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CANADIAN MECHANICS MAGAZINE AND PATENT OFFICE RECORD

Vol. 6. APRIL, 1878. No. 4.

PRACTICAL TRAINING FOR YOUNG MECHANICS.

EVERY youth in learning his trade should endeavour to become thoroughly acquainted with the nature and capabilities of the materials in which he has to work, and the character and adaptation of the tools used in handling these materials, and the best mode of selecting and using the tools necessary to form the materials into the shape required. It is not necessary to go deeply into the theory of action of these tools, whether they are to be used with the hand or appertain to a machine, but he should first of all study the nature of the materials to be worked and the first principles of working them; and then the hand or machine tools can be handled to the best advantage, so as to encounter the least resistance, and to produce the most perfect work.

In order for the pupil to become fully acquainted with this subject, it is necessary that he should begin his study and practice upon the most common and easiest worked materials—such as wood, as the basis of operation, or rather as the first subject of instruction. He should study how wood forms, why it has a heart, a longitudinal fibre, circular and concentric rings and radial plates; the influence which each of these elements exerts upon its strength, elasticity, durability, ease of working, &c., and then he will be better prepared to understand the theory of saw teeth, and why a rip saw must be made differently from a cross-cut, a pine saw from one for hard woods.

One great object the student should always have in view in learning a trade is to endeavour to sketch out for himself a system of keeping notes or memoranda, and applying both theory and practice in a reasoning and reasonable manner, so as to best realize the desideratum of "Practical Training."

The action of each tooth should be considered—whether it is a cutting, a tearing, or a rasping action; how durable will be the edge; how wide the "kerf" in proportion of the net lumber, and how smooth the sides of the cut are. (There is more philosophy in a pine plank and its manipulation than one would at first think for.) Having followed the material through its growth and selections, its felling, seasoning and ripping, we are next ready to consider the question of planing — introducing an entirely new principle (or development) of action. The wonderful principle of the guide is here introduced to aid in the smoothing and planing action. The learner must be taught that a "*smooth*" surface is often out of plane, and a "plane" surface very often a rough one. The chisel and gouge can be used to groove, chamfer, tenon and mortise. The theory of the saw and plane, chisel and gouge being understood, and their use, and the grain and character and behavior of the wood somewhat familiar, the learner is now ready to comprehend without difficulty the action of lathe tools; the finding also in the lathe the guide principle. He should be taught to *analyse*, to consider the lathe tool as a cutting edge with a convenient handle, and not a handle with a convenient cutting edge. He will then gradually develop into the proper understanding of the action of the lathe, and the angles of lathe and other tools, viewed in the abstract — while at the same time he will be familiar with the practical difficulties and problems attendant upon the grain and nature of the material, and the cause, direction, nature, effect and amount of the strains, &c., upon the various portions of the lathe. Having handled pine wood, he may next be put upon a material having better cutting qualities and less marked grain—sap maple wood—and afterwards develop into the working of walnut, oak and box, and eventually ebony and ironwood.

In each of these stages the learner should be set a definite problem to accomplish— a problem differing from one in constructive geometry, in being solid and tangible instead of plane and representative.

Cylindrical turning and circular facing being mastered, boring, hollowing and under-cutting may be taken up, until the tools and materials are, as it were, mastered, or rendered subservient to the will of the worker. Then may come spherical, oval and eccentric turning, bringing out but little more concerning the nature of the materials, or the action of the cutting-edges, but calling forth observation and analysis of the lathe-action and training the mind to consider a given piece of work not as a "job" or whole, but rather as a result —a series of solutions of problems long ago learned, or to be solved. During all this time there may be a "commercial note" made of the quantity of or bulk of material proper to be removed by various tools and at various cutting-speeds; so that when the learner is put upon "jobs," he may estimate the amount of time required to complete each stage—so many hours for ripping, cutting, roughing, &c.

Having learned that with various grades of wood, and working them in various directions, he must employ cutting-edges of various degrees of acuteness applied, the learner will be quite ready to consider the subject of metal-cutting. He will find the fibrous wrought-iron and the granular cast-iron, the various kinds of steel and alloys, requiring special treatment, just as the various kinds of wood did; and his analysis will dictate that he employ less acute tools, at a less acute angle; that the cutting-speed and the feed be slower, &c. His bench work may be conducted just as with wood; sawing, chipping, filling, &c., coming before lathe work. The lathe and its tools having been studied, the planing, slotting and shaping machine will be more readily comprehended—the action of the tools being governed by precisely the same general principles; the idiosyncracies of each machine, and the amount of work per hour, requiring special study.

If, during this time, the learner has been taught something of the laws of stress and strain, he may apply them to the use of the materials with whose nature and strength he has familiarised himself, and will be prepared to analyse and criticise structures, and eventually to design and construct them.

Such a system, as hastily and roughly sketched out, will be ten-fold more effective than the shop and apprentice system, in producing, not machine tenders (able to make, with a full shop and kit to aid them, what they have found out by failures how to make), but reasoning *mechanics*, competent to make good things, and to turn out good work with inferior appliances, in emergencies.

We are indebted to an excellent article in the *Polytechnic* for many of the practical ideas herein suggested.

CANADIAN BUTTER.

In March number we inserted an article and some illustrations from that excellent work, the *American Agriculturist*—a work which we heartily wish was in the hands of all our Canadian farmers. These articles treated on—The Cheese Factory, Cheese Making, and Butter Working Instruments. We now give a page from the same work showing the construction of an American Dairy, a model of which was exhibited at the late Centennial Exhibition.

The quantity of inferior butter manufactured in Canada is simply a disgrace to our farmers and a national loss to the country. Every pound of bad butter made is so much money lost to it.

The number of tubs of butter offered for sale in Montreal at the present time, selling at prices as low as 12 cents per pound, and only fit for axle grease at that, is something extraordinary, and shows a great lack of knowledge in its manufacture, or a total disregard of cleanliness in the dairy. It is roughly calculated that the loss to the farmers of Canada, by manufacturing such an inferior quality of butter, is, at a low calculation, not less than $500,000 per annum. Why should this be? Why should we not make as good an article as is made in the New England States and the State of New York, where a pound of bad butter is hardly ever seen? There is no reason why we should not do so —except that arising from carelessness and ignorance— and the sooner Canadian farmers look to the matter the better for themselves.

(See page 123 for model of a Dairy Farm).

THE HOUSE FURNISHER.

The leading article of the first number for the year of this useful journal, informs us that it has entered upon a new field of usefulness and wider importance than that which it hitherto occupied, and that its principal mission will be to lay before dealers in every branch of the house furnishing business full and accurate information in regard to all matters pertaining to their trade, and especially as to the state of the wholesale market of their wares. To this end it will contain a monthly revised and carefully compiled list of all staple goods as well as all such novelties as may from time to time be introduced. All the different articles of house-furnishing are illustrated and alphabetically arranged, which is most convenient to dealers who may wish to order goods or to check off the prices of those they have ordered. It is a work which should be in the hands of all dealers in house-furnishing, for it not only gives correct information as to prices and where the goods are to be bought, but it contains some excellent illustrations of such novelties as may seem most deserving of conspicuous notice, and also some excellent illustrations of handicraft in tinware, &c., of great service to mechanics.

The work is published by Tuft & Howard, 12 Murray St., 15 Park Place, New York.

SIMPLE WAY OF LEVELLING AND GRADING.

(See page 111.)

The simplest instrument for the purpose of establishing levels and grades, consists of two glass tubes, A and A, each tied to a stick C and D, and placed vertically; the tubes are opened at both ends and connected at their lower parts by a large piece of India-rubber tubing E F. If now water is poured in one of the two glass tubes A, it will pass through the rubber hose E F, reach the other glass tube B, and stop there just as high as in the first, no matter how uneven the ground in which the sticks are placed. If the ground is very uneven, it is well to have the glass tubes long enough. If now poles G H are driven to the height of the water in the tubes, their tops will all indicate one level, and the depression of the soil can be measured on the poles; and if a grade is required, it can be measured above or below the thus established level.

This arrangement is similar to the Japanese level represented on page 74 of our April number for 1876, with the advantage that it is more correct in proportion to the length of the rubber tube, while a special advantage is that it is even possible in this way to make levels between places around corners where from one point the other is invisible, or at both sides of an intervening object, as a rock K, a wall, tree, &c., as represented in our engraving, in which we wish to correct the impression which the engraver unfortunately conveys by making the hill like a section in which the tube passes through a hole. It is intended to represent the exterior of a hill, around which the tube is conducted, lying everywhere on the upper surface of the ground. As rubber tubes may be had in lengths of 24 feet, and are easily joined together, the levels may be easily determined in this way at distances of 100 feet or more.—*Scientific.*

THE CANTERBURY. WESTMINSTER BRIDGE, LONDON.

THE MANUFACTURE OF MARBLEIZED SLATE MANTELS.

The manufacture and use of marbleized slate for many purposes—the most important of which is for mantel pieces—has reached such a magnitude as to warrant description at our hands, even were the process less interesting to note.

We have accordingly availed ourselves of the courtesy of one of the leading houses in this line, in obtaining information on the subject, from personal inspection of the works and the work there going on.

The material chosen for ornamentation, in imitation of fancy marbles, is slate, which has the advantage of low cost, ease of sawing and working, and fine grain. The slate used at these works comes from Vermont by vessel, and is landed on the wharf of the works.

It is in slabs, about an inch thick, roughed to the sizes and shapes most used. The outlines are cut with a band saw. Marble is inferior for "marbleizing," because of its cost and its coarser grain; the grain of slate running in planes parallel with the flat surfaces, while marble is open and porous, and requires more coats of pigment. Rubbing and smoothing are performed on a horizontal cast iron wheel, about 10 ft. in diameter, running 57 revolutions a minute. For marble, coarse grit sand is used, for slate a very fine grit.

The wheel at the works in question has been worn down from 2¼ inches, to less than ⅞ in. in thickness. After smoothing, any channels that are to be made are cut with a rotary diamond cutter, the bit being hollow and rotating about 5,000 times per minute; a stream of water passing through it preventing injury to the diamonds.

The channel in a "half front" is cut in about three minutes; by hand, it would take one man an hour. The arm carrying the bit is heavily weighted, to ease the operator and cause greater steadiness of cut. Channels having acute angles, or sunken bevels, must be cut by hand, as must some irregular designs. The inner curve of the front is worked to a true line, if a fire-board is to be set in, otherwise, the frame of the heater will cover any trifling irregularity. The slab being worked to the required outline and surface, is now ready for marbleizing. The "ground" is mineral color, ground in copal varnish, because this is a quick dryer. The ground is generally black or brown. When dry, it is ready for the veining or pattern. Upon the surface of a tank of water, various colors mixed in oil are spread in peculiar characteristic patterns, these varying according as the color is ground, dropped, or sprinkled on, and stirred, fanned or otherwise mingled and intertangled. The colors do not blend. A slab being dipped edgewise in the water, is brought up so that the variegated film adheres to its surface, making the "marble pattern."

The marbled slabs are put in a steam kiln and kept at from 185° to 210° F. for 12 hours, baking the colors thoroughly. They are next coated with copal varnish, and again kiln-dried; then rubbed down with pumice-stone powder, again varnished and dried, and then rubbed with the finest polishing powder, and then with the hand; when they have a high, rich lustre, and are ready to be shipped or to be put together by clamps, &c., in place. There are about nine "standard" marbles which are imitated; about six or seven occasionally selected, and about six or eight odd patterns very rarely called for. Mexican onyx has, as yet, baffled all imitative skill.

Where there are "panels" to represent various marbles on one slab, they are separated by cut lines, which are either filled with gold size, or otherwise used to act as boundaries. The veining of one stone should not appear continuous in an adjacent panel representing another kind of stone; this is a common fault, and is in part remedied by leaving a wide unveined band or channel between the panels. Where there is a small veined panel, or a series of such, on a plain black ground, the panels are first colored by dipping or hand work, and the surrounding surface is colored with a brush.

If the general surface is veined, the panels are first made, and then covered with paper, the whole slab is then dipped, and the panels are protected by paper. We should mention that an expert "dipper" will prepare the films and dip 400 square feet of slate (about 150 slabs) in five hours.

[Some fine specimens of imitation marble can be seen at the private office of the Editor, 539½ Craig Street.]

Quickly Drying Glue.—Put your glue into a bottle two-thirds full, up with common whiskey, cork tightly, and set it by for two or three days; it will dissolve without the application of heat, and will keep for years.

The following United States Patents were granted to Canadians during the months of January and February last:

N. Loverin, Montreal, Que., January 1, 1878, No. 198,749, Apparatus for Teaching History.

H. F. Howell, Sarnia, Ont., January 1, 1878, No. 198,767, Roasting Ores.

E. A. Bradley, Ottawa, Ont., January 1, 1878, No. 198,869, Camp Bedstead.

W. D. Webster, St. Catherines, Ont., January 1, 1878, No. 198,910, Hand Hoe.

W. Drum, St. Mary's, Ont., January 8, 1876, No. 198,972, Car Coupling.

G. Goodwin, Cookshire, Que., January 8, 1878, No. 199,054, Tanning Leather.

G. Bisset, Jr., Quebec, Que., January 15, 1878, No. 199,179, Collapsible Cores for Casting.

B. F. Baltzby, Montreal, Que., January 22, 1878, No. 199,491, Photographic Plate Holder.

J. Blakeley, Toronto, Ont., January 29, 1878, No. 199,618, Car Axle Box.

G. Brown, Montreal, Que., January 29, 1878, No. 199,616, Metal Cans.

J. Kinney, London, Ont., January 29, 1878, No. 199,651, Iron Fences.

W. T. Aikins, Toronto, Ont., February 5, 1878, No. 200,012, Grease-arresters for Sinks.

S. Horsford, Halifax, N. S., February 5, 1878, No. 199,906, Skates.

E. R. Whitney, Magog, Que., February 5, 1878, No. 200,114, Harvester Cutter Bars.

H. W. Searle, Hamilton, Ont., February 12, 1878, No. 200,152, Snow Shovels.

L. Durand, Quebec, Que., February 12, 1878, No. 200,183, Dough Kneading Machines.

E. B. Beer, Sussex, N.B., February 19, 1878, No. 200,426, Target.

J. Foley, Montreal, Que., February 26, 1878, No. 200,608, Water Filters.

T. Walsh, Montreal, Que., February 26, 1878, No. 200,676, Water Meters.

J. Dewe, Ottawa, Ont., February 26, 1878, No. 200,702, Postage Stamps.

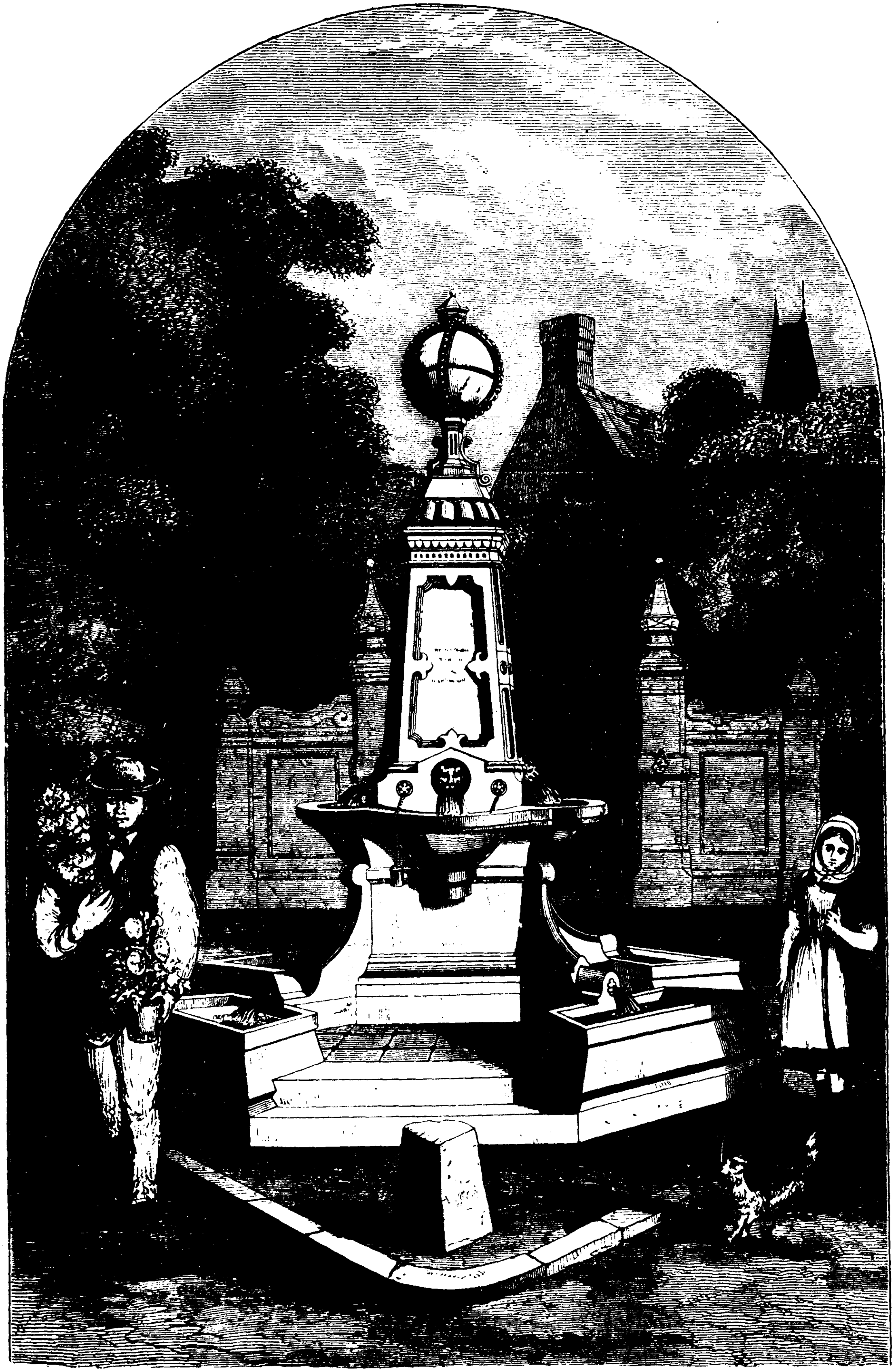
A solution of cyanid of potassium is the best poison to kill insects of any kind.

A cord of stone, 3 bushels of lime, and a cubic yard of sand will lay 100 cubic feet of wall.

French Furniture Polish.—Take 5½ pounds of shellac, 3½ pounds of resin, and also 3½ pounds of turpentine, 1 pound of lampblack, 3 gallons of alcohol, and ½ a gallon of linseed oil. Melt the gums in the oil by gentle heat, let the mixture get cool, and then add the other ingredients. It should be allowed to stand two or three weeks before using.

Paper Lace.—The perfection in machinery, and the novelties introduced thereby, find illustration in a recent occurrence at Berlin. A lady purchased for some relatives two silk ties, with lace borders, which were generally admired, until it was discovered that one of the ties was bordered with real lace and the other by paper lace of similar pattern.

Pivot Teeth in Dentistry—Among the best of the inventions in the way of pivoting is a device of Dr. Bonwill's. The root being cut down, the pulp-canal is reamed out greatly in excess of the size of the pivot that is to occupy it. A pivot made of platinum wire, upon which a screw is cut, is next fitted into the canal and firmly packed into place through the use of amalgam. When this amalgam is set, the teeth—the pivot hole running through it—is placed upon the pivot, and is screwed solidly into place by means of a delicate nut, made of gold. It will be understood, of course, that the fitting of the tooth in position has been done at the time of setting the pivot into the root. This operation, when well accomplished, holds a pivot tooth so firmly in place that it may be used with the utmost freedom in mastication.—*Scientific American.*



THE WEBSTER MEMORIAL FOUNTAIN, DULWICH.——MR. CHARLES BARRY, F.S.A., ARCHITECT.

FREEHAND ORNAMENT.

(From VERE FOSTER'S work on Drawing.)

Freehand, though perhaps not so interesting in its nature as many other branches of drawing, is an essential feature in art-training, since by its means the eye is educated to a due perception of form, and the hand gains power in its delineation. Hence a double advantage is gained:—first, the power to appreciate beauty or to detect error, and, secondly, the faculty of producing really accurate representations of such forms. Thanks to the felt need of technical education, that time is now rapidly approaching when drawing will cease to be classed as an accomplishment merely. Seeing, then, this growing demand for art instruction, it becomes a matter of grave importance that examples of a suitable kind, and proper methods of instruction, should be provided, if drawing is really to possess that practical value which is now claimed for it. On the other hand, it is no less needful that the student—such examples being provided—should bear in mind that perfection is a plant of slow growth. Hence arises one of the difficulties of the teacher; for, while many are willing to undergo what we may call the drudgery of the earlier lessons—those attempts that seem so disheartening before the interest is aroused and the mind encouraged by progress made—others (and they are not few) cast aside such restraints. They see no value in their work: they are machinis s, and want at once to draw plan and elevation of a locomotive; or they are cabinet-makers, and they must begin at once to design for furniture; or they may be amateurs —persons who need not study drawing with a view to increased efficiency in their business, and the corollary of such additional power, more wages to receive—and, therefore, they think that, to them at least, no such course of study is necessary. Thus many a pupil has come to me desiring to sketch in water-colors who was unable even so much as to outline correctly, and yet too proud to learn. Such do not realise that the loftiest buildings have the deepest foundations; that the tree must be tended many a year before its fruit is gathered; that the facile touch they admire so much in some eminent man's work has been acquired by dint of long years of devotion to his art; and that the clever sketch they saw done in some twenty minutes was but the gathering in of the fruit of many months of previous practice.

While thus cautioning the student, however, I may also dishearten him: for he will say: "How can I now give years of my life to this pursuit?" I would, therefore, hasten to add that, while eminence can only thus be attained, yet, if only the foundation be truly laid, enough art-power may be speedily acquired to become both pleasure and profit to its possessor.

Freehand drawing possesses this great advantage over many other kinds of art-work, that it impresses on the beginner the necessity of scrupulous accuracy. Beginners are frequently set to a much more seductive kind of work—little picturesque details of gables, rustic gates, and so forth; but these, though more attractive, and therefore more dangerous, are not nearly so good for the preliminary practice. When the hand has acquired the needful accuracy, then the freedom of touch will come in due course; but the attempted freedom without firm basis is only hurtful and mischievous. For this same reason, geometry makes an excellent study in alternation with the freehand work, as, in that too, the most careful work is required. In geometry, as in freehand drawing, the eye readily detects error, even when the hand, from want of present skill, is unable to remedy it. The pupil must be careful to keep the two modes of working quite distinct. Freehand drawing is so called, because it is quite independent of any such mechanical aids as the ruler or compass; in fact, their use is not permissable, as it ceases to be freehand if they are employed. On the other hand, geometry absolutely requires their use; and it is as much an error (and one commonly indulged in) for the student to sketch his geometrical problems by hand as to use any artificial helps in overcoming the difficulties he may encounter in his freehand. I have seen many a student, after sketching a problem freely on the black board, utterly unable to work it rigidly out with his instruments on a sheet of paper, the two things being so very different in their nature. In the same way, the student who allows himself the use of compasses or ruler while engaged in so-called freehand becomes their slave: their use cramps his progress, and he is under a painful feeling of restraint directly a stroke has to be attempted without their aid.

While anything like ruling, or bending the paper down the middle, or such-like little subterfuges, are thus, from the nature of the work, inadmissable, it is a question in my own mind how far an occasional measurement, after the completion of the work, is at times allowable. If resorted to at all, it should always be in the order just named—not first the measurement and then the drawing made to fit it—but first the drawing honestly striven for, and then, if at all, the measuring test. The temptation to resort to its use, even under these limited conditions, is very great; but its only value lies in this, that where a beginner's untrained eye fails to show him how grievously he may be wrong, and the teacher fails to convince him of his fault, a strip of paper judiciously applied, first to the copy and then to the student's work, is an irresistible argument—an umpire whose decision cannot be impugned. Bear in mind, however, that it can hardly be too little used, and that its use may very easily degenerate into an abuse.

It will not in all cases be necessary for the pupil to go through the whole of these examples. Some will show more natural aptitude than others; and while a few may find it necessary, not only to go through the entire set, but even to draw some again and again, others will feel justified by their progress in missing one occasionally, while the great number to select from will be a welcome feature in the present course. Be the number attempted few or many, let the work, so far as it goes, be thorough. If at any time the task grows wearisome, either subdue the feeling by sheer force of will, or failing that, let the work be put aside for a while, as half-hearted work is of little value. Above all, beware of that constant temptation to young beginners —the desire to get a thing done and out of the way. This is doubly wrong; for, first, to finish one drawing is but the first step towards beginning another; the subject truly has altered, but the next subject brings its own share of difficulty and labour to be gone through no less than its predecessor; and, secondly, it raises a false standard in the pupil's mind: quality should be striven for rather than mere quantity. The practical question is not "How many done?" but rather, "How well done?" Let the student conquer as he proceeds. If his first attempt is a failure, let that rather spur him to a fresh endeavour. There is nothing heroic in being beaten, and, if any of these examples present an amount of difficulty that seems hard to overcome, the learner must not rest satisfied with the sense of failure, but try again.

Practice frequently rather than for any considerable time at one sitting. Drawing is so essentially a thing of practice and habit, of hand and eye, that he who is half-hearted enough about it to put it aside for a few weeks at a stretch, must be content to find, when he resumes his work, that his faculties have rusted somewhat, that his eye has lost its nice discrimination, his hand some, at least, of its old cunning. By little and little, if steadily adhered to, the sense of growing power will arise, and thus the student, having tided over the earlier days of disappointment, will begin to see some show of fruit, some return for days of disappointment, some return for his labour. Let him beware, however, of an overweening confidence in himself. No student is worthy of the name who does not realise that the road to perfection stretches before him for many a mile to come; and such an one will hardly care to repose on his laurels at this early stage of the journey. In requiring the student, so far as our influence extends, to retrace his steps, and try again and again at any of these examples which he fails to manage at first, I am aware that the teacher is imposing a somewhat heavy burden on him; but I have nowhere throughout this little essay told him that drawing is all sunshine: I have, on the contrary, tried to impress on him, without discouraging him, that drawing is real work. A boy at school will go through the same French exercises time after time, till he has mastered them; the girl will sit at the piano for hours together, going over the same scales; the child has many a fall before it runs alone: why then expect that drawing alone should be an exception, and that, in this, to attempt is to achieve?

In looking carefully through this book, the pupil will easily discern that the examples may be conveniently divided into two broad classes: the first consisting of representations of natural leaves, the second of arbitrary, ornamental forms, more or less based upon such natural growth. During the time he is at work upon the first of these sections, he will find it a pleasant variation in his task, if he occasionally try a real leaf instead. He will find it a more difficult study than the other; but as it is perhaps pleasanter, and also the sort of thing his practice in these outlines ought speedily to lead to, it will give him a sense of greater reality in his labours. We do not want him to feel that these few outlines sum up the whole of what we may legitimately call freehand. When I once again remind him that freehand, in the broad sense of the word, means any kind of drawing in which instruments have no share, he will see that the subject has far wider range. To draw a cat is as much an exercise in freehand as to draw an ornamental scroll, and it is no less so if your model is a veritable living animal. We merely give the ornamental forms first, because they present fewer difficulties to the beginner, and their rigid precision is a valuable discipline at the outset. In drawing the section following the natural leaf forms, the work may also be pleasantly varied by finding other examples of a similar type. The acanthus leaf in the series having been drawn, it would be excellent practice to find such another on the capital of some column, and attempt it when in relief. The designs embossed on book-covers will often afford good examples for a change of work, or the monograms so often stamped on envelopes. By thus at times diverging from the beaten course, the student will realize what his drawing power is doing for him, and see and comprehend more fully its service.

In drawing any object, it is often an advantage to lightly draw an enclosing line passing through all the salient points. Thus, in the oak leaf in this present series, the learner will notice that all the lobes of the leaf could be just fitted, so to speak, within an elliptical line. It is a good plan, then, to draw such a line, as it gives greater accuracy frequently to his work, and it can, when done with, be removed. He will see that, in the drawing of natural leaves, this principle has in every case been applied. Where any leaf is serrated, that is to say, the edge of it cut like the teeth of a saw, let him draw a line first of all to get the general shape of the leaf—such a line as would touch the points of the leading serrations. After this has been successfully managed, the smaller toothing of the edges can more easily be added. The copy based on the leaf of the strawberry is a very good illustration of this, which is also indicated in the acanthus leaf already referred to.

Whenever the copy has both sides alike, let him begin by drawing a central line, and in this, as in all constructive lines, let the work be as good as he has the power of making it. He must not think, because these lines really form no part of the finished work, and are destined on its completion to be removed, that, therefore, they need not be drawn with much care; for on their accuracy or inaccuracy depends, in a very great measure, the question whether the drawing built up by their means shall be a success or a failure. The drawing that thus begins askew must end askew, and no amount of added detail, however good, can hide the fact that the drawing was too hastily commenced. Having got the central line true, the pupil should begin at the top and draw a portion of the left side, selecting first those parts that are contiguous to the middle line, and afterwards adding the outlying parts. He should not, however, finish the whole of the left side first, and then endeavour to reproduce it on the right hand; but rather, having drawn one curve on the one side, draw the corresponding balancing curve on the other side. When a curve starting from the central line ends at some distance from it, a line should be drawn from the outlying point at right angles to the upright line in the middle of the work, and then, judging the distance very carefully by the eye, should be continued from the middle, until it is equal in length on each side of the central axis: its extremity will then give the point for the termination of the corresponding curve on the right hand side. The learner may draw as many such lines as he pleases from all the leading points, bearing in mind that the distances must be judged by the eye alone, and that the lines must be truly perpendicular to the centre line.

The concluding and more elaborate examples, it will be seen, are selected from existing remains of past ornamental art, chiefly of the Renaissance period. It has been thought advisable in these closing sheets, after the student has had preliminary practice at the forms which have been specially designed to facilitate his progress, to set before him some illustrations from authentic sources of the direct application of the power in freehand drawing that he has thus acquired to decorative art, as exemplified in the works of others. He will thus, we trust, see to what end his labours have been tending, and so derive, possibly, greater encouragement to go forward than he might do from the mere copying of arbitrary forms which, though excellent as exercises, may not, perhaps, sufficiently in themselves satisfy the student as to their utility and ultimate bearing. These examples are all what is technically termed "flat"—all ornamental art, whatsoever, being capable of classification under two great divisions, the "flat" and the "round"—or, in other words, surface ornament, be it painted, woven, enamelled, engraved, inlaid, &c.; and relief ornament—work resulting from carving, stamping, or modelling. In the first great class, the decorative effect is produced by lines or masses of colour, and in the second by masses of light and shade. A fictitious effect of relief can be produced in surface decorations, as in many sixteenth century illuminated MSS; but such treatment is not really legitimate, and is never met with in the best periods of ornamental art.

Should the student, on arriving at this point, feel desirous of emulating the skill in design of others, we would recommend him, before entering upon a too ambitious and independent trial, to take one of the present advanced illustrations, and, after studying the general arrangement of lines, to adapt some other foliated forms to them—the leaves of the ivy, strawberry, arrowhead, and many others given in the earlier examples, being admirably suited to such a purpose. It must be remembered, however, that true ornament does not consist in the mere reproduction of natural growth, but in its due adaptation to decorative forms. A certain "conventionalism" of treatment to fit the design for its service is the true principle to adopt, although "naturalism" may, according to circumstances, be more or less suggested. It is a very difficult problem to define how far either principle may be developed in a given design, but if the student will bear in mind the distinction between pictorial and decorative art—the one dealing with the actual appearance, a direct transcript of Nature's loveliness, while the other is a more or less idealized rendering, a suggestion of the natural beauty, rather than an attempt to directly imitate it in an unsuitable material—such consideration will possibly sufficiently safe guide to indicate the right course to adopt, though it is impossible to lay down any general rule to regulate the precise degree of conventionalism that may at any special case be desirable.

Though these examples will be found to be of the best practical size for working from, it will sometimes be a piece of good discipline to re-draw them to a larger or smaller scale, and more especially if any tendency to unfair measuring manifests itself. In all examinations, too, in which freehand enters, the examples have always to be enlarged or reduced. If, therefore, the intention is to go in for any such examination, it will be well to bear this in mind from time to time. In thus altering the scale, the pupil must be careful to keep his work in the due proportion seen in the copy. As his work progresses, even if it appears satisfactory, let him turn it upside down occasionally: his eye will then, very probably, notice little inaccuracies that would otherwise escape observation, as he sees his work under fresh conditions; and the eye, somewhat jaded before, detects more readily any errors that may have crept in. Let him avoid using bread, or the preparation known as ink-eraser—the bread, because the crumbs will frequently get under the paper, and so spoil a good curve by the unevenness they cause, and the ink-eraser because it leads to carelessness of work. The pupil using it does not take the pains he should do, as he knows that, no matter how bad the line, this preparation will remove it. It also damages the surface of the paper. The slovenly style of work to which it leads is, however, the greatest objection to its use. India rubber is sufficient for all purposes. No line should be drawn in the first sketch so darkly that that would not remove it: while, in the finished drawing, the darker lines employed are those which the preliminary sketch should have shown to be correct, and all erasure then becomes needless. Bread may be occasionally used to clean the whole surface of the paper; but if due care be taken, and a piece of clean paper kept under the hand during the progress of the work, the paper need never get so soiled as to render the use of bread necessary.

When one form passes in front of another, draw the lower one faintly through, as indicated by the dotted lines seen in several of the examples. Without this precaution, the forms are very likely to have a disjointed look.

In conclusion, let me once more urge on the student that, while the discipline is a valuable one if due pains are exercised, the value will be very slight without such care. No arithmetician is satisfied with a working that comes nearly right; no mathematician will accept an approximation to the truth merely: let me then impress upon the learner the importance of attaining as full a measure of proficiency, step by step, as lies in his power, since a few of the examples, well drawn, will have a value a hundred-fold greater than could possibly result from a slurred execution of the whole series.

F. E. Hulme, F.L.S., &c.

CHEMISTRY, PHYSICS AND TECHNOLOGY.

Horn Buttons, How Made.—The manufacture of horn buttons is one that is interesting from its antiquity, and from the modern improvements that have been introduced into it. Long before metal buttons were made for general wear, the horn button shared with the bone button the patronage of the poor. At present, the horn button is used principally for shooting coats and vests, and for shoes and boots. The horn button is not, however, made from horn as the name indicates, but from the hoofs of horned cattle. The hoofs of each animal will weigh about two pounds, and more than eighty tons are used up yearly by one factory in Aberdeen. The hoofs of horses are not suitable for the purpose. When the hoofs arrive they are thrown into a large cauldron and boiled until they are soft. They are then cut into halves, and the sections transferred to the work-shop. Here the "blanks" are pierced or punched out by young women seated at hand-presses. The blanks, which are of a whitish color, are then placed in vats in a strong dye, either of black, red or green, the only colors which the hoof will take, where they remain until they are thoroughly dyed. Black is the most common color used. The next operation is to fix the shank, which is done while the blank is soft and hot. This is a rapid process, and like most of the other operations is performed by children. The horn button, after being shanked, remains but a plain piece of rounded hoof, not even flattened or smoothed on its surface. The next operation is to place it in a mould, having an orifice for the shank to fit it. This mould merely contains the makers' name or trade-mark, and is for the under surface of the button. The mould contains a dozen repetitions of the same pattern. When the buttons are ranged in this receptacle they are heated over an oven until they are almost as soft as wax, when an upper mould, containing the pattern which is to be impressed upon them, and which fits closely upon the other is placed over it. The two are then subjected to the press, and the buttons are taken out round and complete, with the exception of an occasional roughness around the edge, resulting from the overflow of the molten substance. This is afterwards pared off. The buttons are then fixed by their shanks upon a plate of metal, and subjected to the operation of a brush or a series of brushes moved by steam power, which gives them the last touch and produces a beautiful polish. They are now ready for carding and packing.

The Paris makers of horn buttons are celebrated for employing many of the best die-sinkers of France. Buttons of large size enable the artist to display ability, and the very fine classical heads upon some of the buttons in alto-relievo show a great amount of skill in the execution of the dies; on some, colors have been introduced in indented rings, which at a short distance look both neat and effective. In some French buttons the opacity of the horn (or more properly hoof) renders them unattractive at a short distance, and it is only upon close examination that their merits are discovered.—*Scientific News.*

Remedy for Obesity.

According to Dr. Philbert, the waters of Brides in Savoy, which are very similar to those of Carlsbad, are very useful in the treatment of obesity. The purgative salts contained in these waters are sulphate of soda, chloride of sodium, chloride of magnesium, sulphate of magnesia, and sulphate of lime. To increase the effect, from 15 to 80 grains of sulphate of soda are added to each glass of mineral water. The quantity taken daily is ⅘ quart, divided into three doses, and the purgative effect is produced in two or three days. The course may last from four to six weeks. As an adjuvant to the waters, a vapor bath may be taken every day or every second day. Farinaceous and saccharine articles of food are not allowed, and brandy, liqueurs, and coffee are interdicted; but the quantity of food is not limited, and a moderate amount of wine may be taken without harm. Muscular exercise is considered indispensable, and the mountains in the vicinity of Brides afford every facility for walking, where, in addition, this treatment may be followed by the grape cure.

TO BLEACH SPONGE.—Soak it well in dilute muriatic acid for twelve hours. Wash well with water, to remove the lime, then immerse it in a solution of hyposulphate of soda, to which dilute muriatic acid has been added a moment before. After it is bleached sufficiently, remove it, wash again, and dry it. It may thus be bleached almost snow white.

Color-Blindness is still the subject of much investigation in Europe, with somewhat surprising results. On one French railroad 1,050 men, from 18 to 50 years of age, were examined from July, 1873, to October, 1876, on objects of color, violet, green, blue, yellow and red. Ninety-eight, or nearly 10 per cent., mistook at least one of these colors. The errors made were: Concerning violet, 78; blue, 50; green, 54; yellow, 14; red, 10. Twenty-nine gave correct answers "after repeated hesitations," and eight corrected mistakes afterwards. Only eleven of the whole number were rejected for color-blindness. —*Railway Review*, vol. xv, 203.

Facts and Simple Formulæ for Mechanics, Farmers, and Engineers.

Two hundred and seventy cubic feet of new meadow hay and 216 and 243 feet from large or red stacks will weigh a tun; 297 to 324 cubic feet of dry clover will weigh a tun.

Laths are 1¼ to 1½ inches by 4 feet in length, are usually set ¼ of an inch apart, and a bundle contains 100.

A tarred rope is about one fourth weaker than untarred white rope. Tarred hemp and manilla ropes are of about equal strength. Wire rope of the same strength as new hemp rope will run on the same sized sheaves; but the greater the diameter of the latter, the longer it will wear. One wire rope will usually outlast three hemp ropes. Running wire rope needs no protection; standing rigging should be kept well painted or tarred.

The coefficient of friction of leather belts over wooden drums is 0·47 of the pressure, and over turned cast iron pulleys 0·28 of the pressure.

A mixture of 9 parts phosphate of soda, 6 parts nitrate of ammonia, and 4 parts dilute nitric acid is a freezing compound which will cause a fall in temperature of 71° Fah.

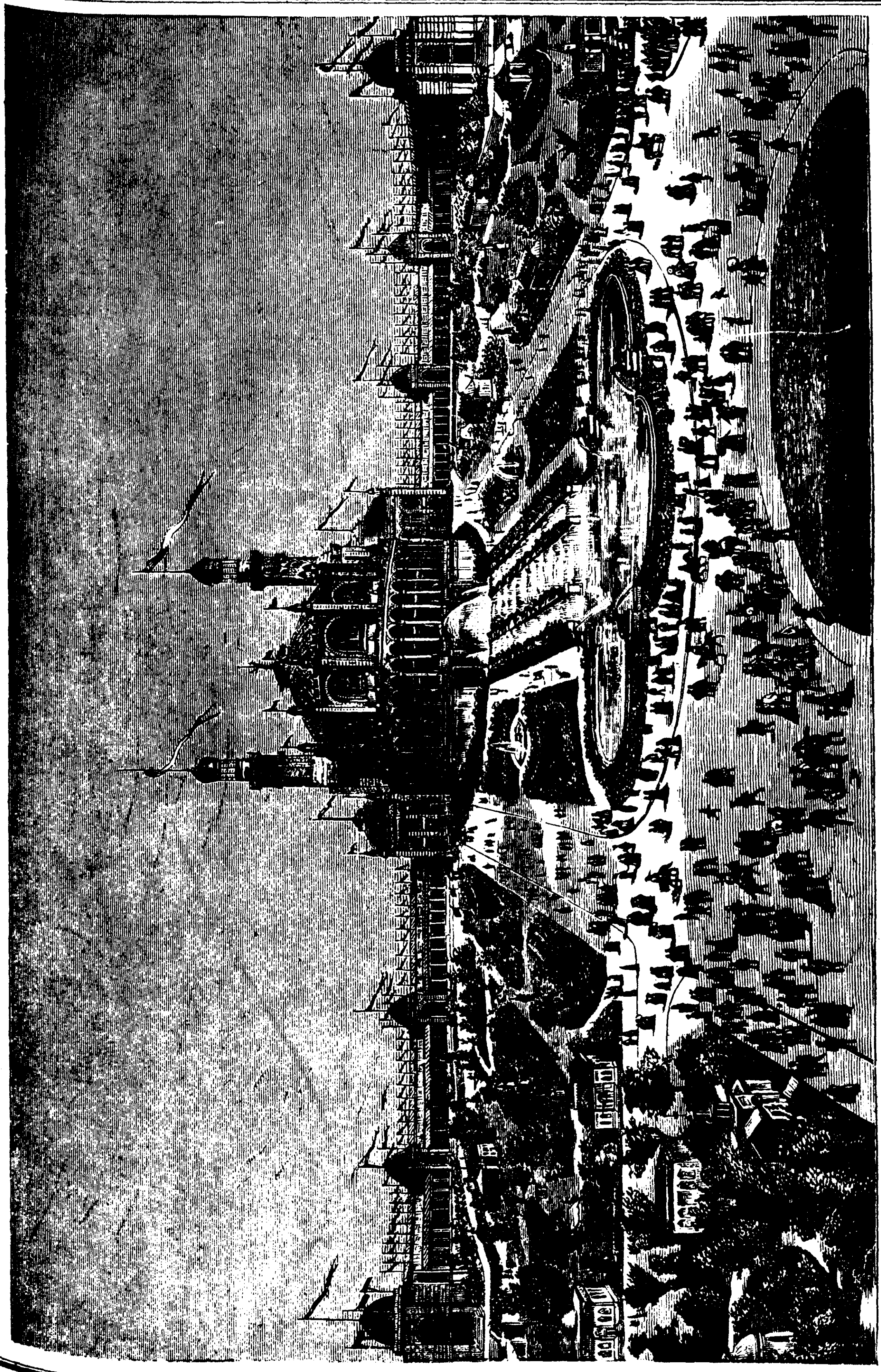
Three fourths of a cubic foot of water evaporated per hour will produce 1 horse power.

Cold blast iron is stronger than hot blast. Annealing cast-iron diminishes its tensile strength.

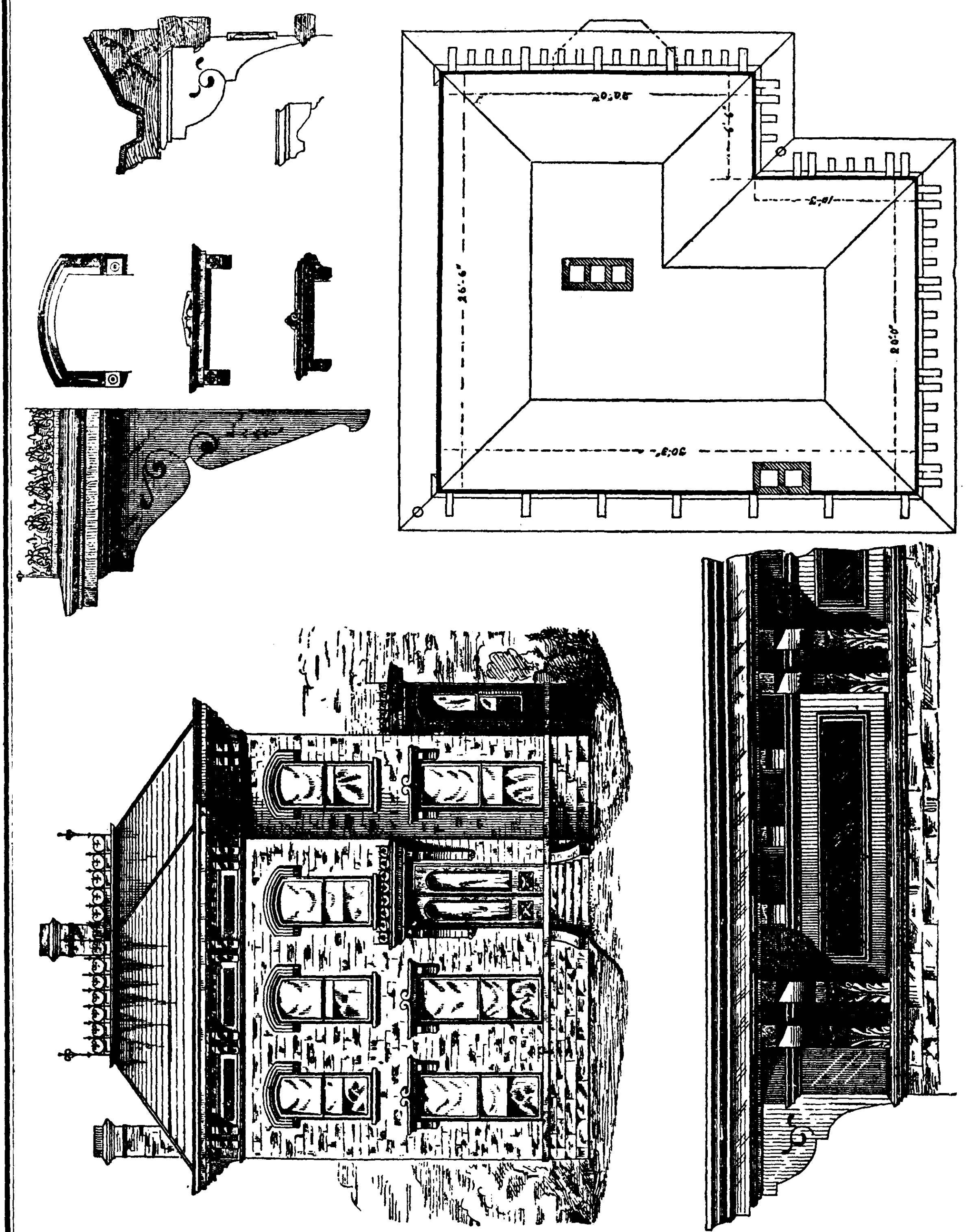
The safe load in tuns which an iron chain will withstand equals the square of the diameter divided by 9.

HOT WATERPROOF CEMENT.—The following is a valuable cement which, if properly applied, will be insoluble even in boiling water: Gelatin, 5 parts; soluble acid chromate of lime, 1 part. Cover the broken edges with this, press lightly together, and expose to the sunlight: the effect of the latter being to render the compound insoluble.

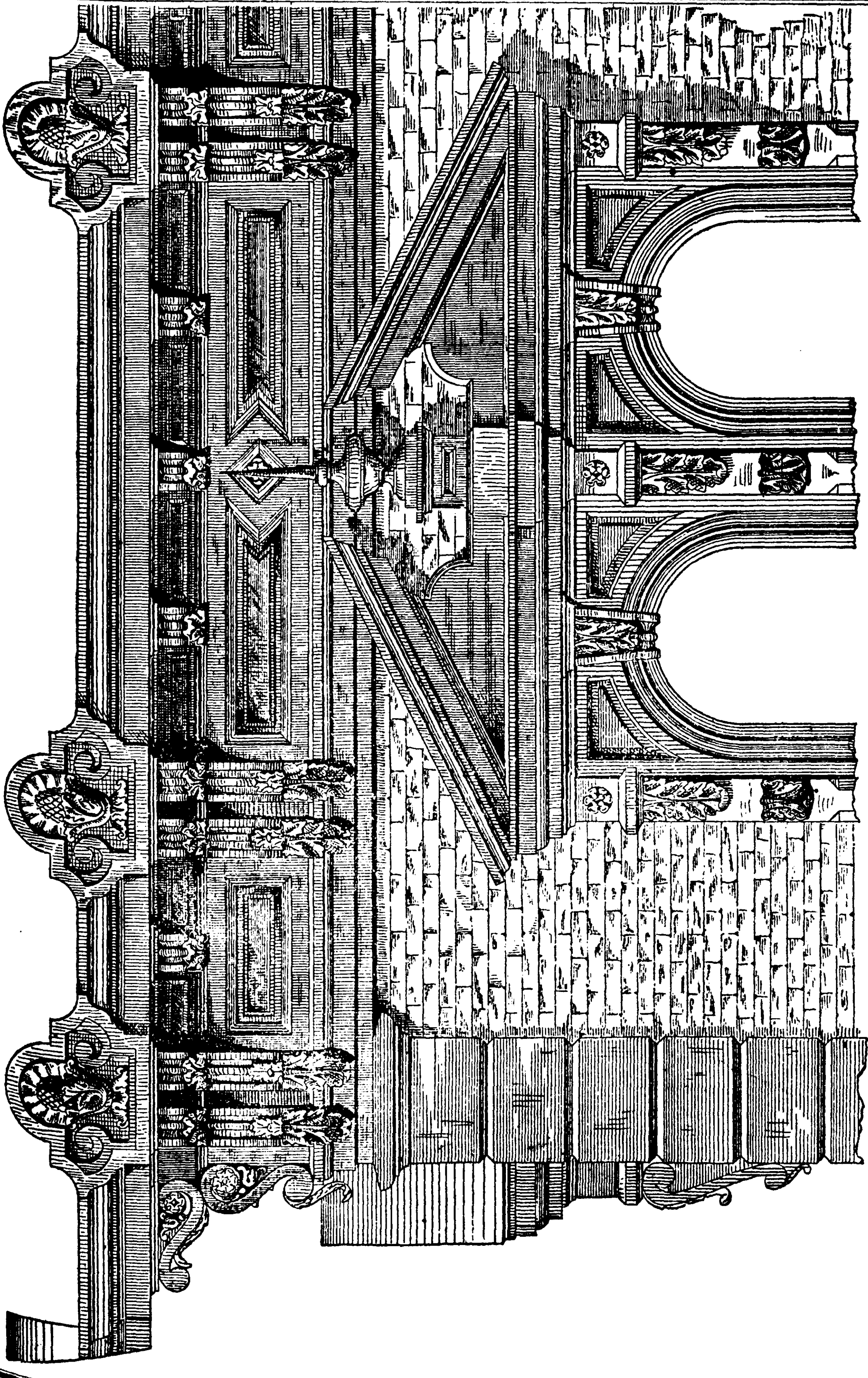
A HARMLESS glaze for earthenware, destined to replace the lead glazes hitherto employed, has lately been devised by M. Constantin. One recipe is 100 parts silicate of soda, 15 powdered quartz, and 25 Meudon chalk. Another is the same with the addition of 10 parts of borax. The articles glazed can be colored by copper for green, and manganese for brown.



BUILDINGS OF THE FRENCH EXPOSITION OF 1878—THE TROCADERO.



SHEET METAL IN ARCHITECTURE.



SHEET METAL IN ARCHITECTURE.

SHEET METAL IN ARCHITECTURE.

[EXAMPLE OF AN ESTIMATE IN DETAIL.*]

It is usual in almost all sections of the country, at the present time, to make one contract cover the galvanized-iron work, tinning and slate-roofing. Accordingly, as being of greater interest to our readers, we have choosen an example which combines the specifications of all three of these items.

We present the Architect's drawings, from which the estimate is to be made. They consist of the following:—Front elevation of building—scale ⅛ inch = 1 foot. Plan of roof and cornice—same scale. Details of main cornice—scale ½ inch = 1 foot. Side elevation of hood to entrance—same scale. Elevation of first story window cap—scale $\frac{1}{16}$ = 1 foot. Elevation second story window caps—scale ¼ inch = 1 foot. Elevation of caps on side on rear of building—same scale.

The architect's specification reads as follows:—galvanized-iron work. The following items are made of No. 26 galvanized iron: The main cornice extending entirely around the main building. The cornice at the junction of slate and tin roof. The cornice to bay-window. Hood to front door. Caps for all openings, except those in the bay window. Capping for hips of roof. Chimney caps. Conductor pipes.

There will also be the following items in pressed-zinc work: Cresting and finials, main roof. Cresting on bay window. Cresting on front door hood.

All to be made and placed upon the building in the most substantial and workman-like manner, and left perfect on completion. The cornices, both upon main-building and bay-window, will be constructed upon wood look-outs. The front door hood will also be supported by wood look-outs, as may be necessary. The cresting to main-roof shall be constructed with all proper stays and tubes, and in putting up shall be sustained by a ½ inch rod bent 4 inches flat on roof, placed in each alternate stem. The crestings on front door hood and bay-window are to be similarly supported, but with proportionately lighter material.

The main cornice varies in the placing of brackets and modillions, as shown on the roof plan. In the rear, the brackets, modillions, frieze-pieces and foot-mouldings are omitted. The foot-mouldings and modillion course are to be returned around back corners, as shown on roof plan. A brick frieze is left on left hand side. The window-caps (including cap over door in rear) are in number and design as follows:—

3 caps, first story, front, No. 978, K. C. & O. Co. Catalogue.
14 caps, second story, front sides and rear, No. 26, K. C. & O. Co. Catalogue.
10 caps, first story, front sides and rear, No. 738 " "

There will be two conductors from main cornice to ground line, to be five inches in diameter. Also, one from gutter in bay-window to ground line, to be two inches in diameter.

Cresting No. 1250, K. C. & O. Co. Catalogue, is deemed satisfactory for main deck, to be provided with suitable finials at all angles. Cresting No. 1254, same catalogue, may be used on bay-window and front hood; also, to have suitable finials at corners.

Tin-Work.—The deck of main roof and roofs of bay-window and door hood are to be covered with best quality of 14×20 IC charcoal roofing-tin, to be laid flat seam, to be well cleated with not less than four cleats to each sheet, and to be well soldered. The valley will require a gutter of not less than fourteen inches in width, to be made of best charcoal roofing-tin. Flash all chimneys six inches above roof line, and securely counter flash cementing joints in brick work when done. Extend chimney flashing under slate not less than eight inches. Line all gutters with best bright charcoal tin. The main gutter to be securely joined to cornice in front and to extend up under slate at back.

Slate-Work.—The steep part of main roof is to be covered with best quality of 10×20 Vermont roofing slate, of either blue or purple, as may be selected, to be laid with proper lap in plain pattern, without cutting, upon two thicknesses of the best quality tarred roofing felt.

Concerning the above specifications, it is to be remarked that it is seldom or never that one is written as complete as the above. Very much of what is here given in ordinary cases is conveyed by a general understanding, by the custom of building in the community, or by verbal explanation upon the part of the architect. In all estimates made to fix a price at which a job is to be executed, too great care cannot be taken in obtaining exact information as to the requirements in all respects.

Upon close inspection of the drawings the mechanic will see at once that there are some very material variations between the designs as given on the elevations and in the details. In the window-caps a leaf is found on the corbels of one, and a rosette on another, which does not appear on the elevation. The same may be said as to the main cornice, wherein it will be noticed that a leaf is shown on the face of the bracket in the detail, which does not appear in the elevation. Such changes as these are very common in all sets of drawings, and must be guarded carefully. As a rule base all estimates upon the drawings from which the work is to be made, or in absence of the working drawings at the time the bid is made, agree to do the work only as shown on the drawings furnished at that time, and which were used in making the estimate.

WATERSPOUTS.

HISTORY OF A NAUTICAL PREJUDICE.

In the midst of the profound calm which often precedes thunder-storms, the lower strata of the atmosphere are not agitated by the least breath; heavy clouds approach at a great speed and cover the sky—a clear proof that powerful currents prevail above, the influence of which does not extend to the ground. From one of these clouds a sort of bag or end of a tube or funnel is seen to issue, and which gradually descends, lengthening at the same time. It seems to be formed of the same material as the cloud, and, in fact, is a true fog which envelops the cloud, thus rendering it visible to our eyes.

Meantime, the centre of this funnel is agitated by a violent whirling movement, of which the small whirlwinds of dust that are sometimes seen on our roads give a very accurate idea. When the waterspout reaches the ground and encounters obstacles in its way, it sets to work upon these after the manner of a turning-machine of great speed at the end of a vertical axis. It raises around its lower extremity a cloud of dust, overturns trees, batters down walls, and unroofs houses. If, instead of land, the waterspout meets with a water surface, it acts upon it like a square-bladed scoop at the end of a vertical axis, and the churned water is thrown to a distance in foam. If it advances on a pool, it empties it in an instant; if on a lake or a sea, the water spurts out all round the foot of the waterspout in clouds of spray.

Look particularly at this long, vaporous tube, which extends from the surface of the earth to the clouds to a height of from 1,600 to 2,000 feet and upwards. It appears flexible, and has an undulatory movement through its entire length; the least breath of air alters and distorts its form, and its whirling movements are felt down even to its base, which sweeps over the earth, carrying devastation in its train. If it assumes greater dimensions, it is no longer a waterspout, but a tornado. We have here in two words the history of the tornado of January 20, 1854, which occurred in the county of Knox, Ohio, and which in half an hour levelled 50,000 trees with the ground, hewing for itself a pathway through the forest a quarter of a mile broad, which could not have been made in some weeks by a whole army of backwoodsmen.

The tube, which takes the form of a pillar, a funnel, the trunk of an elephant, etc., usually disappears after being, as it were, broken across by the violence of its own gyratory movements. Further, the misty vapors which compose it slowly ascend, and the combination of the ascending and whirling motions give the appearance, when seen at some distance, of a spirally-ascending movement, which, however, bears no relation to the internal gyrations of the waterspout. Movements, not real but illusory, are all that are perceived. The spectator supposes he sees objects ascending in the interior of the waterspout. Thus, a bit of cloudy vapor looks like a bird caught by the waterspout and rapidly whirled aloft. If the vermicular

motion is continuous and along the whole length of the waterspout, the question is asked, What can in this manner ascend in a long tube whose base is plunged into the sea and which violently agitates its surface? At once and without any enquiry the logic of the imagination comes into play, and the conclusion is come to that it is the water of the sea which the waterspout is in quest of—this it pumps up and distributes among the clouds, and its ascent up the tube is plainly seen. No question is put as to how a tube composed of aqueous vapor can hold and sustain deluges of solid water. Moreover, are the clouds not seen rapidly to grow portentously heavier and bigger by the water so abundantly supplied by the waterspout?

It were idle to listen even to observations made under such impressions. For thousands of years sailors have transmitted from age to age tales of waterspouts which have lifted ships into the air, sucked up the water of the sea, and poured it down again on some hapless ship which was unfortunate enough to pass under and break the tube of the spout. Tales like these, unceasingly reproduced with ever-fresh details, powerfully aid the illusion in determining the event before it is seen.

THE CRANEY MILL DOG.

The cuts show, with considerable clearness, one of the best of the saw mill dogs in use in this country. There is a single tooth of steel which, like the old-fashioned bail-dog, enters the top of the board or log, and has a direct downward thrust; but requires no mallet, and is immovable by any vibration of the log. Its construction will be understood from the following description:

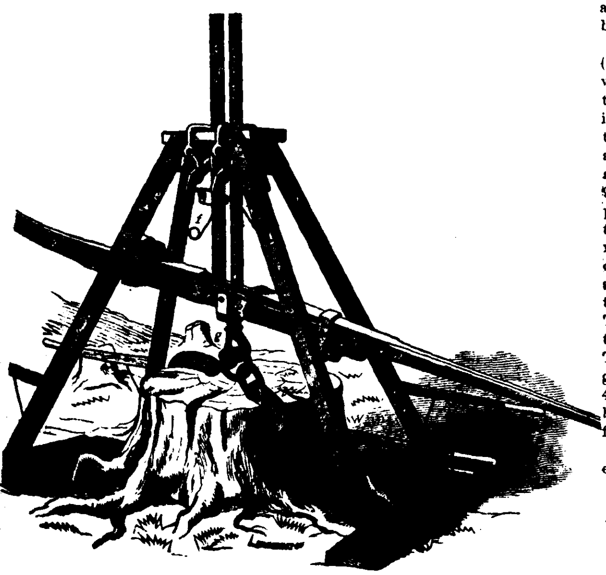
"A solid plate of wrought iron is bolted to the head block (and is adapted to any block); to this is attached a flat bar perforated with holes one-fourth of an inch apart; a yoke over the top connecting this side plate to the main plate, to which is attached the lever by which the dog is secured to the log. The dog consists of a straight solid piece of steel with tooth turned down at right angles. This tooth or dog is movable in a perpendicular direction at the will of the setter, and when dropped upon the log a spring pin passing through the perforated plate holds it securely in position, for holding either the round log or the cant. The operator, by a slight pull upon the lever, causes the perforated bar with the dog to depend sufficiently to imbed the point of the dog to the requisite depth in the log, where it cannot get loose until the lever bar is raised. To release it, the operator gives an upward motion to the lever, which relieves the dog from the log, and taking hold of the pin handle the tooth is raised to any required height on the perforated plate, the spring in the handle causing a pin to enter the plate, holding it safely until ready to be dropped for work."

SAW-MILL APPLIANCES.

It is claimed that this dog tends to draw the timber to the knees instead of pushing it away, which last is the case with most of the dogs which work from the side—especially if the teeth strike a knot. The makers claim that it operates with equal certainty in frozen or hard timber as in soft, there being no tendency to crowd hard timber away from the head-block, or to catch only the bark of timber with thick bark—which would be especially hazardous should the bark peel from the log while the saw was passing through the cut. It is also claimed, as one of the advantages of having no dog from the side or underneath that if, (as often happens) after taking off the first slab, and turning the log with the face side to the knee, it should be out at the bottom, and should be dogged in that position, the action of setting up will bring the log or cant directly up to the standard. In common with other dogs which enter the top of the cant, this dog does not mar the last board, which is the bane of all mill dogs that cut into the side. Another claim is, that if, in sawing a butt log, one end of the stick should be set out from the standard, this dog will reach it and hold it firmly in its place. It is also stated that if, as frequently happens, the bottom of the cant or log does not hug the knee closely, the action of setting brings it close without danger of loosening the grip of the dog, so that the last cut is correct and true, an advantage over other dogs which will be readily appreciated by sawyers. By a second spring pin the dog is adjusted to the proper length for the round log or board, as the case may be, and it should be simply by willful carelessness that the dog can be brought in contact with the saw.

THE LITTLE GIANT STUMP AND ROCK EXTRACTOR.

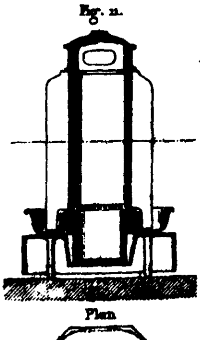
This apparatus is based in action on the power obtained by the compound leverage supplied by the two horizontal bars, *aa*, which work upon fulcrums, *bb*, formed by their connection with vertical rods, *cc*. On depressing either bar, the rod farthest from it is raised and held in position by one of the self-adjusting clamps or dogs, *dd*, and then affords solid fulcrumage for the elevation of the other rod. Since each vertical rod becomes clamped in turn and affords fulcrumage for the other, the elevation of the stump or rock will be in successive steps and very rapid. The adjustable clevis, *g*, allows sudden dropping of the load. The distance between the rods, *cc*, can be varied from 1½ to 3 in., augmenting the power in proportion.



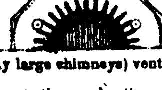
WARMING AND VENTILATING.

The domestic stove, placed within the room, is the most economical mode of heating. When made of porcelain, sheet-iron or cast-iron, without hot air passages, they give out 85 to 90 per cent. of the useful effect of the fuel, (see Fig. 11). But as the amount of air passing through the stove and up the chimney is but about 80 cu. ft. per pound of wood, from 96 to 112 cu. ft. per pound of coal, and from 160 to 192 cu. ft. per pound of coke; even with a brisk fire these stoves produce but slow change of air, say $\frac{1}{18}$ the capacity of the place warmed, effecting complete change of air but once in ten hours. Stoves are then unhealthful. They are also injurious in causing marked differences in temperatures at different heights in a room—as much as 18° or 20° in a room 13 to 16 feet high.

Fig. 11.



Plan



Cast-iron stoves are more injurious than porcelain, on account of the great and irregular heating of their sides. As usually made, they should not be used in dwellings. The experiments of H. Deville and Troost showed that cast-iron at a red heat readily allowed the passage of gas (especially hydrogen and carbonic acid); thus explaining the very injurious and even poisonous effects produced in dwellings. At first they should be used for passages and rooms seldom used, or easily changed in air.

More recent improvements in cast-iron stoves permit of the opening of movable doors or the removal of blowers, so as to convert them (after the fire is started) into grates detached from the wall, and able to produce (with sufficiently large chimneys) ventilation similar to that in ordinary fire-places.

The insertion of an easily removed fire-brick lining prevents the overheating and rapid destruction of the metal, and lessens the injurious effects of the stove.

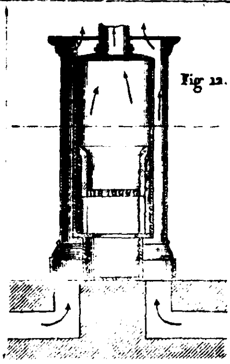


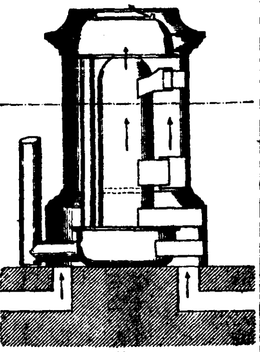
Fig. 12.

Plan

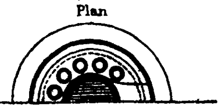
Stoves, with circulation of hot air effected through pipes and passages, are even more unhealthful than the last, as the air from these is frequently more than 212°. If the hot air passages and the draft be supplied from the external cold air, so that a part of the heat is employed to warm this air, the useful effect of this apparatus will be slightly increased, because the escaping gases will be cooler; but the hot air will still be at an unhealthful temperature; and the removal of foul air will be diminished rather than increased, on account of the diminished temperature of escaping gases.

A model devised by René Duvoir and the General Gas Light Company, and used in many Parisian schools, is specially recommended for coke-burning; utilizing 67 per cent. of the useful heating effect. The escaping gases have, at 13 feet from the fire, a temperature of 750°, the warm air passing into the school is as high as 392°; its volume being only 800 cu. ft. per pound of coal burned, on account of the insufficient size of the passages. Stoves of the usual proportions produce a change of but 2,119 cu. ft. per hour, or 352 cu. ft. per pound of coal. They are consequently unhealthful and unmeriting the name of "ventilating stoves," given by some makers. To make them cheap, such stoves have generally but 20 times as much heating as grate surface; when they should have from 60 to 80 times. The area of the hot air passages is scarcely equal to that of the grate; it should be three or four times as much, to increase the amount of air and lessen its temperature. The chimney area is but 18 per cent. that of the stove; this, if doubled, would secure more rapid change of air, but the heating effect would be materially reduced.

Fig. 13.



Plan



Portable heaters, of the Chaussenot model (Fig. 13), are for large rooms, hall-ways, &c., and while being "stoves with hot air circulation," they are true heaters; because, before escaping into the air, the products of combustion pass through many pipes; and there may be obtained a considerable amount of air, drawn from the outside of the building. Their heating effect reaches 93 per cent. They introduce and warm for each pound of coal, 2,551 cu. ft. of air at 266° or more; thus indicating insufficient passages. They remove but 91 cu. ft. of foul air for each pound of coal burned; and are consequently unhealthful, and suited only for warming passages, &c., where the external air may mix with the warmed air. The total heating surface in one tested was 100 times the grate surface; a good and large ratio. The air passages had three times the area of the grate; not quite enough. The chimney area is 47 per cent. of the grate area; enough for draft, but not securing sufficiently rapid removal of foul air.

The principal defects of all stoves (without exception) are:

(1) Not carrying off foul air as quickly as healthful. (2) Giving too high a temperature to the air passing through them.

These faults may be lessened by:

(1) Making separate ventilating drafts heated directly by the stove and the chimney. (2) Enlarging the hot air passages and taking the air from the outside of the building, so as to prevent it entering at doors and windows.

(3) Furnishing stoves with doors, which (after kindling) can be opened, thus almost making of them open fire-places, and causing a strong draft into the chimney, the size of which should be enlarged without fear of too much increasing the expense for fuel.

In some cases, where there is no flue above the fire-place, the smoke must be carried to a horizontal passage below, which conveys it to the bottom of a vertical flue some distance off. To obtain sufficient draft in lighting, it is generally necessary to start a small fire in the opening in the horizontal passage at the foot of the flue, causing a momentary draft, the external supply of air to this fire being stopped as soon as kindled; so that, taking air from the horizontal passage alone, it may produce a current to the chimney or the stove. This arrangement is often insufficient.

In houses lighted by gas it is preferable to introduce into the chimney at the occupied story, and not at the level of the lower horizontal passage, gas jets in a little metallic chimney 9⅞ to 11⅞ inches high, with separate air supply to prevent it being extinguished by the smoke.

Three or four jets, each consuming 4 cu. ft. of gas an hour, are enough. Their heat produces in the flue an increase of temperature, which keeps up the stove or chimney draft. They may be put out after the fire is kindled.

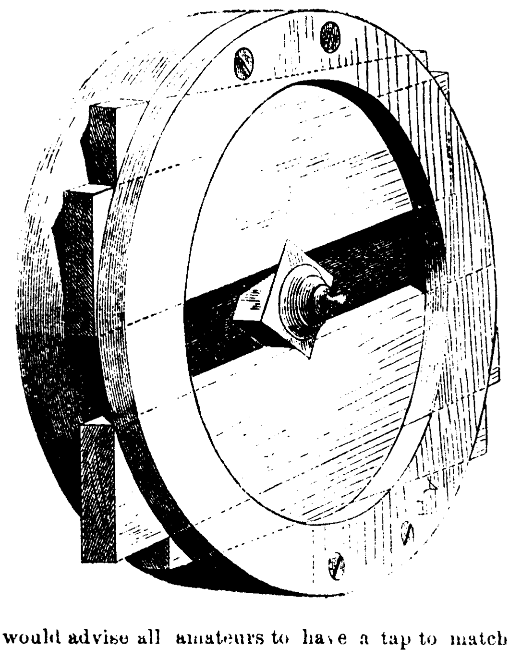
Hardening Paper.—The French papers speak of a method of rendering paper extremely hard and tenacious by subjecting the pulp to the action of chloride of zinc. After it has been treated with the chloride it is submitted to a strong pressure, thereafter becoming as hard as wood and as tough as leather. The hardness varies according to the strength of the metallic solution. The material thus produced can be easily colored. It may be employed in covering floors with advantage, and may be made to replace leather in the manufacture of coarse shoes, and is a good material for whip-handles, the mountings of saws, for buttons, combs, and other articles of various descriptions. An excellent use of it is in large sheets for roofing. Paper already manufactured acquires the same consistency when plunged, unsized, into a solution of the chloride.

A Handy Form of Chuck.

To the Editor of the Scientific American:

I want to thank you as well as Mr. Joshua Rose for the many useful hints to amateurs contained in his notes on tools and their uses, and particularly to the articles on lathes and lathe tools am I indebted much for useful information.

I send you a model of a chuck something in the style of the one described by Mr. Rose in your issue of August 5, 1876, in which, as your readers will see, by the use of a variety of parallel slips, many different sized pieces can be held for turning, by only two wedges; and any boy who can use a lathe can make it.



I would advise all amateurs to have a tap to match the screw on the mandrel; and also a small piece of hard, close-grained wood, tapped to fit, the hole being bored with the grain, and then screwed on to the mandrel, and there turned with slight taper from left to right. A small shoulder or flange should be turned on the left hand end, so that, when screwed on, it fits up close. Then turn a piece of good soft dry pine board, as large as will swing, 1½ to 2 inches thick, and turn a hole in the center to exactly fit the piece of hard wood in which you have cut the thread; put these together with good glue; when the glue is dry, turn the face and edge, and you have a chuck or face plate, which (being of soft wood) can be easily turned out so as to hold any block that is less in diameter. When this face plate is used up, it can easily be renewed on the same piece of hard wood in which the screw is cut. Dogwood is perhaps the best of the common woods in which to cut a thread; it is cheap, and to be found in almost any yard where firewood is sold. I have some of these wooden chucks, the threads being cut across the grain, which have been in use in my chuck for years; and they are as good as new. I prefer a wooden face plate, made as above described, to screwing a board on to an iron face plate, because the screws give in the wood, and they do not remain true.

AMATEUR.

Philadelphia, Pa.

LINSEED OIL VARNISH.—Boil linseed oil, 60 parts, with litharge, 2 parts, and white vitriol, 1 part, each finely powdered, until all water is evaporated. Then set by. Or, rub up borate of manganese, 4 parts, with some of the oil, then add linseed oil, 3,000 parts and heat to boiling.

Solvent for Rubber.

This new solvent consists of a mixture of methylated ether and petroleum spirit—the common benzolene used for burning in sponge lamps. This forms the most rapid and, perhaps, the best solvent we have tried; the mixture is as much superior in power to either of its constituents singly as the ether-alcohol is to plain ether in its action on pyroxylin. We make a very thick solution by dissolving sixty grains of good india rubber in two ounces of benzoline and one ounce of sulphuric ether. If the india rubber be cut up fine and the mixture shaken occasionally, the solution will be complete in two or three hours, when it may be diluted to any required strength with benzoline alone. The india rubber should be as light colored as possible, and all the outer oxidized portions must be cut away. Shred the clean india rubber with a pair of scissors, and throw it at once into the solvent.—*British Journal of Photography.*

To Dispose of Curculios.

A correspondent of the *Ohio Farmer* states that he kept a plum tree from curculios by sprinkling the ground under the tree with corn meal. This induced the chickens to scratch and search. The meal was strewn every morning, from the time the trees blossomed until the fruit was large enough to be out of danger. The consequence was that the fowls picked up the curculios with the meal, and the tree being saved from the presence of the insects, was wonderfully fruitful.

AN English inventor proposes to pump exhaust steam back into the boiler in place of condensing it, and experiments are now being conducted with an engine for testing the invention. The inventor contends that "the pressure exerted by the steam on one side of the piston represents, by its elastic power, the same expressions of power in pressure on the other side; so that the elastic charge is always ready to give back the exact power expended for its expression."

Horseflesh for Human Food.

In 1875 the horse butcheries of Paris furnished for public consumption 6,865 horses, asses, and mules; in 1876 they furnished 9,271, giving 1,685,470 kilogrammes of neat meat. At Lyons, the number has diminished from 1,262 in 1875 to 1,088 in 1876. On the 1st of January there were 58 butcheries in Paris and only 7 in Lyons. At its meeting, on January 9, the committee *de la Viande Cheval* awarded a silver medal to M. Petard, who has nine butcheries in Paris, as a reward for his enterprise.

Greasing Axles.

On the authority of the *Carriage Monthly*, more injury is done to carriages and wagons by greasing too much than the reverse. Tallow is the best lubricant for wood axles, and castor oil for iron. Lard and common grease are apt to penetrate the hub, and work their way out around the tenons of the spokes and spoil the wheel. For common wood axles, just enough grease should be applied to the spindle to give it a light coating. To oil an iron axle, first wipe clean with a cloth wet with turpentine, and then apply a few drops of castor oil near the shoulder and end. One teaspoonful is enough for the four wheels. Carriages are sometimes oiled so much that their appearance is spoiled by having the grease spattered upon their varnished surfaces. When they are washed in that condition, the grease is sure to be transferred to the chamois from the wheel, and from thence on to the panels.

An English engineering paper commences a lengthy illustrated article on "The Ashtabula Bridge," as follows: "When a bridge gives way suddenly under the weight of its ordinary working load, it may be taken for granted that there is something radically wrong in either the design or the construction, and the event cannot be called an accident."—*Hardware Reporter.*

DESIGN FOR A COTTAGE RESIDENCE.

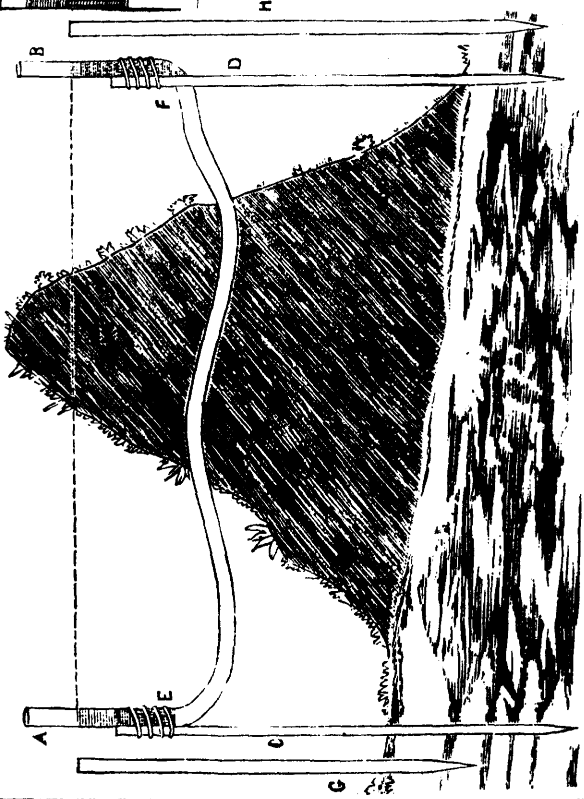
We simply give the elevation of a design which appeared in the *Manufacturer and Builder* without giving the interior laying out and arrangements. So many have their particular fancies in this respect that our experience has taught us they are very seldom of much use.

The Destiny of a Million of Men.

Among one million human beings, there are at birth on an average 512,000 boys and 488,000 girls. Between the time of birth and the age of 5 more than one-fourth, or 262,000 children die, namely, 142,000 boys and 120,000 girls, leaving 370,000 boys and 368,000 girls, the greater mortality of the boys reducing them thus soon to nearly equal numbers. The next five years are more favorable, and so is the period from 10 to 15, during which the mortality is the least, but especially for boys; from 15 to 20 the mortality is greater again, and still greater from 20 to 25, so that at that time 104,000 will have died, leaving 634,000 to enter their 26th year. At the end of 35 years 200,000 women will have married, while 62,000 persons will have died, of whom nearly half will die from consumption, leaving 572,000. The next ten years will reduce the number by 70,000 deaths, leaving 202,000, at the age of 45. Now each succeeding ten years will be more fatal and the numbers shrink so rapidly that during the next 30 years they will die at an increasing ratio of an average of more than 10,000 per year, so that at 75 years of age 341,000 will have died, and only 161,000 will be left; the death rate per year still increasing from 75 to 85, is now about 12,000 per year, so that during this decade 122,000 will die, and 39,000 left to attain 85 years of age; now the death rate increases still more, but as there are less people left to die, the absolute number of deaths grows less than 4,000 per year, so that 37,000 will die in the next decade, and only 2,000 will reach the age of 95; of these 1,750 will die before the age of 100 years, so that only 250 will reach the age of 100; of these 250 half will die the first year over 100, leaving 150 to attain 101 years; again half of this number the next year, or 75 at 102, and so on, 37 at 103, 18 at 104, 9 at 105, 4 at 106, 2 at 107, and 1 at 108. This single surviving individual, among one million human beings dying around and before him, will then in his turn at last also bid earth farewell, to make room for other generations as his contemporaries have wisely and more promptly done before him. For many years he was only in the way, and perhaps life has even been a burden to himself.

PLOWING UNDER WATER.—During the past summer we witnessed deep-sea plowing in the harbor of Belfast, Me. The bottom of the bay is covered with a tenacious, clayey deposit, into which the steam shovel penetrates with difficulty, and to loosen it a huge Michigan plow was set to work under the water, drawn by steam power on the shore, using a wire rope to form connections. The water at high tide was about twenty feet deep when the plow was working. The man that held it was encased in the diver's armor, and supplied with air by a flexible tube connecting with an air-pump on board of a vessel floating above. He came up at our request, and after removing his air-tight helmet and conversing a few moments, was again put in connection with the pump, and disappearing under water went on with the plowing. This to us was a novel proceeding, and so far as we can learn, it was the first experiment of the kind ever made.—*Boston Journal of Chemistry.*

AMONGST the jewels presented by Lord Roseberry to Miss Rothschild was the largest sapphire known. It was brought to England some time ago in its rough state, and for a long time remained unsaleable, as the dealers saw, or fancied they saw, in it a flaw. At length one more courageous than the others purchased it for £800, taking all the risk. On being sent to the polishers it was found that the defect was barely skin deep. Lord Rosebery paid £2,000 for it, precisely the same price as the Duke of Westminster paid some years ago for the largest known turquoise, a flatter stone, has a somewhat larger surface.



SIMPLE METHOD OF LEVELLING AND GRADING.

PATTERN-MAKING.

By Mr. Joshua Rose.

Turning Tools.

FOR finishing plain work we have the tool shown in Fig. 59, which is the exception noted previously as being a finishing and, at the same time, a cutting tool. It is called a skew chisel, because its cutting edge is ground at an angle askew to the centre line of its length. Furthermore, it is bevelled at the cutting end on both sides (as shown in the edge view), being ground very keen. It is employed for finishing straight or parallel surfaces, and for dressing down the ends or down the sides of a collar or shoulder. When used for finishing straight or parallel surfaces, it performs its cutting in the centre of the length of its cutting edge only, as shown at A, in Fig. 60, and is held in the position relative to the work shown in Fig. 59. When nicely sharpened it leaves a polish, unlike other finishing tools; but with these advantages, it has a drawback (and a serious one) to learners, as it seems to have a terrible propensity for tearing into the work, whether it is used upon the circumference or facing the shoulders of the work. This difficulty can only be overcome by practice, and the reason lies in the difficulty of learning how to handle the tool with dexterity. It must be held almost flat to the work; and yet, if it should get quite flat against the work, the cutting edge would cut along its whole length, and the pressure of the cut would be sufficient to force the tool edge deeper into the work than is intended, which process would continue, causing the tool to rip in and spoil the work. The face of the chisel nearest to the face of the work being operated upon stands almost parallel, with just sufficient tilt of the tool to let the cutting edge meet the work in advance of the inside face of the tool; or in other words, the amount of the tilt should be about that of the intended depth of the cut; so that, when the cutting edge of the tool has entered the wood to the requisite depth, the flat face will bear against the work and form a guide to the cutting edge. The corner of the chisel which is not cutting must be kept clear of the work. Fig. 60 will convey the idea, the arrows showing the direction in which the chisel is, in each case, supposed to be travelling.

The short lines, A and B, under the arrows, and those touching the collar, at C and D, show the tilt or incline of the chisel to the work. In turning the circumference the obtuse corner of the chisel is the cutting one; while in turning down a side face it is the acute angle. Most pattern-makers, however, do not often use the skew chisel for finishing straight cylindrical work, because it is liable to make the surface of the work more or less wavy. It is, however, almost always used for cutting off and for cutting down shoulders, for which purpose it is highly advantageous. For circumferential work on cylindrical surfaces, an ordinary chisel is mostly employed, the position in which it is held to the work causing it to scrape rather than cut. A worn-out paring chisel is as good as any, but in any event it should be a short one. Such a chisel is shown in Fig. 61, the position in which it is held being illustrated by A, which represents a section of a piece of cylindrical work, B representing the chisel, and C the hand rest. Some pattern-makers prefer to increase the keenness of this tool by holding it so that the plane of its length lies in the direction denoted by the dotted line, D; this, however, renders it more likely to rip into the work, and the position shown is all that is necessary, providing the cutting edge be kept properly sharpened. This chisel is also used on side faces.

Still another tool, sometimes used for finishing plain cylindrical surfaces and side faces, is that shown in Fig. 62 at A. It is used in the same manner and relative position as the chisel shown above, in Fig. 61.

For finishing hollows, which should first be roughed out with the gouge, the form of tool shown at B, in Fig. 62, should be used. Several of these tools, of various sizes, should be kept; they are used in the same position as the finishing chisel shown in Fig. 61. The tool shown at C, in Fig. 62, is used upon large work, and is advantageous because it presents less surface of cutting edge in proportion to the depth of the cut than does the gouge; and, in consequence, it is less liable to cause the work to jar or tremble. It is usually made about 2 feet long, which enables the operator to hold it very firmly and steadily. It is used with its top face lying horizontally, and should be kept keen. D, in the same figure, represents a similar tool, with a round nose; this latter is not, however, made long and may be used in a handle.

For boring purposes the tool shown in Fig. 63 are employed; those shown at A and B, having their cutting edges at C and D, are therefore right and left hand tools. When, however, the hole is too small to admit of those tools being used, that shown at E may be employed, its cutting edge being on its end, at F.

The temper of all these tools should be drawn to a light brown colour, and the instruction given for grinding bench tools should be rigidly observed in grinding and oilstoning these turning tools.

Scientific American.

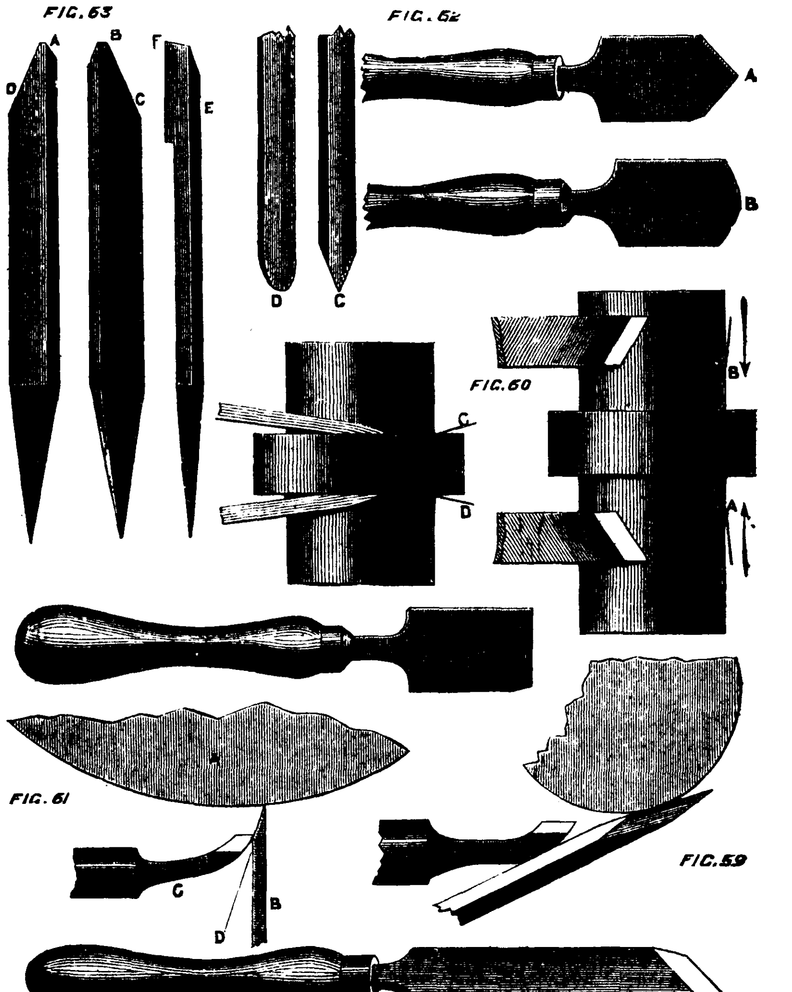


FIG. 63 FIG. 62 FIG. 60 FIG. 61 FIG. 59

Cheap French Flat Tenements.

House builders have of late been experimenting in French flats, and the result is that apartments are now offered to families in which elegance, comfort, and cheapness combine. Having had occasion to visit one of the latest houses built of this kind, on Macdougal street, near Eighth, we saw, on stepping into the porch, a row of five bells in horizontal line, beautifully arranged, one for each flat, with the occupant's name in a glass frame at each bell, and over each was a speaking-tube, through which conversation could be held by any person standing in the porch. On touching one of the bells the door noiselessly and mechanically opened near by, as if by enchantment, showing a richly carpeted hall and stairway, up which the heaviest foot might pass noiselessly. The rooms are well lighted and ventilated. The kitchen, with its wash-tubs, range, hot and cold water, bath-house, etc., is admirable. The landlord furnishes the stair and hall carpets, the kitchen range, and copper boiler attached, for about the same rent as a floor in any common tenement house. This is a revolution in house-building which, if continued, will do as much to civilize and elevate humanity as the church or schoolhouse.—*N. Y. Commercial Advertiser.*

Cheap and Fine Varnish for Wood.

A correspondent has called our attention to a prescription under the above head, which somehow found its way in our columns more than six years ago, (May, 1870.) and which, on reading it now for the first time, we can by no means indorse.

It advises to prepare the wood with glue-water, to which, for light colored wood, chalk is added, and for dark colored wood a dark pigment; when dry, a mixture of copal varnish with linseed-oil varnish is to be put on; when this is dry, it is rubbed with a solution of wax in ether, and so gives a high polish.

Any one who is in the least acquainted with the simple methods employed by manufacturers to give a high polish to various wooden objects, must see that the prescription is absurd, and not worth trying. The coating with glue-water is all wrong, as it will prevent the varnish from filling the pores and adhering, but cause it to come off easily. The mixing of chalk or dark pigments is all wrong, as it will spoil the appearance of the wood. The mixing of the copal with the linseed-oil varnish is, to say the least, unnecessary, if not injurious; the copal varnish alone applied to the wood, previously oiled with linseed oil, and given time to dry well before applying the varnish, is much better. The rubbing with a solution of wax in ether after having been varnished, is absurd. The most old-fashioned way of polishing is to rub nothing but wax on the wood; it is very objectionable however, as it comes off easily, and when used on chairs spoils the clothes.

As a correction of the erroneous prescription, we refer to the answer to query 293, on page 71 of our March number for 1872, where we have answered the question in regard to giving a fine polish to furniture in our own way—giving a condensed but full and correct account of the method used by American manufacturers, and the very different way in which the French and German cabinet-makers attain the same object, but with more labor.

Cubical Contents of a Ton.—Few persons have any idea as to the amount of coal that can be stowed in a given space; we therefore give an example of the manner in which it may be figured up. A shed or room 15 feet high, 18 feet wide, and 300 feet long, will hold 200 tons of anthracite coal, and perhaps 10 tons less of Cumberland. Thus 15 × 18 × 30 = 8,100, divided by 40, average cubic contents of a ton of anthracite = 202½.

Making Wheels by Machinery.

The lightness, elegance, and surprising strength of American carriage wheels are well known, not only everywhere in this country, but are considered remarkable in Europe. American carriages are becoming fashionable in England, now that their lightness has been found consistent with actually greater strength than is possessed by the heavy, lumbering English vehicles. Our carriages, wagons, and wheeled vehicles generally, owe much of their beauty and usefulness to the excellent structure of the wheels, and this is principally due to the excellence of the machinery by which all the parts of the wheels are made and fitted together. Formerly it was a long and tedious labor to make a wheel, and when it was made, the joints were ill-fitted and soon worked loose. When a wheel gives out, the carriage is useless, and it is therefore of the greatest importance that the wheels of all our vehicles, subjected to very hard usage upon our generally miserable roads, should be made in the best manner and fitted with exactness. It is only by the use of machinery that joints can be made to fit perfectly close, and that every mortise and tenon of this kind in a wheel should be precisely alike. Since machinery has come into general use, and there have been such extensive wagon and carriage manufactories as those of the Milburn and the South Bend works in operation, farm and road wagons and carriages of all sorts have been greatly cheapened and improved. The work about a wagon or carriage requiring the greatest skill, is in the wheels. If the joints are not well made, the

Fig. 1.—Hub-boring auger.

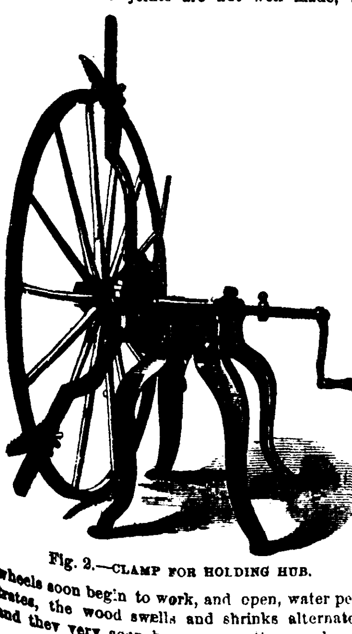


Fig. 2.—Clamp for holding hub.

wheels soon begin to work, and open, water penetrates, the wood swells and shrinks alternately, and they very soon become an utter wreck. No more severe test of the perfection of a wheel can be exacted than that of the arid plains of the West;

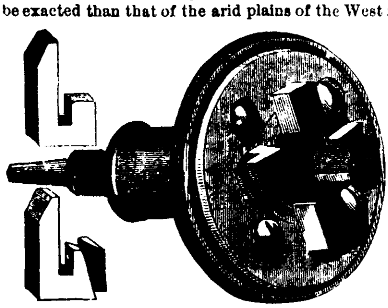


Fig. 3.—Hollow auger.

and machine made wheels have stood this test without failure. The machinery used in making wheels is very varied. The hubs are turned in lathes and mortised by mortising machines; the felloes are sawed by band-saws, which cut several pieces at one operation, and the spokes are turned in a lathe and tenoned by a tenoning machine. All this is simple work, however, and could be done very well by an expert mechanic by hand. But to bore out the hub perfectly true, with a tapering hole if required, and at right angles with the plane of the wheel, is hardly possible to be done by hand in every case, even by the most skillful workman. This, however, is done by the auger shown at figure 1, which is held at right angles to the rim of the

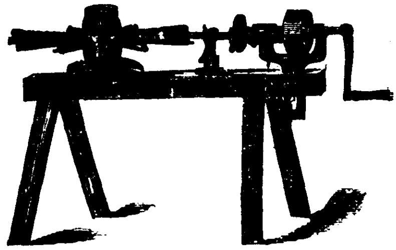


Fig. 4.—Making tenons.

wheel by the clamps shown at figure 2. This ensures the proper boring of the hub and the true running of the wheel upon the axle. The tenons of the spokes are cut with the hollow auger shown at figure 3. This is mounted upon a frame, upon which the hub is also mounted, as shown at figure 4, and thus every tenon is made to bear an exact and proper relation to the hub and the axle and with each other. The felloes are bored in the manner shown at figure 5, and each hole being of precisely the same size and in the same direction, is made to fit any one of the tenons of the spokes. This ensures the easy but perfectly accurate fitting of these parts, and the consequent strength and durability of the wheel, although it may be of such exceeding lightness as is seen in one of the road wagons to which the fastest roadsters are hitched. The machinery here illustrated is made by the Silver & Deming Manufacturing Co., Salem, Ohio.

The American Agriculturist.

Comparative Value of Pedigree and Non-Recorded Jerseys

BY THOMAS FITCH, NEW LONDON, CONN.

The Boston "Evening Traveler," of Oct. 19th, gave a full report of the sale of the herd of the late Alvin Adams, of Watertown, Mass., with the pedigree, name, and number of registry in the American Jersey Cattle Club Register, of 38 cows recorded in the book, with the names of the purchaser and residence; and also of 5 cows without pedigrees, with names of cows and purchaser, and the price each cow sold for, I find by this report that the five cows without pedigrees, or record, sold for a higher average price by about $10 each, than those registered with authentic pedigrees. This report says, also, there were present about 800 of the Jersey stockraisers of the United States, etc., and that this herd was considered the finest in the country.

Admitting these facts, how happens it that the five cows, without record or pedigree, sold for a higher price than the Herd Register cows, except for the real reason, that they were the best cows, as they were, in all that makes value in a Jersey cow, viz., in form, size, udders, teats, colors, beauty, and all the qualities making value. I have conversed with several breeders, members of this Club, that were present at this sale, and they, without exception, all admit this.

The American Jersey Cattle Club, when it formed their Register, claimed that its object was to prevent imposition upon purchasers of Jerseys, by separating the pure from the mixed stock, or grades, that were sold for thoroughbreds. It was to be a purely philanthropic institution to prevent fraud. After years of labor, and sacrifice, and the collecting of thousands of dollars from the public, in the shape of entry fees to non-members of this Club, of

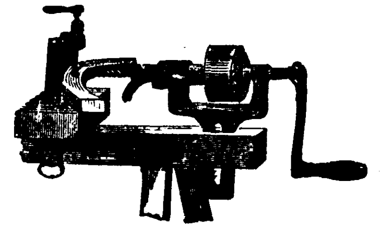


Fig. 5.—Boring rims.

$3 on each animal registered, and the boast in one of the Club's reports, that an additional value of more than 50 p. c. had been given to every Jersey entered in this Register, in almost the suburbs of Boston, on the very spot where the Club originated, with this great company of experts, breeders, and judges, the cows without pedigrees, or record, outsell those with pedigrees and record in this book.

[The writer of the above has perhaps singled out an exceptional case whereon to found a general rule. Any person who expects that pedigree alone will confer excellence, will probably be disappointed; but we imagine that Mr. Fitch himself places some reliance on the pedigree or descent of his own stock, even of those not recorded in the A. J. C. C. Herd Register.—Ed.]

The American Agriculturist.

Rustic Poultry Houses.

The most profitable poultry in the world are those of the Irish and French people. More eggs are exported from France and Ireland than from any other countries. The fowls of those countries are in greater part lodged in the most primitive sort of shelters, there being few, or none, of the costly buildings which in this country are generally supposed to be needed for profitable poultry keeping. The usual French fowl house is a little cabin of boards or bark, with a thatched roof, and a yard fenced in with small poles or brush. Generally

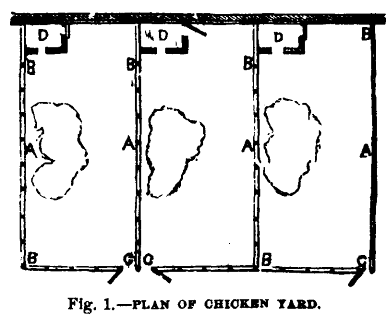


Fig. 1.—Plan of chicken yard.

there is a fruit tree of some kind, or more than one, in the yard. The Irish fowls are kept either in shelters made wholly of sods, built against the back part of the house, and warmed by the heat of the chimney, or the birds are accommodated with roosting places, along with the cow, in a part of the house itself. The hens are kept dry and warm and this is the secret of their prolificness in eggs.

PRACTICAL GEOMETRY APPLIED.

(By G. Magnell.)

THE SCREW.

The figure of a screw may be described in general terms as consisting of a projection of uniform cross-section, called the *thread*, winding, in successive coils, round a circular cylinder; and the pitch of the screw is the distance, measured parallel to the axis, from any point in one coil of the thread to the corresponding point in the next coil; or the distance between two successive coils of the same thread. The pitch is also the uniform distance through which the screw advances at each turn.

PROBLEM 116.—To Draw a triangular or vee threaded Screw.

Let **A B** represent the axis of the Screw.

1.—Draw **C D**, the ground line, at right angles to **A B**, and intersecting in the point **A**.

2.—Draw another line, **C′ D′**, parallel to, and at a suitable distance from, the line **C D**, cutting the line **B A** produced in the point **O**.

3.—From **O** as centre, describe two semi-circles, whose diameters shall be equal to the diameters of the interior and exterior cylinders of the screw, and cutting the line **C′ D′** in the points **C′ E′ F′ D′**.

4.—From the points **C′**, **E′**, **F′**, and **D′**, draw the lines **C′ G**, **E′ K**, **F′ L**, and **D′ H**, parallel to **A B**; these lines are the traces of the interior and exterior cylinders.

5.—Then divide the semi-circles into any number of equal parts, by first dividing the exterior semi-circle, and then through each point draw radii, which will, of course, divide the interior semi-circle similarly.

6.—On **C G**, or any other line parallel to the axis, lay off the pitch of the screw as many times as it may be required, and, through each point of division, draw straight lines C^2 D^2, C^3 D^3, &c., parallel to the ground line.

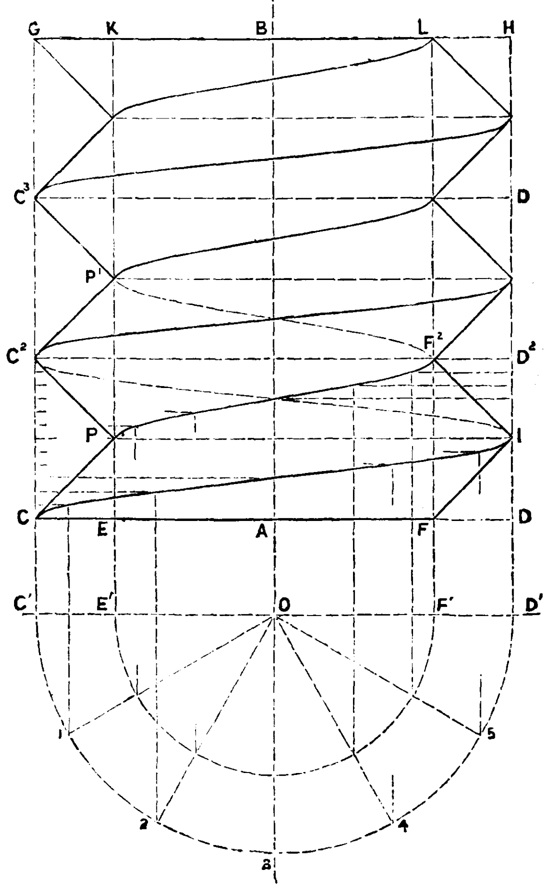
7.—Then divide the first distance **C** C^2 into twice the number of equal parts that the semi-circles have been divided into.

8.—Then construct, by the foregoing rule, the helix **C I** C^2.

9.—The point **P** having been obtained by the intersection of the horizontal line, passing through the middle division of **C** C^2, with the perpendicular **E K**,

10.—Then, from the point **P**, describe the helix **P** F^2 P^1, which will represent the bottom of the groove. The outlines of the screw will be completed by joining the points **C P**, C^2, P_1 &c.

PROBLEM 116.



SCREWS may have two, three, or even a greater number of threads, in which case the distance between any coil of any one thread, and the next coil of the same thread, is divided by the other threads, into as many parts as the total number of threads.

A screw is said to be right-handed or left-handed, according as right-handed or left-handed rotation is required, in order to make it advance. Most screws used in machinery, &c., are right-handed; left-handed screws are made for special purposes only.

The screw is generally accompanied by a nut, which is a detached piece, formed of suitable material, and is a hollow cylinder, with a thread winding round inside of it, the same size and pitch as the screw it is for, so that the threads of the screw shall fit exactly into the grooves of the nut, and all the corresponding points in the two surfaces shall coincide.

In square-threaded screws the depth of the thread is generally equal to its thickness, and the thickness to the breadth of the groove.

PROBLEM 117.—To Draw a double square-threaded Screw.

Let **A B** represent the axis of the screw.

1.—Having drawn the ground line **C D**, and also the horizontal projections of the interior and exterior cylinders of the screw, by describing semi-circles with radii equal to half their required diameters, as before directed,—

2.—Divide the semi-circles into any number of equal parts.

3.—Set off, on the line **M N**, drawn parallel to the axis, the length of the pitch, and divide it into twice the number of equal parts that the semi-circles are divided into.

4.—Then draw the traces of the interior and exterior cylinders of the screw, and construct the helix **C** D^2 C^2, described upon the exterior cylinder. Draw, in like manner, another helix **E** F^2 E^2, of the same pitch, upon the interior cylinder.

5.—Then divide the pitch into four equal parts, and through these points draw lines parallel to the ground line **C A D**, intersecting the traces of the screw in the points *a*, *b*, *c*, &c.

6.—Draw, through the points *a*, *b*, *c*, other helical curves parallel to the first, so as to form two threads and two grooves. The bottom of the grooves are represented by drawing other helical grooves upon the interior cylinder.

Vere Foster's Drawing Books—R 3.

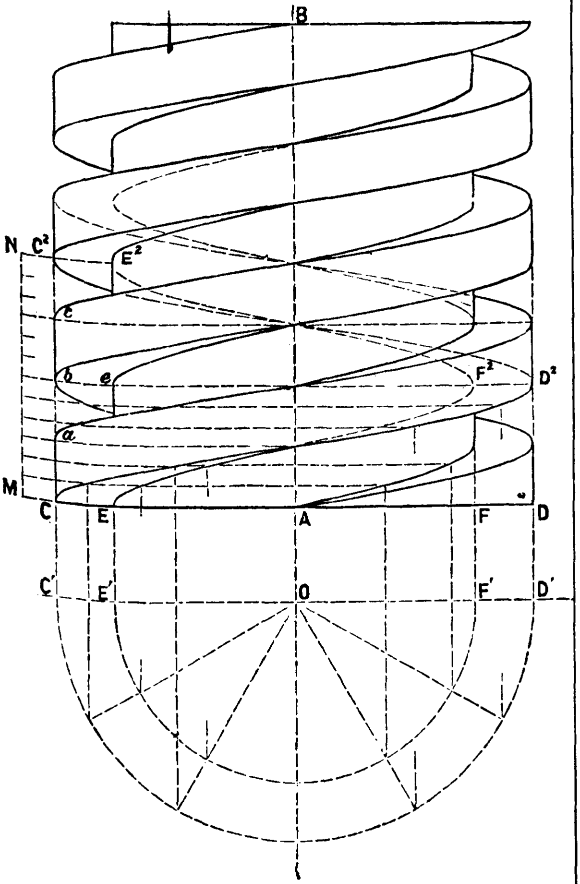
ECCENTRICS.

The term eccentric is applied in general to all such curves as are composed of points situated at unequal distances from a central point or axis. The ellipse, the curve called the heart, and even the circle itself, when supposed to be fixed upon an axis which does not pass through its centre, are examples of eccentric curves.

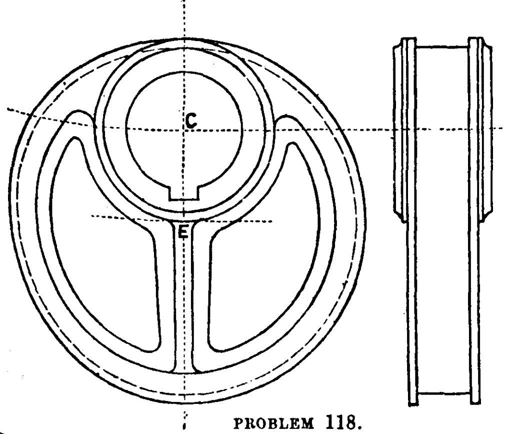
The object of such curves, which are of frequent occurrence in machinery, is to convert a rotatory into a reciprocating rectilinear motion; and their forms admit of an infinite variety, according to the nature of the motion desired to be imparted.

The circular eccentric is a disc or pulley keyed on a shaft, with whose axis its centre does not coincide, and is used to give a reciprocating motion to a rod, for working the valves of steam engines, pumps, &c., &c. The distance between the axis of the shaft and the centre of the disc is called the eccentricity, as C E, in the annexed figure. The throw or travel of the eccentric is twice the eccentricity C E.

PROBLEM 117.

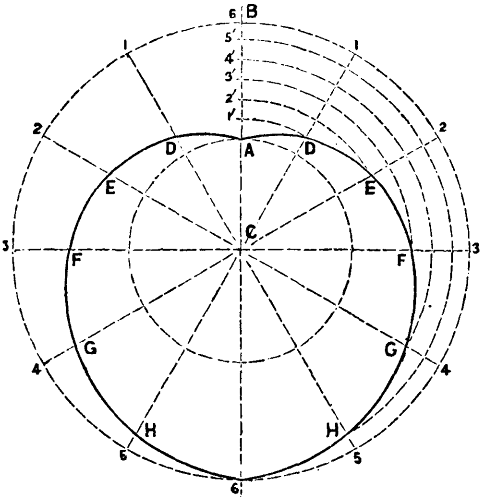


PROBLEM 118.—The method of drawing this eccentric is so obvious as to need no further description.



PROBLEM 118.

PROBLEM 119.—To Draw the Eccentric Curve, called the Heart Wheel.

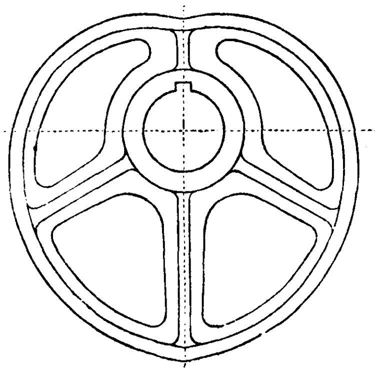


Let O be the axis or centre of rotation upon which the Heart Wheel is fixed, and let **A B** be the required extent of the rectilinear motion.

1. — From the centre **C**, with radii respectively equal to **C A** and **C E**, describe two circles.

2. — Divide the larger into any number of equal parts (say 12), and, through these points of division, draw the radii **C 1, C 2, C 3**, &c.

Elevation of Heart Wheel in the form in which it is usually applied in practice.



3.—Divide the line **A B** into half the number of equal parts as the circle is divided into (in this case 6), as 1′, 2′, 3′, &c.

4.—Then, from the centre **C**, with the distance **C 1′**, describe an arc, cutting the first radius in the point **D**; then take the other divisions on the line **A B** in succession, and from the centre **C** draw arcs, cutting their respective radii **C 1, C 2, C 3**, &c., in the points **D, E, F, G**, and **H**, which are points in the curve required, its vertex being the point 6.

THE INVOLUTE.

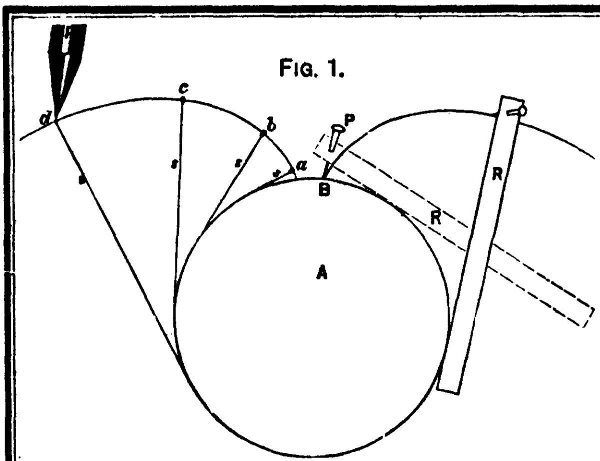
The Involute is a trace or curve described by the opening out or unrolling of the successive parts of the periphery of a given curve or circle into their equivalent straight lines.

PROBLEM 120.—To Describe the Involute.

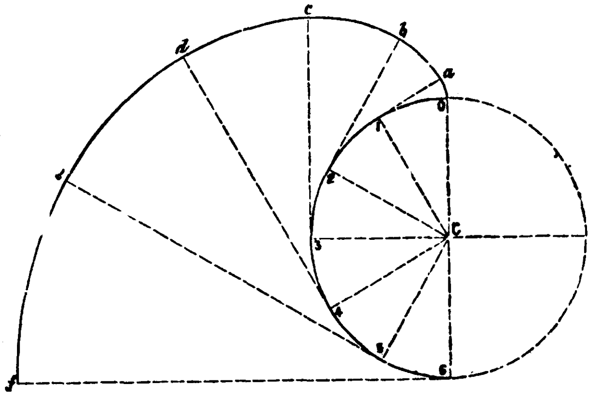
If a circular piece of wood, or thick card-board, be fastened down on a board, and an inelastic thread, equal in length to the circumference, be fastened by one end to it, and rolled round it, a pencil placed in a loop at the other end of the thread, and gradually unrolled, the thread being kept tight, the curve thus described by the point of the pencil will be the involute (see Fig. 1).

It may also be described thus—let **A** (Fig. 1) represent a circular piece of wood the exact size of the circle of which the involute is required, and let **R** represent a straight flat ruler, with a pin **P** fixed at one end of it, with the point resting upon the point **B** of the curve. Then, by rolling the straight ruler upon the edge or circumference of the circular piece of wood, the curve traced by the pin **P** will be the involute required.

FIG. 1.



PROBLEM 121.—To Describe the Involute of a Circle Geometrically.



Let C be the centre of the given circle.

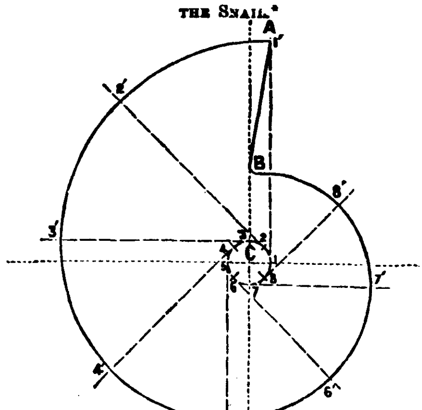
1.—Divide the given circle into any number of equal parts, as 0, 1 2, 3, 4, &c., and, through each of these points, draw tangents to the given circle.

2.—Then, upon the first, set off, from 1 to a, the length of the arc 0 1; and, upon the second, set off, from 2 to b, a distance equal to twice the length of the arc; and, from 3, set off 3 c, a distance three times the length of the arc 0 1, and so on. The curve which passes through these points will be the involute required.

This curve is often used in mechanical movements, and it is the form given to many cams, wipers, &c., and also the exact curve given to the teeth of a wheel working into a rack.

If we continue or prolong the involute of a circle indefinitely, the curve will then assume the form and title of a Spiral.

PROBLEM 122.—To Draw, by Circular Arcs, the Curve called the Snail.*



Let C be the axis or centre of rotation upon which the snail is fixed, the radius C A and the depth of the step A B being also given.

1.—From the centre C, describe a circle whose diameter shall be equal to a third of A B, and divide the circumference into any number of equal parts, as 1, 2, 3, 4, &c.

2.—Draw, indefinitely, through each of these points, tangents to this circle.

3.—Then, from the point 1 as a centre, 1 A as radius, draw the arc 1', 2'; and from 2 as centre, 2, 2' as radius, describe the arc 2' 3'; and from 3, draw the arc 3' 4', and so on, taking, in order, the point 1, 2, 3, &c., as centres.

*The snail is a mechanical movement used in time-pieces, to lift the hammer for striking the hours, and also in turret clocks, &c. It is an example of the involute curve.

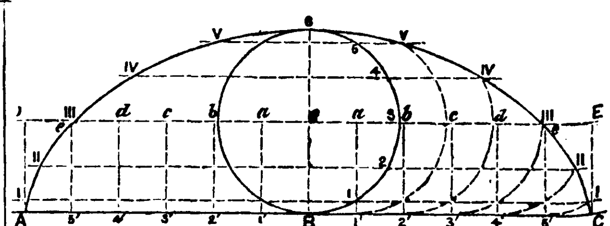
CYCLOID.

The Cycloid is a curve, described by a point in the circumference of a circle, during one revolution, and which rolls, without sliding, upon a straight line.

The straight line upon which the circle rolls is called the Director.

The circle is called the Generating Circle, and the point in it is called the Generator.

PROBLEM 123.—To Draw a Cycloid, the Generating Circle being given.



Let O be the centre of the Generating Circle, and the line A C the Director.

1.—Divide each half of the circumference of the given circle into any number of equal parts (say 6), as 1, 2, 3, &c., and through these points draw lines indefinitely, and parallel to A C.

2.—Then draw the diameter B 6, and set off, on each side of B, upon the given straight line, an equal number of points as half the circumference of the generating circle is divided into, and whose common distance is equal to the length of one of these parts, reduced to a straight line, as 1', 2', 3', &c.

3.—Through each of these points erect perpendiculars, cutting the line D E, in the points a, b, c, &c.

4.—Then, from the point a, with the radius O B, or a 1', describe an arc, cutting the fifth parallel line in the point V; and from the point b, with same radius, cut the fourth parallel in the point IV; and from c, with same radius, cut the third, in the point III, and so on. The points I, II, III, IV, V, are points in the curve, and through which draw the Cycloid.

EPICYCLOID.

The Epicycloid is a curve described by a point in the circumference of a circle during one revolution, and which rolls, without sliding, upon or within another circle, supposed to be a rest.

If the generating circle rolls upon the convex circumference of another, the curve is termed an exterior epicycloid; if it move within, or on the concave circumference, it is called an interior epicycloid.

Smoky Stoves.

There is a very simple way of avoiding the disagreeable smoke and gas which always pours into the room when a fire is lit in a stove, heater, or fire place, on a damp day Put in the wood and coal as usual; but before lighting them, ignite a handful of paper or shavings placed on the top of the coal. This produces a current of hot air in the chimney, which draws up the smoke and gas at once. Not one person out of fifty ever thinks of this easy expedient.

Blood and its Uses.—Domestic economy and the industrial arts now use up a large quantity of the blood of animals which was formerly thrown away. The chief difficulty is that it is only possible to obtain it in quantity in extensive slaughter houses.

Its most important use is for making blood albumen. The product being cheaper than egg albumen.

Blood is composed almost entirely of albuminous matter, of which 51.44 per cent. has contained in the clot which forms after the blood is stood. Two kinds of blood albumen are met with in commerce; ordinary, of which there are two or three qualities, and patent, which is transparent and soluble, and used for mordanting yarns and cloth for dyeing. Ordinary albumen is prepared by adding a small quantity of spirits of turpentine to the serum, and mixing it well, which bleaches it and removes the grease. It is left to rest for twenty-four or thirty-six hours, and the serum which has become clear is separated from the deposit. It it then dried and enamelled on iron plates at from 50 to 57° centigrade, for two hours, and the temperature lowered to 40 to 47 1-2° for the space of thirty-six hours.

The patent or transparent albumen is prepared with diluted sulphuric and acetic acids, and a further addition of turpentine agitated for about an hour. It is then left for a day to rest and the clear liquid drawn off, neutralized with ammonia and dried.

Ten pounds of serum will give about one pound of albumen.

The coloring matter of the blood may be obtained by evaporating its aqueous solution at a temperature below 100°; it then appears almost black, but resumes its red color when dissolved in water. Coagulated is sold to calico printers for dyeing Turkey-red, and to chemical manufacturers for preparing red liquor for printers' use. About 6,000 tons are estimated to be thus employed.

Dried blood serves to clarify wines, syrups, and other thick solutions. A very general use of blood is for manure, and it is one of the best fertilizers, equaling, in fact, powdered flesh. Blood for clarifying is of a good quality when it dissolves entirely in cold water, and when the solution of one pint of blood in ten of water, heated to boiling, produces an abundant scum and then leaves the liquor clear. An ounce of blood is usually sufficient to clarify a cask of wine.

Dyed blood used to be extensively employed on the sugar estates in the colonies to separated the scum and sediments in sugar boiling. Blood is also used in the purification of sugar in our sugar refineries.

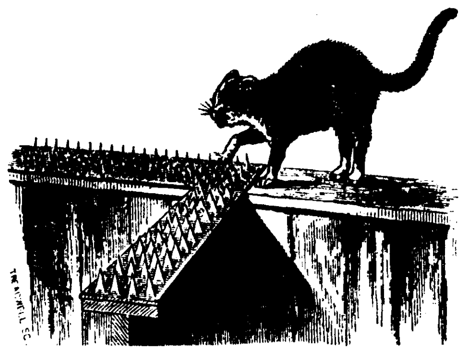
Attempts have frequently been made to utilize the blood of cattle as human food, but with little success; and yet it contains all the principals out of which tissues are formed, and hence must be eminently nutritious. In Sweden they prepare a very good bread for the poor made with blood and wheat flour. The blood of most of the domestic animals might thus be extensively utilized. Prof. Panum, of the University of Copenhagen, has recently called attention to the amount of nutritious matter contained in Blood, and usually entirely lost, which can be preserved in forms suitable for food, as sausages, cakes, etc., mixed with fat, meal, sugar, salt, and a few spices. The blood of pigs and sheep is made into "black pudding," and largely consumed in Europe, but the blood of cattle and calves is thrown aside as waste, a thing not easily understood.

Recently, a draught of blood has been recommended by physicians, in pulmonary diseases, and in Paris, New York and some other cities, numbers of patients are said to resort to the slaughter houses to drink the fuming blood.

This is somewhat like the practice of the African in Central Africa, who Captain Burton tells us, severs one of the jugulars of a bullock, and fastens upon it like a leech. The custom is common in some northern tribes to churn the blood with milk. The Chinese seem to have great faith in blood. They use as medicine the dried blood of many birds and animals. The blood of the goat they consider a specific in pleurisy. They open the jugulars of the deer, and by a long tube drink as much blood as the stomach will support. The coagulated blood of the rhinoceros is used in Siam, medicinally, in case of unsound heart.—*Scientific News* 1, 18.

THE CAT TEASER.

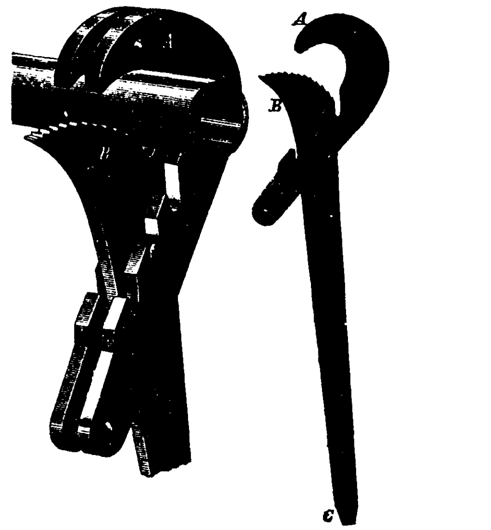
No one who in the chill midnight air has hurled improper language and miscellaneous toilet articles at feline vocalists chanting on the back fence can afford to remain in ignorance of the merits of the ingenious little device represented in our engraving. It prevents cat concerts, simply by preventing the cats from prowling on the top of fences; and it compels them to take refuge on the fences of one's neighbors. Distance then lends enchantment to their howls, and the thoughtful man who has provided himself with the cat teaser "may wrap the drapery of his couch about him and lie down to pleasant dreams," lulled by the distant wauls, mingled with the profanity of some one several doors away, both reduced to gentle murmurs ere they reach his ear.



The cat teaser consists of a strip of sheet metal in which V-shaped cuts are made. The pointed pieces of the metal are then bent upward so as to stand perpendicularly; and the strips are tacked on the top of the fence. It is not necessary to surround an entire back fence with the device, because, if the fence at the rear end of the yard, and for a short distance adjoining on each side, is covered, cats cannot jump into the yard from the adjoining fences. It is impossible for a cat to walk on the points, nor can she insert her paws between them. Not only fences but roofs may thus be protected, while the device may also be used for keeping cats away from flower beds.

Practical tests of the invention have shown that it is discouraging to cats in a high degree. Tom cats of exceptional intelligence, who have long treated with contempt such trivial obstacles as spikes and broken glass, have retreated baffled before the teaser. As a means of preventing chickens roosting on unauthorized fences, the device has also proved very useful, and carries far deeper conviction to the mind of the average hen than does throwing stones at her after she is comfortably settled for the night.

To electrotype insects, ferns, etc., immerse the object in a solution of nitrate of silver in wood naphtha. When partially dried, the object should be treated with ammonia, the result being a double salt easily reduced. After thorough drying, expose the article to the vapor of mercury, when the surface becomes completely metallized in a few minutes.
Scientific American.



COMBINED PIPE TONGS, WRENCH, AND SCREW-DRIVER.

The accompanying illustration represents a device recently invented by Messrs. States & Cook, of Topeka, Kansas. It is a combination of the three tools that the gas and steam fitter has the most constant need of—the pipe tongs, the wrench, and the screw-driver.

The double jaw or clamp, A, laterally connected by stay pins, is curved, and has its lower part notched in order to form a support for the pivot pin of the single jaw, B, which enters between the double clamp, A, referred to. The jaw, B, has an eccentrically shaped and serrated clamping end, and has the lower end or handle so shaped as to answer as a screw-driver. The action of the jaws is apparent from the figure.

S. A.

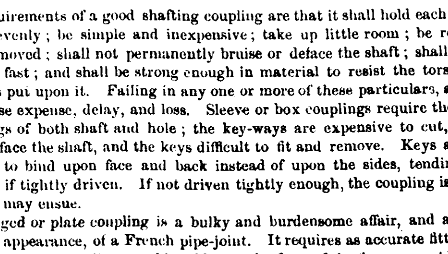
SHAFTING COUPLINGS.

The requirements of a good shafting coupling are that it shall hold each shaft-end firmly and evenly; be simple and inexpensive; take up little room; be readily applied and removed; shall not permanently bruise or deface the shaft; shall not work loose or rust fast; and shall be strong enough in material to resist the torsional and other strains put upon it. Failing in any one or more of these particulars, a coupling is apt to cause expense, delay, and loss. Sleeve or box couplings require the most accurate fittings of both shaft and hole; the key-ways are expensive to cut, and permanently deface the shaft, and the keys difficult to fit and remove. Keys are apt to be cut so as to bind upon face and back instead of upon the sides, tending to split the coupling if tightly driven. If not driven tightly enough, the coupling is insecure, and damage may ensue.

The flanged or plate coupling is a bulky and burdensome affair, and always reminds us, in appearance, of a French pipe-joint. It requires as accurate fitting of the hole, as does the box coupling; and in addition, the faces of the flanges must be mathematically true and at right angles to the axis of the bore; the bolt holes, too, must be equidistant from each other and from the centre. The disadvantages of keyed couplings attach themselves here also.

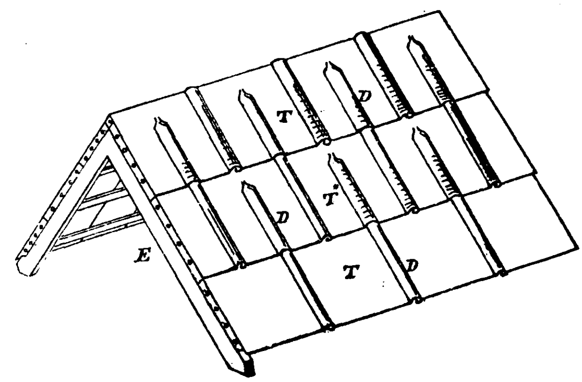
A compression coupling with a longitudinal cut in the sleeve, and which has its "grip" given it by screwing or driving rings upon the outside, or by bolts passing through it, has the merit that it does not deface the shaft with a key, requires no accurate hand-fitting; and can be applied or removed with ease. But as it is next to impossible to get two shaft ends turned exactly of the same diameter, the larger shaft end will be tightly bound, and the smaller end gripped only by the end of the coupling; and there is liability to work loose, with the attendant damage and loss.

If we add a transverse cut to this compression sleeve, we overcome this last difficulty, permitting each end of the coupling to grip tightly and over its whole bearing surface, and giving a uniformly distributed pressure upon nearly the whole surface of each shaft end; and if we employ such means of tightening as will not be likely to fail (as in the case where bolts are used, and there is a severe tensile strain, giving liability of the bolt breaking or the thread stripping, with the alternative of the nuts working loose, and the likelihood that the whole may become rusted tightly together), we have secured a practically perfect coupling.



CRESSON'S INTERNAL CLAMP SLEEVE COUPLING.

The coupling shown herewith* has a compression sleeve, cut both longitudinally, to give the grip, and transversely, to allow it to grip two shafts of differing diameters. The compression is effected by taper screws, which thrust against an outer shell or wall, and may be slackened as readily as tightened up. There is but one piece to handle. The grip is as powerful as could be devised, and the tightening device not subject to work loose or to rust fast.



IMPROVEMENT IN METAL SHINGLES.

"The object of this invention is a metallic shingle which is durable, comparatively light, and can be cheaply and easily manufactured and applied. The engraving is a perspective view, showing a roof constructed with these shingles.

The shingle consists of a metal plate, *T*, having at one or both edges ribs, *a c*. *B* represents a small tag with a rib which fits over a corresponding rib of the plate *T*, as hereafter described. *D* is a raised rib midway between the ribs *a c* of the plate *T*. The ribs *A* are formed by bending the edges of the plates to curl upwards, and the ribs *C* by bending the edges downwards, and these ribs *C* are made slightly larger than the ribs *A*, so that the latter may slide easily and fit snugly into the larger ribs *C*. The rib of the tag *B* slides over the smaller rib *A*, and the flat part is nailed down to the roof or rafters and prevents the slipping of the plates. The shingle *T'*, intended for the bottom of the roof or lower course, need have no central rib *D*, and the side shingle *T''* need have but one rib, the opposite side being plain so as to facilitate bending it down and nailing to the edge of the roof.

The shingles *T'* are placed on the lower course, the smaller hollow rib *A* of each shingle being slipped into the larger rib *C* of the next shingle. In applying the next course, the side half shingle *T''* is first secured, and then the shingles *T* successively in the same manner as the first row, the hollow ribs *D* receiving the ribs of the course below, so that the joints of the shingles in each row are midway between those of the other rows, permitting the desirable alternate arrangement common with ordinary shingles.

It is claimed that this shingle is easily made, simple in construction, only three different forms being required in making a roof; and that the roof-covering is water-tight, ornamental, and easily applied and removed."

[Patented April 3d, 1877, by Edward Locher and Christian Knispel, of Newark, New Jersey.]

THE FRENCH EXPOSITION OF 1878.

By the courtesy of our contemporary, *The Manufacturers' Review and Industrial Record*, we are enabled to present to our readers the accompanying illustration and description of the above-named project, viz:—

The architecture of the buildings for the French Exposition of 1878, differs widely from that of the Paris Exposition of 1867, as well as from the Philadelphia Exhibition of last year. Preparations for the great fair are already well advanced. The main building, in the Champs de Mars, will extend from the Ecole Militaire to the river Seine, at the bridge of Jena. Crossing the bridge, brings one to the beautiful gardens of the Trocadero, a view of which as it will appear in the summer of 1878, from the bridge, is given in the illustration below. There are to be other subsidiary buildings and offices erected in the grounds, and a grand central hall for *fêtes*, etc., will stand in the middle of the further end on the higher ground, towards the Bois du Boulogne.

The two crescent-shaped side structures, which, as will be seen, are to be of great extent, will be devoted to the historical collections of pictures, contemporary paintings being exhibited elsewhere. The fountain and cascade will be very attractive features, and will show how artistically the French arrange the water displays which ornament so many of their parks, gardens and other public resorts. The cascade is 160 feet wide, falling in several descents to a lake, from which the different parks and shrubberies will be watered. The palace of the Trocadero is, from one pavilion to the other, about 1,330 feet in length, the pavilions at the extremities being connected with the great central rotunda, from the foot of which flows the cascade, by galleries forming segments of a semicircle. In the great hall of the rotunda, an immense organ is to be placed, and concerts will be given on the grandest scale. It will seat 8,000 people. Round the concert room outside, giving access to the boxes, are double galleries, closed from the weather, and affording to promenaders a splendid view of the city. On either side are peristyles opening on the Place du Trocadero on the side of the Bois du Boulogne. Above them are the offices of the managers and committees; they also serve as vestibules to the two great curved galleries that run from the central rotunda to the pavilions. These galleries are in a succession of halls; before each is a light covered portico, running the whole length.

From all parts of Paris will be visible the two immense towers, 260 feet in height, flanking the Trocadero. A flight of seventeen broad steps conducts to the palace, before the portico of which a wide terrace stretches from one extremity to the other. The principal entrance is at the middle, and at each end are two immense domes in iron and glass, surmounted by lanterns and flagstaffs. The gardens stretch on either side of the façade between the palace and the avenues, and contain a number of small buildings, kiosks, model farms, cottages, *cafés*, greenhouses, and the like. The centre is left unoccupied for the better convenience of spectators. *Polytechnic Review*

How to Build a Boat-house.

Having in former numbers described different kinds of boats, we now comply with several requests and describe a house in which to safely keep a boat. Any kind of a house that is large enough may be used, if provided with the needed fittings named below. Where the level of the water is liable to little change, the house need not be raised much above the surface of the water, but the floor may be make so low that one can easily step out of the boat to the floor. Of course there should be a channel made in the center of the house, deep enough to float the boat when loaded. The plan of the floor is shown at figure 1, with the boat in the center. The floor should be protected by a light railing around it, (see fig. 2), to prevent accidents from slipping when the floor is wet. Where the water level changes, the house should be raised on posts, or bents, as may be necessary to keep it above high water. A hanging ladder, that may be drawn up, is provided for use at low water.

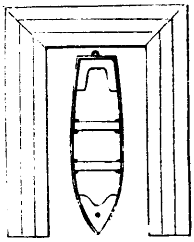


Fig. 1.—PLAN OF HOUSE

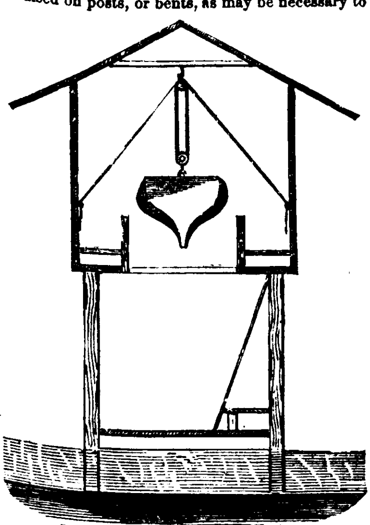


Fig. 2.—SECTION OF BOAT-HOUSE.

A New Theory of the Origin of Rocks.—The most recent deep-sea soundings have proved that the grand areas of the general sea bottoms of the Atlantic and Pacific oceans are similarly constituted of a girdle of calcareous mud, of indefinite depth, formed by a similar vein of discarded calcareous shells of animals of low organization—the foraminifera. This white calcareous matter of the foraminifera shells is replaced in certain deep oceanic valleys, for instance between Tristan d'Acunha and Kerguelen's Land and elsewhere, by a very fine red clay. In certain geological deposits, of greater or less antiquity, beds of glauconite or green siliceous sand exist, which are constituted entirely of the casts of ancient foraminifera formed of a green material, which is a compound of silicate of iron and alumina. Chemists have found that the red mud is the accumulation of a small percentage of clayey matter, resulting from the wholesale decomposition of the calcareous shells: clay deposits can therefore be assigned, like siliceous and calcareous deposits, to the resultant debris of organisms living at the surface of the sea. Supposing therefore that the whole globe were immersed under an entire envelop of water, deposits of all the materials of our stratified geological rocks could be going on without the slightest assistance from the degradation and wearing away of any actual land surface at all; and these deposits, subjected in the ordinary natural course of events to ordinary processes and actions, could be modified into gneiss, schist, slate, limestone, and every variety of geologic rocks.

A Hint to Builders of Frame Structures.

There are various ways of joining lumber, and ingenuity has almost exhausted itself to find the most proper methods suitable for special purposes. We represent in Fig. 1 a method of inserting a panel by means of a single molding overlapping the stile on both sides, and filling in a groove made in the latter, while a groove receives the panel. It is evident that in regard to strength and durability, this method is far superior to the common way of inserting the panel and covering the joint by a strip of thin molding, which, being only nailed on, is easily displaced by shrinkage of the wood, and frequently gets loose and comes off. Here it is all in one piece, and no nails whatever are required. In this respect we ought to imitate the Japanese, who, in erecting their building on the Centennial grounds, have given many a useful hint to our carpenters how to avoid the excessive use of nails, to which our builders are much inclined.

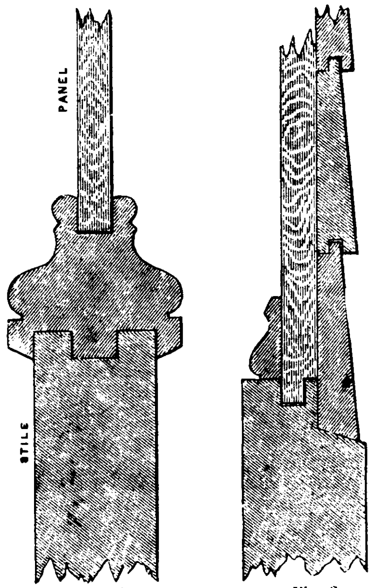


Fig. 1. *Fig. 2.*

This solid way of panelling is very appropriate for partitions of parts of rooms, while Fig. 2 represents a section of an outside wall covered with weather-boards. The peculiarity is in the tongue and groove with which each board is provided, the tongue on top entering the groove in the bottom of the board over it. It is clear that this arrangement makes the whole perfectly water-tight, and when covered with paint, especially over the seams, it will be very durable, as no moisture can possibly enter, even if the wind should sweep the rain against the wall. The wall is only a kind of heavy panelling fitting in a groove of the stile below, while a molding is nailed on in the usual way.

A Window Transparency.

Mrs. M. E. B. The window transparency referred to is made up of ferns, and other plants of pleasing foliage, and grasses. Autumn leaves are also introduced with good effect. All should be thoroughly pressed and dried beforehand, and in selecting the materials, choose those of light and graceful outline. If autumn leaves are used, they should not be varnished, but may be oiled, with linseed oil, or treated with paraffine or spermaceti; either of these may be rubbed on a flat-iron—not too hot, and the le—es ironed until they have taken up what they w. of the material. This will strengthen the colors without giving an unnatural gloss. Two pieces of thin clear glass, of equal size, are made perfectly clean, and the ferns, leaves, etc., laid upon one of them according to fancy. If none of the stems cross, there is no need of fastening them, as they may be held in place by pressure; but if an uneven surface is presented, some will need a touch of gum to hold them in place. Having arranged them properly, put on the other glass, and fasten them by narrow strips of paper put upon the edges, using gum, tragacanth, or flour paste. Gum Arabic will not hold well to glass. Colored paper may be put on over the strips, or if strong enough, may be used at first. The engraving will show how the affair appears when finished. We have seen the side lights to a front door thus decorated with very pleasing effect. Care should be taken to have the materials perfectly dry when made up, and the paper around the edges carefully put on. If any moisture is present, or should enter afterwards, mould will be apt to spoil the whole.

A WINDOW TRANSPARENCY.

ORNAMENTAL SPRUCE WORK,

or fancy articles made from spruce twigs, from which the leaves have fallen. The material generally used is the small shoots of the Norway Spruce, as that is very common in cultivation, though I do not see why those from our native White or Black Spruce would not answer as well. The twigs are cut, and laid away to dry; when quite dry, the leaves will fall off themselves, or by a little shaking. To make them up, soak the twigs in warm water, until so softened that a pin will pass through them easily. Common pins of different sizes are used for putting the pieces together, and if one has a pair of pliers or small pincers, and cutting nippers, such as are used for cutting wire, the work may be done all the easier.

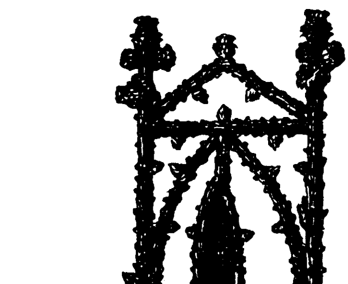


Fig. 1.—CHAIR MADE OF SPRUCE TWIGS.

CONSTRUCTIVE CARPENTRY.

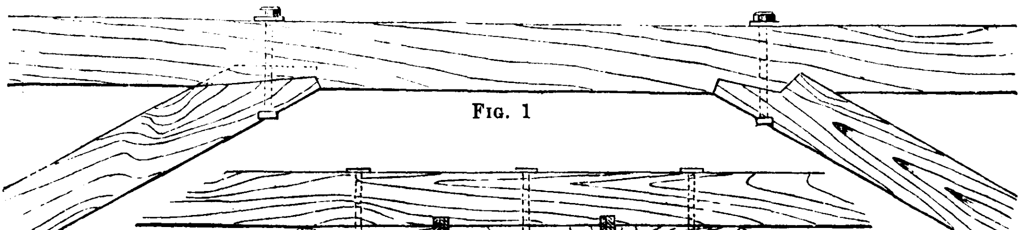


Fig. 1

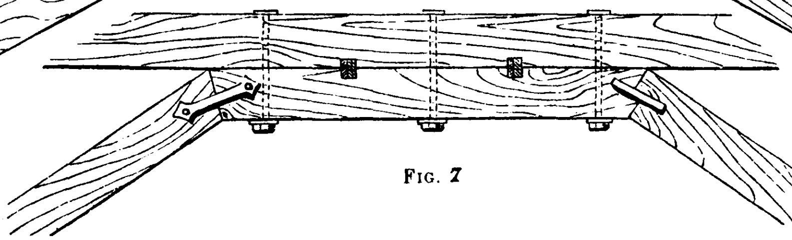


Fig. 7

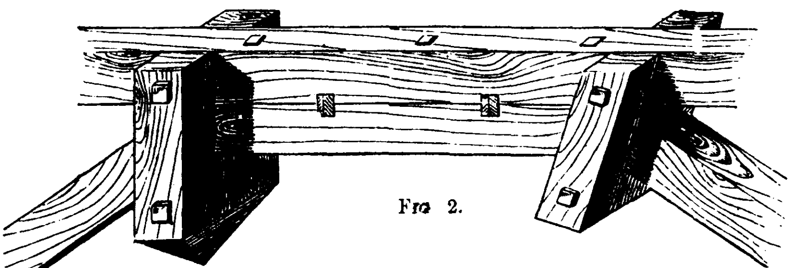


Fig 2.

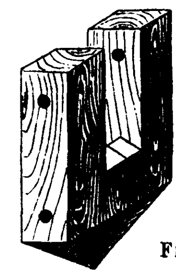


Fig. 3.

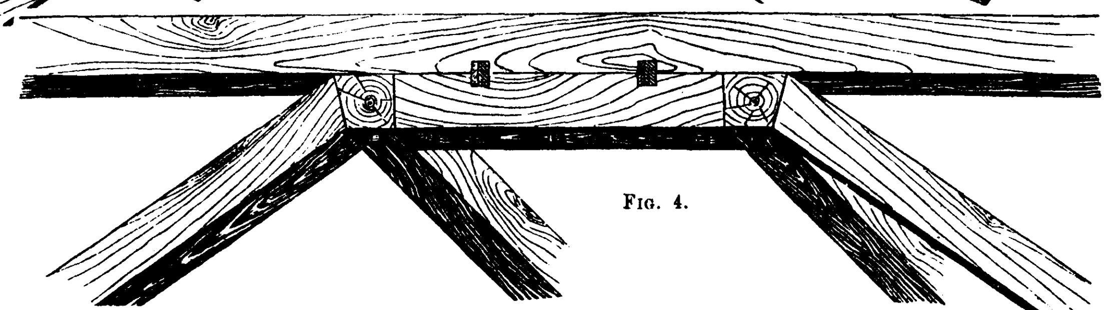


Fig. 4.

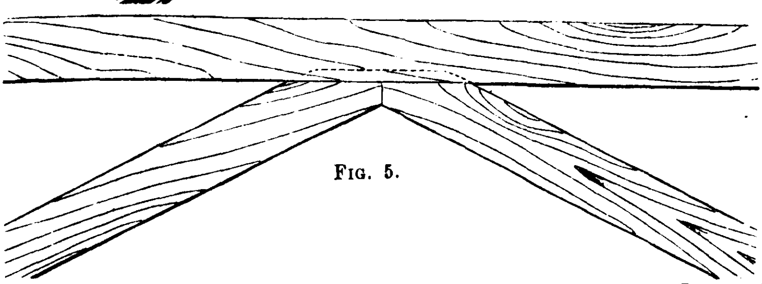


Fig. 5.

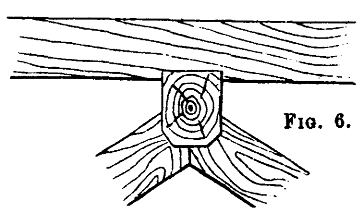


Fig. 6.

CONSTRUCTIVE CARPENTRY.

For the future we shall, in each number of the Magazine, devote a page or more to Constructive Carpentry. In so doing, we must presume that such of our readers who follow that branch of mechanics are sufficently versed in the elements of construction as not to require too lengthy a description of the illustrations, which are of themselves sufficiently explanatory. We shall, therefore, in order to save space, which is valuable in a monthly journal like this Magazine, condense the letter-press and use as terse language as possible compatible with clearness :—

Fig. 1. In a beam to bear on extra heavy load, the short struts serve to strengthen it, and relieve it from the compressing strain of the struts. The iron screw bolts uniting the two serve to guard against side displacement. Look well after the wedges while the structure is seasoning, and drive in so as to keep them always tight.

Fig. 2. Represents the same arrangement in perspective with the addition of the tongue-pieces, which should be made to fit half into the horizontal beam and half into the strut, as seen in

Fig. 3. This piece may be applied either in a vertical position, as in Fig. 2, or in an oblique position, as seen at the right ; but, in any case, the screw bolts are necessary to keep them in place. These side pieces guard against side displacement.

Fig. 4. Represents part of a double span in which the struts are mortised into beams lying across under the main beams, which are keyed to the short strengthening plates.

Fig. 5. Represents a method of supporting plates and other horizontal beams by means of oblique struts or braces at the sides—resting its lower end on the king or queen post. This method is seldom applied to buildings except when in churches when an antique appearance is desired to be given. This method is very strong but only good for short beams, as in long beams the struts have to be so long.

When the beams are connected with a cross-beam it is well to support them instead of the beam over it, as in Fig. 6.

For long beams the arrangement shown in Fig. 7 is preferable. When the struts are more vertical than horizontal the bolts may be omitted.

A CHEAP POULTRY YARD.

An illustration is here given (figure 2) of a very cheap poultry yard, similar to those we have often seen about the French farms. It is in three parts, and any number of compartments may be added. In each division there is a small, cheaply constructed house for roosting and laying. This is made low in the roof, for the purpose of warmth, and may hold a dozen fowls. For this number, a house four or five feet square, with roosts around three sides, will be large enough. If the floor should be sunk two feet below the surface, it would be warmer than if level with the ground. A few

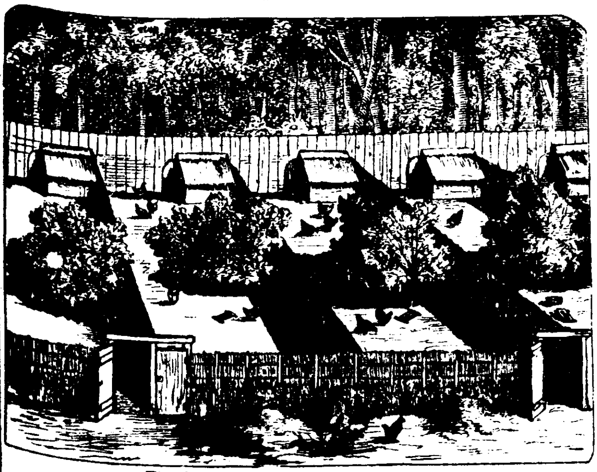


Fig 2.—ELEVATION OF CHICKEN YARD.

nest boxes may be hung upon the wall, so that the eggs can be removed through the window as well as the door. In the summer the window would be removed. A few nesting places may be made amongst the bushes, or trees planted in each yard. The ground plan is shown at fig. 1, on p. 56. Each yard may be 12 feet wide by 25 or 30 feet feet long. It will be found much better to keep the fowls in small families, of a few hens with one cock, than to have them all together in one yard; the cocks may then be changed each year. The doors to the yards are made in pairs, thus saving cost in making the frames. When desired, one lot of fowls may be given a run outside by leaving a gate open.

Hints and Helps for Farmers.

A Feed Trough for Pigs.—This (fig. 1) opens by a falling door in the front of the pen, and has an inner dividing board and partitions in the front, by which the pigs are prevented from fouling the meal, or fighting each other away. In this trough the meal can be kept before the pigs all the time, so that they can eat when they wish. There is a watering trough used with this pen, so arranged that one end is within, and the other outside of the pen. One pig, only, can drink at a time, and the water is not fouled. With meal and water, ready at all times, 2½ pounds of flesh has been put upon a pig in a single day.

Fig. 1.—FEED TROUGH FOR PIGS.

Feed Troughs for Poultry.—"W. L.," Pontiac, Michigan, sends a drawing of a feed trough, (fig. 2), which he uses for his chickens. It is made of narrow boards with square ends, and to prevent the fowls from getting into the trough, and wasting the feed, he fastens a small post at each end, and runs two cords, or wires, from one to the other, as seen in the engraving. This device is not so effective as that of the iron feed trough made by J. S. Spencer's Sons, of Guilford, Ct. This, shown at figure 3, is of cast iron; it is provided with three flanges on the edges, two of which are double, and are tightened with screws. The wire cover, shown in the engraving, is fastened to these flanges, and prevents the fowls from wasting the feed. A large size may be used for feeding pigs. The troughs being of iron, and painted, are very cleanly and indestructible. We have used several of these feed troughs in our yards, and find the saving of feed will pay for them in one season.

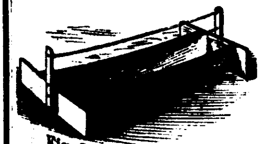


Fig. 2.—FEED TROUGH.

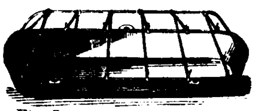


Fig. 3.—IRON FEED TROUGH.

A Useful Farm Gate.—J. B. Berry, Casper Co., Mo., sends a plan for a farm gate, which he has had in use for 10 years, and which he made as follows: The posts (*A*, *A*, figure 4,) are of white oak sticks 11 feet long, and large enough to square 12 inches; these are squared for 7 feet, leaving 4 feet rough and round; the bark being taken off, the rough ends are set in the ground 10 feet apart, and 4 feet deep. The post holes are filled with dry earth, well tamped all the way up. In loose soil, it is wise to set a sill between the posts near the surface of the ground, to prevent sagging, but in compact soil this is not necessary. The 6 bars are 10½ feet long and 6 inches

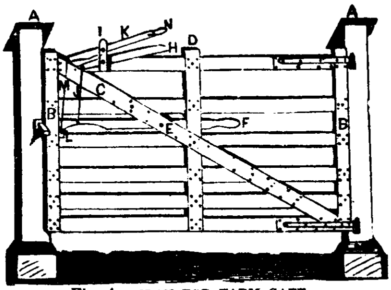


Fig. 4.—PLAN FOR FARM GATE.

wide; the uprights at the ends (*B*, *B*,) are 6 feet long. These are arranged and bolted together at every lap, as shown in the engraving. A brace (*C*,) 11 feet long, is bolted on to the bars upon each side wherever they cross. The upright slat, *D*, is then

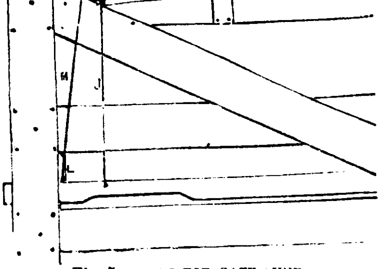


Fig. 5.—LOCK FOR GATE SHUT.

bolted on. The latch is 7 feet long, 4 inches wide, and thin enough to work easily between the braces where it is pivoted at *E*. It is raised by pressing on the handle, *F*. The hinges are then bolted on to the side *from* the post, so that the gate will open completely back. They are seated upon pieces of wood fitted to the upper and lower bars to make them level with the upright bar. To prevent the latch being lifted by animals, a lock, *L*, is fixed to the gate. This is connected by a wire, *M*, to the lever, *K*. Another lever, *H*, is pivoted at *I*, and connected with the latch by a wire, *J*. When the

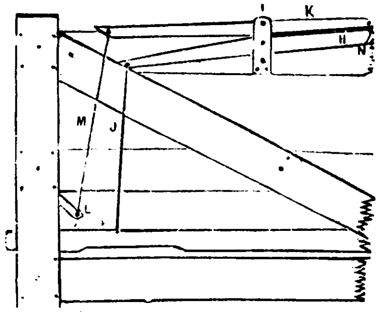


Fig. 6.—LOCK WHEN OPENING.

lock is out of use, the loop, *N*, is slipped over the lever, *H*; the latch will then work as if there was no lock. For the catch, a piece of 2 x 3 stuff is cut, as shown at *A*, *B*, *C*, fig. 7; the slope, *B*, being 4½

Fig. 7.—FORM OF CATCH.

inches long, the catch 1 inch deep, and the stem, *C*, 2 inches square. The lock, when closed, is shown at figure 5, and when open at figure 6.

A Brace for a Sled Tongue.—"J. K.," Sullivan County, New York, gives a description of a brace for the tongue of a sled, shown at figure 8. This is made of two short chains, one at each side of a ring, which slips over the tongue, and rests against an iron bolt. The chains are hooked to the rings which are fastened on to the ends of the roller, as shown in the engraving.

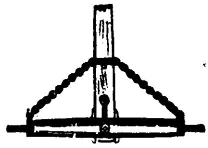
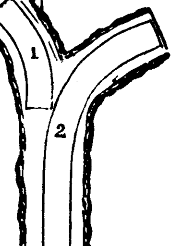


Fig. 8.—SLED BRACE.

——— *The American Agriculturist*.

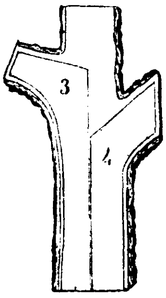
The Value of Crooked Timber.

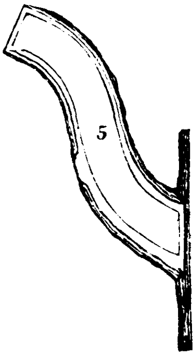
When timber was plentiful many years ago, it was used without any thought of economy, or of the time when it would be worth saving. Then it was customary to use the finest pine, cherry, and walnut for fence-rails, and to split into slabs for making and flooring stables and pig pens; the best of the timber was used for this purpose, because it was most easily split, and made the smoothest and broadest slabs. Now timber is scarce and valuable, but we have not yet learned to use what is left to the best advantage. We use the straight timber for sawing, and burn everything that is crooked. For some purposes crooked timber is most valuable. Where it will pay to freight timber to places where ships are built, crooked timber is more valuable than any other. For ships' ribs, knees, etc., various kinds of bent timber are in great demand. But there are various uses for crooked timber on the farm, or for house-building. A brace of bent timber of such shapes as are shown at figures 1, 2, and 5, would answer every purpose in a building that a straight one would do, and for supporting beams the forms shown at figures 3 and 4 would, altered slightly to make them right-angled,



Figs. 1 and 2.

serve as substitutes for braces, or if of light timber, would answer to fasten to rafters as feet to sustain the thrust of the roof against the plates. We have become accustomed to building with very light timber, and our houses and barns are worn





Figs. 3 and 4. Fig. 5.

out and wrecked, before the generation which built them has passed away. By making use of heavier timbers, and working into them such crooked pieces for the purposes mentioned, our buildings would be many times more durable than they now are, and a farmer might then build a barn, which would last and be used by his grandchildren.

The mode in which such crooked timber is brought into proper shape for use, is as follows.

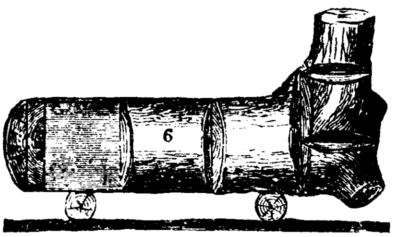


Fig. 6.—HEWING A KNEE.

The rough pieces, which are generally the roots, limbs, and crotches of trees, are laid upon some cross-piece and blocked up firmly, or are held so by "dogs," which grip the logs. The dogs are bars of iron half an inch thick, bent and pointed at the ends as shown at figure 7, and in use at *a*, figure 8. The timber is lined on the top with a chalk line upon the bark, which has been first "rossed" with the axe or adze, and is then notched down to the line, as shown in figure 6, at intervals of one or two feet—the distance depending upon the difficulty or ease with which the wood is split. The slabs between the notches are split off with the axe, as seen at the upper end of the piece shown in the figure.

Fig. 7.—DOG.

Fig. 8.—THE SAW-PIT.

When all the slabs are split off, the surface is hewed smoothly with the broad-axe. This is being done on both sides, the timber is laid down, and the edges are treated in the same manner. Where there is a hill-side, a saw pit may be made, as shown at figure 8. A few posts are set in the ground a short distance down the hill, and a timber is mortised or bolted upon them. Three or four timbers are laid from the bank so as to rest upon the frame below, as shown in figure 8. The log is rolled on to these cross timbers, and blocked or spiked fast with the dogs. A whip-saw is used to bring the timber into a finished condition. When the saw reaches one of the cross pieces, the log is lifted with bars so as to free the timber, and it is moved from before to behind the saw, and so on until the work is complete. Where a mill is distant and time can be devoted to it, a saw-pit of this kind may be made very useful upon many farms where there is timber to be cut for buildings, fences, posts, or other purposes.

A Method of Hanging Hogs.

An easy method of hanging a hog or a beef, is by

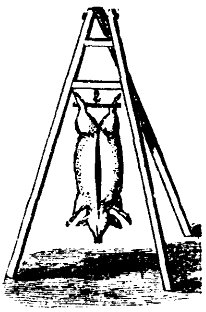


Fig. 2.—TRIPOD SET UP.

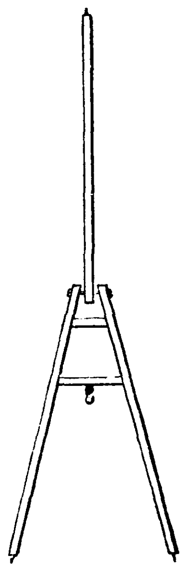


Fig. 1.—TRIPOD.

the use of the tripod shown in the accompanying engravings. It is made of three pieces of 3 x 3 oak scantling, 6 feet long, connected at one end, in the manner shown, by means of an iron bar one inch thick, passed through a hole bored in each piece. The two outside pieces are fastened together by two cross pieces, bolted to them, so that they are spread at the bottom sufficiently, which would be about 3 feet. A hook is fastened to the lower cross-piece, upon which the hog is suspended. To hang the hog the frame is laid upon the ground with the hog between the outside legs, the third leg being drawn backwards, as shown in figure 1. The hog being hooked by the gambrel stick to the cross-piece, the frame is lifted up, and the binder leg is spread out so as to support it, as shown at figure 2. The frame may be lowered easily when the hog has to be taken down, and as the frames are cheaply made, and occupy little room, it will be well to have several of them. They may be made to serve other useful purposes.

An Ice-house in the Barn.

Many farmers fail to put up ice because they think an ice-house to be too costly for them. We here give a hint which we received from a neighboring farmer, some years ago, as to putting up ice in a corner of the barn, without anything more than a few boards and some sawdust. The coolest corner of the barn is set apart for the ice, and a board is nailed to the floor on each side of the corner, or across it, one of these should be just beneath a beam of the upper floor. Some rough boards are tacked to the posts of the barn wall, up to near the top. A batten is then nailed to the floor, one inch from the board; this makes the foundation of which the ground plan is as shown at figure 1. If necessary, a board is nailed up to the beams above, for the purpose soon to be described. The spaces, *a*, *a*, are filled with sawdust. The ice is then packed in the space, bounded by the dotted lines, placing a foot of sawdust beneath it, and as it is put in, sawdust is packed around it. The sawdust is kept in at the sides, *b* and *c*, by upright boards placed against those nailed to the floor and a beam above it, or the board nailed to the beams before mentioned. These boards are thus kept in their place. When all the ice is in, it is well covered on the top, a space for a door being left in the boarding above the ice. Then a second row of boards is placed between the boards on the floor and the battens, and fastened as may be convenient, a door space being made to match the inner one. The space between these boards may be filled with cut straw, sawdust, clover-chaff, or any other non-conducting material, up to the hight of the ice within. There is no need to close the door space; it will be better to leave that open for ventilation. Figure 2 shows the out-

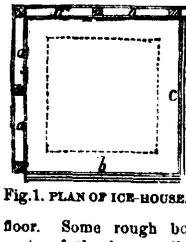


Fig. 1. PLAN OF ICE-HOUSE.

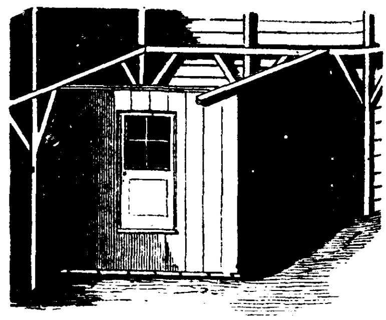


Fig. 2.—VIEW OF ICE-HOUSE IN BARN.

side of this ice-room as it appears from the barn floor. Such a place as this may be easily arranged in many barns; our neighbor thus kept an ample supply of ice every season without losing by waste more than is usual in the best built ice-houses.

American Agriculturist.

WALNUT STAINS.

Oil Walnut Stain.—1 qt. linseed oil; 2 qts. turpentine; 1 pt. Japan; 4 parts umber; 1 part Venetian red; 1 part yellow ochre. This stain I find to give the best walnut color, is much easier worked, and is less liable to be streaked than water or asphaltum stains. With one coat of shellac and one of varnish it gives a good finish, to maple chairs, cribs, cottage bedsteads, bureaus, tables, etc.

For A Cheap Walnut Stain.—Umber 3 parts; Venetian red 1 part, mixed in potash water; 1oz potash to a gal. water. This makes a good stain to dip cottage bedsteads in if you have a tank. Or it can be applied with a brush, and wipe the work over with a rag after brushing it. This stain is cheaper than the oil walnut stain, but to finish over this takes double the stock of the oil stain, for this stain like all water stain, opens the grain, and oil stain fills the grain, to a great extent, and two coats of varnish on the water stain does not look as well as one on the oil stain.

Another good walnut color is made by dissolving 2 lbs. asphaltum in 1 gal. turpentine, and after the ashpaltum is dissolved, add a little Venetian red, and 1 pt. Japan drier. This makes a good stain when it is first put on but after a while it fades out to a nasty, muddy color, and unless you use great care in staining your work, it will run. This stain without the Venetian red makes a good rosewood imitation when used over a red ground.

Walnut Water Stain.—Burnt umber 2 parts; rose pink 1 part; glue 1 part, mixed in water. Heat all together, and apply warm to the work, first with a sponge, and then with a brush.

A MODEL AMERICAN DAIRY.

Much interest has been excited amongst dairymen by the violent squabble, or dispute, which occurred in the committee appointed by the American Dairymen's Association, to take charge of the dairy displays at the Centennial Exposition. A small minority, one person in fact, made itself very conspicuous and demonstrative in opposition to the rest of the committee. The cause of the dispute seems to have been that a patented device for cooling dairy rooms, for which the party in question was the agent, was not put into the dairy factory at the Exposition at the expense of the Association. This party, who is not a dairyman, but a produce dealer, procured the wide publication of his grievances and charges against the committee and the model factory, and went so far as to counsel dairymen not to exhibit their products in the building erected for the purpose. Under the circumstances, this course was a very remarkable one, and unfortunately had the effect of greatly curtailing the contributions of the dairymen to the dairy exhibits.

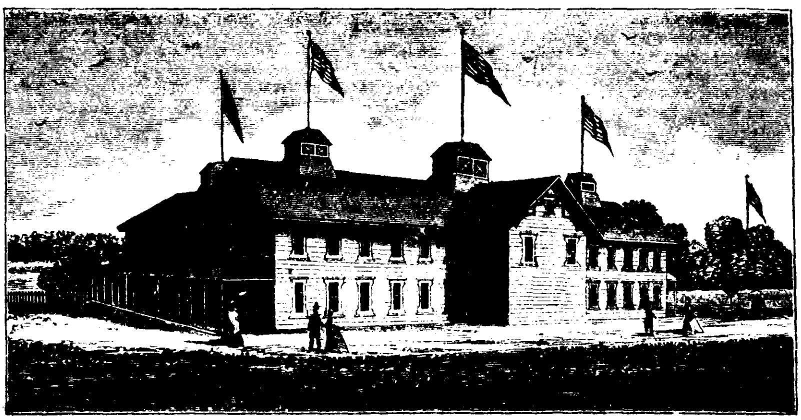


Fig. 1.—MODEL DAIRY FACTORY—CENTENNIAL EXHIBITION.

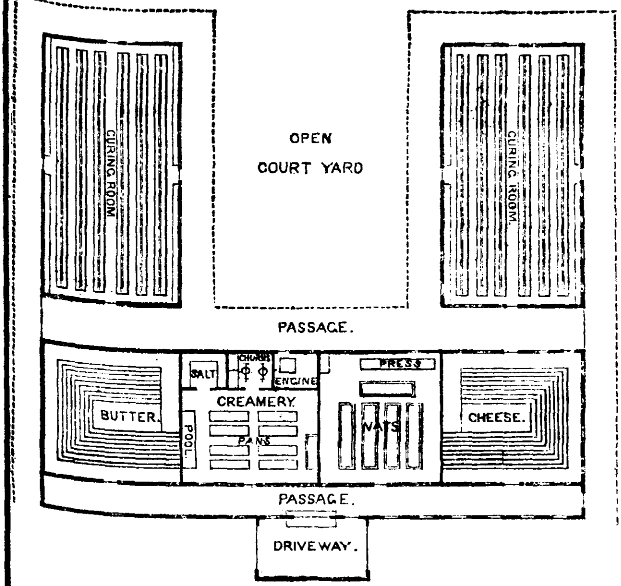


Fig. 2.—PLAN OF GROUND FLOOR—MODEL FACTORY.

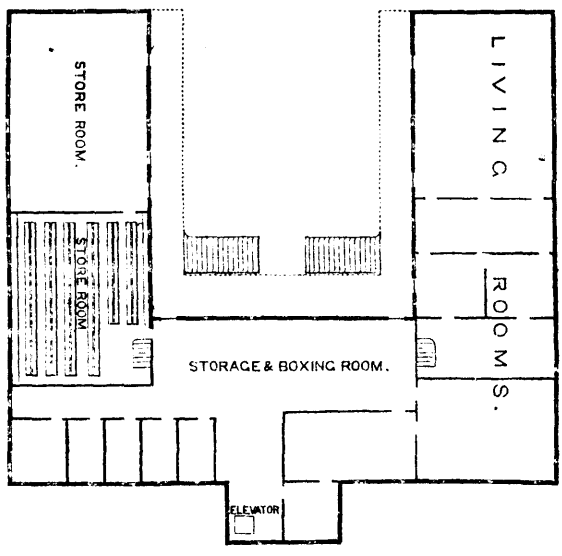


Fig. 3.—PLAN OF UPPER FLOOR.

At the July exhibition of dairy products there were but seven boxes of cheese from New York, against 600 from other places, of which Wisconsin and Canada sent over 200 each. Of course the loss, if any, in this ignoring of a brilliant opportunity,

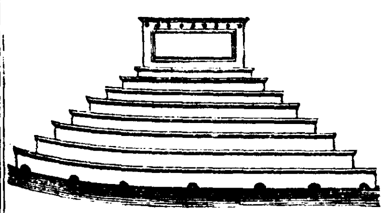


Fig. 4.—STAGE FOR BUTTER.

which cannot soon be repeated, falls upon those dairymen who were misadvised and misguided by injudicious and spiteful counsels. The trouble, however, seems to have passed away by the retirement of the disappointed member of the committee, which is now left in harmony. The Canadian exhibitors, and other leading dairymen, among whom is the Hon. Harris Lewis, of New York, with the committee themselves, have declared the Model Factory to be well adapted for an exhibition, and to be well provided for the care of whatever dairy produce may be sent there for the display in October. We earnestly join with the committee in urging dairymen to seize this opportunity of showing what they can do to the thousands of visitors who will be at Philadelphia this month. It will be ever to be regretted if, having made a beginning by building a model factory, the dairymen should permit or oblige it to become a ridiculous failure by withholding their products, which alone can give the building an excuse for its existence there. Filled with dairy appliances and dairy products, the building would be an interesting attraction amongst many attractive exhibitions; and whatever gain is to occur through the exhibition, the whole will accrue to the dairymen of America.

For the information of our readers interested in cheese factories and creamèries, we have engraved an elevation and plans of the Centennial Dairy Factory, built by Mr. Wm. Blanding, of Hawleyton, Broome Co., N. Y. The building is shown at figure 1, the main floor at figure 2, the upper floor at figure 3, the stage for the butter with ice-box and cooler at figure 4, and the section of cooler at figure 5. The building has a drive-way in the front, in which are the platform and scales. An open passage is made the whole length of the building, from which the doors open into the various departments, as shown. At the rear is an open court yard, and an open passage way, sheltered by a broad veranda, runs all around the wings. The construction gives abundant air and ventilation, and perfect facilities for the utmost cleanliness and neatness. The main building is 116 by 28 feet, and the wings 56 by 30 feet each. The cheese-room, butter-room, and creamery, are each 30 by 28 feet, and the cheese make-room is 26 by 28 feet. The second floor contains store-rooms and living-rooms. Grated ventilators are in the floor and ceiling of all the passage ways and store-rooms, giving abundance of ventilation, which can be regulated by slides in the grates. The plans of the butter and cheese-rooms in the main building are readily understood from the engravings. The raised platforms admit of thorough ventilation, and in the butter-room a constant flow of cool air is procured from the ice chest. The model factory is not furnished with shutters, which would be needed for actual use, to shade the store-rooms from the sun's heat, at least on the upper floor. The lower floor is well sheltered by the broad veranda which surrounds the building, and there shutters might not be needed. The extra expense, however, would be small in comparison with the benefits that would be derived from them. The cost of the building is about $8,000, which, however, is large on account

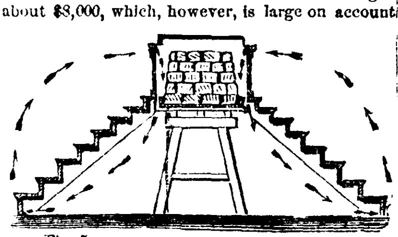
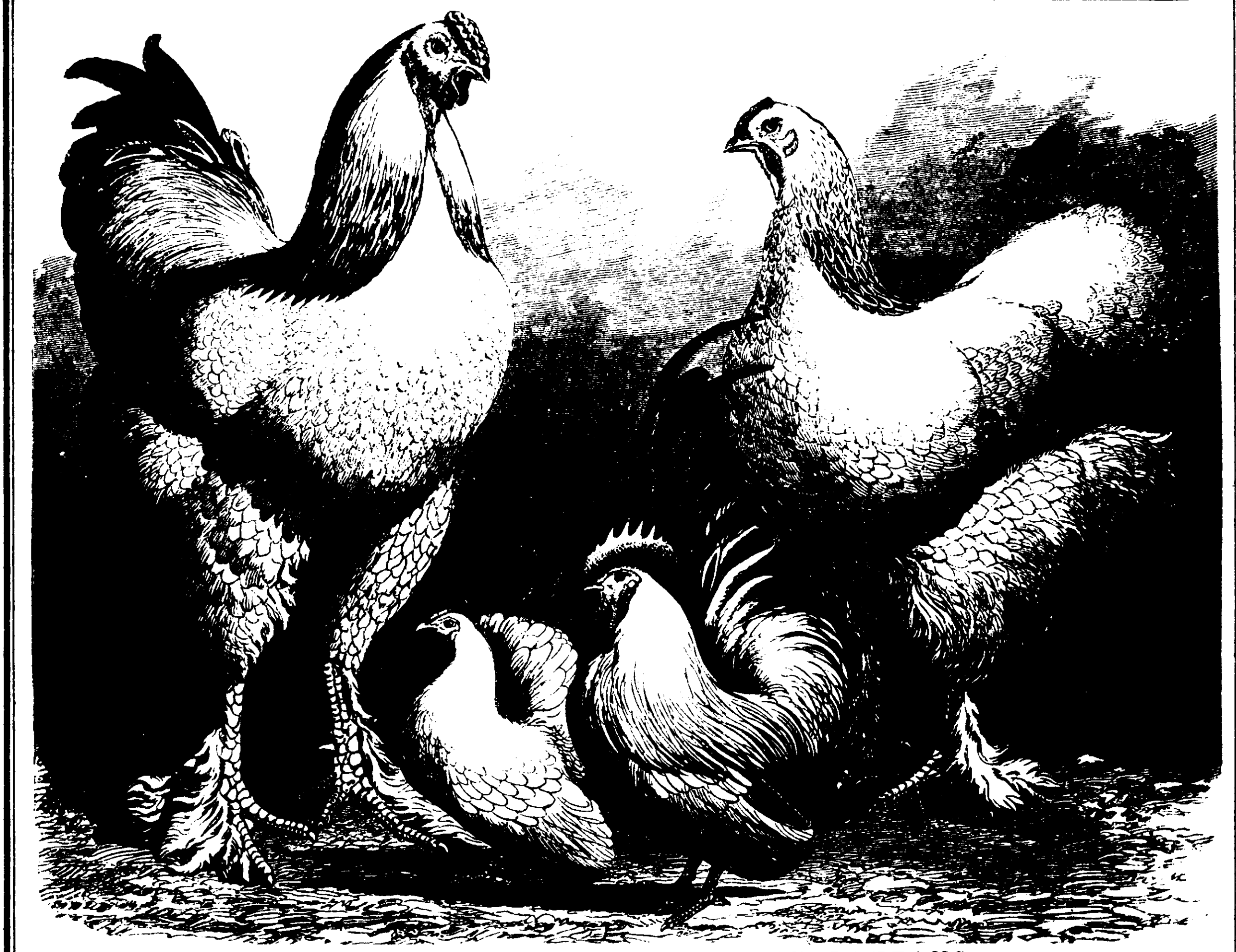


Fig. 5.—SECTION OF STAGE FOR BUTTER.

of the difficulties of building in a city, but is not by any means excessive for a house of this size, and completeness and thoroughness of construction.—*The American Agriculturist.*



LIGHT BRAHMAS AND JAPANESE BANTAMS.

Portraits are given above of fowls of two conspicuous breeds. One is remarkable for its large size, and the other for its diminutive, as well as picturesque and odd appearance. The Light Brahma is now well known amongst breeders and fanciers, but is not yet nearly so popular amongst farmers, and those who rear poultry for market, as it should be. The above portraits are drawn from life from some birds bred and owned by Messrs. Magrane & Fairservice, of Woodside, near Newark, N. J. These gentlemen, who are well known amongst fancy poultry breeders, have been more than usually successful in taking premiums at exhibitions, and their birds are in great demand, not only at home, but in foreign countries. Some fine specimens were recently sold and shipped to an English breeder. After an inspection of their poultry, the selection of a pair for illustration was no easy matter, as it was difficult to choose where many were worthy of the distinction. Having so frequently described the Light Brahmas, we need not now repeat their characteristics, but merely point out here, the small head, the lofty carriage, the broad full breast, the deep round body, the short stout limbs, all of which mark the high-bred bird, and one producing a great amount of flesh with the least offal. This is one distinguishing feature of the Brahma fowl, which renders it a profitable breed for the farmer. No other bird excels it as a winter layer, and as it is a good mother, the plentiful fluff about it serving to keep the chicks warm in the coldest weather, and as the chicks are hardy, it is easy to have very early birds. The young birds, as broilers, are remarkably juicy, well flavored, and tender, and the young cockerels of 4 to 6 months, weighing, as they easily do, 8 to 9 lbs., make most excellent roasters. As with all high-bred, pure races, the half-bred crosses of these, on the common stock, are nearly as good as the pure bred. There is no breed that excels the Light Brahma as the farmer's fowl. To introduce one young cock for every 25 common hens, would be to easily double the value of the farmer's yearly product. This we can say after several years' experience, during which our main stock has been of this breed, and having had occasionally some hundreds of cross-bred chickens for the market.

The Japanese Bantams, from which the portraits were taken, are also the property of Messrs. Magrane & Fairservice, who, to save trouble, request us to state that they have none of these birds for sale this season. These quaint little creatures are drawn in proportion to the larger birds, and weigh a pound and a quarter each. The plumage is white, excepting some of the wing feathers, the tail, and sometimes the tips of the neck feathers, which are black. The legs are bright yellow. The tail is the most curious part of this breed, being large, and carried so erect as to nearly touch the head. The legs are so short as to be almost invisible, and this gives the birds a curious creeping sort of gait. The little hens are exemplary mothers, and one of them, with a brood of tiny chicks, would be the delight of a boy or girl, as well as attractive pets for old folks. This breed has the virtue, rare amongst bantams, of being exceedingly peaceable and quiet.

The American Agriculturist.

The True way to Treat Workmen.

The prosperity of France after her misfortunes in war, is simply due to the care its government took to encourage and assist the only source of all wealth—industrial labor; this act, combined with the fact that on account of the excellence of all French products, there is an almost unlimited demand for them in the markets of the world, has caused the depression of all trades to be less felt in France than anywhere else.

To show the spirit of that country, we will mention the gratifying fact that lately fifty thousand francs have been appropriated in aid of artisans who have meritorious objects to exhibit at the Paris Exposition of 1878, the objects being constructed by men who are working on their own account, but are unable to defray the expense of exhibition from their own resources. The Prefects of each of the eighty-six departments are to supervise the applications under this head.

Tape-Worms.

The origin of tape-worms is the eating of measly pork, which has not been sufficiently cooked to destroy the germ. It may also be communicated to beef by the knife of the butcher should he cut pork and beef with the same knife. The germ adheres to the interior of the human intestines, soon becomes the head of the tape-worm, and then the links grow, each of which eats and digests independently of the head.

To remove it, a large dose of Rochelle salts is given at night; at 10 o'clock in the morning a dose is given made of ½ ounce of bark of pomegranate root, ½ drachm pumpkin-seed, 1 drachm ethereal extract of male fern, ½ drachm powdered ergot, 2 drachms powdered gum arabic, and 2 drops of croton oil. The pomegranate bark and pumpkin-seed are to be thoroughly bruised, and, with the ergot, boiled in 8 ounces of water for 15 minutes, then strained through a coarse cloth. The croton oil is first well rubbed up with the acacia and extract of male fern, and then formed into an emulsion with the decoction. In each case the worm will be expelled alive and entire within two hours.

The above prescription is from the *Druggist's Circular*, and is similar to the old established method; but a recent publication informs us that where this failed, the tape-worm was effectively driven out by means of diluted carbolic acid, which is a poison for all small animals and inferior forms of life.

THE PRICKLY COMFERY.

Our illustrations represent a plant now much recommended, by the French scientific journals, to farmers, as yielding large quantities of excellent forage. It is known as the prickly comfrey, its botanical name being *symphytum asperium.* With regard to the rapidity of growth and amount of herbage yielded by it, the *Journal de l'Agriculture de la France*, of October 7 last, says: "Two sets put late into the ground in the month of May, in a fairly deep soil but of poor quality, gave on September 29, the one 7,150 lbs. forage, and the second 3,850 lbs. The height of each plant was 15 inches, diameter 32 inches. The appearance was that of the small eugraving, Fig. 2, which was drawn from nature at the Botanical Garden, Kew, in England. Two cows, to which we offered the leaves freshly cut, ate them at once, in spite of their roughness. The quantity of water is 88 per cent, and the proportion of nitrogen 0.4 per cent in the green state, or about the same as in green Indian corn. The total of nitrogenous substances is about one-third, a remarkable richness, justifying the high opinion cultivators who have tried it have formed of the plant. The sets we experimented on were sent us by M. A. E. Ragou."

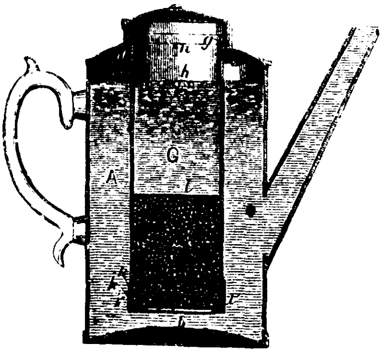
The *Journal d'Agriculture Progressive* says: "We persist in recommending this plant, chiefly for small and middle farming; those who farm on a large scale will probably adopt it all in good time. The price of the plant is high; but we must not forget that a thousand plants will yield from fifteen to twenty thousand the year following, and that the planting of these sets, the original price deducted, does not cost more than pricking out cabbages, and less than does planting potatoes."

The following letter, dated October 30, from Culloor, in Malabar, Madras Presidency of British India, was received by *Land and Water*, from the pages of which we select the engraving:

"Thus far I am glad to be able to report most favorably on the progress of the comfrey roots I brought out with me here for the Tambracherry Coffee Estate Company. I have them planted on a low, marshy soil, in ridges three feet apart, taking care previously to have the soil broken up two feet deep, and at subsoil of the ridges making a good coating of cattle manure mixed with jungle soil. By this cultivation the roots will not only have considerable depth of soil to grow in, but in the event of having a dry season, the manure, being placed at a fair depth under the top soil, will tend to make it moist for a very considerable time. I was greatly surprised at the quick germinating qualities of these roots, which, in several instances, had not been planted more than forty-eight hours at about three to four inches below the surface. I also found, after a voyage of six weeks from England, on opening the case, that the roots had germinated a little. The comfrey has now been planted about ten days, and promise well. I only hope our cattle will take to it here, as, being so quick in growth, it will be invaluable, in my opinion, here on coffee estates as a standard food for cattle: grasses being often difficult to obtain during some seasons of the year. I shall advocate its trial to my agricultural friends in England. I am surprised it is not more generally grown. To a dairy farmer it would be an acquisition. I confidently expect to get here a crop every two months, if not more frequently."

McFARLAND'S IMPROVED COFFEE-POT.

This invention consists, as shown in the accompanying engraving, in the combination with a coffee-pot of a coffee-receptacle and strainer of novel construction, whereby the ground coffee is thoroughly infused, and may be then removed from the coffee-pot, leaving the liquid coffee therein ready for use. The coffee-pot, A, may be of any suitable form approximating that shown in the engraving, but it is preferably made cylindrical or slightly tapering. The bottom, *b*, is concavo-convex, so that only its outer edge will rest directly on the stove, while its central portion will be slightly above the stove, and will thereby be prevented from becoming so hot as to burn any coffee which may settle on the bottom. The top tapers from the upper edge of the sides of the pot to the lower edge of the ring or band which receives the lid. It extends slightly beyond the inner side of the ring so as to form a flange, as shown in the engraving. The coffee-receptacle consists of a cylindrical case or box,



G, the upper end of which is open, and has its edge turned outwards to form a flange, *g*, a short distance below which is a series of perforations, *h*. This case has a movable bottom, *i*, which shuts over the bottom of the cylinder, G, like the cover of a box. It is provided with an annular slot, *k*, which engages a pin *k'*, by which means it may be readily attached and held in place, and as readily removed. On the inside of this case, at a suitable point, is a partition, *l*, of perforated sheet metal, which with the bottom, *i*, forms a chamber in which the coffee is retained during the process of steeping, the case, G, being taken out and inverted while the coffee is being placed in the chamber, and the removable bottom is placed in position. The case is then lowered into the coffee-pot until the flange, *g*, rests upon the flange, *d*. Boiling water is then poured into the top of the case, G, so that it passes through the ground coffee in the coffee-chamber, and rises outside of the case, G, care being taken not to let the water rise above the perforations *h*, on the inside of the case, G, but to cause it to pass through the ground coffee and rise outside of the case before passing through these perforations. The coffee-pot being thus filled and arranged, is allowed to remain upon the stove until the infusion is complete. The circulation of liquid will now be through the coffee *h*. When the infusion is complete, the case is removed from the pot by means of a cross-bar, M, attached to its upper portion, leaving the clear liquid coffee in the pot ready for use. —*Scientific*

Balloons and Science.—In conversation with a St. Louis newspaper reporter a few days ago, Prof Wise, the aeronaut, expressed his views of the possibility of ballooning, as follows: "Balloons may be made of boiler iron if built large enough. You know it is the battle of cubes and surfaces. When the surface is doubled the cube is quadrupled, and a balloon of 400 feet diameter of copper boiler plate will lift up a man-of-war ship and sail away with it. With such a balloon stocked with bombs and other munitions of war, think what consternation could be carried into a besieged camp. But the mission of the balloon will be more for scientific explorations. That overshadowing science called meteorology will yet provide its definition in the use of the balloon."

THE GORILLA.

The gorilla is the largest of the anthropoid apes ; and since his discovery in 1847, by Dr. T. S. Savage, he has attracted much attention from naturalists. The writings of Du Chaillu have done much to familiarize us with this remarkable animal ; and its strength, ferocity, and cunning have made it remarkable, even in these days of natural wonders. The gorilla is chiefly found on the west coast of Africa, both north and south of the equator. It is generally seen in troops of four females and one male ; and these never associate with other animals. The muscular strength of the gorilla is great. He marches steadily towards his enemy, beating his breast with both hands and roaring terribly ; when near enough, he springs upon him, and destroys him by tearing him to pieces. One of Du Chaillu's men was eviscerated by a single blow from the paw of a gorilla.

In the dense forests of the African continent, man can only advance with difficulty ; and the miasma that pervades them is sooner or later fatal to mankind. But here the gorilla takes up his abode, and his long arms and prehensible toes enable him to swing himself over long distances between the trees, and thus to wander over large tracts of country, passing each night in a rudely constructed nest made for the purpose.

Some of the antics of the gorilla are amusing, and resemble certain human characteristics to a remarkable degree. Mr. A. R. Wallace had one in Borneo ; and when he gave it a piece of food to its liking, it licked its lips, drew in its cheeks, and turned up its eyes with an expression of supreme satisfaction. If it disliked a morsel, it would roll it round on its tongue, and then push it out between its lips. If it could not get the food it desired, it would scream like a baby in a passion.

The specimen shown in our engraving, in his sagacious watchfulness against strangers, is at once on the alert on the approach of a strange footstep ; and the intruder who will face such a sentinel must be either very ignorant or very incautious. The picture is so vivid and life-like that it seems almost like a portrait taken on the spot ; it is the work of Mr. Joseph Wolf, the eminent naturalist and artist, whose book, "The Life and Habits of Wild Animals," we have heretofore had occasion to notice.—*Scientific.*

AN ANECDOTE OF SIR ISAAC NEWTON.

The house which Newton occupied on the south side of Leicester Square, in London, is still standing, and his observatory is shown to visitors. When he took up his residence there, his next door neighbor was a widow lady, who was much puzzled by the little she observed of the philosopher. One of the Fellows of the Royal Society of London called upon her one day, when among other domestic news, she mentioned that some one had come to reside in the adjoining house who, she felt certain, was a poor, crazy gentleman, "because," she continued, "he diverts himself in the oddest way imaginable. Every morning, when the sun shines so brightly that we are obliged to draw the window blinds, he takes his seat in front of a tub of soapsuds, and occupies himself for hours blowing soap-bubbles through a common clay pipe, and intently watches them till they burst. He is doubtless now at his favorite amusement," she added ; "do come and look at him."

The gentleman smiled and then went up stairs, when, after looking through the window in the adjoining yard, he turned around and said : "My dear madam, the person whom you suppose to be a poor lunatic is no other than the great Sir Isaac Newton, studying the refraction of light upon thin plates, a phenomenon which is beautifully exhibited upon the surface of a common soap-bubble."

Slate Roofs.

A very economical system of slating buildings with large slates is as follows: The rafters are placed at a clear distance apart about 1½ inch less than the width of the slates. Down the center of each rafter is nailed a fillet, thus forming a rebate on each side, in which the edges of the slates rest, being secured by black putty, or—as this looks smeary and uneven—by a second fillet 2 inches wider than the first, nailed over it so as to cover the edges of the slates and hold them down. Each slate laps about 3 inches over the one below it. Only half the number is required in this as compared with the ordinary method of slating, and no boarding or battens are necessary.—*Notes on Building Construction.*

THE GORILLA.

THE HARPY EAGLE.

THE HARPY EAGLE.

Sitting motionless on the ground in the corner of the eagles' cage, in Central Park, New York city, is a curious bird which, at first sight, visitors mistake for an owl, and wonder why it is confined among the more noble birds of prey and apart from its own species. The creature rarely stirs from its favorite corner. When food is offered, or when some one of the eagles ventures to approach it too closely, it erects a tuft of feathers on the back of its neck, and twists its head about with a rapidity that shows it, despite its sleepy attitude, to be keenly on the alert. The eagles, even the huge bald-headed monarchs of the air, cherish a wholesome respect for the formidable beak and huge talons, and permit the uncommunicative stranger to continue its ponderous thinking without intruding upon its meditations.

The bird is a harpy eagle (*harpya destructor*), and is probably, next to the condor, the most dangerous and ravenous bird of prey indigenous to the New World. It inhabits the tropics between Mexico and the southern part of Brazil, and abounds in great numbers in the warm regions in the interior of South America. In size it is smaller than the condor, but larger than the true eagle, and stands as a kind of connecting link between the latter and the buzzards. The characteristic features of the bird are well shown in the engraving presented herewith. The beak is strong and curved, and the tail long; and the wings are of medium size. The back, wings, upper chest, and neck are greyish black, the tail is black with whitish cross bands, the lower chest and abdomen are white, and the claws yellow.

Unlike the condor, the harpy avoids high mountains where the air is rare and cold, and dwells in dense forests or on the shores of large bodies of water. Its food is small animals, especially monkeys. Regarding its eggs or its breeding habits, but very little is definitely known.