing water; by washing the woodwork in this way you will not remove the paint, and the borax will soften and make the hands white—a fact well worth knowing. The uses of borax in domestic economy are numerous; and one of the most valuable is its employment to aid the detergent properties of soap.

WHITE HOUSE WHITEWASH.—The following recipe, which is frequently inquired after, is given for the famous whitewash with which the Presidential mansion is adorned:

Take one half bushel of nice unslaked lime, slake it with boiling water; cover it during the process to keep in the steam. Strain the liquid through a fine sieve or strainer, and add to it a peck of salt, previously dissolved in warm water; three pounds of ground rice boiled to a thin paste; one half pound of powdered Spanish whiting, and one pound of clean glue which has been previously dissolved by soaking it well, and then hang it over a slow fire in a small kettle within a larger one filled with water. Add five gallons of hot water to the mixture, stir it well, and let it stand a few days covered from dust. It should be put on hot, and for this purpose it can be kept in a kettle on a portable furnace. About a pint of this mixture will cover a square yard upon the outside of a house, if properly applied. Fine or coarse brushes may be used, according to the neatness of the job required. It answers as well as oil paint for wood, brick or stone, and is cheaper. It retains its brilliancy for many years. There is nothing of the kind that will compare with it, either for inside or outside work. Coloring matter may be added of any shade desired except green, for there is no material that can be used with lime. Spanish brown will make reddish pink when stirred in, more or less deep according to quantity. A delicate tinge of this is very pretty for inside walls. Finely pulverized common clay, well mixed with Spanish brown, makes a reddish stone color; yellow ochre stirred in makes a yellow wash, but chrome goes further, and makes a color generally esteemed prettier. It is best to try experiments on a shingle and let it dry.—*American Builder*, xiii, 131.

TO AVOID SLEEPLESSNESS.—If you wish to sleep well, eat sparingly of late suppers. Avoid all arguments or contested subjects near night, as these are likely to have a bad effect upon one who is troubled with sleeplessness at night. Avoid having too much company. Many persons become so excited with the meeting of friends that sleep departs for a time. There is probably nothing better, after cultivating a tranquil mind, than exercise in the open air. By observing these simple rules, sleeplessness, in the majority of instances, may be cured.

PURE MILK FOR INFANTS.

The ills which the innocents have suffered through the drinking of impure milk form one of the most startling chapters of modern hygienic literature. It is wise when we know the evil exists to guard against its coming to our loved ones. Prof. James Law, of Cornell University, writes on the subject to the New York *Tribune* many useful suggestions:

The milk must be obtained from a sound, healthy cow, as it is unquestionably tainted in some cases before it leaves the udder. Few people have any idea of the perfect cleanliness necessary to the preservation of milk. An ordinary washing with water, though uncomfortably warm for the hands, or even with soap-suds, is utterly insufficient. There should first be the thorough cleansing of the dish, and then a rinsing with water at a boiling temperature, which must be poured out, and the vessel dried by simply inverting it over a drawer or table, but without the possibility of contact of its interior with any solid body. If dried with a towel, or if hand or finger, or, indeed, any solid body, is brought in contact with its interior after it has been scalded, organic matter, bacteria, and other germs may be deposited which will precipitate decomposition in the milk placed in it. But if the vessel is first carefully cleansed from all organic matter that may cover and protect such germs, then rinsed out with boiling water, set aside to drip, and finally filled with milk, having had nothing touch its inner surface from the contact with the boiling water until now, such vessel will not communicate to the milk any decomposing element. Every vessel, from the pail which receives the milk as drawn from the udder, to the bottle from which the baby sucks its supply, must be treated in the same way. In the case of babies' bottles, it is best to keep two, to be used alternately, the one with its tubes and the teat being thoroughly washed with soda, and then immersed in a dish of pure water until wanted, when it may be taken out and scalded before the milk is put in.

As regards temperature and antiferments. None of the chemical antiseptics are entirely unobjectionable. Boiling of the milk renders it more indigestible, and tends to produce costiveness. The only unobjectionable method is to secure perfect purity of dishes and milk, and to keep the latter at a low temperature. A sufficient degree of cold may be obtained in any house, with no expense and little trouble, by simply enveloping the dish in which the milk is kept in a wet towel, from which evaporation will go on constantly. A tin can with cover, enveloped in a wet cloth, will not only be kept very cold, but will be protected against the access of germs which would superinduce decay. I have in this way kept milk for the baby, perfectly sweet and good, in the warm rooms of a boarding house, in midsummer, while the landlord failed to keep the same milk sweet for half the time, though in a cellar and abundantly surrounded with ice. The great superiority of the wet-cloth preservation consists in its filtration from the air of all germs of decomposition which would otherwise gain access to the milk.

RULES FOR MAKING GOOD BREAD.

Dr. Holbrook gives to the readers of that excellent publication, the *New York Weekly Sun*, some useful suggestions on the important subject of bread making, which we transfer to our columns. We know that while many of our fair readers need no such advice, there are others who may profitably turn their attention to learning how to make good bread. Without good bread in the household, no matter how good the meal in other respects, the house-wife is exposed to severe criticism. Indeed, the quality of the bread, with few exceptions, may be looked on as an index to the good or bad management, and industry, or the absence of it, in the household.

"With good flour, a good oven, and a good, sensible, interested cook, we can be pretty sure of good, wholesome bread. Yeast bread is considered the standard bread, and is, perhaps, more generally found on every table than any other kind. Hence it is important to know how to make good, sweet, wholesome yeast bread. Good flour is the first indispensable; then good, lively yeast, either yeast cakes or bottled; the former is preferable in all respects. Then, of course, there must be the proper materials to work with. A bread bowl or pan—the pan is easiest kept clean; a stone or earthen jar for setting the sponge; a sieve—flour should always be sifted before making bread of any kind; first, to be sure that it is perfectly clean; secondly, sifting enlivens and aerates the flour, and makes both mixing and rising easier and quicker; a clean, white cloth to cover the dough, and a woolen blanket to keep the dough of even temperature while rising: baking pans, large and shallow, a large, strong spoon for stirring, and a little melted suet or fresh butter for oiling the pans; never use poor butter. If you want shortening, rich milk or cream scalded and cooled will answer the purpose, and be most wholesome. But thorough kneading is better still, and should always be done effectually. Scalding a portion of the flour makes a sweeter bread and speeds the work. Water, milk or butter—milk may be poured boiling hot on a quart or two of the flour, stirring well, and cooling to a moderate temperature before adding the yeast—this makes the sponge. Scalded flour always makes a little darker bread, unless we use buttermilk, which makes a rich, creamy, white bread. Yeast is fermented flour or meal—the first stages of decomposition or decay.

Understanding this, every baker will comprehend the necessity of regulating the extent of the fermentation with the greatest care; for a sponge or bread fermented or 'raised' too long is decomposing, spoiling—actually rotting! This is the language of an experienced English baker to us only a few days ago, during a talk about the delicate, foamy loaves 'yeasted to death,' which so many families are eating and calling 'the staff of life,' quite discarding the firm, sweet, substantial, home-made loaf which our mothers and grandmothers kneaded with their own skilled hands. Bread-making should stand at the head of domestic accomplishments, since the health and happiness of the family depend incalculably upon good bread; there comes a time in every true, thoughtful woman's experience, when she is glad she can make nice, sweet loaves, free from soda, alum, and other injurious ingredients, or an earnest regret that she neglected or was so unfortunate as not to have been taught at least what are the requisites of good bread-making."

DO NOT CHECK PERSPIRATION.

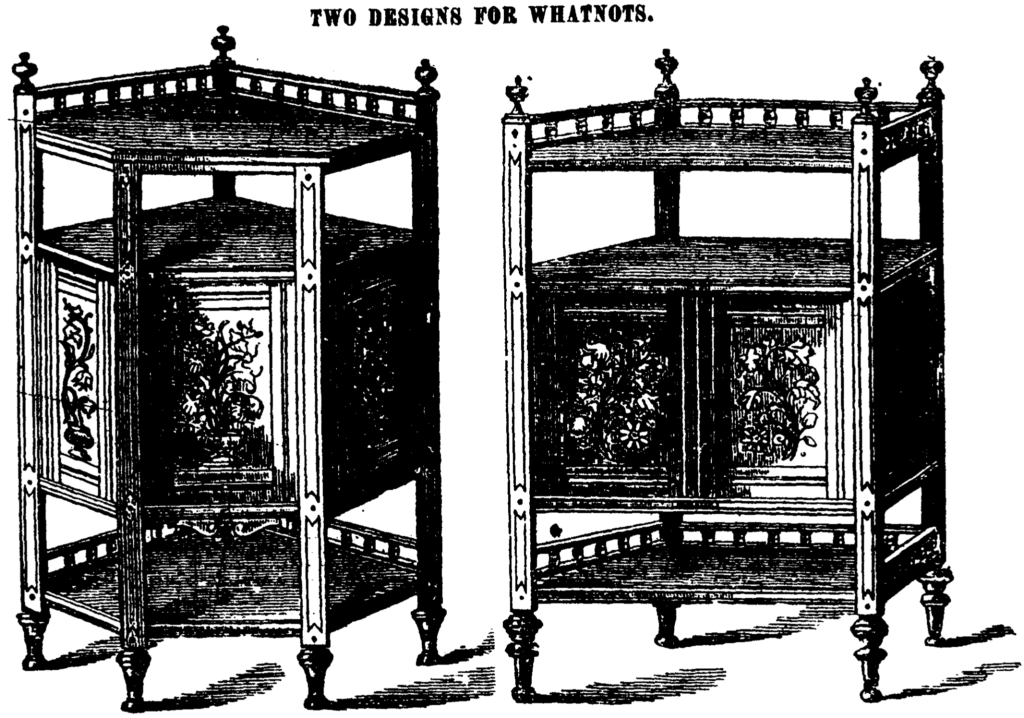
Nearly every one knows it is dangerous to check perspiration quickly, and yet many forget to practice the truth they know. The weather has been unusually hot, and the heat may return. Let the following be a hint for behaviour. *Hall's Journal* says checked perspiration is the fruitful cause of sickness, disease and death to multitudes every year. If a tea-kettle of water is boiling on the fire, the steam is seen issuing from the spout, carrying the extra heat away with it, but if the lid be fastened down and the spout be plugged, a destructive explosion follows in a very short time.

Heat is constantly generated within the human body, by the chemical disorganization, the combustion, of the food we eat. There are 7,000,000 of tubes or pores on the surface of the body, which in health are constantly open, conveying from the system by what is called insensible perspiration this internal heat, which, having answered its purpose, is passed off like the jets of steam which are thrown from the escape-pipe, in puffs, of any ordinary steam-engine; but this insensible perspiration carries with it, in a dissolved form, very much of the waste matter of the system, to the extent of a pound or two or more every twenty-four hours. It must be apparent, then, that if the pores of the skin are closed, if the multitudes of valves, which are placed over the whole surface of the human body, are shut down, great harm results. The great practical lesson which we wish to impress upon the mind of the reader is this: When you are perspiring freely, keep in motion until you get to a good fire, or to some place where you are perfectly sheltered from any draft of air whatever.

Cooling off suddenly when heated sends many of our youth to an early tomb. It is often a matter of surprise that so many farmers' boys and girls die of consumption. It is thought that abundant exercise in the open air is directly opposed to that disease. So it is; but judgment and knowledge of the laws of health are essential to the preservation of health under any circumstances. When over-heated cool off slowly; never in a strong draft of air. Gentle fanning, especially if the face is wet with cold water, will soon produce a delightful coolness, which leaves no disagreeable results.

The Beautiful World.—Ah, this beautiful world! Indeed, we know not what to think of it. Sometimes it is all gladness and sunshine, and heaven itself lies not far off. And then it changes suddenly, and is dark and sorrowful, and the clouds shut out the sky. In the lives of the saddest of us there are bright days like this, when we feel as if we could take the great world in our arms. Then come the gloomy hours, when the fire will neither burn in our hearts, nor on our hearths; and all without and within is dismal, cold, and dark. Every heart has its secret sorrows, and oftentimes we call a man cold when he is only sad.

TWO DESIGNS FOR WHATNOTS.



TWO DESIGNS FOR WHATNOTS.

(See page 256.)

We offer two more simple designs for whatnots, of a class similar to the two representations shown in our reading columns in recent issues. They are plain and serviceable without being cumbersome or ugly. They show in their arrangement a due recognition of that very important principle—fitness for practical, everyday use. As in the other examples the panels may be decorated as the taste of the workman shall dictate. It is the simplicity of such designs that makes them valuable. The eye is not outraged, the taste is not offended, the room wherein the articles are placed is ornamented by their presence, and you are constantly and pleasantly reminded of them by their usefulness. It is to such unobtrusive furnishings that homes owe most of the cheerfulness they possess.

MISCELLANEA.

Luxury Prevented.—To restrain luxury, and prevent the ruin of families, Perer I., King of Portugal, absolutely forbade all his subjects to buy or sell any of their commodities without immediate payment, and made the second commission of the offence death.

Newton's Philosophy.—Sir Isaac Newton, a little before he died, said: "I don't know what I may seem to the world, but, as to myself, I seem to have been only like a boy playing on the seashore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me."

Self-Denial.—There are many seasons in a man's life, and the more exalted and responsible his station the more frequently do these seasons recur, when the voice of duty and the dictates of feeling are opposed to each other; and it is only the weak and the wicked who yield that obedience to the selfish impulses of the heart, which is due to reason and honour.

Tyranny and Insolence.—Tyranny is an exuberance of pride, by which all mankind are so much enraged, that it is never quietly endured, except by those who can reward the patience which they exact; and insolence is generally surrounded only by such whose baseness inclines them to think nothing insupportable that produces gain, and who can laugh at scurrility and rudeness with a luxurious table and an open purse.

A Promise.—A promise should be given with caution, and kept with care. A promise should be made with the heart, and remembered by the head. A promise is the offspring of the intention, and should be nurtured by recollection. A promise and its performance should, like a true balance, always present a mutual adjustment. A promise delayed is justice deferred. A promise neglected is an untruth told. A promise attended to is a debt settled.

Childhood's Home.—Our childhood's home! How our affections centre around the place of our nativity! How we bless that dear old name as we look over our past lives, and brush away the mist which the River of Time, in its ceaseless flow, has obscured the purer and holier aspirations, inspired by the hopes and fears of earlier days; how many fires are kindled on as many hearths, as we cross the old threshold of the homestead, whose embers will glow when all others are extinguished. And then, how our hearts go out in longings for the old scenes, when in after years we are weary with the battle of life.

A Popular Delusion.—It is an error to suppose that a man belongs to himself. No man does. He belongs to his wife, or his relations; or his creditors, or to society in some form or other. It is for their especial good and behalf that he lives and works; and they kindly allow him to retain a percentage of his gains to administer to his own pleasures or wants. He has his body, and that is all; and even for that he is answerable to society. In short, society is the master, and man is the servant; and it is entirely as society proves a good or a bad master, whether the man turns out a good or bad servant.

Dyeing Veneers a Fine Black.—Have a small copper ready, into which put 6 lbs. of chip logwood and as many veneers as it will conveniently hold without pressing too tight; fill it with water and boil slowly for three hours; add ½ lb. of powdered verdigris, ½ lb. of copperas, and 6 oz. of bruised nut-galls, filling the copper up with vinegar as the water evaporates. Boil gently two hours each day till the wood is dyed through.

Gold Pens.—Gold pens are made much in the same manner as steel, with this important difference, that, as they cannot be tempered in the same way as steel is, the necessary elasticity is imparted to them by hammering, and by rubbing them with a small hard stone and water, instead of the tempering, &c., in oil. As gold is too soft of itself to make a durable pen, it is found necessary to attach a minute portion of an alloy of iridium and osmium, by soldering to the tips. This makes an extremely hard and durable point.