THE GRINDING AND POLISHING OF PLATE GLASS BY MACHINERY.

[From the Handbook for the Artisan.]

This is perhaps the largest example of the production of plane surfaces by grinding.

The plates of glass, as they come from the annealing oven, measure about half an inch thick, and the surface is full of small irregularities, presenting a mottled appearance, the roughest side being generally that which was placed downwards upon the bed of the annealing oven, and copied all the irregularities of the bricks of which the bed of the oven is formed. The side of the glass that was uppermost in the oven is comparatively smooth and bright from the action of the fire, although in many cases this surface is not so nearly flat as the lower. The plates have therefore to be ground flat, and polished on both sides; formerly this was effected entirely by hand, but of late years the rough grinding with coarse sand, and the polishing with crocus, are almost always done by machinery, and hand labor is only resorted to for the intermediate process of smoothing with fine emery.

The grinding and polishing machines employed for plate glass differ somewhat in construction in various manufactories; but a single example of each will sufficiently explain the general method.

The grinding machines employed for the largest plate glass are arranged in pairs along the grinding room; every pair of machines is driven by one central beam, and consists of two benches of stone fifteen feet long, eight feet wide, and eighteen inches high, placed about ten feet asunder; upon each of these benches one or more plates of glass are embedded in plaster of Paris, close together, and quite level. Other plates of glass are cemented upon the lower faces of two swing-tables, or runners, which are traversed over the fixed beds by a horizontal frame or beam about thirty feet long; the machinery for driving the beam is fixed in a frame about six feet square and eighteen inches high, placed between the two grinding benches. A horizontal shaft, fixed underground, extends throughout the length of the grinding room between the lines of benches, and the motion from the shaft is communicated to every pair of machines, by a pair of bevel wheels, leading to a central crank that revolves horizontally, and has a radius of about two feet; the arm of the crank is attached by a pivot to the center of the horizontal beam. Four other cranks of the same radius are placed parallel to the central driving crank, one at each corner of the square frame, and serve to guide the traverse of the horizontal beam, which is thus swung in a circle of four feet diameter in a manner somewhat similar to the grinding bed for marble. The beam is supported at various parts of its length by chains suspended from the roof of the building, which allow of the traverse of the beam, and serve for raising it by means of levers for the removal of the work.

Near each end of the beam is attached, with the power of adjustment for position, a small sliding frame, carrying bearings for the reception of the central pivot of the swing table or runner, which consists of a strong frame of wood covered with boards, and measuring eight feet long and six feet wide, placed face downward upon the bench; a central pivot stands up from the back of the runner, and enters the bearing fixed on the horizontal beam, which thus communicates a circular swinging motion to the center of the runner, exactly the same as that of the driving crank; and the runner, being free to revolve upon its pivot, acquires a continual rotation around its own axis. By the combination of the two movements the relative positions of the fixed bench and runner are continually changing; this tends to the mutual correction of the two surfaces of the glass, and greatly assists the equal distribution of the sand and water used in grinding. The horizontal beam makes about fifty circulating strokes in a minute, and the runners revolve upon their own axes about once to every five or six strokes. The position of the runners upon the driving beam is shifted once or twice during the grinding, to distribute the action as uniformly as possible over the entire surfaces of the glass plates.

The largest plates of glass are nearly equal in size to the fixed bench, and these are embedded singly upon the bench with the most irregular side upwards; but more generally plates of medium and small size are ground together; they are selected of uniform thickness, and arranged close together upon the bench, with the largest plates in the middle and the smallest at the ends. The runner is covered by one or two plates at most, as small pieces would be liable to be thrown off by the centrifugal force.

All the irregularities of the surfaces are first ground out with sharp river sand that has been washed and sifted into two sizes; the sand and water are thrown on by hand occasionally, and when the plates have been ground quite flat, the finer sand is employed, and followed by emery of two finer sizes, applied as usual in succession, in order to remove the scratches made by the coarser powders. The plates of glass are thoroughly washed between every change of grinding powder, and when the one side of the glass has been ground with the finer sizes in succession, the plates are inverted, and the same routine is followed on the second side.

The grinding machines do not, however, admit of being employed with very fine emery, as the close approximation of large surfaces, traveling over each other at a considerable velocity, causes so much friction that it would be liable to tear the surface of the glass, and, consequently, as the plates become sufficiently smooth to require the application of fine emeries, the velocity and pressure should be proportionally reduced, and a greater degree of care and management is required.

The plates are smoothed upon stone benches of suitable size, about two feet high, made very flat upon their surfaces, and covered with wet canvas. One large plate, nearly equal to the size of the bench, and two or three plates of about half the size, are usually given out as a set of work. The large plate is laid upon the wet canvas, which serves to hold it firmly; emery and water are spread over the surface; and one of the small plates is used as a grinder or runner. If the plates be large, a few flat lead weights of about fourteen pounds each are laid near the middle of the runner, to distribute the pressure uniformly, and the runner is traversed over the lower plate with a swinging stroke backwards and forwards, so as to describe nearly a semicircle around the center of the runner, which is at the same time shifted a few inches during the stroke. Every stroke follows a slightly different path from the preceding one, and the runner is also gradually twisted round as the smoothing proceeds. The combination of these movements serves to expose every part of the surfaces of the bed plate and runner to an equal amount of grinding, and also to distribute the emery very uniformly.

Small plates are smoothed by young girls; and large plates, which require greater dexterity and a proportionate increase in the amount of traverse, are smoothed by two women, who stand on opposite sides of the bench, and, placing their outstretched hands flat upon the runner, swing it with a stroke of five or six feet. The employment appears most masculine, but it is found that the smoothing is, upon the whole, executed better by women than men, as only a moderate force is required, and, from the greater delicacy of touch possessed by females, they more readily appreciate when any particles of grit have become accidentally mixed with the emery.

About six sizes of carefully washed emery are used in the smoothing, and between every size the plates, canvas, bench, and hands are thoroughly washed; perfect cleanliness in the clothing is also quite essential, as a particle of coarse grit would make a scratch that would require the smoothing of the plates to be recommenced. The fine emery last employed gives a very smooth and partly polished surface, which is completed with the machine next described.

The polishing machine has a bed fifteen feet long and eight feet wide, that is mounted upon rollers, and slowly traversed sideways, a space of four feet, to and fro, by means of a rack and pinion beneath. A few inches above the bed are reciprocated, longitudinally, two beams or carriages, each about eighteen feet long and nine inches wide, and consisting of two cast-iron side plates connected together at intervals, and supported at each end upon two small wheels, that run upon a short railway at the end of the traversing table. The carriages are placed four feet asunder, and reciprocated about two feet, by means of two cranks fixed opposite to each other on the same axis, so that the beams work in opposite directions—the one advancing as the other recedes.

The plates of glass are embedded close together, with their surfaces quite level, upon movable platforms that are afterwards fixed upon the traversing bed, and the polishing is effected with a series of rubbers, placed one foot asunder and measuring eight by six inches, covered with thick felt, and attached to the reciprocating carriages, which drag the rubbers backwards and forwards over the surface of the glass, while the latter is traversed beneath the rubbers a space equal to the distance between the two lines of rubbers, to expose all parts of the glass equally to their action.

Every rubber is separately attached to one of the two carriages, to allow it to ply uniformly to the surface of the glass. This is effected as follows: Between the two side plates of the beam are fixed, near the top and bottom edges, two cross-pieces having square holes, through which slides vertically a square bar, the lower end of which projects about two inches below the beam, and is rounded semi-cylindrically. The rubber is made quite detached, with a central cavity at the back to fit the end of the upright bar, which thus forms a joint that allows the rubber to adjust itself to any trifling irregularities of the surface over which it is traversed, and the rubbers admit of being readily removed while the plates of glass are being exchanged. The pressure is given separately upon every rubber by two lead weights of about fifteen pounds each, fixed one on each side of the upright bar.

The powder generally employed for polishing plate glass by machinery is the Venetian pink of the colorman, a cheap powder, which contains only a small proportion of the oxide of iron, mixed with earthy matter that renders the powder less active, and allows of the free use of water, which serves to reduce the friction and prevent the glass becoming heated by the action of the rubbers. Tripoli, crocus, and putty powder used with water, are too active to produce a high polish on glass, and therefore they are generally employed dry for the last finish of glass polished by hand. But the great amount of rubbing surface, the velocity, and power employed for polishing plate glass by machinery, render the use of dry powders inadmissible, as the surface would be torn by the friction, and the heat evolved would be liable to break the glass.

Sometimes old plate glass, that has become scratched, is repolished; when the plates are large, and sufficiently numerous, they are repolished by machinery, just the same as new glass, but more generally old plates are repolished by hand, as the process can be then restricted principally to the scratched portions of the surface.

The polishing is commenced with tripoli on cloth rubbers of the usual form, and finished with putty powder or crocus. The pressure is generally given as in hand calendering, by attaching the rubber to the lower end of an upright pole, suspended from a long horizontal spring fixed overhead, like that of a pole lathe. The elasticity of the spring supplies the pressure, and the workman has only to push the rubber backwards and forwards, but the process is both laborious and tedious with large plates, and from the irregular action of the hand, the surfaces of glass thus polished present a wavy appearance much inferior to those polished by machinery.

Suspension Bridges.

There is a close resemblance in the relation of cast-iron bridges to railway traffic to that occupied by those of the hanging or suspension type. The similarity is not, however, fully borne out, for in this country there are numerous bridges of cast iron, which have served the purposes of conveying locomotive traffic for many years, whereas there is not a single instance in which a suspension bridge has done duty in that capacity. The difference, therefore, is, that the use of cast iron for railway bridges is restricted within narrow limits; that of the suspension principle prohibited altogether. Where the analogy exists most forcibly is in the reason or cause of this restriction and prohibition. It will be found to be identical in both instances and to have emanated from the circumstance of actual failure having attended both of these descriptions of structures in the early days of steam locomotion. Many may be inclined to argue that, bearing in mind the very imperfect manner in which the theory and practice of iron bridge construction were understood at that time, this circumstance is really of little value, and that the bridges may be more sinned against than sinning. It is possible that there may be some amount of truth in this argument, so far as regards the employment of cast iron, but it does not extend to suspension bridges. The complete unsuitability of that principle to the purposes of a heavy isochronously moving load was demonstrated too palpably to allow of any hesitation respecting its rejection in future for that purpose. In the early part of his professional career Sir William Fairbairn was called upon to devise means for strengthening one of these suspension structures that had been erected on a line of railway. For this object a staging was erected, and piles driven into the ground, when the undulations into which the platform of the bridge was thrown by the passage of a train, caused so tremendous a vibration that it actually drew the piles out of the ground. The point worthy of notice in this failure presents an aspect different to that to which we shall presently draw attention when touching upon cast-iron bridges. It indicates, unmistakably the radical unsoundness of the principle when employed for the conveyance of loads that have a tendency not only to create, but, in conjunction with the system of structure adopted, to accumulate vibration and oscillation. This unfortunate predisposition to accumulate vibration *a crescendo* from a moving load is the bane of the suspension principle. If the cause, such as the measured tramp of a number of people, the march of troops, or the passage of cattle, be continued long enough, the bridge would infallibly yield to the disturbing action, and the chains give way. A suspension bridge may be said to contain in itself, by virtue of the principles which govern its construction, more than other descriptions of bridges, the elements of self-destruction.

Reference is usually made when this subject is touched upon to the Niagara Suspension Bridge as a proof that this principle has been successfully applied to railway traffic. This argument is specious and shallow to the last degree. It is true that railway cars do creep across the Niagara bridge at about six miles an hour, but this does not constitute that bridge a railway bridge in the proper sense of the term. When a suspension bridge is erected over which a mail express can rush at a speed of fifty miles per hour, the problem will be solved, the present insurmountable difficulty overcome, and we shall have in reality a "rigid suspension bridge." In the eyes of English engineers it is a mere farce to put forward the Niagara Bridge as a successful example of the application of the suspension principle to the conveyance of locomotive traffic.

Besides the structure is such a mass of stays, struts, and braces above and below that it is scarcely possible to consider it in the light of a genuine suspension bridge. In all probability the design was originally based on that principle, but the exigencies of actual practice required it to be so materially modified that it retains very few of its normal characteristics. There is no difficulty in designing a bridge on the suspension principle, and subsequently introducing such elements of trussing and bracing that may ultimately convert the whole structure into a girder bridge. This is really what occurs when a suspension bridge is stiffened to such a degree that it cannot possibly vibrate, oscillate, or deflect. But when this is accomplished, not only is all the value of the principle nullified, but the amount of material required is a great deal more than what would suffice to build a bridge on another plan altogether.—*London Mechanics' Magazine.*

A COOLING DRINK IN HOT WEATHER.—A delicious and slightly aperient effervescing citrate of magnesia may be made by thoroughly mixing 3 ounces of powdered loaf sugar with 2 ounces of powdered citric acid, then add ¾ ounce of calcined magnesia, 1½ ounce of bicarbonate of soda, and 1½ ounce of tartaric acid. Pass the whole thrice through a fine sieve, and then moisten it with very strong alcohol. Granulate it by passing it through a coarse sieve, and dry on a wooden tray at a temperature of 50° C. When dry add ten drops of essential oil of lemons, and then bottle at once in clean dry bottles.

EVERY year the sugar manufactory of Halfweg, situate between Amsterdam and Haarlem, sends into the province a seed-sowing machine for use in the fields devoted to the culture of the beet. Advances are even made to the proprietors of the ground, on condition that they sell their products at the manufactory above mentioned at a merchantable price. In this way the population is initiated in the employment of agricultural machines, at the same time being engaged in a work advantageous to the country.

Summer Rules.

Dr. Hall, in his *Journal of Health*, says: If you have walking or riding to do, ride first, because if you walk you may get over heated, and then, when you ride, you may be exposed to an open window or a draft of air while you are in a still position, to be followed by a chill, a pleurisy, or lung fever, which is pneumonia.

If on any occasion you find yourself the least bit noticeably cool, or notice the very slightest disposition to a chill running along the back, as you value health and life, begin a brisk walk instantaneously, and keep at it until perspiration begins to return; this will seldom fail to ward off a summer cold, which is more dangerous than a cold taken in winter to all persons having the slightest tendency to consumption.

DRINKING WATER.—If very thirsty and warm, take but a swallow at a time, taking the glass from your lips, with a dozen seconds between the swallows, then you will never fall dead while taking a drink, as many have; in this way half the amount of water will abundantly satisfy the thirst.

Soda water is an agreeable beverage, but half a glass of cold water will better and more safely satisfy the thirst and costs nothing. Besides, in taking a glass of water, you stop when you feel you have had enough; this you never do with a glass of soda, but keep on drinking after it is positively disagreeable; and you hate to stop, but drink on again, to prevent wasting it.

Never sleep in the day-time uncovered, in summer; it is always dangerous, even if it be but half an hour on a bed; a lace shawl is better for a covering than nothing. Many lie down for a few moments, especially ladies coming from a walk, visit, or shopping; they do not intend to go to sleep, just to rest a minute or two; but many times they go to sleep and wake up with an indistinct chilly feeling, followed in many cases by serious illness.

When you reach home tired and weak, and may be accompanied with an indefinable feeling of sadness or depression, without being conscious of any adequate cause for it, don't take a drink of ice water, however thirsty, nor a glass of soda, nor a drink of wine, but a cup of hot tea, as hot as you can swallow comfortably; the heat is of more value than the tea itself, but both combined, are of incalculable value; if you are sitting down to a meal in this tired condition of body, and mental depression, some hot tea, taken before anything is eaten, will rouse the circulation, exhilarate the stomach, rally the spirits, and make you a different, a better, and a happier man in less than ten minutes, because the increasing debility and downward progress of the system is arrested by the warmth of the water and the active quality of the tea, until strength begins to be imparted to the system from the food taken.

It is safe to cool oneself off by dabbling the hands in cold water; safer and more natural if the water is warm, by the rapid evaporation every time the hand is lifted out of the water. But it is positively dangerous to wash the face in cold water when much heated. It is not dangerous but pleasantly efficacious if warm water is used.

Summer Clothing.

For all persons, especially invalids, and those who take cold easily, a thin material of woolen gauze, next the skin, is safest and best, because—

First, it is a non-conductor, carries heat from the body more slowly than cotton, linen, or silk; all colds are caused by the body becoming colder than natural, especially if it is made colder rapidly, and woolen material next the skin is the best thing known to prevent this rapid cooling, especially after exercise which has caused perspiration, and does not cause that disagreeable sepulchral dampness which wet linen does when it comes in contact with the skin.

The warmer the weather the more need for woolen next the skin; hence British sailors are required to wear woolen next the skin, in tropical latitudes, in summer, as the best observed protection against disease.

All garments worn next the skin during the day should be removed at night and spread out for thorough airing and drying.

Cotton is the best material to be worn next the skin at night. All changes from a heavier to a lighter clothing in summer, should be made by putting on the lighter clothing at the first dressing in the morning.

It is greatly safer for children, for invalids, and for old persons, to have too much clothing than too little.

Testimonial to the Family of Niepce de Saint Victor.

We recently noticed the death of this distinguished man. He was the nephew of Nicéphore Niepce, the first inventor of photography, and was worthy of the name he bore, for he consecrated his life to researches and discoveries in photography. Among his numerous labors may be cited the following: Researches into photographing and fixing natural colors; memoirs upon the persistence of luminous rays; heliographic process; and it is claimed for him that he was the first to take negatives upon glass, an invention that opened the way to the use of collodion, which is at the base of all actual progress in photography.

If he had taken out a patent for this discovery he would have secured a fortune to his family, but he belonged to the class who, oblivious of all selfish gain, sacrifice their lives to the good of their fellow men.

He is now dead, leaving a widow and two children without any means and with no pension, as the emoluments of his office terminated with his life. In view of these facts it is proposed to raise a fund for the support of his family. Subscriptions may be sent to the President of the Photographic Society of France, No. 9 Rue Cadet, Paris.

The Camphor-Tree of Sumatra.

Among the most luxuriant and valuable trees of the island of Sumatra the first place belongs to the *Dryobalanops camphora*. The tree is straight, extraordinarily tall, and has a gigantic crown, which often overtops the other woody giants by 100 feet or so. The stem is sometimes twenty feet thick. According to the natives there are three kinds of camphor tree, which they name "mailanguan," "marbin tungan," and "marbin targan," from the outward color of the bark, which is sometimes yellow, sometimes black, and often red. The bark is rough and grooved, and is overgrown with moss. The leaves are of a dark green, oblong oval in shape, and pointed; they smell of camphor, and are besides hard and tough. The outward form of the fruit is very like that of the acorn, but it has around it five petals; these are placed somewhat apart from each other, and the whole in form much resembles a lily. The fruit is also impregnated with camphor, and is eaten by the natives when it is well ripened and fresh. The amazing hight of the tree hinders the regular gathering, but when the tree yields its fruit, which takes place in March, April, and May, the population go out to collect it, which they speedily effect, as, if the fruit be allowed to remain four days on the ground, it sends forth a root of about the length of a finger, and becomes unfit to be eaten. Amongst other things, this fruit, prepared with sugar, furnishes a tasty comfit or article of confectionery. It is said that it is very unhealthy to remain near the camphor tree during the flowering season, because of the extraordinary hot exhalations from it during that period. The greater the age of the tree the more camphor it contains. Usually the order of the rajah is given for a number of men, say thirty, to gather camphor in the bush belonging to territory which he claims. The men appointed then seek for a place where many trees grow together; there they construct rude huts. The tree is cut down just above the roots, after which it is divided into small pieces, and these are afterwards split, upon which the camphor, which is found in hollows or crevices in the body of the tree, and, above all, in the knots and swellings of branches from the trunk, becomes visible in the form of granules or grains. The quantity of camphor yielded by a single tree seldom amounts to more than half a pound, and if we take into account the great and long-continued labor requisite in gathering it, we have the natural reply to the question why it fetches so high a price. At the same time that the camphor is gathered—that is, during the cutting down of the tree—the oil, which then drips from the cuttings, is caught in considerable quantity. It is seldom brought to market, because probably the price and the trouble of carriage are not sufficiently remunerative. Whenever the oil is offered for sale at Baros the usual price is one guilder for an ordinary quart wine-bottleful. The production of Baros camphor lessens yearly; and the profitable operation of former times, say in the year 1753, when fully 1,250 lbs. were sent from Padang to Batavia, will never return. Since time out of mind the beautiful clumps and clusters of camphor-trees have been destroyed in a ruthless manner; young and old have been felled, and as no planting or means of renewal has taken place, but the growth of the trees has been left to nature, it is not improbable that this noble species will ere long wholly disappear from Sumatra.—*Journal of Applied Science.*

The Culture of the Mushroom.

As the culture of mushrooms is attracting increased attention in this country, the following directions, found in the *English Mechanic* will be of use to those interested in this subject:

"Those who wish to succeed in their cultivation should first procure a quantity of horse droppings, free from straw and stones, and pile them into a heap, which must be patted down firmly, and allowed to heat; when well warmed all through it should be shaken out, and again made into a heap, changing the sides into the middle. After two or three of these "heatings" the dung will become sweet, which may be known by placing a piece of glass on the heap, and if the water that condenses on it is clear, the material will be fit to form into a bed. The bed may be of almost any dimensions, but a rounded form is best, as giving a greater surface from which to gather the mushrooms; some say 2 feet broad by 2 feet thick, rounded off, others 18 inches or 2 feet thick sloping to nothing. It must be put together rather firmly, and should be neither too hot nor too dry. In a few days the heap will in all probability heat violently, and when the temperature has fallen to 70° or 75° Fah., will be about the best time to put in the spawn. After the insertion of the spawn, which should be broken into pieces, the size of hens' eggs, and placed in holes about 9 in. apart, the surface of the bed should be patted together with a spade, and then covered with a layer of straw about 6 in. thick. In about ten or twelve days examine the bed, and if you do not see the thin white filaments of the mycelium spreading out from the lumps of spawn, it is certain that the heat is not sufficient, or the spawn is bad. If the former, the whole bed had better be pulled to pieces and re-made; if the latter, procure fresh spawn, which should be placed in different holes to the first. But if the spawn has begun to run you may proceed to cover the bed with an inch or an inch and a half of good loam, which should be patted close and gently watered, and the covering restored.

This form of bed will do for a cellar, outhouse, cupboard, or the open air, but if the latter it should be covered with straw, at least a foot in thickness. When the mushrooms are gathered a little earth should be placed in the holes whence they are taken. As to the kind of spawn to use, I think the French is undoubtedly the best, as what is generally bought at the seedsmen's is too hard and dry, whereas the French is in thin flakes, cut from heaps full of mycelium. Droppings obtained from a mill track, invariably contain spawn, and have only to be placed in small heaps to produce abundant crops of mushrooms. In the neighborhood of Paris these delicious fungi are grown in caves either underground, or excavated in the side of a hill, and even in deserted slate and stone quarries, as at Frepillon, Méry-sur-Oise, where at one time no fewer than 21 miles of beds were in full bearing. Of course, in these comparatively warm subterranean caves a bed does not require any covering, but yields abundant crops for two, three, and even four months.

There is, in fact, scarcely any kind of waste space where mushrooms might not be grown—in pots and old tubs under the stage of greenhouses, on shelves in stables; indeed, in any situation where sufficient dung can be placed to heat, or merely enough for the spawn to spread if artificially warmed.

Purification of Feathers, Hair, etc.

Horse hair, so-called, cannot, where the markets are competitive, be produced pure and simple—in other words, that of the buffalo, ox, bison, and pig, is proportionately intermixed. At the extremity, the epidermis, and occasionally minute portions of cuticle adhere. The curling does not destroy the tendency of ova to generate. Wool, and other material, from its naturally oily nature, is also subject to the ravages of neglected attention, *alias* moth, etc. Feathers occasionally are subject to their attack, but in a much less degree, inasmuch as these must be prepared by some process before it is possible to use them. All the inferior material used by the moderns cannot but be the hot bed, so to say, of these destroyers, inasmuch as old carpets in which they have long made their home, old clothing—in a word, the mixed refuse—etc., contribute their quota to multiply them. And now to speak of the more mystic causes—these will be manifest upon unfolding facts. "If from the body's purity the mind derives a secret and sympathetic aid," the homes of the wealthier portion of the community should be subject to special vigilance in ascertaining the condition of all bedding, and cause them to be subject to a process capable of fulfilling all its intention, in an economical as well as sanitary aspect. It will, of course, be readily conceded that the necessity of preserving the greatest immunity from all cutaneous and febrile maladies, but others of a more subitle nature demand equal attention. The process employed in manipulating is one simple and effective. 1st. Thoroughly saturating with alkalies of a certain strength. 2d. Submitting the materials to sulphur dioxide in combination with water of a certain specific gravity, so as not to destroy the material. 3d. Well steaming at a pressure of two atmospheres. 4th. Removing to rotary drying chambers, and finally to the dusting machine. By this process, feathers, hair, wool, etc., acquire a freedom from impurities, also elastic properties, and an intrinsic value not to be obtained by other means.

Tinning Iron without Fuel.

A cold process of tinning has been invented by Mr. Daubié, of Bellefontaine, France. The iron is treated by successive immersion in baths containing cold solutions of salts of tin, with the addition of a certain amount of organic matter, such as fecula or starch, which has always been found valuable, both in tinning and galvanization.

The solution patented is thus made: To each 20 gallons of water add 6 lbs. of rye flour, and let it boil for about half an hour; filter it, and afterwards add 212 lbs. of pyrophosphate of soda, 34 lbs. of crystallized salt of tin, 134 lbs. of neutral photochloride of tin, and from 3 ozs. to 4 ozs. of sulphuric acid. When the salts are dissolved the solution is distributed in eight or ten wooden vats, a little additional water being added to the first two or three of the vats. The wire is passed successively through the whole of the vats, and if great brilliancy of surface is required, also through draw plates at intervals, and the wire, while retaining all its rigidity, becomes covered with a brilliantly-polished coat of tin.

Wootz, or India Steel.

In 1819, while Faraday was an assistant in the Royal Institution, he made an analysis of wootz which attracted considerable attention, as, besides carbon, it was found to contain only silica and alumina, from which the conclusion was drawn that the peculiar property of the metal was due to the presence of silicium and aluminum. The uncertain state of analytical chemistry at the time of Faraday, says the *Journal of Applied Chemistry*, has induced Rammelsberg to repeat the analysis of wootz, and he has communicated the results of his work to the Berlin Chemical Society. The following is Rammelsberg's analysis: carbon, 0·867; silicium, 0·136; phosphorus, 0·009; sulphur, 0·002. It will be seen seen that the metal contains no trace of aluminum, and Rammelsberg doubts the existence of such a thing as aluminum steel. It is certain that the usual alloys of aluminum and iron are crystalline and brittle and not at all possessed of the properties of steel.

Aniline Photographs.

The process consists in preparing paper with bichromate of potash, to which some phosphoric acid has been added; when dry, the paper is exposed under a *positive* for a sufficient time, and when removed from the printing frame the picture is held over a dish containing a solution of aniline in benzole. The benzole in volatilizing, carries with it the vapor of aniline, and when the latter comes in contact with the unaltered bichromate on which light has *not* acted, a rich black body is produced, which is believed to be a very stable compound. Washing in water and dilute sulphuric acid now clears the lights of the prints and leaves a paper positive, which is the equivalent of a carbon print.

Improved Sawing Machine.

In the use of the ordinary cross-cut saw, a great waste of muscular power occurs. The weaker muscles of the shoulders and chest are chiefly employed in the propulsion of the saw, while the stronger muscles of the back, hips, and thighs are exerted to maintain the bent and fatiguing position of the body. Nor is this all, the muscles of the shoulders, chest, and arms are employed to great disadvantage on account of the leverage being all against them.

The device shown in our engraving has for its object, first, to relieve the muscles from supporting the body, and second, to add their force to those of the chest, arms, and shoulders in driving the saw, so that the power expended shall all be applied to useful work, except that necessarily absorbed by friction.

The muscles are relieved from supporting the body by seating the operator upon a suitable inclined bench, as shown, having a foot-board against which the feet rest; the position and motion of the body being precisely that of rowing. The hands grasp a cross bar upon one end of a handle or connecting rod, which is hinged to a planet-wheel, at the other end, the sun-wheel around which it revolves being keyed to the shaft of a fly wheel. The proportions of this gearing are such that four revolutions of the sun-wheel to one of the planet wheel are secured.

SMITH'S HAND-POWER SAWING MACHINE.

The fly wheel carries a crank wrist, from which a pitman passes to the saw, and gives it reciprocating motion. The vertical position of the saw in starting is secured by means of a staple driven into the log over the back of the saw, the legs of which support the saw laterally, and give it the proper direction.

The log is moreover connected to the frame of the fly wheel and sun and planet wheels by means of a timber brace having a metallic eye, through which a metallic pivot pin is driven into the timber. The machine is thus supported while it can be moved to cut at any desired angle across the log.

This description definitely applies to the saw only when used for vertical cutting. A slight modification of the parts upon which we need not dwell, adapts it to horizontal cutting in felling timber, etc.

Patented, May 3, 1870, by Addison Smith, of Perrysburg, Ohio, who may be addressed for further particulars.

THE "FARMER" FOUNTAIN.

Our engraving shows an ornamental design for a fountain for the parlor or conservatory, patented by an inventor who has made many improvements in this field.

In form it is an oval vase, 25×19 inches, the base forming a flower-pot, properly drained, in which vines may be planted, and trained up and around it by tying them to the projecting berries, provided for that purpose. The handles are represented by a young lady in an arbor, offering to shake hands.

There are two basins; the upper one of flint glass, shell-shaped, and flat on the bottom, to allow the fishes to sleep; the lower one of metal, rests, by an overlapping curtain, on the rim of the vase.

The pipes supplying the water pass through the stem of the vase. The other parts of the design show sufficiently for themselves.

Patented, July 12, 1870, through the Scientific American Patent Agency, by John Hegarty, of Jersey City, N. J., and manufactured by Eldridge & Co., New Haven, Conn., and 120 Nassau street, New York city, who may be addressed for further information.

What do Your Children Read?

We commend to parents the following from the *Workingman*: "A bad book, magazine, or newspaper is as dangerous to your child as a vicious companion, and will as surely corrupt his morals, and lead him away from the paths of safety. Every parent should set this thought clearly before his mind and ponder it well. Look to what your children read, and especially to the kind of papers that get into their hands, for there are now published scores of weekly papers with attractive and sensuous illustrations, that are as hurtful to young and innocent souls as poison to a healthful body.

"Many of these papers have attained large circulations, and are sowing broadcast the seeds of vice and crime. Trenching on the very borders of indecency, they corrupt the morals, taint the imagination, and allure the weak and unguarded from the paths of innocence. The danger to young persons from this cause was never so great as at this time; and every father and mother should be on guard against an enemy that is sure to meet their child.

"Our mental companions—the thoughts and feelings that dwell with us when alone, and influence our action—these are what lift us up or drag us down. If your child has pure and good mental companions he is safe; but if, through corrupt books and papers, evil thoughts and impure imaginings get into his mind, his danger is imminent.

"Look to it, then, that your children are kept as free as possible from this taint. Never bring into your house a paper or periodical that is not strictly pure, and watch carefully lest any such get into the hands of your growing-up boys."

Hollow Railway Axles.

A recent railway disaster occurred on a railway train at Newark, England, caused by an axle breaking on a freight car, whereby some eighteen persons were killed and a large amount of damage done to property and person. The axle had been in use eighteen years at least; it was 3 ½in. in diameter at the center; up to the boss, 4½ in.; inside the boss or through the wheel, 3 $\frac{15}{16}$ in., and the shoulder was turned up square. The fracture was at the shoulder, showing another instance of the viciousness of the practice of thus turning up axles or other bearings to a sharp shoulder. They should all be rounded off smoothly, thus allowing no chance for the slightest check to be made in the metal. The English press have been discussing the cause of the accident as though it were an entirely new question, but in the United States we have long since discarded the square shoulders to axles and other heavy bearings. Sir Joseph Whitworth, in discussing the question of the best method of detecting unsoundness in railway axles, says: "The best method that can be adopted for the purpose is that of drilling a hole through the center of the axle, throughout its length, thus opening up to inspection and examination that part of the material which, in the case of ordinary manufacture, is most subject to unsoundness. The hole should be about one inch in diameter, and, with suitable mechanical arrangements, might be drilled at an average cost of about 1s. 6d. per axle. With the outside turned, and the inside thus exposed to view, a serious flaw in an axle, which is only about 4½ inches in diameter, could hardly escape discovery. The plan would also diminish the tendency of the axle to get heated, and by removing the material near the neutral axis, would, under the circumstances, reduce the internal strains and render the axle safer. It is of great importance both to give proper diameters to every portion of the length of the axle, and to avoid all approach to sudden change of diameter."

The suggestion is a good one, and we commend its practice to our engineers and mechanics.—*Railway Times.*

The Mystery of Life.

It is a simple matter of fact and of every day observation that all forms of animal work are the result of the reception and assimilation of a few cubic feet of oxygen, a few ounces of water, of starch, of fat, and of flesh. In a chemical point of view man may be defined to be something of this sort. That great authority, Professor Huxley, has lately been discussing what he calls "protoplasm," or "the physical basis of life." He seeks for that community of faculty which exists between the mossy, rock-incrusting lichen, and the painter or botanist that studies it; between "the flower which a girl wears in her hair and the blood which courses through her youthful veins." Mr. Huxley finds it in the protoplasm, the structural unit of the body, the corpuscle, the spheroidal nucleus, which, in their multiples, make up the body or the plant. But unless his statement is limited and guarded some color for materialism may be afforded by it. These make up the body, but, nevertheless, they are not the body. Suppose, to illustrate, we take the letters of the alphabet, *a, b, c, d,* we might similarly argue that because these letters occur in mathematics, metaphysical writings, and in comic songs, there is therefore something essentially mathematical, metaphysical, and comic about these letters. Again, Professor Huxley has not proved, and it is impossible for him to prove, that these protoplasms may not have essential points of difference. The facts of organic life cannot be interpreted by the ascertained laws of chemistry and physics. Physiologists cannot tell us how it is "of four cells absolutely identical in organic structure and composition, one will grow into Socrates, another into a toadstool, one into a cockchafer, another into a whale"

ANDERSON'S OIL SAFE.

Our engravings illustrate a device for the safe keeping and storage of oils or other inflammable liquids, patented, by G. D. Anderson, September 1, 1868, and which, we are informed, has come into extensive demand. It is intended to supply a want long felt in retail stores for a suitable receptacle to contain kerosene and other inflammable liquids.

Fig. 1 is a perspective view, and Fig. 2 a section of the safe. The construction is very simple. The general appearance is that of a refrigerator The oil is contained in a metallic vessel, which is inclosed in a wooden case. The interior vessel is of zinc with double-soldered joints. The bottom is made to incline from each end toward the middle into a groove, from the lowest point of which the faucet issues This structure prevents all clogging and deposit of sediment.

Fig. 1.

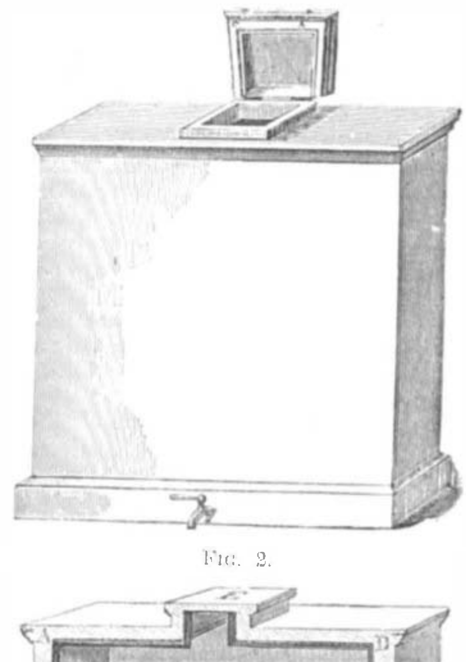
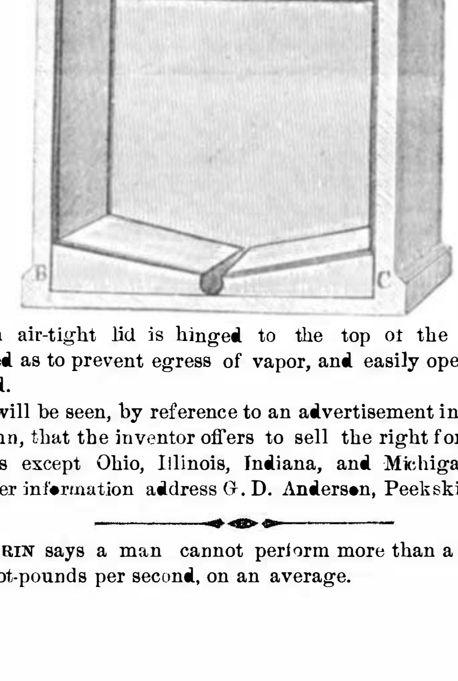


Fig. 2.



An air-tight lid is hinged to the top of the safe, so packed as to prevent egress of vapor, and easily opened and closed.

It will be seen, by reference to an advertisement in another column, that the inventor offers to sell the right for all the States except Ohio, Illinois, Indiana, and Michigan. For further information address G. D. Anderson, Peekskill, N. Y.

Morin says a man cannot perform more than a work of 58 foot-pounds per second, on an average.